

APPENDIX A

**PUBLIC COMMENT MATRIX
AND CORRESPONDENCE**

[This page is left intentionally blank]

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

COMMENTS FROM PUBLIC SCOPING MEETING APRIL 27, 2016					
Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
1	Kenneth Erwin	Self	I am a resident of Foxcroft Heights neighborhood just to the west of the project western boundary. I have been a resident here on Oak St for more than 14 years. Unfortunately, I will not be able to attend the public scoping meeting on April 27th so I am submitting these comments for your consideration regarding the project. First, thank you for following the NEPA process and especially for sending me the pamphlet to my house. I appreciate the opportunity to provide comments and partake in the process. One thing that is not clear on either the pamphlet or the website is how the roads will be changed. Where will Columbia Pike go? What will happen to the current area that is occupied by Southgate Road? What type of pedestrian or bicycle access will the project provide for travel from the west and north portions of the project to the Pentagon memorial and the bike trail that goes along Washington Blvd north towards Memorial Bridge? This is very important. The current layout on the pamphlet and website makes it appear as if the current access to the area will be cut off (i.e. the route of walking east on Southgate Road to Columbia Pike and then under Washington Blvd to the Pentagon Memorial). It is very important to make sure that there is access to the Pentagon Memorial along the northern part of the current project. Forcing eastbound pedestrian or bicycle traffic to go under the interstate (south along current Joyce Street) then walk left along the parking lot (North of Pentagon Row and south of 395) and up to the tunnel back under 395 (heading north) to get to the Pentagon memorial and bike trail would create real problems. Finally, what will the state and county get in exchange for the Southgate Road and Columbia Pike roadways? Will the federal government exchange land of equal square footage to the county in a different area of the project?	See Sections 2.3 and 3.10. Also, Figures 2-1, 2-4, 2-15, 3-9, and 3-10. Response Update 2019: Additional discussion has been added to Section 3.10 regarding the bicycle and pedestrian trails. Also, there will be no land exchange; the Army is working with the County to acquire the County-owned property necessary for the project. The Pentagon Memorial is a separate project and this project will not preclude access to it. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI.	
2	Maria Durgan	Self	I love the cemetery and my grandparents are all buried there. I live in Penrose and I love to walk through it. The plans are really nice. I think they will work out nicely. I strongly recommend two things: 1. an entrance to the cemetery by the Henderson Gate. Persons who live close by in S. Arlington need the same kind of access that is afforded to North Arlington near Iwo Jima. I will push for this Loudly. All Arlingtonians who live within walking distance need the ability to visit this beautiful & significant place. It's a treasure.	See Section 2.2 and Figures 2-5 and 2-15. Response Update 2019: Elements of the final design are still under consideration. Pedestrian access is now planned in the vicinity of the Air Force Memorial.	
3	Terri Armao	Self	Create a new ceremonial tradition that eliminates the need for a caisson to carry cremated remains.	This is an ANC policy decision; not a part of the proposed action.	
4	George Fioliozzi	Self	The involvement of VDOT and Arl. Co. governments ensure this project will fail. Much as the reconstruction of the new Washington Blvd Bridge, the local residents will be ignored and the project will go on and have a negative impact on the adjacent community. I oppose the project and will continue to do so until the state takes responsibility for the noise that has resulted from the bridge project. The state + county have zero credibility. I will vocally oppose this project as I believe we're not being provided with <u>all</u> the info we should have.	See Section 3.3-Noise	
5	Brian A Glenn	Self	Provide parking area for Air Force Memorial; Design Columbia Pike cross-section to not preclude future streetcar; Consider using Arlington County property for ART bus & future streetcar storage & maintenance facility; Support parking for 9/11 Pentagon Memorial; Support access road from Southgate Rd/Hobson Dr to Columbia Pike w/ adequate separation from residential property.	See Section 2.3; also Figures 2-3 and 2-5. Response Update 2019: Parking and traffic/ transportation are discussed in Section 3.10. A parking area has been added across Columbia Pike from the Air Force Memorial. Also, there will be no land exchange; the Army is working with the County to acquire the County-owned property necessary for the project. The Pentagon Memorial Visitor's Center is not part of this project, and it has not been designed at this time. Access requirements will be determined at a later date.	
6	Betty Siegel	self	Need convenient, easily accessible for older adults parking at the Air Force Memorial. One of my 89 yr old mothers favorite things to do on a Friday night is attend the free air force band concerts. The parking is already inadequate & whatever is lost needs to be replaced/expanded, please!! They can get 200 to 300 people of <u>all</u> ages & it is lovely!!	See Section 2.3 and Figure 2-5.	
7	Terri Armao	Self	1. Southgate Road should not be closed. It is direct access to 395. 2. Col. Pike should NOT be narrowed. Bus is 10 ft- that leaves 1 foot clearance. Dangerous! 3. Losing trees on north side of Col Pike. 4. To make wider sidewalk makes our neighborhoods UGLY! 5. Grading - icy roads? 6. Arl. Museum space? 7. When will cemetery expansion end? *we need schools & parks 8. Tighten restrictions on Arl. Cem. burials.	See Figure 2-1, 2-3, 2-4. Realigned roadways would meet VDOT and AASHTO guidelines.	
8	Margaret Alvord	Self	1. Col. Pike should not be narrowed - It is difficult for a car driver when a bus or large truck is in the adjacent lane. Very dangerous. 2. Oppose the multi purpose sidewalk plan on the north side of Col Pike from Rolfe to Wayne - loss of many mature locust trees. Arl. Cty needs to outline intent of purpose for land swap. I do not think that Col Pike should be changed. The hill serves to slow traffic.	See Section 2.3 and Figures 2-1 and 2-3. Realigned roadways would meet VDOT and AASHTO guidelines. Response Update 2019: There will be no land exchange; the Army is working with the County to acquire the County-owned property necessary for the project.	
9	Stefanie Pryor	Self	Clarify grade - during icy roads this is raceway. Buses are 10.5' wide so 11' wide streets are too narrow. Good news is that curve not as harsh but buses still moving out into the other passing lanes. Clarify parking & signs for cemetery visitors & AF Memorial visitors. Clarify truck access for the service area. Where is space for Arl Museum? Clarify bike lanes into Pentagon Reservation. Utilize trip pads for the street light; concern 110 traffic coming off US the local Col Pike eastbound into Reservation; clarify land swap process - who would make decision? combo of Senate, House, Dept of Army/ANC? Clarify how the gas station was remediated & if still [has] problems; clarify pedestrian access to AF Memorial ppl walk up the other sidewalk & then realize they have to cross - likely to have underground water / 1 of streams near Ft Myer	See Section 2.3 and Figures 2-1 and 2-3, and Section 3-10. Realigned roadways would meet VDOT and AASHTO guidelines. Response Update 2019: There will be no land exchange; the Army is working with the County to acquire the County-owned property necessary for the project. Parking across from the AFM is part of the Preferred Alternative.	
10	Lance Allen	Foxcroft Heights Civic Assoc.	Most of the concern of the people who live in the Foxcroft Heights neighborhood (incl. S. Orme, S. Ode, and S. Oak) is the traffic flow through the neighborhood. The traffic in and out of Fort Myer is terrible and is a daily problem - particularly in the morning and early evening. With respect to the ANC/ARL land-swpa, our main concern is how traffic will flow after Southgate is closed. If another road is built, we need to ensure that there is no adverse affect on our small neighborhood which already bares the brunt of the area's traffic problems.	See Sections 2.2 and 3.10 and Figure 2-1. Response Update 2019: In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization.	
11	Louise Flynn	Self	Please consider extending the bike lane on the north side of the cemetery such that extends to Columbia Pike adjacent to the Cemetery. Currently the path requires riders to cross the highway at several locations in order to go from Rosslyn south to the Columbia Pike area. This increases traffic and puts bike riders at risk. A continuous bike path from Columbia Pike to Rosslyn would provide multi-modal access to the cemetery and provide aesthetic benefits.	Arlington County's "Wall Trail" was looked at, but it appears to have severe constraints due to aboveground utilities. Response Update 2019: The regional bike/ped trail will not be severed. Roadway crossings will remain.	

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
12	Michael Servello	Self	1. I helped 5 people including myself buy 5 single family homes on Oak Street facing the Navy Annex - "PLEASE DON'T BLOCK VIEW" 2. Maybe put trees in between houses so homes don't lose the view.	Landscaping will be part of the cemetery design. Response Update 2019: The Cemetery is being carefully designed and attractively landscaped to maintain the aesthetic and historical character of ANC. See Section 3.14.	
13	Adam Henderson	Douglas Park Civic Association	Sooner than later... Address safety of S Joyce/Southgate/Col Pike intersection; Retain Arl Cemetery South Boundary Wall in Current position.	Traffic safety is discussed in Section 3.10. The boundary wall is discussed in Section 2.3. See Section 2.3 and 3.10, and Figures 2-1, 3-9, and 3-10. Response Update 2019: In addition to the previous traffic study, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI.	
14	Bruce Marshall	Self	*Keep Boundary wall at Cemetery but cut pedestrian access paths. 911 Pentagon Memorial - ensure easy access via pedestrian & bike paths. Clear markings for car & bus parking.	The boundary wall is discussed in Section 2.3. Response Update 2019: The Pentagon Memorial Visitor's Center is not part of this project, and is not designed at this time. This project will not preclude bicycle and pedestrian access to the Visitor's Center; however actual access requirements will be determined at a later date.	
15	John T. Michel	self	New public road from Columbia Pike to Southgate Rd: Provide curbing & possibly break in curbing so I can pave my backyard. I'm the last row of houses on east side of Oak. Mandatory (Please) to keep magnificent red stone wall on south side of existing ANC & Southgate Rd. If there is going to be a privacy wall on east side of new road between Columbia Pike and what's remaining of Southgate Road make it as short as is allowed. Thanks.	See Section 2.3.1 and Figure 2-1. Response Update 2019: Access to residential properties from Southgate Road connector is not part of the Proposed Action.	
16	Dr. Drue Shropshire Guy	Black Heritage Museum Arlington	A great concern is that the Black Heritage Museum Arlington will be swallowed up in the needs of the cemetery which will negate the cultural, environmental, historical, and educational value of this very rich area and community. Memories, sites, and activities will vanish if there are not museums to provide places, artifacts, etc for future residents. Be careful to not lose our <u>history</u> - we can not afford to replace the <u>history</u> . Provide green spaces for the BHMA along w/ the Arlington Historical Society.	See Section 3.7. Response Update 2019: In addition to Section 3.7, please see the Memorandum of Agreement to address adverse effects to and mitigation for cultural resources. It is found in the Appendix of the EA.	
17	Daniel Woo	Self	Concerned about noise and speed on access road. Also, what parking will remain so it doesn't overflow to neighborhood.	Noise is discussed in Section 3.3 and 3.10	
18	Bill Goodwin	Self	Please provide a convenient pedestrian entry into the cemetery such as the low fence now near S Gate Rd & Oak St.	See Figure 2-1, 2-2, and 2-5.	Pedestrian access is now planned in the vicinity of the Air Force Memorial.
19	Doris C. Eichorn	Self	I had a lot of my questions answered. Thanks.	No response.	
20	Sarah McKinley	Columbia Height Civic Assn.	As a community leader in South Arlington I believe that my civic association would support the land swap, realignment of Columbia Pike, the creation of a new street to support military traffic (and relieve traffic problems on S. Orme Street). This plan would also free up space South of Columbia Pike for development possibilities.	See Section 2.3 and Figure 2.1, and 2.2.	There will be no land exchange; the Army is working with the County to acquire the County-owned property necessary for the project.
21	Charles Bynum	St. John's Baptist Church	Well done.	No response.	
22	Joe Leonard, OUSD Comptroller, Engine Room	Self	I am writing to give some feedback to the proposal of the Southern Expansion Road realignment. As a current Arlington resident and DoD/Pentagon employee I would just like to give my feedback on the need for proper bike and pedestrian access lanes in your proposal for road realignment. I have attached a link to the Arlington bike map and if you look at the map most of Columbia Pike is marked as a "Route strongly discouraged" to use even though Columbia Pike is the only access for a large amount of travel to the Pentagon. On the map linked below South Gate road is the safer and less car congested route for pedestrians and bicyclist to access the base, memorials and Pentagon. If the road realignment causes the South Gate road to be removed completely then access to a safer route for pedestrians and bicyclists should be taken into consideration when designing the new access way that goes around the expansion of Arlington National Cemetery. Hopefully by implementing a safe and effective way for pedestrians/bicyclists to access these important areas then hopefully it can lead to a safer environment for everyone in the future. Thank you for providing an avenue to give feedback to such an important change in our area. http://www.bikearlington.com/pages/maps-rides/	See Sections 2-3 and 3.10, and Figures 2-1, 2-2, and 2-3.	In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. Elements of the final design are still under consideration. Traffic and transportation are discussed in Section 3.10. In addition, please see the response to Comment #16, under the Draft EA comments and responses.

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
23	Travis Mayo	Self	<p>My name is Travis Mayo and I'm the home owner of 900 S Ode St. Living in Foxcroft Heights, the decisions made for this development will have a daily impact on my life, from accessing and leaving my street, to the property value of my home, and to the safety of my child. For these reasons, please take the following points into consideration for the expansion plans.</p> <p>Pedestrian and Vehicle Traffic – the closure of Southgate Rd. will create a considerable increase in traffic for the community of Foxcroft Heights. I implore the design committee to take into consideration the ramifications an increase in traffic will have on our small community and offer the following comments and suggestions:</p> <p>a. The main Fort Meyer gate is already creating a significant bottleneck for traffic in our community. Due to increased security measures instituted over the last 18 months (approximately), the gate entrance has created large lines of cars backing up Orme st and Southgate road, which impedes local residents from using the roads. I suggest removing the parking lane currently in use approaching the gate and transform this into a dedicated lane for entrance into the base. I suggest that traffic coming down Orme st for the purpose of entering the base be forced to make a right at the end of the street, and then provided with a turn around area to enter the dedicated base entry lane. This would help solve the issue of base traffic backing up Orme St and Southgate Rd. A second option is expanding the number of entry points at the gate to create a second entry lane.</p> <p>b. If, as proposed, a new road is created on the north-east side of Oak st for the use of access to Fort Meyer – a critical consideration is enforcement. How will traffic into and out of the base be funneled onto this road? I encourage planners to ensure drivers are motivated to use this dedicated access road by making it the fastest way in and out of the community, to make clear and visible signs prohibiting base traffic from using Orme, Ode an Oak, and if needed, placing speed abatement measures along Orme, Ode and Oak.</p> <p>c. As a resident of Ode St, I know that within the past 10 months there have been at least three babies born to families on our street, with many more children already living in the community. This is emblematic of the overall demographic of Foxcroft Heights. We have many families with young children, our houses are situated very close to the streets and we have no sidewalks on our roads. These issues combine to make traffic reduction and speed easement a very high priority. Please take these factors into account when planning new traffic patterns.</p> <p>d. A daily proportion of vehicular and pedestrian traffic travelling on Southgate Road are tourists looking for an entrance into Arlington Cemetery. With the closure of Southgate, this traffic will likely start coming through the roads of Foxcroft Heights. To prevent this, I recommend signs along Joyce st, Colombia Pike, and around the Pentagon Memorial guiding tourists to the entrance of Arlington Cemetery.</p> <p>e. Southgate road is currently used as thoroughfare for cyclists commuting along Columbia Pike. With its closure, it will be important to ensure the sidewalks along Columbia Pike are improved and widened to allow for an increase in traffic. Given the steep hills along this route, an ideal solution is to create a dedicated bike lane along this portion of Colombia Pike.</p> <p>f. The traffic lights installed during the reconstruction of the Washington Blvd bridge over Columbia Pike have created unnecessary traffic and delays. With the closure of Southgate road these delays will only increase. I implore Arlington County to reassess the timing, placement, and necessity of these traffic lights. The highest priority fixes would be to a) remove the light for traffic entering West bound Colombia Pike (after exiting Washington Blvd). This is an unnecessary light that could just as easily be served with a yield sign and merge area; b) East bound traffic on Columbia Pike making a left onto Orme St – currently traffic is not allowed to make a left unless there is a green arrow, this should be changed to allow for left turns with a yield to oncoming traffic; and c) the timing and sequencing of lights surrounding the bridge needs to be reassessed.</p> <p>g. One of the great traditions within the Foxcroft Heights community is hosting 4th of July parties. Our access to the viewing of the fireworks from the Air Force Memorial makes this area a draw for hundreds if not thousands of local residents. Enjoying the 4th of July fireworks from our nations capital in such close proximity to Arlington Cemetery is a very inspiring and unique experience. In the design of the expansion, I encourage you to take into account the many families who have made a tradition of enjoying the fireworks and honoring our country from the hill surrounding the Air Force Memorial.</p> <p>Thank you for consideration of these comments and recommendations and look forward to continuing to work with you.</p>	See Sections 2-3 and 3.10, and Figures 2-1, 2-2, and 2-3.	In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. Improvements to Orme, Ode, and Oak Streets and creating a dedicated lane for JBMHH traffic are a County decision.
24	Donna DeFelice	Self	<p>As a long-time resident of Arlington (33+ years) living just a few blocks from the Arlington National Cemetery Southern Expansion project, I was thankful to have an opportunity to attend the recent Open House event held on April 27 to display and discuss the proposed plans. In lieu of leaving a "Comment Card", I am writing this letter. I am an energetic advocate for this expansion and discussed with representatives my wish that there could be a pedestrian pathway that would grant access to this southern portion of the cemetery as well as lead into the adjacent and, what will then be connected, greater cemetery. I would like to see pedestrian access become an option for everyone who would otherwise have to drive into the cemetery through its main entry, access metro, or find some other transportation through the main gate. As I imagine the cemetery landscape will be connected via a roadway that would be utilized for service vehicles and potentially a circulator vehicle/tourmobile, a pathway alongside for pedestrians would be easy to accomplish. The concern, I imagine, may relate largely to how you would achieve a "secure" access. The Air Force Memorial already has a security "gate" of sorts for pedestrian access. Once through that, in partnership with that Memorial could a pedestrian continue into the cemetery? Or could a security point be considered elsewhere if that is not feasible? This would all require an assessment of thus where "fencing" must exist to retain the desired level of security overall for the enlarged cemetery. I believe that anything that can be done to enhance visitation to this tranquil and hallowed ground should be explored. I hope you will give my thoughts some consideration.</p>	See Section 2.3 and 2.5.1. Also Figure 2-1 through 2.5, and 2.15.	Pedestrian access is now planned in the vicinity of the Air Force Memorial. Elements of the final design are still under consideration.
25	Arthur Fox, Lobel, Novins & Lamont, LLP	Arlington Ridge Civic Association	<p>I write on behalf of the Arlington Ridge Civic Association which represents citizen-property owners on the opposite, or southern side of I-395 from the site under consideration. We support the proposed realignment of Columbia Pike and the land-swap between Arlington Cemetery. Although it does not directly affect our immediate neighborhood, our residents do regularly travel on that portion of Columbia Pike and Joyce Street that will reconfigured in an eminently sensible manner. Further, we consider the land-swap to be a win-win for both the County and the Cemetery which will each end up being able to constructively utilize land for their respective purposes which is not possible under the current status quo. And we are aware of no negative consequences from an environmental standpoint.</p>	See Figure 2-1 and 2-4.	There will be no land exchange; the Army is working with the County to acquire the County-owned property necessary for the project.

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
26	Alison MacDonald		Thank you for the opportunity to comment on the Arlington National Cemetery southern expansion project and associated roadway realignment. As a homeowner in the Penrose neighborhood who often commutes on foot to and from the Pentagon Metro station, I am particularly pleased to see that the project plans include a 5.5 foot buffer between the sidewalk and the travel lanes on Columbia Pike between S. Orme St. and S. Joyce St. At present, the stretch of sidewalk on the north side of Columbia Pike between S. Orme St. and S. Joyce St. is very narrow, and it is not separated from traffic. As a result, the sidewalk is completely terrifying for pedestrians during rush hour, especially when westbound buses pass the blocks just west of the Air Force Memorial. A 5.5 foot buffer between the sidewalk and travel lanes would be a very welcome improvement, and I urge you to retain this aspect of the plan as you move forward. I also urge you to maintain safe pedestrian access between the intersection of S. Orme St and Columbia Pike and the Pentagon as you move through the planned two-year road construction phase. Currently, I use Southgate Road between Orme St. and S. Joyce St. to avoid the narrow sidewalks on Columbia Pike. It would be very helpful if you continued to allow pedestrian access on Southgate Road until the new separated sidewalk is completed on Columbia Pike. Thank you for your consideration.	See Figure 2-1 through 2-5. the construction phasing has not been completed at this time.	Pedestrian, bicycle, and vehicular travel may experience delays during construction.
27	Maria "Pete" Durgan	Penrose Neighborhood Assn. President	I went to the meeting last night. I think the plan looks great. Here are my suggestions: 1. We need an entrance to the cemetery that will serve pedestrians from Columbia Pike. This should be similar to the one that is close to the Iwo Jima memorial. I recommend that it be close to the Henderson Hall entrance for easy access. This is particularly necessary since we no longer can walk through Fort Meyer to enter by the Old Chapel, which I did for years. South Arlington needs easy pedestrian access. 2) Henderson Hall entrance cannot be closed. The 2nd Street entrance to Fort Meyer is too small to accommodate all the traffic. When there's a big funeral, 2nd Street and South Court House Road are impassable. This cannot be allowed to happen. 3) The road proposed to go from Columbia Pike to the Henderson Hall entrance must be a 4-lane road to accommodate the traffic at that gate. If it is any smaller, you will see backups spilling out to Columbia Pike. This would completely ruin the perception of improvements to the Pike. I love the cemetery, and support the expansion. Both sets of my grandparents are buried there, and I live close enough that I can walk there. It's a treasure and more people need access. I recommend more columbaria rather than in-ground graves if you want this to serve the country longer than 20 years.	See Section 2.3 and Figures 2-1 through 2-5. These are conceptual roadway cross sections. Final design has not been completed.	Pedestrian access is now planned in the vicinity of the Air Force Memorial. Elements of the final design are still under consideration. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. Traffic issues are discussed in Section 3.10.
28	Bettina Sullivan, DEQ Program Manager, Environmental Impact Review and Long-Range Priorities	Virginia Department of Environmental Quality Office of Environmental Impact Review(OEIR)	DEQ-OEIR is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to NEPA, and responding to appropriate federal officials on behalf of the Commonwealth. Similarly, DEQ-OEIR coordinates documents prepared pursuant to the Coastal Zone Management Act, which applies to all federal activities which are reasonably likely to affect any land or water use or natural resources of Virginia's designated coastal resources management area must be consistent with the enforceable policies of Virginia Coastal Zone Management Program. We request one electronic copy and two hard copies of the NEPA document; document needs to include a USGS topo map, and preferably in shapefile. We are providing notice of your scoping request to the following Virginia agencies: DEQ (Regional Office, Air Division, Office of Wetland and Stream Protection, Office of Local Government Programs, Division of Land Protection and Revitalization, Office of Stormwater Management), DCR, DOH, DOACS, DGIF, VMRC, DHR, DMME, DOF, DOT. (NOTE: This is just an excerpt of this letter. The full letter will be included in the appendix of this document.	See Section 3.5.1.6.	Noted. A federal consistency determination was prepared in accordance with the CZMA, was submitted to VDEQ, and received concurrence on May 17, 2018. The project sponsor will comply with all applicable state-federal environmental regulations.
29	Wenonah Haire/Caitlin Totherow	Catawba Indian Nation	We wish to be a consulting party for Section 106. We also require hard copies of project information.	Noted. This organization was invited.	
30	Andrew Beacher	VDOT Northern Virginia District	We wish to be a consulting party for Section 106.	Noted. This organization was invited.	
31	Rebecca Ballo	Arlington County	We wish to be a consulting party for Section 106.	Noted. This organization was invited.	
32	Matt Virta	National Park service, George Washington Memorial Parkway	We wish to be a consulting party for Section 106.	Noted. This organization was invited.	
33	Andrew Ammerman	Pentagon Memorial	We wish to be a consulting party for Section 106.	Noted. This organization was invited.	
34	Mark Eversole, VMRC	Virginia Marine Resources Commission	Should any impacts be planned to any tidal or non-tidal streams, then permit may be required by the Marine Resources Commission.	The project sponsor will comply with all applicable environmental regulations.	There are no tidal or non-tidal streams; therefore, no permit will be required.
35	Susan Bachor	Delaware Tribe of Indians	We do not wish to enter into consultation on this project. The area of the proposed work is outside of our current areas of interest.	No response required.	
36	Katy Dacey, DEQ,	Virginia Division of Land Protection and Revitalization	All of the information that is listed in the letter sent to you, dated April 20, 2016, from Bettina Sullivan of this Department address all DLPR comments at this time.	No response required.	

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
37	Gerald J. Laporte (POC Karl VanNewkirk--President)	Arlington Historical Society	We wish to be a consulting party for Section 106.	Noted. This organization was invited.	
38	Steven Lopes	self	I am a resident of Foxcroft Heights at 707 S. Orme Street and attended your public meetings at the Sheraton Hotel on April 27th. After reviewing the expansion plans, I offer the following comment: the plan needs to include a dedicated road to provide access to Joint Base Myer/Henderson Hall that effectively isolates JBMHH traffic from the residential streets of the neighborhood. Eliminating the eastern portion of Southgate Road will push more traffic on to Oak/Ode/Orme Streets. In fact, most traffic coming from the west on Columbia Pike or 395 will be inclined to enter the base via Orme Street. Base traffic on Orme Street is already unbearable during the morning rush hour, most weekends, and holidays or special events. Most days I can't back out of my driveway as cars backup at the stop sign waiting for the guards to clear entering vehicles. And many drivers don't have the common courtesy to let residents enter and exit their own driveways. The new light at the Columbia Pike/Orme Street intersection further exasperates the problem as traffic leaving JBMHH typically turn right onto Orme Street and frequently speed down the street attempting to arrive at the stop light before it turns red. Any plan that does not isolate JBMHH traffic from the residential neighborhood will be unacceptable.	See Sections 2.3 and 3.10, and Figures 2-1, 2-3, 3-9, and 3-10.	In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. However, neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. This is a County decision. Traffic and transportation issues are discussed in Section 3.10.
39	Dale Drysdale		Please bring to the attention of all relevant parties the presence of a cultural resource near to or possibly within the Project area: portions of the former Alexandria Canal. The exact path is uncertain; any remnants may lie outside of the Project area. Preliminary estimates place the Canal's path under the west flank of the Pentagon; but this is uncertain. Please see attached GIS overlay, which was created with a modern street map and various historical maps roughly depicting canal's path. Alexandria Canal ran for approximately 7 miles through present-day Arlington County and Alexandria, from its intersection with the C&O Canal in Georgetown to its terminus in Alexandria where it joined the Potomac River. The Canal operated from 1843 to 1886, Its significance to the cultural history of the area is documented elsewhere (Cites: 1. "Office of Historic Alexandria{VA}, Department of Planning and Community Development & Alexandria Archeology. "Alexandria Canal" undated brochure. 2. Hahn T.S. And E.L. Kemp 1992 "The Alexandria Canal: Its History and Preservation..." Once abandoned, it was gradually filled in and most of it disappeared from view; there are few if any visible remains of the Canal except those excavated and exquisitely restored in Old Town Alexandria. If evidence or remnants of the Canal are discovered within the Project Area, reasonable steps should be taken to notify appropriate archeological authorities, and ensure that any features are properly documented and any artifacts recovered. (I.e. soil profile may reveal evidence of the initial excavation and subsequent refilling, and masonry work could still be present that once lined portions of the Canal walls. It would be particularly important to document the precise location of any such remnants to assist in the more accurate determination of the Canal's path.	The Georgetown & Alexandria Canal ran east of the project area, through the Pentagon site and, therefore, was outside of the development area. There would be no impacts to this resource.	
40	Richie Singh	Self	I am a property owner in Foxcroft Heights, and I want to provide some input for the upcoming cemetery expansion. I also invite a survey team to enter my property to take measurements to help with the planning process. Natural barriers, such as hedges should be used instead of concrete barrier wall. The landscaping should be dense enough to discourage people from walking through. Additional large growth trees should be planted to increase privacy to the residences and provide additional sound dampening for Arlington Cemetery. Natural barriers should be high enough to provide privacy to residents. Sound dampening should be considered when implementing materials, both for residents and Arlington Cemetery.	See Section 3.14.	Landscaping and other project elements have not been finalized.
41	Richie Singh		Neighborhood alleyway: The residents' alleyway should be widened for safety and critical access reasons. The widening should NOT come to cost of lost burial grounds. The widening should only comply with ADA standards, and with first responders minimum requirements.	No neighborhood alleyways in the Foxcroft Heights neighborhood would be impacted. See Figures 2-1 and 2-15.	
42	Alli Baird, DCR Locality Liasion	Virginia Department of Conservation and Recreation/Division of Natural Heritage	DCR has searched its Biotics Data System for occurrences of rare, threatened, endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations. According to our files, the wood turtle (Glyptemys insculpta, G3/S2/NL/LT) has been documented downstream in Four Mile Run. The wood turtle (State threatened) inhabits areas with clear streams with adjacent forested floodplains, and nearby fields, wet meadows, and farmlands.. Since this species overwinters on the bottoms of creeks and streams, a primary habitat requirement is the presence of water. Threats include habitat fragmentation, urbanization, automobile mortality. To minimize adverse impacts, adhere to strict E & S and stormwater management laws/regs. Recommend coordination with VDGIF, Virginia's regulatory authority, for management/protection of species (Ernie Aschenbach (804-367-2733/Ernie.Aschenbach@dgif.virginia.gov); also recommend contacting him for anadromous fish and trout stream information. The project will not affect any documented state-listed plants or insects. There are no State Natural Area Preserves in the project vicinity.	See Section 3.6.	The project sponsor will comply with all applicable state-federal environmental regulations.
43	Daniel Burstein, DEQ Regional Enforcement Specialist, II (NOVA)	Virginia Department of Environmental Quality, Land Protection Division	The project manager is reminded that if any solid or hazardous waste is generated/encountered during construction, he would follow applicable federal, state, and county regulations for their disposal.	See Section 3.13.3.1.	The project sponsor will comply with all applicable state-federal environmental regulations during construction.

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
44	Daniel Burstein, DEQ Regional Enforcement Specialist, II (NOVA)	Virginia Department of Environmental Quality, Air Compliance	The project manager is reminded that during the construction phases that occur with this project; the project is subject to the Fugitive Dust/Fugitive Emissions Rule 9 VAC 5-50-60 through 9 VAC 5-50-120. In addition, should any open burning or use of special incineration devices be employed in the disposal of land clearing debris during demolition and construction, the operation would be subject to the Open Burning Regulation 9 VAC 5-130-10 through 9 VAC 5-130-60 and 9 VAC 5-130-100.	See Section 3.17.1	The project sponsor will comply with all applicable state-federal environmental regulations during construction.
45	Daniel Burstein, DEQ Regional Enforcement Specialist, II (NOVA)	Virginia Department of Environmental Quality, Virginia Water Protection Permit Program	The project manager is reminded that a VWP permit from DEQ may be required should impacts to surface waters be necessary. DEQ VWP staff recommends that the avoidance and minimization of surface water impacts to the maximum extent practicable. Upon receipt of a Joint Permit Application for the proposed surface water impacts, DEQ VWP Permit staff will review the proposed project in accordance with the VWP permit program regulations and current VWP permit program guidance. The project manager is also reminded to follow all applicable regulations related to stormwater management and erosion and sediment controls.	There are no impacts anticipated to surface water. See Section 3.5.	
46	George Fioliozzi	self	I am opposed to the project as currently proposed. Based on recent history with the involved agencies, project will cause significant traffic, parking, and noise impacts to the community of Arlington View.	See Chapter 3: Affected Environment and Environmental Consequences (Sections 3.3 and 3.10).	Section 3 of the Draft EA discusses and analyzes the existing conditions of the area and potential impacts from the proposed development. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. A parking area is proposed across from the AFM.
47	George Fioliozzi		In 2006, VDOT, FHWA, and the County built a replacement bridge to replace the Washington Blvd bridge over Columbia Pike at the Route 27/244 Interchange. Despite numerous concerns expressed in advance by neighboring communities, the project resulted in a dangerous traffic configuration, including: confusing signage, unneeded traffic signals, new traffic backups onto 395 and considerable traffic delays within the Arlington View community. Heavily wooded area needlessly cleared for the project. Same three governmental agencies responsible for these failed outcomes and the failed traffic configuration are coordinating with the Corps for the roadway realignment project related, which causes considerable consternation.	See Section 3.10 for discussion of traffic and transportation.	The 2012 Arlington County traffic study determined a level of service of D (acceptable) or better during both AM and PM peak travel times for future build years 2018 and 2038.
48	George Fioliozzi	self	The removal of the cloverleaf interchange and installation of a new signalized interchange at Columbia Pike adjacent to the Pentagon parking area will encourage traffic to remain on Washington Boulevard instead of utilizing the Columbia Pike ramp. The traffic remaining on Washington Boulevard will likely continue onto the Interchange at Washington Boulevard and Columbia Pike. This additional traffic will greatly impact traffic operations at the Interchange. In addition and more concerning, the removal of the ramp from the Pentagon parking lot onto Washington Boulevard will cause traffic heading in that direction during peak rush hours to travel along Columbia Pike to the Washington Boulevard Interchange and make a U-turn onto the ramp adjacent to Arlington View to avoid rush hour traffic jams. This Interchange is poorly configured to accept new traffic, particularly at the level to be expected from the proposed configuration. Alternative plans need to be developed to resolve the expected traffic from the Pentagon area. I respectfully request the scope of the project be expanded to include the impact the project will have in particular on traffic at Rt 27/244 Interchange.	See Section 3.10 for discussion of traffic and transportation.	Replacing the cloverleaf interchange with a tight-diamond interchange design will not negatively affect traffic patterns in this area. A discussion of traffic conditions, safety, ramps, and queuing are discussed in Section 3.10 of the Draft EA. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI.
49	George Fioliozzi	self	As a result of the disastrous reconfiguration of the Route 27/244 Interchange by VDOT, and the decision to eliminate the noise wall along the ramp leading from Columbia Pike to Washington Boulevard, the Arlington View community continues to be negatively impacted by substantial and unbearable noise from traffic. Despite concerns raised during the development of the project, VDOT continued to assert there would not be a considerable impact. I have had the windows of my home facing the ramp boarded up for over 5 years to mitigate noise. Alternative plans need to be developed to resolve the additional noise resulting from the proposed elimination of the cloverleaf Interchange adjacent to the Pentagon. I respectfully request the scope of the project be expanded to include the environmental and noise impacts to the Arlington View community.	See Section 3.10 for discussion of traffic and transportation.	

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
50	George Fioliozzi	self	During construction of the Route 27/244 Interchange, a number of representations VDOT and Shirley Contracting pertaining to construction hours and noise. Despite assurances, construction activities began as early as 5:00 AM on most weekday mornings and on several occasions continued throughout the night. The County, VDOT, and FHWA failed to respond to complaints. VDOT failed entirely in its design/execution of project, failed to provide meaningful supervision, and misrepresented themselves to community, and the community suffered through 3 years of noise and traffic congestion. VDOT staff misinformed and misrepresented and deceived the community to complete the project.	See Section 3.3 for discussion of potential noise impacts.	See last comment. The reconfiguration of the Route 27/244 (West Arlington) interchange was considered under potential cumulative impacts. Noise issues were discussed in Section 3.3.
51	George Fioliozzi		The current plan presented eliminates several hundred parking spaces along Southgate Road. This parking demand will be absorbed by the adjacent communities which will impact the unrestricted parking areas within Arlington View. Alternative plans need to be developed to resolve the elimination of the parking in this area.	The parking on Southgate Road was constructed for employees of the Navy Annex which no longer exists, but continues to be used by Pentagon employees. The Pentagon Reservation Master Plan included a Transportation Management Plan to promote more efficient commuting patterns by minimizing single-occupancy vehicle trips to the Pentagon. One of the objectives is to reduce parking land use area and encourage transit use.	
52	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	EPA (NEPA review)	Since the range of alternatives evaluated is defined by the purpose and need, it is imperative that the purpose and need be clearly identified in the EA. The purpose or objective of the proposal should be defined in relationship to the need for the action. Therefore, the need for action should identify and describe the underlying problem, facts/analysis supporting the problem in the particular location at the particular time should be specified, and the context/perspective of the agency mission in relation to the need for action should be stated.	See Section 1.1 - 1.3	
53	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	EPA (NEPA review)	The alternatives analysis is central to the EA and is important to provide. It should include other alternative sites considered/eliminated and alternative site designs of the Preferred Alternative to determine the least environmentally intrusive alternative. As described in the CEQ regulations (40 CFR 1502.14), the examination/comparison of alternatives is the heart of the environmental document. It is through this comparison that the lead agency incorporates agency/public input to make informed decisions and the advantages/disadvantages of each alternative, including the "no action" alternative. Alternatives must be clearly presented in a comparative form for easy analysis. The rationale for the preferred alternative should be clearly stated. For those alternatives eliminated from consideration, the reasons should be given.	See Section 2.4 - 2.5.	Many alternatives, including varying roadway and interchange alignments, as well as cemetery layout alternatives, were considered. The alternatives analysis, including the reasons that the other alternatives were screened out, are detailed in the Proposed Action and Alternatives chapter of this document.
54	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	EPA (NEPA review)	Project Area should be described in detail and quantified, specifying the type and acreage of land impacted, as well as a description of existing buildings onsite. Discuss any permits required. This may include Section 10/404 permits from the Corps of Engineers, state water quality certification, and local land construction/zoning permits. Other laws, regs, permits, licenses, EOs may be applicable. A summary of applicable regulatory requirements and approvals should be discussed.	See Sections 1.7 and 2.1, and Figures 2-1 and 2-4.	Required permits are discussed at the end of Chapter 1. A listing of federal laws and Executive Orders and the level of compliance are provided at the end of the document.
55	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	EPA (NEPA review)	The EA must examine direct/indirect effects and mitigation measures for any adverse environmental impacts should be described.	See Section 3.18.	
56	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	EPA (NEPA review)	Attainment/non-attainment: the EA should identify areas that meet or do not meet the National Ambient Air Quality Standards (NAAQS) for each of the six pollutant criteria: ozone (O3), carbon monoxide (CO), nitrogen dioxide (NO2), particulate matter for both coarse (PM10) and fine (PM2.5) matter, lead (Pb), and sulfur dioxide (SO2).	See Section 3.2.	

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
57	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	EPA (NEPA review)	Conformity/nonconformity: A general conformity rule analysis needs to be conducted. Reasonable foreseeable emissions associated with all operation and construction of the project, both direct and indirect, must be quantified and compared to the annual de minimis levels for those pollutants in nonattainment for that area.	See Section 3.2.3.	
58	Karen Delgrosso/Barbara Rudnick, EPA Office of Environmental Programs	"	Construction permit requirements: In an effort to eliminate the NAAQS violation, GSA/DOS should control or minimize construction emissions with BMPs during construction.	See Section 3.2.3.	
59	""	""	Aquifers in the region, groundwater recharge, and all wells, public and private, that could be potentially affected should be identified and described.	See Section 3.5.1.2.	
60	""	""	The EA should outline measures to protect surface waters, including a detailed discussion of runoff, sediment and erosion control measures. Wetlands should be identified using the 1987 Corps manual. Wetland size and functional assessment should be provided. Mitigation measures must address both short term and long term impacts.	See Section 3.5.	There are no wetlands or surface waters in the project's Region of Influence. Erosion control measures and stormwater are discussed in the Aquatic Resources section of the document, and the Appendices.
61	""	""	Chesapeake Bay EO 13508 sets out clear goals, outcomes, and objectives to be accomplished through 2025 by federal agencies, working closely with state, local, nongovernmental partners. Strategy is that federal agencies lead by example.	See Section 3.5.	
62	""	""	EPA published Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence Act. Implementation can be achieved through green infrastructure/LID (www.epa.gov/owow/nps/lid/section438). For information on LID: (www.epa.gov/nps.lid). Requires systems/practices to: 1) infiltrate/recharge, 2) evapotranspire and/or 3) harvest and use rainwater near where it falls.	See Section 3.1.1.	Improvements to water quality are realized through the removal of approximately 45 acres of impervious surface, which was removed for the purpose of making way for this project. A regional approach to meeting stormwater requirements, including potential use of LIDS, raingardens, and other types of water quality enhancement methods are being studied and considered. The project will meet the EISA through adherence to the Virginia Stormwater Management Program. This is further described in the Stormwater and Water Quality section of Chapter 3.
63	""	""	Specific comments regarding existing water main: there is a 12" water main running through the site. Please address how/if it will be impacted. The EPA has a 2007 map that indicates that valve 229 was closed and pipes cut/capped. Please discuss current status of that line. EPA would be concerned if construction interferes with the closed valves (229 and 232) that might breach the active 12" line. Please discuss if the "dry" side of the abandoned lines will be removed so as not to interfere with future digging for interments.	See Section 3.1.1.	
64	""	""	Physical/natural resources of the project area should be described, including physiographic provinces, topography, climate, and geologic setting. Soils should be mapped, outlined, described.	See Chapter 3.	
65	""	""	Provide complete description of terrestrial habitat in the project area. Complete lists for mammals, birds, amphibians, reptiles, and plants. The composition and characteristics of each community should be summarized and functions/total acreages indicated.	See Section 3.6.	

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
66	""	""	Provide description of terrestrial, wildlife, and aquatic species in the area. List any threatened/endangered species, describe critical habitat, and potential project impacts. Include interagency coordination letters. We recommend that appropriate state and federal agencies be contacted annually at a minimum regarding these issues.	See Section 3.6.	There are no federally- or state-listed species within the ROI. There are no surface waters or wetlands; therefore, there are no aquatic species. This information is provided in the Special Status Species, Vegetation, Wildlife, and Migratory Bird sections of the document.
67	""	""	Management of hazardous waste must be conducted in compliance with RCRA. Identify known hazardous materials, including asbestos-containing materials, lead-based paint, and oil and other hazardous materials located within the study area. Describe status of materials and remedial methods. In particular, please discuss the former gas station located within the project area. Were the underground tanks removed or do they remain? Were there any leaks/spills? If so, was the area remediated? Has soil been tested or will it be tested to ensure the area is free of contaminants?	See Section 3.13.3.1.	
68	""	""	EPA retains authority to investigate and study noise and its effect, disseminate information to the public regarding noise pollution, evaluate effectiveness of existing regulations, pursuant to the Noise Control Act of 1972 and the Quiet Communities Act of 1978. Please discuss potential noise impacts that may result from Proposed Action.	See Section 3.3.	
69	""	""	Discuss, including number of people, employees and/or jobs impacted as a result of the project. Address increase/decrease of people/employees/jobs in relation to its effect on the tax base, local housing, job markets, schools, utilities, businesses, etc.	See Section 3.9.	
70	""	""	Address traffic and transportation as it relates to the Proposed Action. It may be necessary to provide an evaluation of existing roads, specifying existing levels of service at major intersections near the project area and accident data. If appropriate, an evaluation of impacts associated with an increased number of employees. Discuss existing/proposed public transportation to the area and provide estimates of expected usage. Traffic projections should be made to show expected conditions for the completed project.	See Section 3.10.	In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. A parking area is proposed across from the AFM.
71	""	""	EO 12898 directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, activities, on minority and low-income populations. It requires equal consideration for Native American programs. Identify EJ communities and discuss potential impacts of the Proposed Action.	See Section 3.9.	Although the official Census Tract data, and the Draft EA, indicated a minority population less than 50% (U.S. Census 2016), the Arlington County demographic data for the Foxcroft Heights neighborhood showed a minority population of approximately 68% (Arlington County, VA 2018). Neighborhood-level statistics for income were not available. Therefore, the EA has been revised to include analysis of Foxcroft Heights as an Environmental Justice community. Although the Foxcroft Heights community may be greater than 50% minority, the EA concluded that the Preferred Alternative would not create disproportionately high and adverse human health or environmental effects on minority or low-income populations or children within this community.
72	""	""	EO 13045 requires federal agencies to identify and assess environmental health and safety risks to children. "Environmental health and safety risks" are "risks to health and safety that are attributable to products or substances that the child is likely to come in contact with or ingest. Please identify children and infants in the study area and potential impacts as they relate to health risks from environmental hazards.	See Section 3.9.	

COMMENT MATRIX
FROM PUBLIC SCOPING MEETING APRIL 27, 2016

Comment #	Name	Representing	Comment (Potential impact or issue)	Response	Response Updated 2019
73	""	""	EPA understands that you will be consulting with the District of Columbia Historic Preservation Office, the Virginia Department of Historic Resources, the Maryland Historic Trust, and other interested parties to identify historic properties and any adverse effects. Please include detailed descriptions of the affected site, potential impacts, correspondence, and MOA, if applicable.	See Section 3.7. Update: This project does involve an adverse effect to historic properties; therefore, an MOA is being prepared to assess the effects.	
74	""	""	EO 13693 is Federal Leadership in Environmental, Energy, and Economic Performance and was signed by the President on 3/19/15. See www.fedcenter.gov/programs/eo13693). It requires that agencies increase efficiency by reducing energy use and cost, finding renewable or alternative energy solutions. Qualitatively describe relevant climate change impacts, analyze reasonable alternatives and/or practicable mitigation measures to reduce GHG emissions. Consider changes to design to incorporate GHG and make clear whether commitments have been made in design or other measures to reduce GHG or to adapt to climate change. Specifically, <u>Affected Environment</u> should include a discussion of ongoing and reasonable foreseeable climate change impacts relevant to the project, based on US Global Change Research Program assessments. <u>Environmental Consequences</u> section should include: 1) an estimate of GHG from the project and its alternatives. (See CEQ NEPA.gov website), 2) Do not compare GHG emissions to total US emissions. Consider providing a frame of reference, such as applicable Federal, State, Tribal, or local goals for GHG emission reductions and discuss consistency with those. 3) Describe measures to reduce GHG emissions, including reasonable alternatives or other practicable mitigation, i.e., use of energy efficient lighting, solar/other renewable energy, energy-efficient construction equipment. Consider practicable changes to proposal to make it more resilient to climate change. FONSI needs to commit to implementation of reasonable mitigation measures that would reduce/eliminate project-related GHG emissions.	See Section 3.17.4. Update: E.O 13693 has been revoked and replaced with E. O. 13834. The project is in compliance with E. O. 13834.	
75	""	""	Include cumulative impacts section per 40 CFR 1508.7 (past, present, reasonable foreseeable future impacts), as it is an integral part of the EA	See Section 3.18.	
76	""		Leadership in Energy and Environmental Design (LEED) is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. It provides a complete framework for assessing building performance and meeting sustainability goals. Please see: www.usgbc.org/leed .	This project will not be LEED certified.	
77	""		The EA should include a Distribution List of agencies, organizations, and persons to whom copies of the document were sent as indicated in 40 CFR 1502.10 and 1502.19. It indicates those who have been given the opportunity to comment and reveals that those not included may need to be given the EA for review.	Draft and Final EA documents were/are being sent to cooperating agencies, appropriate state and federal agencies, and local libraries.	The documents are/will be also available on the project website at: http://www.nao.usace.army.mil/Missions/Military-Construction/ANCSouthernExpansion/

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

COMMENTS FROM AUGUST 2018, RELEASE OF DRAFT EA				
Comment #	Name	Representing	Comment (Potential impact or issue)	Response
1	Matt Rhodes	Self	As a pedestrian who walks along the stretch of Columbia Pike in question, I am very concerned about pedestrian access to the Air Force Memorial. Where will the fences be located? Will there be an entrance to the cemetery proper on Columbia Pike?	Pedestrian access will be in the vicinity of the Air Force Memorial (AFM). Final decision will be made prior to final design.
2	Dana Bres	Self	It seems inappropriate to present conceptual roadway designs in the absence of Columbia Pike traffic counts and future estimates. Please identify the traffic studies for Columbia Pike between Oak and Joyce. Reconcile the proposed roadway's capacity. Bottom line--you need to separate bikes and pedestrians on the hill.	The conceptual roadway design presented in the Draft EA is a generic depiction of what the proposed roadway cross-section may look like. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. The final design will account for present and future traffic counts, turning movements, traffic signalization, etc. that will result in a corridor with safe and efficient operations for all modes of transportation. See Section 3.10 for further details. See "Response to Bike/Pedestrian comments, #96," below.
3	C.S. Lee	Self	The project has come a very long way from the 1st public meeting 2 years ago. Congratulations. My only concern deals with the issue of eligibility. So I will continue to monitor & be involved in that process. Good Luck!	Burial eligibility is currently being considered by the ANC leadership.
4	Lisa Nisenson	Self	Would love to see grade separated bike lane. One big factor is expected growth in micro mobility, electric bikes, scooters. This plan relies on a static portfolio of modes even as pressure is growing for trips between 2-6 miles. These will convert (given concurrent trends in right-sizing & right pricing, parking) from auto trips to multiple modes. Also consider 3 travel lanes to give space to bike/e-mobility. Thank you.	Grade-separated bicycle lanes would be incompatible with cemetery designs. See "Response to Bike/Pedestrian comments; Comment #96," and Section 3.10. There are standards for urban highways. A 4-lane arterial roadway is the standard for Columbia Pike in order to accommodate morning and evening peak commuter traffic flow and, in this case, a high volume of bus traffic.
5	Sandra Amendala	Organization - ARCA	The elimination of exits from SB Washington Road to Columbia Pike, Pentagon S Parkway will cut off Memorial Bridge traffic, Board for Pentagon & Capital City & residential areas of Aurora Hills & ARCA. Divert more SB traffic from Mem. Bridge to I-395 Arlington Ridge Rd overpass where it will add to more [illegible] its a real mess after that time. Divert more traffic to Ridge Road & 23rd St S.	The SB Washington Blvd exit ramp is not being eliminated. The design will change to a "tight-diamond" configuration, rather than the current clover-leaf. Please see Section 3.10.
6	Sean McGarahan	Self	Recommend dead-ending ORME St before JBM-HH. This will prevent non-local traffic from using this road for access to the base. On exit from S Wash Blvd to Columbia Pike, add dedicated right turn lane to allow exit onto Columbia Pike West and from S Wash Blvd. Likewise add lane to exit to I-395 South a la Joyce St exit.	Neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. The decision whether or not to dead-end these roads rests with the County. The traffic lanes for S. Wash Blvd and I-395 are already included in the project. Please see Section 3.10.
7	Amelia Zimmerman	Self	There needs to be improvements made to the section of Southgate North of ORME/Ode/Oak Streets leading into Henderson. Ideally creating a dedicated lane into the base. Currently, traffic backs up on Orme and Southgate. A dedicated lane would help with overall traffic flow. There is currently enough footage for this if you remove the parking spots on this section of Southgate (see diagram). There should be space for a dedicated bike lane from the Pentagon up Columbia Pike. Especially if there is expected to be increased Air Force Memorial traffic with new parking lot. You are eliminating one stop light intersection and adding two, potentially 3 with one at Nash. There are already three lights at the intersection of 27 (Wash Blvd) and Columbia Pike. The more you can limit stop lights and keep the flow of traffic the better. No pedestrian access to cemetery should be permitted from Air Force Memorial. This would be unsafe and increase traffic congestion.	Improvements to Orme, Ode, and Oak Streets and creating a dedicated lane for JBMHH traffic are a County decision. There will be bicycle access from the Pentagon up Columbia Pike. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. There will be some type of safety crossing at the AFM, as determined following completion of the traffic study. Please see Section 3.10.
8	Kim & Kevin Murphy	Self	As nearby residents who utilize Joyce St and Columbia Pike regularly, our biggest interest/concern is that these roads continue to be accessible as well as provide the same access to major arteries such as I-395, 110 and 27. The proposed plan appears to do that, although the temporary closures and inconveniences during expansion remain unclear. To minimize this is critical as the last thing this area needs is more congestion-even for this important cause of internment for our veterans. We appreciate the opportunity to comment.	All roadways will remain accessible post-construction. The 4-way intersection at Southgate Road/South Joyce will become a 3-way intersection. The exit ramp from Southbound Washington Boulevard will remain but will have a "tight-diamond" configuration rather than the current "clover-leaf" configuration. A traffic plan will be developed for safe traffic flow during construction. Limitations on traffic flow during construction will be minimized to the extent practicable. Please see Section 3.10.
9	Donna Mullins	Self	Request that the Sheraton direct the tour buses to use Nash St, when completed, to get to the Sheraton drop off/pick up on Orme St and not go down the neighborhood streets of Oak and Ode. Possible solution also would to build speed bumps on neighborhood streets. Buses currently speed down the neighborhood streets.	Neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. This is a County decision.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
10	Bob Trencheny	Organization - Alexandria BPAC & Virginia Bicycling Fed.	Concerned about multiuse trail access for bicycles and pedestrians. Plan appears to accommodate motor vehicles very well. Ten-foot trail on Columbia Pike is the concern. This is a primary commuter route for bike/peds and their numbers are increasing. Connections under I-395 are not yet clearly understood. Need to be safe for travel, well lit for safety and have adequate drainage for rain & snow for the bike/ped trails, not just the roads.	Please see "Response to Bike/Pedestrian comments" below for the response to bike lane comment. Please see Section 3.10; it shows the interchange configuration and directions. Drainage will be carefully considered during design.
11	Lance Allen	Organization - Foxcroft Heights Civic Association	The Foxcroft Heights neighborhood has several concerns about this project and is looking forward to seeing this neglected area improved in the near future. Major concerns are the following: Traffic- although we are pleased to see the realignment of the Pike and the plan for Nash Street, it is unclear whether the closure of Southgate road will have a positive impact on traffic. Specifically, we need to be consulted on the change in traffic patterns to ensure that traffic through the neighborhood is minimized. Parking- there are several concerns about how these changes will affect the issue of long-term parking in the neighborhood. The County has suspended reviews of parking in the county but we feel that this project is a special case and we would like to see the County and ANC work together with us to make sure both traffic and parking are addressed sooner rather than later. Visual and Audio impact- we want to ensure that the plans for this project consider the visual and audio impact (from construction) as well as the long-term effects to the neighborhood. Operations Complex/Underpass- Foxcroft wants to support the plan for an underpass to minimize disruption to traffic flow around the neighborhood.	The Interchange Modification Report (IMR) conducted by the County concluded that overall traffic flow would not be adversely affected by the new configuration. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. Neither ANC or FHWA has the authority to control traffic flow or parking on Orme, Ode, and Oak streets. This is a County decision. There will be an extra parking lot across Columbia Pike from AFM. This EA contains a detailed assessment of the project's visual and audio impacts. Please see Section 3.10 for further discussion.
12	Brian Nilsson	Self	I like the proposed plan, especially straightening Columbia Pike to do more directly to the South Parking Lot. My only concern is no apparent gate for pedestrian traffic into the cemetery as there is in North Arlington or N. Marshall Drive. I previously lived near Clarendon and enjoyed being able to walk in the cemetery. Residents of S. Arlington must drive [illegible] to the main entrance, or park at or near two [illegible] to use the north gate. My comment is to provide a south gate comparable to the north gate. It isn't clear if there will be access to the cemetery from the Air Force Memorial & it would be [illegible]. Otherwise I like the plans as proposed. Good job all!	Pedestrian access will be in the vicinity of the Air Force Memorial (AFM). Final decision will be made prior to final design.
13	Anonymous	Self	Why not BRAC Henderson Hall and use their buildings for relocating the cemetery service facilities? No tunnel! Closer to where operations can easily work at cemetery.	ANC does not have the authority to BRAC Henderson Hall. Therefore, moving the Operations Complex there is not a reasonably available alternative.
14	Sarah McKinley	Organization - Columbia Heights Civic Assoc.	We support the realignment of Columbia Pike and look forward to completed plans. No further comment at this time.	No response needed. Thank you for your comment.
15	Neal Collins	Self	Current plans present a thoughtful use of land and resources. My compliments to the people and agencies involved in this important project which holds such value for Veterans their families and the nation.	No response needed. Thank you for your comment.
16	Josephine Lin	Self	Given that one of the stated purposes of this project is to "increase capacity for regional multimodal transportation" please do not relegate people on bikes to a 10 foot wide sidewalk shared with pedestrians. A shared sidewalk will be uncomfortable for pedestrians being passed by faster moving cyclists and unsafe for cyclists at driveways and intersections. A protected bike lane on both sides of Columbia Pike will be a better solution for pedestrians and cyclists alike and should not unduly impede cars and buses on Columbia Pike, given the relatively low level of automobile traffic in the project area as compared to the rest of Columbia Pike. Many cyclists currently use Southgate Rd to move between the commercial areas of Pentagon City and Columbia Pike, including people like myself, who come from outside Arlington County to shop and dine in those areas. Eliminating Southgate Rd and forcing cyclists onto a substandard and unsafe sidewalk will discourage people like me from visiting the area. Thank you for considering my comment.	<u>Response to Bike/Pedestrian comments:</u> We received numerous comments/suggestions regarding bicycle and pedestrian infrastructure along the Columbia Pike corridor. Because many of the comments were similar in nature, this response is intended as a response to all bicycle and pedestrian-related comments. ANC is sensitive to the public's concerns. However, the conceptual realigned roadway and trail corridor width is not unlimited. The conceptual roadway design presented in the Draft EA is a generic depiction. It is in keeping with state and local policies for "complete streets," and will preserve the bicycle and pedestrian trail link between Southgate Road and South Joyce Street via the proposed South Nash Street and Columbia Pike. Based on input received, we have decided to separate the bicycle and pedestrian trails, which would connect with Arlington County's existing trails to the Pentagon. We have passed along the public's specific design suggestions to the design team. The roadway and trails are still under design at this time. The final design, including actual widths of the Columbia Pike realignment and trails, is outside the scope of this EA, however it will include the appropriate level of bike/pedestrian infrastructure that is consistent with VDOT/AASHTO/NACTO standards and Arlington County's Columbia Pike design standard. Please see Section 3.10 for additional information.
17	Collier Cook	Self	As someone who cycles daily through this corridor, I generally support this expansion of the cemetery & realignment of Columbia Pike with a few caveats. The side path as currently proposed is too narrow. Especially due to the steep grade as uphill bicyclists need extra space to pass slower riders & the downhill bicyclists need extra "recovery" space as their speed will very fast. Would prefer segregated pedestrian & bicycle facilities rather than shared use. However if shared use, the width should be at least sixteen (16) feet. Also, take special care in the design of intersection at Joyce St. as that is a growing cycling connection to points south (Pentagon City).	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
18	Samantha Brann	Self	I ride along the Columbia Pike regularly. The proposal is worrisome to me for a number of reasons: A sidewalk with two-way bike & pedestrian traffic is dangerous, especially given the business of the Columbia Pike (Buses, high pedestrian traffic & hills). Pedestrians will not hear/listen for bikes & with two-way cycling traffic there will be accidents. Bicycles will be forced onto the road, causing more friction between cyclists & drivers, when drivers believe cyclists have a designated lane they become more aggressive when encountering bikes on the road. In the end this plan leaves cyclists without a safe place to ride & pits them against both drivers & pedestrians. A bad plan is just as bad, if not worse than no infrastructure at all.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
19	Katherine Lizotte	Self	Please provide a segregated bike path from Pentagon City up Columbia Pike as far as possible. I lived in Pentagon City for 16 years before buying my own condo in Shirlington last year. I rode my bike from PC through Ft. Myer all the time to avoid the very dangerous CP to get to Clarendon and areas east. I still do. I now live off Walter Reed and near Columbia Pike but avoid most of CP because of the traffic. If you build a multiuse path going down the big hill, it will be very dangerous for pedestrians since cyclists can easily reach 30 mph. I support Bike Arlington's proposal.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
20	Lori Bowes	Self	Please consider adding a protected bicycle lane Columbia Pike is a nightmare for cyclists and under the proposal, I will lose Southgate Rd, which I use almost everyday. Even though I'm a conservative, law-abiding cyclist, I have already been hit by a car twice in 15 years of riding here (only place in the area I have ever been hit). The path at the Wharf which is intended to be used by cyclists on one half and pedestrians on the other demonstrates how poorly this approach works. There are many people in the area who would like to cycle, but are terrified of the Pike - failing to take this opportunity for a protected lane is a last opportunity. Thanks for considering my comment.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
21	Jerry Cowden	Self	It is difficult to bicycle on Columbia Pike. Some would say impossible. Yet Columbia Pike is often the only practical route for people in South Arlington to take if they are going into DC via the I-395 bridge. Columbia Pike should ideally have a separated bike lane running in each direction through the County. There may be parts of the Pike where this would be difficult to achieve. However, on the portion between Washington Blvd and the Pentagon South parking lot I think separated bike lanes on the Pike itself are feasible and more desirable than a 10 foot sidewalk shared by pedestrians and cyclists. I encourage Arlington County to build for the future rather than the past by creating separated bike lanes on Columbia Pike.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
22	John Hoopes	Self	I am a bike commuter from Annadale to the Pentagon. I take Columbia Pike downhill and Southgate going up. I am very dubious you are going to achieve your claimed 5/6% grade with the new route. If the government is supposed to be removing restrictions, please take this opportunity to remove the 2016 regulations on riding bicycles on Arlington National Cemetery. That was a real thumb in the eye to local cyclists and the authorized users from Fort Meyer who used to take the route through the cemetery. I say this as a military retiree who used that route on occasion. We should be bending over backwards to reduce our nation's fuel dependency.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. The elimination of bicycle access within ANC was a Department of Defense policy decision.
23	Garrett Hennigan	Organization - Washington Area Bicyclist Assoc	Columbia Pike should be built as a complete street, which safely & conveniently accommodates all road [illegible]. People who bike can use this road, but changes would make it much easier. Existing traffic volume, even assuming some growth do not justify a 4-lane road. Given the limited right of way, this road space would be better used a protected bike lane on either side. This allows conflict-free sidewalks and a high quality bike connection between Pentagon City & the rest of the Pike. The North Wall Trail is a key part of the trail network and should be implemented fully or in part. If interchanges are to be rebuilt, they should include the planned segments of that trail Side apth design is critical for a quality bike experience. Ten-foot clear width, lighting, visibility at intersections + 15mph design speed.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. There are standards for urban highways. Experts in the field of transportation, both planners and engineers, design urban major arterial roadways such as Columbia Pike to accommodate morning and evening peak commuter traffic flow and, in this case, a high volume of bus traffic. The Arlington National Cemetery Wall trail is a "recommended" trail project contained in the November 2018 Master Transportation Plan Bicycle Element report. It would construct a trail parallel to the east wall of ANC to link Columbia Pike to Memorial Drive. According to the MTP, the project, if constructed, would be completed by 2040.
24	Fred Mull	Self	Suggest putting traffic tables or other traffic calming measures on Oak St & Ode St to encourage the use of Nash St for non-neighborhood traffic. Bike lanes on Columbia Pike would also be nice.	Neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. This is a County decision. We have given your suggested diagram to the County for consideration. There will be bicycle use and pedestrian trails along Columbia Pike. Please see the response to Comment #96 and Section 3.10 of the EA.
25	John Snyder	Organization - Columbia Pike Revitalization Organization	To be a good neighbor to the Pike community, the project should include: Protected bike lanes along the Pike; Wide Nash St to keep traffic out of Foxcroft Heights; Easy access, including some parking for elderly, for visitors to the Air Force Memorial; Left turn arrow from Joyce St to westbound Pike; Safer intersection at Wash Blvd (ear Pentagon); Easy pedestrian access from Pike to 911 Memorial; Transit stop at Air Force Memorial.	See "Response to Bike/Pedestrian comments" - Comment #96 and Section 3.10 of the EA. The final design has not been completed; pedestrian access and transit stops to be determined. Parking is planned across Columbia Pike from the Air Force Memorial. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI.
26	Lee Mitchell	Organization - Out Riders	The proposed Columbia Pike design with a shared pedestrian and bicycle 10' path is not acceptable nor safe. Bicycle thruways are needed to safely transport current and future needs. This is a prime opportunity to make a portion of Columbia Pike bicycle friendly. Bicycle community, exercise cyclists both need dedicated lanes. This section of Columbia Pike does not need 4 lanes - consider a 3 lane configuration with two lanes alternating directions with rush hour, or remove shrubbery to allow on street dedicated bicycle lane. Again - this is an opportunity to do something correct to fix (at least part of) Columbia Pike.	See "Response to Bike/Pedestrian comments", Comment #96 and Section 3.10 of the EA. There are standards for urban highways. Experts in the field of transportation, both planners and engineers, design urban major arterial roadways such as Columbia Pike to accommodate morning and evening peak commuter traffic flow and, in this case, a high volume of bus traffic. Therefore, four lanes of traffic were determined to be necessary.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
27	Kate Koppy	Self	The current plan for Col. Pike redevelopment after swapping land with Arlington National Cemetery does not enhance safety for bicycles and pedestrians. 6' on one side and 10' on the other side is woefully insufficient given the current volume of bike & pedestrian traffic on Southgate Rd, the incline of the hill and the possibility of increased traffic to a pedestrian entrance to the cemetery and to Pentagon City once improvements have been made. Given the available land, this project should include dedicated protected bike lanes, sidewalks for pedestrians and 3 lanes for cars.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. Experts in the field of transportation, both planners and engineers, design urban major arterial roadways such as Columbia Pike to accommodate morning and evening peak commuter traffic flow and, in this case, a high volume of bus traffic. Therefore, four lanes of traffic were determined to be necessary.
28	Mark Blacknell	Self	I appreciate the need for additional space at ANC (and expect to bury my father there one day). I am writing to strongly urge the Corps to cede sufficient space to make Columbia Pike a complete Street. This means additional space for protected bike lanes should be included. Many service members & civilian employees who work on JBMMHH would benefit from these facilities, & say nothing of the land area residents and commuters who deserve a safe way to move between South Arlington & the Pentagon, Crystal City etc. Thank you for your time & consideration.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
29	Megan Jones	Self	As a 20+ year resident of Arlington, an avid cyclist who rides with others of many abilities, this plan is inadequate in providing appropriate bike & pedestrian facilities. Consider speed of a bike on downhill versus pedestrian going uphill. Consider protected or striped bike lanes to separate cars & bikes. Take a better look at the car traffic from Bridge down 27 when citing car volume. Car volume is not as high as the rest of Columbia Pike. Need more current data that is dates that section before giving it as a reason for no bike facilities. Thank you	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
30	Alyssa Moore	Organization - Columbia Forest Civic Assoc	The single 10ft combined bike and pedestrian sidewalk is insufficient for cyclist and pedestrians. Over and over nationwide we see this results in pedestrian and cyclist deaths. A dedicated bike lane is required in both directions, especially to address the 4.7% grade. Closure of Southgate also removes a safe bike boulevard route. The cemetery needs to find ways to be more bike friendly and less car centric for this plan to work, we must have safe, direct and stress free bike routes. Combined sidewalks are not the answer. Removal of Southgate also removes the fastest and most direct route for emergency vehicles. We support expansion, but community needs come first.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
31	Leslie Tierstein	Self	Better bicycle access needed & a dedicated bike path, distinct from pedestrians.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
32	Kelsy Johnson	Self	Fully supportive of cemetery expansion. Primary concern is a safe bike route for commuters. Currently use the road by Southgate to avoid Columbia Pike. I am concerned about bike access/safety during & post construction. As an employee at Pentagon I hope we consider all users of the military areas in Arlington/DC.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
33	Maria Durgan	Organization - Penros Neighborhood Assn	Needs bike path on Columbia Pike from Ode to Pentagon City. Add a right turn lane from Wash Blvd to Columbia Pike. Need pedestrian access to the cemetery from Columbia Pike or from new Southgate. Add Columbia to the new cemetery space. Stop in-ground interments for everyone, there is no space.	In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. Pedestrian access is planned in the vicinity of the Air Force Memorial. Interment types are based on need, ANC policy, and family choice. ANC is currently considering burial eligibility in the future.
34	Bayley Vanderpoel	Self	I'd much prefer to see protected bike lanes. I don't see the current proposal making anything safer for my family. Please prioritize safety over convenience of motorists. Thank you	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
35	Amanda Wernicke	Self	Since we are losing Southgate Rd no matter what, the final design for Columbia Pike should go above and beyond a mixed use trail & have separated pedestrian and bike infrastructure, making it safer for both. Widen the 10' sidewalk. Demarcate areas for pedestrians & cyclists with differentiated materials.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
36	William Fucas Jr	Organization - Popillon Cycles	My concern is not just monitoring, but improving safe access for bicycles. This section of the Pike is a critical easy connection to Pentagon City, and the trail to Lady Bird Johnson Park. Neither going around the north side, to Memorial Bridge, or south along Four Mile Run, are realistic options to get to Pentagon City. Both are very long detours. Your presented solution, a 10 ft shared sidewalk, coupled with losing Southgate (which we expected all along) is a bicycling downgrade. You will see presented our preferred option of a dedicated cycetrack, with separate sidewalk, for this part of the Pike. All old infrastructure is being replaced anyway. Opportunity to do something magnificent. To show how this route is being used, I lead rides for my local bike shop, Popillon Cycles, on Columbia Pike. I use this route for a Monuments at Night Ride. The Pike is the only route option that lets me include a stop at Lady Bird Johnson Park. Thank you for your consideration.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
37	Dexter Clifton	Self	A brand new arterial road, free from constraints should have dedicated, protected space for both pedestrians and cyclists. During construction, any portion of the "wall trail" called for in Arlington County's MTP, that falls within the disturbance area should be built. The County should be given sufficient right of way to provide dedicated space for bikes and pedestrians as well as space for median refuges for pedestrian crossings of Columbia Pike. The removal of Southgate Rd, a designated low-stress bike route constitutes a decrease in the quality of bike accommodations. This analysis devotes a massive amount of time and analysis to automotive level of service and none to multimodal level of service. This project, by making a new destination (new pedestrian access to cemetery) will draw new bike & pedestrian traffic to area. Where is analysis of whether 10' is sufficient to support this new traffic? Cemetery Wall Trail, if built by Arlington, will link this area to regional trail network bringing significant bike traffic & recreational/health joggers, etc.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
38	Dan Kois	Self	I'd love to see a dedicated two-direction protected bike lane on Columbia Pike. It seems to me that encouraging multimodal transit is much more valuable than creating/maintaining a high-volume auto corridor. Given how many bikes & pedestrians use this road now and how many more will use them when there's any kind of accommodations. I truly wish that the plan included a protected, two-way bike only path. Why not remove some of that landscaping or even reduce the road to 3 or 2 lanes. That's a much better vision for the future of Arlington than a stream of cars and bikes & walkers stuck on one small trail. Thanks.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
39	Stephanie Pryor	Self	Please clarify planning/development for the 911 and AF memorial tourist parking. Please clarify planning/development of the pedestrian entrance of cemetery. 6% grade is quite steep. What are compensating constraints for every runoff from area. Green roof on the new support complex to assist with storm water management and the views from cemetery (to help hide the facility in the pit near 395). Could you put support facility into the ground? Serve as deep shelter, hides heavy mechanicals & provides significant fill dirt for other areas? Parking for tourists on top? See the service & house facilities around the Capitol - we stash cars, carpentry, repair & other O&M facilities out of sight. Fountains & garden on top so views maintained but waters still has sufficient safe space.	The Air Force Memorial will be incorporated into ANC. This project will include additional parking across the street from the AFM. The project design is underway; your suggestions seem cost-prohibitive. The 911 Visitor Education Center is not part of this project; its design is on hold while the Pentagon Memorial Fund conducts market research. It will address its own capacity needs.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
40	Anonymous	Anonymous	In the section "Archaeological & Historical Evaluations for the Arlington National Cemetery Southern Expansion Project" one reference is obviously missing is a book by John Michael - Images of America Fort Myer, which contains [illegible] excellent maps that show South post Fort Myer from the 1940's where WACS & soldiers lived who worked in the Pentagon. That area is now all Arlington National Cemetery. I would suggest the book be included in your references (beginning on page 39)	Thank you for your comment. We will consider your suggestion.
41	Leilani Lansing	Self	Please set aside a parcel for the unsung heroes who must continue to remain anonymous and little. Kind of like the unknown soldier, but different. Like a grassy knoll which will not be dug up ever. I applaud your efforts to expand. Unfortunately it will be needed because dangers are increasing not decreasing. Thanks.	Design is ongoing, in consideration of the desires and needs of ANC leadership, eligible veterans, and staff.
42	Joseph Leonard	Self	I currently live in Arlington and work at the Pentagon. I am all for the Southern Expansion as it will help with expanding spaces for the ANC and that is extremely important. In your brochure you do not speak about how sidewalks, streets, and what I hope for, a protected bike lane down Columbia Pike and Joyce street into the entrance to the Pentagon will be implemented. Taking away South Gate RD is unfortunate as many biker and network mobility riders utilize it because it is light to car traffic and doesn't have the dangers that using the current Columbia Pike street has. When South Gate Rd is removed to expand the ANC then the need for a protected bike lane down Columbia Pike and Joyce St will be even greater. Washington, DC, saw a 200 percent increase in cycling along Pennsylvania Avenue after it installed a center- running protected bike lane there in 2010, according to a study by District Department of Transportation DC. While I know we are not DC this DC study showing the impacts of bikes lanes shows the benefits. https://ddot.dc.gov/sites/default/files/dc/sites/ddot/publication/attachments/bike_lane_count_fact_sheet_2011.pdf Here are several articles that state why the need for bikes lanes are a bonus to the Arlington and DoD community and how new things like electric scooters and bike share program will only increase the need to protected bike lanes. While these might mention DC all these companies offer the same product in Arlington or will soon enough. http://www.bikearlington.com/why-protected-bike-lanes-matter-to-us-all/ ; https://ggwash.org/view/67638/dockless-bikeshare-helped-grow-the-total-shared-bicycle-trips-in-dc ; https://www.washingtonpost.com/opinions/how-those-red-public-bicycles-are-changing-dc/2011/08/26/gIQAkZizgl_story.html?utm_term=.f3c9a5176557 From 2011. There is also dealing with the issue of dealing with these bikes as the Pentagon reservation, from my knowledge, doesn't allow these bikes to be parked on site. I appreciate you taking comments on this. If you have any questions please feel free to contact me. If you do plan on using or not using protected bike lanes in your plans please let me know so that I can pass this information on to community leaders. Thanks	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
43	Lawrence A. Morrison, CDR USN, Ret	Self	I am a long time resident of the ARCA area and interested in the planned expansion. Unfortunately, I will be out of town on the 22nd so I am forwarding my comments on the proposed plan by this email. I am concerned by the apparent elimination of exits from southbound Washington Blvd. to Columbia Pike, Pentagon South Parking, and the Pentagon Memorial. These closings will: 1. Cut off Memorial Bridge traffic bound for Pentagon City, Crystal City, residential areas of ARCA and Aurora Hills; 2. Divert more southbound traffic from Memorial Bridge to the I-395 Arlington Ridge Road overpass. Which will add more cars turning left at the already confused intersection at Ridge Road. (two or three Stop Signs, a Yield Sign no one understands, and a steady stream of northbound left turn traffic with no burden). Increase traffic from and to Memorial Bridge on Ridge Road and 23rd St. South. I will leave comment on South Parking and the Memorial to the Pentagon. I would caution them that commuters can find alternates that might lead through your reservation. I hope you will consider my comments. I have served in the old Navy Annex, the Pentagon and used Memorial Bridge to commute to NW Washington from my home above Pentagon City so I am well aware of the traffic during the present configuration and a couple of earlier ones. The connections from Southbound Washington Blvd should remain.	These ramps are not being eliminated. There will still be ramps for these traffic movements, but they will be in a "tight-diamond" configuration, rather than the current loop configuration. A traffic plan will be developed for safe traffic flow during construction. Limitations on traffic flow during construction will be minimized to the extent practicable. See Section 3.10 of the EA.
44	Joseph Leonard	Self	(1) Thanks you so much for replying to my email with the story boards highlighting the project. It looks like you have a couple story boards that will go up for the meeting. While the concept you sent me looks nice I do not feel it adequately represents what the Columbia Pike route presently needs to accommodate bikes traffic let alone the increases that will happen in the future. I have attached 3 concepts of bike lanes that I feel you can easily accommodate in one of your storyboards utilizing a portion of the large sidewalk and tree planters section. Simply having a large sidewalk for walking pedestrians and bikers will not be a safe to use especially with the heavy traffic that the Air Force memorial and ANC draws. I know this is a quick turnaround but I hope you could have at least one storyboard concept that utilizes a designated bike lane. Thank you for your accommodations. (2) I guess we will have to deal with a lot of scooters also in our future. https://www.washingtonpost.com/transportation/2018/08/21/more-shared-scooters-are-coming-streets-dc/?utm_term=.6185dcc88d98 (3) I just wanted to say thanks for meeting with the people who had opinions on the additions of bike lanes to the Columbia Pike street adjustment. I know some of us come off as having very strong opinions but it is just because it is rare we have a place that people can vent their frustrations with the current transportation issues plaguing Columbia Pike. We are just trying to have a plan for the future where more people will be riding bikes and in our current state we are not liked by both walkers and cars so we feel we are a minority that needs help. Thanks again for listening to our comments. I hope that we can come up with a plan that works best for the DoD Engineers, cars, walkers, and bikers. When you have finished the set up for the street design would you please let us know? Thanks. (4) This is a great example of what could be implemented on the Columbia Pike road where the ANC expansion is happening. https://www.arlnow.com/2018/08/27/new-protected-bike-lane-opens-connecting-rosslyn-and-courthouse/ . https://usace.contentdm.oclc.org/utis/getfile/collection/p16021coll7/id/7720	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
45	John Easterbrook	Self	To Whom It May Concern: I wanted to give my option on Arlington's plan to expand the cemetery. Understanding the need for such a place for our military, and in the same note, making sure there is room for longer than 2050, has the committee thought about Mausoleums? You have more room, and for those who were cremated, would also allow more personal to be buried on these hallowed grounds. The Japanese and other cultures as well as elsewhere in the US do this, and again not only saving land, but money as well, as that always seems to be the bottom line-even in death. I don't have faith in my opinion gaining traction, but I had to comment and wish all the best in your goals to satisfy all. I do believe that more room can be saved with the interment spaces being in suggested Mausoleum and tradition burial in the ground end. It seems to be the only way to save room, land and still be buried there-change and death are inevitable, so why not save the space so the grounds can still receive future "remains" well beyond the expected date when you run out of room.	The cemetery design will incorporate columbaria, niche walls, and in-ground burials, according to ANC leadership's determination of the needs of each type.
46	Jennifer Pence	Self	Hello and thank you for seeking public comments regarding the proposed expansion of Arlington Cemetery. I support the expansion of the cemetery and there are three aspects of its development that are important to me as a resident of the Pentagon City neighborhood. 1. Continued access to Columbia Pike from S. Joyce St. 2. Continued access to Columbia Pike from Washington Blvd. (The proposed plan looks like it maintains the current traffic access to Columbia Pike, S. Joyce Street and Washington Blvd so that makes me happy). 3. Lastly, please ensure there is pedestrian access to the Cemetery from the Air Force memorial (or a nearby entry point). Those of us who are S. Arlington residents currently don't have the same ease of access to the Cemetery like N. Arlington residents do via the entrance by the Marine Corps memorial. It would be wonderful to be able to walk to a south entrance to the Cemetery rather than depending on driving or metro.	These ramps are not being eliminated. There will still be ramps for these traffic movements, but they will be in a "tight-diamond" configuration, rather than the current loop configuration. A traffic plan will be developed for safe traffic flow during construction. Limitations on traffic flow during construction will be minimized to the extent practicable. Pedestrian access is planned in the vicinity of the Air Force Memorial. Also, please see "Response to Bike/Pedestrian comments, Comment #96 and Section 3.10 of the EA."

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
47	Jacinythe G	Self	I'm unable to attend the meeting at the Sheraton this evening that will discuss the expansion to the cemetery. I'm a resident of The Representative, at 1101 South Arlington Ridge Road. I use Joyce Street to access Comlumbia Pike to get into Arlington. I also turn right on Columbia Pike to S Washington Blvd. to the Memorial Bridge to DC. I would like to request that as part of establishing the proposed single contiguous parcel of land south of the cemetery, you will relocate and still grant us our access to Comlumbia Pike and Washington Blvd. and not close it.	These ramps are not being eliminated. There will still be ramps for these traffic movements, but they will be in a "tight-diamond" configuration, rather than the current loop configuration. A traffic plan will be developed for safe traffic flow during construction. Limitations on traffic flow during construction will be minimized to the extent practicable. See Section 3.10 of the EA
48	Marc Buursink	Self	Great news on the ability to expand ANC. Please consider bike lanes and bike infrastructure.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
49	Tim & Alejandra Underwood	Self	Thank you for the information below. My wife and I attended the event this evening. We appreciated the transparency and details provided; however, there are three concerns. Respectfully request your prompt response, before any contracts are signed to begin construction. In our full transparency, we plan to contact our city council and congressional representatives if we do not receive a response within 90-days. 1. Insufficient parking for tourists to ANC and the AF Memorial. We appreciate the AF Memorial will provide access to ANC given many locals and tourists often request it. Can you please provide your studies (including their methodology) that projects for the existing and increased parking demand -- factoring the continued explosive growth in south Arlington and the new entrance access to the cemetery that will greatly increase the parking demand. Based on local experience, ample underground parking appears to be critical, and hopefully it is considered. 2. No access to Nash Road for those that live on Oak Street. We greatly depend on SouthGate Rd and the access behind the house for maintenance on our homes and convenient access Pentagon City. Placing a wall without access to Nash will hamper our neighborhood's access to the community and to our homes. 3. High trees and high internments within the expanded cemetery. To respect the loved ones of those who have served our Nation and our neighborhood, we highly recommend the panoramic views of Washington, DC be left open -- providing a patriotic ambiance that maximizes the existing DC views of the monuments regardless of where someone is at within the expanded cemetery, to include our neighbors and I located on Oak Street. Can you please provide the general expectations of the height? Thank you for your team's obvious hard work and transparency here, and we look forward to your response.	1) A new parking facility will be located across from the AFM. In addition, visitors can utilize existing parking facilities within ANC, and enter the AFM from within the cemetery. 2) Nash Street will be designed as a through street from Columbia Pike to the section of Southgate Road that will remain. No access to Foxcroft Heights residents will be provided along Nash Street. 3) The project remains under design, and is being designed to be aesthetically pleasing. The final design of the cemetery is outside the scope of this EA. Section 3.10 of the EA for further details.
50	Frithjov Iversen	Self	I recently learned of the plans to expand Arlington National Cemetery. While I support the initiative in general, I have a concern about continued access to the Air Force Memorial, which is a location were I occasionally go to take photographs at sunrise. Currently cars are restricted before 8am at the Air Force Memorial, but pedestrian access is available. However access to the cemetery is restricted before 8am, with security screening in place during open hours. If the Air Force Memorial becomes integrated in the cemetery, will pedestrian access procedures/hours change in any way? I greatly appreciate the current opportunity available to me and other local photographers to visit the Air Force Memorial at sunrise. Granted, the proposed cemetery expansion will eliminate some of the nearby parking, but I hope the memorial will continue to be accessible at these early hours.	The AFM will be integrated as a part of the ANC. As such, it will be subject to the same operation hours and security requirements as the rest of the cemetery. There will be a new parking facility across Columbia Pike from the AFM.
51	John Michael	Self	IN AN EFFORT TO REVIEW THE DRAFT DOCUMENT, BOTH LINKS ON THE PAGE BELOW DELIVER 404 ERRORS: http://www.nao.usace.army.mil/Media/Public-Notices/Article/1607604/anc-180821/ "Preserving the memories so others will remember"™ http://www.John-Michael.net < http://www.john-michael.net/ >; Author of "Images of America - Fort Lesley J. McNair" published by Arcadia MAY 2015 http://www.Historic-FortMcNair.com < http://www.historic-fortmcnair.com/ >; Author of "Images of America - Fort Myer" published by Arcadia JUN 2011 http://www.Historic-FortMyer.com <Blocked http://www.historic-fortmyer.com/ >; https://www.avast.com/sig-email?utm_medium=email&utm_source=link&utm_campaign=sig-email&utm_content=webmail&utm_term=icon > Virus-free. www.avast.com < https://www.avast.com/sig-email?utm_medium=email&utm_source=link&utm_campaign=sig-email&utm_content=webmail&utm_term=link >	(Editor's Response): Thank you so much for bringing this to our attention. I am forwarding this to our Public Affairs Office so that they can activate the links. In the interim, please use this link: http://www.nao.usace.army.mil/Missions/Military-Construction/ANCSouthernExpansion/ . If "Blocked" appears in front of the "http" when I send this to you, please delete it and then you can access the project website. Thank you again for bringing this to our attention. We apologize for the inconvenience.
52	Maria Durgan	Penrose Neighborhood, President	It is essential to this project that sufficient land be provided to allow a bike path along Columbia Pike to/from the Pentagon and Pentagon City. Failure to do so will impede access to the Cemetery, the Air Force Memorial, the 911 project from these points of access. Given that this will be a significant tourist destination, all access modes need to be considered and accommodated in this planning stage. Failure to do so will reflect badly on this project for the foreseeable future.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
53	Thomas Dunbar	Self	I understand the proposed mixed use trail alongside Columbia Pike, replacing the currently very wide and safe Southgate Road used by cyclists, will only be 10 ft. This mixed use trail should be 12-15 ft wide, which meets or exceeds the "standard" trail width for the Capital Trails Network. It should exceed the standard trail width for our region because this is an opportunity where the entire roadway is being re-designed, and is less constrained than the rest of Columbia Pike west of this project by the existing right-of-way. The currently proposed trail's surface should be distinct from the surface of a typical sidewalk to draw pedestrians' attention to the fact that they need to behave differently (be more aware) and expect bicycles. There should be signage reinforcing safe and courteous trail behavior for users of all types. Even better would be to separate out the bike and pedestrian traffic so there is a sidewalk AND a bi-directional protected bike lane on the North Side of Columbia Pike protected by a curb or other physical barrier. Example < http://2irfbl23rse12dglqd39cw6v.wpengine.netdna-cdn.com/wp-content/uploads/2017/03/downtown-bike-lanes-2017-03-23-pic1web.jpg > 1. Or demarcating separate pedestrian and cyclist areas in a wider-than-10 ft area like so Example 2 < http://www.pedbikeinfo.org/images/library/IndianapolisCulturalTrail_07.JPG >, Example 3 < http://www.cambridgema.gov/~media/Images/CDD/Transportation/Bike/VassarStata.JPG?la=en >. Building the trail wider or in the other ways that I propose will encourage more local visitors to the Cemetery, and the businesses on Columbia Pike, and reduce the amount of car traffic. I personally never consider going to the restaurants on Columbia Pike because parking is such a hassle and I can safely and comfortably walk to the restaurants in Crystal City and Pentagon City or bike to Del Ray or Shirlington.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
54	Gerry Fuller	Self	I attended the presentation on August 22, 2018, and provide the following comments and concerns. Overall project looks good, particularly the moving of the Operations Complex to the other side of Columbia Pike with an underpass access to ANC to avoid traffic conflicts. As a bicyclist, however, I am concerned by the decision to propose a combined pedestrian-bicyclist sidewalk. Bicyclists, and particularly commuter bicyclists, do not like to ride among pedestrians both for safety and convenience. Bicyclists like to move quickly; pedestrians, particularly families with children, are slow and unpredictable. Especially because Arlington now encourages more bicyclists to reduce the number of cars crowding the roadway, this decision for a mixed used sidewalk seems unwise and retrograde thinking. The "combined use sidewalk" would be good only if there are clearly marked and divided paths for pedestrians and bicyclists. Similarly, the lack of bicycle path on the other side of the roadway also seems wrongheaded. A bicycle path only requires three feet of roadway. Finally, as I am sure you are aware, bicyclists prefer a dedicated "bicycle only" path, either at the side of the roadway, or completely separated from the roadway. There are many such bike paths in the region. A bi-directional bicycle path needs only to be a few feet wide, and I think could easily be designed to aesthetically be a part of the landscape divide that will be needed to separate ANC from the busy Columbia Pike.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
55	Tyler Wean	Self	I would like to provide comments on the Draft EA for the ANC Southern Expansion project. 1. By replacing Southgate Road with just a sidewalk, this project is arguably a downgrade in cycling infrastructure, since a lot of cyclists (myself included) use Southgate Rd. 2. With the elimination of Southgate Rd, this portion of Columbia Pike will have no reasonable nearby alternative, so the final design for the Pike needs to include great bike infrastructure, such as a dedicated space for cycling that is not shared with pedestrians or automobiles and should be separated from automobiles by a physical barrier such as a curb. 3. The final design for Columbia Pike within the project area should be designed to transition seamlessly to the existing plans for Columbia Pike west of this project, but should be better than those plans because they are not constrained by an existing right-of-way. 4. Here are some potential solutions: a. A bi-directional protected bike lane on the North Side of Columbia Pike protected by a curb or other physical barrier. b. Widening the 10' sidewalk to be a trail and providing demarcated areas for pedestrians and cyclists marked with paint, signage or differentiated materials. Thank you very much for your consideration of my comments, I hope that this project will help enhance the biking infrastructure of Arlington and Columbia Pike.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
56	Andrea Mangones	Self	I am an Arlington County Resident who lives along the Columbia Pike Corridor and regularly commutes to work via both bicycle and car through the area for the proposed Arlington National Cemetery Expansion. I am writing to provide the following comments regarding the project: This portion of Columbia Pike has no reasonable nearby alternative. It needs great bicycle and pedestrian infrastructure. This area of Columbia Pike as it is today is NOT optimal for pedestrian/bike access, it is what is achievable given the constrained right-of-way west of this project area. The new portion of Columbia Pike being planned as part of this project is NOT similarly constrained and so should NOT adopt that sub-optimal configuration in the name of "consistency". It should instead be designed to provide the best multimodal experience. The bicycle and pedestrian infrastructure should be designed to accommodate the expected future bicycle and pedestrian traffic, not what is there now. All of the following can reasonably be expected to bring more bicycle & pedestrian traffic to this stretch: Planned pedestrian entrance to the cemetery; Improved biking & walking infrastructure nearby: Army Navy Drive Complete Streets Project, 110 Trail / Cemetery Wall Trail, Washington Blvd Trail, Columbia Pike Multimodal Project; Improved biking & walking experience from this project - current sidewalk infrastructure is actively hostile to pedestrians; The closing of Southgate Rd which is currently the preferred bike & pedestrian route for many users. The final design for Columbia Pike should feature dedicated space for cycling that is not shared with pedestrians or automobiles and should be separated from automobiles by a physical barrier such as a curb. Thank you for considering this feedback, Andrea Mangones	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. The Arlington National Cemetery Wall trail is a "recommended" trail project contained in the November 2018 Master Transportation Plan Bicycle Element report. It would construct a trail parallel to the east wall of ANC to link Columbia Pike to Memorial Drive. According to the MTP, the project, if constructed, would be completed by 2040.
57	Carlos Cerra	Self	I hope this email finds you having a good day. I am writing to you with some particular thoughts on the Southern Expansion project and, in particular, with some concerns for the traffic that is going, and may go, through our neighborhood, Foxcroft Heights; I will try to keep it short as I'm sure you're busy. My main concern/desire is to make sure that the base traffic through our neighborhood is not increased, and is hopefully decreased...preferably even eradicated completely. We have very narrow streets, two of which don't have sidewalks, and a lot of small children, pets and people walking on them creating many possibilities for accidents. I was very happy to see the Nash St. addition to the plan as I think that will be a great way for the base traffic to access & leave the base without going through our residential streets. Unfortunately, the problem will be how to make sure all the base traffic uses this new, purpose built road vs the neighborhood streets. People tend to go with the shortest distance between two points and, unfortunately, for anyone coming from or going to the West on Columbia Pike, they're going to want to go through our neighborhood. I think there are a couple of simple solutions to ensure the base traffic uses Nash St. First off, make a nice base entry sign where Nash St. meets Columbia Pike as well as signs farther down both sides of Columbia Pike directing people to Nash St. as the way to enter the base. I think I read this is proposed in the plan, but am stating the obvious just in case it is not. Secondly, and more importantly, both Northbound Orme St. and Oak St., where they end at Southgate Rd., should be made right turn only/no left turn with some sort of physical restraint (curb? posts?) keeping people from being able to make a left turn onto Southgate Rd./into the base. In addition, Eastbound Southgate Rd. coming out of the base should have no right turns allowed onto Southbound Orme St. or Ode St., again with some sort of physical restraint to keep people from doing so. (obviously, left hand turns from Westbound Southgate Rd. onto Ode St. & Orme St. must still be allowed for residential access). Not only would these things force all base traffic onto Nash Rd. (newly built at some expense exactly for this purpose) keeping the residential streets clearer, but it will also smooth the flow into and out of the base. Right now traffic trying to turn left onto Southgate Rd. from Orme St. backs up quite a ways while trying to merge with the stacked up traffic on Southgate Rd., often creating confrontations. Take away their ability to do so once Nash St. is up and running and then everyone entering the base would have to que up on Southgate Rd., making it less troublesome/confrontational for them and opening up the residential streets for the residents. I think making these small changes to the traffic patterns would offer a high/positive return to everyone involved for a minimal cost/disruption. I thank you for your time in reading this and appreciate your consideration on making these additions to the plan for everyone's benefit. I think you guys are doing a great job with the expansion plans and I, for one, am very happy with the proposed plan and hope it goes through quickly. Thanks again & have a great day.	Neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. This is a County decision. Whether or not to add a base entry sign at Columbia Pike & South Nash Street would be a Base and County decision. See Section 3.10 of the EA.
58	Rob Mandle	Self	Good Morning - I am looking for the links to the Draft EA for the Arlington Cemetery Southern Expansion. It appears that the links provided here < http://www.nao.usace.army.mil/Media/Public-Notices/Article/1607604/anc-180821/ > aren't active. Would you mind passing along an active link?	(Editor's Response): Thank you so much for bringing this to our attention. I am forwarding this to our Public Affairs Office so that they can activate the links. In the interim, please use this link: http://www.nao.usace.army.mil/Missions/Military-Construction/ANCSouthernExpansion/ . If "Blocked" appears in front of the "http" when I send this to you, please delete it and then you can access the project website. Thank you again for bringing this to our attention. We apologize for the inconvenience.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
59	Rebecca Carter	Self	<p>This portion of Columbia Pike has no reasonable nearby alternative. It needs great bicycle and pedestrian infrastructure. The street cross section for the rest of Columbia Pike is not an optimal facility, it is what is achievable given the constrained right-of-way west of this project area. The new portion of Columbia Pike being planned as part of this project is NOT similarly constrained and so should not adopt that sub-optimal configuration in the name of "consistency." It should instead be designed to provide the best multimodal experience and to seamlessly transition to that planned less-than-optimal facility.</p> <p>The bicycle and pedestrian infrastructure should be designed to accommodate the expected future bicycle and pedestrian traffic, not what is there now. All of the following can reasonably be expected to bring more bicycle & pedestrian traffic to this stretch: Planned pedestrian entrance to the cemetery.</p> <ul style="list-style-type: none"> * Improved biking & walking infrastructure nearby: Army Navy Drive Complete Streets Project, 110 Trail / Cemetery Wall Trail, Washington Blvd Trail, Columbia Pike Multimodal Project * Improved biking & walking experience from this project - current sidewalk infrastructure is actively hostile to pedestrians. * The closing of Southgate Rd which is currently the preferred bike & pedestrian route for many users. <p>The final design for Columbia Pike should feature dedicated space for cycling that is not shared with pedestrians or automobiles and should be separated from automobiles by a physical barrier such as a curb.</p> <p>* Potential Solutions:</p> <ul style="list-style-type: none"> * A bi-directional protected bike lane on the North Side of Columbia Pike protected by a curb, planters or other physical barrier. Example <http://2irfbl23rse12dglqd39cw6v.wpengine.netdna-cdn.com/wp-content/uploads/2017/03/downtown-bike-lanes-2017-03-23-pic1web.jpg> * Widening the 10' sidewalk to be a trail and providing demarcated areas for pedestrians and cyclists marked with paint, signage, barriers, plantings or differentiated materials. Example 1 <http://www.pedbikeinfo.org/images/library/IndianapolisCulturalTrail_07.JPG> , Example 2 <http://www.cambridgema.gov/~media/Images/CDD/Transportation/Bike/VassarStata.JPG?la=en> 	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
60	Allison J Foster	Self	As someone who bikes to work from Arlington County into DC every day, I request that you consider adding a bike lane to the East Pike Realignment. Biking reduces traffic, saves wear and tears on roads and just makes for a better community. But as a biker, it can be perilous out there. Pedestrians don't like to share sidewalks (I don't blame them) but sharing a lane with cars is just plain dangerous for bikers. Please protect the bikers and give them a dedicated bike lane.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
61	Mark Ruckh	Self	<p>This section of Columbia Pike, without dedicated, SEPARATE areas for bike and pedestrians will present a hazard to bikers from cars and pedestrians from bikers. Please don't do what has always been done and take this opportunity to create a safe environment for all users of Columbia Pike and the area around the Air Force Memorial and Arlington Cemetery. The following are both reasonable and viable solutions.</p> <ul style="list-style-type: none"> * The bicycle and pedestrian infrastructure should be designed to accommodate the expected future bicycle and pedestrian traffic, not what is there now. All of the following can reasonably be expected to bring more bicycle & pedestrian traffic to this stretch: * Planned pedestrian entrance to the cemetery. * Improved biking & walking infrastructure nearby: Army Navy Drive Complete Streets Project, 110 Trail / Cemetery Wall Trail, Washington Blvd Trail, Columbia Pike Multimodal Project * Improved biking & walking experience from this project - current sidewalk infrastructure is actively hostile to pedestrians. * The closing of Southgate Rd which is currently the preferred bike & pedestrian route for many users. <p>* The final design for Columbia Pike should feature dedicated space for cycling that is not shared with pedestrians or automobiles and should be separated from automobiles by a physical barrier such as a curb.</p>	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
62	Robert Sidman	Self	The preferred alternative for the realignment of the east end of Columbia Pike will not meet the needs of the citizens and visitors to the cemetery as it is currently drafted. With the removal of Southgate Road, this is the only route from Columbia Pike to the Pentagon City area. As it is currently drafted, it is not pedestrian or bike friendly and not in line with the needs of the area. We need to have a dedicated space separated from traffic for bikes. This will also ensure that the sidewalks will be safe for the pedestrians who are walking in the area to visit the cemetery or the Air Force Memorial. Additionally, the planned underpass should be realigned so that it is closer to South Joyce street so it will be able to be used by those walking to and from the area. As it is currently, it appears to be for operations as opposed to the users and visitors for which the cemetery is designed. Thank you for consideration of these comments.	
63	Virginia Strobach	Self	I am a regular user of Southgate Rd. to commute on bike from Pentagon City to the Courthouse area of Arlington. I support a design of the new alignment of Columbia Pike that has a dedicated bike lane that is separate from both traffic and pedestrians. Given the elimination of Southgate Rd, and the steep hill that the realignment will create, a separate bikeway is needed to keep drivers, pedestrians and cyclists safe.	
64	Ted Billings	Self	As a neighbor of 40 years I am honored, proud and pleased that Arlington National Cemetery will be expanding to provide more much needed burial sites. This is a wonderful opportunity to provide a final resting place for our brave soldiers and their families. I also believe this opportunity should be taken to further integrate the cemetery with its surrounding community. To that end, I strongly suggest we make the investment to provide much needed safe and attractive space for pedestrian and bike traffic along the portion of Columbia Pike which will be rebuilt. I and many of my neighbors use this space to walk and bike exercise, take in the vistas, and get to work, either by connecting to other paths or to public transportation. Arlington Cemetery and Arlington County should join together to provide a beautiful final resting place for the dead and a safe space for the living. Thank you for your consideration.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
65	Bart Epstein	Self	I fully support the expansion of the cemetery to honor our nation's heroes. As you do the project, however, I hope you will take into account the need for protecting cyclists. Many people in my neighborhood including many military families including kids, need protected bike lanes there. This portion of Columbia Pike has no reasonable nearby alternative. It needs great bicycle and pedestrian infrastructure. The street cross section for the rest of Columbia Pike is not an optimal facility, it is what is achievable given the constrained right-of-way west of this project area. The new portion of Columbia Pike being planned as part of this project is NOT similarly constrained and so should not adopt that sub-optimal configuration in the name of "consistency". It should instead be designed to provide the best multimodal experience and to seamlessly transition to that planned less-than-optimal facility. The bicycle and pedestrian infrastructure should be designed to accommodate the expected future bicycle and pedestrian traffic, not what is there now. All of the following can reasonably be expected to bring more bicycle & pedestrian traffic to this stretch: Planned pedestrian entrance to the cemetery; Improved biking & walking infrastructure nearby: Army Navy Drive Complete Streets Project, 110 Trail / Cemetery Wall Trail, Washington Blvd Trail, Columbia Pike Multimodal Project; Improved biking & walking experience from this project - current sidewalk infrastructure is actively hostile to pedestrians; The closing of Southgate Rd which is currently the preferred bike & pedestrian route for many users. The final design for Columbia Pike should feature dedicated space for cycling that is not shared with pedestrians or automobiles and should be separated from automobiles by a physical barrier such as a curb. Potential Solutions: *A bi-directional protected bike lane on the North Side of Columbia Pike protected by a curb, planters or other physical barrier. Example http://2irfb123rse12dglqd39cw6v.wpengine.netdna-cdn.com/wp-content/uploads/2017/03/downtown-bike-lanes-2017-03-23-pic1web.jpg *Widening the 10' sidewalk to be a trail and providing demarcated areas for pedestrians and cyclists marked with paint, signage, barriers, plantings or differentiated materials. Example 1 http://www.pedbikeinfo.org/images/library/IndianapolisCulturalTrail_07.JPG , Example 2 http://www.cambridgema.gov/~media/Images/CDD/Transportation/Bike/VassarStata.JPG?la=en . Thank you for your consideration.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. Pedestrian access is planned in the vicinity of the Air Force Memorial.
66	Fred Mull	Self	I wanted to comment on the Draft Environmental Assessment for the ANC Southern Expansion Project and Associated Roadway Realignment. In particular, I want to suggest the the portion of Southgate Road that is to remain be split in two, with the northern half, still called Southgate Road, connecting Nash Street to the Joint-Base gate. The southern half, which could be renamed Foxcroft Road, would connect Oak, Ode, and Orme Streets. This would prevent Joint-Base traffic from using the neighborhood streets when commuting to and from the Joint-Base, which is already a problem, and is expected to get worse with the removal of the eastern-portion of Southgate Road. I've attached a conceptual map of what I am suggesting.	Neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. The decision whether or not to dead-end or separate these roads rests with the County.
67	John Michel	Self	Thank-you for this opportunity to comment on the southern expansion of Arlington National Cemetery and the associated roadway realignments. I live on south Oak Street in the Foxcroft Heights neighborhood of Arlington and will be significantly affected by these two projects. There are many positive changes that are in store for my neighborhood as a result of the projects. However, I have some major concerns over the potential impact to traffic and parking in my neighborhood as a result. My first concern, and I feel that it is a major concern, has to do with the flow of traffic through Foxcroft Heights. It is unclear how the proposed configuration will impact traffic in my neighborhood if Nash Street simply connects to the current gate at the Joint Base Meyer-Henderson Hall (JBM-HH). I would like to see a dedicated flow of traffic to and from JBM-HH to minimize traffic on neighborhood streets. I believe that this could be facilitated by including the possibility of opening up the currently unused Gate 3 for JBM-HH at the north end of Nash Street, if not all day, perhaps, at a minimum, from 6:00 - 9:00 AM and 3:00 - 5:00 PM, for example. Traffic patterns that route traffic away from S. Orme, S. Ode, and S. Oak are a priority. Parking in Foxcroft Heights has been an issue for many years and the closure of Southgate Road east of Nash Street and the probable increased traffic to the area as a result of the project could aggravate this problem. I would like to see the plan include a comprehensive vision and consideration of the impact to parking in my neighborhood. Proposed changes to intersections along Columbia Pike at Washington Boulevard, Joyce Street, and Nash street require serious consideration of the safety of pedestrians and the impact on traffic. At present, when southbound traffic on I-395 backs up, many vehicles exit Washington Boulevard to Joyce Street, Columbia Pike, and/or Southgate Road to avoid the traffic. With the realignments and closures, this situation will probably worsen and, like I said, needs some serious consideration on how to reduce safety risks.	Neither ANC or FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. The decision whether or not to dead-end these roads rests with the County. Parking allowances within Foxcroft Heights is also a County decision. The Interchange Modification Report indicated that traffic flow would improve rather than worsen as a result of the reconfigured interchange. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. See Section 3.10 for more detail.
68	Sarah McKinley	Columbia Heights Civic Association	Our civic association has reviewed the plans by the U.S. Department of the Army to expand the Arlington Cemetery into area once reserved for the Navy Annex. These plans also propose realigning Columbia Pike. We are supportive of the realignment of the Pike. However, we are very concerned about the proposal for a combined pedestrian/bike path along the north side of Columbia Pike. Based on our experience in the community, we believe that 10 feet is insufficient for the future transportation needs and urge you to widen this proposed path. First, pedestrian and bicycle traffic should be separated. Currently Arlington County requires sidewalks to be at least five feet wide, with very few exceptions. Sidewalks next to major arterials are often larger. That means that all bicycle traffic would have to be confined to five feet. We don't think this is practical. Ideally we need a two-way bicycle path. Bicycling is growing in Arlington, and traffic along Columbia Pike will not only go to the Pentagon. A much greater share will be going to other locations—including routes to DC. We believe that the estimates of usage cited by the Army, while based on estimates provided by Arlington County, underestimate future growth. In addition, there will be a much steeper grade on that section of the Pike, which means that bicycles will be rolling downhill at much faster speeds. Bikes will need space to pass each other, particularly during rush hour. The failure to separate pedestrians from bicycle traffic, and the inability of bicycles to have enough space to pass each other, will lead to accidents. The cemetery is already being extended considerably with its facility buildings now being moved South of Columbia Pike. We understand the dire need for internment space within the cemetery, but that need must be balanced with the needs of the community.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
69	Mark Obrinsky	Self	Your proposed plan is generally good. But there needs to be more and better space for cyclists. There are more and more cyclists every year, including those who commute by bike, which is helpful in taking car traffic off the roads. Please help further this trend with dedicated space for bikes. As one who commutes to work by bike about once a week, I can tell you that the danger comes not just from cars, but also pedestrians. Let pedestrians have their sidewalks, but give us cyclists our bikeways too.	
70	Jane Green	Self	I have great concern about the proposed infrastructure for walking and biking along the rebuilt portion of Columbia Pike as part of the Arlington Cemetery expansion. It is very likely that starting in 2019, families from the Pentagon City area will be zone for Hoffman-Boston Elementary School (1415 S Queen St, Arlington, VA 22204). This section of Columbia Pike will be a crucial route for safely transporting children to and from school. Having safe and adequate walking and biking space will encourage more parents to forgo driving their kids to and from school, which will reduce congestion in this area. The school rezoning is a major element in this project that must be considered. Please speak to the Arlington Public Schools staff (engage@apsva.us) to learn more about the impact. Under new zoning that will likely go into effect, an large number of families could have a unappealing and dangerous connection to their school.	
71	Paul Guttridge	Self	Thank you for realigning Columbia Pike! Please also include provision for separate bike lanes with separation to vehicles and pedestrians. This has the potential to be a really great connection for cyclists and pedestrians from Crystal city and pentagon city, Aurora Highlands and Arlington Ridge to points West. Thanks for your consideration.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
72	Grant Madsager	Self	I am writing to request that the proposed Cemetery expansion plan be modified to better accommodate biking and walking on the realigned Columbia Pike. I'm a father of three and we use bikes as our primary means of transportation in Arlington, usually with the kids in a cargo bike but often on their own bikes. Currently, when we travel to Crystal City, Pentagon City, Long Bridge Park, and other parts of Arlington east of I-395 we use Southgate road as a comfortable and low-traffic bike route. The proposal eliminates Southgate road, but the proposal does not adequately replace it. A 10' sidepath is not wide enough to accommodate two-way bike and pedestrian traffic, especially with the increased traffic from Air Force and Pentagon memorials. In order for my family and others to continue to bike safely in this corridor, the plan needs to be modified according to current transportation standards (wider and separated facilities). This need is even greater since Fort Meyer and ANC have banned the general public from using their roadways as a cycling route. If that policy were reversed, it would have a huge positive impact for the surrounding community and greatly increase the safety for those who bike to/from DC and East Arlington. Thank you for your consideration	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
73	Robb Dooling	Self	I live in DC but often work in Virginia and bike commute through this area. Please include a two-way, physically protected bikeway in the new construction. Thank you for all you do.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
74	Steve Leutner	Self	I fully support expanded multi-modal infrastructure as detailed here: https://ggwash.org/view/69093/the-impacts-of-the-planned-arlington-cemetery-expansion-on-cyclists . Columbia Pike absolutely needs improved bicycle infrastructure. As an Arlington resident and military officer stationed at the Pentagon I cycle to work daily. This area is in desperate need of substantial improvements for pedestrians and cyclists. The Corps proposals are a start, but they need to be improved.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
75	Matt Wilcox	Self	Please include a two way cycle track on the north side of Columbia Pike. My wife would like to bike for transportation like me but without dedicated, safe infrastructure she doesn't feel safe enough to do it. This is a crucial connection and a one time opportunity. Please encourage active and sustainable transportation. Sincerely, a cycling loving Republican.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
76	Elizabeth Hearn	Self	Please include protected bidirectional bike lanes along the redesign of Columbia Pike!	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
77	Franklin Green	Self	I am all for the Arlington Cemetery expansion, but the proposal for only a 10 foot wide pedestrian/bike path is clearly inadequate. The proposed pedestrian/bike path will set maximum limits for transportation and visitor pedestrian access or for the long haul. I don't think anyone would dishonor and diminish the veterans who served our country and who will be buried in the cemetery expansion, which means no one will ask that veterans be moved/re-interred to accommodate additional right of way in the future. The current bicycle restrictions in the cemetery, while appropriate, contribute to the current extreme difficulty of circumnavigating the pentagon/arlington cemetery/fort meyer complex. So please widen the proposed pedestrian/bike corridor along the new Columbia Pike to 20 feet. If the extra ROW proves unnecessary in the long run, it can revert back to the cemetery. The extra width will also provide more flexibility via landscaping in softening the transition from I-395 and Columbia Pike. Finally, anyone who commutes through Arlington to the District for work knows that biking in is the most reliable and least stressful way to commute vs. Metro and traffic.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA.
78-139	(exact same comment from a total of 61 people)	Self	As someone who bikes for recreation and transportation in Arlington, I was disappointed to see bicycling not better accounted for in the Southern Expansion plan. By closing Southgate Rd, the rebuilt Columbia Pike will be the only bikeable connection between Pike neighborhoods to the west, Pentagon City, the Pentagon, and trails (both existing and planned). The proposed 10 foot sidewalk on Columbia Pike does not meet best practices for a high use bicycle and pedestrian facility and will result in continuous conflicts between people biking and walking. We can do better. I urge you to: (1) Modify the Columbia Pike design to include separate spaces for all modes: sidewalks for walking, curb-protected bike lanes for bicycling, and driving lanes for cars and buses; (2) Study whether Columbia Pike must have four driving lanes to move the cars and buses that use it. Narrow roads are safer for everyone, cheaper to build, and less impactful to our environment; (3) Consider the existing & planned bicycle network and likely destinations near the project. Ensure that the bikeways, intersections and driveways are convenient and safe for people on bikes; (4) Ensure that this plan does not prevent construction of long-planned trail projects like the 110 / Wall Trail or improvements to existing trails.	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. Experts in the field of transportation, both planners and engineers, design urban major arterial roadways such as Columbia Pike to accommodate morning and evening peak commuter traffic flow and, in this case, a high volume of bus traffic. Therefore, four lanes of traffic were determined to be necessary. The roadways cannot be narrowed. They, like the bicycle and pedestrian trails, must be constructed according to AASHTO and VDOT safety standards. The Arlington National Cemetery Wall trail is a "recommended" trail project contained in the November 2018 Master Transportation Plan Bicycle Element report. It would construct a trail parallel to the east wall of ANC to link Columbia Pike to Memorial Drive. According to the MTP, the project, if constructed, would be completed by 2040.
140	Dan Kois	Self	I lived for a time last year in the Netherlands, where I was amazed at the way that concerted and careful city planning can make a better transportation experience for everyone: drivers, walkers, and bikers. As someone who bikes for recreation and transportation in Arlington, I was disappointed to see bicycling not better accounted for in the Southern Expansion plan. By closing Southgate Rd, the rebuilt Columbia Pike will be the only bikeable connection between Pike neighborhoods to the west, Pentagon City, the Pentagon, and trails (both existing and planned). The proposed 10 foot sidewalk on Columbia Pike does not meet best practices for a high use bicycle and pedestrian facility and will result in continuous conflicts between people biking and walking. We can do better. I urge you to: (1) Modify the Columbia Pike design to include separate spaces for all modes: sidewalks for walking, curb-protected bike lanes for bicycling, and driving lanes for cars and buses. (2) Study whether Columbia Pike must have four driving lanes to move the cars and buses that use it. Narrow roads are safer for everyone, cheaper to build, and less impactful to our environment. This last point is particularly important to me. Everyone's experience in that neighborhood and that area would be so much better if the thruway was devoted to non-auto traffic. A two-lane road would accommodate plenty of cars while still leaving plenty of space for other modes to embrace the route.	See "Response to Bike/Pedestrian comments" - Comment #96, Response to Comments 78-139, and Section 3.10 of the EA.
141	Mark Lee	Self	I am a DC resident who regularly travels through the Arlington Cemetery expansion area in Arlington to travel for sports activities and a few side jobs teaching music in Northern Virginia. I rely on biking for commuting, which is more convenient than driving or using transit. Expanded bike access to the area is important to me and many of us who live in the area, as we must develop transportation solutions that mitigate traffic demand and encourage folks to use environmentally friendly transportation options. I hope that you consider expanding this path to include dedicated bike lanes, not just lanes that are shared with pedestrians.	See "Response to Bike/Pedestrian comments" - Comment #96, Response to Comments 78-139, and Section 3.10 of the EA.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
142	Pamela Van Hine	Self	I am writing to you about the preferred alternatives in the Environmental Assessment for the Southern Expansion of the Arlington National Cemetery. I live in Aurora Highlands, a neighborhood on the other side of I-395 from the Cemetery, and I run and walk from my neighborhood to points further west on Columbia Pike. I have read the assessment and attended the public meeting on August 22. My first comment is to document a comment I had at the public meeting. I am glad that you plan to have a traffic light/pedestrian light on Columbia Pike between the proposed parking structure on the south side and the Air Force Memorial and proposed new Cemetery entrance on the north side. My suggestion was to add a flashing light, activated when traffic/ped light is on, to warn drivers heading from the west. I think this warning light will be needed because the hill causes poor sight lines. My second comment is about the proposed new T-shaped intersection at Joyce and Columbia Pike. Although I think this is a great design, I want to ensure that pedestrians and cyclists can cross safely through the new intersection without conflict with drivers. Please consider a Barnes dance light to avoid conflict. My third, final, and most significant comment is about the proposed 10' wide shared use sidewalk on the north side of Columbia Pike. I feel that this width is grossly inadequate and dangerous for both cyclists and pedestrians. Most cyclists - and many pedestrians - currently travel up and down Southgate Road because it is safer, easier, and a bit more pleasant than traveling on Columbia Pike. However, your plans call for closing most of Southgate Road, but do not specifically address that the cyclists and pedestrians will now be on the 10' wide sidewalk, as riding on the Pike is very dangerous. Cyclists riding up and down on this narrow sidewalk will endanger pedestrians who are older or disabled, and cyclists riding down the 6% grade will be a hazard to all pedestrians. Your report also does not consider increased cycling and pedestrian traffic after Columbia Pike has been renovated and your new facilities are open. First, Columbia Pike is a critical link between growing, high-density neighborhoods south of I-395 and west of Washington Boulevard. Community riders and walkers who do not currently travel up and down the Pike will be encouraged to use it if it is designed for safety for all users. Second, an increasing number of tourists will either park at the new parking facilities, walk from local transit options, or use shared mobility devices. These tourists will also be on the 10' sidewalk to visit the Cemetery, the Air Force Memorial, and the current and proposed 9/11 memorials. I strongly encourage you to work with Arlington County staff to either expand the sidewalk to at least 15' wide or provide protected bike lanes on Columbia Pike (see examples from SUSMO site <Blockedhttps://susmo.org/biking/east-pike-realignment/>).	See "Response to Bike/Pedestrian comments" - Comment #96, and Section 3.10 of the EA. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. Signalization types will be determined during the design phase. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI.
143	Sarah Husband	Self	I bike along the road by the cemetery to get to work. I work near Gallery Place/Chinatown, so the bike path that goes next to the Pentagon is a nice way for me to get to work. I'd be scared to bike on the 10 foot sidewalk along Columbia pike, because cars often don't notice cyclists on sidewalks and turn right in front of them or hit them. I cycle to get from A to B both on weekdays and weekends, and in my many miles of cycling, the two times I've actually been hit were when I was on a sidewalk path and crossing a place where cars turn in or out. I was disappointed to see bicycling not better accounted for in the Southern Expansion plan. By closing Southgate Rd, the rebuilt Columbia Pike will be the only bikeable connection between Pike neighborhoods to the west, Pentagon City, the Pentagon, and trails (both existing and planned). We can do better. I urge you to: (1) Modify the Columbia Pike design to include separate spaces for all modes: sidewalks for walking, curb-protected bike lanes for bicycling, and driving lanes for cars and buses. (2) Study whether Columbia Pike must have four driving lanes to move the cars and buses that use it. Narrow roads are safer for everyone, cheaper to build, and less impactful to our environment. (3) Consider the existing & planned bicycle network and likely destinations near the project. Ensure that the bikeways, intersections and driveways are convenient and safe for people on bikes. (4) Ensure that this plan does not prevent construction of long-planned trail projects like the 110 / Wall Trail or improvements to existing trails.	See "Response to Bike/Pedestrian comments" - Comment #16, Response to Comments 78-139, and Section 3.10 of the EA.
144	Andy G	Self	As a member of the military I understand the need for expansion. As a resident of Arlington in an adjoining neighborhood and avid cyclist who uses the south gate road currently, a dedicated bicycle lane in both directions is a necessity. Please include a dedicated bike lane and separate sidewalk in the planned expansion. This corridor needs to have good pedestrian and cycling options to keep all parts of the town accessible	See "Response to Bike/Pedestrian comments" - Comment #16, and Section 3.10 of the EA.
145	Terri Armao	Self	Your plans are going to cause problems for people living in Arlington County and need access to 395 from Southgate road. Instead of continuing to expand ANC, please find other land. We have no land for schools in Arlington and this proposal is tone deaf to people who live along Col. Pike and in South Arlington. To claim, as you have, that there is no archeological artifacts in the proposed area is ludicrous. You just don't want to admit that there are artifacts there as it would derail your land grab. You have already destroyed 12 of the 24 acres of woods on the grounds of ANC that were supposed to be protected forever. You cut down trees that were 250 years old so the caisson could make a loop. You destroyed important bird and wildlife habitat within Arlington County for more burial space and claimed that you had only 7 mores acres available for expansion, thereby making it appear necessary to destroy the woods. Now this proposal shows up which quite obviously had been in the works for many years. You are doing a disservice to the residents of Arlington County and the public by the continued half truth and claims of necessity. ANC will fill up and so face the future now. Find another hallowed ground for our men and woman service members who deserve our utmost respect.	The former Navy Annex property was first identified in the 1998 ANC Master Plan as suitable interment space due to its location adjacent to the ANC boundary and existing DoD ownership. The National Defense Authorization Act of 2000 validated its suitability and required the Secretary of Defense to transfer the former Navy Annex property to the Secretary of the Army and incorporate the land into Arlington National Cemetery. Studies to address any cultural and historic resources, as well as any natural habitat to be impacted, are addressed in the EA. The EA indicates that there will be an adverse effect on historic/cultural resources; the effects and mitigation for them are being addressed through a Memorandum of Agreement.
146	Roman Gelman	Self	As a veteran the hallow grounds of the cemetery is very special to me. I'd like to take this opportunity to express my short thought on the expansion. While I support some of the land to be used for the unfortunate and inevitable death of service members, I believe splitting the land to be enjoyed the living is warranted. In particular, I am proposing using the land of the former annex to be made a national park, perhaps named Remembrance Park, to be enjoyed by all those with us today. Thank you for the opportunity to share my opinion and recommendation.	The National Defense Authorization Act of 2000 required the Secretary of Defense to transfer the former Navy Annex property to the Secretary of the Army and incorporate the land into Arlington National Cemetery. The project purpose is to expand the cemetery to serve future need, as mandated by Congress. Converting the land into a park would not meet the purpose and need of the project.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
147	Melanie Batenchuk	Self	<p>I'm writing today about the Arlington National Cemetery expansion plans. I am a 13-year resident of the Columbia Pike corridor. I have witnessed many positive changes to our neighborhood in that time, including the building of the Air Force Memorial. Throughout my time here, one of my favorite things to do is to skip past the I-395 entrance and take SR-244 Eastbound into Pentagon City. Driving over the crest, as it curves next to the Memorial, the road provides a breathtaking view of our nation's capital. This always is a humbling and warming experience for me. I believe our veterans deserve the utmost respect, especially that peaceful view of the center of the world, which they fought so hard to defend. My grandfather served in the Army Corps of Engineers for 30 years, including WWII, the Korean War, and working on the Pershing missile. My grandmother lived here in the 1940's as part of the women code breakers at Arlington Hall. They met at Ft. Belvoir and somehow I made my way to the same neighborhood, just a young gal from NC, nearly 60 years later. In developing the expansion, however, I believe we need to deeply contemplate the impacts to local neighbors, as well as the positive opportunities that the "Southern Expansion" provides. South Arlington, particularly the Columbia Pike corridor, has long been the forgotten middle child of Arlington County. Often times, our local government neglects our input for their own financial benefit, all the while pouring more and more investment into our neighbors to the North. It's quite the sore spot for us in this neighborhood, who value diversity of thought, background, culture and language. After all, we are called "the world in one zip code." https://learningenglish.voanews.com/a/diversity-on-columbia-pike-northern-virginia/3297171.html I believe it is important to be prudent with this expansion that will re-align the Pike. I think that there is a wonderful opportunity here to provide great access to pedestrians, bicyclists, and the like to have back-door access to the nation's most tangible historical record of those we've lost at the cost of American freedom. With all of this being said, I'm writing to encourage the Army to: (1) Put a stronger emphasis on this section of the road existing for pedestrians, public transit and cyclists than for passenger vehicles. I believe we should encourage passenger vehicles and tractor trailers to use the Washington Blvd and I-395 ramps so that this new area could be presented as a safe place for local residents and tourists to visit and spend time. This expands the opportunity for events on this side of the Cemetery as well. (2) Include wide pedestrian walkways that are fit for runners, families with strollers, and persons walking their pets (I do not believe 10ft is sufficient). The walk to the Memorial from Pentagon City is safer than it used to be, but it's still a bit treacherous for pedestrians. A well-executed example is the Atlanta Beltline <https://beltline.org/about/the-atlanta-beltline-project/atlanta-beltline-overview/> , which provides plenty of room for all who want to enjoy the city's new pathways. (3) Incorporate dedicated bike lanes into the traffic lanes for cyclists. (4) Incorporate a Capital Bikeshare station nearby to encourage riders from the area to visit. (5) Work with WMATA or ART to provide complimentary transport to the new gate from the Pentagon and Pentagon City metro station.</p>	<p>See "Response to Bike/Pedestrian comments" - Comment #16, and Section 3.10 of the EA. Neither ANC nor FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. The decision whether or not to dead-end these roads rests with Arlington County. Parking allowances within Foxcroft Heights is also a County decision. The Interchange Modification Report indicated that traffic flow would improve rather than worsen. FHWA is also analyzing further traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI.</p>
148	Foxcroft Heights Civic Association	Foxcroft Heights	<p>We are writing to you as the Board of the Foxcroft Heights Civic Association regarding the planning and design of the Southern Expansion Project for Arlington National Cemetery. Overall, we look forward to improvement of the area of the Southern Expansion Project. The blighted areas of the previous Navy Annex site and the roads and land immediately south of Columbia Pike have lain dormant for a long time and we hope that the project will improve the area immediately surrounding our neighborhood. However we would like to outline a number of serious concerns that we have about the project: 1) While we are happy that the creation of South Nash Street remains in the project planning, we are uncertain about the success of this addition in alleviating traffic and parking problems in Foxcroft Heights. We understand that while the project will build South Nash Street through Federal Highway funding, it's maintenance and the direction of traffic will be handled by Arlington County. With the closure of Southgate road east of South Oak Street, we fear that the thousands of individuals who have used Southgate Road daily for decades will aggravate the parking and traffic problems that our neighborhood has experienced for many years. Without a dedicated access route to JBM-HH, the addition of South Nash Street will simply connect to the current operational gate while still allowing for transit access on South Orme, South Ode, and South Oak streets. We do not see how the addition of Nash will improve traffic flow or parking. Currently, all of our streets bear the burden of extensive traffic backups as a result of ingress to and egress from the base, particularly at certain times of the day. We would like to be ensured that the design and the traffic routing will consider this at these early stages to help alleviate our current problems. It was our hope that Nash would connect directly to JBM-HH (perhaps through the unused Gate 3 which would meet the north end of South Nash) or via some other route. This would eliminate the need to traverse our streets. Residents would also like to entertain other options including the possibility of creating closed-ended streets or some sort of barriers that could eliminate our current traffic issues. We are the smallest neighborhood in Arlington and we have suffered for many years from a lack of consideration and design of how the public and our commercial and governmental neighbors use our streets. 2) There needs to be coordination between Arlington County and the ACE in these early stages to ensure that there will be a successful vision for traffic flow and parking in the Foxcroft Heights neighborhood. It seems that little thought has been given to these issues apart from simply building an additional road which will be handed over to Arlington County for maintenance. There are also concerns that increased access to the Cemetery via the Southern Expansion will increase the number of visitors with little consideration for parking and access. We are skeptical that the currently envisioned parking garage will satisfy the parking needs from this increase. 3) Changes have been proposed to intersections along Columbia Pike as well as the addition of ramps and traffic lights. We would like to see impact studies on these changes. This area currently contains circuitous routes from numerous major thoroughways. Changes to the current patterns could have a detrimental impact to commuters, bikers, and pedestrians. We would like to emphasize our concern for the intersection of these interests, particularly with regard to safety and connecting this area to others. We have long been considered the eastern gateway to Columbia Pike and we would like to see that status elevated while maintaining attractiveness, safety, and foresight for the future of Columbia Pike and surrounding areas. We also concur with the concerns of other groups that the current plan for bicycle and pedestrian access along the corridor should be expanded to ensure a long-term vision along the Pike accommodating pedestrians, bicyclists, and automobiles in a safe manner. We are particularly concerned about the traffic light proposed at Washington Boulevard and the Pike. There was recently a pedestrian death at one of the intersections near here, emphasizing the importance for proper planning and execution in this regard. Thank you for the opportunity to express our concerns. We look forward to working together with ACE, ANC, and Arlington County in the future to ensure that this project is an improvement for the Cemetery and four our local communities.</p>	<p>South Nash Street was proposed as a way to carry traffic from Columbia Pike to Joint Base Myer-Henderson Hall after most of Southgate Road is removed. Neither ANC nor FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. That is a County issue. Additional parking is planned on Columbia Pike across from the AFM, and visitors to the AFM may also utilize existing parking within ANC. Parking authorization within Foxcroft Heights is a County decision. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing further traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. See "Response to Bike/Pedestrian comments" - Comment #16, Response to Comments 78-139, and Section 3.10 of the EA.</p>

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
149	Steve Lopes	Self	<p>I live at 707 South Orme Street and have a couple of comments and concerns with the expansion. - Most significantly, i'm concerned about the traffic flow through Foxcroft Heights. It is unclear how the proposed configuration will impact traffic in the neighborhood if Nash Street simply connects to the current gate at the Joint Base Meyer-Henderson Hall (JBMHH). Currently traffic to and from JBMHH relies on Orme St and Southgate Road and the gate can not clear vehicles fast enough to prevent significant back-ups on both roads. Most mornings I am unable to get out of my driveway.</p> <p>- Consequently I would like to see dedicated lane to and from the base to minimize traffic on our streets, including the possibility of opening up the currently unused Gate 3 for JBM-HH at the north end of Nash Street. Traffic patterns that route traffic away from S. Orme, S. Ode, and S. Oak are a priority. - Parking in Foxcroft Heights has been an issue for many years and the closure of Southgate road east of Nash and increased traffic to the area as a result of the project could aggravate this problem. The plan should include a comprehensive vision and consideration of the impact to parking in our neighborhood. - Proposed changes to intersections along the Pike at Washington Boulevard, Joyce Street, and Nash street require serious consideration of the safety of pedestrians and the impact on traffic.</p>	<p>South Nash Street was proposed as a substitute facility for Southgate Road; traffic from Columbia Pike to Joint Base Meyer-Henderson Hall would utilize this route and avoid Foxcroft Heights' streets. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. Neither ANC nor FHWA has the authority to control traffic flow or access on Orme, Ode, and Oak streets. Additional parking is planned on Columbia Pike across from the AFM, and visitors to the AFM may also utilize existing parking within ANC. Parking allowances within Foxcroft Heights is also a County decision.</p>
150	Ken Erwin	Self	<p>The traffic through this project should be studied in more detail. There will be major problems with a 4 way stoplight at the Washington Blvd and Columbia Pike intersection. Also, the flow through the Foxcroft Heights neighborhood is going to get worse, not better from Nash Street. There should be a complete study by the county on this. The County is trading away significant and sizeable land area and getting nothing in return. Just because the Army is authorized to purchase the land doesn't mean the County has to sell. I don't just walk to my neighbors and tell him I have the money to buy his or her house and therefore they must sell. The County should reexamine why they are not getting the land for Nash Street or an equivalent amount of land for what they are giving up. The State of VA should consider this as well. If necessary, the County and State should get Don Beyer, Tim Kaine, and Mark Warner involved; if they can't reach an agreement that is valuable to both the County and the Army. Finally, once these traffic studies and land swap issues are rectified, the County should ensure that Foxcroft Heights neighborhood gets a portion of this land for a public park expansion. The amount of land that the army is giving the neighborhood for the park extension is miniscule and really a joke.</p>	<p>An analysis of traffic in this area was documented in an Interchange Modification Report prepared by Arlington County's traffic consultant. The report indicated that the proposed closure and realignment of roadways and future signalized intersections would improve traffic operations. The project anticipates less JBMHH traffic using residential streets with the addition of South Nash Street. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. There is no longer a land exchange proposed; the Army is acquiring the land necessary for the project from the County.</p>
151	Gillian Burgess	Self	<p>Our family primarily bikes to get around. The area of the expansion is a critical link to get from where we live to the shopping, restaurants, schools and spaces in Pentagon City and Crystal City. Our kids will likely go to Middle School in that area, and make bike through the project area to get that. Right now, we rely on Southgate Road as a safe and comfortable place to bike. The project will remove Southgate Road, and thus must provide space to bike that is at least as safe and comfortable. The proposed design does not do that. Thus, the environmental assessment (EA) is incorrect that the proposed design "increases multi-modal transportation option". The proposed design reduces options for biking. In order for the EA to provide acceptable options for biking, the design must include segregated space for people riding bikes. That space could be an onstreet protected two-way cycletrack on the north side of the Columbia Pike, or a dual track trail, with a minimum of 8' each for walking and biking, similar to the separated trail that NovaParks is planning for the W&OD Trail. Additionally, the Army dismisses Arlington's plan for a Cemetery Wall Trail. The County has planned for that Trail. The proposed plan could very easily designate the "sidepath" as the Cemetery Wall Trail and be consistent with Arlington's plan. That trail should be built to AASHTO standards, with a minimum width of 12 feet, to accommodate the foot traffic for the Cemetery and the Visitor's Center. Additionally, the trail along the new North Nash Street should be on the Cemetery side of the street, and should be a continuation of the Cemetery Wall Trail. While not mentioned in the proposed design, the Army should be sure that all destinations along the project corridor - the Visitor's Center and Memorial, entrances to the Cemetery and the Operations Complex - should have adequate bike entrances and bike parking. The Operations Complex should have facilities to enable people to walk and bike to work. The greatest opportunity to increase the capacity for regional multimodal transportation in this area would be for the Cemetery and Fort Myer to allow people bike through the property. Like most other cemeteries in the region, Arlington National Cemetery should let everyone on two feet and two (and three) wheels travel through on its roads, subject to rules of decorum and respect. Bicycles would certainly not be less dignified than the tour buses that already travel the Cemetery's roads. A speed limit for bikes and limits attire (e.g. wear shirts) and noise would be reasonable propositions. Fort Myer should allow everyone on a bike to travel through each of its gates, when open. If necessary, random bag searches could ease security fears. The Corps should take advantage of this rare opportunity to ensure that the design of the realigned Columbia Pike increases capacity for people walking and biking.</p>	<p>The project purpose and need of cemetery expansion and road realignment necessary for the project creates an opportunity to address multimodal capacity and maintaining safety and capacity levels. "Multi-modal traffic" includes bicycles, pedestrians, cars, buses, or trolleys. The proposed bicycle and pedestrian trails via South Nash Street and Columbia Pike would replace Southgate Road as the preferred route to South Joyce Street and link to a shared-use trail to the Pentagon. Bicycle traffic is no longer allowed within ANC and JBMHH in accordance with Department of Defense policy. The Arlington National Cemetery Wall trail is a "recommended" trail project contained in the November 2018 Master Transportation Plan Bicycle Element report (draft). It would construct a trail parallel to the east wall of ANC to link Columbia Pike to Memorial Drive. According to the MTP, the project, if constructed, would be completed by 2040. See "Response to Bike/Pedestrian comments #16, Response to Comments #78-139, and Section 3.10, for additional information.</p>

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
152	Joan Grey	Self	The re-design of roads required to accommodate the planned expansion of Arlington Cemetery Direct is an opportunity to minimize violence against the most vulnerable road users—those not encased in motor vehicles. We seem to have forgotten. Humans are born with legs not wheels. Motor vehicles are pervasive invasives—a comfortable and convenient way to travel, but ultimately unsustainable. Even if at some point, we realize that continuing to burn fossil fuels causes indirect harm (air quality, connection between carbon concentration and storm volatility, etc.), there are also direct injuries—approximately 40000 killed each year in US motor vehicle crashes and over 2 million injured. This construction project is an opportunity to build for the future—not just for an increased volume of private vehicles, but recognizing the need to encourage and even prioritizing traditional modes of movement, like walking and biking. As someone who regularly travels from Pentagon City to Joint Base Myer Henderson Hall (Army retiree) and Arlington Cemetery (Army Arlington Lady), I see the need for awareness and design to make the route safer for cyclists (the sidewalk under 395 is wide, but the curb cuts for bike access to sidewalks are ill-conceived.) Having been sideswiped by a bus while biking last year and previously hit by a car making a right turn, I am sensitive to personal vulnerabilities while biking and aware of structural violence: traffic laws like right turn on red and speed limits, lack of connections to protected trails, and even cobra lights enable car dominance. REDESIGN roads to protect vulnerable users. The DOT standard width for mixed use trails is 14 feet. https://safety.fhwa.dot.gov/saferjourney1/Library/countermeasures/08.htm . Encourage REDUCING carbon emissions. Arlington County and the builders can do this right by balancing protecting the vulnerable over expediting machines.	See "Response to Bike/Pedestrian comments" - Comment #16, and Section 3.10 of the EA.
153	Dana Bres	Self	Presentation of a four lane road in the concept drawing suggests, to the public and project staff that a four lane road will be constructed. If that is not the case, please show just the right of way. To avoid biasing the ultimate design, please make direct statements to indicate that the roadway has not yet been designed and what the designs will be based on. The traffic on the stretch of Columbia Pike down the hill is comparatively low, and unlike other county roadways with numerous opportunities to enter and exit the roadway, the road is largely without exits. Those conditions would increase traffic flow compared to other roadways and four lanes are likely unnecessary. Show just the right of way and unequivocally identify the agency that will be responsible for the roadway design. It wasn't clear from the presentation or the draft EA which organization would design the roadway or what design standards would be used. In the absence of such details, it is not possible to comment on the impact of the proposal. Please state the organization that would do the design and the anticipated design approval process. Given the traffic on Columbia Pike at that location and the lack of potential conflict points, it seems that four lanes are not required. The Columbia Pike Multimodal Study (June 2012) shows dramatic differences in Columbia Pike traffic at Scott (west of the study area) and at the Navy Annex crosswalk (east of Oak). Traffic counts at those locations is only through traffic with no turns. At Scott, the westbound peak traffic is 902 (AM) and 1628 (PM), and eastbound peaks are 1770 (AM) and 939 (PM). This compares to the Navy Annex crosswalk westbound counts of 351 (AM) and 1414 (PM), 39% and 87% of the Scott location traffic. Eastbound peak counts are 750 (AM) and 675 (PM), 42% and 72% of the Scott location traffic. The closure of Southgate Road will eliminate a widely used route for bicyclists, particularly those climbing the hill. The closure will force bicycle traffic to use the reconstructed Columbia Pike. As the conceptual sketch was shown, this would place cyclists, pedestrians, and others using the multi-use path into a single location with great differences in speed. Pedestrians walking up the path could be expected to be moving slowly, probably 1.5-2.5 mph. Cyclists riding up the hill would be moving relatively slowly, about 5-10 mph. While the pedestrians going down the hill would not be moving dramatically faster, cyclists might be traveling in excess of 20 mph. Mitigation for the loss of Southgate should be openly addressed in the EA. A single shared uphill/downhill path for pedestrians and motorists is not an effective mitigation. There seem to be two elevations that cannot change, Columbia Pike at the intersection with Oak is 154 feet and the approximate elevation of the new intersection of the Pike and Joyce will be about 58-60 feet. It appears that the straight line slope between those two points is about 4.6%, as the distance is about 2060 feet. The multi-use path will likely present mobility challenges to pedestrians with limited mobility. While it is possible the actual alignment of the roadway, sidewalks, and paths might result in areas where the slope is shallower than the average, that will necessitate steeper slopes in other locations along the alignment. This slope will impact both pedestrian and cyclist use of the trail. The shorter roadway length with the same elevation difference will increase the slope. Putting cyclists heading down the sidepath will likely pick up significant speed, which will place other sidepath users at risk. Having two sidepaths will increase the safety for the sidepath users. The desire of the ANC to have direct access from the equipment lot to the south of Columbia Pike to the cemetery was addressed through the use of a tunnel under Columbia Pike. The EA was silent about the visual impact of the retaining wall that would be necessary as well as the impact on the redesigned Columbia Pike and side paths. The concept drawings appeared to omit this key element of the design. Please publically release revised concept drawings and permit the public to comment on the potential impacts.	The conceptual roadway design presented in the Draft EA is a generic depiction of what the proposed roadway cross-section may look like. An analysis of traffic in this area was documented in an Interchange Modification Report prepared by Arlington County's traffic consultant, Kimley Horn (<i>Arlington County, Virginia, Transportation Planning Bureau, August 2017. Columbia Pike/Washington Boulevard Interchange Modification Report (Final). Prepared by Kimley-Horn Consultants</i>). The report indicated that the proposed closure and realignment of roadways and future signalized intersections would improve traffic operations. In addition to the previous traffic analysis in the EA, a follow-up traffic study was completed in April 2019 and will further inform the design, traffic flow, and signalization within the project limits. FHWA is also analyzing traffic studies for the modified access to Route 27/Columbia Pike, and will finalize this effort prior to issuing its own FONSI. The final design will account for present and future traffic counts, turning movements, traffic signalization, etc. that will result in a corridor with safe and efficient operations for all modes of transportation. See "Response to Bike/Pedestrian Comment #16 and Section 3.10 for additional information. Final design of the roadway and trails are outside of the scope of this EA.
154	William Fuchs	Self	I live on the Pike (since 1985). I also work on the Pike, as a Ride Leader for Papillon Cycles, and on occasion, our group rides require use of Columbia Pike. I hope we are agreed that bicycle & pedestrian safety need to be improved dramatically on this road. For anyone who wishes to go direct to Pentagon City, or the shortest route to DC, Columbia Pike is hazardous in many ways. The only other options available are significantly longer in time and distance, which discourages their use. ANC's expansion has provided a chance to rethink that stretch of the Pike. The need is there. Many of us *want* to use the direct route. But we do not feel safe doing so. The Corp's proposal promises no "downgrading" of multimodal access. Yet losing Southgate Rd, and replacing it with a sidewalk configuration no better than what is under the Freedmans' Bridge, is a *downgrade* of safety and capacity. It would *discourage* bicycle and *pedestrian* traffic, not encourage it. As to the realignment to Joyce St, any way you slice it, this is a stout climb, even for the fit & fast cyclist. Very slow up, fast down. And trying to share that narrow path with pedestrians will make no one happy. This is why *doing this properly* would be creating *separated* and dedicated bike lanes, for comfort and safety for pedestrians who will visit the cemetery, 9/11 Visitors Center, and the Air Force Memorial. Comfort and safety for the increasing number of cyclists who *want* to use this route. Motorists would benefit too. The separated bike lanes/separated sidewalk proposal (the NACTO spec proposal) would fulfill the Corp's stated objective of improving service for ALL modes, and, contrary to accusation, would not reduce capacity for future heros inside the cemetery.	See "Response to Bike/Pedestrian comments #16, and Section 3.10 of the EA." The EA acknowledges that the that Southgate Road is currently designated as a bicycle-friendly roadway by the County, and it is preferred to remain as such by many members of the public. It is also acknowledged that the proposed trails along Columbia Pike will not be of the same width and slope as Southgate Road. The closure of Southgate Road will not eliminate the route from Foxcroft Heights to South Joyce Street; the connection will remain via South Nash Street and Columbia Pike. The safety of bicyclists and pedestrians would remain a key issue for travel on Columbia Pike; there will be separate bicycle and pedestrian trails. This is not a sidewalk. Much like other trails in Arlington County, this is a wider facility to safely accommodate many types of users. Final design of the roadway and trails are outside of the scope of this EA.

COMMENT MATRIX
FROM AUGUST 2018, RELEASE OF DRAFT EA

Comment #	Name	Representing	Comment (Potential impact or issue)	Response
155	Richard Bullington-McGuire	Self	<p>These remarks are inspired by Gillian Burgess's remarks. Our family bikes to get around frequently. The area of the expansion is a critical link to get from where we live to the shopping, restaurants, schools and spaces in Pentagon City and Crystal City. Right now, we rely on Southgate Road as a safe and comfortable place to bike. The project will remove Southgate Road, and thus must provide space to bike that is at least as safe and comfortable. The proposed design does not do that. Thus, the environmental assessment (EA) is incorrect that the proposed design "increases multi-modal transportation option". The proposed design reduces options for biking. In order for the EA to provide acceptable options for biking, the design must include segregated space for people riding bikes. That space could be an onstreet protected two-way cycletrack on the north side of the Columbia Pike, or a dual track trail, with a minimum of 8' each for walking and biking, similar to the separated trail that NovaParks is planning for the W&OD Trail. Additionally, the Army dismisses Arlington's plan for a Cemetery Wall Trail. The County has planned for that Trail. The proposed plan could very easily designate the "sidepath" as the Cemetery Wall Trail and be consistent with Arlington's plan. That trail should be built to AASHTO standards, with a minimum width of 12 feet, to accommodate the foot traffic for the Cemetery and the Visitor's Center. Additionally, the trail along the new North Nash Street should be on the Cemetery side of the street, and should be a continuation of the Cemetery Wall Trail. While not mentioned in the proposed design, the Army should be sure that all destinations along the project corridor - the Visitor's Center and Memorial, entrances to the Cemetery and the Operations Complex - should have adequate bike entrances and bike parking. The Operations Complex should have facilities to enable people to walk and bike to work. The greatest opportunity to increase the capacity for regional multimodal transportation in this area would be for the Cemetery and Fort Myer to allow people bike through the property. Like most other cemeteries in the region, Arlington National Cemetery should let everyone on two feet and two (and three) wheels travel through on its roads, subject to rules of decorum and respect. Bicycles would certainly not be less dignified than the tour buses that already travel the Cemetery's roads. A speed limit for bikes and limits on attire (e.g. wear shirts) and noise would be reasonable propositions. Fort Myer should allow everyone on a bike to travel through each of its gates, when open. If necessary, random bag searches could ease security fears. The Corps should take advantage of this rare opportunity to ensure that the design of the realigned Columbia Pike increases capacity for people walking and biking.</p>	<p>Multi-modal traffic includes bicycles, pedestrians, cars, buses, or trolleys. The proposed bicycle and pedestrian trail via South Nash Street and Columbia Pike would replace Southgate Road as the preferred route to South Joyce Street and link to a shared-use trail to the Pentagon. Bicycle traffic is no longer allowed within ANC and JBMHH in accordance with Department of Defense policy. The Arlington National Cemetery Wall trail is a "recommended" trail project contained in the November 2018 Master Transportation Plan Bicycle Element report (draft). It would construct a trail parallel to the east wall of ANC to link Columbia Pike to Memorial Drive. According to the MTP, the project, if constructed, would be completed by 2040. See "Response to Bike/Pedestrian comments", Comment #16 and Section 3.10 of the EA for additional information. The final design has yet to be determined and is outside the scope of this EA.</p>
156	Sargon de Jesus	Self	<p>As a lifetime resident of Arlington County, and current resident of Penrose, I am writing to emphatically voice my support for and recommendation of more expansive biking infrastructure (dedicated lane) along this new roadway. Southgate Road presently serves as the de facto bike route, providing reasonably "safe" room for bikers along a modest grade. As I understand it, the expansion will render this road inaccessible and will be replaced by a single 10 ft. shared path along this hilly transit. Yet, this is perhaps the single biking access route for most of residential south Arlington, Columbia Pike corridor and most of North Arlington to the Pentagon and Pentagon City. With the new bike path the Arlington County is putting in along Washington Blvd (already underway and to be completed this winter), there is no reason to create a new bike-unfriendly bottleneck along the Pike — where that bike path is directly headed. JBMHH has already significantly restricted eastward bike access to DOD staff only (it's their right of course), but that only further makes the case that adequate, safe, and *functional* biking infrastructure be provided. Since this will be a pedestrian heavy area (what with a new cemetery building there plus the AF memorial), this can only mean dedicated biking lane. Please please please - don't make shortsighted plans. Biking transit is the fastest growing mode of transportation in our city and deserves to be well positioned for the future. This would be a huge setback for all bikers — and Pentagon employees especially.</p>	<p>See "Response to Bike/Pedestrian comments" - Comment #16, and Section 3.10 of the EA.</p>
157	Patrick Murphy	Superintendent, Arlington Public Schools	<p>Arlington County Public Schools educates approximately 28,000 students residing in a 26-square mile County, with a population of more than 225,000 residents. We have a total of 33 educational facilities for elementary, middle and high school students distributed throughout the County. Enrollment in our school system has steadily increased over the past 10 years, and is expected to grow to about 32,000 students by 2026. Operating in such a dense environment presents many challenges for our system. To address our transportation challenges, in 2014, we developed a Transportation Demand Management (TOM) program called APSGo! to encourage and incentivize our students, families and staff to choose transportation options other than a single-occupant vehicle. Our Safe Routes to School (SRTS) program focuses on safe walking and biking options for students and their families, while our Commuter benefits program and partnership with Arlington Transportation Partners (ATP) focuses on encouraging staff to use non-SOY modes of transportation. Providing opportunities for more students to walk or bike to school also allows us to more efficiently use our bus transportation system. As with many school systems, we operate in a fiscally constrained environment, so using our resources more efficiently is a key goal. Finally, walking and biking to school helps develop healthy bodies and minds for students and adults alike. This Fall, to address some of our elementary school capacity issues, we are conducting a re-districting process to help balance enrollment at schools in South Arlington, some of which are located just off Columbia Pike. One potential option will move some students in the Pentagon City area to Hoffman-Boston Elementary School located at 1415 S Queen St, Arlington, VA 22204. The new alignment for the eastern segment of Columbia Pike presents a major opportunity to improve non-motorized connectivity between Columbia Pike and Pentagon City. Regarding the proposed street cross-section, we would prefer that this new stretch of Columbia Pike feature ample, dedicated and separated space for pedestrians and cyclists, with a buffer between sidewalk and traveling vehicles. As proposed, pedestrians and cyclists would be required to share the same space. During the school year, we often have parents walking students to school with strollers and/or the family pet, perhaps with some siblings in tow. We also have students who are walking together in groups for safety. Sharing space with cyclists -whether other students or commuters -would make maneuvering difficult for both walkers and cyclists. Having separate space would create a safer travel environment for pedestrians and cyclists. It appears there is more than sufficient room in the right-of-way to accommodate this solution.</p>	<p>ANC understands the concerns of the Arlington County Public School System. We received an overwhelming number of comments concerning the pedestrian and bicycle trails. As a result, we have separated the bicycle trail from the pedestrian trail. Please see "Response to Bike/Pedestrian comments" - Comment #16, and Section 3.10 of the EA for further information.</p>



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

September 20, 2018

Kathy Perdue
Planning and Policy Branch
U. S. Army Corps of Engineers
Norfolk District
803 Front Street
Norfolk, VA 23510

Re: Draft Environmental Assessment for the Arlington National Cemetery Southern Expansion and Associated Roadway Realignment Project, Arlington County, Virginia (September 2018)

Dear Ms. Perdue:

In accordance with the National Environmental Policy Act (NEPA) of 1969, Section 309 of the Clean Air Act and Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508), the U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Assessment (EA) for the Arlington National Cemetery Southern Expansion and Associated Roadway Realignment Arlington County, Virginia.

The purpose of the Proposed Action is to establish a single, contiguous parcel of land south of the Arlington National Cemetery (ANC) by closing and relocating local roadways and developing the parcel to increase interment capacity and multimodal transportation capacity on Columbia Pike. The future demand for interment space at ANC outweighs its capacity. Currently, there are over 7,000 internments that take place at ANC annually. The Proposed Action in this EA would add needed continuous acreage to ANC via land acquisition and jurisdictional transfers. In addition, creating this contiguous parcel would result in corridor improvements and help avoid future increases in roadway congestions while maintaining adequate safety and capacity levels of service for roadways within the action area.

The EA considers the No Action Alternative and three Action Alternatives including: Maintain Operations Complex without Underpass Alternative, Maintain Operations Complex with Underpass Alternative, and the Preferred Alternative, Relocate Operations Complex Alternative. The Preferred Alternative would create a 49-acre contiguous parcel for cemetery development, the maximum acreage of all proposed alternatives. The Proposed Action includes relocation of the Operations Complex to the noncontiguous parcel south of Columbia Pike.



*Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474*

EPA provided comments on the ANC Southern Expansion on March 28, 2018 related to contaminated soils, best management practices, and additional minor requests for information. Our comments were thoroughly addressed in the EA and on coordination calls. EPA understands the purpose and need of this project and has only minor comments to provide.

- Though a jurisdictional determination completed by the U.S. Army Corps of Engineers (USACE) revealed no wetlands or surface waters were found on site, EPA suggests the EA include the documentation that USACE produced during the site visit to reach this conclusion.
- EPA recommends including additional information regarding the Pentagon Memorial Fund Visitor Center, if plans have been developed further, including the acreage and legal bounds of the site. It might be beneficial to include an estimate of when the NEPA analysis will be conducted and available for public review.
- Due to the reduction in impervious surface, pollutant loads and stormwater runoff are expected to decrease. EPA recommends quantifying this anticipated decrease, particularly in phosphorus and nitrogen, if possible.
- EPA encourages maximum “rescue and reuse” of trees onsite that have been identified for this purpose.
- As concepts for integrating the Air Force Memorial into the Southern Expansion are explored and developed, EPA recommends continuing to interface frequently with the public regarding potential impacts to visitor experience at the Memorial.
- EPA appreciates that the chemical contaminants found during the 2016 soil sampling at the Navy Annex Property/FOB2 site are identified in the EA. If possible, please quantify the concentrations of these chemicals and the associated acceptable risk ranges.
- Lastly, EPA suggests considering potential reuse of materials from the demolition process. It would be helpful in evaluation of project impact to include discussion of anticipated approaches to disposal of demolition debris, including hauling and landfilling, if planned. If materials from demolition can be salvaged or recycled, environmental impact of this project may be reduced.

We appreciate the opportunity to review this project. If you have questions regarding these comments, the staff contact for this project is Ms. Nora Theodore; she can be reached at 215-814-2728 or theodore.nora@epa.gov.

Sincerely,



Barbara Rudnick
NEPA Review Coordinator /Team Leader
Office of Environmental Programs





DEPARTMENT OF THE ARMY
ARMY NATIONAL MILITARY CEMETERIES
ARLINGTON NATIONAL CEMETERY
ARLINGTON, VIRGINIA 22211-5003

March 29, 2019

Barbara Rudnick
NEPA Review Coordinator/Team Leader
Office of Environmental Programs
U.S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Dear Ms. Rudnick:

Thank you for your letter dated September 20, 2018, regarding the Arlington National Cemetery (ANC) Southern Expansion Draft Environmental Assessment. The enclosed document provides responses to your comments.

Sincerely,

Michael D. Peloquin
Colonel, U.S. Army
Chief, Engineering

Enclosure

Arlington National Cemetery - Response to EPA Comments
Southern Expansion Draft Environmental Assessment

1. **EPA Comment:** *Though a jurisdictional determination completed by the U.S. Army Corps of Engineers (USACE) revealed no wetlands or surface waters were found on site, EPA suggests the EA include the documentation that USACE produced during the site visit to reach this conclusion.*

ANC Response: A representative of the Army Corps of Engineers conducted a wetlands assessment using the three criteria from the 1987 USACE Wetlands Delineation Manual. They did not identify any wetlands; the assessment includes a brief discussion of those findings. The data from the worksheets used to make the determination would not add any critical information to the discussion in the EA.

2. **EPA Comment:** *EPA recommends including additional information regarding the Pentagon Memorial Fund Visitor Center, if plans have been developed further, including the acreage and legal bounds of the site. It might be beneficial to include an estimate of when the NEPA analysis will be conducted and available for public review.*

ANC Response: The proposed Pentagon Memorial Fund has not developed any formal plans for the Visitor Education Center. As a result, the EA does not speculate on the future development of this center.

3. **EPA Comment:** *Due to the reduction in impervious surface, pollutant loads and stormwater runoff are expected to decrease. EPA recommends quantifying this anticipated decrease, particularly in phosphorus and nitrogen, if possible.*

ANC Response: Based on 2009 land use, the proposed project identifies the potential for a reduction of impervious surface. In accordance with the Virginia Stormwater Management Program Regulation, this project will require submission of stormwater management documentation to the Virginia Department of Environmental quality for review, approval, and permit issuance.

4. **EPA Comment:** *EPA encourages maximum "rescue and reuse" of trees onsite that have been identified for this purpose.*

ANC Response: ANC anticipates the design would include the potential for rescue and reuse of trees identified by ANC's Horticulture program.

5. **EPA Comment:** *As concepts for integrating the Air Force Memorial into the Southern Expansion are explored and developed, EPA recommends continuing to interface frequently with the public regarding potential impacts to visitor experience at the Memorial.*

ANC Response: Integration of the Air Force Memorial into the Southern Expansion requires a Determination of Eligibility. The ongoing Section 106 process for the memorial includes consultation and input from key stakeholders for the development of a Memorandum of Agreement.

Arlington National Cemetery - Response to EPA Comments
Southern Expansion Draft Environmental Assessment

6. **EPA Comment:** *EPA appreciates that the chemical contaminants found during the 2016 soil sampling at the Navy Annex Property/FOB2 site are identified in the EA. If possible, please quantify the concentrations of these chemicals and the associated acceptable risk ranges.*

ANC Response: ANC's Site Inspection report includes chemical concentrations and acceptable risk ranges for site workers and visitors. ANC will follow the Virginia Department of Environmental Quality Federal Facilities Program recommendations from their review of the Site Inspection report. Including the concentrations used to make risk determinations would not alter the discussion found in the EA.

7. **EPA Comment:** *EPA suggests considering potential reuse of materials from the demolition process. It would be helpful in evaluation of project impact to include discussion of anticipated approaches to disposal of demolition debris, including hauling and landfilling, if planned. If materials from demolition can be salvaged or recycled, environmental impact of this project may be reduced.*

ANC Response: Prior to any land disturbing activities, the Contractor would be required to develop a waste management plan in compliance with Army Regulation 420-1. As the Draft EA discusses, the plan would include methods for achieving a minimum 50 percent diversion of construction and demolition (C&D) debris from landfill disposal. Army Regulation 200-1 requires integration of activities that would reuse C&D materials in their original form with little or no processing, through deconstruction, segregating, and careful handling and making them available to specialized markets.



September 21, 2018

Ms. Kathy Perdue
U.S. Army Corps of Engineers, Norfolk District
803 Front Street
Norfolk, VA 23510

Re: Draft Environmental Assessment - Arlington County Comments

Dear Ms. Perdue:

Arlington County appreciates the opportunity to serve as a cooperating agency in the environmental review of Arlington National Cemetery's proposed Southern Expansion project and offers its comments to the draft environmental assessment. It does so despite the identified adverse impacts the preferred alternative imposes on the County, most notably the abandonment of Southgate Road and constrictions a proposed tunnel under Columbia Pike will have on the County's future ability to address the area's utility right-of-way and public transportation needs. The County remains hopeful that its participation as a cooperating agency has helped inform the federal partners of these local impacts and helped identify practical mitigation measures that could address the County's concerns.

Regretfully, the County must still take issue with the methodologically deficient manner in which the result oriented analysis was done. The analysis does not adequately analyze the factors relevant and required to satisfy an environmental review and the methodology used in the draft EA is deficient and fails to provide any rational basis for concluding the preferred alternative is appropriate. In conclusory fashion, the draft EA makes no distinction between and among the impacts of the alternatives and concludes the preferred alternative is appropriate. For example, characterizing multimodal improvements to Columbia Pike as part of the project's purpose and objective is incorrect. The proposed improvements to Columbia Pike should more appropriately be characterized as a mitigation response to the federal acquisition and closure of Southgate Road, the primary transportation connection between the Pentagon and Joint Base Myer-Henderson Hall.

Irrespective of the proposed Nash Street, the closure of Southgate Road will force additional traffic on to, and further constrain, Columbia Pike, a regionally, if not nationally, significant arterial connection that serves Northern Virginia and provides a critical evacuation route from the Pentagon. Arlington County has planned to make intermodal and safety improvements to Columbia Pike along the Southern Expansion project area regardless of any planned expansion of the Cemetery. Moreover, realigning the roadway within a constrained 75-foot wide right of way and constructing a tunnel underneath the roadway to maximize burial capacity and optimize cemetery maintenance operations does not increase intermodal capacity. It limits it.

These federal actions will constrain future roadway improvements and impose an upper capacity limit on the only utility corridor connecting the Pentagon, Pentagon City, Crystal City and Potomac Yard to the rest of Arlington County. The tunnel will also require Arlington County Board action to approve an encroachment of the tunnel structure within the County right-of-way, contrary to County policy. What once was authorized as a land exchange between Arlington County and the federal government to support Cemetery expansion, as a result of a more

recent act by Congress, has now become a land acquisition by the federal government at Arlington County's expense. This change in federal policy will limit the County's ability to accommodate the ever changing and growing utility and transportation needs for the area. Arlington National Cemetery's commitment to identify and establish an alternative utility corridor that addresses the County's concerns is greatly appreciated but provides no certainty for when and how a definite need will be addressed while the Cemetery's objectives are achieved.

Arlington County also objects to the dismissal of any environmental justice review relative to Foxcroft Heights community. 2010 Census block data confirms that the Foxcroft Heights community, the only residential community directly adjacent to the project area, is more than two-thirds non-white. A more thorough analysis of this affected community is warranted.

And finally, the County asks that consideration be given to the enclosed comments it received from its Pedestrian Advisory Committee. The committee raise important safety concerns that a 10-foot shared use trail is too narrow in segments with a six percent grade in elevation. The County concurs with the recommendation that an additional five feet, perhaps from the buffer area outside the proposed wall, be added to the right-of-way where the slope approaches a six percent grade.

The balance of the County's comments is enclosed on a separate comment sheet that accompanies this letter.

As the County continues its collaborative approach to achieving the Cemetery's expansion objectives, the County hopes its federal partners will work with the County to address the deficiencies in the draft environmental assessment and achieve an outcome that does not unduly impact the County and its citizens.

Sincerely,



Mark J. Schwartz
County Manager

Enclosure

cc: County Board of Arlington County, Virginia

The Honorable Don Beyer, United States House of Representatives

The Honorable Tim Kaine, United States Senate

The Honorable Mark R. Warner, United States Senate

Dr. Mark T. Esper, Secretary of the United States Army

Ms. Monique R. Evans, Director, Eastern Federal Lands Highway Division

Mr. Stephen C. Brich, Commissioner, Virginia Department of Transportation

Ms. Katharine Kelley, Superintendent, Arlington National Cemetery

1 Executive Summary

2 ES-1 Type of Report

3 This Environmental Assessment (EA) evaluates the potential environmental impacts associated with
4 Arlington National Cemetery's (ANC) Proposed Action to establish a single contiguous parcel of land south
5 of the cemetery by closing and relocating local roadways and developing the parcel to increase interment
6 capacity and increase multimodal transportation capacity on Columbia Pike. This document simultaneously
7 addresses the establishment and development components of this action with the FHWA, VDOT, and
8 Arlington County as cooperating agencies. The realignment of Columbia Pike is integral to a successful
9 ANC expansion; this EA assesses the potential impacts of the realignment to ensure that the cumulative
10 effects of the collective federal actions – roadways and cemetery expansion – are considered.

11 This EA follows regulatory guidance of the National Environmental Policy Act (NEPA) of 1969; the
12 Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal
13 Regulations [CFR] 1500-1508); and Environmental Analysis of Army Actions (32 CFR 651). Arlington
14 National Cemetery, a Direct Report Unit of the Headquarters, Department of the Army (HQDA) is the lead
15 agency for the Proposed Action. Cooperating agencies are Federal Highway Administration (FHWA), U.S.
16 Environmental Protection Agency (EPA), National Capital Planning Commission (NCP), Virginia
17 Department of Transportation (VDOT), and the Board of Arlington County, Virginia.

18 This EA is tiered¹ from the 2014 ANC Real Property Master Plan Programmatic Environmental Assessment
19 (RPMP PEA) and contains references to and summaries of that document. The earlier document contained
20 development alternatives of the Southern Expansion site including Alternative 4 – Southern Expansion Site
21 with Realigned Roadways. This EA contains a robust analysis of Alternative 4.

22 ES-2 Purpose of and Need for Action

23 The Proposed Action is needed to meet the forecasted interment/inurnment demands of eligible veterans,
24 to preserve ANC as an active military cemetery, and to improve multimodal transportation options for the
25 Columbia Pike corridor. The related actions involving land acquisition and jurisdictional transfers and the
26 realignment of roadways will allow several noncontiguous parcels to merge into a single contiguous parcel
27 to maximize burial space for ANC. The purpose of the Proposed Action is to increase the burial capacity
28 to extend the operational life of the cemetery. The objectives of the Proposed Action are to increase burial
29 capacity; increase capacity for regional multimodal transportation for the Columbia Pike corridor; and
30 maintain adequate multimodal access, levels of service, and safety for the affected roadway, trail, and
31 sidewalk network and interchange ramps, and transit.

32 ES-3 Description of the Proposed Action

33 The Proposed Action is to establish a single contiguous parcel of land south of the cemetery by closing and
34 relocating local roadways and developing the parcel to increase interment capacity and increase multimodal
35 transportation capacity on Columbia Pike. Land acquisition and jurisdictional transfers and roadway

¹ Agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review. (40 CFR §1502.20 Tiering.)

Summary of Comments on 2018-08-00_D33S_RPT_ANC-Draft-EA-for- Public-Hearing-9-20-2018.pdf

Page: 12

Author: sfinotti Subject: Cross-Out Date: 09/18/2018 6:31:29 AM

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 9:28:45 AM
It should say Arlington County. If it must reference the board, then it should say "Arlington County Board", not "Board of Arlington County"

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 4:26:47 PM
If compared with current conditions a different conclusion would be reached.

Table ES-1:
Summary of Environmental Consequences

Impact Category	Relocate Operations Complex Alternative (Preferred)	Maintain Operations Complex with Underpass Alternative	Maintain Operations Complex without Underpass Alternative	No Action Alternative
	impervious surface and increase the amount of open space when compared to the 2006 conditions which included the Navy Annex facilities.			space and would not support Arlington County's plans for improving the multimodal capacity of the Columbia Pike corridor.
Air Quality				
Short Term	Temporary impacts would result from construction vehicle air emissions and fugitive dust. The short-term impact would not have local or regional significance. Emissions associated with construction were compared to the Clean Air Act (CAA) <i>de minimis</i> values with respect to General Conformity. The estimated emissions were below these values and therefore the Proposed Action is presumed to conform to the State Implementation Plan. The use of Best Management Practices (BMPs) during construction would minimize impacts from fugitive dust.	Short-term impacts would be similar to those under the Preferred Alternative.	Short-term impacts would be similar to those under the Preferred Alternative.	There would be no modifications to Columbia Pike and the Southern Expansion site would remain undeveloped. Air emissions for criteria pollutants would remain consistent with estimates for the National Capital Region.
Long Term	The Preferred Alternative would not change employment or traffic estimates included in the 2015 CLRP Air Quality Conformity Analysis. Future emissions, therefore, would not exceed the NAAQS and the Preferred	Long-term impacts would be similar to those under the Preferred Alternative.	Long-term impacts would be similar to those under the Preferred Alternative.	There would be no long-term benefit to air quality because there would be no increased capacity from a multimodal transportation corridor.

Table ES-1:
Summary of Environmental Consequences

Impact Category	Relocate Operations Complex Alternative (Preferred)	Maintain Operations Complex with Underpass Alternative	Maintain Operations Complex without Underpass Alternative	No Action Alternative
Long Term	The current or future land use would not create a new burden on consumption of local or regional utility services. There would be no long-term disruptions to local utility customers after construction. There would be no cumulative impacts with future private development in Arlington County. A positive long-term effect would be realized by the upgrading of aging utility infrastructure.	The benefits and impacts would be similar to those under the Preferred Alternative. Although there would be less utility design required – since there would be no Operations Complex relocation – there would still be utility construction to realign utility corridors.	Long-term impacts would be similar to those under the Maintain Operations Complex with Underpass.	
Solid Waste				
Short Term	Construction activities would generate solid waste. The contractors would be responsible for following acceptable protocol for avoiding or minimizing impacts from generating solid waste at the site.	Short-term impacts would be similar to those under the Preferred Alternative.	Short-term impacts would be similar to those under the Preferred Alternative.	There would be no changes to the diversion rate of ANC's nonhazardous solid waste.
Long Term	There would be no noticeable increase in the amount of solid waste produced from daily operations and no changes to ANC's diversion rate or its adherence to the Integrated Solid Waste Management Plan (ISWMP).	Long-term impacts would be similar to those under the Preferred Alternative.	Long-term impacts would be similar to those under the Preferred Alternative.	

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 2:47:19 PM
Utilities - Long Term - County disagrees. There will be long term adverse impacts. Future utility capacity will be restricted by the 75 foot Columbia Pike right of way and construction of a tunnel under Columbia Pike. Alternatives that would address this should be described in detail.

The County maintains that the regional multimodal transportation and safety improvements are mitigation measures, not objectives. Future capacity for regional multimodal transportation and safety improvements is restricted, not increased, by the limited 75 foot right-of-way and further constricted by the proposed tunnel under Columbia Pike.

- 1 • Increase the capacity for regional multimodal transportation for roadways within the Action
2 Area; and,
3 • Maintain adequate safety and capacity levels of service for roadways within the Action Area.

4 1.3.1 Increase Burial Capacity

5 Extending the operational life of the cemetery by providing sufficient capacity would enable ANC to serve
6 projected demand of eligible veterans and active-duty service members and their families. The cemetery
7 is currently experiencing a heavy demand for burials. The Army, as custodian of this hallowed site, is
8 committed to the cemetery's iconic nature and its long-term legacy. The Southern Expansion site's
9 noncontiguous parcels contain underutilized land which could be made contiguous with the cemetery by
10 realigning and relocating roadways. The public roadways within the Southern Expansion site bisect DA
11 property and impede contiguous expansion of ANC.

12 1.3.2 Increase Capacity for Regional Multimodal Transportation for Roadways within the
13 Action Area

14 A 1999 study by the Northern Virginia Transportation Coordinating Council (replaced by the Northern
15 Virginia Transportation Authority ("NVTA")) recommended investments in multimodal system expansion,
16 including Columbia Pike, to avoid further increases in roadway congestion. NVTA's 2006 transportation
17 plan update, TransAction 2030 Long-Range Plan, had many goals, among them to provide an integrated
18 multimodal transportation system for the region. The 2006 regional Council of Governments' forecasts
19 showed increases of 650,000 new jobs and nearly a million new residents by 2030 in the Northern Virginia
20 region. Realigning and relocating Columbia Pike and other the roadways near the Southern Expansion site
21 affords the opportunity to simultaneously address this purpose jointly with the FHWA, VDOT, and
22 Arlington County. Examples of corridor improvements to increase multimodal transportation capacity may
23 include providing a standardized street cross-section (two travel lanes in each direction with a center median
24 or left-turn lane; upgrading utility infrastructure (including utility undergrounding); incorporating roadway
25 geometry to accommodate mass transit options; accommodations for bicycles; wider sidewalks; enhanced
26 pedestrian crossings; and enhanced streetscapes.

27 1.3.3 Maintain Adequate Safety and Capacity Levels of Service for Roadways within the
28 Action Area

29 Rapid growth in northern Virginia, particularly in Arlington County, has necessitated improved
30 transportation safety and security, improved traffic and transit operations, and efficient pedestrian and
31 bicycle access along Columbia Pike through the Washington Boulevard interchange near the Pentagon.
32 Current roadway geometric and sight distance limitations on Columbia Pike create operational issues and
33 potential safety concerns.

34 1.4 Laws or Previous Actions Influencing the Proposed Action

35 The following describes recently passed legislation, legal actions, and earlier planning documents
36 pertaining to the Proposed Action.

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 10:38:41 AM
The County does not consider Southgate Road a "surplus road right-of-way." The right-of-way could be re-purposed to meet transportation needs in the future as the need warrants.

1 1.4.2 ANC Real Property Master Plan and Programmatic EA

2 Goals of the ANC 2013 Real Property Master Plan (RPMP) were to enhance cemetery visitor experiences
3 and to provide new interment capacity. The 2014 ANC RPMP Programmatic EA (PEA) addressed the
4 overall needs of ANC including the proposed Southern Expansion. The present EA is tiered¹⁰ from that
5 document and contains references to and summaries of its text. The earlier document addressed the broad
6 issues and impacts associated with multiple alternatives for development of the Southern Expansion
7 including realigned roadways. The current roadway alignment impedes contiguous expansion of ANC to
8 increase its burial capacity; it does not support efficient use of land for interments or for transportation.

9 The PEA carried forward cemetery expansion alternatives that included: 1) expansion utilizing the current
10 roadway configuration; 2) expansion with the closure of Southgate Road, and 3) expansion with the closure
11 of Southgate Road as well as the realignment of Columbia Pike and connecting roadways, to create a single
12 large contiguous parcel. See Section 2.4, *Alternatives Considered and Eliminated*. The current roadway
13 network is a limiting factor to increasing the contiguous acreage to allow the maximum burial space for
14 ANC. The RPMP PEA included development of the Southern Expansion and focused on the need for land
15 acquisition and jurisdictional transfers, realigning roadways, abandoning surplus road rights-of-way, and
16 consolidation of land parcels.

17 The RPMP PEA Finding of No Significant Impact (FNSI) indicated that future tiering of subsequent
18 environmental analyses would be expected as more site-specific details become known.¹¹

19 1.4.3 Arlington County Improvements for Regional Multimodal Transportation

20 Beginning with the 2001 Columbia Pike Initiative, Arlington County has engaged in efforts to strengthen
21 the community by: providing increased housing options; providing opportunities for mixed use
22 development; improving safety for pedestrians, bicyclists, transit riders, and motorists; and implementing
23 high-capacity multimodal transportation investments to achieve greater mobility and accessibility.

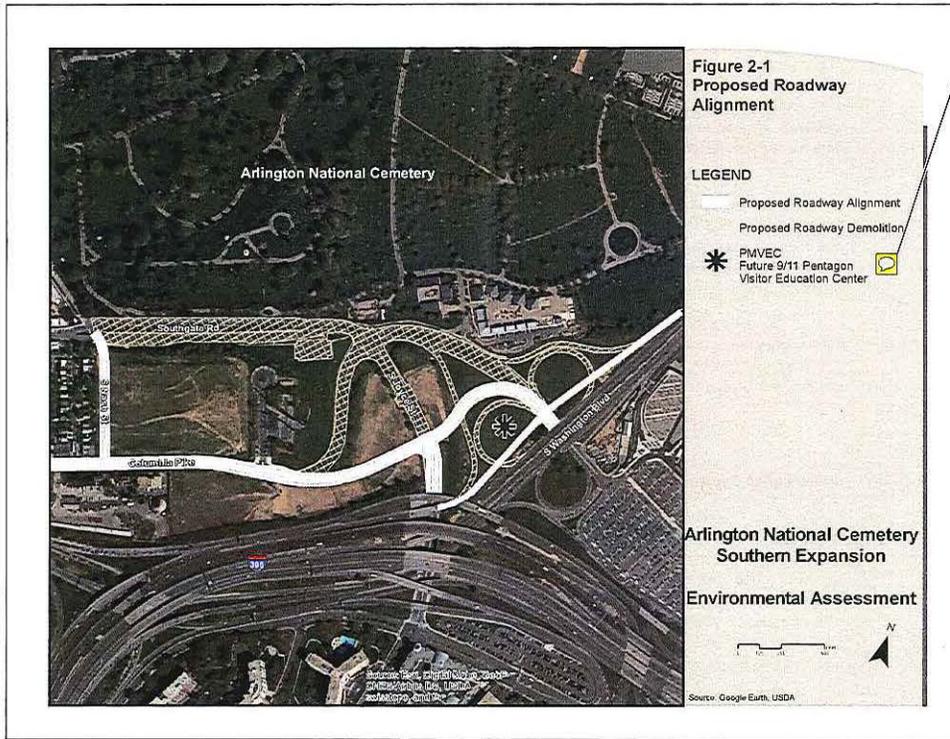
24 The ANC Southern Expansion was discussed in the Arlington County 2005 Columbia Pike Initiative
25 Update.¹² The plan called for Columbia Pike to be straightened and widened at its eastern end, adjacent to
26 ANC, to accommodate the proposed cemetery expansion. The County proposed additional planning and
27 evaluation for a comprehensive redevelopment of this eastern gateway of Columbia Pike to complement
28 the cemetery expansion and to begin implementing some of the proposed improvements mentioned in the
29 previous paragraph.

30 Arlington County has planned, designed, and constructed improvements along three miles of the existing
31 Columbia Pike corridor between the Fairfax County line and Washington Boulevard near the Pentagon
32 since 2005. Improvements to date include: providing a standardized street cross-section (two travel lanes
33 in each direction with a center median or left-turn lane west of Washington Boulevard and two lanes in
34 each direction with no median between the two Washington Boulevard intersections); upgrading utility
35 infrastructure (including utility undergrounding); bicycle accommodations; wider sidewalks; enhanced
36 pedestrian crossings; and enhanced streetscape, where practicable. These improvements were discussed in
37 a Categorical Exclusion document ("Columbia Pike Multimodal Street Improvements project") and

¹⁰ Agencies are encouraged to tier their environmental impact statements to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review. 40 CFR §1502.20 *Tiering*.

¹¹ Programmatic Environmental Assessment for the Arlington National Cemetery Real Property Master Plan, 2014. Page 1. <http://www.nao.usace.army.mil/Missions/Military-Construction/ANC/SouthernExpansion/>

¹² Arlington County, Department of Community Planning, Housing, and Development, 2005. *Columbia Pike Initiative – A Revitalization Plan Update*. Page 16. www.arlingtonva.us



1 The realignment is integral to a successful ANC expansion. This EA assesses the potential impacts of the
2 realignment to ensure that the cumulative effects of the collective federal actions are considered.

3 The Proposed Action includes land acquisition and
4 jurisdictional transfers for the realignment of roadways and
5 ramps to support the expansion. The combined roadway
6 realignments would create a single contiguous parcel of
7 land to increase burial capacity and improve multimodal
8 transportation capacity.

9 2.3.2 Land Acquisitions/Disposals

10 The properties under consideration for acquisition or
11 disposal and key objectives are described generally as
12 follows: The DA plans to acquire the Southgate Road
13 ROW from Arlington County. The Southern Expansion
14 project would include an approximate 55-foot wide ROW
15 (South Nash Street) along the western-most boundary of
16 the former Navy Annex property to be used for a new
17 access road from Columbia Pike to Southgate Road to
18 serve JBMHH and other local traffic. It would be a minor
19 arterial road with no curb cuts.

20 VDOT would convey any of its remaining land north of the
21 realigned Columbia Pike (within the current Washington
22 Boulevard/ Columbia Pike interchange) to ANC. VDOT
23 would receive new ramp connections for Washington
24 Boulevard. The land east of South Joyce Street to
25 Columbia Pike would remain in DA ownership. The
26 proposed land acquisitions/disposals are shown in Figure
27 2-4.

28 The land for the proposed PMVEC was previously
29 transferred to WHS from VDOT for purposes of building
30 an interpretive center and museum associated with the
31 Pentagon Memorial. The land is now under ANC
32 ownership. This project is in the early stages of
33 development and is not part of the Proposed Action.
34 Planning for the PMVEC project would include
35 coordination for service access to the site. The exact
36 acreage and legal bounds of the PMVEC site would be
37 determined by land survey at a future date.

38 The AFM is located on land owned by the DA; the Air Force has a 50-year permit to use the land.

39 2.3.3 Air Force Memorial

40 The site of the AFM was authorized by Congressional legislation in the NDAA of 2000. The 3-acre AFM
41 site was constructed in 2005-2006, and required demolition of Wing 8 of the Navy Annex. When the

Pentagon Memorial Fund Visitor Education Center

Through a donation from VDOT, the Pentagon Memorial Fund (PMF) – a non-profit organization created in 2003 by the families of the 9/11 attack on the Pentagon – was afforded a parcel of land necessary to construct a 9/11 Pentagon Memorial Visitor's Education Center (PMVEC) on a parcel on the north side of Columbia Pike within the footprint of the Washington Boulevard interchange.

Due to existing development constraints, and at the request of ANC, the PMF agreed to relocate the center to an area south of Columbia Pike. The PMVEC would be located on DA land under a long-term lease agreement.

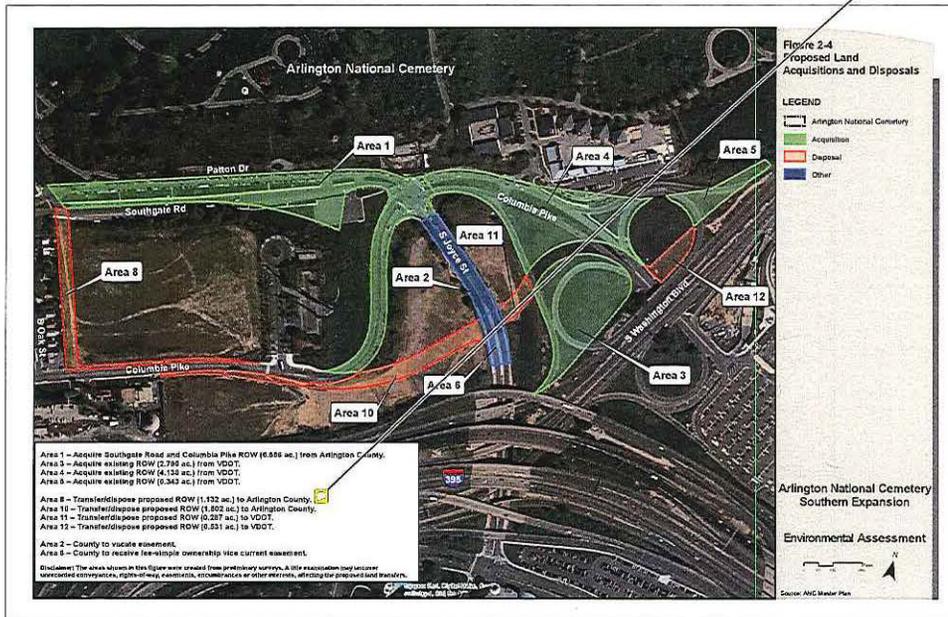
Although this parcel is within the Southern Expansion site, the PMVEC is an independent and unrelated project not included in the Proposed Action. The exact acreage and legal bounds of this project would be determined by survey at a future date upon achieving the necessary funding; the PMF is currently soliciting funds for the building design. If the project progresses, then a separate environmental assessment would be necessary. The engineering design e.g. building, parking, utilities, etc. would be the responsibility of the owner. The future project would comply with all applicable regulations and building permit requirements at that time.

Source:

<http://pentagonmemorial.org/visitor-education-center-0/project-information>

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 4:12:32 PM

Area 8 - Proposed Acquisitions and Disposals includes a proposed transfer/disposal of 1.132 acres of ROW to Arlington County for the new Joint Base gate access road. It is Arlington County's position that this ROW is required to provide access to the two Joint Base Hall gates along the remaining portion of Southgate Road. The ROW would be owned by the United States, not transferred to Arlington County, with Arlington County willing to accept the maintenance responsibilities as part of an easement for public use of the ROW.



- 1 o Sub-Alternative 4e. This alternative, illustrated in Figure 2-14, did not maximize burial space
2 contiguous with the existing cemetery and provided only 35.7 acres for expansion. This alternative
3 provided the necessary geometry for a high capacity regional multimodal transportation corridor.
4 While this alternative maintained the level of service at the Washington Boulevard/ Columbia Pike
5 intersection, it did not meet the purpose and need for the Proposed Action. It was eliminated from
6 further consideration.

7 2.5 Alternatives Considered in Detail

8 Three "action" alternatives were considered for this EA. The three action alternatives included the planning
9 elements discussed at the beginning of this chapter. All three action alternatives would:

- 10 • utilize the identical proposed roadway realignment;
- 11 • acquire and dispose of land to accommodate the roadway realignment;
- 12 • integrate the AFM enhancement area with the cemetery design (Figure 2-5);
- 13 • provide adequate screening and/or landscaping on both sides of Columbia Pike that would
14 complement the overall design and development of the site;
- 15 • plan and design for the highest and best use of the land;
- 16 • remove the southern boundary wall, leaving intact the original South Gate (ca. 1897) for
17 historical context;
- 18 • include the necessary supporting infrastructure; and,
- 19 • adhere to the Department of Veterans Affairs, National Cemetery Administration's Sustainable
20 Design Manual.

21 The three action alternatives are: (1) Relocate Operations Complex Alternative (Preferred); (2) Maintain
22 Operations Complex with Underpass Alternative; and, (3) Maintain Operations Complex without
23 Underpass Alternative.

24 2.5.1 Relocate Operations Complex Alternative (Preferred)

25 This alternative follows the guidance provided in the RPMP – develop in a manner that represents the best
26 use of the land. This alternative proposes the best land use opportunity to support the ANC mission by
27 relocating the Operations Complex from its current location to the area south of Columbia Pike. This
28 alternative would provide the maximum contiguous area for increasing burial capacity of all the
29 alternatives, approximately 49 acres. The Operations Complex includes offices, maintenance vehicle
30 garages, equipment and material storage areas, and vehicle service bays to support cemetery operations.
31 The Preferred Alternative is shown in Figure 2-15. The preferred location for the Operations Complex is
32 the area abutting the VDOT Management Center facility, which is a land use that is compatible with the
33 ANC Operations Complex. Further, the relocated ANC Operations Complex would be removed from the
34 cemetery viewshed.
35

36 In order to use the eight-acre noncontiguous parcel south of Columbia Pike to achieve its highest and best
37 use, several options were considered for accommodating the movement of cemetery vehicles, personnel,
38 and material between the Operations Complex and the contiguous cemetery site. The amount of planning
39 that occurs each day – from grave opening to grave closing – for nearly 30 burials per day requires

Author: sfnotti Subject: Sticky Note Date: 09/21/2018 11:23:50 AM

The analysis of design option alternatives in Section 2.5 Alternatives Considered in Detail is a deficient, result-oriented superficial analysis that does not adequately identify and discuss/analyze: 1) the relative cost of the options; 2) the lost grave space associated with the underpass alternative vs. at grade crossing alternative; 3) the adverse impacts to the County's limited utility corridor resources from the underpass alternative (It is not sufficient to just state: "The final design would include a suitable utility corridor that would not preclude future expansion by Arlington County."); 4 the need to obtain County Board permission to construct an underpass under the County Columbia Pike right of way; and 5) the current County policy that would not permit construction of non-County owned structures under a major County arterial right-of-way. The design option alternatives analysis also provides a dismissive (of the County's suggestions), result-oriented, conclusory analysis of the impacts of the at-grade crossing design option, with no separate analysis identifying and discussing potential at-grade crossing designs, changes in cemetery operations and/or practices, and other measures that could be taken to mitigate potential negative impacts of an at-grade crossing alternative (Proponents could cynically remark "The final design of the at-grade crossing alternative would address and adequately mitigate safety and security, traffic/transit operations and cemetery operations impacts).

1 **3.1 Land Use and Sustainability**

2 3.1.1 Affected Environment

3 3.1.1.1 Land Use and Land Cover

4 The entire Southern Expansion site is approximately 70 acres including all roadways, the Navy Annex property
5 parcels, ANC's Operations Complex, the AFM, and the VDOT interchange area. The action area is in
6 Arlington County, Virginia (part of the Washington-Arlington-Alexandria, DC, VA, MD, WV metropolitan
7 statistical area – the 6th largest metropolitan area in the U.S.). Arlington County is one of the smallest counties
8 with one of the highest population densities in the Commonwealth of Virginia. The Southern Expansion site
9 consists of several vacant, noncontiguous parcels owned by ANC and VDOT and divided by the local roadway
10 network owned by Arlington County and VDOT. Adjacent land uses include transportation (Interstate 395
11 and Washington Boulevard), residential (Foxcroft Heights), commercial properties including a Sheraton Hotel,
12 government installations (JBMHH and the Pentagon), and ANC. The Foxcroft Heights neighborhood is part
13 of a Special Revitalization District which encourages mixed use development and enhanced multimodal
14 circulation. The AFM is a prominent landmark in the middle of the site. The ANC Operations Complex is
15 situated within the current ANC boundary, but could be relocated to improve the viewshed for the expansion
16 and to increase burial capacity. Arlington County and VDOT have ownership of the road rights-of-way.
17 Roadways (and functional classification²⁵) include Columbia Pike (principal arterial), Southgate Road (urban
18 collector), and South Joyce Street (minor arterial). There are surface and subsurface utility corridors paralleling
19 Southgate Road, Columbia Pike, and South Joyce Street.

20 The former Navy Annex building, surface parking lots, and the Navy Exchange service station once occupied
21 a portion of the Southern Expansion site. The Navy Annex was constructed in 1940 and was commonly used
22 as swing space for employees temporarily displaced from the Pentagon or other federal facilities.²⁶ The Navy
23 Annex structures were demolished and the land transferred to the DA in April 2012 for cemetery use in
24 accordance with the FY2000 NDAA. The AFM, constructed in 2005, is situated on Army property with
25 interest transferred to the Air Force through a 50-year permit; the Department of the Air Force is responsible
26 for maintaining the property.

27 Foxcroft Heights is a low-density residential neighborhood consisting of primarily row houses and single-
28 family detached dwelling units bordering the Southern Expansion site to the west.

29 The area surrounding the Southern Expansion site is developed. A full discussion of surrounding land uses
30 and land use plans of Arlington County were included in the 2014 RPMP PEA²⁷. Figure 3-1 depicts the land
31 use around ANC and the Southern Expansion site.

32 There are two land cover types – impervious and green area/open space. Impervious areas include roadways,
33 the former Navy Annex property parcels, and the Operations Complex.

²⁵ Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Basic to this process is the recognition that individual roads and streets do not serve travel independently in any major way. Rather, most travel involves movement through a network of roads.
http://www.thwa.dot.gov/planning/processes/statewide/related/functional_classification/fo02.cfm

²⁶ U.S. Department of Defense, Washington Headquarters Services, August 2011. Navy Annex/FOB2 Property Transfer – Land Transfer Plan. Prepared by U.S. Army Corps of Engineers, Baltimore District.

²⁷ U.S. Army Corps of Engineers, Norfolk District. USACE, Norfolk District, 2014. Programmatic Environmental Assessment for the Arlington National Cemetery Real Property Master Plan, pages 3-2, et seq. Prepared by HNTB Corporation.

1 for eligible veterans. The battery cannon salute, when available, is offered to Generals/Admirals from all
2 services. The small arms salute is offered to most enlisted members of the Armed Forces and is a unique
3 component of the ANC experience. The type of military funeral honors received depends on the rank of the
4 deceased.

Table 3.2
Noise Sources at Southern Expansion Site

Noise	Sensitive Receptors	Origination
Traffic (existing and new)	Cemetery, residences	I-395, Columbia Pike, proposed South Nash Street
Air traffic (existing) (commercial and military)	Cemetery, residences	Fly-overs (Reagan National Airport, to/from Pentagon)
Military band (existing) (Interment ceremonies, summer concerts)	Cemetery, residences	ANC and AFM
Small arms (rifle) salutes (existing and new)	Cemetery, residences	ANC (new to Southern Expansion site)
Battery cannon salutes (existing)	Cemetery, residences	ANC

5
6 Small arms salutes during interment ceremonies consist of three volleys of 0.30-caliber blank rounds from
7 seven simultaneous firings. The salutes occur on average at 15-18 graveside services per day³⁶, out of a daily
8 total of approximately 27 services, throughout the entire cemetery. Firing the three rounds takes approximately
9 ten seconds. Small arms salutes are characterized as impulsive noise that is associated with a higher level of
10 annoyance as compared to more continuous noise sources such as traffic. Impulsive noise is of short duration
11 – typically less than one second – and high intensity. It has an abrupt onset and rapid decay.³⁷ The rifle salute
12 is not a chronic noise source; it is short-term, infrequent, and non-repetitive, and would occur only on weekdays
13 between 9 AM and 4 PM. The location of the rifle salute would vary based on the burial site, and the direction
14 of fire is not limited to a single direction.

15 Battery cannon salutes during interment ceremonies are infrequent – average two per month – and presently
16 occur at only three designated locations. The number of cannon salutes depends on the rank of the deceased.³⁸
17 Future interment ceremonies on the Southern Expansion may include battery cannon salutes, but would be
18 limited to the area east of the AFM. The battery cannon noise is a recognizable component of the affected
19 environment; the Presidential Salute Battery of the U.S. 3rd Infantry Regiment at JBMHH conducts training
20 exercises monthly.

³⁶ Based on ANC historical data for period October 2015 through September 2016.

³⁷ Blue Ridge Research and Consulting, Technical Memorandum, October 2016.

³⁸ General/flag officers of the Army, Marine Corps, Navy, Air Force and Coast Guard may receive a cannon salute (17 guns for a four-star general, 13 for a three-star, 13 for a two-star, 11 for a one-star), if available. Minute Guns may be used for general officers/flag officers of the Navy, Coast Guard and Marine Corps. The President of the United States is entitled to a 21-gun salute during ceremonial visits to the cemetery.

1 civilian workers, mostly female. South of the cemetery, flanking the Navy Annex were barracks for WAVES,
2 the women's naval reserve (Women Accepted for Volunteer Emergency Service), referred to as "Quarters K."
3 A plan was made in 1966 to demolish South Post and finally expand ANC eastward, but escalation of the
4 Vietnam War and the need for the South Post housing continued. Although Arlington Farms housing was
5 demolished by 1968, South Post remained until 1971. It was probably sometime after 1971 that the boundary
6 wall was extended to the east of its 1897 terminus at the former location of the Georgetown-Alexandria Pike.
7 Quarters K was also demolished in 1971.

8 The ANC Southern Expansion project marks the first expansion of ANC outside the bounds of the Arlington
9 Estate. The Navy Annex area had little development through 1900, save for a few small buildings shown on
10 Civil War era maps at the intersection of Georgetown-Alexandria Pike and Columbia Pike, probably a toll
11 house and associated out-buildings. Just east of the project area was the Alexandria Canal, which ran through
12 the current site of the Pentagon. Fort Albany, one of the earthwork forts forming a defensive chain around
13 Washington during the Civil War was south of the project area where Shirley Highway/I-395 is now. An early
14 20th century residential area – referred to as Queen City – developed near the area of what is now the ramps
15 for the Columbia Pike/I-395 interchange. The neighborhood was demolished by the early 1940s for the
16 Pentagon reservation development.

17 Formally designated Federal Office Building #2, the Navy Annex was originally intended as a warehouse when
18 it was built in 1941. The Marine Corps' need for office space led to its conversion into Marine Corps
19 Headquarters soon thereafter. The Navy Annex was later home to the Missile Defense Agency as well. A
20 large, rather plain, and utilitarian building, it consisted of eight wings connected by a frontal wing in a sort of
21 "E" configuration. Photo 5 shows an aerial view of the Navy Annex building and the surrounding landscape.
22 It was considered eligible for the NRHP due to the historical significance of its tenancy rather than architectural
23 significance. In 2004 the eastern wing was demolished to make space for the AFM; in 2013 the remaining
24 building was demolished to provide space for the ANC Southern Expansion project.

25 A more detailed overview of the area's history is presented in a report titled *Archaeological and Historic*
26 *Evaluations for the Arlington National Cemetery Southern Expansion, Arlington County, Virginia (Appendix*
27 *G)*.

28 3.7.1.2 Archaeological Resources

29 There are no archaeological resources recorded in the APE for direct physical disturbances. The areas south
30 of the boundary wall have had repeated disturbances from cycles of construction and demolition, and as a result
31 have a very low potential for intact archaeological sites. The history of the site, past land uses, and data from
32 test borings, remote sensing, and excavation done for site evaluation were examined in an archaeological
33 evaluation of the project area.⁷⁶ The Virginia Department of Historic Resources has concurred with the
34 findings of that evaluation that intact archaeological deposits are unlikely within the APE, and no further survey
35 is warranted.⁷⁹ The portion of the APE within the cemetery, the Boundary Wall along Patton Drive shows
36 modifications; a stream running along much of the length of Patton Drive appeared on an 1897 map⁸⁰. The
37 stream must have been diverted into a culvert and filled. There is virtually no undisturbed ground in that part
38 of the APE given the roadway, graves, and utilities filling the area. The likelihood of finding or identifying
39 NRHP eligible archaeological resources would be small. If unanticipated cultural artifacts would be identified

⁷⁶ Haynes, J. H. 2016, *Archaeological and Historical Evaluation for the Arlington National Cemetery Southern Expansion Project*.
U.S. Army Corps of Engineers Norfolk District, Norfolk, Virginia.

⁷⁹ Letter, Marc Holma, Virginia Department of Historic Resources to Rebecca Stevens, Arlington National Cemetery dated February
7, 2017 (DHR File No. 2014-1094)

⁸⁰ Depot Quartermaster's Office, 1897. *Map of Arlington National Cemetery, Washington, D.C.*

Author: sfinotti Subject: Sticky Note Date: 09/18/2018 11:04:38 AM

- The historic context for the former Navy Annex and the VDOT owned parcel (both within the APE) needs to be corrected and expanded (see below) to reflect the development of the parcel.

- There are additional sources that should be reviewed as part of the context. The historic context fails to fully recognize the resources and African American communities that were formerly within the boundaries of the APE.

1. Lithograph of "Fort Albany at Arlington Heights," 1862. <https://lccn.loc.gov/2003680881> and General Barnard's Defenses of Washington, Map 5, 1865. <https://catalog.archives.gov/id/305800>

- Civil War lithograph and map shows the house of nationally known Dr. Thomas Antisell, toll house, and other outbuildings within or adjacent to the boundary of the project area.

2. Hopkin's "The Vicinity of Washington, D.C.," 1894. <http://hdl.loc.gov/loc/gmd/g3850.ct003624>

- The map depicts at least twenty buildings within the APE. Many of these may have been associated with an African American community at this intersection.

- The leaders of Mount Olive Baptist Church, the third (known) congregation established at Freedman's Village, purchased a two-acre parcel, built a church, and established Queen City in 1892. There are direct connections between this neighborhood and Feedman's Village. According to map overlays, Queen City also was mostly within the APE.

- The EA inaccurately describes Queen City as an early 20th century development and neglects to tie its history to Freedman's Village.

3. Howell & Taylor, "Map of Alexandria County, Virginia," 1900 <https://www.loc.gov/item/89692758/> and Sanborn Fire Insurance Maps, 1936 (see below).

- A portion of the APE is located on the former site of East Arlington (platted in 1904). This African American community was demolished to make way for the Pentagon's Road Network. Please reference this subdivision in the context.

- For additional understanding of the site, 1900 Map of Alexandria County, Virginia, has been overlaid on current maps. See Arlington County GIS. <http://gis.arlingtonva.us/Html5Viewer/Index.html?viewer=ACMaps.HTML5#>

Author: sfinotti Subject: Sticky Note Date: 09/18/2018 11:08:55 AM

Evaluate whether 3.7.1.2 Archaeological Resources needs to be amended with a better understanding of the historic context as outlined above. The potential for NR-eligible resources remains unlikely due to redevelopment and land disturbance, but there is a greater history to the site that has not been considered as part of this analysis.

1 The AFM honors the service of the men and women of the United States Air Force and its heritage
2 organizations. The AFM uses architectural design, inscriptions and sculpture to represent the Air Force
3 heritage from early pioneers in flight to the advent of manned space-flight.⁸⁸

4 Visitors to the DC area who visit the AFM come to remember, honor, and celebrate the Air Force and its
5 servicemembers. The Air Force Band has weekly concerts during the summer months. The AFM also provides
6 a unique view of the Washington D.C. landscape.

7 3.8.2 Threshold of Significance

8 The threshold of significance for visitor use and experience impacts for the long term would be exceeded if
9 visitors could no longer visit family member's grave sites or if visitors could not experience the key
10 destinations.

11 3.8.3 Environmental Consequences

12 3.8.3.1 Relocate Operations Complex Alternative (Preferred)

13 There would be beneficial impacts provided by the Preferred Alternative, based on preliminary design, due to
14 proposed new and additional amenities including pedestrian gate(s) along the new boundary wall, a visitor
15 parking area opposite the AFM south of Columbia Pike, and a Freedman's Village Park. The overall design
16 would be a seamless extension of the current cemetery and provide the same iconic image captured by the
17 ordered grid of headstones and landscaping that creates the sense of peace and beauty. Furthermore, positive
18 impacts would include extending the longevity of the cemetery by adding additional burial space, and
19 expanding the footprint to allow additional area for visitors to experience the history, heritage, honor, and
20 sacrifice of our military service members.

21 The integration of the AFM into the cemetery boundaries would improve the visitor experience. The final
22 design integrating the AFM would preserve the tradition, character, and experience of ANC. Pedestrian access
23 would be enhanced from both Columbia Pike and ANC. The design elements would be ADA compliant. A
24 new parking facility is proposed on the south side of Columbia Pike and would accommodate visitors to the
25 AFM. The summer band concerts would end once integrated with the cemetery. The memorial honoring Air
26 Force servicemembers would continue to provide the sweeping view of the DC landscape and entrance to the
27 Memorial Avenue Corridor. Visitors' safety is a key design element; appropriate safety features for safe
28 crossing of Columbia Pike would be part of the final design. ANC's security policy and procedures would
29 apply to the integrated AFM.

30 Relocation of the Operations Complex would create additional burial space as well as improve aesthetics for
31 burials in the Cemetery.

32 Temporary impacts from dust and noise may be experienced due to increased construction traffic and other
33 activities during the project's construction. Any impacts would cease upon completion of construction
34 activities. Gravesites located between Patton Drive and the boundary wall may require the temporary
35 displacement of headstones to avoid the potential for damage. Tremendous care would be taken to avoid
36 impacts to gravesites; there would be no disturbance to buried remains. Family members wishing to visit one
37 of these gravesites would be provided either escorted or pre-arranged access, to minimize
38 interruptions/intrusion of construction activities during the visit. The proposed construction would not
39 preclude any family member from visiting a gravesite.

⁸⁸ Air Force District Washington, 2018. <https://www.afdw.af.mil/about/>

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 10:21:42 AM

Incorporating the AFM into the cemetery could adversely affect the hundreds/thousands of visitors who walk to the site for a broad array of public events which are currently supported but would be impacted by the future cemetery expansion.

1 3.8.3.2 Maintain Operations Complex with Underpass Alternative

2 This alternative would provide similar benefits as discussed in the Preferred Alternative although there
3 would be less acreage for interments; the cemetery would reach maximum capacity sooner than under the
4 Preferred Alternative. At that time, the cemetery would remain a national shrine popular with visitors and a
5 place of peaceful reflection for the families of interred loved ones.

6 3.8.3.3 Maintain Operations Complex without Underpass Alternative

7 This alternative would provide similar benefits and impacts as discussed under the previous alternative, but
8 without an underpass for maintenance vehicles, visitors may experience an increase in traffic on Columbia
9 Pike. Crossing Columbia Pike from the proposed visitor parking may be inconvenient due to the maintenance
10 vehicles traveling into and out of the existing cemetery entrance, but the incremental inconvenience over
11 normal traffic would be negligible.

12 3.8.3.4 No Action Alternative

13 Under the No Action Alternative, there would be no comprehensive development of the Southern Expansion
14 site. There would be no new burial space; the visitor use and experience would be confined to the existing
15 limits of ANC. Over the long term, burial space would be reduced to a point where it would no longer be
16 available. This would greatly impact visitor use and experience as the cemetery would eventually transition
17 from an active cemetery to a national memorial.

18 3.9 Socioeconomics, Environmental Justice, and Protection of Children from
19 Environmental Health Risks and Safety Risks

20 Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race,
21 color, national origin, or income, with respect to the development, implementation, and enforcement of
22 environmental laws, regulations, and policies.⁴⁹ Economic and social elements, including demographic
23 information and applicable Executive Orders (EO) protecting various segments of the population are required
24 for the NEPA analysis. EO 12898 – *Federal Actions to Address Environmental Justice in Minority Populations*
25 *and Low-Income Populations*, and EO 13045 – *Protection of Children from Environmental Health Risks and*
26 *Safety Risks* directs federal agencies to identify and evaluate potential impacts and avoid or minimize to the
27 greatest extent practicable and permitted by law. The environmental health risks and safety risks outlined in
28 EO 13045 are risks attributable to products or substances, including air, water, and soil, that a child may
29 encounter or ingest. Environmental Justice includes full and fair participation by all potentially affected
30 communities in the transportation decision-making process.

31 3.9.1 Affected Environment

32 The baseline information documented in the RPMP PEA remains applicable to this current EA and provides a
33 detailed discussion of census data (2010) and the EOs. Interim census data is available, but provides only
34 estimates based on the 2010 U.S. Census and would not provide meaningful information for an updated
35 analysis.

36 Demographic and economic data from the RPMP PEA described the action area consisting of Arlington
37 County, JBMHH, and adjacent neighborhoods including Radnor-Fort Meyer Heights and Foxcroft Heights.
38 Radnor-Fort Meyer Heights (Census tract 1017.03) is located at the north end of ANC and does not apply to

⁴⁹ U.S. Environmental Protection Agency, 2018. <https://www.epa.gov/environmentaljustice>

Arlington County notes that the only residential community directly affected by the Southern Expansion project is Foxcroft Heights. The 2010 US Census Data shows a majority of residents in Foxcroft Heights is non-white.

1 Westbound Washington Boulevard has a short-length merging and weaving area of 350 feet, between the entry
2 and exit ramps, that is susceptible to higher crash rates.⁹⁵ Weaving areas less than 900 feet have crash rates
3 25% higher than longer length areas \geq 1600 feet.⁹⁶ The existing yield-controlled merge area off-ramps onto
4 Columbia Pike have a history of crashes. The Washington Boulevard westbound side on-ramp had a crash
5 involving a pedestrian at an unsignalized crosswalk. Overall, there were 18 vehicle crashes at this interchange,
6 several involving multiple vehicles between 2009 and 2013.⁹⁷

7 3.10.1.4 Interchange Ramps and Queuing

8 All movements on the west side of the Columbia Pike/Washington Boulevard interchange operated at LOS
9 "C" or better during both AM and PM peak hours. Movements included:

- 10 • Washington Boulevard westbound off-ramp to westbound Columbia Pike;
- 11 • Washington Boulevard off-ramp to eastbound Columbia Pike (Pentagon);
- 12 • Columbia Pike westbound to Washington Boulevard westbound; and,
- 13 • Columbia Pike eastbound on-ramp to I-395 and Washington Boulevard westbound.⁹⁸

14 3.10.1.5 Parking

15 Southgate Road currently provides approximately 370 (parallel and perpendicular) parking spaces. Westbound
16 Southgate Road has approximately 140 unrestricted parking spaces. Parking space on the eastbound lane is in
17 the Arlington County right-of-way; parking restrictions are regulated by JBMHH. Eastbound Southgate Road
18 has 150 on-street spaces. There is a 78-space parking lot on the east end of Southgate Road originally
19 constructed for overflow parking for the Navy Annex employees. This parking lot is owned partly by Arlington
20 County and partly by JBMHH; it is currently used as overflow parking by the AFM with permission from
21 JBMHH and Arlington County.

22 All parking spaces are generally occupied by 10 AM according to observations during the traffic counts of the
23 RPMP PEA. Most of these vehicles entered from the intersection of Columbia Pike and South Joyce Street. In
24 the evening, most of these vehicles make a U-turn prior to Hobson Drive to exit via the intersection of Columbia
25 Pike and South Joyce Street.

26 3.10.1.6 Pedestrian and Bicycle Circulation

27 Pedestrian and bicycle facilities within and adjacent to the Southern Expansion are illustrated in Figure 3-7.
28 Sidewalks within the action area provide connections with the Pentagon and Pentagon City. The sidewalks
29 range in width from four feet along portions of the residential streets to twelve feet near the Sheraton Hotel.
30 Crosswalks are present at many locations in the action area; however, striping is extremely faint at crosswalks
31 along Southgate Road. Crosswalks with pedestrian-actuated signals are available at the intersections of
32 Columbia Pike and South Orme Street, and Columbia Pike and South Joyce Street. There are three pedestrian
33 islands at the intersection of South Joyce Street which provide higher safety to pedestrians. Many sidewalks
34 and crosswalks in the action area are not compliant with the ADA.

⁹⁵ Arlington County, Virginia, Transportation Planning Bureau, August 2017. *Columbia Pike/Washington Boulevard Interchange Modification Report (Final)*. Prepared by Kimley-Horn Consultants. Unpublished report. Page 185-186.

⁹⁶ *Ibid.* Page 185.

⁹⁷ *Ibid.* Page 186.

⁹⁸ *Ibid.* Page 108, 110.

1 An on-street bicycle route sign is posted from Columbia Pike along South Orme Street to Southgate Road and
2 onto South Joyce Street. The illustrated route is part of the Arlington County bicycle routes and connects with
3 trails leading to JBMHH, the Pentagon, ANC, Mount Vernon Trail, Arlington Memorial Bridge, and Rosslyn.

4 A "Wall Trail" located between ANC's east side boundary wall and Washington Boulevard/Route 110 to link
5 the Foxcroft Heights area with Memorial Drive is part of Arlington County's Transportation Master Plan. The
6 trail appears to have severe space constraints due to aboveground utilities along the proposed route.

7 A Capital Bikeshare docking station is located on South Orme Street at the Sheraton Hotel. This station has 11
8 bike docks and allows riders to connect with over 300 docking stations in the National Capital Region.

9 3.10.2 Threshold of Significance

10 The threshold of significance for traffic and transportation impacts would be exceeded if the alternative would
11 result in any of the following:

- 12 • A degradation of an intersection LOS to "E" or "F";
- 13 • A degradation in safety; or,
- 14 • Severing an existing major route for bicycles or pedestrians.

15 3.10.3 Environmental Consequences

16 3.10.3.1 Relocate Operations Complex Alternative (Preferred)

17 Transportation Network

18 Under the Preferred Alternative, Columbia Pike would be realigned; Southgate Road and the parking lot would
19 be closed and redeveloped for cemetery use; a new access road ("South Nash Street") for JBMHH would be
20 constructed; and the Route 27 ramps at the Columbia Pike interchange would be realigned.⁹⁹ Conceptual cross-
21 sections of the proposed realigned Columbia Pike and the connector road are illustrated in Figures 2-2 and 2-
22 3 in Chapter 2. The new realigned roadways, including the Route 27 ramps, would meet current VDOT and
23 AASHTO highway design guidelines, including curve radii and maximum grade. Columbia Pike would be
24 constructed as a four-lane principal arterial with a speed limit of 25 MPH. South Nash Street would be
25 constructed as a two-lane minor arterial with a speed limit of 25 MPH; it would have street trees and a sidewalk
26 on the east side. The realigned Columbia Pike would have street trees on both sides along with a 10' shared
27 use facility on the north side and a 6' sidewalk on the south side. The alignment for the future Columbia Pike
28 has the necessary geometry for a high capacity regional multimodal transportation corridor as discussed in
29 Chapter 2.

30 The proposed underpass below Columbia Pike connecting the relocated Operations Complex south of
31 Columbia Pike with the cemetery's interment area is a design element to make the highest and best use of the
32 available land. The underpass would be used by ANC vehicles only.

33 Southgate Road, a minor arterial roadway, would be replaced with a South Nash Street, also a minor arterial.
34 The connector road's primary function would be identical to Southgate Road – to provide ingress/egress for

⁹⁹ Arlington County prepared an Interchange Modification Report (IMR) for the proposed reconfiguration. The IMR was developed in accordance with applicable VDOT and FHWA interchange modification criteria. The purpose and need statement for the proposed modification included: to improve safety; to allow for more contiguous land for Arlington National Cemetery Expansion; to improve traffic and transit operations at signalized intersections; to provide

Author: sfinotti Subject: Sticky Note Date: 09/20/2018 1:36:35 PM

The closure of Southgate Road, which is both an official Arlington County bike route and the preferred route for most cyclists and many pedestrians heading up and down the hill, is not mentioned as an impact to cyclists and pedestrians.

Author: sfinotti Subject: Sticky Note Date: 09/20/2018 2:45:26 PM

Based on the recommendation by the Arlington County Pedestrian Advisory Committee, a 15 foot shared use facility on the north side of Columbia Pike would be preferred if separate protected bike lanes is unattainable. Cyclists maneuvering the slope of Columbia Pike in this area presents a hazard to pedestrians. Additionally, in the preferred alternative plan, the Army proposes to include a significant parking area, with public access on the south side of Columbia Pike, serving the cemetery, Air Force Memorial, the Pentagon 9/11 memorial, and a new 9/11 memorial. With these changes, there will be a dramatic increase in tourists traversing Columbia Pike on foot or by bike, adding significantly to the bike-ped traffic in the area.

1 bike/pedestrian trail network. Short term impacts due to traffic diversions, reduced travel lanes, etc., would
2 occur during construction.

3 *Underpass*

4 The proposed underpass is a design element to make the most efficient use of available land. The underpass
5 would allow maintenance vehicles originating from the new Operations Complex on the south side of
6 Columbia Pike to access the interment area without encountering or contributing to traffic on public roadways.
7 An overpass and at-grade crossing of Columbia Pike were considered but determined not feasible due to
8 aesthetics, space constraints, potential traffic impacts, and a reduction in burial capacity. The underpass would
9 be used solely for cemetery maintenance vehicles; there would be no public access, either vehicular or
10 pedestrian. Finally, the proposed underpass would have no impact on future transit alternatives; it would be
11 designed to accommodate standard highway and streetcar loading and utilities.

12 A future traffic study will be conducted to help determine the proper locations for ingress/egress of the
13 proposed parking area, safe pedestrian crossing of Columbia Pike, curb cuts, additional signals and timing, etc.
14 All design elements would comply with ADA requirements.

15 3.10.3.2 Maintain Operations Complex with Underpass Alternative

16 The roadway alignment would be identical to the Preferred Alternative; all benefits and impacts would be the
17 same.

18 3.10.3.3 Maintain Operations Complex without Underpass Alternative

19 The roadway alignment would be identical to the Preferred Alternative; all benefits and impacts would be the
20 same. Not having an underpass would mean trucks and heavy equipment utilizing the area south of Columbia
21 Pike for support services/functions such as landscaping contractor and laydown area would have to use
22 Columbia Pike and the current entrance near the existing Operations Complex to access the
23 interment/inurnment area. This alternative would have a negative impact on highway safety in this area.

24 3.10.3.4 No Action Alternative

25 Under No Action Alternative, there would be no comprehensive development and no expectation of changes
26 to levels of service for vehicular, bicycle, or pedestrian traffic around the Southern Expansion.

27 The future condition without improvements potentially would result in:

- 28
- 29 • An increase in crashes in the merging/weaving area from/to Washington Boulevard/Columbia Pike interchange;

30

 - 31 • A poorly performing off-ramp from Washington Boulevard westbound to Columbia Pike westbound
32 with decreased speeds and higher vehicle densities, resulting in queuing spillback onto the Washington
Boulevard mainline; and,

33

 - 34 • Worsening performance and crash rates at the South Joyce Street/Southgate Road/Columbia Pike
intersection.

Author: sfinotti Subject: Sticky Note Date: 09/20/2018 7:23:28 AM

The "No Action Alternative" assumes the County would make no transportation improvements to the project affected segment of Columbia Pike. The Columbia Pike Initiative: Revitalization Plan adopted in March 2002, the Columbia Pike Form Based Code adopted in February 2003, and the Street Space Planning Task Force Report adopted in February 2004 were the drivers behind the creation of the Columbia Pike Multimodal Project, which envisioned improvements throughout the entire County-controlled Columbia Pike corridor.

1 Standard utilities mentioned previously would be required for the Operations Complex relocation; no
2 special utilities would be needed. If placing all utilities in a subsurface utility corridor is not practical, all
3 efforts would be taken to minimize any additional land required. The utility design would be developed to
4 incorporate the remaining utilities that could not fit within the corridor. All efforts would be taken to design
5 a location that would provide the most benefit to ANC.

Author: sfinotti Subject: Sticky Note Date: 09/18/2018 10:06:17 AM
Should read: "a location that would ensure access for future maintenance and minimize disruption to ANC operations."

6 The current and future land use would not create a new burden on consumption of local or regional utility
7 services, nor would the cemetery development have a cumulative effect when considering other private
8 development projects occurring within Arlington County.

Author: sfinotti Subject: Cross-Out Date: 09/18/2018 10:06:02 AM

9 3.11.3.2 Maintain Operations Complex with Underpass Alternative

10 The benefits and impacts under this alternative would be similar to those under the Preferred Alternative.
11 Although there would be less utility design required for this alternative – since there would be no Operations
12 Complex relocation – there would still be utility construction to realign utility corridors.

13 3.11.3.3 Maintain Operations Complex without Underpass Alternative

14 The benefits and impacts under this alternative would be similar to those under the previous alternative.

15 3.11.3.4 No Action Alternative

16 Under the No Action Alternative, there would be no changes to utility service demand requiring substantial
17 improvements because there would be no comprehensive development of the Southern Expansion site.

18 3.12 Solid Waste

19 Solid waste is regulated under federal, state, and local laws. The Resource Conservation and Recovery Act
20 (RCRA) Subtitle D is the federal law that governs the collection, treatment, storage, and disposal of non-
21 hazardous solid waste. The Commonwealth of Virginia has its own solid waste management regulations
22 that establishes standards and procedures to protect the public health and safety, and the environment.

23 3.12.1 Affected Environment

24 ANC manages its waste under an Integrated Solid Waste Management Plan (ISWMP). The objectives of
25 the plan are to reduce, reuse, or recycle solid waste to the maximum extent possible. The plan emphasizes
26 source reduction and identifies opportunities for additional recycling such as composting leaves on site.
27 Solid waste generators at ANC include the administrative facilities, maintenance activities, and visitors.
28 Yard waste and floral debris make up most of ANC's waste.

29 ANC has a robust recycling program and submits annual recycling reports to Arlington County. Materials
30 such as general office waste, yard waste, metals, used tires, and wood pallets are collected and recycled off-
31 site by private contractors. In 2011, ANC recycled nearly 1,800 tons of materials including yard waste,
32 scrap wood, cardboard, truck batteries, and oil filters. The current diversion rate, i.e. the percentage of
33 nonhazardous solid waste that is diverted from entering a disposal facility (landfill), is approximately
34 75%.¹⁰³

¹⁰³ U.S. Army Corps of Engineers, Norfolk District, 2014. Programmatic Environmental Assessment for the Arlington National Cemetery Real Property Master Plan. Prepared by HNTB Corporation.

1 3.12.2 Threshold of Significance

2 The threshold of significance for solid waste impacts would be exceeded if the alternative would cause the
3 diversion rate of ANC's nonhazardous solid waste to drop below 50%.

4 3.12.3 Environmental Consequences

5 3.12.3.1 Relocate Operations Complex Alternative (Preferred)

6 The Southern Expansion site, once operational, would be part of the same ISWMP. The number of burials
7 per year essentially would remain unchanged even with the proposed increase in capacity. There would be
8 no noticeable increase in the amount of solid waste produced from daily operations.

9 Construction activities would generate additional waste. In accordance with Army Regulation 420-1,
10 construction contracts would include a performance requirement to divert a minimum of 50% of
11 construction waste from landfill disposal. Contractors would also be required to submit a construction and
12 demolition waste management plan.

13 Due to diversion and recycling requirements in Army and ANC policies, and the adherence to the ISWMP,
14 the Preferred Alternative would not cause a reduction in the diversion rate to less than 50%.

15 3.12.3.2 Maintain Operations Complex with Underpass Alternative

16 Solid waste management for cemetery operations would be the same under this alternative. The ISWMP
17 would apply to the cemetery expansion regardless of the amount of acreage and burial capacity. The
18 cemetery would continue to follow the ISWMP to achieve its goals and objectives.

19 3.12.3.3 Maintain Operations Complex without Underpass Alternative

20 Solid waste management for cemetery operations would be the same under this alternative. The ISWMP
21 would apply to the cemetery expansion regardless of the amount of acreage and burial capacity. The
22 cemetery would continue to follow the ISWMP to achieve its goals and objectives.

23 3.12.3.4 No Action Alternative

24 Under the No Action Alternative, there would be no changes to the diversion rate of ANC's nonhazardous
25 solid waste.

26 **3.13 Hazardous Materials and Waste**

27 3.13.1 Affected Environment

28 3.13.1.1 Navy Annex Property/FOB2

29 The Navy Annex/FOB2 complex consisted of the Federal Office Building 2, surface parking lots, and the
30 Navy Exchange (NEX) Service Station. The site contains potential environmental impacts due to its
31 historical use, including potential releases related to underground storage tanks (UST), aboveground storage
32 tanks (AST), transformers containing PCBs, lead-based paint (LBP), and asbestos-containing material

Author: sfinotti Subject: Sticky Note Date: 09/21/2018 10:53:55 AM

Text should state that confining the County's right of way to the 75 foot corridor and constructing a tunnel under the roadway could adversely affect future economic growth constricting future utility capacity connecting the Pentagon, Pentagon City and Crystal City with the rest of Arlington County.



September 17, 2018

Mr. Mark Schwartz
Arlington County Manager
2100 Clarendon Boulevard
Arlington, Virginia 22201
Via e-mail: mschwartz@arlingtonva.us

Committee Members
Eric Goldstein, Chair
Chris Yarie, Vice Chair
Pamela Van Hine, Recording Secretary
John Armstrong
Ian Blackwell
Jim Feaster
Eric Goodman
Tom Kornis
Leeann Sinpatanasakul
Andrea Walker

Dear Mr. Schwartz:

The Pedestrian Advisory Committee (PAC) is writing to you to encourage the County to submit a strong response to the US Army's [Draft Environmental Assessment](#) for the Arlington National Cemetery Southern Expansion and Associated Roadway Alignment.

The PAC agrees with some, but not all, of the preferred alternative plans described in the draft Environmental Assessment (EA):

- We applaud that the proposal will provide a continuous, albeit relatively narrow, 6 foot sidewalk on the south side of the realigned Columbia Pike.
- We appreciate that the bike-ped passageways east of Joyce will connect more easily and safely to the Pentagon area trails, although we request that the north side passageway be 15 feet wide. These new connections will provide "long-term benefits from connecting bike/pedestrian trails to regional bike/pedestrian trail network."
- We are grateful that trees will be planted and streetlights will be added to the landscape zone on both sides of Columbia Pike, making a currently miserable walk much more pleasant. We recommend adding benches as well - it's a long, steep hill to climb, and benches could make the area more secure.
- We are glad that a new traffic and pedestrian signal will be installed to allow people to cross Columbia Pike safely between the Air Force Memorial/new entrance to Cemetery and the south side of the Pike and parking facility. We recommend adding a flashing warning light over the hill when the traffic light is on because the sight line is inadequate.
- We believe that the proposed T-shaped intersection at Joyce and Columbia Pike will make this intersection safer for vehicular traffic. However, we hope that pedestrians receive adequate safety consideration in signal timing, including consideration of dedicated phases for pedestrian crossing.

We do not, however, accept that the proposed shared 10 foot sidewalk on the north side of Columbia Pike is adequate or safe for either cyclists or pedestrians. The proposal, particularly in combination with the closing of Southgate Road, creates significant safety issues for pedestrians. These issues will only worsen over time as the level of bike and pedestrian traffic increases. Instead, separate dedicated bike facilities (protected bike lanes) should be built, or the mixed use pathway should be widened to a minimum of 15 feet.

Under the guidelines in the EA, this proposal will result in “the threshold of significance for traffic and transportation impacts” being “exceeded” due to both a degradation of safety; and severing an existing major route for bicycles or pedestrians (3.10.2, p. 3-43).

The EA plan proposes to close most of Southgate Road, which is both an official Arlington County bike route and the preferred route for most cyclists and many pedestrians heading up and down the hill. The report makes no mention of the impact of the loss of Southgate Road to cyclists and pedestrians – which severs “an existing major route for bicycles or pedestrians”.

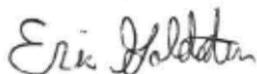
A 10 foot sidewalk is not an adequate facility for this section of road to accommodate the current level of pedestrians and cyclists. Cyclists cannot ride safely on Columbia Pike because the traffic is too heavy, buses constantly pull in and out of the travel lane, sight lines are not adequate, and the hill is too steep. Yet the proposed 10 foot wide sidewalk for use of both cyclists and pedestrians is too narrow to accommodate even the current volume of pedestrian and cyclist traffic that uses either Southgate Road or Columbia Pike. Passing pedestrians safely will be a major challenge for cyclists going up and down the hill, and many pedestrians will feel threatened and vulnerable, especially those who are frail or have disabilities. Cyclists racing down the 6% grade hill on the same narrow sidewalk will be a real hazard to pedestrians.

These problems will only worsen as the expected additional bike-ped traffic along Columbia Pike arrives. Because the current travel conditions for both cyclists and pedestrians up and down the Pike are so difficult, many cyclists and pedestrians rarely, if ever, travel on the Pike. But the potential increase for both commuting and recreational cyclists and pedestrians is significant. Provided with adequate new facilities, cyclists and pedestrians would be encouraged to navigate up and down the Pike to shopping and dining in Pentagon City and Crystal City, trails and parks, the Pike’s terrific eateries and events, and County meetings and facilities. Additionally, in the preferred alternative plan, the Army proposes to include a significant parking area, with public access on the south side of Columbia Pike, serving the cemetery, the Air Force Memorial, the Pentagon 9/11 memorial, and a new 9/11 memorial. With these changes there will be a dramatic increase in tourists traversing Columbia Pike on foot or by bike, adding significantly to the bike-ped traffic in the area.

Rebuilding this section of Columbia Pike is a once in a lifetime opportunity to rebuild a major County street that is safe and convenient for everyone and built according to Complete Street principles described for the project on the County [website](#). Separate protected bike lanes, such as in the alternative streetscape [proposal](#) from the Sustainable Mobility for Arlington County, would make both pedestrians and cyclists safer. Alternatively, making the north side pathway a minimum of 15 feet wide would 1) provide adequate space for cyclists and pedestrians, 2) require only 5 more feet of ROW, and 3) match the width of the appropriately majestic, yet welcoming sidewalks on either side of Memorial Drive.

Let's use this opportunity to build it right - safe, accessible, and pleasant for all users.

Sincerely,



Eric Goldstein
Chair, Pedestrian Advisory Committee



DEPARTMENT OF THE ARMY
ARMY NATIONAL MILITARY CEMETERIES
ARLINGTON NATIONAL CEMETERY
ARLINGTON, VA 22211-5003

27 August 2019

Mr. Mark Schwartz
County Manager, County of Arlington
2100 Clarendon Boulevard, Suite 302
Arlington, Virginia 22201

Dear Mr. Schwartz:

Thank you for your letter dated September 21, 2018, providing comments the Arlington National Cemetery (ANC) Southern Expansion Draft Environmental Assessment (EA). The enclosed document provides responses to your comments. The EA has undergone revision since we received comments on the draft EA. I believe the Final EA, which we expect to publish very soon, fully evaluates the environmental and social effects of the projects, as required by NEPA.

I would also like to take this opportunity to express my appreciation for your staff's ongoing participation in numerous technical reviews and coordination meetings for more than a year regarding design details of the road relocation and cemetery expansion. Design of the project is ongoing and the technical working group, in which your staff participates, is addressing design concerns raised in your letter. Although that level of detail is outside the purview of NEPA, our partnership in working through these concerns has helped to refine the Final EA.

I look forward to Arlington County's continued coordination with ANC and FHWA on these important expansion projects.

Sincerely,

PELOQUIN.MICHAEL
.DAVID.1043747882

Digitally signed by
PELOQUIN.MICHAEL.DAVID.1043
747882
Date: 2019.08.27 10:31:32 -04'00'

Michael D. Peloquin
Colonel, U.S. Army
Program Director for Cemetery Expansion

Enclosure

Arlington National Cemetery -- Response to Arlington County Comments

Southern Expansion Final Environmental Assessment

- 1) **County Comment:** *The County offers its comments to the draft environmental assessment. It does so despite the identified adverse impacts the preferred alternative imposes on the County, most notably the abandonment of Southgate Road and constrictions a proposed tunnel under Columbia Pike will have on the County's future ability to address the area's utility right-of-way and public transportation needs. The County remains hopeful that its participation as a cooperating agency has helped inform the federal partners of these local impacts and helped identify practical mitigation measures that could address the County's concerns.*

ANC Response: ANC appreciates the efforts of the County and all of our Cooperating Agency partners. As you know, in addition to the County, we also have worked closely with the Federal Highway Administration, Eastern Federal Lands Highway Division (FHWA-EFLHD), the Environmental Protection Agency (EPA), the National Capital Planning Commission (NCPC), and the Virginia Department of Transportation (VDOT), since the onset of the National Environmental Policy Act (NEPA) process. Recognizing that there would be considerable public interest with respect to this project, we have also held public meetings for NEPA scoping and the release of the Draft Environmental Assessment (EA) and collected and addressed public comments.

The abandonment of Southgate Road has been planned since the onset of the project. The proposed alignment and configuration of South Nash Street, the relocation of Columbia Pike, and the Interchange were a collaborative effort among ANC, FHWA-EFLHD, VDOT, and the County. While we recognize that certain aspects of the project have evolved during the NEPA process due in part to changes in federal policy, we have maintained a dialog with the cooperating agencies, including Arlington County, throughout the development of the EA and regarding the specifics of the roadways and right-of-way changes and regarding the utility relocation. We believe that cooperating agency participation in this process, in addition to our public outreach, have strengthened this document.

- 2) **County Comment:** *Regretfully, the County must still take issue with the methodologically deficient manner in which the result oriented analysis was done. The analysis does not adequately analyze the factors relevant and required to satisfy an environmental review and the methodology used in the draft is deficient and fails to provide any rational basis for concluding the preferred alternative is appropriate. In conclusory fashion, the draft EA makes no distinction between and among the impacts of the alternatives and concludes the preferred alternative is appropriate.*

ANC Response: We believe the methodology used in the alternative analysis included the "hard look" required under the NEPA statute. Pursuant to the requirements of NEPA, the EA described the Purpose and Need for the Proposed Action, listed and evaluated the alternatives (including the Preferred Alternative), and documented the existing conditions and environmental consequences. The Preferred Alternative is appropriate because it achieves Congress' intent for this project while balancing other interests, one of the key tenets of NEPA.

Based on public comments from the Draft EA, we have clarified factors differentiating the alternatives, where necessary, and reasoning for eliminating alternatives and/or sub-alternatives. The document described the short-term and long-term, beneficial and adverse effects of the federal action, and addressed the ways in which the adverse effects are, or may be, minimized. In short, the EA provided a thorough alternatives analysis for development of ANC's land to its highest and best use in conjunction with the collaborative plan for realignment of Columbia Pike, closure of Southgate Road, and redesign of the Washington Boulevard/Columbia Pike interchange. NEPA requires a "hard look," but does not require an exhaustive list of alternatives.

The EA examined three different alternatives in detail: Relocate Operations Complex Alternative (Preferred Alternative); Maintain Operations Complex with Underpass Alternative; and Maintain Operations Complex without Underpass Alternative. The EA also examined three sub-alternatives for the Preferred Alternative (Bridge, At-grade, or Underpass crossing at Columbia Pike), and two sub-alternatives for the At-grade crossing: (Revised Operations Scheduling, and Decentralized Operations). Prior to that, the EA considered and screened out more than five different alternatives for roadway and interchange alignment in collaboration with the partners, as described earlier. The EA explained the similarities and differences between the alternatives.

- 3) **County Comment:** *Characterizing the multi-modal improvements to Columbia Pike as part of the project's purpose and need is incorrect. The proposed improvements to Columbia Pike are a mitigation response to the federal acquisition and closure of Southgate Road. Irrespective of the proposed Nash Street, the closure of Southgate Road will force additional traffic onto and further constrain, Columbia Pike. Arlington County has planned to make intermodal and safety improvements to Columbia Pike along the Southern Expansion project area regardless of any planned expansion of the Cemetery. Moreover, realigning the roadway within a constrained 75-foot-wide right of way and constructing a tunnel underneath the roadway to maximize burial capacity and optimize cemetery maintenance operations does not increase intermodal capacity. It limits it.*

ANC Response: The Proposed Action is a two-fold federal action – the cemetery expansion and the road and interchange realignment – requiring the document to analyze both simultaneously. Past improvements to other sections of the Columbia Pike corridor have included a standardized street cross-section, wider sidewalks, bicycle accommodations, etc. These improvements were identified and discussed in the Columbia Pike Multimodal Street Improvements Categorical Exclusion document approved by FHWA VA Division Office. The proposed realignment of Columbia Pike creates an opportunity to address multimodal capacity, safety, and capacity levels on this stretch of Columbia Pike. The conceptual cross section depicting the 75-foot right-of-way width that was included in the Draft EA has been replaced with a typical cross section of the roadways and trails without dimensions. Actual roadway and right-of-way widths are design phase decisions that may vary, and are outside the scope of this EA. The EA addresses the operational efficiency of the proposed redesign of the Washington Boulevard/ Columbia Pike interchange and proposed signalized intersections in part using data from the County's Interchange Modification Report (IMR), dated August 2017, prepared by its consultant, Kimley-Horn. The proposed South Nash Street replaces Southgate Road as an access road for Joint Base Meyer Henderson Hall (JBMHH) and provides

circulation for other local traffic. The IMR modeled traffic using data collected between October 2011 and October 2014 to determine level of service for each existing and proposed signalized intersection for Opening Year 2020 and Design Year 2040. The IMR states that it utilized existing traffic data, VDOT historic traffic count data, and the Metropolitan Washington Council of Governments (MWCOC) Version 2.3.57 regional travel model to develop future year traffic forecasts; this approach was agreed to by VDOT and the County. The IMR indicated that for the 2040 Build conditions, generally, movement delays are “significantly reduced compared to 2040 No-Build conditions.” Although the IMR acknowledges that traffic volumes will increase in the future, it concluded the following:

- “It has been determined that with the preferred alternative, in addition to the realignment of Columbia Pike, and relocation of Southgate Road, the operation along Columbia Pike and particularly in the areas surrounding the interchange can be significantly improved.
- The preferred build supports a more multi-modal Columbia Pike with improved sign distances, a safer pedestrian crossing experience, road and intersection configuration that supports transit movements, and a multimodal trail.
- The elimination/consolidation of ramp movements reduces many high-speed weave, merge, diverge areas, potentially improving the safety of travelers and through the interchange.
- This modification has the potential to benefit multiple stakeholders, to improve access to some of the nation’s most important government and cultural facilities, and to improve multi-modal traffic operations for motorists, pedestrians, transit riders, and bicyclists.

The proposed modification has been respectfully designed to consider a balancing of many diverse and competing interests and represents a collaborative and thoughtful approach to enhance the functionality and compatibility of this vital interchange.” (Arlington County, 2017). HNTB Corporation subsequently completed a traffic study and described the results in the Arlington National Cemetery – Southern Expansion Traffic Technical Memorandum – Future Conditions, dated April 15, 2019. It further validated the IMR’s results and included additional traffic counts along Columbia Pike corridor in October 2018. The traffic study results will be used to inform roadway design improvements needed due to our project (HNTB 2019). This traffic study is being added to the EA Appendix.

FHWA-EFLHD has assisted with the EA as a cooperating agency. In addition, FHWA-EFLHD will be designing the roadways that will be relocated as a result of the ANC expansion. Recently, FHWA-EFLHD and ANC, per concerns expressed by both the County and VDOT related to changes to planned, adjacent land use since the IMR was published, including the location of Amazon HQ2 in Pentagon City, agreed to further traffic studies to further analyze the modified access to Route 27 (Washington Boulevard) with Columbia Pike. FHWA-EFLHD has indicated to ANC that all decision-making to-date concerning the EA is agreeable to them, and that FHWA-EFLHD intends to adopt the ANC’s EA and issue its own FONSI if appropriate, after the traffic study and following IMR update.

It should be noted that this study does not include any assumptions with respect to the Pentagon Memorial Fund Visitor Education Center (PMF VEC). We consider the future design and construction of the PMF VEC too speculative to inform sound decision-making. Currently, the

proposed VEC design effort is on hold while PMF conducts market research to inform size/scope of a possible VEC. Also please note that the plan to develop the VEC is a separate land use action sponsored by private interests, subject to site plan approval and traffic impact analysis, if necessary, by regulatory agencies. There is no current plan of development upon which to assess traffic impacts. FHWA-EFLHD's traffic study and IMR update will use assumptions, as agreed to with the County and VDOT, to determine potential impacts to the Route 27/Columbia Pike Interchange along with suggested mitigations, during the design process.

- 4) **County Comment:** *The federal actions will impose an upper capacity limit on the only utility corridor connecting the Pentagon, Pentagon City, Crystal City, and Potomac Yard to the rest of Arlington County. The tunnel will also require Arlington County Board action to approve an encroachment of the tunnel structure within the County right-of-way, contrary to County policy. What once was authorized as a land exchange between Arlington County and the federal government to support Cemetery expansion, as a result of a more recent act by Congress, has now become a land acquisition by the federal government at Arlington County's expense. This change in federal policy will limit the County's ability to accommodate the ever changing and growing utility and transportation needs for the area. Arlington National Cemetery's commitment to identify and establish an alternative utility corridor that addresses the County's concerns is greatly appreciated but provides no certainty for when and how a definite need will be addressed while the Cemetery's objectives are achieved.*

ANC Response: Future transportation needs are addressed in the previous response. My staff has had many meetings with yours to try to design the Cemetery to accommodate the County's future utility needs; however, no specific feedback has been available. No currently used utility services or functions are being eliminated or scaled back as part of these projects. In fact, those that are going to be relocated will also be upgraded to allow for future expansion. ANC and the Arlington County Manager recently reached an agreement in good faith regarding the Columbia Pike right-of-way and utility relocation as part of this project, and the County Manager has communicated his intent to present these details to the County Board for approval. ANC agrees that the county-owned sewer lines currently located below Southgate Road will remain in place or be relocated at Army expense to an alternate utility corridor within the cemetery with an appropriate easement to the County for its continual operation and maintenance. All other utilities impacted by the expansion project will be relocated by the Army to a new corridor within the realigned Columbia Pike right-of-way in a manner consistent with applicable code and anticipated expansion capacity. ANC remains committed to working with the County on these and other design issues as the project's design phase moves forward.

- 5) **County Comment:** *Arlington County also objects to the dismissal of any environmental justice review relative to Foxcroft Heights community. 2010 Census block data confirms that the Foxcroft Heights community, the only residential community directly adjacent to the project area, is more than two-thirds non-white. A more thorough analysis of this affected community is warranted.*

ANC Response: Although the official Census Tract data showed a minority population less than 50% (U.S. Census 2016), the Arlington County demographic data for the Foxcroft Heights neighborhood showed a minority population of approximately 68% (Arlington County, VA 2018). Neighborhood-level statistics for income were not available. Therefore, the EA has been revised to include analysis of Foxcroft Heights as an Environmental Justice community. Although the Foxcroft Heights community may be greater than 50% minority, the EA concluded that the Preferred Alternative would not create disproportionately high and adverse human health or environmental effects on minority or low-income populations or children within this community.

- 6) **County Comment:** *The County asks that consideration be given to the enclosed comments it received from its Pedestrian Advisory Committee. The committee raises important safety concerns that a 10-foot shared use trail is too narrow in segments with a six percent grade in elevation. The County concurs with the recommendation that an additional five feet, perhaps from the buffer area outside the proposed wall, be added to the right-of-way where the slope approaches a six percent grade.*

ANC Response: We received numerous comments/suggestions regarding bicycle and pedestrian infrastructure along the Columbia Pike corridor. ANC is sensitive to the public's concerns and desires for the project to provide a safe corridor for all users. The conceptual corridor is in keeping with state and local policies for "complete streets." The conceptual corridor will preserve the bicycle and pedestrian trail link between Southgate Road and South Joyce Street via the proposed South Nash Street and Columbia Pike using separated bicycle and pedestrian trails, which would connect with Arlington County's existing trail to the Pentagon. The roadway and trails are still under design at this time, but ANC and Arlington County have agreed in good faith to a right-of-way cross section that provides a separate 10-foot wide bike path along the north side of Columbia Pike in addition to sidewalks on both the north and south sides of Columbia Pike. The final design of the Columbia Pike realignment and trails is outside the scope of this EA; however, design will include the appropriate level of bike/pedestrian infrastructure that is consistent with VDOT/AASHTO/NACTO standards and Arlington County's Columbia Pike design standard. Please see Section 3.10 of the Final EA for additional information.

References

Arlington County, VA, 2018. Civic Association Demographics, <https://projects.arlingtonva.us/wp-content/uploads/sites/31/2014/03/Foxcroft-Heights.pdf>.

Arlington County, Virginia, Transportation Planning Bureau, August 2017. *Columbia Pike/Washington Boulevard Interchange Modification Report (Final)*. Prepared by Kimley-Horn Consultants. Unpublished report.

U.S. Census, 2016. <http://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html>.



September 22, 2018

By Electronic Mail

Ms. Kathy Perdue
U.S. Army Corps of Engineers
Norfolk District, 803 Front St.
Norfolk, VA 23510

Dear Ms. Perdue:

The Pentagon Memorial Fund, Inc. (PMF) is grateful for the opportunity to comment on the Arlington National Cemetery (ANC) Draft Environmental Assessment for the Southern Expansion and Associated Roadway Realignment. As a stakeholder and partner in the Southern Expansion Project, the PMF supports Action Alternative 1, the Preferred Alternative, and ANC's objectives to increase contiguous acreage and realign the roadways to add burial capacity for our nation's heroes and their families, support cemetery operations and sustainability, and enhance family and visitor experiences. We believe that the PMF's plans for the 9/11 Pentagon Memorial Visitor Education Center (PMVEC) complement ANC's efforts to achieve these goals.

Based upon the PMF's review of the Draft Environmental Assessment, we have specific comments with respect to Section 2.3.2, Land Acquisitions/Disposals, and the adjacent boxed text titled "Pentagon Memorial Fund Visitor Education Center," both on page 2-4. As depicted in various descriptions and figures throughout the Draft Environmental Assessment, the site of the future PMVEC is within the Southeast Expansion Project Boundary. As a result, it's PMF's understanding that the site of the PMVEC is part of the Proposed Action and that, as noted on page 3-71, the Proposed Action anticipates "reasonably foreseeable impacts . . . based on an assumed construction footprint of a [PMVEC] building and a parking lot"

As such, it is our further understanding that the Proposed Action takes into account the use of the land identified in Figure 2-1 as the "PMVEC Future 9/11 Pentagon Visitor Education Center" by the PMF for that very purpose and that a separate environmental assessment may not be necessary. The PMF expects that a determination with respect to the need for a separate environmental assessment will be made as the design of the PMVEC is further developed and finalized, which will be done in ongoing collaboration with ANC and the U.S. Army Corps of Engineers, Norfolk District.

Thank you for considering the PMF's comments on the Draft Environmental Assessment, and in particular the need for a separate environmental assessment for the PMVEC. The PMF and its design

team look forward to continuing to work with ANC and the U.S. Army Corp of Engineers in bringing to realization this historic project. We are proud to be partners in the Southern Expansion and look forward to our collaborative work together in the months and years ahead.

Sincerely,

A handwritten signature in purple ink that reads "James Laychak". The signature is fluid and cursive, with a long horizontal stroke extending to the right from the end of the name.

Jim Laychak
President
Pentagon Memorial Fund, Inc.

DB1/ 99776177.2



DEPARTMENT OF THE ARMY
ARMY NATIONAL MILITARY CEMETERIES
ARLINGTON NATIONAL CEMETERY
ARLINGTON, VA 22211-5003

27 August 27, 2019

Mr. Jim Laychak
President, Pentagon Memorial Fund, Inc.
P.O. Box 3879
Gaithersburg, MD 20885

Dear Mr. Laychak:

Thank you for your letter dated September 22, 2018, providing comments to and expressing your interest as a stakeholder and partner in the Arlington National Cemetery (ANC) Southern Expansion and Associated Roadway alignment Draft Environmental Assessment (Draft EA), prepared pursuant to the National Environmental Policy Act of 1969, as amended (NEPA).

Since the release of the Draft EA and receipt of public comments in September 2018, we have been working to complete the final EA and the NEPA process. The enclosed document provides responses to your comments.

Sincerely,

PELOQUIN.MICHAEL
.DAVID.1043747882

Digitally signed by
PELOQUIN.MICHAEL.DAVID.1043
747882
Date: 2019.08.27 10:32:31 -04'00'

Michael D. Peloquin
Colonel, U.S. Army
Program Manager for Cemetery Expansion

Enclosure

Response to Pentagon Memorial Fund comments

Southern Expansion Final Environmental Assessment

- 1) **PMF Comment:** *As a stakeholder and partner in the Southern Expansion Project, the PMF supports Action Alternative 1, the Preferred Alternative, and ANC's objectives to increase contiguous acreage and realign the roadways to add burial capacity for our nation's heroes and their families, support cemetery operations and sustainability, and enhance family and visitor experiences. We believe that the PMF's plans for the 9/11 Pentagon Memorial Visitor Education Center (PMVEC) complement ANC's efforts to achieve these goals.*

ANC Response: ANC appreciates your comments and support of our project. In particular, we very much appreciate your cooperation and willingness to work with us in relocating the proposed location of the PMVEC to an area south of Columbia Pike.

- 2) **PMF Comment:** *Based upon the PMF's review of the Draft Environmental Assessment, we have specific comments with respect to Section 2.3.2, Land Acquisitions/Disposals, and the adjacent boxed text titled, "Pentagon Memorial Fund Visitor Education Center, both on page 2-4. As depicted in various descriptions and figures throughout the Draft Environmental Assessment, the site of the future PMVEC is within the Southern Expansion Project Boundary. As a result, it's PMF's understanding that the site of the PMVEC is part of the Proposed Action and that, as noted on page 3-71, the Proposed Action anticipates "reasonably foreseeable impacts...based on an assumed construction footprint of a [PMVEC] building and parking lot... As such, it is our further understanding that the Proposed Action takes into account the use of the land identified in Figure 2-1 as the "PMVEC Future 9/11 Pentagon Visitor Education Center" by the PMF for that very purpose and that a separate environmental assessment may not be necessary. The PMF expects that a determination with respect to the need for a separate environmental assessment will be made as the design of the PMVEC is further developed and finalized, which will be done in ongoing collaboration with ANC and the U.S. Army Corps of Engineers, Norfolk District.*

ANC Response: It is correct that the proposed PMVEC is within the Southern Expansion Project Boundary, and we concur that the PMF's plans could complement ANC's. However, the PMVEC has a separate purpose and need, and is being funded, planned, and constructed as a separate facility from the ANC Southern Expansion project. It is our understanding that the size and scope of your future facility has not been determined and is pending further market research. At the appropriate time, it would be subject to independent site plan approval and traffic impact analysis, as necessary, by regulatory authorities. Consequently, ANC has recently recommended to PMF that it presents its new site use/access concept to FHWA and VDOT as soon as possible to inform the ongoing IMR update. In the meantime, we have stated in our EA that although this parcel is within the Southern Expansion site, the PMVEC is an independent and unrelated project not included in the Proposed Action. The EA further states that the exact acreage and legal bounds of this project would be determined by survey at a future date upon achieving the necessary funding. Although this future project is listed in the EA under Section 3.18 Indirect and Cumulative Effects as a "Reasonably Foreseeable Future Actions", there is no current plan of development upon which to assess further cumulative impacts.

Additional NEPA analysis likely would be necessary for the PMVEC. However, the PMVEC NEPA document likely could be “tiered” from the ANC Southern Expansion EA, in accordance with Council of Environmental Quality (CEQ) NEPA implementing regulations, 40 CFR 1508.28. These regulations allow your project to incorporate by reference the general discussions from our EA, concentrating solely on the issues specific to your document subsequently prepared.

APPENDIX B

ROAD ALIGNMENT CRITERIA MATRIX

[This page is left intentionally blank]

High-Level Screening of Alternatives: Columbia Pike Realignment and Columbia Pike/Washington Boulevard Interchange Modification

Evaluation Criteria	Traffic Operations (A)					Geometric Considerations (B)		Land Use Impacts (C)				Transit Accommodations (D)		Multi-modal Connectivity (E)		Feasibility (F)		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Alternatives	Interchange Operations	Columbia Pike Operations	Access Management	Multimodal Safety	I-395 / Washington Blvd Mainline Ops	Potential DEs/DWs	Sight Distance	ANC Contiguous Land Expansion	Cultural/Heritage Center	9/11 Memorial Visitor's Center	Public Parking (for memorials etc.)	Transit Vehicle Turning Radius	Transit Vehicle Grade Restrictions	Along Columbia Pike	Sub-regional	Constructability	Maintainability	Delivery Schedule
Sub-Alt 4a	○	○	●	○	●	○	●	○	●	●	●	●	●	●	●	●	○	○
Sub-Alt 4b	×	○	○	●	○	×	○	○	●	●	●	●	●	○	●	●	●	●
Sub-Alt 4c	×	○	●	●	×	●	●	●	●	●	●	○	○	●	●	●	●	●
Sub-Alt 4d	○	○	○	●	●	●	●	●	●	●	●	○	○	●	●	●	●	●
Sub-Alt 4e	○	○	○	●	●	●	●	○	●	●	●	●	●	●	●	●	●	●
No Build	○	●	●	○	●	●	●	×	●	×	●	●	○	●	●	N/A	●	N/A
Preferred Alt.	●	●	●	●	●	●	●	●	N/A	●	●	●	●	●	●	●	●	●

● = CRITERIA MET, NO SIGNIFICANT ISSUES ○ = CRITERIA PARTIALLY MET, CONCERNS × = CRITERIA NOT MET, CONSTRAINTS

Notes:

A. Traffic Operations - This evaluation involves qualitative analysis, with only high-level quantitative considerations of capacity (e.g., storage lane lengths, volume/capacity estimates, etc.)

- 1 Interchange Operations: High-level analysis of weaving/merging areas, ramp radii, ramp termini, estimated future volumes over assumed capacity
- 2 Columbia Pike Operations: High-level analysis of intersection operations, estimated future volumes over assumed capacity
- 3 Access Management: High-level analysis of intersection spacing, existing and proposed driveways (including vehicle driveways for the ANC maintenance facility)
- 4 Multimodal Safety: Pedestrian, bicycle, and traffic safety
- 5 I-395 / Washington Blvd. Operations: High-level analysis of impact on mainline I-395 and Washington Blvd. traffic operations

B. Geometric Considerations - Relative comparison of designs

- 6 Potential Design Exceptions and/or Design Waivers: Likelihood of the need for VDOT approvals of non-standard designs
- 7 Sight Distance: For intersection, interchange ramps, and horizontal and vertical alignments of streets

C. Land Use - Focus on impacts of alternatives on existing and future land uses

- 8 ANC Contiguous Land Expansion: Ability of the land resulting from the realignment to be used by ANC and for that land to not be interrupted by public street
- 9 Cultural/ Heritage Center: Ability of the land resulting from the realignment to be used by Arlington County for its planned center
- 10 9/11 Memorial Visitors Center: Ability of the land resulting from the realignment to be used as a site for the visitors center, ability to safely access the center as a pedestrian or transit user
- 11 Public Parking (for memorials etc.): Ability of the land resulting from the realignment to be used for parking within a reasonable walking distance to the Air Force Memorial, Pentagon 9/11 Memorial, and other destinations in the area

D. Transit Accommodations - Operations of Transit Vehicles on Columbia Pike and S. Joyce Street

- 12 Transit Turning Radius: Ability of the concept to accommodate
- 13 Transit Grade Restrictions: Ability of the proposed street grades to accommodate

E. Multimodal Connectivity - pedestrian, bike, transit, and vehicle connectivity for Pentagon Memorial, 9/11 Visitor Education Center, and ANC group internment site

- 14 Columbia Pike: Connections along Columbia Pike corridor sidewalks, trails, street, and transit routes
- 15 Sub-regional: Connection to/from regional trails, transit routes, streets

F. Feasibility - qualitative assessment

- 16 Constructability: Qualitative comparison for improvements of sequence of construction, maintenance of traffic, temporary roadways needed
- 17 Maintainability: Life-cycle cost considerations, including long-term maintenance of the improvements
- 18 Delivery schedule: Assessment of the time frame for evaluation and approval by VDOT and stakeholders and impact on the overall schedule of the project

[This page is left intentionally blank]

APPENDIX C

AIR QUALITY

[This page is left intentionally blank]

Appendix C:

Air Quality

This Appendix documents the analysis of potential air quality impacts that would result from the construction of the Preferred Alternative. Air quality impacts during construction would be short-term and minor due to the nature of the development. To estimate the impactful emissions associated with the Southern Expansion, the maximum grading in conformance with ANC guidelines was estimated. All excavated soils were presumed to be removed from the site and all necessary embankment materials were presumed to be trucked to the site. The quantity of earthwork was combined with a conservative construction timeline of two years for the roadway improvements and two years for site grading on the Southern Expansion area. As shown in **Table 1**, the estimated maximum construction emissions are 11.2 tons per year (tpy) of NO_x and 4.4 tpy of VOC, which would be below the major source thresholds for Arlington County and therefore a general conformity determination is not required for the Preferred Alternative.

Table 1
Summary of Temporary Emissions (tons)

	Construction Equipment Emissions (tons)	EPA Threshold (tons)	Exceed Thresholds?
NO _x	11.2	100	No
HC/VOCs	4.4	100	No

Source: HNTB analysis, 2016.

The following attachments provide the analysis of construction emissions associated with development of the cemetery expansion included in the Proposed Action:

Attachment 1: Earthwork Assumptions

Attachment 2: Earthwork Calculations

Attachment 3: Construction Emissions Worksheet

[This page is left intentionally blank]

Attachment 1: Earthwork Assumptions

[This page is left intentionally blank]

Arlington National Cemetery

Earthwork Assumptions

General Assumptions:

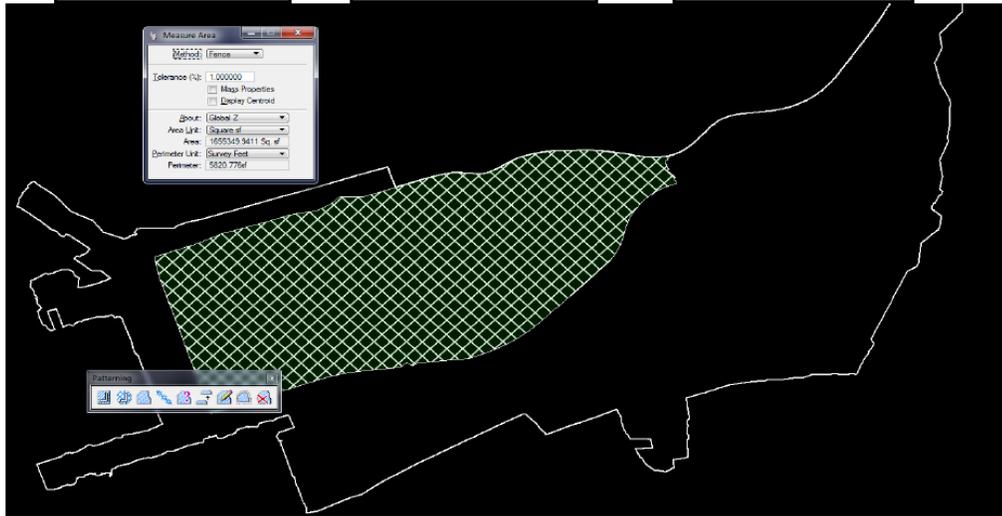
- 1) Crew loadings and durations are assuming 220 working days per year.
- 2) Hauling of material shall be at maximum 50 miles roundtrip.
 - a. For off-site stock piling of cut material
 - b. For off-site delivery of fill material (40 miles roundtrip)
 - c. (1) 20 C.Y. Dump Truck = 78 C.Y. per day
- 3) Determination of production rates derived from RS Means in consideration of the information provided below:

Surface Area: 1,655,349.94 sf
38.00 ac

Existing vs Proposed	
Original Surface:	s59776_5706
Description:	
Preference:	Default
Type:	Existing
Design Surface:	POptionC
Description:	
Preference:	Default
Type:	Existing
Cut Factor:	1
Fill Factor:	1
Cut:	7,464,933.70 cu ft
Fill:	5,586,575.30 cu ft
Cut:	276,479.00 cu yd
Fill:	206,910.20 cu yd

Existing vs (Proposed - 8')	
Original Surface:	s59776_5706
Description:	
Preference:	Default
Type:	Existing
Design Surface:	POptionCDrop8
Description:	
Preference:	Default
Type:	Existing
Cut Factor:	1
Fill Factor:	1
Cut:	17,085,690.50 cu ft
Fill:	1,964,616.60 cu ft
Cut:	632,803.40 cu yd
Fill:	72,763.60 cu yd

Existing vs (Proposed + 2')	
Original Surface:	s59776_5706
Description:	
Preference:	Default
Type:	Existing
Design Surface:	POptionCUp2
Description:	
Preference:	Default
Type:	Existing
Cut Factor:	1
Fill Factor:	1
Fill:	7,238,393.50 cu ft
Fill:	268,088.60 cu yd



Existing vs Roadway	
Original Surface:	s59776_5706
Description:	
Preference:	Default
Type:	Existing
Design Surface:	Roadway
Description:	
Preference:	Default
Type:	Existing
Cut Factor:	1
Fill Factor:	1
Cut:	644,246.60 cu ft
Fill:	1,511,095.80 cu ft
Cut:	23,861.00 cu yd
Fill:	55,966.50 cu yd

Existing vs Proposed – Total Max Duration = 440 days

Cut: 276,479.00 CY

Fill: 206,910.20 CY

Net: 69,569.00 CY of excess cut material

Excavation Crew (B-12D) – 220 days in operation

- 1 Equipment Operator
 - 1 Hydraulic Excavator w/ 3.5 C.Y. Bucket
- Production Rate = 160 C.Y per Hour / 1,280 C.Y. per Day

Fill Crew (B-10M & B-10Y) – 220 days in operation

- 3 Equipment Operators
 - 2 Dozers (300 H.P.)
 - 1 Vibratory Drum Roller
- Production Rate = 3,500 C.Y. per day (Roller) / 1200 C.Y. per day (Dozer)

Assuming all material is cut and removed from the site hauling is as follows:

Cut = 16 trucks per day; removing 1,257 C.Y. of material per day.

Fill = 12 trucks per day; placing 941 C.Y. of material per day

The above assumes each operation is restricted to 220 working days per calendar year.

Worst case scenario the Cut and fill operations are performed sequentially, resulting in a 2-year operation (440 days).

Existing vs (Proposed – 8') – Total Max Duration = 294 days

Cut: 632,803.40 C.Y.

Fill: 72,763.60 C.Y.

Net: 560,039.80 C.Y. of excess cut material

Excavation Crew (B-12D) – 220 days in operation

- 1 Equipment Operator
 - 1 Hydraulic Excavator w/ 3.5 C.Y. Bucket
- Production Rate = 160 C.Y per Hour / 1,280 C.Y. per Day

Fill Crew & Compaction Crew (B-10M & B-10Y) – 74 days in operation

- 3 Equipment Operators
 - 2 Dozers (300 H.P.)
 - 1 Vibratory Drum Roller
- Production Rate = 3,500 C.Y. per day (Roller) / 1200 C.Y. per day (Dozer)

Assuming all material is cut and removed from the site hauling is as follows:

Cut = 37 trucks per day; removing 2877 C.Y. of material per day.

Fill = 12 trucks per day; placing 941 C.Y. of material per day

The above assumes each operation is restricted to 220 working days per calendar year.

Worst case scenario the Cut and Fill operation is performed sequentially. Maintaining the 220-day restriction; the cut operation will result in the full 220 days. Utilizing a full 12 truck fill crew, this operation will be completed in 74 days. Total duration of cut and fill = 294 days.

Existing vs (Proposed + 2') – Total Max Duration = 146 days.

Fill: 268,088.60 C.Y.

Fill & Compaction Crew (B-10M & B-10Y) – 146 days in operation.

- 5 Equipment Operators
- 4 Dozers (300 H.P.)
- 1 Vibratory Drum Roller

Production Rate = 3,500 C.Y. per day (Roller) / 2400 C.Y. per day (Dozer)

Worst case scenario is that all fill material is trucked in from offsite. After completing the 294-day previous operation; to complete the total fill within 2 years, for the purposes of this exercise, it shall be assumed that the 2' of fill will be completed within 146 days.

Fill = 24 trucks per day; placing 1837 C.Y. of material per day.

Existing vs Roadway – Total Max Duration = 171 days.

Cut: 23,861.00 C.Y.

Fill: 55,966.00 C.Y.

Net: 32,105.50 C.Y. of fill needed.

Excavation Crew (B-12D) – 51 days in operation

- 1 Equipment Operator
- 1 Hydraulic Excavator w/ 3.5 C.Y. Bucket

Output = 160 C.Y per Hour / 1,280 C.Y. per Day

Fill Crew & Compaction Crew (B-10M & B-10Y) – 120 days in operation

- 2 Equipment Operators
- 1 Dozers (300 H.P.)
- 1 Vibratory Drum Roller

Production Rate = 3,500 C.Y. per day (Roller) / 600 C.Y. per day (Dozer)

At 6 trucks per day the Cut operation can be completed within 51 days (468 C.Y. per day). Utilizing those same 6 trucks the Fill and Compaction (Fill) operation can be completed within 120 days.

[This page is left intentionally blank]

Attachment 2: Earthwork Calculations

[This page is left intentionally blank]

Existing vs (Proposed - 8')

Cut		Cut and Fill Totals (CY)	
		Cut	Fill
<i>Assume 20 CY trucks with 50 mile roundtrip haul</i>			
<i>37 trucks per day</i>			
# trips	31640.17	632803.4	72763.6
total miles (x 50)	1582008.5	632803.4	72763.6
CY per day	2877		
CY per week	14385		
Total weeks	43.990504	44 weeks	220 days
<i>Assume hauling in one year</i>			220 days
<i>37 drivers (+1 equipment operator) round trip 100 mile commute at 2 per car</i>			
each year truck haul miles	1582008.5	heavy duty dump truck	
each year worker commute miles	418000	light duty pick up	
1 hydraulic excavator	220 days, 8 hrs/day	1760 hours	

Fill			
<i>Assume 20 CY trucks with 40 mile roundtrip</i>			
<i>12 trucks per day</i>			
# trips	3638.18		
total miles (x 40)	145527.2		
CY per day	941		
CY per week	4705		
Total weeks	15.4651647	16 weeks	80 days
<i>Assume hauling is performed sequentially with cut</i>			80 days per year
<i>12 drivers (+3 equipment operators) round trip 100 mile commute at 2 per car</i>			
each year truck haul miles	145527.2	heavy duty dump truck	
each year worker commute miles	60000	light duty pick up	
2 dozers	80 days, 8 hrs/day	1280 hrs	
1 vibratory drum roller	80 days, 8 hrs/day	640 hrs	

Existing vs (Proposed +2')

Fill

Assume 20 CY trucks with 40 mile roundtrip
24 trucks per day

trips 13404.43
total miles (x 40) 536177.2

Cut and Fill Totals (CY)

Cut	Fill
	268088.6
0	268088.6

CY per day 1837
CY per week 9185
Total weeks 29.1876538

146 days

Assume hauling is performed sequentially with previous cut/fill 146 days per year
24 drivers (+5 equipment operators) round trip 100 mile commute at 2 per car

each year truck haul miles 536177.2 heavy duty dump truck
each year worker commute miles 211700 light duty pick up

4 dozers 146 days, 8 hrs/day 4672 hrs
1 vibratory drum roller 146 days, 8 hrs/day 1168 hrs

*Assume entire operation completed in 220 days + 80 days + 146 days = 446 days (2 years)

TOTALS (both years combined)

Heavy Truck 2263712.9 miles
Light Truck 689700 miles
Hydraulic Excavator 1760 hours
Dozer 5952 hours
Vibratory Drum Roller 1808 hours

Total Emissions in 2 years (see worksheet)

NOx 22.3785 tons 11.18925 tons/year
VOC 8.7901 tons 4.39505 tons/year

Attachment 3: Construction Emissions Worksheet

[This page is left intentionally blank]

		ANC Southern Expansion				Date:	11/13/2016							
Project Name:		ANC Southern Expansion												
NON-ROAD EQUIPMENT				PROJECT DATA			NOx Unit Rates		Total NOx Emissions		HC Unit Rates		Total HC Emissions	
HP Range	Model Year	Typical Fuel and Engine	Equipment	HP	Load Factor ^a	Hours	g/hp-hr	lbs/hr ^b	lbs	Tons	g/hp-hr	lbs/hr	lbs	Tons
>0 to 11		2-Stroke Gas	Tampers/Rammers											
	1900			4	0.55		0.969	0.00	0	0	159.58	0.774	0	0
	1996			4	0.55		1.39	0.01	0	0	139.82	0.678	0	0
	2002			4	0.55		1.82	0.01	0	0	120.06	0.582	0	0
	2006			4	0.55		1.14	0.01	0	0	66	0.320	0	0
	2008			4	0.55		0.91	0.00	0	0	47.98	0.233	0	0
		4-Stroke Gas	Plate Compactors											
	1900			5	0.55		1.68	0.01	0	0	67.63	0.410	0	0
	1997			5	0.55		3.54	0.02	0	0	8.4	0.051	0	0
	2007			5	0.55		3.28	0.02	0	0	7.93	0.048	0	0
	2008			5	0.55		2.91	0.02	0	0	7.27	0.044	0	0
	2012			5	0.55		1.08	0.01	0	0	4.19	0.025	0	0
		4-Stroke Gas	Air Compressors											
	1900			9	0.56		2.07	0.02	0	0	10.57	0.117	0	0
	1997			9	0.56		4.48	0.05	0	0	5.49	0.061	0	0
	2003			9	0.56		3.20	0.04	0	0	4.50	0.050	0	0
	2005			9	0.56		2.77	0.03	0	0	4.16	0.046	0	0
	2011			9	0.56		1.31	0.01	0	0	3.34	0.037	0	0
		4-Stroke Gas	Welders											
	1900			19	0.68		2.07	0.06	0	0	10.57	0.301	0	0
	1997			19	0.68		4.48	0.13	0	0	5.49	0.156	0	0
	2003			19	0.68		3.20	0.09	0	0	4.50	0.128	0	0
	2005			19	0.68		2.77	0.08	0	0	4.16	0.118	0	0
	2011			19	0.68		1.31	0.04	0	0	3.34	0.095	0	0
>50 to 100		Diesel	Aerial Lifts ⁴											
	pre-88 ¹			56	0.21		7.58	0.20	0	0	1.25	0.032	0	0
	1988			56	0.21		6.54	0.17	0	0	1.03	0.027	0	0
	1998			56	0.21		5.30	0.14	0	0	0.54	0.014	0	0
	2004			56	0.21		4.62	0.12	0	0	0.41	0.011	0	0
	2006			56	0.21		4.54	0.12	0	0	0.40	0.010	0	0
	2008			56	0.21		3.23	0.08	0	0	0.22	0.006	0	0
	2010			56	0.21		3.00	0.08	0	0	0.18	0.005	0	0
	2013			56	0.21		3.00	0.08	0	0	0.13	0.003	0	0
		Diesel	Concrete Saw											
	pre-88 ²			56	0.59		10.43	0.76	0	0	1.05	0.076	0	0
	1988			56	0.59		6.54	0.48	0	0	1.03	0.075	0	0
	1998			56	0.59		5.30	0.39	0	0	0.54	0.039	0	0
	2004			56	0.59		4.62	0.34	0	0	0.41	0.030	0	0
	2006			56	0.59		4.54	0.33	0	0	0.40	0.029	0	0
	2008			56	0.59		3.23	0.24	0	0	0.22	0.016	0	0
	2010			56	0.59		3.00	0.22	0	0	0.18	0.013	0	0
	2013			56	0.59		3.00	0.22	3	0	0.13	0.009	0	0
		Diesel	Tractor/Loader (Backhoe)											
	pre-88 ²			77	0.21		11.14	0.40	0	0	2.29	0.082	0	0
	1988			77	0.21		7.61	0.27	0	0	2.27	0.081	0	0
	1998			77	0.21		6.18	0.22	0	0	1.20	0.043	0	0
	2004			77	0.21		5.39	0.19	0	0	0.91	0.033	0	0
	2006			77	0.21		5.29	0.19	0	0	0.88	0.031	0	0
	2008			77	0.21		3.89	0.14	0	0	0.50	0.018	0	0
	2010			77	0.21		3.64	0.13	0	0	0.42	0.015	0	0
	2012			77	0.21		1.64	0.06	0	0	0.13	0.005	0	0
	2014			77	0.21		0.28	0.01	0	0	0.13	0.005	0	0
		Diesel	Asphalt Paver											
	pre-88 ²			91	0.59		9.63	1.14	0	0	0.99	0.117	0	0
	1988			91	0.59		6.54	0.77	0	0	1.03	0.122	0	0
	1998			91	0.59		5.30	0.63	0	0	0.54	0.064	0	0
	2004			91	0.59		4.62	0.55	0	0	0.41	0.049	0	0
	2006			91	0.59		4.54	0.54	0	0	0.40	0.047	0	0
	2008			91	0.59		3.35	0.40	0	0	0.23	0.027	0	0
	2010			91	0.59		3.13	0.37	0	0	0.19	0.022	0	0
	2012			91	0.59		1.64	0.19	0	0	0.13	0.015	0	0
	2014			91	0.59		0.28	0.03	0	0	0.13	0.015	0	0
		Diesel	Paint Sprayers ⁵											
	pre-88 ³			92	0.58		10.43	1.23	0	0	1.05	0.124	0	0
	1988			92	0.58		6.54	0.77	0	0	1.03	0.121	0	0
	1998			92	0.58		5.30	0.62	0	0	0.54	0.064	0	0
	2004			92	0.58		4.62	0.54	0	0	0.41	0.048	0	0
	2006			92	0.58		4.54	0.53	0	0	0.40	0.047	0	0
	2008			92	0.58		3.35	0.39	0	0	0.23	0.026	0	0
	2010			92	0.58		3.13	0.37	0	0	0.19	0.022	0	0
	2012			92	0.58		1.64	0.19	0	0	0.13	0.015	0	0
	2014			92	0.58		0.28	0.03	0	0	0.13	0.015	0	0
		Diesel	Paving Equipment											
	pre-88 ²			99	0.59		10.43	1.34	0	0	1.06	0.136	0	0
	88-97			99	0.59		8.30	1.07	0	0	0.99	0.127	0	0
	98-03			99	0.59		6.90	0.89	0	0	0.70	0.090	0	0
	04-07			99	0.59		5.32	0.69	0	0	0.40	0.052	0	0
	08-			99	0.59		3.33	0.43	0	0	0.20	0.026	0	0
		Diesel	Rollers (Compactor Roller incl.)											
	pre-88 ²			99	0.59		8.81	1.13	0	0	0.84	0.108	0	0
	1988			99	0.59		6.54	0.84	0	0	1.03	0.133	0	0
	1998			99	0.59		5.30	0.68	0	0	0.54	0.070	0	0
	2004			99	0.59	1808	4.62	0.59	1075.63305	0.537816523	0.41	0.053	95.9222544	0.047961127
	2006			99	0.59		4.54	0.58	0	0	0.40	0.051	0	0
	2008			99	0.59		3.35	0.43	0	0	0.23	0.029	0	0
	2010			99	0.59		3.13	0.40	0	0	0.19	0.024	0	0
	2012			99	0.59		1.64	0.21	0	0	0.13	0.017	0	0
	2014			99	0.59		0.28	0.04	0	0	0.13	0.017	0	0
		Diesel	Concrete Pavers											
	pre-88 ²			130	0.59		9.63	1.63	0	0	0.99	0.167	0	0
	1988			130	0.59		7.94	1.34	0	0	0.71	0.120	0	0
	1997			130	0.59		5.36	0.91	0	0	0.35	0.059	0	0
	2003			130	0.59		4.18	0.71	0	0	0.35	0.059	0	0
	2005			130	0.59		4.03	0.68	0	0	0.35	0.059	0	0

2007			130	0.59		2.89	0.49	0	0	0.21	0.035	0	0
2009			130	0.59		2.61	0.44	0	0	0.19	0.032	0	0
2012			130	0.59		1.39	0.24	0	0	0.13	0.022	0	0
2014			130	0.59		0.28	0.05	0	0	0.13	0.022	0	0
	Diesel	Crawler Loader/Dozer ⁵											
pre-88 ²			134	0.64		9.76	1.85	0	0	0.94	0.178	0	0
1988			134	0.64		7.94	1.50	0	0	0.71	0.134	0	0
1997			134	0.64		5.36	1.01	0	0	0.35	0.066	0	0
2003			134	0.64	5952	4.18	0.79	4703.92626	2.351963131	0.35	0.066	393.869424	0.196934712
2005			134	0.64		4.03	0.76	0	0	0.35	0.066	0	0
2007			134	0.64		2.89	0.55	0	0	0.21	0.039	0	0
2009			134	0.64		2.61	0.49	0	0	0.19	0.036	0	0
2012			134	0.64		1.39	0.26	0	0	0.13	0.025	0	0
2014			134	0.64		0.28	0.05	0	0	0.13	0.025	0	0
	Diesel	Excavators											
pre-88 ²			143	0.59		10.19	1.90	0	0	0.52	0.097	0	0
1988			143	0.59		7.94	1.48	0	0	0.71	0.132	0	0
1997			143	0.59		5.36	1.00	0	0	0.35	0.065	0	0
2003			143	0.59	1760	4.18	0.78	1368.40146	0.684200728	0.35	0.065	114.579069	0.057289535
2005			143	0.59		4.03	0.75	0	0	0.35	0.065	0	0
2007			143	0.59		2.89	0.54	0	0	0.21	0.038	0	0
2009			143	0.59		2.61	0.49	0	0	0.19	0.035	0	0
2012			143	0.59		1.39	0.26	0	0	0.13	0.024	0	0
2014			143	0.59		0.28	0.05	0	0	0.13	0.024	0	0
	Diesel	Other Construction Equipment											
pre-88 ²			161	0.59		10.43	2.18	0	0	1.05	0.220	0	0
1988			161	0.59		7.94	1.66	0	0	0.71	0.149	0	0
1997			161	0.59		5.36	1.12	0	0	0.35	0.073	0	0
2003			161	0.59		4.18	0.88	0	0	0.35	0.073	0	0
2005			161	0.59		4.03	0.84	0	0	0.35	0.073	0	0
2007			161	0.59		2.89	0.61	0	0	0.21	0.043	0	0
2009			161	0.59		2.61	0.55	0	0	0.19	0.040	0	0
2012			161	0.59		1.39	0.29	0	0	0.13	0.027	0	0
2014			161	0.59		0.28	0.06	0	0	0.13	0.027	0	0
	Diesel	Graders											
pre-88 ²			172	0.59		9.10	2.04	0	0	1.15	0.257	0	0
1988			172	0.59		7.94	1.78	0	0	0.71	0.159	0	0
1997			172	0.59		5.36	1.20	0	0	0.35	0.078	0	0
2003			172	0.59		4.18	0.94	0	0	0.35	0.078	0	0
2005			172	0.59		4.03	0.90	0	0	0.35	0.078	0	0
2007			172	0.59		2.89	0.65	0	0	0.21	0.046	0	0
2009			172	0.59		2.61	0.58	0	0	0.19	0.043	0	0
2012			172	0.59		1.39	0.31	0	0	0.13	0.029	0	0
2014			172	0.59		0.28	0.06	0	0	0.13	0.029	0	0
	Diesel	Drill Rigs ⁴											
pre-88 ²			177	0.43		11.01	1.85	0	0	1.01	0.169	0	0
88-95			177	0.43		8.38	1.41	0	0	0.68	0.114	0	0
96-02			177	0.43		6.90	1.16	0	0	0.40	0.067	0	0
03-05			177	0.43		4.66	0.78	0	0	0.40	0.067	0	0
06-			177	0.43		2.85	0.48	0	0	0.20	0.034	0	0
	Diesel	Cranes											
pre-88 ²			194	0.43		10.30	1.89	0	0	0.90	0.166	0	0
1988			194	0.43		8.38	1.54	0	0	0.68	0.125	0	0
1996			194	0.43		5.58	1.03	0	0	0.31	0.057	0	0
2003			194	0.43		4.32	0.79	0	0	0.31	0.057	0	0
2005			194	0.43		4.16	0.77	0	0	0.31	0.057	0	0
2006			194	0.43		2.81	0.52	0	0	0.19	0.035	0	0
2009			194	0.43		2.50	0.46	0	0	0.18	0.033	0	0
2011			194	0.43		1.39	0.26	0	0	0.13	0.024	0	0
2014			194	0.43		0.28	0.05	0	0	0.13	0.024	0	0
	Diesel	Concrete Pump ⁴											
pre-88 ³			200	0.74		10.43	3.40	0	0	1.05	0.343	0	0
1988			200	0.74		7.94	2.59	0	0	0.71	0.232	0	0
1996			200	0.74		5.28	1.72	0	0	0.32	0.104	0	0
2003			200	0.74		4.09	1.33	0	0	0.32	0.104	0	0
2005			200	0.74		3.94	1.29	0	0	0.32	0.104	0	0
2006			200	0.74		2.88	0.94	0	0	0.20	0.066	0	0
2009			200	0.74		2.61	0.85	0	0	0.19	0.062	0	0
2011			200	0.74		1.39	0.45	0	0	0.13	0.042	0	0
2014			200	0.74		0.28	0.09	0	0	0.13	0.042	0	0
>300 to 600	Diesel	Off Highway Trucks											
pre-88 ²			300	0.59		9.10	3.55	0	0	0.63	0.246	0	0
1988			300	0.59		7.94	3.10	0	0	0.71	0.277	0	0
1996			300	0.59		5.70	2.22	0	0	0.21	0.082	0	0
2001			300	0.59		4.43	1.73	0	0	0.18	0.069	0	0
2003			300	0.59		4.27	1.67	0	0	0.17	0.068	0	0
2006			300	0.59		2.92	1.14	0	0	0.17	0.068	0	0
2007			300	0.59		2.61	1.02	0	0	0.17	0.066	0	0
2011			300	0.59		1.39	0.54	0	0	0.13	0.051	0	0
2014			300	0.59		0.28	0.11	0	0	0.13	0.051	0	0
	Diesel	Stabilizer											
pre-88 ³			310	1.00		11.30	7.72	0	0	3.44	2.351	0	0
88-95			310	1.00		8.38	5.73	0	0	0.68	0.465	0	0
96-00			310	1.00		6.90	4.72	0	0	0.30	0.205	0	0
01-05			310	1.00		4.56	3.12	0	0	0.30	0.205	0	0
06-			310	1.00		2.85	1.95	0	0	0.20	0.137	0	0
EPA Model 5 and 6 Onroad Model													
					Miles	g/mile ⁷	lbs/mile	Total lbs	Total Tons	g/mile ⁷	lbs/mile	Total lbs	Total Tons
1995		Pickups (Light duty trucks)				3.3	0.007275	0.00	0.00000	5.7	0.012566	0.00	0.00000
1997						3	0.006614	0.00	0.00000	5.0	0.011023	0.00	0.00000
2001						2.4	0.005291	0.00	0.00000	3.6	0.007937	0.00	0.00000
2003					689,700	3.4	0.007496	5169.82	2.58491	4.6	0.010141	6994.47	3.49723
2005						1.6	0.003527	0.00	0.00000	2.2	0.004850	0.00	0.00000
91-97		Highway Trucks (Heavy duty trucks)				8.2	0.018078	32439.28	0.00000	2.0	0.004409	9981.32	4.99066
1998-2012					2,263,713	6.5	0.014330		16.21964	2.0	0.004409		
									TOTAL NOX	22.3785			
												TOTAL HC	8.7901
												TOTAL VOC	8.7901

Note 1: The estimated emission factors for Pre-88 equipment were lower than the Tier 1 values, therefore, the Tier 1 values were assumed to be conservative.

Note 2: Pre-88 emission factor estimates were taken from US EPA Draft NONROAD model which is based on NEVES.

Note 3: Pre-88 emission factor estimates were not provided in the US EPA Draft NONROAD model so the maximum values are assumed to be conservative.

Note 4: Average Horsepower is calculated from the *Rental Rate Blue Book for Construction Volume 1 copyright 2000*.

Note 5: Load Factors taken from "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling," Report No. NR-005A, US EPA, 12/9/97, revised 6/16/98.

Note 6: One pound=453.59 grams

Note 7: The emission factors for Highway Trucks and Pickups are taken from EPA Model 5 and 6.

Note 8: All load factors for the "other equipment" category are assumed to be 1.00 unless information is available to support a lower factor.

Note 9: Load Factors taken from the "Nonroad Engine and Vehicle Emission Study Report, November 1991" (NEVES), table 2-05 and "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", Report NR-005c, EPA420-P-04-005, revised April 2004; <http://www.epa.gov/oms/models/nonrdmdl/nonrdmdl2004/420p04005.pdf>

Note 10: Average Horsepower taken from the "Nonroad Engine and Vehicle Emission Study Report, November 1991" (NEVES), table 2-04.

Note 11: All emission factors for "other gas equipment" category are assigned maximum values to be conservative, maximum factors taken from the, "Nonroad Engine and Vehicle Emission Study Report, November 1991" (NEVES), or based on EPA nonroad exhaust emission standards for Compression-Ignition engines. Federal Register notice for Tier 2-3 rule: <http://www.epa.gov/nonroad-diesel/frm1998/nr-fr.pdf>.

Note 12: Most HCs are presumed to be VOCs in the regulatory context, unless otherwise specified by the EPA. Conversion Factors for Common Measures of Organic Air Pollutants

[This page is left intentionally blank]

APPENDIX D

FEDERAL CONSISTENCY DETERMINATION

COASTAL ZONE MANAGEMENT ACT

[This page is left intentionally blank]

**COASTAL ZONE MANAGEMENT ACT (CZMA)
FEDERAL CONSISTENCY DETERMINATION FOR THE
PROPOSED SOUTHERN EXPANSION PROJECT AT
ARLINGTON NATIONAL CEMETERY,
ARLINGTON, VIRGINIA**

CONSISTENCY REVIEW: This document provides the Commonwealth of Virginia with the Arlington National Cemetery's (ANC) Consistency Determination under CZMA section 307(c)(1) [or (2)] and 15 CFR Part 930, subpart C, for the proposed Southern Expansion site and associated roadway project. The information in this Consistency Determination is provided pursuant to 15 CFR §930.39. Information to support this Federal consistency determination (including maps and additional supporting information) can be found in the accompanying Draft Environmental Assessment (DEA), dated June 2018.

PROJECT DESCRIPTION: ANC, a Direct Reporting Unit of the Headquarters, Department of the Army (HQDA), proposes to establish a single contiguous parcel of land south of the cemetery by closing and relocating local roadways and developing the parcel to increase interment capacity and increase multimodal transportation capacity on Columbia Pike. The Proposed Action requires land acquisitions and jurisdictional transfers, roadway realignments, and interchange reconfigurations, in the area known as the Southern Expansion site, located west of Washington, D.C., in Arlington, Virginia. The Southern Expansion site is bounded on the south by Interstate 395 (I-395), on the north by ANC, on the west by the Foxcroft Heights residential neighborhood and a Virginia Department of Transportation (VDOT) maintenance facility, and on the east by the ramps connecting Columbia Pike to Route 27.

The site includes approximately 70 acres among three landowners: ANC, Arlington County, and VDOT. The Air Force Memorial (AFM) sits within the site and will be incorporated into the design. The key element for creating a contiguous parcel is closure of Southgate Road and constructing a new connector road – Southgate Road connector – to allow access to Joint Base Myer-Henderson Hall (JBMHH). Other changes to the roadways are realigning Columbia Pike; modifying the Route 27/Columbia Pike interchange; and maintaining or improving the roadway level of service for vehicular, pedestrian, and bicycle traffic.

ANC prepared an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) which covers both related federal actions – roadways and cemetery development. The 2013 ANC Real Property Master Plan identified the Southern Expansion site as the best option for increasing burial capacity in an area with many physical constraints. Only one site is possible for the expansion and only one Columbia Pike alignment is agreeable to the involved parties – Arlington County, VDOT, FHWA, and ANC. The roadway alignments are needed to meet highway geometry to increase multimodal transportation opportunities and level of service requirements, and maximize burial space. The resulting contiguous expansion project allows for convenient and safe cemetery operations and perimeter security.

IMPACTS TO RESOURCES/USES OF THE COASTAL ZONE: ANC has determined the proposed Southern Expansion project affects the land or water uses or natural resources of Virginia in the following manner:

- A. Land Use and Sustainability: The Proposed Action would reduce impervious surface area from the previous use as the Navy Annex facility and reduce the volume of stormwater runoff. The comprehensive development of the Southern Expansion site under the Preferred Alternative would be compatible with the surrounding land uses. A new Operations Complex facility would be designed and constructed in accordance with the Army's Sustainable Design and Development guidelines and government policy. It would provide long-term budget saving measures such as reducing water and electricity usage and update the obsolete, 40-year-old service bays at the current facility. (Section 3.1 DEA).
- B. Air Quality: The short-term impact includes increased vehicle air emissions and fugitive dust from construction activities, but the impact does not have local or regional significance. Steps would be taken during construction to minimize or mitigate air emissions and fugitive dust, e.g. reduce engine idling and spraying water on disturbed areas and high traffic areas. Long-term impact resulting from roadway improvements includes reduction of vehicular traffic, thus reducing air emissions and congestion on Columbia Pike. Emissions associated with these impacts do not exceed the National Ambient Air Quality Standards. (Section 3.2 DEA)
- C. Noise: There would be short-term impacts from construction noise occurring primarily from heavy equipment. Long-term impacts consist of noise from rifle or cannon salutes during interment ceremonies and vehicular traffic from realigned Columbia Pike and Southgate Road connector. The audible impact from vehicular traffic does not exceed VDOT's noise abatement criteria or its substantial noise increase criteria. The small-arms salutes are not a chronic noise source, are infrequent and non-repetitive, and would occur only on weekdays between 9 AM and 4 PM. The cannon salutes are very infrequent – average of two per month – and presently occur at only three designated locations. Future interment ceremonies on the Southern Expansion may include battery cannon salutes, but would be limited to the area east of the AFM. The battery cannon noise is a recognizable component of the affected environment; the Presidential Salute Battery of the U.S. 3rd Infantry Regiment at JBMHH conducts training exercises monthly. (Section 3.3 DEA)
- D. Topography, Soil, & Geography: The final design would shape the area to match the traditional characteristics of ANC and create a new roadbed for the realigned Columbia Pike involving removal of large quantities of soil. Adherence to VA Stormwater Management Regulation and VA Erosion and Sediment Control Regulations would minimize impacts to storm drains, surface water, and groundwater from soil erosion and sedimentation. (Section 3.4 DEA)
- E. Water Resources: The final design would avoid sensitive areas, consistent with the Coastal Zone Management Program (CZMP), to the maximum extent practicable. Adherence to VA Stormwater Management Regulation and VA Erosion and Sediment Control Regulations would minimize impacts (pollutant loading) to storm drains, surface water, and groundwater. Reduction of impervious surface area from the previous use as the Navy Annex facility (in 2006), would reduce the volume of stormwater runoff to storm drains, surface water, and groundwater. There are no wetlands or floodplains on or near the site. (Section 3.5 DEA)

- F. Biological Resources: The site contains low quality habitat for wildlife species as a result of previous site disturbance and land use as the Navy Annex facility. No threatened or endangered species will be impacted by this project. Any wildlife species would move to adjacent areas that provide equivalent habitat during construction. Post-construction landscaping will include more trees and other vegetation, and would benefit wildlife species in the area. (Section 3.6 DEA)
- G. Cultural Resources: The proposed action would have an adverse effect on elements of the ANC historic district – deconstructing the southern boundary wall and relocating the Operations Complex. The existing AFM will be incorporated into the design. The eligibility of the AFM to be listed in the National Register of Historic Places is currently being investigated. Any impacts would be mitigated through the National Historic Preservation Act Section 106 process, which includes coordination with the Advisory Council on Historic Preservation (ACHP), the Virginia Department of Historic Resources (VDHR), and consulting parties, and the development of a Memorandum of Agreement (MOA). The preliminary design includes reusing the boundary wall stone in the construction of a new boundary wall on the perimeter of the Southern Expansion site. (Section 3.7 DEA)
- H. Visitor Use and Experience: There would be beneficial impacts provided based on preliminary design, due to proposed new and additional amenities including pedestrian gate(s) along the new boundary wall, a visitor parking area south of Columbia Pike opposite the AFM, and incorporating the AFM into the cemetery design. The overall design would be a seamless extension of the current cemetery and provide the same iconic image captured by the ordered grid of headstones and landscaping that creates the sense of peace and beauty. Furthermore, positive impacts would include extending the longevity of the cemetery by adding additional burial space, and expanding the footprint to allow additional area for visitors to experience the history, heritage, honor, and sacrifice of our military service members. (Section 3.8 DEA)
- I. Socioeconomics and Environmental Justice: There would be no disproportionately high or adverse impacts to minority or low-income populations or children resulting from the Preferred Alternative. The minority population evaluated in the two census tracts was below the 50% threshold in accordance with EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations – and the median household income was greater than the 2010 poverty threshold of \$22,113 for a family of four. The Preferred Alternative would not: destroy aesthetic values; disrupt community cohesion or a community’s economic vitality; produce adverse employment effects; displace persons or businesses; affect local land use; add to or generate new hazardous materials or waste; affect water quality or other natural resources; or reduce the level of service on the realigned roadways. (Section 3.9 DEA)
- J. Transportation and Traffic: The Preferred Alternative would include the closure of Southgate Road and construction of a new access road (“Southgate Road connector”) for JBMHH traffic; the realignment of Columbia Pike; and, reconfiguring the Route 27 ramps at the Columbia Pike interchange from a cloverleaf interchange to a tight-diamond. The proposed changes in roadways provides the necessary geometry for a high capacity

regional multimodal transportation corridor on Columbia Pike and provides a contiguous parcel of land for increasing burial capacity. (Section 3.10 DEA)

- K. Utilities: The potential impact of the Preferred Alternative on utility services would be positive in the long term. All utilities would be updated and installed underground, providing dependable service into the future for AFM, Foxcroft Heights, and ANC. (Section 3.11 DEA)
- L. Solid and Hazardous Waste: ANC operations and maintenance in this area would not increase the generation of solid waste or hazardous waste. The construction contractor would manage solid waste (i.e., construction demolition debris, land clearing debris, and trash) generated during construction in accordance with the VA Solid Waste Management Regulations. The Proposed Action would not require ANC to change its status as a conditionally-exempt small-quantity generator to a small-quantity or large-quantity generator. Earth disturbance during construction may create a risk of exposure to Asbestos Containing Materials (ACM), residue from the FOB2 demolition and clean-up. Documentation of a recent investigation would follow the Defense Environmental Restoration program (DERP) requirements for achieving "No Further Action status with VDEQ and USEPA. (Sections 3.12 and 3.13 DEA)
- M. Visual and Aesthetic Resources: Maintaining the aesthetic and historical integrity of ANC is a key goal of the site design. Crafting the sightlines into and from ANC requires careful consideration. Another key consideration is the integration of the AFM into the cemetery design. The proposed connection would allow pedestrian access to the AFM from the cemetery and Columbia Pike. The entire site was assessed for "rescue and reuse" of trees that otherwise would be cleared during the land clearing operation. Select trees were located, studied, tagged, and mapped. Some trees will be candidates for reuse/transplanting during final planning and design; some would remain in place and protected during construction. There would be a permanent change in the viewsheds along the hillsides south of Southgate Road, and along the southeastern roadsides of Columbia Pike due to the necessary loss of trees and the changes in grading. Although the clearing would be temporary, a planting plan including a great number of trees, shrubs, and herbaceous vegetation, to include manicured lawns, would be established that balances the historical and aesthetic character of ANC with burial yields. The cemetery expansion would include some combination of the following: columbaria and/or niche walls, in-ground pre-placed crypts, committal service shelters, service buildings, restrooms, sidewalks, stormwater treatment facilities, and other attendant features. (Section 3.14 DEA)
- N. Section 4(f) Resources: Although Section 4(f) properties – Foxcroft Heights Park and the AFM – are in close proximity to the Southern Expansion site, the proposed action avoids the use of these Section 4(f) properties. The temporary construction impacts would not have a substantial effect on activities, features, or visual attributes of the Foxcroft Heights Park or the AFM. The post-construction road noise from the Southgate Road connector would be similar to the current traffic on Southgate Road and would not approach or exceed FHWA's noise abatement criteria of 67dBA. (Section 3.15 DEA)

Background

The CZMA, codified in 16 U.S. Code section 1451 *et seq.*, and administered by the Secretary of Commerce through the Office of Coastal Resources Management of the National Oceanic and Atmospheric Administration, established a comprehensive regulatory scheme for effective management, beneficial use, protection, and development of the coastal zone and its natural resources. CZMA encourages coastal states to develop and implement a broad-based coastal management program (CMP) and also provides a mechanism for them to obtain federal approval. The Commonwealth of Virginia has developed the CZMP to protect its coastal resources.

Federal approval of a state CMP triggers for federal executive agencies an obligation, under CZMA Section 307, to make coastal consistency determinations for their activities. Section 307 applies to federal agency activities in a state's coastal zone and also to federal agency activities outside the coastal zone, if the activity affects a land or water use in or natural resources of the coastal zone. The federal agency activity includes any activity performed by a federal agency, approved by a federal agency, or for which a federal agency provides financial assistance. Such activity, whether direct, indirect, or cumulative, must be demonstrated to be consistent with the enforceable policies of the state's CMP, that is, fully consistent with those policies, unless full consistency is otherwise prohibited by federal law. There are no categorical exemptions to or exclusions from Section 307.

The Virginia CZMP contains the following applicable enforceable policies: (1) Fisheries management; (2) Subaqueous lands management; (3) Wetlands management; (4) Dunes and beaches management; (5) Non-point source water pollution control; (6) Point source water pollution control; (7) Shoreline sanitation; (8) Point source air pollution control; and, (9) Coastal lands management.

Analysis of Applicable Enforceable Policies

A. Fisheries Management

The program stresses the conservation and enhancement of finfish and shellfish resources and the promotion of commercial and recreational fisheries to maximize food production and recreational opportunities. This program is administered by the Virginia Marine Resources Commission (VMRC) (Virginia Code §28.2-200 through §28.2-713) and the Virginia Department of Game and Inland Fisheries (VDGIF) (Virginia Code §29.1-100 through §29.1-570).

No construction activities or operations would occur within any aquatic features (i.e., streams, rivers, or wetlands); therefore, Fisheries Management will not be impacted by this project.

B. Subaqueous Lands Management

The management program for subaqueous lands establishes conditions for granting or denying permits to use state-owned bottomlands based on considerations of potential effects

to marine and fisheries resources, wetlands, adjacent or nearby properties, anticipated public and private benefits, and water quality standards established by the Virginia Department of Environmental Quality (VDEQ) Water Quality Division. The program is administered by the VMRC (Virginia Code §28.2-1200 through §28.2-1213).

There are no subaqueous lands located within the project area.

C. Wetlands Management

The purpose of the wetlands management program is to preserve tidal wetlands, prevent their despoliation, and accommodate economic development in a manner consistent with wetlands preservation. The tidal wetlands program is administered by the VMRC (Virginia Code §28.2-1301 through §28.2-1320).

The Virginia Water Protection Permit program administered by the DEQ includes protection of wetlands -- both tidal and non-tidal. This program is authorized by Virginia Code § 62.1-44.15.5 and the Water Quality Certification requirements of §401 of the Clean Water Act of 1972.

The Norfolk District U.S. Army Corps of Engineers performed a site visit and determined that no tidal or nontidal wetlands are present on the project site.

D. Dunes and Beaches Management

Dune protection is carried out pursuant to the Coastal Primary Sand Dune Protection Act and is intended to prevent destruction or alteration of primary dunes. This program is administered by the VMRC (Virginia Code §28.2-1400 through §28.2-1420).

No sand dunes or beaches exist at the project site.

E. Non-point Source Water Pollution Control

Virginia's Erosion and Sediment Control Law and Stormwater Management Program requires land-disturbing activities to be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the Chesapeake Bay, its tributaries, and other rivers and waters of the Commonwealth. This program is administered by VDEQ (Virginia Code §62.1-44.15:51 *et seq.*).

Clearing, grubbing, and grading activities during construction requires adherence with the VDEQ Erosion and Sediment Control Program. The program requires erosion and sedimentation control plans to minimize erosion and siltation that could impact local streams.

Soil erosion and sedimentation control measures to control off-site runoff would be implemented during construction. An erosion and sediment control plan detailing construction Best Management Practices (BMPs) would be prepared in accordance with the Virginia

Erosion and Sediment Control Laws and Regulations and Virginia Storm Water Management Law and Regulations. Construction would be monitored to ensure erosion and stormwater management practices are adequate in preventing sediment and pollution migration into nearby surface waters. Therefore, the proposed construction and operations would be consistent to the maximum extent practicable.

F. Point Source Water Pollution Control

The point source water pollution program is administered by the State Water Control Board pursuant to Virginia Code §62.1-44.15. Point source water pollution control is accomplished through the implementation of the National Pollutant Discharge Elimination System (NPDES) permit program established pursuant to §402 of the federal Clean Water Act and administered in Virginia as the Virginia Pollutant Discharge Elimination System (VPDES) permit program. The Water Quality Certification requirements of §401 of the Clean Water Act of 1972 is administered under the Virginia Water Protection Permit program.

The proposed action would reduce the amount of impervious surface from the previous Navy Annex development. An individual VPDES permit for stormwater discharges from construction sites applies to land disturbances exceeding one (1) acre and would be required. For purposes of the Virginia Stormwater Management Program, ANC, VDOT and Arlington County each have their own Municipal Separate Storm Sewer System (MS4) permits with VDEQ, for which each is responsible. Efforts are currently underway to evaluate regional stormwater requirements, and to propose potential BMPs. Integration of the regional stormwater management requirements would facilitate the site design for both the Southern Expansion project and the roadway realignment projects. By meeting the VDEQ requirements covered under VSMP regulations, the stormwater management requirements of the above landowners can be met.

Stormwater runoff from the site would be transported via stormwater system to the Boundary Channel and into the Potomac River. VDOT and Arlington County have their own VPDES permits with VDEQ, for which each is responsible. ANC's VPDES permit, # VAR 040139, and Stormwater Pollution Prevention Plan (SWPPP) would be revised to include a site plan and description of BMPs and would be used to reduce or eliminate impacts to nearby surface waters. ANC personnel will conduct oversight inspection to ensure required stormwater management measures are conducted properly and are maintained. Therefore, the proposed construction and operations would be consistent with regulations to the maximum extent practicable.

G. Shoreline Sanitation

The purpose of this program is to regulate the installation of septic tanks, set standards concerning soil types suitable for septic tanks, and specify minimum distances that tanks must be placed away from streams, rivers, and other waters of the Commonwealth. This program is administered by the Virginia Department of Health (Virginia Code §32.1-164 through §32.1-165).

The proposed construction activities and operations would have no impact on shoreline sanitation. The proposed action would not involve demolition or installation of septic tanks.

H. Point Source Air Pollution Control

The program implements the Federal Clean Air Act to provide a legally enforceable State Implementation Plan for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). This program is administered by the State Air Pollution Control Board (Virginia Code §10.1-1300 through 10.1-1320).

Short-term impacts of the proposed action include increased vehicle air emissions and fugitive dust from construction activities, but the impact would not exceed *de minimis* levels under the General Conformity Rule. The proposed action would generate no new point sources of air pollution. Long-term impacts resulting from roadway improvements incorporate multi-modal traffic options, potentially reducing air emissions and congestion on Columbia Pike. Emissions associated with these impacts do not appear to exceed the NAAQS or have local or regional significance. Therefore, the proposed action would be consistent to the maximum extent practicable.

I. Coastal Lands Management

Coastal lands management consists of state-local cooperative programs administered by VDEQ's Water Division and 84 localities in Tidewater, Virginia established pursuant to the Chesapeake Bay Preservation Act (CBPA) (Virginia Code §§ 62.1-44.15:67 through 62.1-44.15:79) and Chesapeake Bay Preservation Area Designation and Management Regulations (Virginia Administrative Code 9 VAC 25-830-10 *et seq.*).

The CBPA and Management Regulations require local jurisdictions to enact protection ordinances for the Chesapeake Bay watershed. Applications for encroachment into regulated areas are administered by the Local Chesapeake Bay Assistance Boards. While certain localities may have designated CBPA areas on Army property, such designations are not binding on the Federal Government.

Accordingly, no designated Chesapeake Bay Resource Protection Areas (RPAs) or Resource Management Areas (RMAs) are present on the Southern Expansion site. However, the Secretary of the Army attempts to demonstrate consistency with the relevant pollution reduction goals identified in the Act. In addition, the Department of Defense is a signatory of the Chesapeake Bay Watershed Agreement – a multi-state and multi-agency agreement to restore and protect the Chesapeake Bay ecosystem – and is fully committed to supporting its goals and initiatives. Executive Order 13508, signed 12 May 2009, articulates and outlines strategies to be undertaken by all federal agencies and departments in the furtherance of restoring the Chesapeake Bay ecosystem. The proposed activity will be implemented pursuant to these laws and policies. Therefore, the project is consistent to the maximum extent practicable with this policy.

Advisory Policies for Geographic Area of Particular Concern

Although not required for the purposes of consistency, in accordance with 15 CFR §930.39(c), the federal agency should consider the advisory policies (recommendations) of the Virginia CZM Program as well.¹

a. Coastal Natural Resource Areas

These areas are vital to estuarine or marine ecosystems and/or are of great importance to areas immediately inland of the shoreline. Such areas receive special attention from the Commonwealth because of their conservation, recreational, ecological, and aesthetic values. These areas are worthy of special consideration in any planning or resources management processes and include the following resources: wetlands, aquatic spawning, nursing, and feeding grounds, coastal primary sand dunes, barrier islands, significant wildlife habitat areas, public recreation areas, sand and gravel resources, and underwater historic sites.

There are no estuarine or marine ecosystems within the limits of this project.

b. Coastal Natural Hazard Areas

This policy covers areas vulnerable to continuing and severe erosion and areas susceptible to potential damage from wind, tidal, and storm related events including flooding. New buildings and other structures should be designed and sited to minimize the potential for property damage due to storms or shoreline erosion. The areas of concern are as follows: Highly erodible areas and coastal high hazard areas, including floodplains.

There will be no structures or buildings that are vulnerable to potential damage from wind, tidal, and storm related events including flooding.

c. Waterfront Development Areas

These areas are vital to the Commonwealth because of the limited number of areas suitable for waterfront activities. The areas of concern are as follows: commercial ports, commercial fishing piers, and community waterfront.

There are no areas suitable for waterfront activities near this project.

¹ VDEQ Federal Consistency Information Package,
<http://www.deq.virginia.gov/Programs/EnvironmentalImpactReview/FederalConsistencyReviews.aspx#determine>

Determination

Based upon the above information, data, and analysis, ANC finds that the proposed Southern Expansion Project in Arlington County, Virginia is likely to affect a land use, water use, or natural resource of the Commonwealth of Virginia. However, ANC will conduct the proposed activity consistent to the maximum extent practicable with the enforceable policies of the Virginia CZMP. Additionally, all parties would obtain the required permits for the proposed work, as required under applicable laws of the Commonwealth of Virginia.

Pursuant to 15 CFR Section 930.41, the Virginia Coastal Resources Management Program has 60 days from receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under CFR section 930.41 (b). Virginia’s concurrence will be presumed if its response is not received by the U.S. Army Corps of Engineers on the 60th day from receipt of this determination.

COL MICHAEL D. PELOQUIN
Chief Engineer
Arlington National Cemetery

Date



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

May 17, 2018

Mr. Greg Hegge
Arlington National Cemetery Program Manager
Department of the Army
U.S. Army Corps of Engineers, Norfolk District
803 Front St.
Norfolk, VA 23510

RE: U.S. Department of the Army Draft Environmental Assessment and Federal Consistency Determination: Arlington National Cemetery Southern Expansion, Arlington County (DEQ 18-057F).

Dear Mr. Hegge:

The Commonwealth of Virginia has completed its review of the draft Environmental Assessment (EA) and a federal consistency determination (FCD) for the above-referenced project. The Department of Environmental Quality (DEQ) is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating state reviews of FCDs submitted under the Coastal Zone Management Act. The following agencies participated in this review:

Department of Environmental Quality
Department of Game and Inland Fisheries
Department of Conservation and Recreation
Department of Health
Department of Historic Resources

The Marine Resources Commission, Department of Transportation, Arlington County and Northern Virginia Regional Commission also were invited to comment on the project.

PROJECT DESCRIPTION

The Arlington National Cemetery (ANC), which reports to the Department of the Army, proposes to establish a single contiguous parcel of land south of the cemetery by closing and relocating local roadways and developing the parcel to increase interment capacity and increase multimodal transportation capacity on Columbia Pike. The proposed action or preferred alternative requires land acquisitions and jurisdictional transfers, roadway realignments, and interchange reconfigurations, in the area known as the southern expansion site in Arlington County. The southern expansion site is surrounded by Interstate 395 to the south, ANC to the north, the Foxcroft Heights residential neighborhood and a Virginia Department of Transportation (VDOT) maintenance facility to the west, and ramps connecting Columbia Pike to Route 27 to the east. The site includes approximately 66 acres among three landowners: ANC, Arlington County, and VDOT. The Air Force Memorial sits within the site and is not included in the proposed project. The creation of a contiguous parcel would require the closure of Southgate Road and construction of a new connector road – Southgate Road connector – to allow access to Joint Base Myer-Henderson Hall. Other changes to the roadways are realigning Columbia Pike; modifying the Route 27/Columbia Pike interchange; and maintaining or improving the roadway level of service for vehicular, pedestrian, and bicycle traffic. The project also includes the proposed construction of 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 cemetery expansion would include a mixture of columbaria, niche walls and in-ground burial spaces. The preferred alternative also includes relocating the operations complex to the area south of Columbia Pike and connecting it to the southern expansion area of the cemetery by a tunnel. The operations complex would include offices, maintenance vehicle garages, and vehicle service bays to support cemetery operations.

FEDERAL CONSISTENCY PURSUANT TO THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act of 1972, as amended, activities both within and outside of the Commonwealth's designated coastal zone with reasonably foreseeable effects on any coastal uses or resources resulting from a Federal agency activity (15 CFR Part 930, Subpart C) must be consistent to the maximum extent practicable with Virginia's Coastal Zone Management (CZM) Program. The Virginia CZM Program consists of a network of programs administered by several agencies. DEQ coordinates the review of FCDs with agencies administering the enforceable policies of the Virginia CZM Program.

PUBLIC PARTICIPATION

In accordance with 15 CFR §930.2, a public notice with a comment period of April 10, 2018 to May 3, 2018 of this proposed action was published in OEIR's Program Newsletter and on the DEQ website. No public comments were received in response to the notice.

FEDERAL CONSISTENCY CONCURRENCE

The FCD states that the project is consistent to the maximum extent practicable with the enforceable policies of the Virginia CZM Program. The reviewing agencies that are responsible for the administration of the enforceable policies generally agree with the FCD. Based on the review of the FCD and the comments submitted by agencies administering the enforceable policies of the Virginia CZM Program, DEQ concurs that the proposed project is consistent to the maximum extent practicable with the Virginia CZM Program provided all applicable permits and approvals are obtained as described. However, other state approvals which may apply to this project are not included in this concurrence. Therefore, the responsible agent must also ensure that this project is constructed and operated in accordance with all applicable federal, state and local laws and regulations.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Wetlands and Water Quality. The EA (Appendix E, FCD, page 6) states that the U.S. Army Corps of Engineers, Norfolk District, performed a site visit and determined tidal or nontidal wetlands are not present on the project site.

1(a) Agency Jurisdiction. The State Water Control Board promulgates Virginia's water regulations, covering a variety of permits to include Virginia Pollutant Discharge Elimination System (VPDES) Permit, Virginia Pollution Abatement Permit, Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit. The VWP Permit is a state permit which governs wetlands, surface water, and surface water withdrawals/impoundments. It also serves as § 401 certification of the federal Clean Water Act § 404 permits for dredge and fill activities in waters of the U.S. The VWP Program is under the Office of Wetlands and Stream Protection (OWSP). Tidal wetlands are regulated by the Virginia Marine Resources Commission (VMRC) under the authority of Virginia Code §28.2-1301 through §28.2-1320.

1(b) Agency Findings. The DEQ Northern Regional Office (NRO) states that a VWP permit from DEQ may be required should impacts to surface waters be necessary.

1(c) Requirement. A Joint Permit Application (JPA) should be submitted for proposed impacts to surface waters or wetlands and proper authorization from DEQ should be obtained if necessary.

1(d) Conclusion. Provided the project adheres to the above-referenced requirement, as necessary, the project would be consistent to the maximum extent practicable with the wetlands management enforceable policy of the Virginia CZM Program.

2. Air Pollution Control. The EA (Appendix E, FCD, page 8) states that long-term impacts resulting from roadway improvements incorporate multi-modal traffic options, potentially reducing air emissions and congestion on Columbia Pike. Emissions associated with these impacts do not appear to exceed the National Ambient Air Quality Standards or have local or regional significance.

2(a) Agency Jurisdiction. The DEQ Air Division, on behalf of the State Air Pollution Control Board, is responsible for developing regulations that implement Virginia's Air Pollution Control Law (Virginia Code §10.1-1300 et seq.). DEQ is charged with carrying out mandates of the state law and related regulations as well as Virginia's federal obligations under the Clean Air Act as amended in 1990. The objective is to protect and enhance public health and quality of life through control and mitigation of air pollution. The division ensures the safety and quality of air in Virginia by monitoring and analyzing air quality data, regulating sources of air pollution, and working with local, state and federal agencies to plan and implement strategies to protect Virginia's air quality. The appropriate DEQ regional office is directly responsible for the issuance of necessary permits to construct and operate all stationary sources in the region as well as monitoring emissions from these sources for compliance. As a part of this mandate, environmental impact reviews (EIRs) of projects to be undertaken in the state are also reviewed. In the case of certain projects, additional evaluation and demonstration must be made under the general conformity provisions of state and federal law.

The Air Division regulates emissions of air pollutants from industries and facilities and implements programs designed to ensure that Virginia meets national air quality standards. The most common regulations associated with projects are:

- Open burning: 9VAC5-130 *et seq.*
- Fugitive dust control: 9VAC5-50-60 *et seq.*
- Permits for fuel-burning equipment: 9VAC5-80-1100 *et seq.*

2(b) Ozone Non-attainment Area. According to the DEQ Air Division, the project site is located in an ozone non-attainment area and an emission control area for volatile organic compounds (VOCs) and oxides of nitrogen (NO_x), which are contributors to ozone pollution.

2(c) Requirements.

2(c)(i) Fugitive Dust. During future land-disturbing activities, fugitive dust must be kept to a minimum by using control methods outlined in 9VAC5-50-60 *et seq.* of the Regulations for the Control and Abatement of Air Pollution. These precautions include, but are not limited to, the following:

- Use, where possible, water or suitable chemicals for dust control during the proposed demolition and construction operations and from material stockpiles;
- Install and use of hoods, fans and fabric filters to enclose and vent the handling of dusty materials;
- Cover open equipment for conveying materials; and
- Promptly remove spilled or tracked dirt or other materials from paved streets and dried sediments resulting from soil erosion.

2(c)(ii) Open Burning. If project activities include the burning of vegetative debris or use of special incineration devices in the disposal of land clearing debris, this activity must meet the requirements under 9VAC5-130 *et seq.* of the regulations for open burning, and it may require a permit. The regulations provide for, but do not require, the local adoption of a model ordinance concerning open burning. Contact officials with the appropriate locality to determine what local requirements, if any, exist.

2(c)(iii) Asphalt Paving. In accordance with 9VAC5-45-760 *et seq.*, there are limitations on the use of “cut-back” (liquefied asphalt cement, blended with petroleum solvents) that may apply to paving activities associated with the project. The asphalt must be “emulsified” (predominantly cement and water with a small amount of emulsifying agent) except when specified circumstances apply. Moreover, there are time-of-year restrictions on its use during the months of April through October in VOC emission control areas.

2(d) Agency Recommendation. Contact DEQ NRO if any fuel-burning and air-polluting support equipment will be part of the project to ensure compliance with any permitting requirements. DEQ recommends that ANC take all precautions to restrict the emissions of VOCs and NO_x during construction.

2(e) Conclusion. Provided the project complies with applicable requirements, it would be consistent to the maximum extent practicable with the air pollution control enforceable policy of the Virginia CZM Program.

3. Chesapeake Bay Preservation Areas. The EA (page 3-18) states that there are no Chesapeake Bay Preservation Areas on the proposed project site.

3(a) Agency Jurisdiction. The DEQ Office of Local Government Programs (OLGP) administers the Chesapeake Bay Preservation Act (Virginia Code §62.1-44.15:67 *et seq.*) (Bay Act) and Chesapeake Bay Preservation Area Designation and Management

Regulations (9VAC25-830-10 *et seq.*). Each Tidewater locality must adopt a program based on the Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management Regulations. The Act and regulations recognize local government responsibility for land use decisions and are designed to establish a framework for compliance without dictating precisely what local programs must look like. Local governments have flexibility to develop water quality preservation programs that reflect unique local characteristics and embody other community goals. Such flexibility also facilitates innovative and creative approaches in achieving program objectives. The regulations address nonpoint source pollution by identifying and protecting certain lands called Chesapeake Bay Preservation Areas. The regulations use a resource-based approach that recognizes differences between various land forms and treats them differently.

3(b) Chesapeake Bay Preservation Areas. In Arlington County, the areas protected by the Chesapeake Bay Preservation Act, as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by each locality. RPAs include tidal wetlands, certain non-tidal wetlands and tidal shores. RPAs also include a 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow. All areas of the county not included in the RPA are designated as RMAs.

3(c) Agency Findings. Section 3.5.1.6 (Coastal Zone Resources) of the EA states that there are no designated RPAs or RMAs within the action area. While lands analogous to RPA are not present on the proposed project site, DEQ OLGP states that Arlington County's jurisdiction-wide RMA means that lands analogous to RMAs are present within the project area.

3(d) Requirements. While Chesapeake Bay Preservation Areas (CBPA) are not locally designated on federal lands, this does not relieve federal agencies of their responsibility to be consistent with the provisions of the Regulations, 9 VAC 25-830-10 *et seq.*, as one of the enforceable programs of the CZM Program

Pursuant to the *Coastal Zone Management Act of 1972*, as amended, federal activities affecting Virginia's coastal resources or coastal uses must be conducted in a manner "consistent to the maximum extent practicable" and be consistent with Virginia's Coastal Zone Management Program (CZM Program) (see § 307(c)(1) of the Coastal Zone Management Act and 15 CFR Part 930, sub-part C of the *Federal Consistency Regulations*).

Federal actions on installations located within Tidewater Virginia are required to be consistent with the performance criteria of the Regulations on lands analogous to locally designated CBPA's. Projects that include land disturbing activity must adhere to the

general performance criteria, especially with respect to minimizing land disturbance (including access and staging areas), retaining indigenous vegetation and minimizing impervious cover. For land disturbance over 2,500 square feet, the project must comply with the requirements of the *Virginia Erosion and Sediment Control Handbook*, Third Edition, 1992. Additionally, stormwater management criteria consistent with water quality protection provisions of the *Virginia Stormwater Management Regulations* shall be satisfied.

3(e) Conclusion. Provided the applicable requirements are satisfied, the project would be consistent to the maximum extent practicable with the coastal lands management enforceable policy of the Virginia CZM Program.

4. Nonpoint Pollution Control. According to the EA (Appendix E, FCD, page 6), ANC's VPDES permit, # VAR 040139, and Stormwater Pollution Prevention Plan (SWPPP) would be revised to include a site plan and description of proposed best management practices and would be used to reduce or eliminate impacts to nearby surface waters.

4(a) Agency Jurisdiction. The DEQ Office of Stormwater Management (OSM) administers the following laws and regulations governing construction activities:

- Virginia Erosion and Sediment Control Law (§ 62.1-44.15:51 et seq.) and Regulations (VESCL&R) (9VAC25-840);
- Virginia Stormwater Management Act (VSMA) (§ 62.1-44.15:24 et seq.);
- Virginia Stormwater Management Program (VSMP) regulation (9VAC25-870); and
- 2014 General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities (9VAC25-880).

In addition, DEQ is responsible for the VSMP General Permit for Stormwater Discharges from Construction Activities related to Municipal Separate Storm Sewer Systems (MS4s) and construction activities for the control of stormwater discharges from MS4s and land disturbing activities under the Virginia Stormwater Management Program (9VAC25-890-40).

4(b) Requirements. General requirements for the control of nonpoint source pollution are below.

4(b)(i) Erosion and Sediment Control and Stormwater Management Plans. The applicant and its authorized agents conducting regulated land-disturbing activities on private and public lands in the state must comply with VESCL&R and VSMA, including coverage under the general permit for stormwater discharge from construction activities, and other applicable federal nonpoint source pollution mandates (e.g. Clean Water Act-

Section 313). Clearing and grading activities, installation of staging areas, parking lots, roads, buildings, utilities, borrow areas, soil stockpiles, and related land-disturbing activities that result in the total land disturbance of equal to or greater than 10,000 square feet would be regulated by VESCL&R. Accordingly, the applicant must prepare and implement an erosion and sediment control (ESC) plan to ensure compliance with state law and regulations. The ESC plan is submitted to the DEQ regional office that serves the area where the project is located for review for compliance. The applicant is ultimately responsible for achieving project compliance through oversight of on-site contractors, regular field inspection, prompt action against non-compliant sites, and other mechanisms consistent with agency policy (Reference: VESCL 62.1-44.15 *et seq.*).

4(b)(ii) General Permit for Stormwater Discharges from Construction Activities (VAR10). The operator or owner of a construction project involving land-disturbing activities equal to or greater than one acre is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific SWPPP. The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit and the SWPPP must address water quality and quantity in accordance with the VSMP Permit Regulations. General information and registration forms for the General Permit are available on DEQ's website at <http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx> (Reference: VSWA 62.1-44.15 *et seq.*; VSMP Permit Regulations 9VAC 25-870-10 *et seq.*).

4(c) Conclusion. Provided the above requirements are met, the project would be consistent to the maximum extent practicable with the nonpoint pollution control enforceable policy of the Virginia CZM Program.

5. Solid and Hazardous Waste Management. The EA (page 3-47) states there would not be a noticeable increase in the amount of solid waste produced from daily operations. Construction activities would generate additional waste. However, construction contracts would include a performance requirement to divert a minimum of 50% of construction waste from landfill disposal. Contractors would also be required to submit a construction and demolition waste management plan.

5(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization is responsible for carrying out the mandates of the Virginia Waste Management Act (Virginia Code §10.1-1400 *et seq.*), as well as meeting Virginia's federal obligations under the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response Compensation Liability Act (CERCLA), commonly known as Superfund. The DEQ Division of Land Protection and Revitalization also administers those laws and regulations on behalf of

the State Water Control Board that govern Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 et seq.), including Aboveground Storage Tanks (9VAC25-91 et seq.) and Underground Storage Tanks (9VAC25-580 et seq. and 9VAC25-580-370 et seq.), also known as Virginia Tank Regulations, and § 62.1-44.34:14 et seq. which covers oil spills. Virginia:

- Virginia Waste Management Act, Virginia Code § 10.1-1400 et seq.
- Virginia Solid Waste Management Regulations, 9VAC20-81
 - (9VAC20-81-620 applies to asbestos-containing materials)
- Virginia Hazardous Waste Management Regulations, 9VAC20-60
 - (9VAC20-60-261 applies to lead-based paints)
- Virginia Regulations for the Transportation of Hazardous Materials, 9VAC20-110.

Federal:

- Resource Conservation and Recovery Act (RCRA), 42 U.S. Code sections 6901 et seq.
- U.S. Department of Transportation Rules for Transportation of Hazardous Materials, 49 Code of Federal Regulations, Part 107
- Applicable rules contained in Title 40, Code of Federal Regulations.

5(b) Database Search. DLPR staff conducted a search (2000-foot radius) of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity to the project area. Three waste sites within the project area that might affect the project were identified. Additionally, one waste site of possible concern was located within the zip code (22211) of the project area. DLPR staff has reviewed the submittal and offers the following comments:

CERCLA Site: VA8210020626, Fort Myer, 204 Lee Avenue, Route 50 Next to Arlington National, Fort Myer, VA 22211. Not on National Priorities List. Federal Facility.

The information about the above-referenced site can be accessed from EPA's websites at:

- <https://www3.epa.gov/enviro/>
- <https://rcrainfopreprod.epa.gov/rcrainfoweb/action/main-menu/view>
- <https://www.epa.gov/superfund>

Petroleum Releases

- PC#19944087, Federal Office Building, Columbia Pike and Old Ridge Road, Arlington, VA 22211. Release Date: 05/26/1994, Status: Closed

- PC#19963049, Cafritz Property – Riverhouse I, 1111 Army Navy Drive, Arlington, VA 22202. Release Date: 09/28/1995, Status: Closed
- PC#20173142, Quarters K Navy Exchange Gas Station, 801 S. Joyce Street, Arlington, VA 22204. Release Date: 02/22/2017, Status: Closed
- PC#19954100, Navy Annex Gas Station, 801 S. Joyce Street, Arlington, VA 22204. Release Date: 10/20/1994, Status: Closed

5(c) Agency Recommendations.

- Evaluate the identified waste sites to determine potential impacts to the project.
- DEQ encourages all projects to implement pollution prevention principles, including:
 - the reduction, reuse and recycling of all solid wastes generated; and
 - the minimization and proper handling of generated hazardous wastes.

5(d) Requirements.

- Test and dispose of any soil/sediment that is suspected of contamination (including petroleum contamination) or wastes that are generated during construction-related activities in accordance with applicable federal, state, and local laws and regulations.
- Report the installation, relocation or removal of any above or below ground petroleum storage tanks to DEQ TRO as appropriate.
- The installation and use of an aboveground storage tank (AST) (>660 gallons) for temporary fuel storage (>120 days) during the project must follow the requirements in 9 VAC 25-91-10 *et seq.*
- Installation and operation of any regulated petroleum storage tank(s), either AST or underground storage tanks (UST), must also be conducted in accordance with the Virginia Regulations 9VAC25-91-10 *et seq.* and / or 9VAC25-580-10 *et seq.*
- Report evidence of a petroleum release, if discovered during construction of this project, to DEQ TRO, as authorized by Code of Virginia § 62.1-44.34.8-9 and 9VAC25-580-10 *et seq.*
- All structures being demolished or removed should be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to demolition. If ACM and LBP are found, in addition to the federal waste-related regulations mentioned above, state regulations 9VAC20-81-640 for ACM and 9VAC20-60-261 for LBP must be followed.

6. Natural Heritage Resources. The EA (page 3-24) states that the action area includes maintained fields, manicured lawn, grassy highway right-of-way; the Columbia Pike/South Joyce Street/Southgate Road roadway system, parking areas, highway ramps to VA-27, the Operations Complex, and the Air Force Memorial. There are

scattered forested uplands, in the form of linear bands of trees lining the steep embankments along Southgate Road, Columbia Pike, and Interstate-395.

6(a) Agency Jurisdiction.

6(a)(i) The Virginia Department of Conservation and Recreation's (DCR) Division of Natural Heritage (DNH): DNH's mission is conserving Virginia's biodiversity through inventory, protection and stewardship. The Virginia Natural Area Preserves Act (Virginia Code §10.1-209 through 217), authorized DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and to protect and ecologically manage the natural heritage resources of Virginia (the habitats of rare, threatened and endangered species, significant natural communities, geologic sites, and other natural features).

6(a)(ii) The Virginia Department of Agriculture and Consumer Services (VDACS): The Endangered Plant and Insect Species Act of 1979 (Virginia Code Chapter 39 §3.1-1020 through 1030) authorizes VDACS to conserve, protect and manage endangered and threatened species of plants and insects. Under a Memorandum of Agreement established between VDACS and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species.

6(b) Agency Findings – Natural Heritage Resources. The Biotics Data System documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, DCR DNH does not anticipate that this project will adversely impact these natural heritage resources.

6(c) Agency Findings – Threatened and Endangered Plant and Insect Species. DCR states that the current activity will not affect any documented state-listed plants or insects.

6(d) Agency Findings – Natural Area Preserves. There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

6(e) Agency Recommendation. Contact the DCR DNH and resubmit project information if the scope of the project changes and/or six months has passed before it is utilized.

7. Fisheries Management. The EA (Appendix E, FCD, page 5) states that the proposed action would not involve construction in or impacts to waterways. Therefore, no impacts to fisheries are anticipated.

7(a) Agency Jurisdiction. The fisheries management enforceable policy is administered by the VMRC (Virginia Code Section 28.2-200 to 28.2-713) and the DGIF (Virginia Code Section 29.1-100 to 29.1-570). In addition, the VDH Division of Shellfish Sanitation (DSS) is responsible for protecting the health of the consumers of molluscan shellfish and crustacea by ensuring that shellfish growing waters are properly classified for harvesting, and that molluscan shellfish and crustacea processing facilities meet sanitation standards. The mission of this Division is to minimize the risk of disease from molluscan shellfish and crustacea products at the wholesale level by classifying shellfish waters for safe commercial and recreational harvest; by implementing a statewide regulatory inspection program for commercial processors and shippers; and by providing technical guidance and assistance to the shellfish and crustacea industries regarding technical and public health issues.

7(b) Agency Findings. DGIF and VDH did not indicate that fisheries resources under their jurisdictions would be affected.

7(c) Conclusion. Assuming adherence to erosion and sediment controls during ground disturbance, the project would be consistent to the maximum extent practicable with the fisheries management enforceable policy of the Virginia CZM Program.

8. Wildlife Resources. The EA (page 3-26) states that there would be a temporary disruption to wildlife inhabiting the Southern Expansion project area. Wildlife species and any migratory birds in the area would move to adjacent areas upon the start of construction. The temporary impact would be offset at the project completion by providing permanent positive impacts through new landscaping including turf, trees, shrubs, and other plant material in planting beds.

8(a) Agency Jurisdiction. The Virginia Department of Game and Inland Fisheries (DGIF), as the Commonwealth's wildlife and freshwater fish management agency, exercises enforcement and regulatory jurisdiction over wildlife and freshwater fish, including state- or federally-listed endangered or threatened species, but excluding listed insects (Virginia Code, Title 29.1). DGIF is a consulting agency under the U.S. Fish and Wildlife Coordination Act (16 U.S. Code §661 et seq.) and provides environmental analysis of projects or permit applications coordinated through DEQ and several other state and federal agencies. DGIF determines likely impacts upon fish and wildlife resources and habitat, and recommends appropriate measures to avoid, reduce or compensate for those impacts. For more information, see the DGIF website at www.dgif.virginia.gov.

8(b) Agency Findings. Based on the scope and location of the proposed work, DGIF does not anticipate it to result in significant adverse impacts upon listed species or designated resources under its jurisdiction.

8(c) Agency Recommendations. To minimize overall impacts to wildlife and natural resources, DGIF has the following recommendations about development activities:

- Avoid and minimize impacts to undisturbed forest, wetlands, and streams to the fullest extent practicable as applicable.
- Maintain undisturbed naturally vegetated buffers of at least 100 feet in width around all on-site wetlands and on both sides of all perennial and intermittent streams as applicable.
- Design stormwater controls for this project to replicate and maintain the hydrographic condition of the site prior to the change in landscape. This should include, but not be limited to, utilizing bioretention areas, and minimizing the use of curb and gutter in favor of grassed swales. Bioretention areas (also called rain gardens) and grass swales are components of Low Impact Development (LID). They are designed to capture stormwater runoff as close to the source as possible and allow it to slowly infiltrate into the surrounding soil. They benefit natural resources by filtering pollutants and decreasing downstream runoff volumes.
- Adhere to a time-of-year restriction from March 15 through August 15 of any year for all tree removal and ground clearing to protect nesting resident and migratory songbirds.
- Adhere to erosion and sediment controls during ground disturbance

9. Water Supply. The draft EA (page 3-17) states that groundwater is not used for water supply.

9(a) Agency Jurisdiction. The Virginia Department of Health (VDH) Office of Drinking Water (ODW) reviews projects for the potential to impact public drinking water sources (groundwater wells, springs and surface water intakes). The VDH ODW administers both federal and state laws governing waterworks operation.

9(b) Agency Comment. VDH ODW states that there are no apparent impacts to public drinking water source due to this project.

9(c) Requirement. Potential impacts to public water distribution systems or sanitary sewage collection systems must be verified by the local utility according to VDH ODW.

10. Historic and Archaeological Resources. The EA (page 3-33) states that studies that evaluate historic resources will be available for the Virginia Department of Historic Resources (DHR) to review.

10(a) Agency Jurisdiction. The Virginia DHR conducts reviews of both federal and state projects to determine their effect on historic properties. Under the federal process, DHR is the State Historic Preservation Office, and ensures that federal undertakings –

including licenses, permits, or funding – comply with Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulation at 36 CFR Part 800. Section 106 requires federal agencies to consider the effects of federal projects on properties that are listed or eligible for listing on the National Register of Historic Places. For state projects or activities on state lands, DHR is afforded an opportunity to review and comment on (1) the demolition of state property; (2) major state projects requiring an EIR; (3) archaeological investigations on state-controlled land; (4) projects that involve a landmark listed in the Virginia Landmarks Register; (5) the sale or lease of surplus state property; (6) exploration and recovery of underwater historic properties; and (7) excavation or removal of archaeological or historic features from caves. See DHR's website for more information about applicable state and federal laws and how to submit an application for review:
<http://www.dhr.virginia.gov/StateStewardship/Index.htm>.

10(b) Agency Findings. In 2014 Arlington National Cemetery (ANC) initiated consultation with DHR pursuant to Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation 36 CFR Part 800. Meetings and additional coordination between ANC and DHR have occurred since 2014. Consultation for the undertaking has not concluded; however, DHR anticipates that ANC will continue to involve DHR as the project planning progresses.

10(c) Agency Recommendation. DHR requests that ANC continue Section 106 consultation as federal law requires.

11. Pollution Prevention. DEQ advocates that principles of pollution prevention and sustainability be used in all construction projects as well as in facility operations. Effective siting, planning, and on-site Best Management Practices (BMPs) will help to ensure that environmental impacts are minimized. However, pollution prevention and sustainability techniques also include decisions related to construction materials, design, and operational procedures that will facilitate the reduction of wastes at the source.

11(a) Recommendations. We have several pollution prevention recommendations that may be helpful in constructing or operating this facility:

- Consider development of an effective Environmental Management System (EMS). An effective EMS will ensure that the proposed facility is committed to complying with environmental regulations, reducing risk, minimizing environmental impacts, setting environmental goals, and achieving improvements in its environmental performance. DEQ offers EMS development assistance and recognizes facilities with effective Environmental Management Systems through its Virginia Environmental Excellence Program

(VEEP). VEEP provides recognition, annual permit fee discounts, and the possibility for alternative compliance methods.

- Consider environmental attributes when purchasing materials. For example, the extent of recycled material content, toxicity level, and amount of packaging should be considered and can be specified in purchasing contracts.
- Consider contractors' commitment to the environment when choosing contractors. Specifications regarding raw materials and construction practices can be included in contract documents and requests for proposals.
- Choose sustainable materials and practices for building construction and design.
- Integrate pollution prevention techniques into the facility maintenance and operation, to include inventory control for centralized storage of hazardous materials. Maintenance facilities should have sufficient and suitable space to allow for effective inventory control and preventive maintenance.

DEQ's Office of Pollution Prevention provides information and technical assistance relating to pollution prevention techniques and EMS. If interested, please contact DEQ (Meghann Quinn at 804-698-4021).

12. Pesticides and Herbicides. In general, when pesticides or herbicides must be used, their use should be strictly in accordance with manufacturers' recommendations. In addition, to the extent feasible, DEQ recommends that the responsible agent for the project use the least toxic pesticides or herbicides effective in controlling the target species. For more information on pesticide or herbicide use, please contact the Virginia Department of Agriculture and Consumer Services at (804) 786-3501.

13. Sewage Collection and Treatment Regulations. The EA (page 2-7) states that sanitary sewer infrastructure may be constructed as part of the proposed project.

13(a) Agency Jurisdiction. DEQ has approval authority for most discharging sewage collection systems and treatment works, except drainfields and other on-site systems approved by the local health department. This authority is contained in the Sewage Collection and Treatment Regulations (9VAC25-790 *et seq.*). Additional information is available on the DEQ website at <http://www.deq.virginia.gov/Programs/Water/WastewaterEngineering/RegulationsCertifications.aspx>

13(b) Agency Recommendation. Coordinate with the DEQ NRO to ensure that the new sewer line is constructed in accordance with the Sewage Collection and Treatment Regulations.

REGULATORY AND COORDINATION NEEDS

1. Wetlands and Water Quality. The project must be consistent with the requirements of the Virginia Water Protection (VWP) Permit Program (Virginia Code § 62.1-44.15 *et seq.*; 9VAC25-210 *et seq.*). If impacts to waters, including wetlands, are proposed, submit a Joint Permit Application to VMRC (Tony Watkinson at Tony.Watkinson@mrc.virginia.gov). Contact DEQ NRO (Bryant Thomas at Bryant.Thomas@deq.virginia.gov) for additional information on the VWP Permit Program.

2. Air Quality. Guidance on minimizing the emission of volatile organic compounds (VOCs) and oxides of nitrogen (NO_x) during construction may be obtained from DEQ-NRO. Activities associated with this project may be subject to air regulations administered by DEQ. The state air pollution regulations that may apply to the construction phase of the project are:

- asphalt paving operations (9 VAC 5-40-5490 *et seq.*);
- fugitive dust and emissions control (9 VAC 5-50-60 *et seq.*);
- open burning restrictions (9 VAC 5-130); and
- fuel-burning equipment (9 VAC 5-80 *et seq.*).

The applicant should contact Arlington County fire officials for information on any local requirements pertaining to open burning. For more information, contact DEQ NRO (James LaFratta at 703-583-3928).

3. Erosion and Sediment Control and Stormwater Management. This project must comply with Virginia's Erosion and Sediment Control Law (Virginia Code § 62.1-44.15:61) and Regulations (9VAC25-840-30 *et seq.*) and Stormwater Management Law (Virginia Code § 62.1-44.15:31) and Regulations (9VAC25-870-210 *et seq.*) as administered by DEQ. Erosion and sediment control, and stormwater management requirements should be coordinated with the DEQ NRO (Kelly Vanover at Kelly.Vanover@deq.virginia.gov or 757-518-2151).

4. General Permit for Stormwater Discharges from Construction Activities (VAR10). The operator or owner of a construction activity involving land disturbance of equal to or greater than 1 acre is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project specific stormwater pollution prevention plan (SWPPP). Specific questions regarding the Stormwater Management Program requirements should be directed to DEQ (Holly Sepety at 804-698-4039) (Reference: VSWML §62.1-44.15 *et seq.*).

5. Chesapeake Bay Preservation Areas. The project must be conducted in a manner which is consistent with the coastal lands management enforceable policy of the Virginia CZM Program which is governed by the requirements of the Chesapeake Bay

Preservation Act (Virginia Code §§ 10.1-2100 through 10.1-2114) and Chesapeake Bay Preservation Area Designation and Management Regulations (Virginia Code 9VAC25-830-10 *et seq.*). Contact DEQ OLGP (Daniel Moore at Daniel.Moore@deq.virginia.gov or 804-698-4520) for additional information.

6. Solid and Hazardous Wastes. Contact DEQ NRO (Richard Doucette at Richard.Doucette@deq.virginia.gov) for additional information about waste management if necessary. All solid waste, hazardous waste and hazardous materials must be managed in accordance with all applicable federal, state and local environmental regulations. Report the installation, relocation or removal of any above or below ground petroleum storage tanks to DEQ NRO (Randy Chapman at Randy.Chapman@deq.virginia.gov) as appropriate. Report evidence of a petroleum release, if discovered during construction of this project, to DEQ NRO (Randy Chapman at Randy.Chapman@deq.virginia.gov), as authorized by Code of Virginia § 62.1-44.34.8-9 and 9VAC25-580-10 *et seq.*

7. Natural Heritage Resources. Contact the DCR DNH (804-371-2708) to re-submit project information and a map for an update on natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

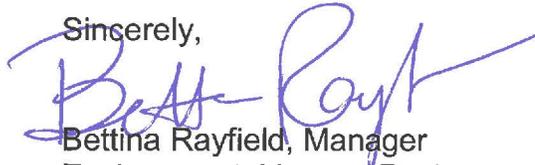
8. Wildlife Resources. Coordinate with DGIF (Amy Ewing at Amy.Ewing@dgif.virginia.gov) about its recommendation if necessary.

9. Historic and Archaeological Resources. The ANC should continue to coordinate with DHR (Marc Holma at Marc.Holma@dhr.virginia.gov) pursuant to Section 106 of the National Historic Preservation Act.

10. Water and Sewerage Requirements. Coordinate with the DEQ NRO (Bryant Thomas at 703-583-3843) as necessary to ensure that sewage lines are constructed in accordance with the Sewage Collection and Treatment Regulations. Potential impacts to public water distribution systems or sanitary sewage collection systems must be verified by the local utility according to VDH ODW.

Thank you for the opportunity to comment on this EA and FCD. The detailed comments of reviewers are attached. If you have questions, please do not hesitate to call me at (804) 698-4204 or Julia Wellman at (804) 698-4326.

Sincerely,



Bettina Rayfield, Manager
Environmental Impact Review and Long Range
Priorities Program

Enclosures

ec: Amy Ewing, DGIF
Robbie Rhur, DCR
Arlene Warren, VDH
Roger Kirchen, DHR
Elizabeth Jordan, VDOT
Mark Gibb, NRVC
March Schwartz, Arlington County
Greg Hegge, Corps
Frederick Kroesen, Corps
Robert Bolich, HNTB



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

MEMORANDUM

TO: Julia Wellman, DEQ Environmental Impact Review Coordinator

FROM: Daniel Moore, DEQ Principal Environmental Planner

DATE: April 5, 2018

SUBJECT: DEQ #18-057F: Army – Southern Expansion Project, Arlington National Cemetery, Arlington County, Virginia

We have reviewed the Federal Consistency Determination for the above-referenced stream restoration project and offer the following comments regarding consistency with the provisions of the *Chesapeake Bay Preservation Area Designation and Management Regulations* (Regulations):

In Arlington County, the areas protected by the *Chesapeake Bay Preservation Act*, as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by each locality. RPAs include tidal wetlands, certain non-tidal wetlands and tidal shores. RPAs also include a 100-foot vegetated buffer area located adjacent to and landward of these features and along both sides of any water body with perennial flow. All areas of the County not included in the RPA are designated as RMAs.

Based on the materials provided for review, the proposed project will utilize a 66-acre site immediately south of ANC and Columbia Pike in order to increase burial capacity by 40,000 to 60,000 first internments. Of the four proposed alternatives, the Relocate Operation Complex Alternative is the preferred alternative, as it would increase burial capacity by approximately 49 acres and provide for a higher capacity multimodal transportation corridor with the realignment of Columbia Pike. The U.S. Fish and Wildlife's National Wetlands Inventory (NWI) mapping showed no jurisdictional wetlands or surface waters present within the confines of the project area.

Pursuant to the *Coastal Zone Management Act of 1972*, as amended, federal activities affecting Virginia's coastal resources or coastal uses must be conducted in a manner "consistent to the

maximum extent practicable” and be consistent with Virginia’s Coastal Zone Management Program (CZM Program) (see § 307(c)(1) of the Coastal Zone Management Act and 15 CFR Part 930, sub-part C of the *Federal Consistency Regulations*).

While Chesapeake Bay Preservation Areas (CBPA) are not locally designated on federal lands, this does not relieve federal agencies of their responsibility to be consistent with the provisions of the Regulations, § 9 VAC 25-830-10 et seq., as one of the enforceable programs of the CZM Program. Federal actions on installations located within Tidewater Virginia are required to be consistent with the performance criteria of the Regulations on lands analogous to locally designated CBPAs. Projects that include land disturbing activity must adhere to the general performance criteria, especially with respect to minimizing land disturbance (including access and staging areas), retaining indigenous vegetation and minimizing impervious cover. For land disturbance over 2,500 square feet, the project must comply with the requirements of the *Virginia Erosion and Sediment Control Handbook*, Third Edition, 1992. Additionally, stormwater management criteria consistent with water quality protection provisions of the *Virginia Stormwater Management Regulations* shall be satisfied. It should be noted that Section 3.5.1.6 (Coastal Zone Resources) of the submitted Environmental Assessment (page 3-18) indicates that “...there are no designated RPAs or RMAs within the action area.” While lands analogous to RPA are not present on site, Arlington County’s jurisdiction-wide RMA means that lands analogous to RMAs are present within the project area.

The 1998 *Federal Agencies’ Chesapeake Ecosystem Unified Plan* (Plan) calls for the signatories of that Plan to cooperate with local and state governments in carrying out actions to comply with stormwater management regulations. The Plan further encourages low impact development practices that minimize the loss of natural areas and reduce impervious surfaces on federal facilities, as well as other best management practices to address stormwater management, and sediment and erosion control. In addition, the *Chesapeake 2000* agreement committed the government agencies to sound land use and stormwater quality controls. The signatories additionally committed the agencies to lead by example with respect to controlling nutrient, sediment and chemical contaminant runoff from government properties. In December 2001, the Executive Council of the Chesapeake Bay Program issued *Directive No. 01-1: Managing Storm Water on State, Federal and District-owned Lands and Facilities*, which includes specific commitments for agencies to lead by example with respect to stormwater control.

Provided adherence to the above requirements, the proposed activity would be consistent with the *Chesapeake Bay Preservation Act* and the Regulations.

**DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION**

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: Julia H. Wellman

DEQ - OEIR PROJECT NUMBER: DEQ #18-057F

PROJECT TYPE: STATE EA / EIR **FEDERAL EA / EIS** SCC
 CONSISTENCY CERTIFICATION

PROJECT TITLE: Southern Expansion Project, Arlington National Cemetery

PROJECT SPONSOR: U.S. Department of the Army

PROJECT LOCATION: **OZONE NON ATTAINMENT
AND EMISSION CONTROL AREA FOR NOX & VOC**

REGULATORY REQUIREMENTS MAY BE APPLICABLE TO: **CONSTRUCTION**
 OPERATION

STATE AIR POLLUTION CONTROL BOARD REGULATIONS THAT MAY APPLY:

1. 9 VAC 5-40-5200 C & 9 VAC 5-40-5220 E – STAGE I
2. 9 VAC 5-45-760 et seq. – Asphalt Paving operations
3. **9 VAC 5-130 et seq. – Open Burning**
4. **9 VAC 5-50-60 et seq. Fugitive Dust Emissions**
5. 9 VAC 5-50-130 et seq. - Odorous Emissions; Applicable to _____
6. 9 VAC 5-60-300 et seq. – Standards of Performance for Toxic Pollutants
7. 9 VAC 5-50-400 Subpart_____, Standards of Performance for New Stationary Sources, designates standards of performance for the _____
8. 9 VAC 5-80-1100 et seq. of the regulations – Permits for Stationary Sources
9. 9 VAC 5-80-1605 et seq. Of the regulations – Major or Modified Sources located in PSD areas. This rule may be applicable to the _____
10. 9 VAC 5-80-2000 et seq. of the regulations – New and modified sources located in non-attainment areas
11. 9 VAC 5-80-800 et seq. Of the regulations – State Operating Permits. This rule may be applicable to _____

COMMENTS SPECIFIC TO THE PROJECT:

All precautions are necessary to restrict the emissions of volatile organic compounds (VOC) and oxides of nitrogen (NO_x).



(Kotur S. Narasimhan)
Office of Air Data Analysis

DATE: April 5, 2018

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director



Rochelle Altholz
*Deputy Director of
Administration and Finance*

Russell W. Baxter
*Deputy Director of
Dam Safety & Floodplain
Management and Soil & Water
Conservation*

Thomas L. Smith
Deputy Director of Operations

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: May 3, 2018
TO: Julia Wellman, DEQ
FROM: Roberta Rhur, Environmental Impact Review Coordinator
SUBJECT: DEQ 18-057F, Southern Expansion Project, Arlington National Cemetery

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from <http://vafwis.org/fwis/> or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov. This project is located within 2 miles of a documented occurrence of a state listed animal. Therefore, DCR recommends coordination with VDGIF, Virginia's regulatory authority for the management and protection of this species to ensure compliance with the Virginia Endangered Species Act (VA ST §§ 29.1-563 – 570).

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Cc: Amy Ewing, VDGIF



Wellman, Julia <julia.wellman@deq.virginia.gov>

ESSLog# 39099_18-057F_ANCSouthernSection_DGIF_AME20180508

1 message

Amy Ewing <amy.ewing@dgif.virginia.gov>
To: Julia Wellman <julia.wellman@deq.virginia.gov>
Cc: rr nhreview <nhreview@dcr.virginia.gov>

Tue, May 8, 2018 at 12:30 PM

Based on the scope and location of the proposed work, we do not anticipate it to result in significant adverse impacts upon listed species or designated resources under our jurisdiction.

This project is located within 2 miles of a documented occurrence of a state or federal threatened or endangered plant or insect species and/or other Natural Heritage coordination species. Therefore, we recommend coordination with VDCR-DNH regarding the protection of these resources.

To minimize overall impacts to wildlife and our natural resources, we offer the following comments about development activities: We recommend that the applicant avoid and minimize impacts to undisturbed forest, wetlands, and streams to the fullest extent practicable. We recommend maintaining undisturbed naturally vegetated buffers of at least 100 feet in width around all on-site wetlands and on both sides of all perennial and intermittent streams.

We recommend that the stormwater controls for this project be designed to replicate and maintain the hydrographic condition of the site prior to the change in landscape. This should include, but not be limited to, utilizing bioretention areas, and minimizing the use of curb and gutter in favor of grassed swales. Bioretention areas (also called rain gardens) and grass swales are components of Low Impact Development (LID). They are designed to capture stormwater runoff as close to the source as possible and allow it to slowly infiltrate into the surrounding soil. They benefit natural resources by filtering pollutants and decreasing downstream runoff volumes.

We recommend that all tree removal and ground clearing adhere to a time of year restriction protective of resident and migratory songbird nesting from March 15 through August 15 of any year.

We recommend adherence to erosion and sediment controls during ground disturbance.

Assuming adherence to erosion and sediment controls, we find this project consistent with the Fisheries Management Section of the CZMA.

Thanks, Amy

Amy Ewing

Environmental Services Biologist

5/8/2018

Commonwealth of Virginia Mail - ESSLog# 39099_18-057F_ANCSouthernSection_DGIF_AME20180508



Manager, Fish and Wildlife Information Services

P [804.367.2211](tel:804.367.2211)

A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228-0778

www.dgif.virginia.gov

CONSERVE. CONNECT. PROTECT.



Wellman, Julia <julia.wellman@deq.virginia.gov>

proposed Arlington National Cemetery Southern Expansion Area, Arlington Co. (DHR #2014-1094; DEQ #18-057F)

1 message

Holma, Marc <marc.holma@dhr.virginia.gov>
To: Julia Wellman <julia.wellman@deq.virginia.gov>

Wed, Apr 18, 2018 at 9:18 AM

Julia,

The DHR has received DEQ's request for our review and comment regarding the above referenced project. In 2014 Arlington National Cemetery (ANC) initiated consultation with our office pursuant to Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation 36 CFR Part 800. Meetings and additional coordination between ANC and DHR have occurred since 2014. Consultation for the undertaking has not concluded; however, we anticipate ANC will continue to involve DHR as the project planning progresses. We request that DEQ remind ANC to continue Section 106 consultation with DHR as federal law requires.

Sincerely,
Marc



MEMORANDUM

TO: Julia Wellman, DEQ/EIR Environmental Program Planner

FROM: Katy Dacey, Division of Land Protection & Revitalization Review Coordinator

DATE: April 18, 2018

COPIES: Sanjay Thirunagari, Division of Land Protection & Revitalization Review Manager; file

SUBJECT: Environmental Impact Review: EIR Project No. 18-057F Southern Expansion Project, Arlington National Cemetery, Arlington County, VA

The Division of Land Protection & Revitalization (DLPR) has completed its review of the February 2018 EIR for the Southern Expansion Project located at Arlington National Cemetery in Arlington, Virginia 22211

Project Scope: establish a single contiguous parcel of land for cemetery expansion by closing a relocating roadways

Solid and hazardous waste issues were addressed within the submittal. The submittal did not clearly indicate that a search of Federal or State environmental databases was conducted. DLPR staff conducted a search (2000-foot radius) of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity to the project area. DLPR search did identify three waste sites within the project area, which might affect the project. Additionally, one waste site of possible concern were located within the zip code of the project area, 22211. DLPR staff has reviewed the submittal and offers the following comments:

Hazardous Waste/RCRA Facilities – none is the project area

CERCLA Sites – one in close proximity to the project area

- 1. VA8210020626, Fort Myer, 204 Lee Avenue, Route 50 Next to Arlington National, Fort Myer, VA 22211. Not on NPL. Federal Facility***

The above information related to hazardous wastes, RCRA/CERCLA sites can be accessed from EPA's websites at <https://www3.epa.gov/enviro/>,

<https://rcrainfopreprod.epa.gov/rcrainfoweb/action/main-menu/view> and <https://www.epa.gov/superfund>

Formerly Used Defense Sites (FUDS) – none in close proximity to the project area

Solid Waste – none in close proximity to the project area

Virginia Remediation Program (VRP) – none in close proximity to the project area

Petroleum Releases – three in close proximity to the project area (*denotes same location)

1. *PC#19944087, Federal Office Building, Columbia Pike and Old Ridge Road, Arlington, VA 22211. Release Date: 05/26/1994, Status: Closed*
2. *PC#19963049, Cafritz Property – Riverhouse I, 1111 Army Navy Drive, Arlington, VA 22202. Release Date: 09/28/1995, Status: Closed*
3. *PC#20173142, Quarters K Navy Exchange Gas Station, 801 S. Joyce Street, Arlington, VA 22204. Release Date: 02/22/2017, Status: Closed*

** PC#19954100, Navy Annex Gas Station, 801 S. Joyce Street, Arlington, VA 22204. Release Date: 10/20/1994, Status: Closed*

Please note that the DEQ's Pollution Complaint (PC) cases identified should be further evaluated by the project engineer or manager to establish the exact location, nature and extent of the petroleum release and the potential to impact the proposed project. In addition, the project engineer or manager should contact the DEQ's Northern Regional Office at (703) 583-3800 (Tanks Program) for further information about the PC cases.

PROJECT SPECIFIC COMMENTS

None

GENERAL COMMENTS

Soil, Sediment, Groundwater, and Waste Management

Any soil, sediment or groundwater that is suspected of contamination or wastes that are generated must be tested and disposed of in accordance with applicable Federal, State, and local laws and regulations. Some of the applicable state laws and regulations are: Virginia Waste Management Act, Code of Virginia Section 10.1-1400 *et seq.*; Virginia Hazardous Waste Management Regulations (VHWMR) (9VAC 20-60); Virginia Solid Waste Management Regulations (VSWMR) (9VAC 20-81); Virginia Regulations for the Transportation of Hazardous Materials (9VAC 20-110). Some of the applicable Federal laws and regulations are: the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901 *et seq.*, and the applicable regulations contained in Title 40 of the Code of Federal Regulations; and the U.S. Department of Transportation Rules for Transportation of Hazardous Materials, 49 CFR Part 107.

Asbestos and/or Lead-based Paint

All structures being demolished/renovated/removed should be checked for asbestos-containing materials (ACM) and lead-based paint (LBP) prior to demolition. If ACM or LBP are found, in addition to the

federal waste-related regulations mentioned above, State regulations 9VAC 20-81-620 for ACM and 9VAC 20-60-261 for LBP must be followed. Questions may be directed to Kathryn Perszyk at the DEQ's Northern Virginia Regional Office at (703) 583-3856.

Pollution Prevention – Reuse - Recycling

Please note that DEQ encourages all construction projects and facilities to implement pollution prevention principles, including the reduction, reuse, and recycling of all solid wastes generated. All generation of hazardous wastes should be minimized and handled appropriately.

If you have any questions or need further information, please contact Katy Dacey at (804) 698-4274.



Wellman, Julia <julia.wellman@deq.virginia.gov>

Fwd: NEW PROJECT: DEQ #18-057F Southern Expansion Project, Arlington National Cemetery

1 message

Miller, Mark <mark.miller@deq.virginia.gov>
To: Julia Wellman <julia.wellman@deq.virginia.gov>

Fri, May 4, 2018 at 9:43 AM

Northern Regional Office comments regarding the Federal Consistency Determination for *Southern Expansion Project, Arlington National Cemetery, DEQ #18-057F, Arlington County*, are as follows:

Land Protection Division – The project manager is reminded that if any solid or hazardous waste is generated/encountered during construction, the project manager would follow applicable federal, state, and local regulations for their disposal.

Air Compliance/Permitting - The project manager is reminded that during the construction phases that occur with this project; the project is subject to the Fugitive Dust/Fugitive Emissions Rule 9 VAC 5-50-60 through 9 VAC 5-50-120. In addition, should any open burning or use of special incineration devices be employed in the disposal of land clearing debris during demolition and construction, the operation would be subject to the Open Burning Regulation 9 VAC 5-130-10 through 9 VAC 5-130-60 and 9 VAC 5-130-100.

Virginia Water Protection Permit (VWPP) Program – The project manager is reminded that a VWP permit from DEQ may be required should impacts to surface waters be necessary. DEQ VWP staff recommends that the avoidance and minimization of surface water impacts to the maximum extent practicable as well as coordination with the US Army Corps of Engineers. Upon receipt of a Joint Permit Application for the proposed surface water impacts, DEQ VWP Permit staff will review the proposed project in accordance with the VWP permit program regulations and current VWP permit program guidance.

Erosion and Sediment Control and Storm Water Management: DEQ has regulatory authority for the Virginia Pollutant Discharge Elimination System (VPDES) programs related to municipal separate storm sewer systems (MS4s) and construction activities. Erosion and sediment control measures are addressed in local ordinances and State regulations. Additional information is available at <http://www.deq.virginia.gov/Programs/Water/StormwaterManagement.aspx>. Non-point source pollution resulting from this project should be minimized by using effective erosion and sediment control practices and structures. Consideration should also be given to using permeable paving for parking areas and walkways where appropriate, and denuded areas should be promptly revegetated following construction work. If the total land disturbance exceeds 10,000 square feet, an erosion and sediment control plan will be required. Some localities also require an E&S plan for disturbances less than 10,000 square feet. A stormwater management plan may also be required. For any land disturbing activities equal to one acre or more, you are required to apply for coverage under the VPDES General Permit for Discharges of Storm Water from Construction Activities. The Virginia Stormwater Management Permit Authority may be DEQ or the locality.

Mark L Miller
Environmental Manager II - Enforcement, Pollution Response, EIR
Department of Environmental Quality - NRO
13901 Crown Court, Woodbridge, VA 22193
Ph: 703.583.3850
mark.miller@deq.virginia.gov



Wellman, Julia <julia.wellman@deq.virginia.gov>

Re: NEW PROJECT: DEQ #18-057F Southern Expansion Project, Arlington National Cemetery

1 message

Warren, Arlene <arlene.warren@vdh.virginia.gov>
To: "Wellman, Julia" <julia.wellman@deq.virginia.gov>

Thu, May 3, 2018 at 10:14 AM

Project Name: Southern Expansion Project, Arlington National Cemetery**Project #: 18-057F**

UPC #: N/A

Location: Arlington County

VDH – Office of Drinking Water has reviewed the above project. Below are our comments as they relate to proximity to **public drinking water sources** (groundwater wells, springs and surface water intakes). Potential impacts to public water distribution systems or sanitary sewage collection systems **must be verified by the local utility**.

There are no public groundwater wells within a 1-mile radius of the project site.

There are no surface water intakes located within a 5-mile radius of the project site.

The project is not within the watershed of any public surface water intakes.

There are no apparent impacts to public drinking water sources due to this project.

- No comments were received from the Office of Environmental Epidemiology, Caroline Holsinger, Director.
- No comments were received from the Office of Environmental Epidemiology, Mr. Dwight Flammia. State PH Toxicologist.

The Virginia Department of Health – Office of Drinking Water appreciates the opportunity to provide comments. If you have any questions, please let me know.

On Wed, Apr 4, 2018 at 4:29 PM, Wellman, Julia <julia.wellman@deq.virginia.gov> wrote:

Good afternoon - this is a new OEIR review request/project:

Document Type: Environmental Assessment/Federal Consistency Determination**Project Sponsor: U.S. Department of the Army****Project Title: Southern Expansion Project, Arlington National Cemetery****Location: Arlington County****Project Number: DEQ #18-057F**

The document is available at <http://www.deq.virginia.gov/filesshare/oeir/ARMY/Arlington%20National%20Cemetery%20Southern%20Expansion%20Project/> .

The due date for comments is MAY 3, 2018. You can send your comments either directly to JULIA WELLMAN by email (Julia.Wellman@deq.virginia.gov), or you can send your comments by regular interagency/U.S. mail to the Department of Environmental Quality, Office of Environmental Impact Review, 1111 East Main St., Richmond, VA 23219 (please note new street address).



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 1111 East Main Street, Suite 1400, Richmond, VA 23219

Mailing address: P.O. Box 1105, Richmond, Virginia 23218

www.deq.virginia.gov

Matthew J. Strickler
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

September 18, 2018

Ms. Kathy Perdue
Department of the Army
U.S. Army Corps of Engineers, Norfolk District
Planning and Policy Branch
803 Front St.
Norfolk, VA 23510

RE: U.S. Department of the Army, Draft Environmental Assessment: Arlington National Cemetery Southern Expansion, Arlington County (DEQ 18-123F).

Dear Ms. Perdue:

The Commonwealth of Virginia has completed its review of the draft Environmental Assessment (EA) that was announced in the Federal Register on August 16, 2018 for the above-referenced project. The Department of Environmental Quality (DEQ) is responsible for coordinating Virginia's review of federal environmental documents prepared pursuant to the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth.

The U.S. Army Corps of Engineers (Corps) previously released a draft EA, including a federal consistency determination (FCD), in April 2018. DEQ reviewed that EA and FCD and responded to the Corps on May 17, 2018. DEQ also reviewed the latest draft EA and asked the Department of Conservation and Recreation (DCR), Department of Historic Resources, Northern Virginia Regional Commission and Arlington County to comment. Reviewers did not provide additional new comments. Therefore, the comments submitted by DEQ on May 17, 2018 remain valid and are being submitted again for your consideration.

Sincerely,

Bettina Rayfield, Manager

Environmental Impact Review and Long Range
Priorities Program

Enclosures

ec: Robbie Rhur, DCR
Mark Gibb, NRVC
March Schwartz, Arlington County
Greg Hegge, Corps
Robert Bolich, HNTB
Kathy Perdue, Corps
Southern Expansion Email Address

[This page is left intentionally blank]

APPENDIX E

STORMWATER MANAGEMENT

[This page is left intentionally blank]

From: [Gregg Schwieterman](mailto:Gregg.Schwieterman)
To: [Robert Bolich](mailto:Robert.Bolich)
Subject: FW: ANC Southern Expansion
Date: Tuesday, December 06, 2016 1:00:36 PM

-----Original Message-----

From: Hegge, Greg E NAO [<mailto:greg.e.hegge@usace.army.mil>]
Sent: Thursday, June 09, 2016 2:48 PM
To: Gregg Schwieterman <gswieterman@HNTB.com>
Subject: FW: ANC Southern Expansion

See below guidance from VDEQ on TMDL reductions.

Greg Hegge, P.E., PMP
Arlington National Cemetery Program Manager USACE, Norfolk District Phone 757-201-7016 (rings through to BB) greg.e.hegge@usace.army.mil

-----Original Message-----

From: Rosenquist, Stacey M CIV (US) [<mailto:stacey.m.rosenquist.civ@mail.mil>]
Sent: Thursday, June 09, 2016 2:46 PM
To: Hegge, Greg E NAO <greg.e.hegge@usace.army.mil>
Subject: [EXTERNAL] FW: ANC Southern Expansion

-----Original Message-----

From: Selengut, Jeffrey (DEQ) [<mailto:Jeffrey.Selengut@deq.virginia.gov>]
Sent: Friday, December 04, 2015 7:25 AM
To: Rosenquist, Stacey M CIV (US) <stacey.m.rosenquist.civ@mail.mil>
Subject: [Non-DoD Source] RE: ANC Southern Expansion

Stacey,

You can consider the land use prior to 2013, you could take it back as far as 2006.

-----Original Message-----

From: Rosenquist, Stacey M CIV (US) [<mailto:stacey.m.rosenquist.civ@mail.mil>]
Sent: Thursday, December 03, 2015 5:22 PM
To: Selengut, Jeffrey (DEQ)
Subject: ANC Southern Expansion

Jeff,

As we discussed this afternoon, in the near future JBMHH will transfer approximately 37 acres to ANC. This property was formerly known as the Navy Annex. The Navy Annex consisted of Office Buildings, parking lots, and a gas station. The structures were demolished in 2013. Currently, the vacant land is primarily turf.

WRT to TMDL reductions (IAW MS4 permit), should ANC consider the property use prior to 2013 (developed) or as received (undeveloped)?

Stacey M. Rosenquist
Environmental Compliance

Arlington National Cemetery
703-614-0520

ESC Combined Administrator #6164

APPENDIX F

BIOLOGICAL RESOURCES

[This page is left intentionally blank]



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Date: 7/11/19

Self-Certification Letter

Project Name: Arlington National Cemetery Southern Expansion

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Virginia Ecological Services online project review process. By printing this letter in conjunction with your project review package, you are certifying that you have completed the online project review process for the project named above in accordance with all instructions provided, using the best available information to reach your conclusions. This letter, and the enclosed project review package, completes the review of your project in accordance with the Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). This letter also provides information for your project review under the National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, 83 Stat. 852), as amended. A copy of this letter and the project review package must be submitted to this office for this certification to be valid. This letter and the project review package will be maintained in our records.

The species conclusions table in the enclosed project review package summarizes your ESA conclusions. These conclusions resulted in:

- “no effect” determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR § 17.40(o) [as determined through the Information, Planning, and Consultation System (IPaC) northern long-eared bat assisted determination key]; and/or
- “may affect, not likely to adversely affect” determinations for proposed/listed species and/or proposed/designated critical habitat.

We certify that use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with the "no effect" or "may affect, not likely to adversely affect" determinations for proposed and listed species and proposed and designated critical habitat. Additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages consideration of these species by avoiding adverse impacts to them. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of proposed or listed species, proposed or designated critical habitat becomes available, this determination may be reconsidered. This certification letter is valid for 1 year.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Virginia is available at our website http://www.fws.gov/northeast/virginiafield/endspecies/project_reviews.html. If you have any questions, please contact Troy Andersen of this office at (804) 824-2428.

Sincerely,



Cindy Schulz
Field Supervisor
Virginia Ecological Services

Enclosures - project review package



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
<http://www.fws.gov/northeast/virginiafield/>

In Reply Refer To:

July 11, 2019

Consultation Code: 05E2VA00-2016-SLI-3115

Event Code: 05E2VA00-2019-E-12664

Project Name: Arlington National Cemetery, Southern Expansion

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

<http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF>

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (<http://www.fws.gov/windenergy/>) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm>; <http://www.towerkill.com>; and <http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html>.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office

6669 Short Lane

Gloucester, VA 23061-4410

(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2016-SLI-3115

Event Code: 05E2VA00-2019-E-12664

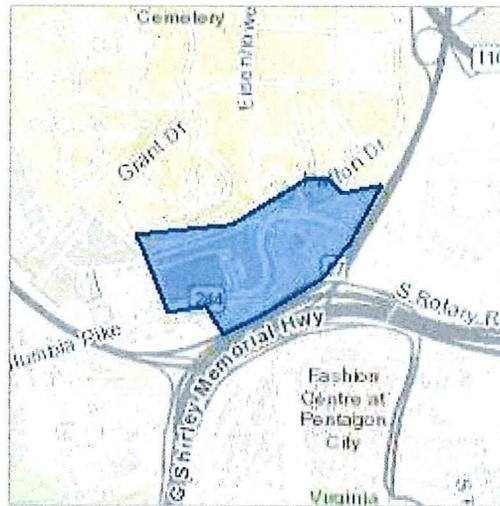
Project Name: Arlington National Cemetery, Southern Expansion

Project Type: DEVELOPMENT

Project Description: The applicant proposes to complete a 49-acre addition to the existing cemetery. The total project area is approximately 70 acres, because the cemetery expansion also includes: the relocation of the Operations Center, the integration of the existing Air Force Memorial into the cemetery, and the realignment of the existing roadway network, which will require a land exchange agreement with Arlington County for closure of its Southgate Road corridor and realignment of Columbia Pike and Joyce Street. The property is bound on the south by Interstate 395 (I-395), on the north by Southgate Road, on the west by the Foxcroft Heights neighborhood and the Virginia Department of Transportation (VDOT) maintenance yard, and on the east by the ramps connecting Columbia Pike to Route 27. Most of the land was formerly the Navy Annex and parking areas. All of that development has been removed in preparation for the cemetery expansion, which will include new inground inurnment and internment sites, columbaria, and possibly niche walls for urns. The site development will also include internal roadways and sidewalks to access the gravesites, as well as committal shelters, restrooms etc. There are no wetlands or waters of the US on the property.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/place/38.86898351193686N77.06643391739519W>



Counties: Arlington, VA

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

-
1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

VaFWIS Search Report Compiled on 7/11/2019, 2:36:19 PM

[Help](#)

Known or likely to occur within a **3 mile radius around point 38.8689840 -77.0664335**
in **013 Arlington County, 510 Alexandria City, VA**

[View Map of Site Location](#)

580 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 24) (24 species with Status* or Tier I** or Tier II**)

<u>BOVA Code</u>	<u>Status*</u>	<u>Tier**</u>	<u>Common Name</u>	<u>Scientific Name</u>
010032	FESE	Ib	Sturgeon, Atlantic	Acipenser oxyrinchus
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis
050020	SE	Ia	Bat, little brown	Myotis lucifugus
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus
060006	SE	Ib	Floater, brook	Alasmidonta varicosa
030062	ST	Ia	Turtle, wood	Glyptemys insculpta
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus
100155	ST	Ia	Skipper, Appalachian grizzled	Pyrgus wyandot
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans
030063	CC	IIIa	Turtle, spotted	Clemmys guttata
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus
040040		Ia	Ibis, glossy	Plegadis falcinellus
100248		Ia	Fritillary, regal	Speyeria idalia idalia
040213		Ic	Owl, northern saw-whet	Aegolius acadicus
040052		IIa	Duck, American black	Anas rubripes
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea
040181		IIa	Tern, common	Sterna hirundo
040320		IIa	Warbler, cerulean	Setophaga cerulea
040140		IIa	Woodcock, American	Scolopax minor
040203		IIb	Cuckoo, black-billed	Coccyzus erythrophthalmus
040105		IIb	Rail, king	Rallus elegans
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii
070020		IIc	Amphipod, Pizzini's	Stygobromus pizzinii
100154		IIc	Butterfly, Persius duskywing	Erynnis persius persius

To view **All 580 species** [View 580](#)

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need;
II=VA Wildlife Action Plan - Tier II - Very High Conservation Need;
III=VA Wildlife Action Plan - Tier III - High Conservation Need;

IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need

Virginia Wildlife Action Plan Conservation Opportunity Ranking:

- a - On the ground management strategies/actions exist and can be feasibly implemented.;
- b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
- c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Anadromous Fish Use Streams (2 records)

[View Map of All Anadromous Fish Use Streams](#)

Stream ID	Stream Name	Reach Status	Anadromous Fish Species			View Map
			Different Species	Highest TE *	Highest Tier **	
C25	Fourmile run	Confirmed	2			Yes
C64	Potomac river	Confirmed	6		IV	Yes

Impediments to Fish Passage

N/A

Threatened and Endangered Waters

N/A

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests (1 records)

[View Map of All Query Results Bald Eagle Nests](#)

Nest	N Obs	Latest Date	DGIF Nest Status	View Map
AR0801	6	Feb 28 2010	Unknown	Yes

Displayed 1 Bald Eagle Nests

Habitat Predicted for Aquatic WAP Tier I & II Species

N/A

Habitat Predicted for Terrestrial WAP Tier I & II Species (2 Species)

ordered by
Status Concern
for

[View Map of Combined Terrestrial Habitat Predicted for 2 WAP Tier I & II Species Listed Below](#)

Conservation

BOVA Code	Status*	Tier**	Common Name	Scientific Name	View Map
040105		Iib	Rail, king	Rallus elegans	Yes
040038			Bittern, American	Botaurus lentiginosus	Yes

Virginia Breeding Bird Atlas Blocks (5 records)

[View Map of All Query Results
Virginia Breeding Bird Atlas Blocks](#)

BBA ID	Atlas Quadrangle Block Name	Breeding Bird Atlas Species			View Map
		Different Species	Highest TE*	Highest Tier**	
54194	Alexandria, CE	49		II	Yes
54193	Alexandria, CW	27		IV	Yes
54192	Alexandria, NE	32		II	Yes
54191	Alexandria, NW	58		III	Yes
54205	Washington West, SW	65		III	Yes

Public Holdings: (5 names)

Name	Agency	Level
Arlington House National Historical Site	National Park Service	Federal
George Washington Memorial National Parkway	National Park Service	Federal
Arlington National Cemetery	U.S. Dept. of Army	Federal
Fort Myer Military Reservation	U.S. Dept. of Army	Federal
The Pentagon	U.S. Dept. of Army	Federal

Summary of BOVA Species Associated with Cities and Counties of the Commonwealth of Virginia:

FIPS Code	City and County Name	Different Species	Highest TE	Highest Tier
013	Arlington	458	FESE	I
510	Alexandria City	475	FESE	I

USGS 7.5' Quadrangles:

Alexandria
Washington West

USGS NRCS Watersheds in Virginia:

N/A

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

HU6 Code	USGS 6th Order Hydrologic Unit	Different Species	Highest TE	Highest Tier
PL24	Potomac River-Pimmit Run	68	SE	I
PL25	Potomac River-Fourmile Run	67	ST	I
PL26	Cameron Run	69	ST	I

Compiled on 7/11/2019, 2:36:19 PM V983312.0 report=V searchType=R dist= 4827 poi= 38.8689840 -77.0664335

Site Location

38,52,08.3 -77,03,59.1
is the Search Point

Show Position Rings

Yes No
1 mile and 1/4 mile at the Search Point

Show Search Area

Yes No
3 Search distance miles radius

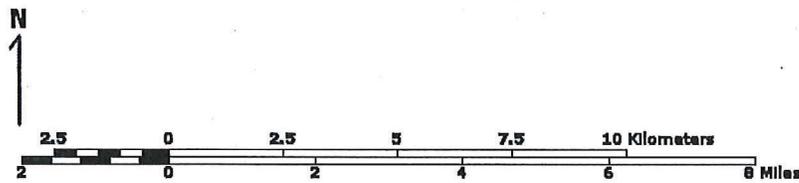
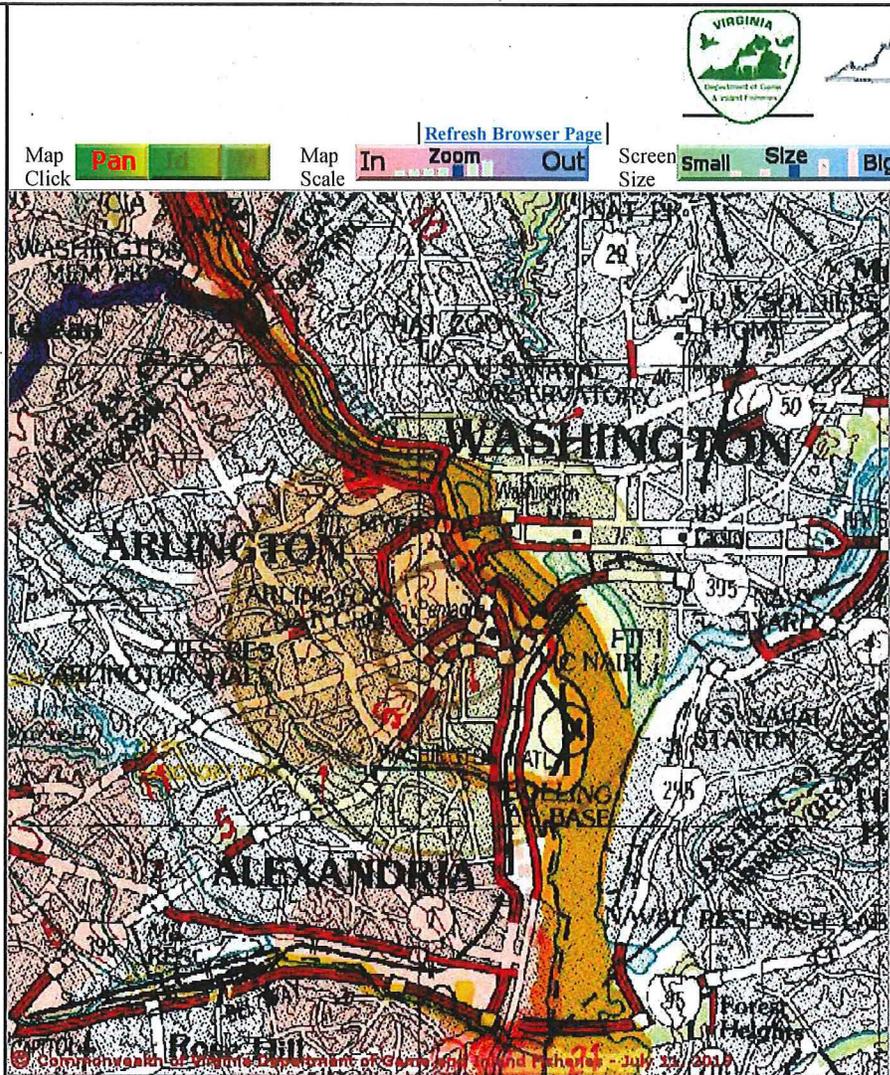
Search Point is at map center

Base Map Choices

Topography

Map Overlay Choices

Current List: Position, Search, BECAR, BAEANests, TEWaters, TierII, Habitat, Trout, Anadromous



Point of Search 38,52,08.3 -77,03,59.1

Map Location 38,52,08.3 -77,03,59.1

- Select Coordinate System:
- Degrees, Minutes, Seconds Latitude - Longitude
 - Decimal Degrees Latitude - Longitude
 - Meters UTM NAD83 East North Zone
 - Meters UTM NAD27 East North Zone

Base Map source: USGS 1:250,000 topographic maps (see [Microsoft terra-server-usa.com](http://Microsoft.terra-server-usa.com) for details)

Map projection is UTM Zone 18 NAD 1983 with left 311128 and top 4313867. Pixel size is 32 meters. Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixels. The map display represents 19200 meters east to west by 19200 meters north to south for a total of 368.6 square kilometers. The map display represents 63002 feet east to west by 63002 feet north to south for a total of 142.3 square miles.

Topographic maps and Black and white aerial photography for year 1990+-

Map Overlay Legend

<p>T & E Waters</p> <p>Federal</p> <p>State</p>	<p>are from the United States Department of the Interior, United States Geological Survey. Color aerial photography aquired 2002 is from Virginia Base Mapping Program, Virginia Geographic Information Network. Shaded topographic maps are from TOPO! ©2006 National Geographic http://www.national.geographic.com/topo All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.</p>
<p>Predicted Habitat WAP Tier I & II</p> <p>Aquatic</p> <p>Terrestrial</p>	<p>map assembled 2019-07-11 14:38:26 (qa/qc March 21, 2016 12:20 - tn=983312.0 dist=4827 Visitor) \$poi=38.8689840 -77.0664335</p>
<p>Trout Waters</p> <p>Class I - IV</p> <p>Class V - VI</p>	
<p>Anadromous Fish Reach</p> <p>Confirmed</p> <p>Potential</p>	
<p> Impediment</p>	
<p> Position Rings 1 mile and 1/4 mile at the Search Point</p>	
<p> 3 mile radius Search Area</p>	
<p>Bald Eagle Concentration Areas and Roosts</p>	

| [DGIF](#) | [Credits](#) | [Disclaimer](#) | Contact vafwis_support@dgif.virginia.gov | Please view our [privacy policy](#) |
© 1998-2019 Commonwealth of Virginia Department of Game and Inland Fisheries

1 Bald Eagle Nests

38,52,08.3 -77,03,59.1
is the Search Point

Show Position Rings

Yes No
1 mile and 1/4 mile at the Search Point

Show Search Area

Yes No
3 Search distance miles radius

Search Point is at map center

Base Map Choices

Topography

Map Overlay Choices

Current List: Position, Search, BAEANests

Map Overlay Legend

-  Position Rings
1 mile and 1/4 mile at the Search Point
-  3 mile radius Search Area
-  Bald Eagle nests
660 and 330 foot management zones



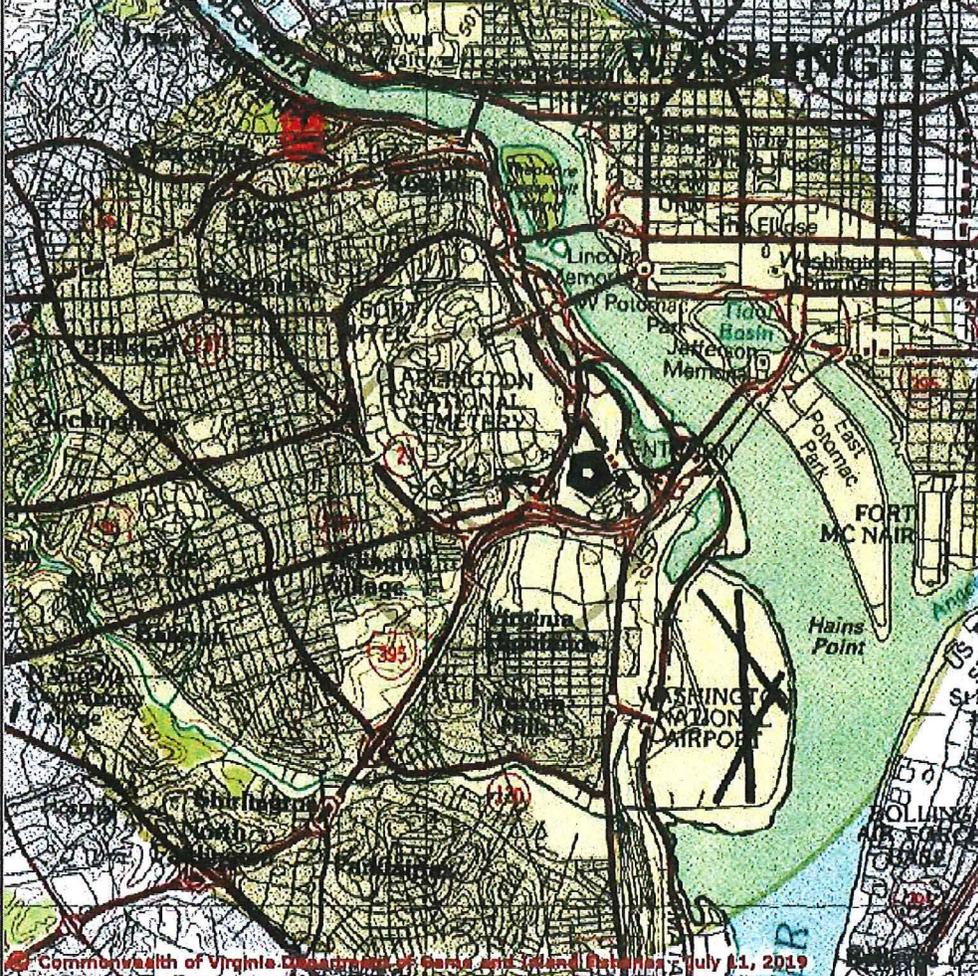

[Refresh Browser Page](#)

Map Click 

Map Scale  

Screen Size  

[Help](#)



© Commonwealth of Virginia Department of Game and Inland Fisheries July 11, 2019




Point of Search 38,52,08.3 -77,03,59.1

Map Location 38,52,08.3 -77,03,59.1

- Select **Coordinate System**:
- Degrees,Minutes,Seconds Latitude - Longitude
 - Decimal Degrees Latitude - Longitude
 - Meters UTM NAD83 East North Zone
 - Meters UTM NAD27 East North Zone

Base Map source: USGS 1:100,000 topographic maps (see [Microsoft terraserver-usa.com](http://Microsoft.terraserver-usa.com) for details)

Map projection is UTM Zone 18 NAD 1983 with left 315928 and top 4309067. Pixel size is 16 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixels. The map display represents 9600 meters east to west by 9600 meters north to south for a total of 92.1 square kilometers. The

map display represents 31501 feet east to west by 31501 feet north to south for a total of 35.5 square miles.

Topographic maps and Black and white aerial photography for year 1990+ are from the United States Department of the Interior, United States Geological Survey. Color aerial photography aquired 2002 is from Virginia Base Mapping Program, Virginia Geographic Information Network.

Shaded topographic maps are from TOPO! ©2006 National Geographic
<http://www.national.geographic.com/topo>

All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.

map assembled 2019-07-11 14:47:21 (qa/qc March 21, 2016 12:20 - tn=983312.0 dist=4827
Visitor)
\$poi=38.8689840 -77.0664335

| [DGIF](#) | [Credits](#) | [Disclaimer](#) | Contact vafwis_support@dgif.virginia.gov | Please view our [privacy policy](#) |
© 1998-2019 Commonwealth of Virginia Department of Game and Inland Fisheries

Molly Joseph Ward
Secretary of Natural Resources

Clyde E. Cristman
Director



COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of
Administration and Finance

David C. Dowling
Deputy Director of
Soil and Water Conservation
and Dam Safety

Thomas L. Smith
Deputy Director of Operations

May 24, 2016

Kathy Perdue
Norfolk District, Corps of Engineers
ATTN: CENAO-WR-R
803 Front Street
Norfolk, VA 23510-1096

Re: Arlington National Cemetery Southern Expansion Project and Associated Roadway Realignment Scoping

Dear Ms. Perdue:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Wood turtle (*Glyptemys insculpta*, G3/S2/NL/LT) has been documented downstream in Four Mile Run. The Wood turtle ranges from southeastern Canada, south to the Great Lake states and New England. In Virginia, it is known from northern counties within the Potomac River drainage (NatureServe, 2009). The Wood turtle inhabits areas with clear streams with adjacent forested floodplains and nearby fields, wet meadows, and farmlands (Buhlmann et al., 2008; Mitchell, 1994). Since this species overwinters on the bottoms of creeks and streams, a primary habitat requirement is the presence of water (Mitchell, 1994).

Threats to the wood turtle include habitat fragmentation, urbanization, and automobile or farm machinery mortality (Buhlmann et al., 2008). Please note that the Wood turtle is currently classified as threatened by the Virginia Department of Game and Inland Fisheries (VDGIF).

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. Due to the legal status of Wood turtle, DCR recommends coordination with Virginia's regulatory authority for the management and protection of this species, the VDGIF, to ensure compliance with the Virginia Endangered Species Act (VA ST §§ 29.1-563 – 570).

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

600 East Main Street, 24th Floor | Richmond, Virginia 23219 | 804-786-6124

**State Parks • Soil and Water Conservation • Outdoor Recreation Planning
Natural Heritage • Dam Safety and Floodplain Management • Land Conservation**

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from <http://vafwis.org/fwis/> or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

Should you have any questions or concerns, feel free to contact me at 804-692-0984. Thank you for the opportunity to comment on this project.

Sincerely,



Alli Baird, LA, ASLA
Coastal Zone Locality Liaison

Cc: DEQ Office of Environmental Impact Review
Amy Ewing, VDGIF

Literature Cited

Buhlmann, K, T. Tuberville, and W. Gibbons. 2008. Turtles of the southeast. University of Georgia Press. Athens, GA. 252 pp.

Mitchell, J. C. 1994. Reptiles of Virginia. Smithsonian Institution Press, Washington. pp. 88-91.

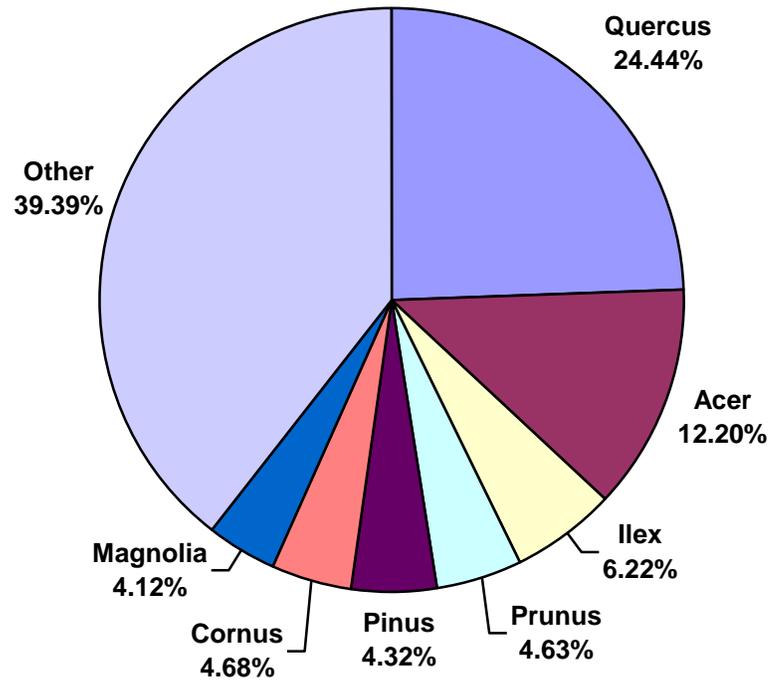
NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: April 8, 2010).

Arlington National Cemetery (existing cemetery)
Tree Genus Distribution
Total of 74 Genera
Total of 8633 Trees
January 13, 2015

Genus	Frequency	% Distribution
Quercus	2110	24.44
Acer	1053	12.20
Ilex	537	6.22
Cornus	404	4.68
Prunus	400	4.63
Pinus	373	4.32
Magnolia	356	4.12
Amelanchier	243	2.81
Cercis	229	2.65
Juniperus	219	2.54
Lagerstroemia	202	2.34
Tilia	169	1.96
Ulmus	143	1.66
Liquidambar	141	1.63
Nyssa	134	1.55
Carya	133	1.54
Malus	130	1.51
Cedrus	103	1.19
Liriodendron	102	1.18
Taxodium	95	1.10
X Cupressocyparis	93	1.08
Tsuga	92	1.07
Zelkova	91	1.05
Thuja	78	0.90
Ginkgo	76	0.88
Picea	70	0.81
Gleditsia	67	0.78
Platanus	66	0.76
Cladrastis	64	0.74
Betula	58	0.67
Crataegus	58	0.67
Fagus	55	0.64
Fraxinus	47	0.54
Carpinus	37	0.50
Morus	33	< 0.50
Aesculus	32	< 0.50
Chamaecyparis	32	< 0.50
Robinia	32	< 0.50

Gymnocladus	30	< 0.50
Diospyros	28	< 0.50
Styrax	28	< 0.50
Celtis	19	< 0.50
Metasequoia	19	< 0.50
Koelreuteria	17	< 0.50
Styphnolobium (Sophora)	13	< 0.50
Maackia	12	< 0.50
Pyrus	9	< 0.50
Castanea	8	< 0.50
Chionanthus	8	< 0.50
Ostrya	8	< 0.50
Viburnum	8	< 0.50
Juglans	7	< 0.50
Abies	6	< 0.50
Parrotia	6	< 0.50
Salix	6	< 0.50
Stewartia	5	< 0.50
Cercidiphyllum	4	< 0.50
Cryptomeria	4	< 0.50
Taxus	4	< 0.50
Halesia	3	< 0.50
Populus	3	< 0.50
Pseudolarix	3	< 0.50
Oxydendrum	3	< 0.50
Ailanthus	2	< 0.50
Asimina	2	< 0.50
Eucommia	1	< 0.50
Maclura	1	< 0.50
Paulownia	1	< 0.50
Phellodendron	1	< 0.50
Pistacia	1	< 0.50
Sassafras	1	< 0.50
Sciadopitys	1	< 0.50
Sorbus	1	< 0.50
Syringa	1	< 0.50

Arlington National Cemetery Tree Genus Distribution



APPENDIX G

CULTURAL RESOURCES

[This page is left intentionally blank]

**MEMORANDUM OF AGREEMENT
AMONG ARLINGTON NATIONAL CEMETERY,
THE VIRGINIA STATE HISTORIC PRESERVATION OFFICER, AND
THE AIR FORCE DISTRICT OF WASHINGTON REGARDING
THE SOUTHERN EXPANSION PROJECT
ARLINGTON NATIONAL CEMETERY
ARLINGTON COUNTY, VIRGINIA**

1. WHEREAS, Arlington National Cemetery (hereafter ANC), is proposing to develop approximately seventy (70) acres of land referred as the Southern Expansion Site (mapped in Attachment A, Figure 1) to increase ANC's land area contiguous with the existing cemetery and expand its burial capacity to meet the demands of eligible Veterans into the future (hereafter Project; Department of Historic Resources [DHR] Review No. 2014-1094); and

2. WHEREAS, ANC has determined that the proposed Project is an "undertaking" as defined in 36 C.F.R. § 800.16(y); and

3. WHEREAS, ANC has consulted with the Virginia State Historic Preservation Officer, (hereafter SHPO) to define the area of potential effects (hereafter APE) for the Projects in accordance with 36 C.F.R. § 800.16(d) and identified the Project's direct, or physical APE as areas of ground disturbance, including areas of grading, cutting, and/or filling; areas where existing building and infrastructure removal will take place; and the indirect, or visual APE as the viewshed of all of the proposed construction associated with the Project (mapped in Attachment A, Figure 2); and

4. WHEREAS, ANC, in consultation with the SHPO and the other Consulting Parties, has conducted efforts to identify historic properties located within the APE for the Project, as documented in the *Summary of Information for National Historic Preservation Act Section 106 Compliance, ANC Southern Expansion Project* and included as Attachment B of this Memorandum of Agreement (hereafter Agreement); and

5. WHEREAS, ANC, in consultation with the SHPO and the other Consulting Parties, has determined that the Air Force Memorial (hereafter AFM; DHR Inventory No. 000-9821) located within ANC property is eligible for listing in the National Register of Historic Places (hereafter NRHP) under Criteria A and C, and under Criteria Considerations F and G; and

6. WHEREAS, ANC, in consultation with the SHPO and the other Consulting Parties, has identified, in addition to the AFM, the following historic properties as defined in 36 C.F.R. § 800.16(l), as being located within the Project APE: ANC Historic District (DHR Inventory No. 000-0042); and

7. WHEREAS, ANC, in consultation with the SHPO and the other Consulting Parties, has determined that the circa 1897 blue granite boundary wall (DHR Inventory No. 000-0042-0017; hereafter Boundary Wall), Patton Drive, and the Service Complex, all located

within ANC, contribute to the NRHP listed ANC Historic District for their association with the history and development of ANC; and

8. **WHEREAS**, ANC, in consultation with the SHPO and the other Consulting Parties, has determined that the Project will have an adverse effect upon the ANC Historic District by removing an estimated 2909-foot portion of the Boundary Wall, converting a portion of Patton Drive, from the South Gate to the current site of the Service Complex, into a pedestrian trail, and demolishing the Service Complex; and

9. **WHEREAS**, ANC, in consultation with the SHPO and the other Consulting Parties, has determined that the Project will have an adverse effect upon the AFM by converting Air Force Memorial Drive and parking spaces into a predominantly pedestrian area, enlarging and remodeling the guardhouse, relocating the dedication and founders walls (with quotes), and other changes to the resource's historic designed landscape; and

10. **WHEREAS**, ANC, in consultation with the SHPO and the other Consulting Parties, has sought to minimize adverse effects to historic properties by modifying the Project design after soliciting comments from the SHPO and the other Consulting Parties, which has resulted in the reduction of adverse effects on historic landscapes and the avoidance of impacts to historic properties; and

11. **WHEREAS**, ANC, in accordance with 36 C.F.R. § 800.6(c)(2)(i), has invited the Air Force District of Washington (hereafter AFDW), which manages the AFM, to participate as a signatory, and AFDW has accepted; and

12. **WHEREAS**, ANC, in accordance with 36 C.F.R. § 800.6(a)(1), has notified the Advisory Council on Historic Preservation (hereafter ACHP) of its adverse effect determination providing the specified documentation, and the ACHP has chosen not to participate in the consultation pursuant to 36 C.F.R. § 800.6(a)(1)(iii) in a letter dated 24 May 2019; and

13. **WHEREAS**, ANC, in accordance with 36 C.F.R. § 800.2(c)(2), has invited the following federally recognized Indian tribes, for which ANC may have religious and cultural significance, to participate in consultation on this Project: the Absentee-Shawnee Tribe of Indians of Oklahoma, Cayuga Nation, Delaware Tribe of Indians, Eastern Shawnee Tribe of Oklahoma, Oneida Indian Nation, Oneida Tribe of Indians of Wisconsin, Onondaga Indian Nation, Pamunkey Indian Tribe, Saint Regis Mohawk Tribe, Seneca-Cayuga Tribe of Oklahoma, Seneca Nation of New York, Shawnee Tribe, Tonawanda Band of Seneca Indians of New York, Tuscarora Nation, Cherokee Nation, Eastern Band of Cherokee Indians, United Keetoowah Band of Cherokee Indians, and the Catawba Indian Tribe; and

14. WHEREAS, the Catawba Indian Nation has indicated that they want to participate in consultation on this Project and other tribes invited have either declined or not responded; and

15. WHEREAS, ANC, in accordance with 36 C.F.R. § 800.2(c)(3), has identified and invited Arlington County to participate in consultation on this Project as the local government and to sign this Agreement as a concurring party in accordance with 36 C.F.R. § 800.6(c)(3) and Arlington County has agreed; and

16. WHEREAS, ANC, in accordance with 36 C.F.R. § 800.2(c)(5) has identified and invited the following organizations to participate in consultation on this Project: the U.S. Commission of Fine Arts, the National Capital Planning Commission, the National Park Service – George Washington Memorial Parkway, Washington Headquarters Service, AFDW, JBM-HH, the National Trust for Historic Preservation, Preservation Virginia (formerly the Association for the Preservation of Virginia Antiquities), the Arlington Historical Society, Inc., and the Historical Society of Washington DC; and

17. WHEREAS, Washington Headquarters Service, National Park Service – George Washington Memorial Parkway, Preservation Virginia, and the Historical Society of Washington DC have not indicated that they want to participate in consultation on this Project; and

18. WHEREAS, the U.S. Commission of Fine Arts, the National Capital Planning Commission, JBM-HH, the Arlington Historical Society, Inc., and the National Trust for Historic Preservation did participate in the development of the Agreement as Consulting Parties (referenced herein by name, as Consulting Party or collectively as Consulting Parties); and

19. WHEREAS, ANC has responded to the interests of Consulting Parties and the public through a series of meetings (27 April 2016, 21 September 2017, 22 August 2018, 11 March 2019, 12 April 2019), and site visits (October 2014, 22 August 2018, 18 December 2018), and has provided studies of the potential effects of the Project to historic properties to the SHPO and the other Consulting Parties, and

20. WHEREAS, ANC has sought and considered the views of the public on this undertaking as evidenced by a public notice and publication of a draft Environmental Assessment (hereafter EA) released 18 August 2018 prepared and issued as part of ANC's compliance with the National Environmental Policy Act, that describes potential effects to historic properties and requests the public's comments and ANC held a public meeting on 22 August, 2018 to solicit comments. ANC received these comments over a thirty (30)-day period, and replied to them as documented in the EA;

NOW, THEREFORE, ANC, AFDW, and SHPO agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effect of the Project on historic properties.

STIPULATIONS

ANC shall ensure that the following stipulations are implemented:

I. Documentation of the Boundary Wall (DHR Inventory No. 000-0042-0017), Air Force Memorial (DHR Inventory No. 000-9621), Service Complex, and ANC Historic District (DHR Inventory No. 000-0042) Landscape.

A. Within six (6) months of the execution of this Agreement, and before any demolition is to occur for the Project, ANC shall update documentation of the estimated 2909-foot portion of the Boundary Wall that will be demolished as a result of the Project. The documentation shall include, at a minimum, the following:

1. Documentation of the exact, to the degree reasonably possible, dates of construction, modification, and repair of the various sections of the wall to be demolished by the Project. Sources consulted to include, but not be limited to: ANC archives, US Army Corps of Engineers (Norfolk and Baltimore Districts), National Archives, Library of Congress, and USGS aerial photography.
2. Petrographic identification of the type of stone used in various parts of the wall to be demolished in the Project, and identification of quarries.
3. Copies of historic photographs and maps showing the Boundary Wall.

B. Within six (6) months of execution of this Agreement, and before any construction is to occur for the project, ANC shall document the approximately nine (9)-acre area of the Service Complex. The documentation shall include, at a minimum, the following:

1. Three and a half by five inch (3.5" X 5") black and white photographic prints of the exteriors and interiors of the buildings, and tagged image format files on archival quality disks.
2. Copies of construction plans for buildings in the Service Complex.
3. Site plan of the Service Complex.
4. Completion of DHR Reconnaissance (Phase I) Level Architectural Survey Forms for each of the buildings and structures in the Service Complex. ANC shall also enter the survey information electronically into DHR's Virginia Cultural Resources Inventory System (V-CRIS).

C. Within six (6) months of execution of this Agreement, and before any construction is to occur for the project, ANC shall document the approximately 1.7-acre area of the Air Force Memorial proposed for conversion to burial and pedestrian space.

1. The documentation shall include the circle drive, the landscaping, the western wall barrier, the left front flags and dedication.
2. The documentation shall meet the standards of Historic American Building Survey/Historic American Engineering Record/Historic American Landscape Survey (HABS/HAER/HALS) Level III (Federal Register / Vol. 68, No. 139 / Monday, July 21, 2003).
3. ANC shall submit the documentation to the HABS/HAER/HALS program for review, and deposit in the Library of Congress upon acceptance.

D. ANC shall provide the SHPO with the draft documentation on the Boundary Wall, Air Force Memorial, and Service Complex for review and approval and the other Consulting Parties for review and comment. The SHPO and the Consulting Parties shall have thirty (30) days to comment on the documentation. ANC shall consider, and incorporate them into the final draft as appropriate, all comments received on the documentation. If the SHPO or any Consulting Party does not respond within the thirty (30)-day review period ANC may assume that the non-responsive party has no comment. Demolition of the Boundary Wall shall not proceed until the documentation has been approved by SHPO, unless thirty (30) days have passed without comment from the SHPO.

E. Once the final documentation for the Boundary Wall, Air Force Memorial, and Service Complex has been approved by the SHPO, ANC shall provide the SHPO with one (1) bound archival hardcopy and one (1) electronic copy on disc of the documentation, and one (1) copy of the documentation the Consulting Parties in a format of the receiver's choice. ANC shall also provide one (1) hardcopy to the main Arlington County library for dissemination to the public. Within three (3) months of approval of the documentation by the SHPO, ANC shall also post electronic copies of the documentation on the ANC website. ANC shall provide the SHPO and the other Consulting Parties' confirmations in writing that the terms of this stipulation have been completed.

II. Repair of the Boundary Wall (DHR Inventory No. 000-0042-0017) and Reuse of Salvaged Stone in the New Wall.

A. During the demolition of the Boundary Wall, ANC shall carefully salvage and store reasonably reusable "blue granite" of the 1897 portion of the Boundary Wall for reuse in the repairs of the remaining sections of the 1897 boundary feature. Specifications for the storage and reuse of the materials from the

deconstructed Boundary Wall are given in Attachment C, Section 02 42 91 "Removal and Salvage of Historic Building Materials", 1.1.2.

B. Pursuant to Stipulation XII, below, ANC shall conduct repairs or reconstruction, as necessary, of the remaining Boundary Wall within the Project using methods and measures specified in Attachment C, Section 04 01 00.91 "Restoration and Cleaning of Masonry in Historic Structures."

III. Mitigation Through Interpretation

A. Pursuant to Stipulation XII, below, ANC shall develop a page for its web site documenting cemetery expansions since its founding.

B. Pursuant to Stipulation XII, below, ANC shall install an interpretive sign at the intersection of Clayton and Jessup Drives documenting the location, purposes, and composition of the Freeman's Village.

C. Pursuant to Stipulation XII, below, ANC shall develop interpretation showing the original design of the AFM including the Air Force Memorial Drive, circle drive, landscaping, barrier wall, front entrance, flags, and dedication inscription at a location agreed upon with AFDW which may be in the form of a sign at the site, or in some electronic media.

IV. Consultation on Design

A. In developing final designs for conversion of the AFM access road and parking lot into cemetery areas ANC shall consult with the AFDW, the SHPO, and the other Consulting Parties on elements important to the symbolism and design of the Air Force Memorial.

B. ANC, in consultation with AFDW, the SHPO, and the other Consulting Parties, shall consider the preservation of and/or the best treatments for the following elements, identified in Attachment C, in designing the modification of the AFM site:

1. Air Force Flag and Pole - Whether they can remain either with the US Flag or can still be displayed at the AFM site.
2. Aviation Pioneers Wall sections engraved with the names Arnold, Mitchell, and Spaatz at the west side of the entrance drive shall be moved east to the most appropriate location, but shall remain intact and facing the Presidential quotes, in keeping with the site's design intent.
3. Presidents Wall engraved with presidential quotes shall remain intact where presently located.

4. AFM Dedication Wall west of the entrance drive shall move east and remain intact perpendicular with the Aviation Pioneers Wall unless a more appropriate location is identified and agreed to by AFDW.

V. Post Review Discoveries

ANC shall ensure that the provisions in this Stipulation shall be included as a stipulation of all Project operations and contracts involving ground disturbance. Basic procedures and contact information shall be provided to project managers and supervisory contractors for on-site reference.

A. If previously unidentified, or unanticipated effects, to historic properties are discovered during excavation, construction, or utility installation, the supervisor shall immediately halt the excavation in the immediate area of the finding and notify the ANC Chief Engineer and Cultural Resources Manager (CRM) of the discovery and implement interim measures (e.g., surveillance, concealment) to protect the discovery from looting and vandalism. Discarded headstones and other items resulting from the routine operation of ANC which may be found shall not be regarded as “historic properties” for the purposes of this Agreement.

B. Immediately upon receipt of the notification required in Stipulation V.A., above, the CRM shall:

1. Inspect the work site to determine the extent of the discovery and ensure that the project manager and contractor supervisors know that construction activities with the potential to affect the historic property in question must be halted as a legal and contractual requirement;
2. Clearly mark the area of discovery and establish a fifty (50)-foot buffer between the discovery and ground disturbing activities;
3. Implement additional measures, e.g., surveillance or concealment as appropriate, to protect the discovery from looting and vandalism;
4. Have a professional archaeologist inspect the construction site to determine the extent of the discovery and provide recommendations regarding its NRHP eligibility and treatment; and
5. Within forty-eight (48) hours of the discovery ANC shall notify the SHPO and other Consulting Parties, as appropriate, of the discovery and describe the measures that shall be implemented within five (5) working days.

C. Upon receipt of the information required above, ANC shall provide the SHPO and other Consulting Parties with its assessment of the NRHP eligibility of the discovery and the measures proposed to resolve adverse effects. In making its evaluation, ANC in consultation with the SHPO may assume the discovery to be NRHP eligible for the purposes of Section 106. The SHPO and other Consulting Parties shall respond to the ANC assessment within forty-eight (48) hours of receipt.

D. ANC shall take into account the SHPO's, and other Consulting Parties' recommendations on eligibility and treatment of the discovery and carry out any appropriate required actions. ANC shall provide the SHPO and other Consulting Parties with a report on the actions within two weeks of implementation.

E. Construction activities may resume in the area of the discovery once the Chief Engineer has determined that implementation of the actions undertaken to address the discovery pursuant to this Stipulation are complete.

F. Any disputes over the evaluation or treatment of previously unidentified historic properties shall be resolved in accordance with Stipulation X ("Dispute Resolution") of this Agreement.

VI. Unidentified Human Remains Dating Prior to the Establishment of Arlington National Cemetery

A. ANC shall make all reasonable efforts to avoid disturbing non-ANC gravesites. ANC shall treat these in a manner consistent with the ACHP "Policy Statement Regarding Treatment of Burial Sites, Human Remains and Funerary Objects" (February 23, 2007; <http://www.achp.gov/docs/hrpolicy0207.pdf>) or ACHP policy in effect at the time remains and funerary artifacts are handled.

B. If the remains are determined to be of Native American origin, ANC shall comply with the provisions of the Native American Graves Protection and Repatriation Act (hereafter NAGPRA) (25 U.S.C. Sec 3001 et seq.).

C. If the unidentified non-ANC remains are determined not to be of Native American origin, ANC shall consult with the SHPO and other appropriate Consulting Parties. Prior to the archaeological excavation of any remains, the following information shall be submitted to the SHPO and other appropriate Consulting Parties for consultation:

1. The name of the property or archaeological site and the specific location from which the recovery is proposed. If the recovery is from a known historic property, a state-issued site number must be included.
2. Indication of whether a waiver of public notice is requested and why. If a waiver is not requested, a copy of the public notice (to be published in a newspaper having general circulation in the area for a minimum of four weeks prior to

recovery) must be submitted.

3. A copy of the curriculum vita of the skeletal biologist who shall perform the analysis of the remains.
4. A statement that the treatment of human skeletal remains and associated artifacts shall be respectful.
5. An expected timetable for excavation, osteological analysis, preparation of final report, and final disposition of remains.
6. A statement of the goals and objectives of the removal (to include both excavation and osteological analysis).
7. If a disposition other than reburial is proposed, a statement of justification.

D. ANC shall use reasonable efforts to ensure that the general public is excluded from viewing any Native American or other human remains or associated funerary artifacts. The parties to this Agreement shall release no photographs of any human remains or associated funerary artifacts to the press or general public subject to the requirements of the federal Freedom of Information Act, 16 U.S.C. 470w-3 of the National Historic Preservation Act, and other laws as applicable. ANC shall notify the appropriate federally-recognized Tribe(s) and/or state recognized tribes when burials, human skeletal remains, or funerary artifacts are encountered on the project, prior to any analysis or recovery. ANC shall deliver any Native American Indian human skeletal remains and associated funerary artifacts recovered pursuant to this Agreement to the appropriate tribe requesting their repatriation. The disposition of any other human skeletal remains and associated funerary artifacts shall be determined in consultation with the SHPO and other appropriate Consulting Parties.

VII. Professional Qualifications

All historical, archaeological, and architectural surveys, studies or treatment actions carried out pursuant to this Agreement shall be conducted by or under the direct supervision of an individual or individuals who meet, at a minimum, the Secretary of the Interior's *Historic Preservation Professional Qualifications Standards* (62 FR 33708-33722) in the appropriate discipline.

VIII. Preparation and Review of Documents

A. All archaeological studies, architectural survey, technical reports, and treatment plans prepared pursuant to the Agreement shall be consistent with the federal standards entitled *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines* (48 FR 44716-44742, September 29, 1983), the SHPO's *Guidelines for Conducting Historic Resources Survey in Virginia* (September 2017), and the ACHP's

Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites (1999) or subsequent revisions or replacements to these documents.

B. The SHPO and the other Consulting Parties agree to provide comments to ANC on all technical materials, findings, and other documentation arising from this Agreement within thirty (30) calendar days of receipt unless otherwise specified. If no comments are received from the SHPO or any Consulting Party within the thirty (30)-calendar-days review period or period otherwise specified, ANC may assume that the non-responsive party has no comment. ANC shall take into consideration all comments received in writing from the SHPO and any Consulting Party to this Agreement within the thirty (30)-calendar-day review period.

C. ANC shall provide the SHPO two (2) copies (one (1) hard copy and one (1) in Adobe Acrobat format (PDF) on compact disk) of all final reports prepared pursuant to this Agreement. ANC shall also provide Consulting Parties a copy of any final report (in hard copy or Adobe Acrobat format, as requested) if so requested by that party. Such requests must be received by ANC in writing prior to the completion of construction of the Project.

IX. Curation Standards

ANC shall ensure that all original archaeological records (research notes, field records, maps, drawings, and photographic records) and all archaeological collections recovered from ANC property produced as a result of implementing the Stipulations of this Agreement are maintained in accordance with 36 C.F.R. § 79, *Curation of Federally Owned and Administered Archaeological Collections*.

X. Dispute Resolution

A. Objections by a Signatory or Consulting Party

1. Should any Signatory or Consulting Party to this Agreement object in writing to ANC regarding any plans provided for review pursuant to this Agreement, or should Signatory or Consulting Party to this Agreement object in writing to ANC regarding the manner in which measures stipulated in this Agreement are being implemented, ANC shall first consult with the objecting party to resolve the objection. If ANC determines that the objection cannot be resolved through such consultation, ANC shall then consult with the Signatories and Consulting Parties to resolve the objection. If ANC then determines that the objection cannot be resolved through consultation, ANC shall forward all documentation relevant to the objection to the ACHP, including ANC's proposed response to the objection. Within forty-five (45) calendar days after receipt of all pertinent documentation, the ACHP shall exercise one (1) of the following options:

- a. Advise ANC that the ACHP concurs with the ANC's proposed response to the objection, whereupon ANC shall respond to the objection accordingly; or
 - b. Provide ANC with recommendations, which ANC shall take into account in reaching a final decision regarding its response to the objection; or
 - c. Notify ANC that the objection shall be referred for comment pursuant to 36 C.F.R. § 800.7(a)(4), and proceed to refer the objection and comment. ANC shall take the resulting comment into account in accordance with 36 C.F.R. § 800.7(c)(4).
2. Should the ACHP not exercise one (1) of the above options within forty-five (45) calendar days after receipt of all pertinent documentation, ANC may assume the ACHP's concurrence in its proposed response to the objection.
 3. The ANC shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of the objection; ANC's responsibility to carry out all actions under this Agreement that are not the subjects of the objection shall remain unchanged.

B. At any time during the implementation of the measures stipulated in this Agreement, should a member of the public object to ANC regarding the manner in which the measures stipulated in this Agreement are being implemented, ANC shall notify the Signatories and consult with the objector, taking their comments into consideration. The Signatories may request that the ANC notify the Consulting Parties to this Agreement about the objection as well.

XI. Efficient Communications

In accordance with Executive Order 13563 "Improving Regulation and Regulatory Review," and Executive Order 13589 "Promoting Efficient Spending," communications between signatories and concurring parties of this Agreement, and Consulting Parties discussed herein shall be in electronic form whenever practicable, permitted by law, and consistent with applicable records retention requirements. Unless the Consulting Party specifically requests the materials in another form (i.e., mail/hard copy).

XII. Timeframe for Completion of Mitigation and Review Process

A. Unless otherwise specified in this Agreement, ANC shall complete the required mitigation measures within three (3) years of execution of this Agreement.

B. ANC shall submit to AFDW, the SHPO, and the Consulting Parties drafts of all documentation materials, design plans and/or specifications, interpretive measures, and

other items associated with Stipulations I through IV, above, for a thirty (30)-day review and comment period.

C. The AFDW, the SHPO, and the Consulting Parties agree to provide comments to the ANC on all technical materials, findings, and other documentation arising from this Agreement within thirty (30)-days of receipt unless otherwise specified in this Agreement.

D. ANC shall take into consideration all comments received in writing from AFDW, the SHPO, and Consulting Parties received within the thirty (30)-day review period.

E. If no comments are received from AFDW, the SHPO or a Consulting Party within the thirty (30)-day review period, ANC may assume that the non-responsive party has no comment.

XIII. Amendments and Termination

A. In accordance with 36 CFR §§ 800.6(c)(1) and (7), any Signatory may propose in writing to ANC that the Agreement be amended, whereupon ANC shall consult with the other signatories to consider such an amendment. 36 C.F.R. § 800.6(c)(7) shall govern the execution of any such amendment. Any Signatory may terminate it in accordance with the provisions of 36 C.F.R. §§ 800.6(c)(1) and (8).

B. If ANC decides it will not proceed with the Project, it may so notify the Signatories and Consulting Parties and then this Agreement shall become null and void.

C. In the event that this Agreement is terminated or rendered null and void, ANC shall submit to the SHPO a technical report on the results of any archaeological investigations conducted prior to and including the date of termination, and shall ensure that any associated collections and records recovered are curated in accordance with Stipulation IX of this Agreement.

D. In the event of termination, ANC shall either execute a memorandum of agreement with the Signatories under 36 C.F.R. § 800.6(c)(1) or request the comments of the ACHP under 36 C.F.R. § 800.7(a).

XIV. Anti-Deficiency Act

ANC's future efforts to execute requirements arising from the stipulations of this Agreement are subject to the provisions of the Anti-Deficiency Act. If compliance with the Anti-Deficiency Act alters or impairs the ANC's ability to implement the stipulations of this Agreement, ANC shall consult in accordance with the amendment and termination procedures found at Stipulation XIII of this Agreement. No provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, Title 31 U.S.C. § 1341.

XV. Duration

This Agreement shall continue in full force and effect until five (5) years after the date of the last signature of a Signatory. At any time in the six (6)-month period prior to such date, ANC may request that the Signatories consider an extension of this Agreement, e.g., until implementation is satisfactory per Stipulation XII. No extension or modification shall be effective unless all Signatories have agreed with it in writing.

XVI. Signatures

This Agreement may be executed in counterparts, with a separate page for each Signatory. Separate pages may also be provided for each concurring party. ANC shall ensure that each Signatory and Consulting Party is provided with a copy of the fully executed Agreement.

Execution of this Agreement by ANC and the SHPO, and its submission to the ACHP in accordance with 36 C.F.R. § 800.6(b)(1)(iv) shall, pursuant to 36 C.F.R. § 800.6(c), be considered to be an agreement with the ACHP for the purposes of Section 106 of the National Historic Preservation Act (16 U.S.C. § 470). Execution and submission of this Agreement and implementation of its terms, evidence that ANC has afforded the ACHP an opportunity to comment on the proposed undertaking and its potential effects on historic properties, and that ANC has taken into account the potential effects of the Project on historic properties.

SIGNATORIES:

ARLINGTON NATIONAL CEMETERY

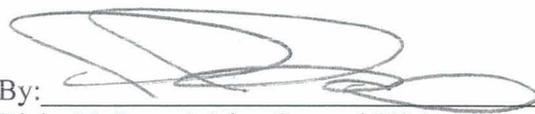
By:  Date: **NOV 15 2019**
Karen Durham-Aquilera, *Executive Director, Army National Military Cemeteries and Arlington National Cemetery*

VIRGINIA STATE HISTORIC PRESERVATION OFFICER

By:  Date: **12-2-19**
Julie Langan, *Director, Virginia Department of Historic Resources*

INVITED SIGNATORY

AIR FORCE DISTRICT OF WASHINGTON

By:  Date: **14 November 2019**
Ricky N. Rupp Major General USAF *Commander, Air Force District of Washington*

CONCURRING:

ARLINGTON COUNTY, VIRGINIA

By: _____ Date: _____
Mark J. Schwartz, *County Manager*

CATAWBA INDIAN NATION

By: _____ Date: _____
Bill Harris, *Chief*

PAMUNKEY INDIAN TRIBE

By: _____ Date: _____
Robert Gray, *Chief*

ARLINGTON HISTORICAL SOCIETY, Inc.

By: _____ Date: _____



Figure 1 Proposed Southern Expansion Design

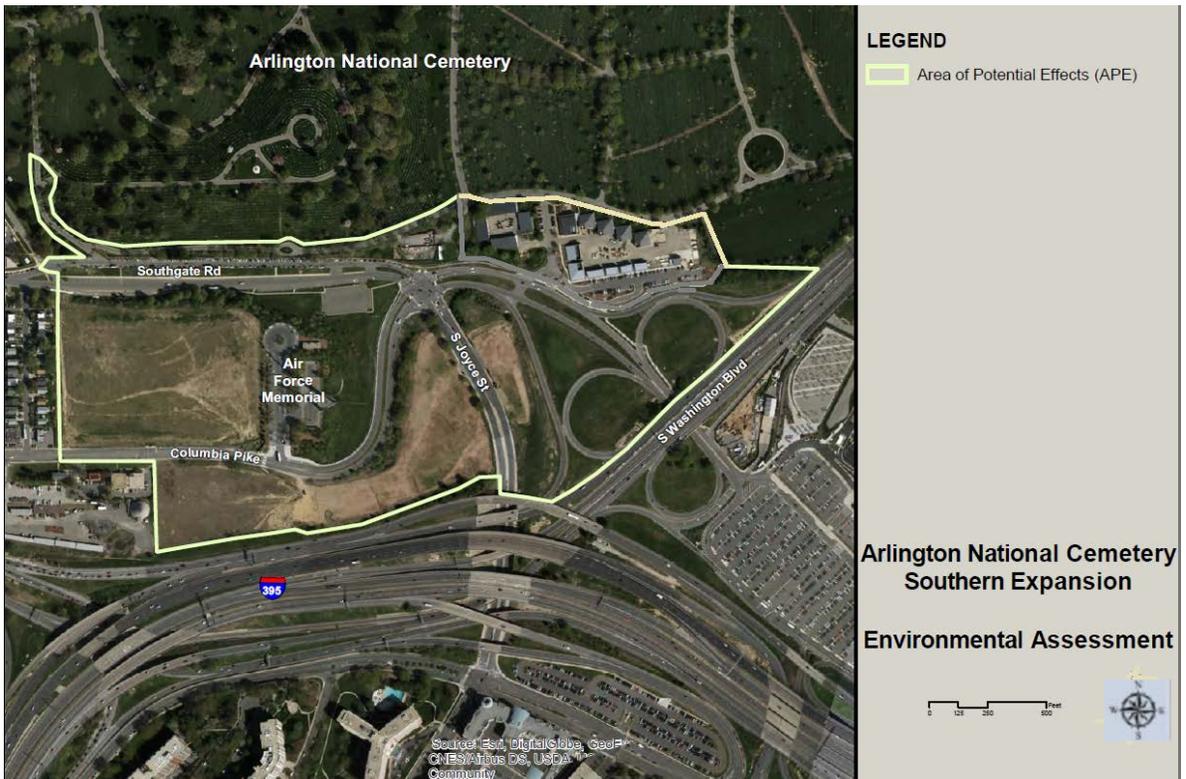


Figure 2 Southern Expansion Site & Physical APE

ATTACHMENT B

Summary of Information for National Historic Preservation Act Section 106 Compliance, ANC Southern Expansion Project

ARCHAEOLOGICAL AND HISTORICAL EVALUATIONS FOR THE ARLINGTON NATIONAL CEMETERY SOUTHERN EXPANSION PROJECT, Arlington County, Virginia. John H. Haynes, US Army Corps of Engineers, Norfolk, Virginia, December 2016.

The past and current land use, geological, and historic contexts of the project area for the Arlington National Cemetery Southern Expansion (ANCSE) project, along with data from geotechnical and hazardous materials site investigations were examined to assess the archaeological potential of the area. Past archaeological investigations in and near the area were also reviewed. There are no archaeological sites recorded in the project Area of Potential Effect (APE) for ground disturbance. A previous archaeological survey on the portion of the APE south of Columbia Pike recovered no archaeological artifacts, and found the ground there to have been disturbed. This study concludes that due to heavy ground disturbance beginning in the 1940's it is highly unlikely that any archaeological sites eligible for listing in the National Register of Historic Places (NRHP) could exist in the ground disturbance APE of any of the action alternatives for the ANCSE project. Therefore, there would be no adverse effects to NRHP eligible or listed archaeological sites.

ARLINGTON NATIONAL CEMETERY SOUTHERN EXPANSION SITE – VIEWSHED STUDY AND IMPACT ASSESSMENT, Robert Wanner EAC/A, Inc., November 2016.

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.

AIR FORCE MEMORIAL: PHYSICAL DESCRIPTION, BACKGROUND RESEARCH, AND EVALUATION OF ELIGIBILITY FOR THE NATIONAL REGISTER OF HISTORIC PLACES EAC/A, Inc., December 2018

EAC/Archaeology, Inc. (EAC/A) prepared a report to determine the eligibility or ineligibility of the Air Force Memorial (AFM) in Alexandria, Virginia, for listing in the National Register of Historic Places (NRHP). Plans for the Arlington National Cemetery Southern Expansion (ANCSE) project include proposed changes to the AFM. The primary purpose of this study was to prepare a National Register of Historic Places determination of eligibility for the AFM, which is required by the National Historic Preservation Act.

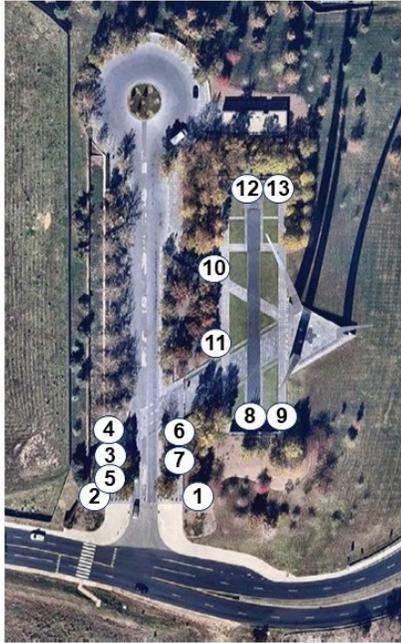
The AFM's exceptional significance stems from its evocative design which depicts flight, while also commemorating Air Force Medal of Honor recipients and the ideals of the Air Force. Most notable are the three soaring stainless-steel spires rising high above the landscape and visible from miles distant. The three spires capture the essence of the Air Force Thunderbird bomb blast maneuver in a very masterful way. The exceptional visual character of the memorial symbolizes the spirit of the United States Air Force and exhibits the high artistic values that architect James Freed articulated with this memorial. It was his last work. He died in December of 2005, shortly before the AFM was completed. The Memorial is considered one of his major works, along with the Jacob K. Javits Convention Center in New York City and the San Francisco Main Public Library. In Washington DC, his buildings include the Ronald Reagan Building and International Trade Center, and the United States Holocaust Memorial Museum.

Because the guard house, access road, parking lot and associated landscaping were included in the original (circa 2004) construction plans for the AFM, EAC/A concluded that these elements contribute to the significance of the historic district. While 36 CFR 60 states that properties primarily commemorative in intent are not normally considered NRHP eligible, the AFM is exceptionally significant, because of its outstanding artistic merit and because it is the only property that commemorates Air Force contributions and memorializes their sacrifices, and meets Criteria Consideration F, the exception to that rule.

ARLINGTON NATIONAL CEMETERY SOUTHERN EXPANSION – BOUNDARY WALL EVALUATION, BELL Architects, PC, Washington DC, October 2016

The document gives a detailed history of the expansion of Arlington National Cemetery as it relates to the southern section of the boundary wall subject to effects of the Southern Expansion project. It evaluates the integrity of the boundary wall and adjacent streets within the cemetery. In appendices sections of the boundary wall are identified for the dates of their construction and modification, integrity, and photography of the entire section that may be affected by the Southern Expansion project. While noting some deterioration and modifications of the wall the report concludes that the wall retains integrity, but terms relocation of the boundary wall as a potential adverse effect. The report identifies Patton Drive as retaining.

Location of Engravings at the AF Memorial



AIR FORCE MEMORIAL ENGRAVING PRESERVATION

1. USAF Inscription at front right entrance
2. AFM dedication at front left entrance
3. Brig Gen Mitchell quote, left side Memorial Drive
4. General Spaatz quote, left side Memorial Drive
5. General Arnold quote, left side Memorial Drive
6. President Bush quote, right side Memorial Drive
7. President Reagan quote, right side Memorial Drive
8. Core Values panels, Honor Guard Statues
9. Core Values panels, Honor Guard Statues
10. AFMIF Panel, on walkway to spires
11. AFMIF Panel, on walkway to spires
12. MoH Recipient panels, Missing Man Formation
13. MoH Recipient panels, Missing Man Formation



COMMONWEALTH of VIRGINIA

Department of Historic Resources

2801 Kensington Avenue, Richmond, Virginia 23221

Molly Joseph Ward
Secretary of Natural Resources

Julie V. Langan
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
www.dhr.virginia.gov

7 February 2017

Ms Rebecca L. Stevens
Department of the Army
Arlington National Cemetery
Arlington, Virginia 22211-5003

RE: Proposed Arlington National Cemetery Southern Expansion Area
Arlington County, Virginia
DHR File No. 2014-1094

Dear Ms Stevens:

The Department of Historic Resources (DHR) has received for review and comment documents pertaining to the above referenced project. The documents submitted for our consideration are "Arlington National Cemetery Southern Expansion Project Boundary Wall Expansion, 28 October 2016", "Arlington National Cemetery Southern Expansion Project Viewshed Study and Impact Assessment, 14 November 2016", and "Archaeological and Historical Evaluation for the Arlington National Cemetery Southern Expansion Project" (December 2016).

It is our understanding from your letter of 6 January 2016 that Arlington National Cemetery (ANC) "has developed a preferred alternative for the Southern Expansion project in context of a draft environmental assessment" (Stevens, 6 January 2016). If this draft environmental assessment is available, DHR has not had an opportunity to review it. Regardless, we are told in your 6 January correspondence that ANC's preferred alternative consists of 65 acres, with 40 of those acres representing new burial space, with the remainder used for Arlington County road realignment and for the Pentagon Memorial Foundation's future development. The design for the preferred alternative requires the demolition of the existing south boundary wall from east of the Clayton Drive gate to east of the Service Complex. Additionally, the preferred alternative will remove Patton Drive from Clayton to Eisenhower drives.

According to the report "Arlington National Cemetery Southern Expansion Project Boundary Wall Expansion, 28 October 2016", the existing southern boundary wall is composed of four distinct sections representing three construction periods. The oldest portion of the wall is the western most extending along South Southgate Road to the intersection of Columbia Pike. This section of the wall dates to 1897, but is believed to have been modified in 1912 when the gate at South/Clayton was added, and possibly again in 1968. East of Columbia Pike the wall was constructed in the 1968-1973 period, along with a section that dates to 2010. The report recommends that the southern boundary stonewall, to include

Eastern Region Office
2801 Kensington Avenue
Richmond, VA 23221
Tel: (804) 367-2323
Fax: (804) 367-2391

Western Region Office
962 Kime Lane
Salem, VA 24153
Tel: (540) 387-5443
Fax: (540) 387-5446

Northern Region Office
5357 Main Street
PO Box 519
Stephens City, VA 22655
Tel: (540) 868-7029
Fax: (540) 868-7033

the metal fence, contributes to the Arlington National Cemetery Historic District (DHR Inventory No. 000-0042) under Criterion C for the 1897 portion as part of General Montgomery Meigs' original design, and Criterion A, with Criterion Considerations F and G, for the later sections. The report also recommends as contributing to the historic district the South/Clayton Gate (Criteria A and C) and the road network consisting of Clayton Drive (Criterion C) and the later Patton Drive (Criteria A and C). The report does not recommend the two gates at the Service Complex as contributing to the resource. We concur with all of these recommendations.

With the preferred alternative design call for the removal of the stonewall and alterations to Patton Drive the report rightly anticipates that the undertaking will have an adverse effect to these contributing features and to the Arlington National Cemetery Historic District as a whole. However, not having reviewed the draft environmental assessment document yet DHR cannot determine if all efforts have been made to avoid or minimize the adverse effect as is required of a federal agency under 36 CFR §800.6(a). For example, has ANC considered retaining the oldest, i.e. 1897, section of the stonewall while removing the more modern (1968-1973 and 2010) portions? Please forward to DHR the draft environmental assessment for our consideration.

With respect to archaeology, we have reviewed the report "Archaeological and Historical Evaluations for the Arlington National Cemetery Southern Expansion Project, Arlington County, Virginia" (December 2016) prepared by Mr. John H. Haynes, U.S. Army Corps of Engineers, Norfolk District. Based on the information provided, we agree that intact archaeological deposits are unlikely within the undertaking's area of potential effects (APE), and that an archaeological survey of the APE is not warranted at this time. Should unexpected archaeological resources be encountered during project implementation, all work in the immediate area should cease and our office contacted to provide guidance on the treatment of the discovery.

Please note that several of the annotations in Table 1 are incomplete. We requests two hardcopies and one digital copy of a revised report that addresses this error.

If you have any questions about our comments, please contact me at (804) 482-6090.

Sincerely,



Marc Holma, Architectural Historian
Review and Compliance Division



COMMONWEALTH of VIRGINIA

Department of Historic Resources

2801 Kensington Avenue, Richmond, Virginia 23221

Molly Joseph Ward
Secretary of Natural Resources

Julie V. Langan
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
www.dhr.virginia.gov

5 April 2017

Ms Rebecca L. Stevens
Department of the Army
Arlington National Cemetery
Arlington, Virginia 22211-5003

RE: Proposed Arlington National Cemetery Southern Expansion Area—Archaeology Survey
Arlington County, Virginia
DHR File No. 2014-1094

Dear Ms Stevens:

The Department of Historic Resources (DHR) has received for our review and comment the report "Archaeological and Historical Evaluations for the Arlington National Cemetery Southern Expansion Project, Arlington County, Virginia" (December 2016) prepared by the U.S. Army Corps of Engineers, Norfolk District. Our comments are provided to Arlington National Cemetery in meeting its responsibilities under Section 106 of the National Historic Preservation Act. Based on the information provided, DHR agrees that impacts to significant, intact archaeological deposits are unlikely due to heavy ground disturbances during the 20th century.

If you have any questions about our comments, please contact me at (804) 482-6090.

Sincerely,

A handwritten signature in black ink, appearing to read "Marc Holma".

Marc Holma, Architectural Historian
Review and Compliance Division

Eastern Region Office
2801 Kensington Avenue
Richmond, VA 23221
Tel: (804) 367-2323
Fax: (804) 367-2391

Western Region Office
962 Kime Lane
Salem, VA 24153
Tel: (540) 387-5443
Fax: (540) 387-5446

Northern Region Office
5357 Main Street
PO Box 519
Stephens City, VA 22655
Tel: (540) 868-7029
Fax: (540) 868-7033

ARCHAEOLOGICAL AND HISTORICAL
EVALUATIONS FOR THE ARLINGTON
NATIONAL CEMETERY SOUTHERN
EXPANSION PROJECT,

Arlington County, Virginia.

December 2016

DHR file #2014 - 1094



John H. Haynes, MA, RPA

Archaeologist



U.S. Army Corps of Engineers
Norfolk District

Abstract

The past and current land use, geological, and historic contexts of the project area for the Arlington National Cemetery Southern Expansion (ANCSE) project, along with geotechnical data from site investigations are examined to assess the archaeological potential of the area. Past archaeological investigations near the area are also reviewed. There are no archaeological sites recorded in the project Area of Potential Effect (APE) for ground disturbance. This study concludes that due to heavy ground disturbance beginning in the 1940's it is highly unlikely that any archaeological sites eligible for listing in the National Register of Historic Places (NRHP) could exist in the ground disturbance APE of any of the action alternatives for the ANCSE project. Therefore, there would be *no adverse effects* to NRHP eligible or listed archaeological sites.

Cover illustration: Portion of a Civil War military map showing Arlington House and vicinity (US Army Corps of Engineers 1864)

Table of Contents

1	<i>Project Description</i>	1
2	<i>Geological Context</i>	2
2.1	Historic Land Use	4
3	<i>Previous Research</i>	10
4	<i>Historic Context</i>	13
4.1	Prehistory	13
4.2	Historic Period	16
4.2.1	SETTLEMENT TO NATION (1607 TO 1789)	16
4.2.2	EARLY NATIONAL PERIOD (1789 TO 1830)	17
4.2.3	ARLINGTON HOUSE (1802 TO 1830)	17
4.2.4	ANTEBELLUM PERIOD AND CIVIL WAR (1830 TO 1865).....	19
4.2.5	THE CIVIL WAR (1861 TO 1865).....	20
4.2.6	FREEDMAN’S VILLAGE (1863 to 1900).....	23
4.2.7	ESTABLISHMENT OF ANC (1864 TO 1867)	24
4.2.8	EXPANSION OF ANC (1867-PRESENT)	25
5	<i>Field Methods</i>	27
6	<i>Remote Sensing Survey and Geotechnical Survey Results</i>	28
6.1	Borings for the Air Force Memorial	28
6.2	Borings, Remote Sensing, and Excavations by the Washington Headquarters Service and Corps of Engineers	28
6.3	Survey of Patton Drive Area	36
7	<i>Conclusions and Recommendations</i>	38
8	<i>References</i>	39

List of Figures

Figure 1 - Arlington National Cemetery Southern Expansion (ANCSE) Area of Potential Effect (APE)	2
Figure 2 Surface Geology of Arlington: Qsh - Quaternary Sand and Gravel; Kp - Potomac Formation, Cretaceous sand, gravel, clay; Tb1 - Bacons Castle Formation, Tertiary sand, gravel, silt, and clay	3
Figure 4 – 1937 aerial photograph with APE georeferenced.....	4
Figure 3 -A Section of a map by the Corps of Topographic Engineers, Army of the Potomac, ca. 1864, the Southern Expansion APE is overlaid in brown.....	4

Figure 4 - The Project Area is on the margin of this 1861 Topographic Map of Washington giving some details of land use.	5
Figure 5 - An overlay of an 1885 topographic map over a recent satellite image, the project APE shown in brown.	6
Figure 6 - Land Ownership in 1900, the brown border is the project area (Virginia Title Co. 1900)	7
Figure 7 - 1936 Sanborn Insurance Map Overlay, west half of project area	8
Figure 8 - 1936 Sanborn Insurance Map, east half of project area	9
Figure 9 - Previous Archaeological Surveys near the Project Area.....	10
Figure 10 - Detail from Capt. John Smith's Map (1624)	14
Figure 11 - Detail from the Augustine Herrman Map (1670).....	16
Figure 12 Composite Map of Antebellum Arlington Estate (Nelligan 1962)	19
Figure 13 - Union Forts and Camps in the Vicinity of Arlington, 1861, Millennium APE Shown in Brown (ArcView Georeference of Atlas to Accompany Official Records).....	20
Figure 14 - Eighth New York Encamped at Arlington House 1861	20
Figure 15 - Major General Augustus DeRussy, Commander of the Southern Defenses of Washington from 1863	21
Figure 16 - Further Development of Defensive Works, c.a. Fall 1862, Rifle Pits in Two Lines .	21
Figure 17 - Ultimate Development of Defensive Works, Arlington Vicinity: Forts Whipple and McPherson, Rifle Pits, Military Roads 1865 (Barnard 1871).....	22
Figure 18 - Scene Allegedly of Fort Whipple.....	22
Figure 19 - Map of Arlington Estate, 1888.....	23
Figure 20 - Detail of 1888 Map of Arlington Estate Showing the Center of the Freedman's Village	24
Figure 21 - Project Site Boundary on 1949 Aerial Photo, Navy Annex in the Northwest Corner, Quarters K to its South and East.....	27
Figure 22 - Boring Locations (those depicted below with second bold label)	30
Figure 23 – Profiles of DH 1-4 (Trainor 2011).....	30
Figure 24 - Profiles of DH 12, 13, 15, 16 (Trainor 2011).....	32
Figure 25 - Profiles of DH 26, 28, 34, 35 (Trainor 2011).....	33
Figure 26 - Magnetometer Survey of the Former Navy Annex Site (Stuby 2014).....	34
Figure 27 - Magnetometer Survey of the Former Quarters K Site (Stuby 2014)	34

Figure 28 - Concrete Slab Causing Anomaly, Part of Navy Annex Foundations (Schneider 2013) 35

Figure 29 - Remains of Concrete Foundations of Quarters K Dining Hall Cause of Anomalies (Schneider 2013)..... 35

Figure 30 - Section of 1897 Map Showing Stream Where Patton Drive is Now 36

Figure 31 - Map of Underground Utilities in the Patton Drive Area..... 37

Figure 32 - West End of Patton Drive Facing East..... 37

Figure 33 - Middle Section of Patton Drive Facing East..... 38

Figure 34 - East End of Patton Drive, Facing West..... 38

List of Tables

Appendix A:

Appendix B:

1 Project Description

The Arlington National Cemetery Southern Expansion (ANCSE) project is being developed to increase burial space at Arlington National Cemetery (ANC). Per the Center of Army Analysis (CAA) Report (May 27, 2015), without the Southern Expansion, ANC is projected to run out of in-ground interment space by 2043 and columbarium space by 2038. The CAA Report accounts for the interments made available by the Millennium Project currently under construction.

The Project would develop the land previously identified as the Navy Annex site to increase burial space at ANC and realign a portion of Columbia Pike. It would also demolish Patton Drive, Southgate Road, and construct an access road from Columbia Pike to Henderson Hall. This land is contiguous to the Cemetery on the south side of the grounds. Construction would be for approximately 20,000 caskets and 50,000 niches arranged around a courtyard to allow ceremonies for burials with full honors. The total project area (Figure 1) encompasses 68 acres, but minus the three acres of the Air Force Memorial site includes about 65 acres. About 40 acres would be converted for cemetery use, with much of the other 25 acres for road realignments, and areas for development by Arlington County and the Pentagon Memorial Foundation. No figures are available for the maximum depth of ground disturbance, but with the rolling terrain of the area this is likely to be quite deep, perhaps on the order of 20 feet or more. Although there may be no ground disturbance from this project in land going to Arlington County, the transfer from federal ownership would be a Section 106 undertaking given the potential for secondary or cumulative effects. Thus the APE includes all of the project area except the Air Force Memorial.

The improvements associated with this construction include a committal service area, circulation space (both vehicular and pedestrian), and limited parking for cemetery vehicles or family members. The buildings include climate control, interior lighting, toilet facilities, elevators suitable for personnel and for casket burial services, and security systems. Building constructions shall be suitable for the environment and compliment the architectural theme and considerations of the National Cemetery at Arlington. Exterior site improvements may include approximately 12,000 pre-sets for in-ground burials, an ornamental security and boundary fence, an access bridge across Columbia Pike, covered ceremonial courtyard, visitor and family gathering and reflection areas, landscaping, plantings and all supporting utilities to include water, sanitary sewer, storm sewer, natural gas, underground electrical service, paving, pedestrian walks, curbs and gutters, communications/information systems, and security considerations and systems. Demolish the existing Southgate Road and all other paved areas for parking or travel on the site and prepare the site for cemetery usage. Provide special foundations to address the varying soil conditions on the site. Anti-terrorism/force protection measures shall be included to the extent required by regulation and all constructions shall comply with ADA requirements and considerations. Comprehensive building, furnishings, and interior design services are required to allow a complete coordinated structure when completed, ready for almost immediate use by the cemetery.

Initial designs for this project did not include the demolition of Patton Drive, an area that is part of the existing cemetery. It is for this reason that many of the maps with the APE boundary shown do not include the Patton Drive area.

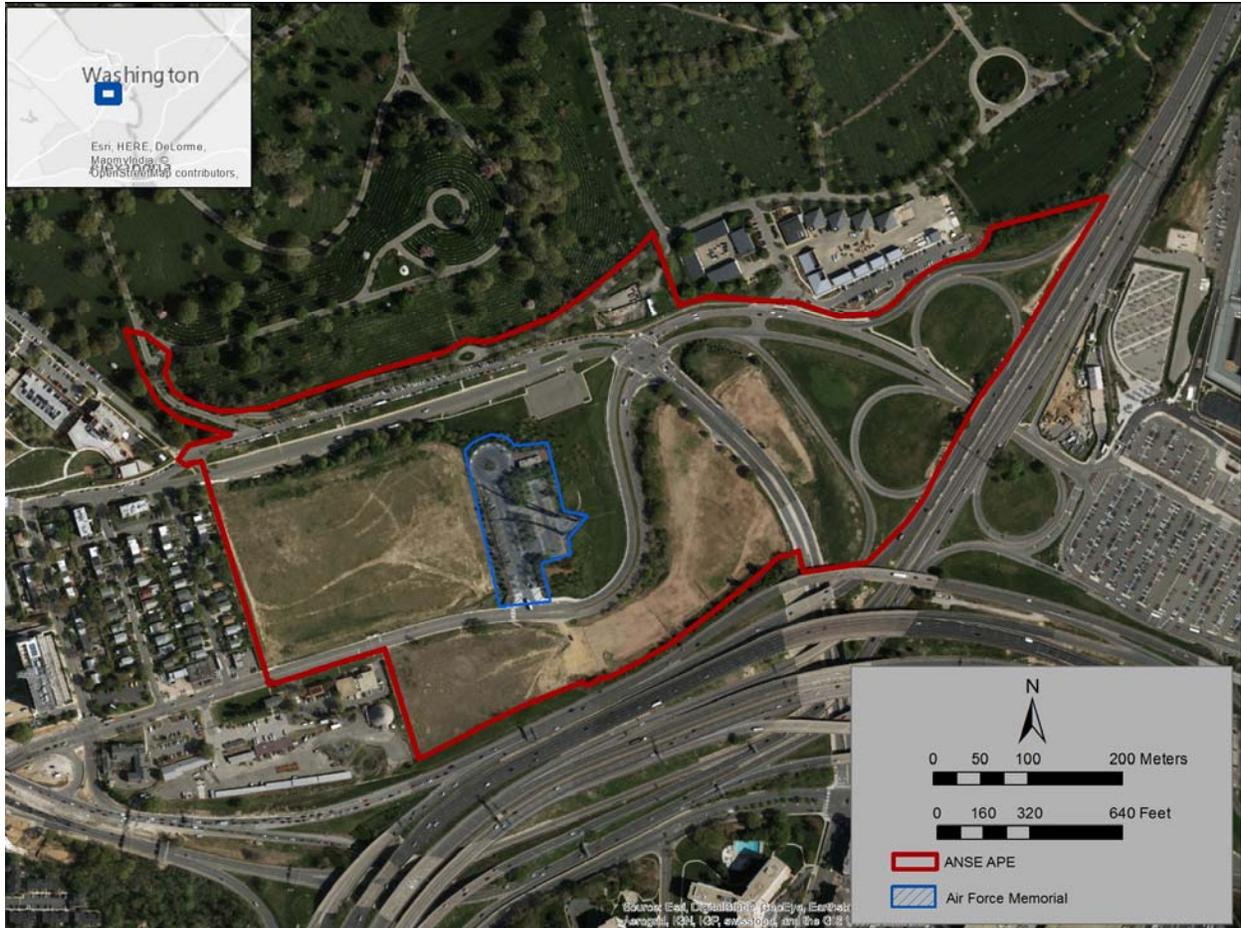


Figure 1 - Arlington National Cemetery Southern Expansion (ANCSE) Area of Potential Effect (APE)

2 Geological Context

Three areas of unconsolidated sedimentary deposits cover the project area. The Potomac Formation of Early Cretaceous marine and riverine deposits, mainly comprised of pebbly sand, covers most of the project area. The Bacons Castle Formation lies along the northwest corner of the project area and is part of the upper member of the Tertiary Bacons Castle Formation described as “massive too thick-bedded pebble and cobble gravel grading upward into cross-bedded, pebbly sand and sandy and clayey silt.” (Department of Mines, Minerals, and Energy 1993) The eastern end of the project area, currently the site of the Columbia Pike – Washington Blvd. interchange, is comprised of more recent Quaternary fluvial deposits of sand and gravel. Bedrock, comprised of older crystalline rock, lies below these formations at depths of 30 meters or more. The soil series mapped for the project area is Urban Land - Udorthents Complex, too heavily modified and variable for detailed description, or typical profile (USDA 2014).

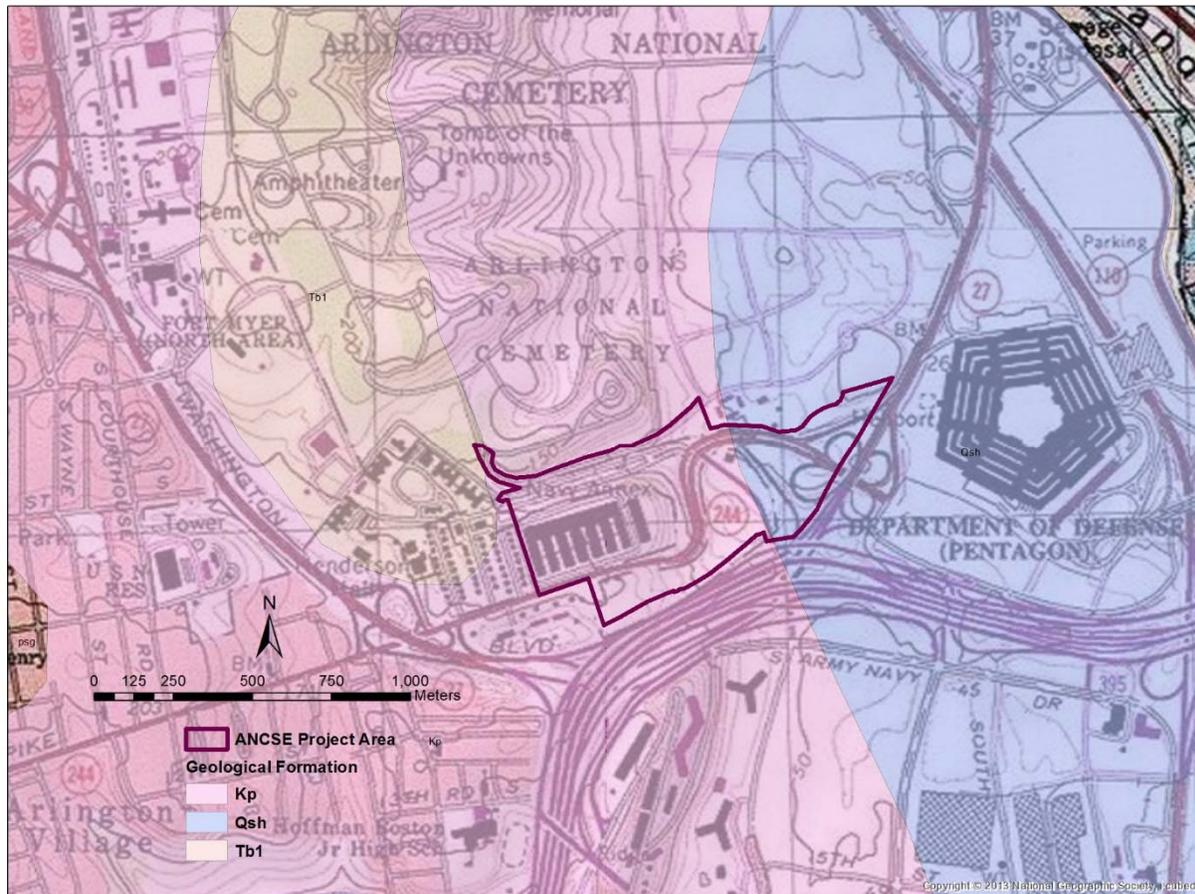


Figure 2 Surface Geology of Arlington: Qsh - Quaternary Sand and Gravel; Kp - Potomac Formation, Cretaceous sand, gravel, clay; Tb1 - Bacons Castle Formation, Tertiary sand, gravel, silt, and clay

2.1 Historic Land Use

The Southern Expansion area was a part of 2713 acres inherited by Gerard Alexander in 1735. The northern most 900 acres was purchased by John Parke Custis in 1778 and later became the Arlington Estate held by the Custis family until the Civil War. The Southern Expansion area lies to the south of what was the Arlington Estate where the eastern third near the river was developed for cultivation, while the remainder was partially of fully wooded. By the



Figure 3 -A Section of a map by the Corps of Topographic Engineers, Army of the Potomac, ca. 1864, the Southern Expansion APE is overlaid in brown.

Civil War, period maps show the project area as an open ridge, bordered by wooded areas to the north and south. Columbia Pike ran close to its present course near the southern boundary of the project area, and intersected with the Georgetown-Alexandria Pike in the eastern side of the project area where Columbia Pike and Washington Boulevard intersect. A period map (Figure 4) shows a toll gate and some small buildings at this intersection. Just south of the project area, under the present course of I-95, was Fort Albany.

USGS maps from the late 19th and early 20th centuries show little detail of this area, other than topography and the course of roads. Columbia Pike and the Georgetown-Alexandria Pike, the latter becoming known as Arlington Ridge Road, are consistent features.

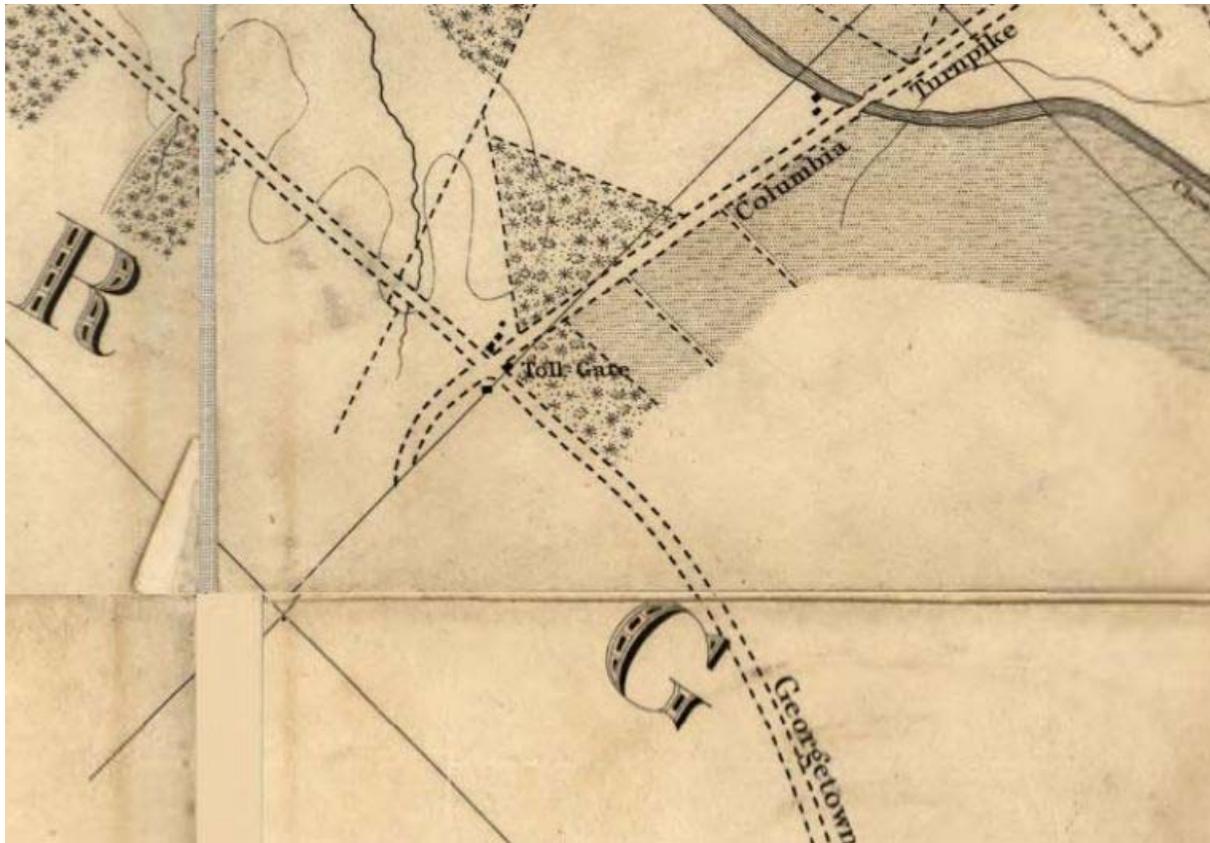


Figure 4 - The Project Area is on the margin of this 1861 Topographic Map of Washington giving some details of land use.



Figure 5 - An overlay of an 1885 topographic map over a recent satellite image, the project APE shown in brown.



Figure 6 - Land Ownership in 1900, the brown border is the project area (Virginia Title Co. 1900)

In contrast to these larger scale maps are the Sanborn Insurance Maps. These go into great detail about the size, location, and construction of individual structures. Sanborn Maps were first made of this area in 1936.

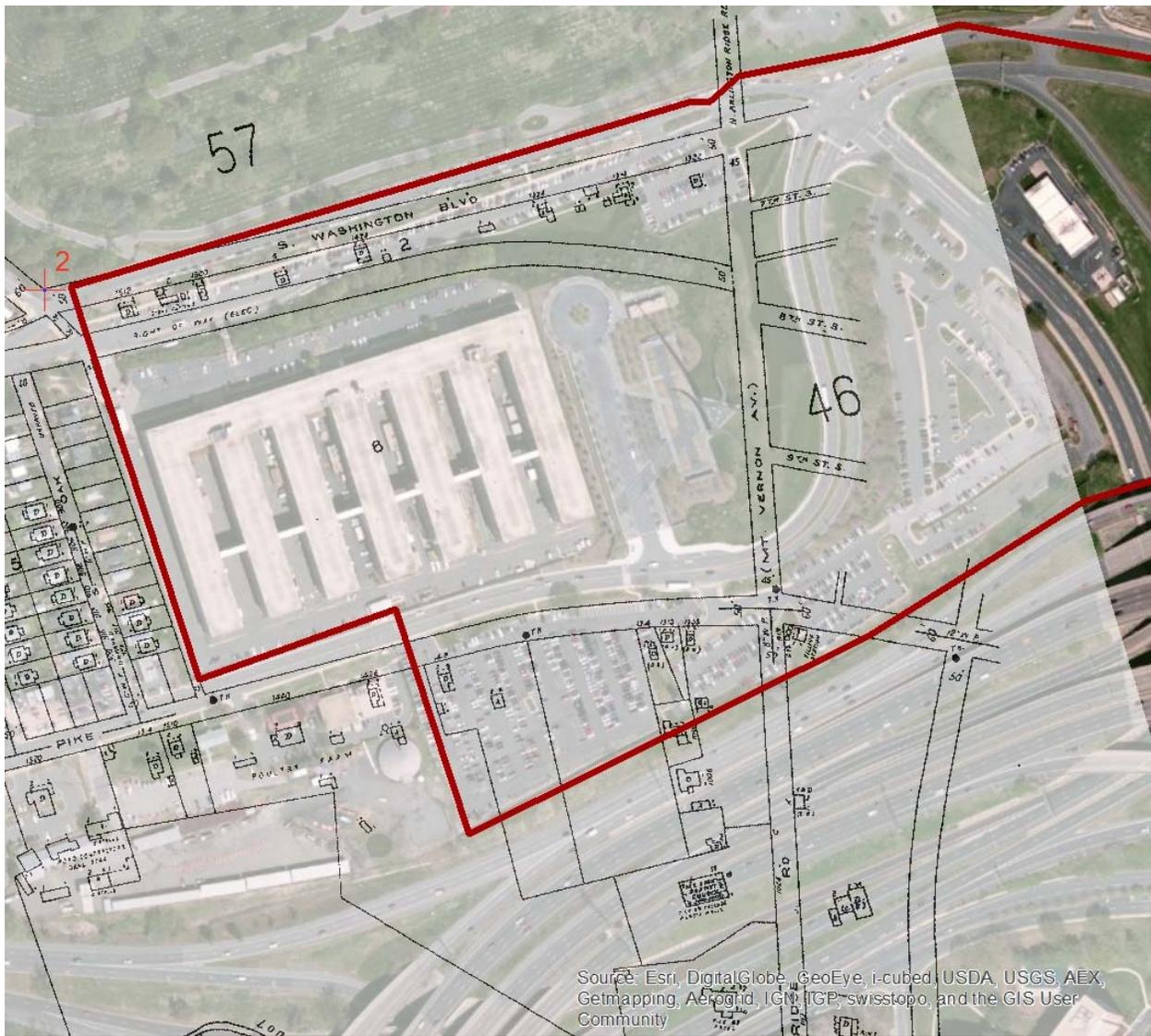


Figure 7 - 1936 Sanborn Insurance Map Overlay, west half of project area

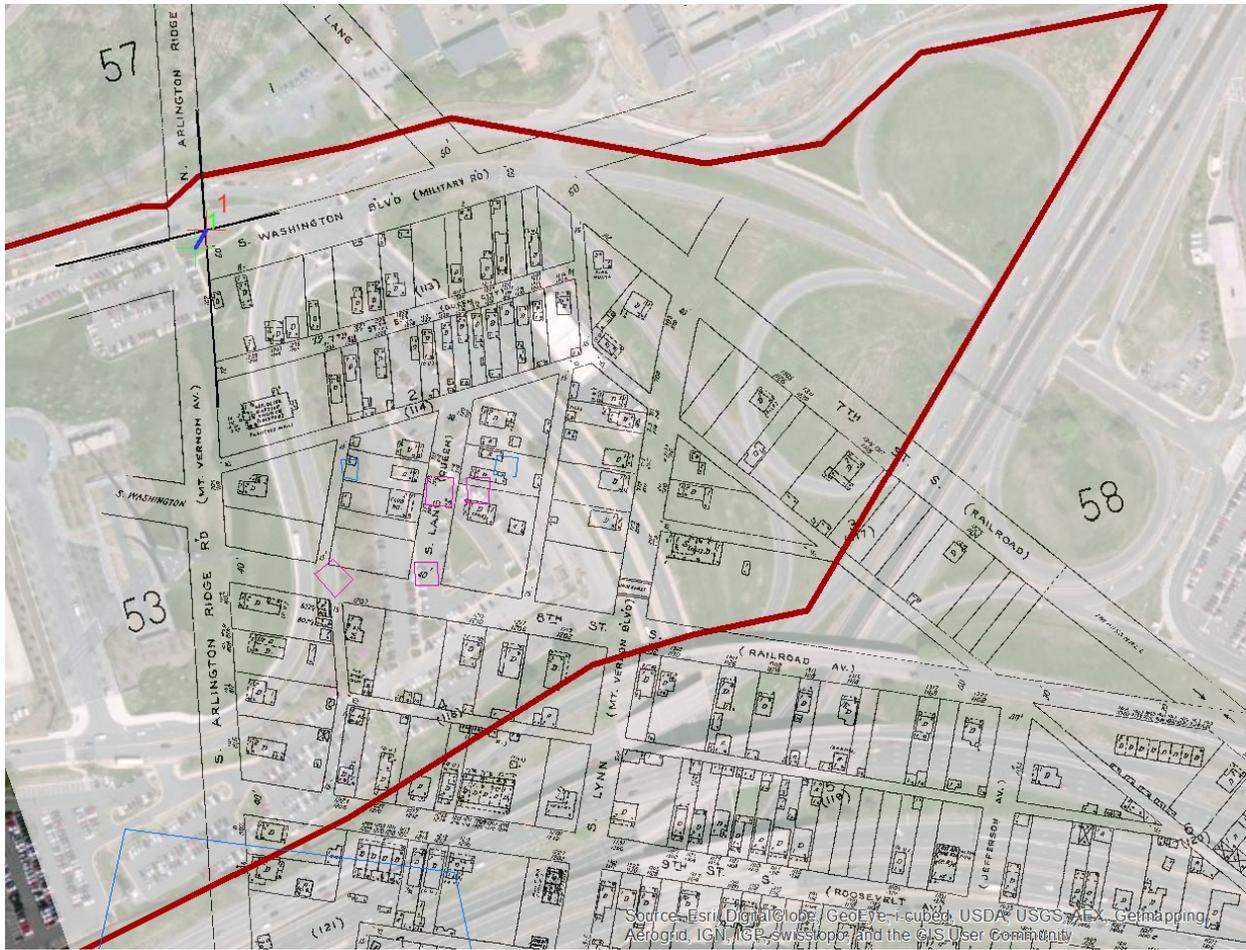


Figure 8 - 1936 Sanborn Insurance Map, east half of project area

3 Previous Research



Figure 9 - Previous Archaeological Surveys near the Project Area

Archaeological surveys in the DHR database V-CRIS are shown along with their catalog numbers in Figure 9. Titles, brief summaries and other information about the reports are given in Table 1, below. One survey (Figure 9, AR-34) was within the project boundary. This was a Phase I survey for a proposed traffic management building that was never built at this site (Higgins et al. 1993). No archaeological sites or locations were found by the survey, which covered only .45 acre.

Table 1.

Report #	Title	DHRR File #	Author	Year	Pages	Annotation	Org.*	Acres
AR-008	Historic and Archaeological Survey Report, Washington National Airport, Arlington County, Virginia			1989	298pp	Comprehensive survey of airport conducted in order to make evaluation of effect and develop procedures to protect, preserve or conserve significant resources.	PES	0.41
AR-031	Phase I Archaeological Survey, BRAC Project Areas, Fort Myer, Arlington County, Virginia (Revised Draft)			1992	26pp	Survey of six areas revealed no cultural resources. No further work recommended.	KFS	51.5
AR-034	Phase I Cultural Resource Survey of Proposed Traffic Management System Building Associated with Interstate 395 Project, Arlington County, Virginia		Thomas F. Higgins III et al	1993	41pp	No archaeological sites or locations were found. No further study is required.	WMCAR	0.45
AR-047	Cultural Resource Investigations at Section 29 at Arlington House, The Robert E. Lee Memorial, Arlington County, Virginia	1995-1353	Heather Mills, Jeff Holland, Todd Cleveland, Bill Nethery	1998	220pp	Investigation of Section 29 prior to transfer from the Army to Arlington National Cemetery discovered Arlington House Ravine site (44AR0032). Former Custis-Lee era icehouse and trash midden located on this site - contributes to Arlington House's NRHP sta	TRC	24.44
AR-055	National Park Service Cultural Landscapes Inventory 2002, Revised 2003, Arlington Ridge Park, George Washington Memorial Parkway	2004-0216		2002	110pp	Archaeological investigations carried out in 2001 and 2002 uncovered artifacts believed to be associated with the small farms that occupied the property in the 19th century. Lack of integrity precluded NRHP listing and no further investigation was recomme	NPS	0
AR-071	Archaeological Assessment, Arlington Service Center, Arlington, Virginia	2009-1622		2005	20pp	Digital file available. Archaeological assessment of the Arlington Service Center concluded that there was low potential for prehistoric archaeological resources. Field survey identified extensive disturbance to the landscape, so there are no areas of a	LBG	30
AR-072	Phase I Archeological Reconnaissance of Selected Portions of the Henderson Hall Marine Corps Facility, Arlington County, Virginia	2009-1912	William Gardner, Gwen Hurst, Kimberly Snyder	1999	77pp	Digital file available. Survey of two areas on the Henderson Hall property which appeared to be undisturbed. Testing revealed little if any of the acreage on which Henderson Hall is located is undisturbed, and no further work is recommended.	TAA	0
AR-076	Archaeological Investigations Radnor Heights Substation and Transmission Line Joint Base Myer-Henderson Hall (Fort Myer), Arlington, Virginia	2009-1740	Kerri Holland, Sarah Traum, Lynn Jones, Donna Seifert	2011	130pp	Ten areas within the project area were subjected to subsurface testing. Due to thick fill deposits or disturbed strata, no sites were identified.	JMA	0

AR-078	Archaeological Survey of Three Areas of Fort Myer, Fort Myer, Virginia	2011-1029	Mackenzie Caldwell Rohm, Brian Crane, Christopher Bowen, G. William Monaghan, Daniel Hayes	2011	110pp	Digital file available. Phase I archaeological survey and geophysical survey of three portions of the 256-acre Fort Myer. 4.5 acres of Fort Myer were investigated. Area A, including the location of three demolished late-19th-century houses and located n	VERSAR	4.5
AR-085	Additional Archaeological Survey and Evaluations for the Arlington National Cemetery Millenium Project, Arlington County, Virginia	2008-1022	John Haynes	2012	103pp	Digital file available. The Millennium Project is an expansion of burial areas of Arlington National Cemetery taking in approximately 29 acres. Land for the project includes a 12 acre area ceded by Joint Base Myer-Henderson Hall (Fort Myer Annex), and ano	COE	29.38
PW-321	Addendum to the Phase I Archeological Investigations of the I-95/395 HOV/Bus/HOT Lanes Project, Arlington, Fairfax, Prince William and Stafford Counties and the City of Alexandria	2007-0006	Jarod Hutson	2008	69pp	A second addendum to original archaeological survey for this project, due to expansion of APE in six areas in Arlington, Fairfax and Prince William counties. No subsurface testing was conducted due to high disturbance or sloping; no further work is recom	TAA	0
ST-153	Phase I Archeological Investigations of the I-95/395 HOV/Bus/HOT Lanes Project, Arlington, Fairfax, Prince William and Stafford Counties and the City of Alexandria, Virginia	2007-0006	Brian Buchanan, Christopher Shephard, David Carroll, Curt Breckenridge, Johnna Flahive, Christine Jirkowic, Tammy Bryant, William Barse	2007	686pp	Digital file available. APE of 1104 acres extends along I-95 for 36 miles, with most of the project area subjected only to visual reconnaissance due to previous construction work. 21 previously recorded archaeological sites, as well as three historic prop	TAA	1104

***Organization Abbreviations**

- PES - Parsons Engineering Science
- KFS - Kise Franks & Straw Inc.
- WMCAR - William and Mary Center for Archaeological Research
- TRC - Garrow and Associates, Inc.
- NPS - National Park Service
- LBG - Louis Berger Group
- TAA - Thunderbird Archaeological Associates
- JMA - John Milner Associates
- VERSAR - VERSAR Inc.
- COE - US Army Corps of Engineers

Three archaeological surveys have been conducted within the APE for the Millennium Project. In 1991 Custer conducted a Phase I survey at several locations within Fort Myer where undertakings were being considered in association with BRAC actions (Custer 1991 and 1992). That survey identified a prehistoric site (44AR0043) in the Picnic Area just south of the Motor Pool, and recommended further work. No further work was undertaken by Fort Myer, and the site which consists of debitage and lacked any diagnostic artifacts was not recorded until nearly 20 years later.

In 1998 Garrow and Associates, under contract with the US Army Corps of Engineers, Baltimore District reported on archaeological survey and historic landscape evaluation of Section 29 in Arlington National Cemetery (Millis et al. 1998). At that time all of Section 29 with the exception of the maintenance yard area was under National Park Service ownership. The archaeological survey identified six areas of artifact concentration in Section 29, but rather than record five or six sites, all of the undisturbed portions Section 29 were recorded as one site, 44AR0032.

Redacted

Site 44AR0019 was recorded in 1992 by Kemron Environmental Services. It is situated in the small county park, immediately northwest of the project area. Twenty-two shovel test pits were excavated, presumably as an identification survey for park development, although there is no report in the DHR database. It may be that the park development involved no federal funding or permitting, and was therefore not subject to Section 106 review. The site form summarizes finds as “3 Civil War-era bullets, 1 pearlware fragment, 1 8/64th” Pipe stem, some whiteware, cut nails, glass, large amounts of unidentified iron fragments.” They categorize the site as a “Trash Scatter” with a chronology of 3rd quarter of the 19th Century, and Prehistoric – unknown. No prehistoric artifacts are noted on the site form, but they would be non-diagnostic lithics, probably debitage. The site evaluation status is marked as not evaluated. As there is no indication of further work having been performed, it would seem that the investigators and the county deemed the site to lack significance.

4 Historic Context

4.1 *Prehistory*

Earliest human inhabitation of the Americas remains one of the most debated issues in archaeology, but clearly Native Americans began to inhabit the Chesapeake Bay region over 12,000 years ago. Many of the sites left by the ‘Paleo-Indians’ of this period may now be submerged on the bottom of the bay and the Atlantic continental shelf, for sea-levels during the Wisconsin Glaciation of the Pleistocene epoch, or Ice

Age were some 400 feet below contemporary levels. Populations were evidently low, but grew considerably during the Archaic Period, which is divided into Early (8000-6500 BC), Middle (6500 to 3000 BC) and Late (3000 to 1200 BC) Archaic Periods. Along with increasing population there is evidence of an increased diversity in resources hunted and gathered for food, with an expansion in fishing and shellfish gathering particularly notable.

Around 1200 BC people in the region began making and using pottery. This marks the beginning of the Woodland Period, also divided into Early (1200-500 BC), Middle (500 BC to AD 900), and Late (AD 900-1600) Woodland Periods. There seems to have been little change in settlement between the Late Archaic and Early Woodland Periods, apart from the use of pottery, but during the Middle Woodland people seem to have dispersed into smaller, though perhaps more sedentary settlements. It was during this period that the maize-beans-squash crop combination of American Indians was adopted in the region. During the Late Woodland Period populations increased with an expansion of agriculture, as did political hierarchy. Village districts consisting of a series of hamlets, or in the native language “hattos” were strung along the shores of the major estuaries, with a nucleated, often palisaded chief’s residence central to them. This was the state of native culture in the Chesapeake Bay region during early exploration and settlement, and the direct historical accounts

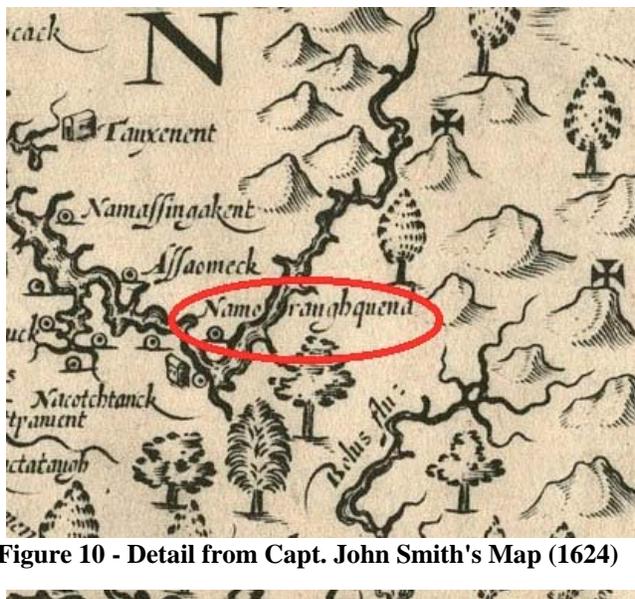


Figure 10 - Detail from Capt. John Smith's Map (1624)

of that period give the name Protohistoric Period to 1600-1650. The larger Native American sites along the lower Potomac River are most often located on points and near the mouths of major tributaries, and often include artifacts from several, sometimes all of the periods of prehistory.

In 1608 John Smith and a crew of just over a dozen men sailed their small open boat up the Potomac as far as the falls. This was the earliest know European contact in the Arlington County vicinity. On the western shore of the river, Smith observed and mapped an Indian village called Namoraughquend (Figure 10) in 1608 (Smith 1624). Nineteenth century anthropologists S.V. Proudfit (1889) and James Mooney (1889) both cite the foot of Long Bridge on the Virginia side of the Potomac as the site of the village. Proudfit’s mapped sites were based on observations of archaeological deposits. Long Bridge was at the approximate location of the 14th Street Bridge today.

Within and near the boundaries of the APE for the Millennium Project, prehistoric artifacts have been reported from two sites: 44AR0032 and 44AR0043 (1998) reported 303 lithic artifacts, including four bifaces, and a steatite bowl fragment from Site 44AR0032. These were distributed among five loci, which are actually individual sites. Of these, Loci 1, 2, 3, and 5 have been evaluated as not NRHP eligible, while Loci 6 is eligible (Loci 4 is a Historic Period component, which contributes to Arlington House). The steatite fragment, found in Loci 5, identifies use of that site during the Late Archaic and Early Woodland Periods from 3000 to 500 B.C., (Truncer 2004), though not limiting it to those ages. The Picnic Area Site (44AR0043) was investigated by Custer (1991) and Katz (2010). Quartz cobbles, debitage, and fire-cracked

rock were reported, but no temporally diagnostic artifacts. Site 44AR0043 was determined ineligible for the NRHP.

4.2 Historic Period

4.2.1 SETTLEMENT TO NATION (1607 TO 1789)¹

While Jamestown was founded in 1607 and its colonists first explored the ANC area, it was not until the

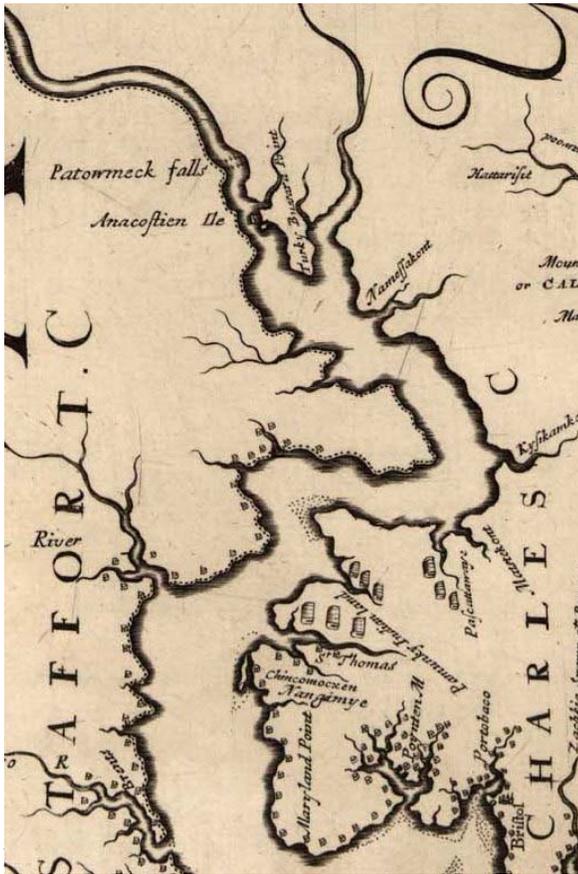


Figure 11 - Map (1670)

1650s that patents were claimed by English settlers for land lying north of present-day Alexandria. Fitting the pattern of large-acreage, absentee-ownership land grants; the land on which ANC is located was first granted by Virginia Governor William Berkley to Robert Howson (also noted as Howsing or Howsen) on October 21, 1669. Howson was a ship's captain and received a tract of an estimated 6,000 acres as payment for transporting 120 emigrants to the Virginia colony. The captain assigned his patent to John Alexander of Stafford County for 6,000 pounds of tobacco. Later surveys would reveal that the property bounds encompassed nearly 8,000 acres (Greenhorne and O'Mara, Inc. 1999:6).

The land that Alexander obtained was uninhabited, and few roads had been established in the area. One notable exception was the corridor known as the Potomac Path, which ran north-south and extended from the Occoquan to Great Hunting Creek. The latter was the southern boundary of Alexander's land grant and where the city of Alexandria, named for the Alexander family, was established in 1749 (Hanna 2001:9). It is unlikely that the area was settled until the end of the 17th century. Prior to that European settlement had stayed close to navigable rivers, and

northernmost Virginia was still Indian territory. The Augustine Herrman (1673) illustrates this (Figure 11). On the Virginia shore settlement had extended only as far as Pohick Bay, while across the river in Maryland it extended only as far as Chicamuxen Creek beyond which were the villages of the Pamunky and Piscataway Indians. It would be the 1690's before the Indians would mostly leave the area and settlement expanded.

In 1735 brothers Gerard and John Alexander inherited the property, with Gerard given 2,713 acres lying north of Four Mile Run, including the land that would become part of ANC (Hanna 2001a:10-11; Stetson 1935:10-15). Gerard Alexander, in addition to being a prosperous landowner, also served in the Virginia

¹ Portions of this context are derived from the ANC history found in Draft, Integrated Cultural Resource Management Plan: September, 2011, and August 2012 (Baltimore, MD: U.S. Army Corps of Engineers, Baltimore District, 2011, Norfolk, VA, U.S. Army Corps of Engineers, Norfolk District, 2012).

House of Burgesses (1751-1755) and served as a colonel in the Virginia militia. Upon his death in 1761, he left his son Gerard 900 acres of the upper part of the tract which included the lands that are now in ANC.

The Howson patent left the possession of the Alexander family in the late eighteenth century, when it began its historical association as a Custis family landholding. In 1750 Daniel Custis of Williamsburg and Northampton County married Martha Dandridge of New Kent County. The couple had two children—John Parke and Martha (“Patsey”). In 1757 Daniel died, leaving his vast estate to Martha, who became one of the wealthiest women in Virginia. In 1759 Martha married George Washington, who was living on his Mount Vernon estate along the Potomac, and he adopted Martha’s two young children, although they retained their father’s surname. In 1774 John Custis married Eleanor Calvert.

In 1778 John Parke Custis purchased 1,000 acres from both Gerard and Robert Alexander, and by 1779 he had moved his wife and two children to the home that Gerard Alexander had built along the Potomac River (Stetson 1935:26-28). Four more children were born to the Custis family, including George Washington Parke Custis, who was born in 1781 and who would inherit his father’s estate along the Potomac. John Parke Custis died of typhoid in 1781, and George Washington adopted the two youngest of Custis’ children—Eleanor (“Nelly”), who was two years old, and George Washington Parke, who was only six months old. The children were reared at Mount Vernon by their grandparents (Stetson 1935:29)

4.2.2 EARLY NATIONAL PERIOD (1789 TO 1830)

In 1789 land was ceded from Virginia and Maryland to the federal government for the formation of a new district, 10 miles square, lying on both sides of the Potomac River. Custis’ estate was located within these boundaries in the newly designated Alexandria County, District of Columbia (Netherton and Netherton 1987:46-47).² Frenchman Pierre Charles L’Enfant, a military engineer, was selected by President Washington in 1791 to lay out the plan for the new city. L’Enfant established locations for important federal buildings set in axial relationships to one another that were connected by a system of radiating avenues with straight sight lines between them. In 1800 the federal government moved from Philadelphia to the new capital (Newton 1971:400-403).

After the end of his second term as President of the United States in 1797, George Washington returned to Mount Vernon and assumed direct and personal management of his farms. His adopted son, George Washington Parke Custis, would be close by to assist. The lessons he learned at Mount Vernon and directly from Washington would inspire and direct his development of his inherited Arlington estate. Washington died on December 14, 1799, at the age of 67. In his will, he left portions of the estate to his adopted grandchildren, which they would inherit after Martha’s death in 1802.

4.2.3 ARLINGTON HOUSE (1802 TO 1830)

George Washington Parke Custis inherited property in 1802 from both his father’s and from Washington’s estates, a total of about 18,000 acres of land and about 200 slaves. Custis turned to his 1,100-acre property on the Potomac and decided to construct a home there that would honor his grandfather’s memory and overlook the city that was named after him. By 1804 Custis referred to his home as “Arlington House” and

² In 1846, Congress approved returning 31 square miles to Virginia, including the land now ANC.

to his estate as “Arlington” (Nelligan 2001:79). As he planned out his estate, he turned to one of the architects who had been involved in designing the Capitol, English-trained George Hadfield (Kimball 1950:266; Nelligan 1951:11). All of Arlington National Cemetery and Fort Myer are within the bounds of the old Arlington estate.

The design for Arlington House is often referenced as the first pedimented front, temple form, Greek Revival-style residence in America. Although already popular in England, the Greek Revival style would not dominate the American architectural scene until the late 1820s and 1830s. Arlington is cited as the earliest example of Greek Revival architecture in America, as well as the most impressive (Kennedy 1989:3; Moeller 2006:337). Clearly, the site was selected by Custis for its commanding vista over the Potomac River and into the federal city, with an unencumbered view of the U.S. Likewise, Custis knew that setting the house upon the brow of the most prominent hill on his estate afforded any visitor to the region a grand view of the house. The gigantic scale of the portico, with its massive Doric columns, was also intended to impress even from a distance (Nelligan 2001:73).

Siting of the house on a promontory backed by dense woods with a sloped “park” landscape to the front reflects an ideal English landscape design. This romantic approach to landscape design rejected the more axial and symmetrical layouts of Colonial-era gardens. Curvilinear pathways and roadways, water elements, open lawns and “pleasure gardens,” as well as areas of forest and ornamental trees, were significant elements of the design. Classical allusions were often introduced into the garden by way of buildings designed in temple forms. In addition, views and vistas from different vantages on the property were intentionally framed by use of vegetation and building placement. While still a highly manipulated landscape, these elements were to be executed in a manner that would not appear manmade but rather as though nature had highlighted a property’s natural advantages while minimizing or concealing the disadvantages. This picturesque concept of landscape development would remain as a defining feature of ANC.

4.2.4 ANTEBELLUM PERIOD AND CIVIL WAR (1830 TO 1865)

In 1831 Custis' daughter, Mary Randolph Custis, married Robert E. Lee, a childhood friend and a young Army engineer who had graduated from West Point. Lee assisted Custis in the management of his properties and travelled to the New Kent and King William landholdings for his father-in-law (Thomas 1995:164-165). Robert E. Lee had followed in the footsteps of his father, Maj. Gen. Henry "Light Horse Harry" Lee, and embarked upon a military career, graduating from West Point in 1829 as a military engineer and focusing his life on building coastal defenses. In 1834 Lee was transferred to Washington as the first lieutenant assisting the Chief Engineer Department (Corps) of the Army, and between 1834 and 1837 the

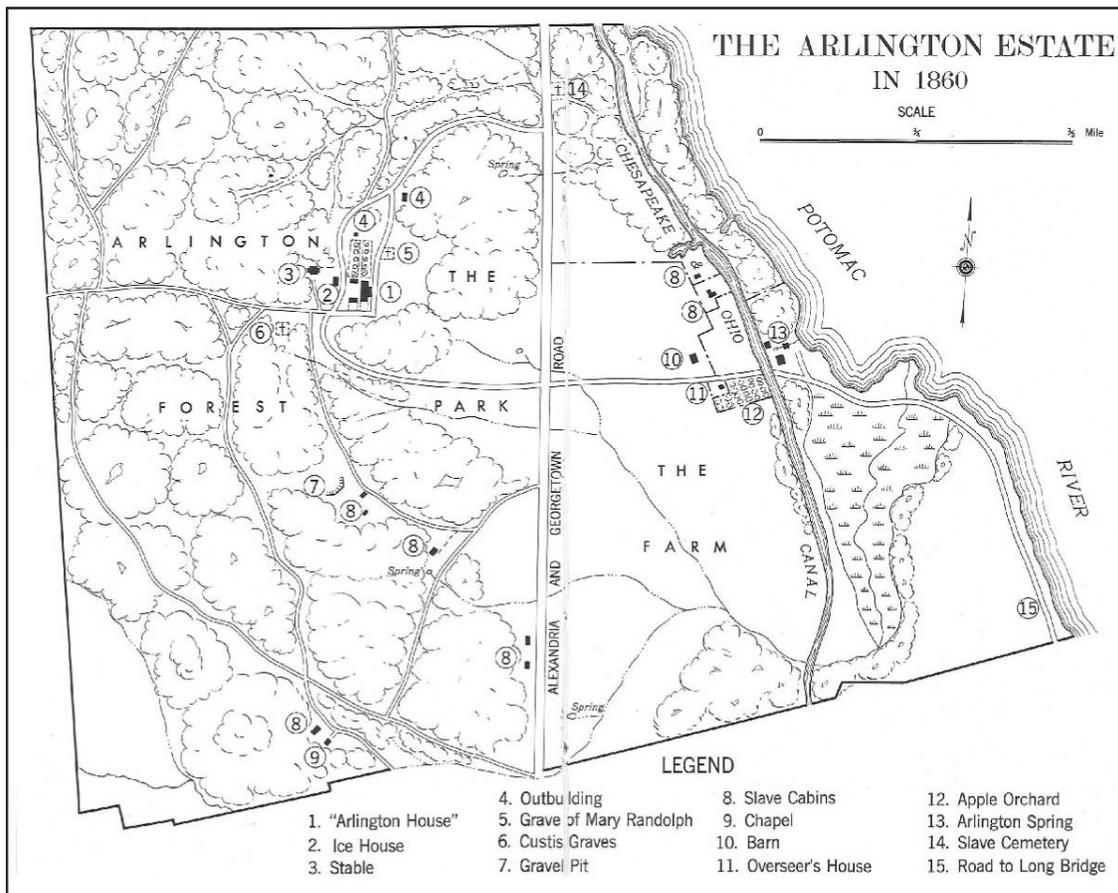


Figure 12 Composite Map of Antebellum Arlington Estate (Nelligan 1962)

Lees were

able to live at Arlington House. In 1857, Custis died and the role of executor fell to Robert E. Lee. In his will, Custis left the Arlington estate to his daughter, Mary Lee, for her lifetime, and at her death the property was to pass to her son, George Washington Custis Lee. Lee found that Custis had died heavily in debt and that all of the estate's properties, including Arlington, were in poor condition and needed work before they could be sold or become profitable. Lee, not a farmer by trade or reputation, endeavored to improve the Custis landholdings. Lee's efforts at Arlington, however, came to an abrupt halt in April 1861 with the onset of the Civil War.

On May 23, 1861 immediately following the plebiscite ratifying Virginia's secession, the Union Army crossed the Potomac and occupied Alexandria and Arlington Heights. Rosslyn and Arlington Heights were of particular importance, commanding approaches to Washington over the Aqueduct Bridge and Long Bridge, as well as major avenues of approach from the west. Arlington House and grounds were commandeered by the Union Army under General Irwin McDowell. Union troop immediately began work on forts to hold the Aqueduct bridge and Long Bridge; these were Forts Corcoran, Bennett, Haggerty, Jackson, and Albany. McDowell ordered that the house and the grounds of Arlington House were to be left alone (*New York Times*, 23 September 1861).

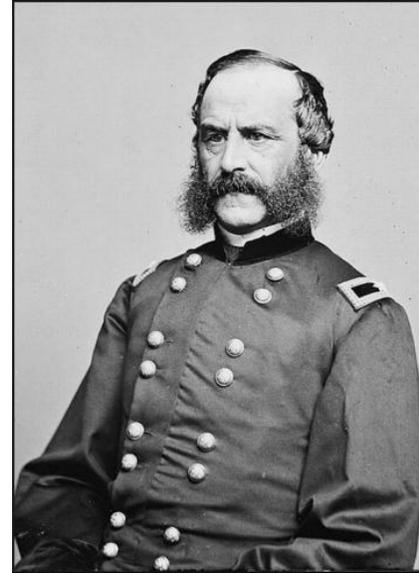


Figure 15 - Major General Augustus DeRussy, Commander of the Southern Defenses of Washington from 1863

Defeat at Manassas put urgency into the construction of already-ordered fortifications to fill in between the initial forts defending the approaches to Washington. A series of rifle pits and lunettes were erected, the lunettes closest to Arlington House were named Forts Woodbury, Cass, and Tillinghast. Still, with an ambition to mount a campaign against Richmond, Washington would have to be defended by fewer troops, and in December of 1861 the Chief of Engineer of the Army of the Potomac reported giving an overview of the progress on fortifications and a grand plan for the defenses of the capital (U.S. War Department 1881: 678-685). This plan called for redundant fortifications in lines, communications systems, roads, and clearing any cover from areas before the defenses, referred to as "Lines of Torres Vedras" after the

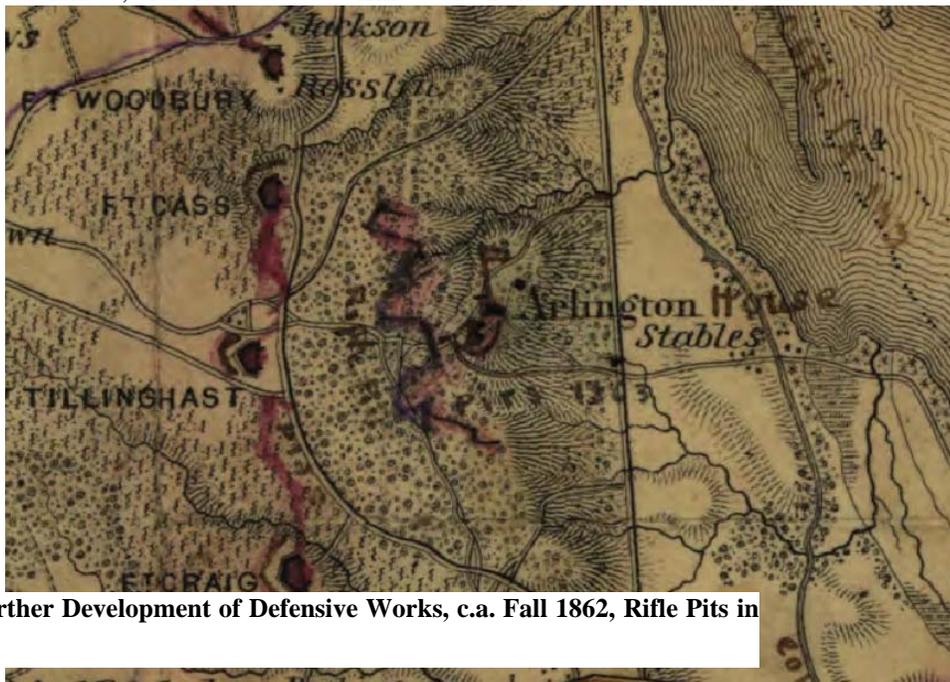


Figure 16 - Further Development of Defensive Works, c.a. Fall 1862, Rifle Pits in Two Lines

exemplary defenses erected by the Duke of Wellington for Lisbon in the Napoleonic Wars.

Initially, tents were set up near the house rather than having the headquarters inside the mansion, but by 1862 the mansion was occupied by officers. It continued to be used by the Union Army throughout the war, serving as headquarters, Defenses (of Washington) South of

the Potomac for most of that time which was commanded by Maj. Gen. DeRussey.

The Arlington estate became one of the greatest concentrations of troops in the Washington area during the first months of the war. The 8th New York Infantry set up camp just south of Arlington House in June 1861. By July 1861 there were nine other units camped on the Arlington estate: 29th New York Artillery, 14th New York (Brooklyn, in 2 camps) 22nd New York, Seymour's Artillery, 2nd Michigan, 12th New York, 3rd Michigan, Griffin's Artillery, and last but not least, the 3rd Infantry Regiment of US Army regulars.



Camps were set up in the grove behind the house (where the Custis tombs were located), trees were cut to construct tents and for use as firewood; and Custis' orchard was reportedly cut down because it obstructed a clear view from the house. Arlington Heights was fortified soon after the onset of hostilities, initiating a network of forts



encircling Washington. Among these were Forts Cass, Tillinghast, and Craig just west of ANC on what is now Fort Myer. Confederate offensives spurred additions to the defenses of Washington until nearly the end of the war. Fort Whipple, just east of Fort Cass and one of the largest in the defense network was completed in 1863. Fort McPherson was planned after Confederate General Jubal Early's July 1864 raid on Washington, but not completed before the end of the war. The earthworks of Fort McPherson remained visible in Section 11 of ANC, until the 1940's. Fort Whipple continued to be manned after the

war, and though physically demolished is active to this day under the name of Joint Base Myer- Henderson Hall.

4.2.6 FREEDMAN'S VILLAGE (1863 to 1900)

Throughout the Civil War large numbers of slaves escaped from the South and came to the District of Columbia seeking their freedom. In the Washington area the government hired black laborers as carpenters, masons, blacksmiths, and construction workers. The laborers were paid between \$20 and \$30 a month plus a daily ration and were accommodated in a contraband camp (Reidy 1987:409). By the summer of 1863, following the Emancipation Proclamation, it was becoming increasingly difficult to provide for the thousands of contrabands in the area.

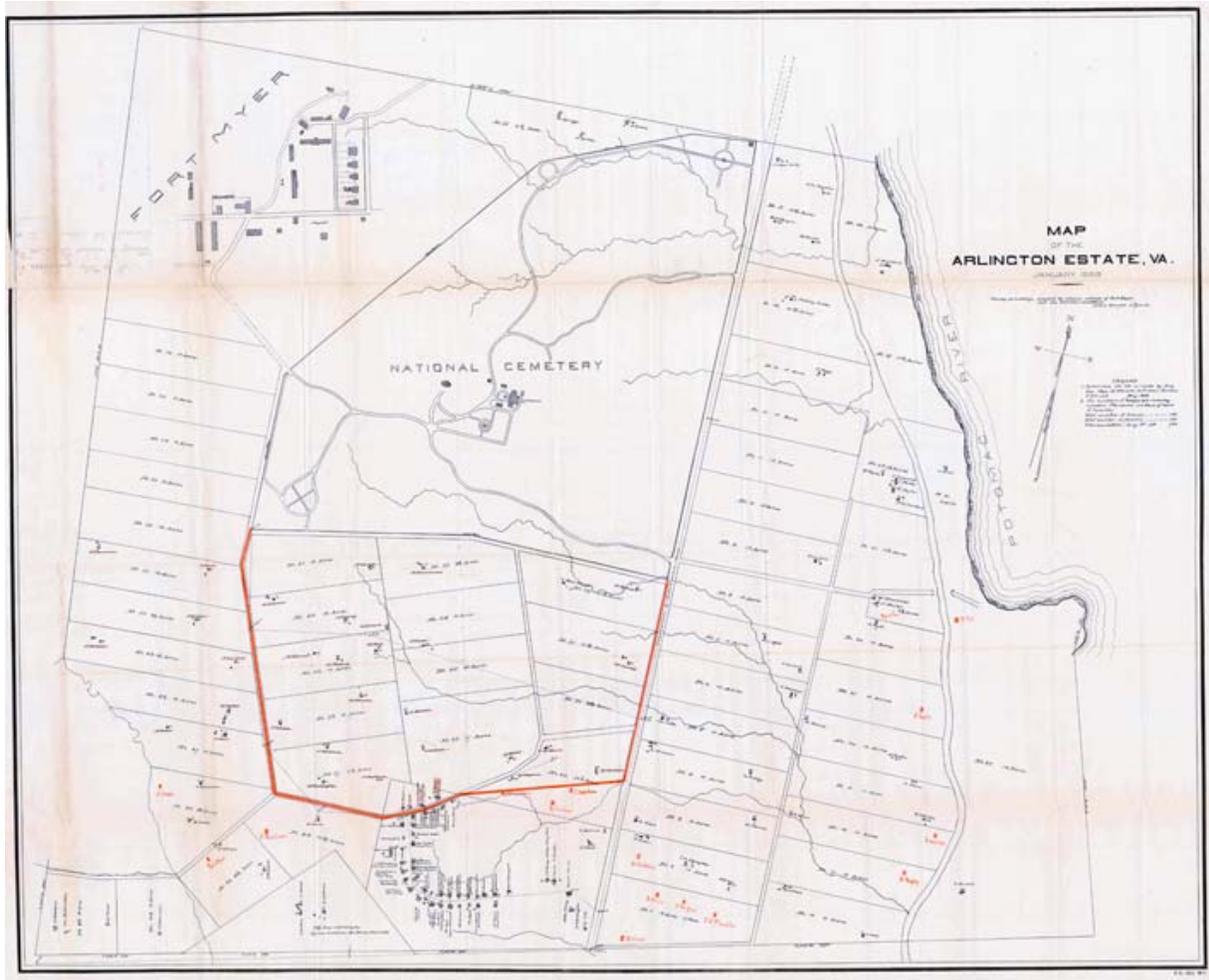


Figure 19 - Map of Arlington Estate, 1888

In an effort to ameliorate the problem, military authorities established a Freedman's Village on the Arlington estate in June 1863, which was officially dedicated on December 4, 1863 (James 1970:91; Schildt 1984:11). Located on the southern section of the Arlington property west of the Alexandria and Georgetown Turnpike (Section 8), and referred to as "Arlington Heights" and "Greene Heights," the camp was placed under the supervision of Danforth B. Nichols of the American Missionary Association and Lt. Col. Elias M. Greene, chief quartermaster of the Department of Washington (Reidy 1987:409). The village consisted of 50 one-and-a-half-story duplex dwellings, the 50-bed Abbott Hospital, a two-story home for the indigent, a school and chapel, and trade school shops (New York Times, 12 December 1863). The buildings were

arranged along a central roadway, Bancroft Drive (now Jessup Drive and a portion of Grant Drive, Figure 20).

Because of its location on the former Custis-Lee estate, the village received national attention and became a showcase for those who sought ways in which to make the former slaves self-sufficient (Reidy 1987:411-413). During the war, village residents were successful in returning Custis' fields to productivity and grew buckwheat, corn, potatoes, and other vegetables (Schildt 1984:14). In May 1865, the village came under the supervision of Maj. Gen. O.O. Howard of the Bureau of Refugees, Freedmen, and Abandoned Lands (commonly called the Freedmen's Bureau), an agency established to help supervise the transition for former slaves from postwar to freedom. By 1866, however, tensions had risen between the government and the village residents, and many who did not pay rents or could not produce a certificate of employment were evicted from the property (Reidy 1987:417-420). From 1870 to 1872, the village was administered under the post commander at Fort Whipple (later Fort Myer). The government retained ownership of the land and also employed many of the residents as laborers at the cemetery and at Fort Whipple.

As conflicts arose between the village residents and the new cemetery officials, efforts were made by the government to remove the civilians from the military reservation of the cemetery (Reidy 1987:425; Schildt 1984:18-19). In 1887 War Department officials gave residents 60 days to move from the property, but this was not actually accomplished until 1900 when the villagers were given compensation for leaving their homes (Reidy 1987:426-427). When the village was disbanded, it was the oldest Freedman's Village in the country (Reidy 1987:426; Schildt 1984:19). Subsequent development of the area for burial use removed the buildings, and with the exception of the basic course of Jessup Drive and Grant Drive, there is now no trace of the Freedman's Village on ANC grounds.

4.2.7 ESTABLISHMENT OF ANC (1864 TO 1867)

Through its Act of July 17, 1862, Congress had granted authority to the President to purchase land "whenever in his opinion it shall be expedient, to purchase cemetery grounds and cause them to be securely enclosed, to be used as a national cemetery for the soldiers who shall die in the service of the country" as public concern arose about the improper burial that some Union soldiers were receiving in the field (U.S. Department of Veterans Affairs 2010). The establishment of a national cemetery near a large area of military encampment was not unusual; however, the selection of a private estate for this use was unusual. In this way Arlington's development is unique in the history of the National Cemetery System. Some national cemeteries were created near battlefields out of necessity, such as Gettysburg National Cemetery, but these were generally established in open fields or areas that were undeveloped (reflecting the fact that Civil War battles often took place in such areas). By designating an established estate as a cemetery, the military was able to take advantage of the existing roadways and other infrastructure already in place and formerly used as part of Custis' farm, parkland, and waterfront.

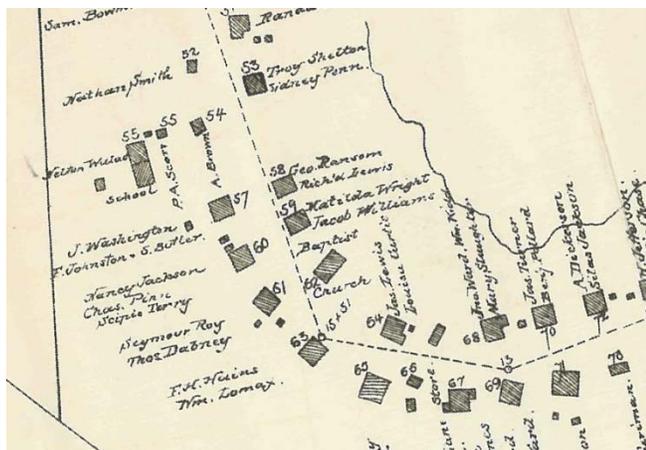


Figure 20 - Detail of 1888 Map of Arlington Estate Showing the Center of the Freedman's Village

A major impetus for the development of Arlington was the Wilderness Campaign, fought in central Virginia between May 4 and June 12, 1864, during which approximately 60,000 Union soldiers were killed. Existing space at the Soldiers' Home National Cemetery in Washington, D.C., and the Alexandria National Cemetery, which had been established in 1862, was filling quickly and new burial locations were needed immediately. By May 1864 there was a critical need for military burial space (Holt 1992:19, 419).

Secretary of War Edwin Stanton requested that Quartermaster Brig. Gen. Montgomery C. Meigs, who was charged with the federal administration of military cemeteries, locate a suitable property for the establishment of a new cemetery near Washington, D.C. On June 15, 1864, Meigs wrote to Stanton and suggested that the Arlington mansion and the grounds immediately encircling it be designated as a military cemetery.

Soldiers who died in hospitals in Washington, D.C., and Alexandria would be buried at Arlington, as well as the war dead. Stanton approved Meigs' request on the day it was received, and about 200 acres surrounding Arlington House were designated as the Arlington National Cemetery. Meigs assigned his assistant, Edward Clark, as "architect and engineer of the cemetery" (Meigs 1864). Clark would later become the Architect of the U.S. Capitol.

Although officially created in June, burials had commenced at the estate a month earlier when Pvt. William Henry Christman, and William H. McKinney, both of Pennsylvania were buried on May 13, 1864. This was in the vicinity of the Custis slave cemetery, now Section 27 of ANC, where these initial burials remain.

4.2.8 EXPANSION OF ANC (1867-PRESENT)

By 1888 increased demands for burial space prompted the Army to expand beyond the original 200 acres designated for the cemetery. The plan was to expand southward, taking land that had been leased to Freedmen for small farms, but at that time leaving the Freedmen's Village in place. The land was designated for cemetery use, but it was later decided to expand further south, eliminating the Freedmen's Village. This came to pass, and in 1897 the cemetery expanded southward to its present southern boundary, and as far east as Georgetown-Alexandria Pike, about where Eisenhower Drive is now. The red sandstone boundary wall was dismantled along the old southern boundary, and rebuilt along the western boundary, extending from the old southern boundary, where Farragut Drive is now, to where the Argonne Cross was later erected, when the material ran out. Past that point, and along the new southern boundary, the new wall was built of a blue-grey igneous or metamorphic stone, ending at Georgetown-Alexandria Pike. The newly extended eastern boundary was also walled, according to maps dating to 1897, but it is not known what material was used there.

This new section of the cemetery was developed through the first half of the twentieth century, receiving the remains of both Union and Confederate veterans, those from the Spanish American War, and a tragically large number from World War I. Many of ANC's most notable monuments were erected there. The Confederate memorial, the Mast of the Maine, the Argonne Cross, and most notably the Memorial Amphitheatre and the Tomb of the Unknown Soldier. The circulation system developed slowly, for example Patton Drive and Dewey Circle were added in the late 1940's and early 1950's respectively. The former may have resulted in a partial burial of the south boundary wall, which at present is about half the height of other portions, perhaps prompting the addition of the iron pike fence and supporting concrete cap.

The eastern side of the Arlington Estate, east of the Georgetown-Arlington Pike, was also held by the Army. Following the eviction of the Freedmen who had leased small farmsteads there, the US Department of Agriculture was allowed to establish an experimental farm there in 1905, with the stipulation that the land would be returned to the Army if ANC needed more space. It took up the area south of where Memorial Avenue would later be built. The northeast corner of the former Arlington Estate was used by Fort Myer for rifle ranges and gardens. The experimental farm lasted until 1941 when the Army need the area for housing clerical workers for the Pentagon. This housing area was known as “South Post” of Fort Myer for military personnel and “Arlington Farms” for civilian workers, mostly female. Although a plan was made in 1966 to demolish South Post and finally expand ANC eastward. Just as this came to pass, the Vietnam War was escalated and the need for the South Post housing continued. Although Arlington Farms housing was demolished by 1968, South Post remained until after 1971. It was probably sometime after 1971 that the boundary wall was extended to the east of its 1897 terminus at the former location of the Georgetown-Alexandria Pike.

This project marks the first expansion of ANC outside the bounds of the Arlington Estate. This area seems to have been little developed, save for a few small buildings shown on Civil War era maps at the intersection of Georgetown-Alexandria Pike and Columbia Pike, probably a toll house and associated out buildings. Just east of the project area was the Alexandria Canal, which ran through the current site of the Pentagon. Fort Albany, one of the earthwork forts forming a defensive chain around Washington during the Civil War was south of the project area where Shirley Highway/I-395 is now.

The area was a patchwork of small homes and fields in the early 20th century, including a poultry farm on the south side of the project area. These gave way to the Pentagon, Navy Annex, Henderson Hall, the WAVES (women’s naval reserve - Women Accepted for Volunteer Emergency Service) barracks, and the network of highways to serve this wartime beehive of activity in the early 1940’s. The Navy Annex was built in 1941, and although it was intended to be a warehouse, office space was needed by the Marine Corps and it became ‘Federal Office Building #2’ although always known as the Navy Annex. It continued to provide office space for Headquarters Marine Corps until shortly before its demolition in 2012. The WAVES barracks, known as “Quarters K” were built soon after the Navy Annex. They occupied all of the APE south of Columbia Pike, including what is now a traffic island between Joyce Street and the on ramp for Washington Boulevard. There were 18 two story barracks buildings, a large one story subsistence building, and a one/two story administration building with an attached clinic (Sanborn 1959). The complex was demolished in 1971 and the area converted to parking, and a Navy Exchange run Citgo Mini Mart named Quarters K after the former barracks on the site.



Figure 21 - Project Site Boundary on 1949 Aerial Photo, Navy Annex in the Northwest Corner, Quarters K to its South and East

5 Field Methods

Based on the review of past land use and site visits the project APE outside of the existing ANC boundary was viewed as too disturbed for shovel testing survey to discover any intact archaeological contexts. Shovel testing survey has not been conducted, however there was considerable evidence on stratigraphy and remnants of modern building foundations produced by a soil testing and remote sensing survey conducted by the Washington Headquarters Service (WHS) prior to the transfer of land to ANC. Information on stratigraphy was also available from soil borings from the Air Force Memorial construction project. The results of these surveys are summarized in the next section.

Conventional shovel test pit survey was conducted in select areas along Patton Drive. Areas not previously disturbed by road construction, underground utilities, and burials were limited and tests were placed in those areas most likely to have had the least prior ground disturbance. Shovel tests, cylindrical in form, averaging 40cm in diameter, and excavated to what were judged to be either culturally sterile levels unless prior ground disturbance was in evidence. The soil matrix was sieved through ¼” hardware cloth. Soil texture was determined through the ‘feel method’ and colors matched to the Munsell® color chart. Non-

soil inclusions and other observations noted, along with brief descriptions and counts of any artifacts identified.

6 Remote Sensing Survey and Geotechnical Survey Results

6.1 Borings for the Air Force Memorial

Soil boring logs from the Air Force Memorial (AFM) project in 2005 showed that the subsurface soil stratum consisted of the following three layers in descending order from the surface: 1) existing fill layer, 2) marine clay layer, and 3) sand layer. Similar layers are likely to be present in the Southern Expansion site. There is an approximately 30-foot elevation difference between the Navy Annex main parcel and the adjacent landscaped area immediately east of the AFM. The fill layer was not encountered in the borings on the landscaped area. The existing fill layer was approximately 28-feet thick and consisted of a mix of sand and clay with roots and asphalt fragments. Naturally occurring marine clay underlies the existing fill layer. Based on the boring logs, the marine clay layer is approximately 30-feet deep and is expected to be immediately below the existing grade at the landscaped area. The sand layer was found below the marine clay layer; the thickness of the sand is 15 unknown.

6.2 Borings, Remote Sensing, and Excavations by the Washington Headquarters Service and Corps of Engineers

The Army Corps of Engineers drilled 80 geotechnical borings were drilled (Figure 22) in the project area to evaluate the site's characteristics (Trainor 2011). The results showed a very high degree of variability in the stratigraphy across the site (Figures 23, 24 25). Although the materials are consistent with the Potomac Formation mapped for this area (Figure 2), consisting of unconsolidated sediments of sand, clay, and pea gravel, the sequences and thicknesses of the strata vary widely, even for tests near each other. This does not reflect natural processes, and reveals profound ground disturbance across the site outside of the ANC boundary.

Under a Memorandum of Agreement with the Army covering the land transfer of the former Navy Annex site, Washington Headquarters Service conducted studies to identify potential hazardous materials. A remote sensing survey was undertaken using magnetometer, conductivity, and ground penetrating radar to identify remnants of structures that might contain or be associated with hazardous materials. Two main concentrations were identified (Stuby 2014). One was in the footprint of the former Navy Annex, the other was in part of the former Pentagon South Parking Lot, where Quarters K had been before that (Figures 26 and 27). These locations were excavated, and a large concrete slab was found in the Navy Annex location (Figure 28), identified as the foundation for a bridge between the east and west wings (Schneider 2013). The remains of concrete foundations were found in the former parking lot, identified as remains of the Quarters K dining hall (Figure 29).

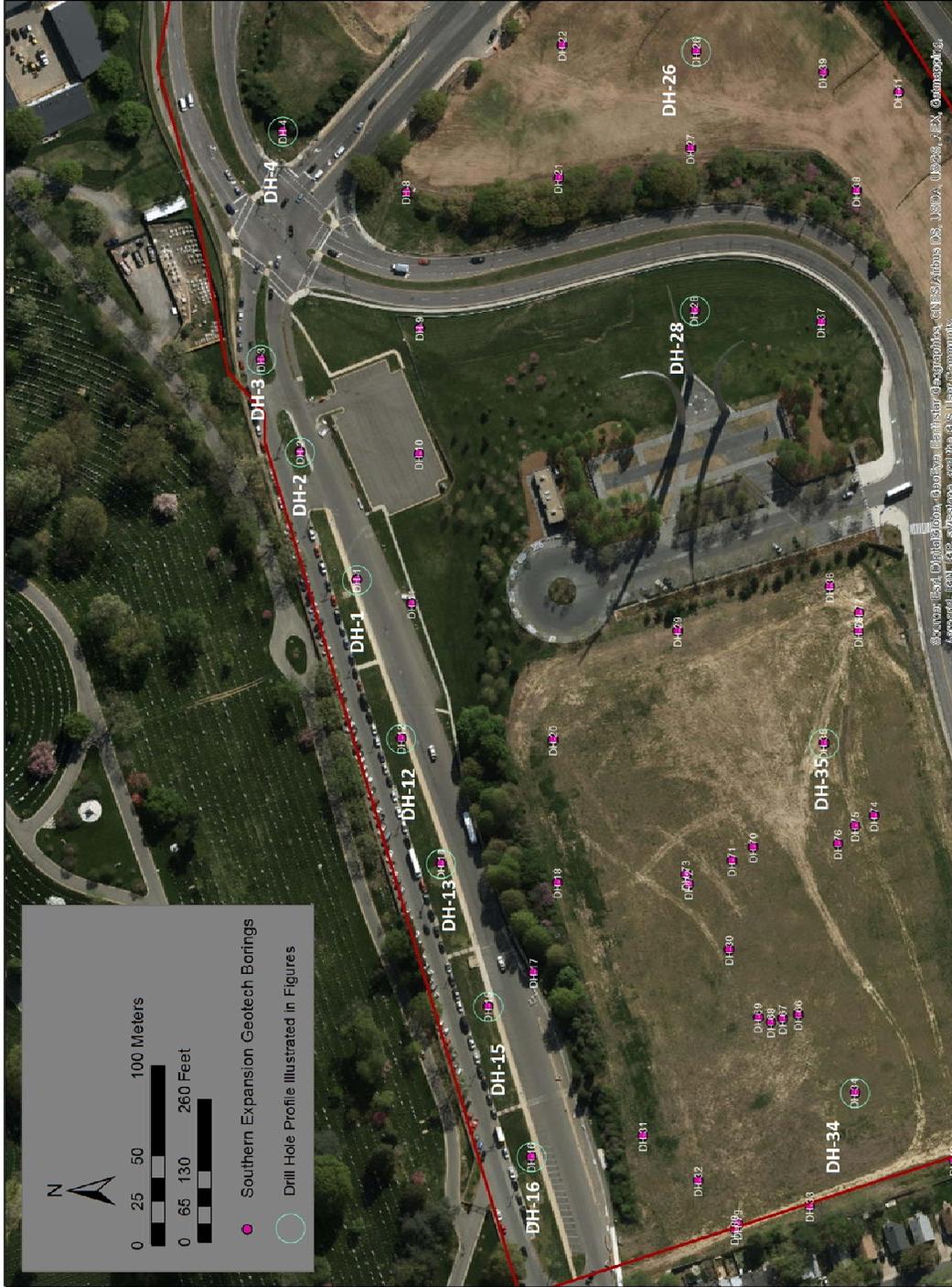
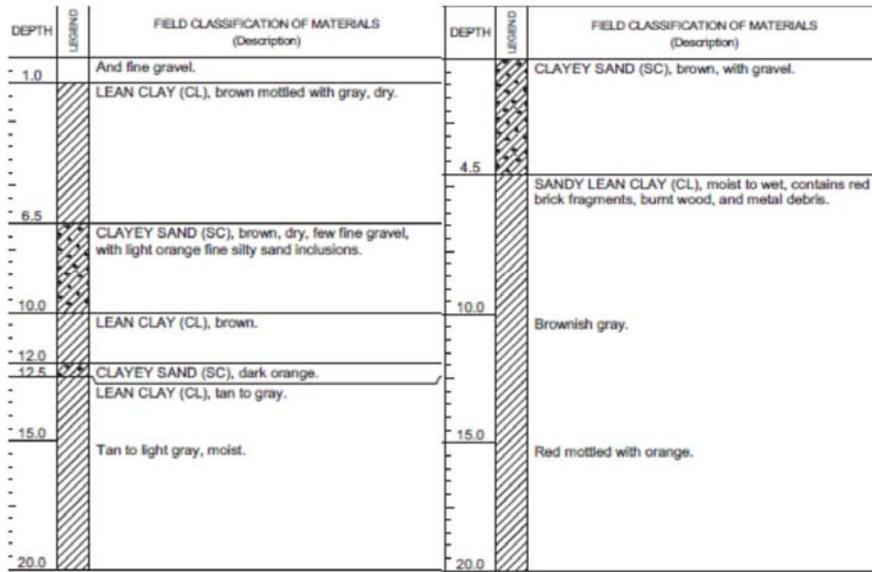
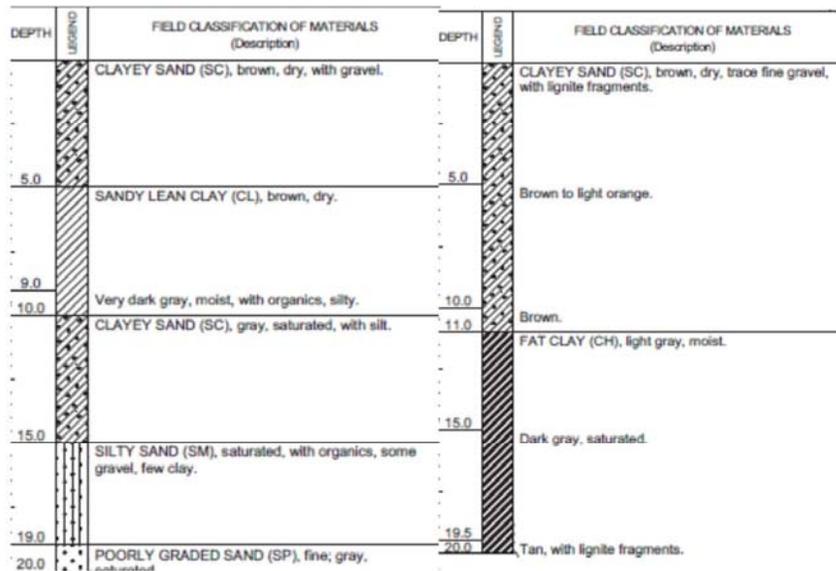


Figure 22 - Boring Locations (those depicted below with second bold label)



DH-1

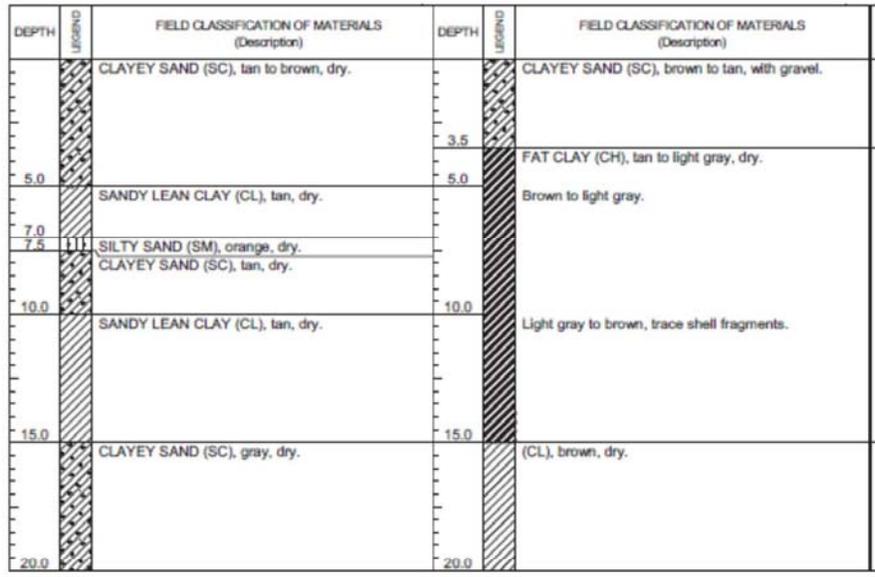
DH-2



DH-3

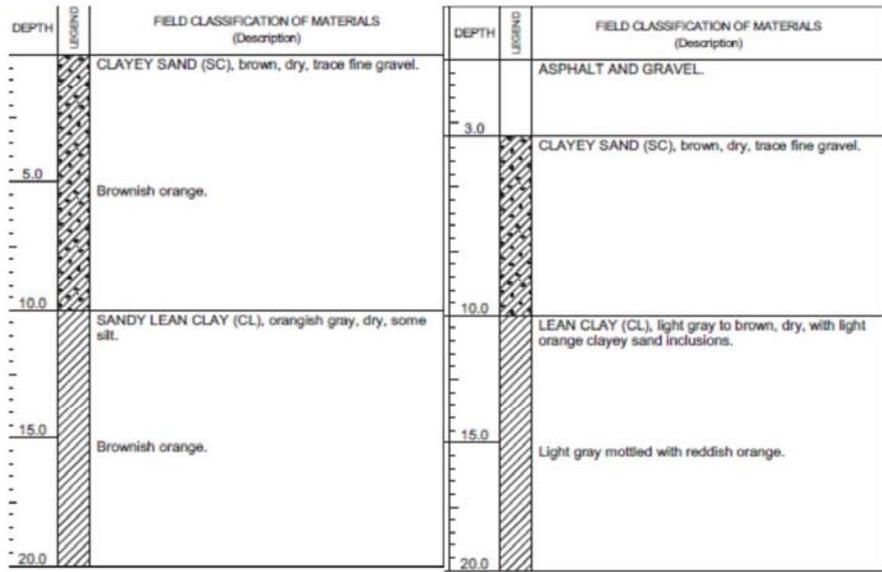
DH-4

Figure 23 – Profiles of DH 1-4 (Trainor 2011)



DH-12

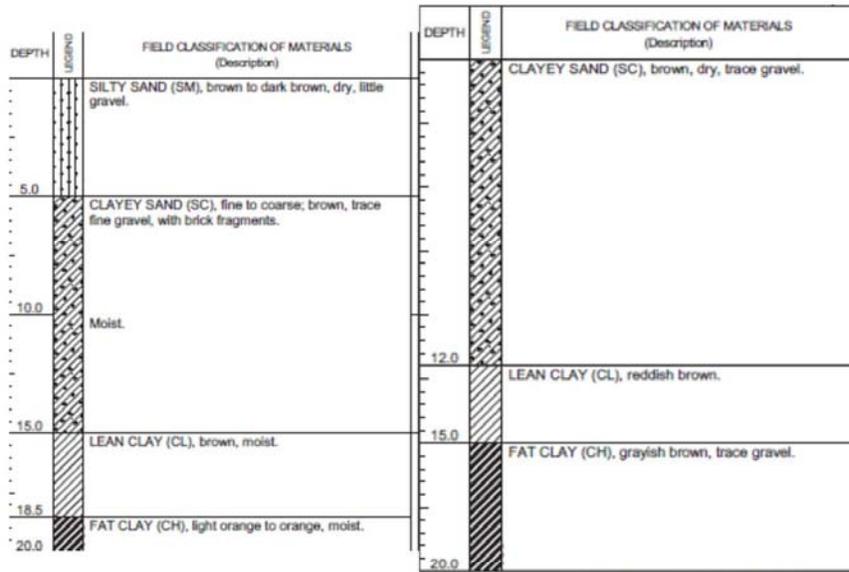
DH-13



DH-15

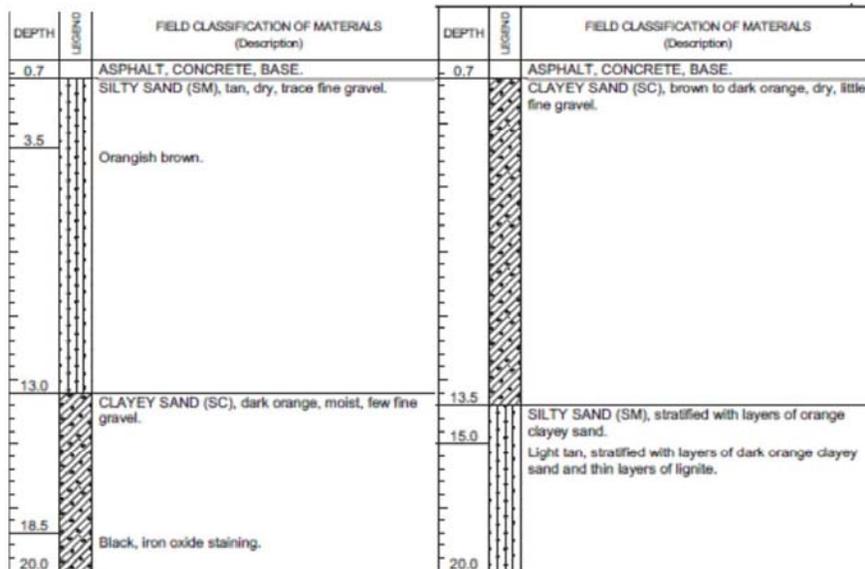
DH-16

Figure 24 - Profiles of DH 12, 13, 15, 16 (Trainor 2011)



DH-26

DH-28



DH-34

DH-35

Figure 25 - Profiles of DH 26, 28, 34, 35 (Trainor 2011)

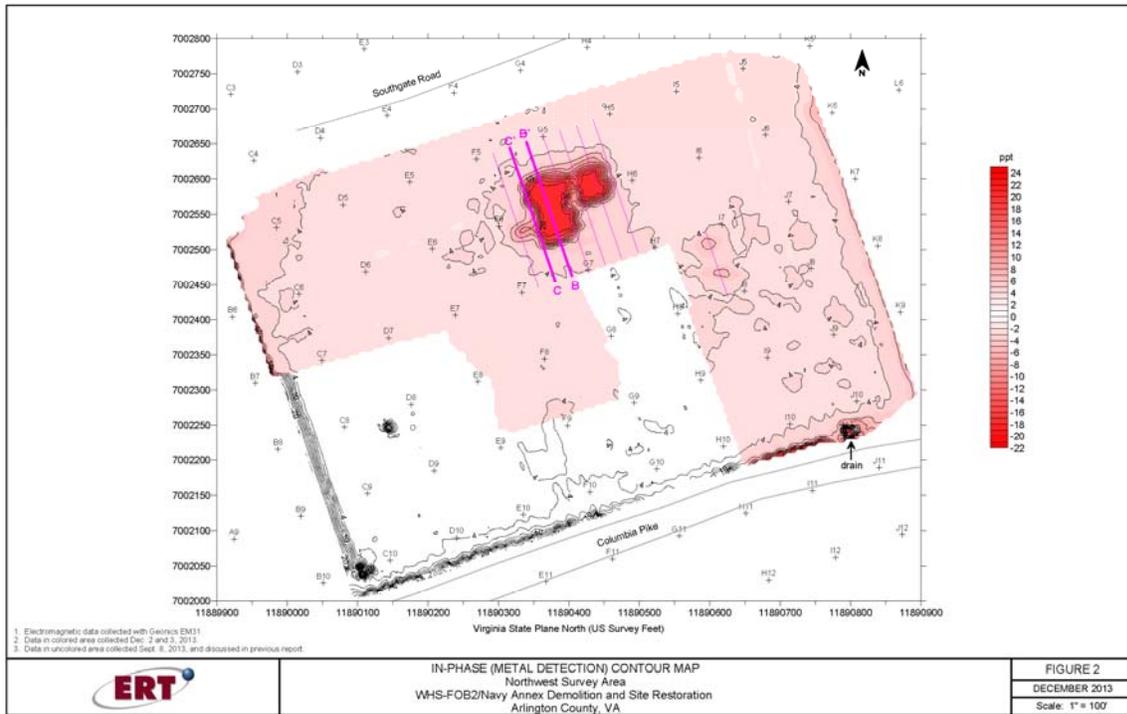


Figure 26 - Magnetometer Survey of the Former Navy Annex Site (Stuby 2014)

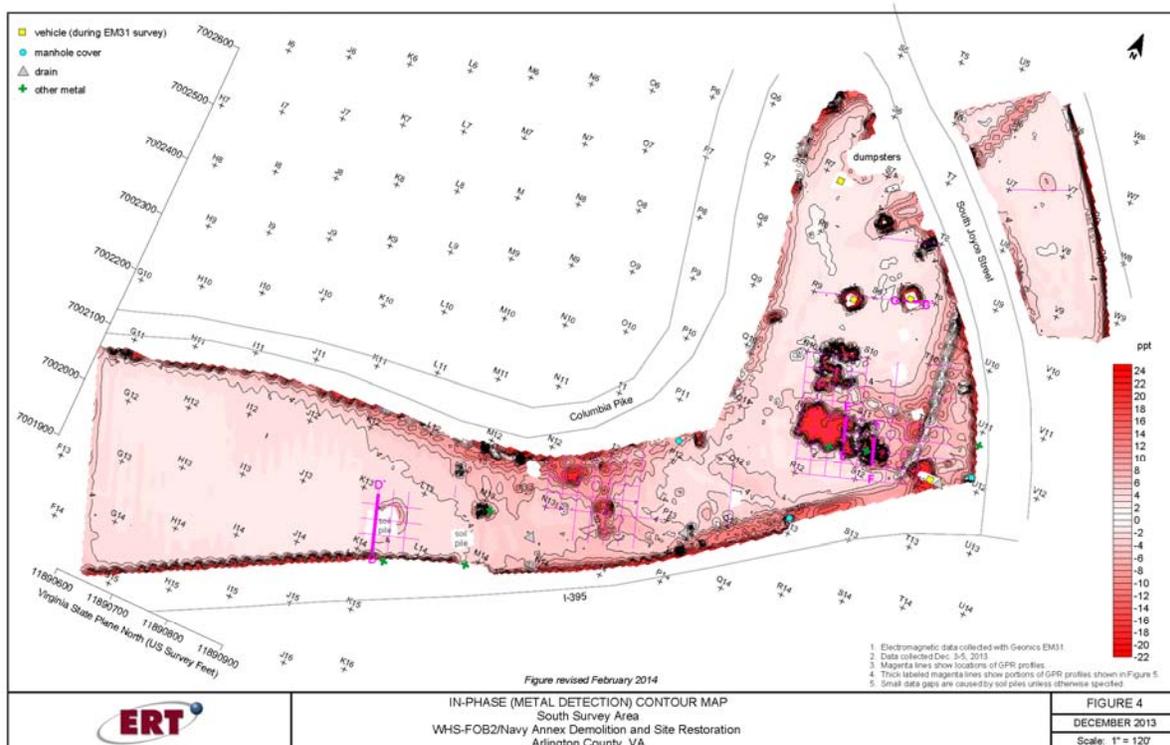


Figure 27 - Magnetometer Survey of the Former Quarters K Site (Stuby 2014)



Figure 28 - Concrete Slab Causing Anomaly, Part of Navy Annex Foundations (Schneider 2013)



Figure 29 - Remains of Concrete Foundations of Quarters K Dining Hall Cause of Anomalies (Schneider 2013)

6.3 Survey of Patton Drive Area

Utility and grave site maps were obtained from the USACE field office at ANC, and a site visit made on November 10, 2016. This information and field observations lead to the conclusion that the Patton Drive area that would be affected by the ANCSE project has a history very heavy ground disturbance.

The exact date of the construction of Patton Drive is not known. It does not appear on a 1935 map, but is present in a 1949 aerial photograph. Although it may have been renamed after construction, it seems unlikely that it would have been named for General Patton until after his death in late 1945. The boundary wall through this area is partly buried. This may have been the result of heavy earth moving to install storm drains and grade the road base. An 1897 map shows a spring and a “running stream” where Patton Drive is and a spring just north of the west end. The stream was at the approximate location of Patton Drive from a short distance from its west end to just east of the traffic circle where the stream made a turn to the southeast and exited the cemetery boundary (Figure 30). The southern boundary wall west of Patton Drive is about four feet above the ground and slightly wider base stones are visible in some places. Eastward from the beginning of Patton Drive the height of the wall above ground varies, and can be as little as a foot and a half above ground. In these sections there is a concrete cap, rather than bluestone, and on that an iron ‘pike’ fence which appear to have been added at a much later date (Figures 32, 33, 34). It is likely that this was added to compensate for the reduced height of the wall that resulted from soil on both sides of the wall being added, most likely from construction of Patton Drive, Southgate Road, and installation of underground utilities.

Maps of utilities (Figure 31) and burial plots show very little area for subsurface testing that would not be in an area previously disturbed by these, and of course a very strong desire not to interfere with them. Because of this and the previously discussed degree of ground disturbance attributed to the Patton Drive construction, subsurface testing did not seem warranted.



Figure 30 - Section of 1897 Map Showing Stream Where Patton Drive is Now



Figure 31 - Map of Underground Utilities in the Patton Drive Area



Figure 32 - West End of Patton Drive Facing East



Figure 33 - Middle Section of Patton Drive Facing East



Figure 34 - East End of Patton Drive, Facing West

7 Conclusions and Recommendations

The ANC Southern Expansion area of potential ground disturbance effects has a history of land use that has greatly altered the land during the mid-20th century. It is highly unlikely that archaeological sites

meeting National Register of Historic Places criteria have survived these processes if they were ever present. The proposed action would therefore have *no adverse effects* to archaeological sites eligible or listed in the National Register of Historic Places.

8 References

Balicki, Joseph F. and Bryan Corle

2006 “Finding Civil War Sites: What Relic Hunters Know; What Archeologists Should and Need to Know”. In *Huts and History*, Clarence Geier, David Orr, and Mathew Reeves, editors. University Press of Florida, Gainesville, Florida

Barnard, John G.

1871 A Report on the Defenses of Washington. Professional Papers of the Corps of Engineers U.S. Army No. 20. Government Printing Office, Washington, D.C.

Batzli, Samuel A.

1998 Fort Myer, Virginia: Historic Landscape Inventory. US Army Corps of Engineers, Construction Engineering Research Laboratories. Champaign, Illinois.

Cleveland, M. Todd

1997 Cultural Landscape Inventory, Arlington National Cemetery and Arlington House, the Robert E. Lee Memorial. Garrow & Associates, Inc., Atlanta, Georgia.

Custer, Jay F.

1991 Draft *Phase I Archeological Investigations, BRAC Project Areas, Fort Myer, Arlington County, Virginia*. Prepared for the Baltimore District, U.S. Army Corps of Engineers, by KFS Historic Preservation Group and Kise, Franks and Straw, Philadelphia.

1992 *Phase I Archeological Investigations, BRAC Project Areas, Fort Myer, Arlington County, Virginia*. Prepared for the Baltimore District, U.S. Army Corps of Engineers, by KFS Historic Preservation Group and Kise, Franks and Straw, Philadelphia.

Department of Mines, Minerals, and Energy

1993 Geologic Map of Virginia. Department of Mines, Minerals, and Energy, Richmond, Va.

Dicey, Edward

1863 *Six Months in the Federal States*. Volume 2. London. Reprinted by Applewood Books, Bedford, Massachusetts. 2008.

Greenhorne & O’Mara, Inc.

1999 Archaeology of the Abingdon Plantation Site (44AR18): Ronald Reagan Washington National Airport, Arlington County, Virginia. Prepared for Washington Metropolitan Airports Authority, Washington, D.C., by Greenhorne & O’Mara, Greenbelt, Maryland.

Hanna, Jennifer

2001 *Arlington House, The Robert E. Lee Memorial: Cultural Landscape Report, Volume 1: History*. National Park Service, National Capital Region Cultural Landscape Program, Washington, D.C.

Herrman, Augustin

1673 *Virginia and Maryland, As it is Planted and Inhabited this Present Year 1670 Surveyed and Exactly Drawne by the Only Labour and Endeavour of Augustine Herrman*. Library of Congress Geography and Map Division Washington, D.C. <
<http://hdl.loc.gov/loc.gmd/g3880.ct000766>>

Holt, Dean W.

1992 *American Military Cemeteries*. McFarland & Company, Inc., Jefferson, North Carolina.

James, Felix

1970 "The Establishment of Freedman's Village in Arlington, Virginia" in *The Negro History Bulletin* 33(4-April):90-93.

Katz, Gregory

2010 *Phase II Evaluation of Site 44AR0043 at the Former Fort Myer Picnic Area, Arlington National Cemetery, Virginia*. Prepared by Louis Berger Group, Washington D.C., for the Baltimore District, U.S. Army Corps of Engineers.

Kennedy, Roger G.

1989 *Greek Revival America*. Stewart Tabori & Chang, New York.

Kimball, Fiske

1950 *Domestic Architecture of the American Colonies and the Early Republic*. Originally published by Charles Scribner's Sons, 1922. Reprinted by Dover Publications, New York.

Knuckle, Robert

2002 *Black Jack: America's Famous Riderless Horse*. General Store Publishing House, Burnstown, Ontario.

Meigs, Montgomery C.

1864 Letter to Edwin M. Stanton, Secretary of War, June 15. Record Group 92, Quartermaster General's Office, National Archives Records Administration I, College Park, Maryland.

Millis, Heather, Jeff Holland, Todd Cleveland, and Bill Nethery

1998 *Cultural Investigations at Section 29 at Arlington House, the Robert E. Lee Memorial, Arlington County, Virginia*. Garrow & Associates, Inc., Chapel Hill, North Carolina.

Moeller, Gerard Martin Jr.

2006 *AIA Guide to the Architecture of Washington, Part 3*. The Johns Hopkins Press, Baltimore.

Mooney, James

1889 Indian Tribes of the District of Columbia. *American Anthropologist* 2:259-266.

Nelligan, Murray H.

1951 The Building of Arlington House. *Journal of the Society of Architectural Historians* 10(2-May):11-15.

2001 *Old Arlington: The Story of Arlington House, The Robert E. Lee Memorial*. Chatelaine Press, Burke, Virginia.

Netherton, Nan and Ross Netherton

1987 *Arlington County in Virginia: A Pictorial History*. The Donning Company, Norfolk, Virginia.

Newton, Norman T.

1971 *Design on the Land: The Development of Landscape Architecture*. The Belknap Press of Harvard University Press, Cambridge, Massachusetts.

New York Times

1861 Views from the Capital. September 23.

1863 Freedmen's Village, Virginia. December 12.

Proudfit, S. V.

1889 Ancient Village Sites and Aboriginal Workshops in the District of Columbia. *American Anthropologist* 2:241-246.

Reidy, Joseph P.

1987 "Coming From the Shadow of the Past": The Transition from Slavery to Freedom at Freemen's Village, 1863-1900. *The Virginia Magazine of History and Biography* 95(4-October):405-428.

Schildt, Roberta

1984 Freedman's Village: Arlington, Virginia, 1863-1900. *The Arlington Historical Magazine* 7(4-October):11-21.

Schneider, Mark E.

2013 Building Debris in Soil Assessment, Federal Office Building #2 (FOB2), South Parking and Navy Exchange (NEX) Parcels (Industrial ;Hygiene (IH) Report 2013-184 Revised). Memorandum for the Special Assistant to the Director, MOC Room, F103 Division, Washington Headquarters Services, The Pentagon, Washington D.C.

Seeley, Nigel

1996 "History of Plate Glass Manufacture" Conservation Distribution List, <http://cool.conservation-us.org/byform/mailling-lists/cdl/1996/1306.html>

Seifert, Donna J., Barbara J. Little, Beth L. Savage, and John H. Sprinkle, Jr.

1997 National Register Bulletin: Defining Boundaries for National Register Properties (1995, revised 1997). U.S. Department of Interior, National Park Service, National Register of Historic Places, Washington, DC.

Smith, John

1624 *Virginia* [map]. Graven by William Hole, London. On file, Geography and Map Division, Library of Congress, Washington, D.C. Available online at <<http://memory.loc.gov/ammem/mdbquery.html>>.

Stuby, James L.

2014 Revised Results of Geophysical Surveys FOB2 Demolition and Site Restoration Project, Test Area, letter report to Kevin Mahoney project manager for Corinthian Contractors, ERT, Inc., Laurel, Maryland.

Stetson, Charles W.

1935 *Four Mile Run Land Grants*. Mimeofom Press, Washington, D.C.

Thomas, Emory M.

1995 *Robert E. Lee: A Biography*. W.W. Norton & Company, New York.

Trainor, Joel

2011 HTW Drilling Log Arlington National Cemetery Expansion, US Army Corps of Engineers, Savannah, Georgia.

USDA

2014 Custom Soil Resource Report for Arlington County, Virginia, United States Department of Agriculture, Natural Resources Conservation Service, Washington, DC.

U.S. Department of Veterans Affairs [VA], National Cemetery Administration

2010 Early Development of the National Cemeteries. Accessed 6 August 2010 at VA web site at: <<http://www.cem.va.gov/pdf/earlydev.pdf>>.

U.S. War Department

1881 *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies.* ; Series 1 - Volume 5, Part 1.Govt. Printing Office, Washington.

1891 *The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate armies.* ; Series 1 - Volume 37 (Part I).

1895 *Atlas to Accompany the Official Records of the Union and Confederate Armies.* Government Printing Office, Washington D.C.

Versar, Inc.

2011 Integrated Cultural Resources Management Plan for Fort Myer Henderson Hall, Virginia and Fort McNair, District of Columbia, 2011-2015. Versar, Inc., Springfield, Virginia.

[This page is left intentionally blank]

APPENDIX H

TRAFFIC STUDY

[This page is left intentionally blank]

Arlington National Cemetery - Southern Expansion

Traffic Technical Memorandum - Future Conditions

FINAL

August 12, 2019

Prepared by



HNTB Corporation

Table of Contents

Study Purpose	1
Study Intersections	1
Parking Analysis and Garage Sizing.....	3
Parking Survey	3
Sizing of Garage.....	3
Traffic Operations Analysis.....	5
Conditions and Scenarios Analyzed.....	5
2040 Volume Development Process	6
Signal Warrant Analysis.....	7
Intersection 1: Columbia Pike and Nash Street.....	8
Intersection 7: Columbia Pike and Route 27 ramps.....	9
Intersection 4: Proposed pedestrian signal at Columbia Pike and the AFM crosswalk	10
Operational Analysis	10
2040 Baseline Scenario.....	11
2040 Build Scenario 1.....	12
2040 Build Scenario 2.....	13
2040 Mitigation.....	14
Gate Capacity Analysis	15
Conclusion	16
APPENDIX A: Interim Parking Analysis Technical Memo.....	1
APPENDIX B: Traffic Volume Diagrams and Intersection Geometry	1
APPENDIX C: Traffic Operations Analysis Results.....	1
APPENDIX D: Signal Warrant Analysis.....	1

List of Figures and Tables

Figure 1: Study Area Intersections	2
Table 1: Parking Demand for new Operations Complex Parking Structure	4
Table 2: Conditions and Scenarios Analyzed	5
Table 3: ANC Southern Expansion Trip Generation	7
Table 4: Diverted Trips from Southgate Road to New Operations Complex Garage.....	7
Table 5: Warrant Analysis Considerations	8
Table 6: Intersection 1 Summary of Warrant 1 (ADT).....	8
Table 7: Intersection 1 Summary of Warrant 3 (Peak Hour).....	8
Table 8: Total Delay for Unsignalized Condition.....	9
Table 9: Intersection 7 Summary of Warrant 1 (ADT).....	9
Table 10: Intersection 7 Summary of Warrant 3 (Peak Hour).....	9
Table 11: Total Delay for Unsignalized Condition.....	9
Table 12: Intersection 4 PHB Warrant Analysis.....	10
Table 13: Intersection Delay Threshold for Level of Service.....	11
Table 14: 2040 Baseline Condition – Baseline Analysis Summary	12
Table 15: Build Scenario 1 Condition – Analysis Summary	13
Table 16: Build Scenario 2 Condition – Analysis Summary	14
Table 17: Build Mitigation Scenario – Overall Intersection Summary Results.....	15

Appendices

- Appendix A: Interim Parking Analysis Technical Memo
- Appendix B: Traffic Volume Diagrams and Intersection Geometry
- Appendix C: Traffic Operations Analysis Results
- Appendix D: Signal Warrant Analysis

Study Purpose

This study documents the findings of the traffic impact analysis for the change in the land use proposed by the Arlington National Cemetery (ANC) Southern Expansion project. The study also serves as validation for the Columbia Pike/Washington Boulevard Interchange Modification Report (IMR), completed in 2017 by Arlington County, to ensure the planned improvements are still valid with the anticipated land use changes, and to determine if additional improvements are needed.

The proposed land use change is to relocate the existing ANC Service Complex to the south side of Columbia Pike. A parking garage will be constructed on the site of the new Operations Complex (replacing the Service Complex). The garage will provide parking spaces for ANC employees, replace in-kind lost on-street parking spaces along Southgate Road, and replace parking at the Air Force Memorial (AFM). As this will result in the redistribution of traffic from the previously analyzed IMR conditions, an evaluation of the new access points is necessary.

This traffic analysis assumed the approved IMR Build 2040 Scenario as the 2040 Baseline Condition. In addition to the Baseline Condition, two Build Scenarios were evaluated; the scenarios are described in the **Traffic Operations Analysis** section.

Study Intersections

The study area includes seven intersections identified for the Baseline Condition, and two new intersections for the Build Scenarios. The location of the study intersections is shown on **Figure 1**:

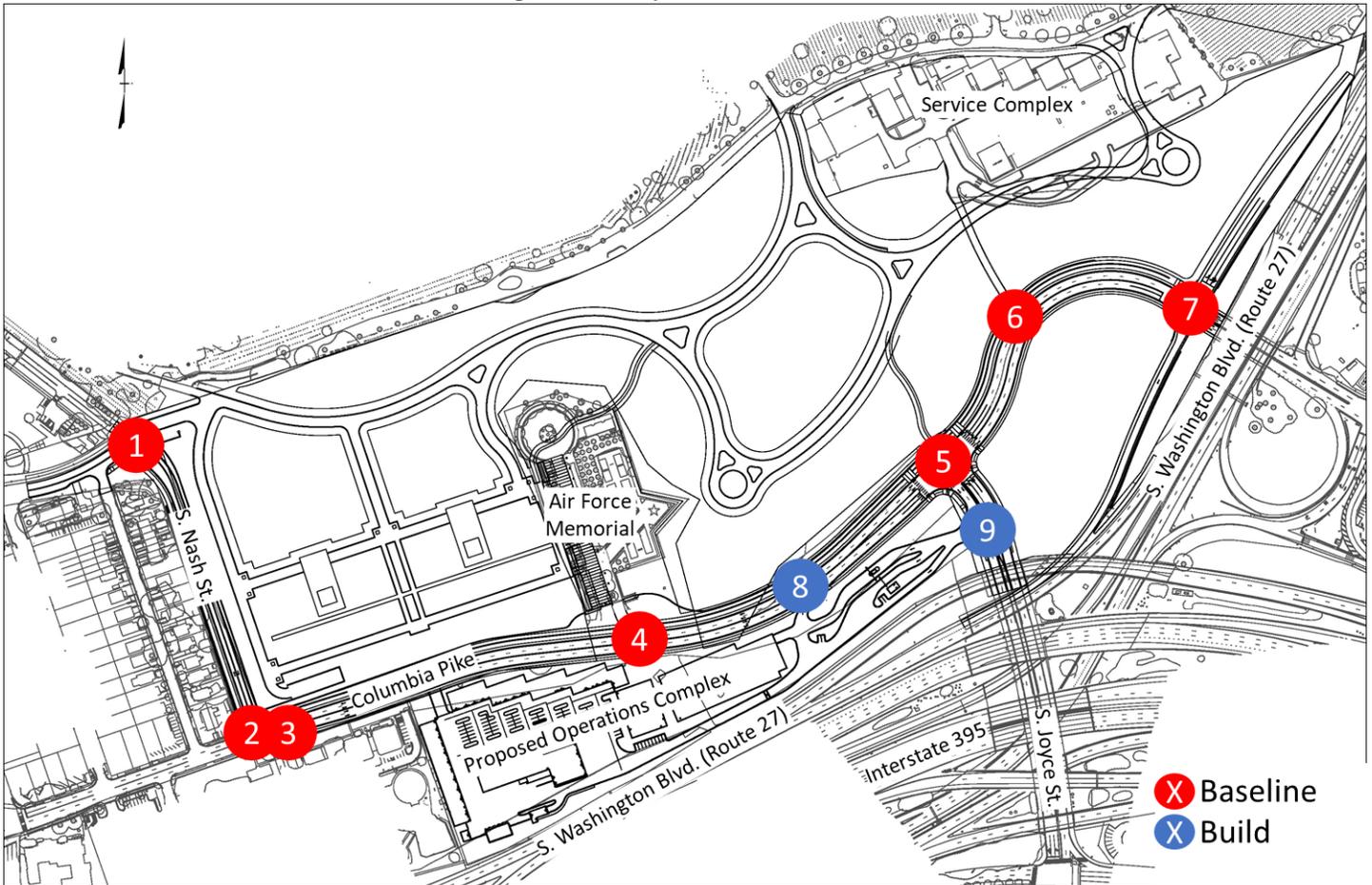
Baseline Condition Intersections:

1. Nash Street, Southgate Road, and Hobson Drive
2. Columbia Pike and S. Nash Street
3. Columbia Pike and East Driveway (VDOT)
4. Columbia Pike and AFM (location of proposed crosswalk in Build Scenarios)
5. Columbia Pike and South Joyce Street
6. Columbia Pike and existing ANC Service Complex
7. Columbia Pike and Southbound Route 27 Ramps

New Intersections for Build Scenarios:

8. Columbia Pike and New Operations Complex Driveway
9. South Joyce Street and New Operations Complex Driveway

Figure 1: Study Area Intersections



Parking Analysis and Garage Sizing

The existing ANC Service Complex will be relocated from its current location along the north side of Columbia Pike (near the Route 27 interchange) to the new Operations Complex on the south side of Columbia Pike (west of South Joyce Street).

Parking Survey

In early January 2019, a survey of ANC personnel, consisting of federal employees and contractors, was undertaken. The purpose of this survey was to obtain travel patterns of these personnel. The information gathered included:

- Mode choice (i.e. how do they get to work: drive alone, bus, carpool, etc.)
- For those driving:
 - Gate used to access ANC
 - Where they park
 - Typical arrival and departing time
 - Routes used to reach ANC
 - Work location on ANC
 - Whether they are a contractor or federal employee

A total of 374 respondents completed the survey across 26 departments. **Appendix A** contains the interim technical memorandum with detailed survey results. Key findings of the survey included:

1. Driving is the preferred mode choice for ANC personnel.
2. The Service Complex gate off Columbia Pike is the preferred access point into ANC, followed by Memorial Avenue.
3. Arrival and departures are centered around 7-8 AM and 4-5 PM, respectively.
4. Key routes used by personnel to reach ANC are Columbia Pike, I-395, and the Memorial Bridge. Similarly, these routes are used to return home at the end of day.
5. The Administration/Welcome Center (located off Memorial Avenue), followed by the Service Complex buildings, are the primary work locations for ANC personnel.

Sizing of Garage

A total of 157 personnel will be relocated to the new Operations Complex (excludes 85 contractors which will have a separate parking area). Based on the survey, 127 of these 157 personnel currently park at ANC. The other 33 personnel use Metro, bus or carpool to commute to ANC. Additionally, one department that is relocating to the new Operations Complex will be expanding by ten (10) employees. Total personnel to be located at the new Operations Complex will be 167 personnel.

In addition, the ANC Southern Expansion project will remove Southgate Road (between Columbia Pike and Hobson Drive) and its on-street parking. These parking spaces will be relocated to the new Operations Complex parking garage.

The new parking garage is intended to supplement the main visitor parking complex at the Welcome Center, as well as to accommodate the Operations Complex and AFM parking needs. The following are key assumptions:

1. The main parking complex at the Welcome Center will remain in its current form.
2. Lost parking spaces along Southgate Road will be replaced in the new garage.
3. AFM parking (employees and visitors) will be moved to the new garage (at same levels as existing).
4. Visitor spaces allocated for AFM and ANC visitors will be not be separated as the two areas are common destinations for visitors.
5. All visitor parking spaces are expected to be paid parking.
6. Twenty spaces will be allocated for the government motor pool vehicles within the garage

Table 1 summarizes the allocation of parking demand for the new Operations Complex parking garage. A total of 244 spaces will be needed to accommodate future needs of the Operations Complex, and future visitors to ANC and the AFM.

Table 1: Parking Demand for new Operations Complex Parking Structure

Section	Spaces needed
ANC Employees ¹	42
Replacement for parking along Southgate Road	159
AFM Visitors and Employees ²	18
Operations Complex Visitors	5
Area for Government Motor Pool ³	20
TOTAL ⁴	244 ⁵

1 - Considers potential expansion of number of employees at the Operations Complex, spaces limited to NCPC guidelines of one space for every four employees.

2 – Includes 3 spaces reserved for AFM staff (Managing Director, Assistant Managing Director and Security)

3 - Per note from ANC that garage must accommodate 20 vehicles, remaining government motor pool vehicles to be in surface lot around maintenance garages.

4 - Excludes storage for maintenance vehicles, equipment, and buses.

5 - The exact number of parking spaces to be provided has not yet been finalized as designs have not been completed. A minimum of 244 spaces will be provided.

Traffic Operations Analysis

The project will close the driveway at the existing ANC Service Complex and divert traffic to the new Operations Complex. Furthermore, the project will also close the existing driveway to public vehicle access at the AFM entrance. Dignitary Vehicles (DV) access for special events will be coordinated and approved by ANC in advance. AFM employees and visitors will park at the Operations Complex. Three Synchro models were developed to analyze the traffic under the 2040 Baseline Condition, 2040 Build Scenario 1, and 2040 Build Scenario 2. For both Build Scenarios, the recommended cross-section is four-lanes along Columbia Pike. Left-turn bays are not necessary along the limits adjacent to the new Operations Complex as there are no left turns along this section of the corridor, with the exception of the intersection at South Joyce Street where turning lanes are present.

Conditions and Scenarios Analyzed

The analyses evaluated 2040 Baseline and Build Scenarios. The Build Scenarios include Build Scenario 1 and 2, as well as identification and analysis of potential mitigations. The Baseline Condition has the intersection of Columbia Pike and South Joyce street relocated south of its existing location as Columbia Pike is realigned (refer to Intersection #5 in **Figure 1**). For the Build Scenarios, the eastbound right-turn channelization is removed. This was done to improve geometric conditions with the proposed downstream driveway on South Joyce Street for the new Operations Complex. **Table 2** outlines the conditions and scenarios for each model.

Table 2: Conditions and Scenarios Analyzed

Condition	Scenario Model	Description
2040 Baseline	Base Condition	Baseline condition based on 2040 IMR Build geometry and volumes
2040 Build	Scenario 1	<ul style="list-style-type: none"> The AFM driveway is closed to public access. Note that the AFM will retain an access for DV/VIP vehicles. Existing ANC Service Complex driveway is closed. New right-turn only exit driveway from new Operations Complex to Columbia Pike. No access from Columbia Pike to the new Operations Complex at this location. New driveway (right-in/right-out) to new Operations Complex from South Joyce Street.
	Scenario 2	<ul style="list-style-type: none"> This scenario permits both left and right turns from the new Operations Complex onto Columbia Pike. No access from Columbia Pike to the new Operations Complex at this location. All other elements are identical to Build Scenario 1.
Mitigations		Baseline and Build scenarios with mitigations to improve operations to acceptable LOS.

One element to note is that the Pentagon Memorial Visitor Education Center (PMVEC) is not considered within this traffic study, as is still under development and the program size is not defined. The PMVEC will perform its own traffic study to gauge impacts from its development.

2040 Volume Development Process

This section describes the process to prepare the 2040 Baseline Condition and Build Scenarios turning movement volume forecasts for the study area intersections. In addition to the IMR volumes, HNTB conducted counts (October 2018) along Columbia Pike at three locations to supplement the IMR volume data:

1. VDOT Driveway, east of the future intersection with Nash Street
2. AFM Driveway
3. Existing ANC Service Complex Driveway

It should be noted that these driveways were not factored into the IMR analysis. The network volumes for the Baseline Condition and Build Scenarios are shown in **Appendix B**. The network volumes were developed using the following procedure:

1. The IMR 2040 Build Condition volumes served as the Baseline volumes for this study. These volumes are based on the IMR existing conditions traffic counts, VDOT historic traffic data, and the Metropolitan Washington Council of Governments (MWCOC) Version 2.3.57 regional travel model.
 - a. Baseline volumes were supplemented by HNTB counts on Columbia Pike at the ANC, VDOT and AFM driveways, as those data elements were not presented in the IMR.
2. The 2040 Build Scenarios 1 and 2 involved looking at the additional trips generated by the ANC Southern Expansion project, the diverted trips from the AFM as that driveway is closed to public access, diverted trips from the driveway closure at the existing Service Complex, and the relocation of existing parking at the Service Complex and along Southgate Road to the new Operations Complex garage.
 - a. New trips generated from ANC Southern Expansion: The Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition, was used to generate trips resulting from the ANC Southern Expansion project. ANC is an atypical land use for which ITE does not provide a specific code to estimate new trips. For the purpose of this analysis, code 411 (Public Park) was used to generate trips during the AM and PM peak hours. An expansion of 38 acres of cemetery space will generate the trips shown in **Table 3**.
 - b. Southgate Road parking diversion to new Operations Complex: The ANC Southern Expansion will remove on-street parking along Southgate Road; these spaces will be relocated to the new Operations Complex garage. **Table 4** shows the diverted volumes from Southgate Road. It was assumed outbound volumes are zero during AM peak hour and zero for inbound during the PM peak hour as observed by the study team in October 2018. The existing spaces are public parking spaces. It should be noted that ANC personnel that responded to the survey indicated that they do not use Southgate Road to park.
 - c. AFM and ANC Service Complex driveway closures: Entry and exit volumes during the AM and PM peak hours were diverted to the new Operations Complex garage through South Joyce Street, and to Columbia Pike from the Operations Complex, respectively.

Table 3: ANC Southern Expansion Trip Generation

ANC Southern Expansion Generated Trips	AM	PM
Washington Boulevard (Inbound)	2	2
I-395 (Inbound)	1	2
Joyce Street (Inbound)	2	3
Washington Boulevard (Outbound)	1	3
I-395 (Outbound)	0	4
Joyce Street (Outbound)	1	4

Table 4: Diverted Trips from Southgate Road to New Operations Complex Garage

Southgate Road Diverted Trips	AM	PM
Washington Boulevard (Inbound)	32	0
I-395 (Inbound)	14	0
Joyce Street (Inbound)	29	0
Washington Boulevard (Outbound)	0	20
I-395 (Outbound)	0	24
Joyce Street (Outbound)	0	28

Signal Warrant Analysis

Signal warrant analyses were conducted for two locations to validate the need of a traffic signal control for the new intersections at Columbia Pike and Nash Street (Intersection 1), and at Columbia Pike and the Route 27 ramps (Intersection 7). The 2017 Columbia Pike IMR recommended traffic signals at these two locations; the following analysis is to validate those recommendations. The warrant analysis also evaluates the need of a pedestrian signal for the crosswalk at the new Operations Complex opposite of AFM (Intersection 4). The VDOT Supplement to the 2009 MUTCD guidelines was used to test different applicable warrants for the study intersections. **Table 5** shows the different warrants and their applicability. **Appendix D** shows supporting data for each considered warrant, including thresholds to meet applicable warrants.

Table 5: Warrant Analysis Considerations

Warrant	Applicable (Y/N)	Intersection Applied to:	Reason
Warrant 1, Average Daily Traffic (ADT) Vehicular Volume	Y	1, 7	Data provided in IMR. VDOT recommends using this for Future/New intersections
Warrant 2, Four-Hour Vehicular Volume	N	-	Warrant 1 is recommended by VDOT for future intersections
Warrant 3, Peak Hour	Y	1, 7	Data provided in IMR
Warrant 4, Pedestrian Volume	N	-	Intersection does not exist, no pedestrian volumes available
Warrant 5, School Crossing	N	-	No school crossing
Warrant 6, Coordinated Signal System	N	-	Warrant does not apply
Warrant 7, Intersection Near a Grade Crossing	N	-	Warrant does not apply
Pedestrian Hybrid Beacon Signal (PHB) Warrant VDOT (IIM-TE-384.0, Section 7.3)	Y	4	Data is available. This warrant was used for the proposed crosswalk on Columbia Pike and AFM

Intersection 1: Columbia Pike and Nash Street

Warrants 1 and 3 were used to evaluate a signal to serve southbound volumes at Columbia Pike and Nash Street. The warrant analysis met the requirements for both parameters suggesting a signal control is needed to improve the performance of this intersection. **Table 6** and **Table 7** list the summary of the warrant analysis for Intersection 1.

Table 6: Intersection 1 Summary of Warrant 1 (ADT)

Major Street/Minor Street	Major Street No. of Lanes	Minor Street No. of Lanes	Vehicles per Day (VPD) on Major Street (Total Both Approaches) *	VPD on Minor Street (Total Both Approaches) *	Warrant met (Y/N)
Columbia Pike / Nash Street	2	1	16,451	2,076	Y

*Source: 2017 Columbia Pike IMR

Table 7: Intersection 1 Summary of Warrant 3 (Peak Hour)

Major Street/Minor Street	Major Street No. of Lanes	Minor Street No. of Lanes	Peak Hour Volume on Major Street (Total Both Approaches)	Peak Hour Volume on Minor Street (Total Both Approaches)	Warrant met (Y/N)
Columbia Pike / Nash Street	2	1	2,325	425	Y

In addition to the warrant analysis, an operational analysis evaluating the intersection performance under unsignalized conditions was performed. **Table 8** shows the Synchro analysis results for the unsignalized condition. The results show over one-hour total delay for the outbound movement in the AM peak and approximately 1,200 hours for the PM peak. The results suggest both peak hours underperform drastically under an unsignalized condition.

Table 8: Total Delay for Unsignalized Condition

Approach	Total Delay (hours)		Queue (ft)	
	AM	PM	AM	PM
SB Columbia Pike and Nash Street	1	1,181	ERR*	ERR*

*ERR: Fatal error result suggesting queues/delays exceeding Synchro’s capability to compute.

The VDOT signal justification guidelines require evaluating intersection configuration alternatives. This traffic analysis report serves as a supplement to the IMR which performed this evaluation as part of that study. An example of an alternative is implementing a roundabout concept for Columbia Pike and Nash Street. This concept cannot be implemented at this location due to physical constraints and right-of-way restrictions.

Intersection 7: Columbia Pike and Route 27 ramps

Warrants 1 and 3 were used to evaluate a signal to serve southbound volumes at Columbia Pike and the Route 27 ramps. The warrant analysis met the requirements for both parameters suggesting a signal control is needed to improve the performance of this intersection. **Table 9** and **Table 10** list the summary of the warrant analysis for Intersection 7.

Table 9: Intersection 7 Summary of Warrant 1 (ADT)

Major Street/Minor Street	Major Street No. of Lanes	Minor Street No. of Lanes	VPD on Major Street (Total Both Approaches) *	VPD on Minor Street (Total Both Approaches) *	Warrant met (Y/N)
Columbia Pike / Route 27 ramps	2	2	15,365	31,041	Y

*Source: 2017 Columbia Pike IMR

Table 10: Intersection 7 Summary of Warrant 3 (Peak Hour)

Major Street/Minor Street	Major Street No. of Lanes	Minor Street No. of Lanes	Peak Hour Volume on Major Street (Total Both Approaches)	Peak Hour Volume on Minor Street (Total Both Approaches)	Warrant met (Y/N)
Columbia Pike / Nash Street	2	1	1,506	888	Y

In addition to the warrant analysis, an operational analysis evaluating the intersection performance under unsignalized conditions was performed. **Table 16** shows the Synchro analysis results for the unsignalized condition. The results show over six hours of total delay for the outbound movement in the AM peak and approximately 18 hours for the PM peak. The results suggest both peak hours underperform drastically under an unsignalized scenario.

Table 11: Total Delay for Unsignalized Condition

Approach	Total Delay (hours)		Queue (ft)	
	AM	PM	AM	PM
SB Columbia Pike and Route 27 Ramps	6	18	ERR*	517

*ERR: Fatal error result suggesting queues/delays exceeding Synchro’s capability to compute.

The VDOT signal justification guidelines require evaluating intersection configuration alternatives. This traffic analysis report serves as a supplement to the IMR which performed this evaluation as part of that study. Among the configurations considered was a roundabout for the Columbia Pike and Route 27 ramps intersection. This concept cannot be implemented at this location due to physical constraints and right-of-way restrictions.

Intersection 4: Proposed pedestrian signal at Columbia Pike and the AFM crosswalk

VDOT’s Pedestrian Hybrid Beacon Signal (PHB) warrant was followed to validate the need of a pedestrian signal for the crosswalk at Columbia Pike and the AFM. The analysis assumed a peak 50 pedestrians per hour (pph) and approximately 2,800 vehicles per hour (vph) during a typical weekday PM peak hour. Pedestrian volumes are based on AFM visitation and relocated Southgate Road on-street parking spaces. The existing on-street parking spaces along Southgate Road are used by the general public, including visitors to ANC, or personnel stationed at the Pentagon or Joint-Base Fort Myers-Henderson Hall. Visitation on a weekend to ANC would expect to be higher. The combination of volumes met the warrant requirements for a PHB signal at this location as per IIM-TE-384.0, Section 7.3 of the VDOT Supplemental MUTCD Guidelines. **Table 12** lists the inputs used for the warrant analysis.

Table 12: Intersection 4 PHB Warrant Analysis

Major Street/Minor Street	Major Street No. of Lanes	Peak Hour Volume on Major Street (Total Both Approaches)	Peak Hour Volume on Minor Street (PPH)	Warrant met (Y/N)
Columbia Pike / New Crosswalk	2 each direction	2,763	50	Y

AFM provided visitor data for the month of October 2018, a total of just over 33,700 people visited the AFM. This translated to nearly 1,100 visitors a day; visitors arrived by passenger cars or buses. Hourly data was not available, but assuming an hourly average, AFM receives approximately 100 visitors an hour. The Operations Complex parking structure will accommodate passenger cars, but not buses. At this time, it is expected that bus traffic will use ANC circulation roads for passenger drop-off and pick-up. Based on total daily visitor traffic, peak hour pedestrian traffic at the AFM crosswalk was estimated to be 50 pedestrians per hour.

Arlington County’s Marked Crosswalk Guidelines (November 2015) was used to determine appropriate pedestrian treatment at this location based on the following characteristics:

- Expected pedestrian volume exceeds 40 pph.
- Nearest crosswalk at signalized intersection is approximately 830 feet away.
- Roadway does not have a median.
- Roadway design speed of 30 mph and posted at 25mph (between Joyce Street and future Nash Street).
- Roadway ADT is forecasted to exceed 15,000 VPD.

Treatment E condition is met, so a PHB signal is recommended (Note Arlington County’s guidelines refer to a PHB as a HAWK signal).

Operational Analysis

The Synchro traffic software was utilized to perform operational analysis of the study area intersections. Results from Synchro are reported using the Highway Capacity Manual (HCM) 2000 methodology for signalized and unsignalized intersections. The HCM 6th Edition methodology was not used because it does not generate results for traffic signals with non-standard National Electrical Manufacturers Association (NEMA)

phasing, such as (but not limited to) split phasing or advance lefts (shared left-through lane). At the intersection of Columbia Pike and Route 27 ramps, there is a non-NEMA configuration of shared left-through movements. The evaluation of the proposed pedestrian signal at Columbia Pike and the AFM crosswalk also required HCM 2000 as HCM 6th Edition does not support exclusive pedestrian phases. The timings for the pedestrian signal have been developed to provide a flash-don't-walk interval that provides pedestrians sufficient time to cross Columbia Pike in a single stage.

In addition to the Synchro analysis for study intersections, the gate performance for the inspection points of the new Operations Complex was evaluated. This evaluation determined whether the proposed number of lanes at the inspection point are sufficient to process the expected flow of vehicles entering the facility.

For all intersection analyses, traffic operations were characterized as a Level of Service (LOS) using delay value equivalencies identified in **Table 13**.

Table 13: Intersection Delay Threshold for Level of Service

LOS	Signalized Delay (sec/veh)	Unsignalized Delay (sec/veh)	Description
A	0-10	0-10	Free-flow operations.
B	10-20	10-15	Free flow conditions with slightly lesser freedom to maneuver.
C	20-35	15-25	Might impact travel speeds with maneuverability affected by other vehicles.
D	35-55	25-35	Ability to maneuver is severely restricted due to traffic congestion.
E	55-80	35-50	Operations at or near capacity, often causing queues.
F	> 80	> 50	Forced or breakdown flow with demand exceeding the capacity.

Delay values and description based on information from the Highway Capacity Manual 2000.

2040 Baseline Scenario

The 2040 Baseline Condition applied the IMR Build 2040 Scenario assumptions to the analysis network. The focus of the 2040 Baseline Condition analysis is to create a baseline to compare the conditions for the Build Scenarios. Analyses for signalized intersections used optimized signal timing and phasing, including 120 second cycle lengths. **Table 14** lists the summary results of the Synchro analysis. **Appendix C** contains the detailed results of the 2040 Baseline Condition traffic operation analysis.

Table 14: 2040 Baseline Condition – Baseline Analysis Summary

Intersection ID and Description	Control	AM Peak		PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1 Nash Street, Southgate Road, and Hobson Drive	All-Way Stop Control	7.7	A	12.7	B
2 Columbia Pike and S. Nash Street	Signal	7.3	A	22.1	C
3 Columbia Pike and East Driveway (VDOT)	Two-Way Stop Control	0.1	A	0.1	A
4 Columbia Pike and Air Force Memorial	Two-Way Stop Control	0.1	A	0.3	A
5 Columbia Pike and S. Joyce Street	Signal	24.9	C	28.4	C
6 Columbia Pike and ANC Service Complex	Two-Way Stop Control	0.2	A	0.7	A
7 Columbia Pike and Southbound Route 27 Ramps	Signal	13.1	B	34.1	C

All intersections operate at LOS C or better during both peak periods, with the exception of some individual movements performing with LOS E or worse. Below is a summary of concern locations:

- Columbia Pike and Nash Street: The single lane southbound approach operates at LOS E in the AM and PM peaks.
- Columbia Pike and AFM driveway: The egress from the AFM operates at LOS F during the PM peak. This is mainly attributed to lack of gaps in the traffic stream, especially with the higher westbound volumes on Columbia Pike during the PM peak.
- Columbia Pike and VDOT driveway: This low volume driveway operates at LOS E during the PM peak.
- Columbia Pike and South Joyce Street: The westbound left movement from Columbia Pike to South Joyce street operates at LOS E in both AM and PM peaks. The northbound left operates at LOS D. Queues for this movement exceed turning bay storage capacity, however the second left-turn lane is continuous back to Army Drive. This distance provides sufficient storage capacity for this movement.
- Columbia Pike and Route 27 ramps: The southbound approach operates at LOS D in the AM peak. During the PM peak, the southbound right movement operates at LOS D, mainly attributed to high right-turn volumes at this location. Queues at this location exceed the storage length in the PM peak.

2040 Build Scenario 1

Table 15 lists the summary results of the Synchro analysis for the 2040 Build Scenario 1, as previously described in **Table 2**. **Appendix C** contains the detailed results of the 2040 Build Scenario 1 traffic operational analysis. It was assumed for the purpose of traffic analysis, that all traffic exiting the Operations Complex would use the egress onto Columbia Pike, as opposed to the egress at Joyce Street, even if destined to Joyce Street. This would present the worst-case scenario for the intersection of Columbia Pike and Joyce Street. If some traffic egressing the Operations Complex used the egress at Joyce Street, operations at the intersection of Columbia Pike and Joyce Street would be better.

Table 15: Build Scenario 1 Condition – Analysis Summary

Intersection ID and Description		Control	AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	Nash Street, Southgate Road, and Hobson Drive	All-Way Stop Control	7.7	A	12.7	B
2	Columbia Pike and S. Nash Street	Signal	6.5	A	30.6	C
3	Columbia Pike and East Driveway (VDOT)	Two-Way Stop Control	0.1	A	0.0	A
4	Columbia Pike and Air Force Memorial	Pedestrian Signal	5.1	A	15.7	B
5	Columbia Pike and S. Joyce Street	Signal	22.7	C	36.0	D
7	Columbia Pike and Southbound Route 27 Ramps	Signal	12.9	B	34.6	C
8	Col. Pike and new Ops. Complex Driveway	Two-Way Stop Control	0.1	A	0.5	A
9	Joyce St. and ANC Service Complex Driveway	Two-Way Stop Control	0.0	A	0.0	A

Overall, operations are consistent with the Baseline Conditions, except for the following location which changed in LOS:

- Columbia Pike and S. Joyce Street: The overall LOS to deteriorate from LOS C to LOS D due to increased eastbound through and westbound left turn movements. The LOS is still within acceptable margins of performance.

2040 Build Scenario 2

Table 16 lists the summary results for the scenario analysis for the 2040 Build Scenario 2, as previously described in **Table 2**. **Appendix C** contains the detailed results of the 2040 Build Scenario 2 traffic operational analysis. Similar to Scenario 1, all traffic destined to Joyce Street was assumed to use the egress onto Columbia Pike, which would be the worst-case scenario for the intersection of Columbia Pike and Joyce Street,

Table 16: Build Scenario 2 Condition – Analysis Summary

Intersection ID and Description		Control	AM Peak		PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
1	Nash Street, Southgate Road, and Hobson Drive	All-Way Stop Control	7.7	A	12.7	B
2	Columbia Pike and S. Nash Street	Signal	6.5	A	31.4	C
3	Columbia Pike and East Driveway (VDOT)	Two-Way Stop Control	0.1	A	0.0	A
4	Columbia Pike and Air Force Memorial	Pedestrian Signal	5.1	A	15.7	B
5	Columbia Pike and S. Joyce Street	Signal	22.7	C	35.6	D
7	Columbia Pike and Southbound Route 27 Ramps	Signal	13.0	B	34.3	C
8	Col. Pike and new Ops. Complex Driveway	Two-Way Stop Control	0.1	A	1.0	A
9	Joyce St. and new Ops. Complex Driveway	Two-Way Stop Control	0.0	A	0.0	A

The findings of the 2040 Build Scenario 2 analysis are consistent to the Build Scenario 1, except for the following location:

- Columbia Pike and new Operations Complex Driveway: The northbound left-turn from new Operations Complex driveway has 4 (50) vehicles in the AM (PM) peak hour. This movement operates at LOS E during the PM peak hour.

2040 Mitigation

The mitigation scenario evaluated different measures to improve operations for the previously discussed intersections to improve performance for the Baseline and Build Scenarios. Different intersection signal schemes were evaluated to determine the best performing configuration. Due to capacity limitations, not every underperforming movement was able to be mitigated. Some individual movements operate at LOS E, however, shifting green time from other movements to these movements simply shift the delays to other movements. In addition, some right-of-way restrictions limit physical mitigation measures such as increasing the number of lanes.

The proposed mitigation for the Baseline Conditions includes adding a second southbound right-turn lane from Route 27 ramp to Columbia Pike. This measure was selected over extending the single lane turn lane due to geometric constraints near the top of the ramp. If the turn lane was extended, a County-proposed path could not be constructed as there would be insufficient space between the turn lane and the ANC boundary wall. The additional lane reduced the queue length from over 700 feet to approximately 365 feet, and reduced the approach delay from 50.3 seconds per vehicle to 38.7. This mitigation measure was also considered for Build Scenarios 1 and 2. This improved the approach delay from 53.6 seconds per vehicle to 39.7. The additional lane also reduced the queue length from over 700 feet to approximately 375 feet.

Table 17 lists the summary results from the implementation of the mitigation measure for each scenario.

Table 17: Build Mitigation Scenario – Overall Intersection Summary Results

Scenario	Intersection	AM Peak		PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Baseline Condition	Columbia Pike and Southbound Route 27 Ramps	13.7	B	25.2	C
Build Scenario 1		12.4	B	26.8	C
Build Scenario 2		13.5	B	26.6	C

Gate Capacity Analysis

A sensitivity analysis was performed to evaluate the gate performance assuming two different processing times to better understand the impacts of flagged vehicles during gate inspections. Typically, a vehicle is expected to be processed at the inspection point within 30 seconds. However, if a vehicle is flagged for further inspection, the processing time becomes 5.5 minutes. The AM peak hour was chosen for the analysis as this is the highest volume time period expected for the inspection point with 119 vph. Testing was completed to determine at what rate which vehicles are flagged that would exceed the capacity of the gate. The capacity checks indicated that if more than 10 percent of the vehicles are flagged during the AM peak hour, this could result in exceeding the processing capacity of the 2-lane gate. This could cause queues to back-up onto South Joyce Street. More so, if there is a vehicle in each lane at the gate at the same time requiring further inspection, queues can be expected to spill back onto South Joyce Street.

Conclusion

The objective of this study was to evaluate the traffic operational impacts resulting from the proposed ANC Southern Expansion project changes to land use, and to identify if any additional improvements beyond the IMR-proposed configuration are necessary. In addition to the trip generation and traffic analysis, a parking analysis based on an employee survey concluded a total of 244 spaces are needed for the new Operations Complex parking garage. The land use changes also required looking at the following elements for the analysis:

1. New trips generated from the ANC Southern Expansion
2. Diversion of traffic to and from:
 - a. AFM
 - b. Existing ANC Service Complex
 - c. Closure of Southgate Road
 - d. New Operations Complex

The following is a summary of the study findings:

1. A signal is warranted for the intersections along Columbia Pike at Nash Street and the Route 27 ramps for the Baseline Conditions and both Build Scenarios.
2. The traffic operations at the new Operations Complex driveways perform at a better LOS in Build Scenario 1 than in Build Scenario 2. As a result, Build Scenario 1 is recommended.
3. The mitigation scenarios for the Baseline Conditions and both Build Scenarios include an additional southbound right-turn lane (dual right turn lanes) with turn bay length of over 400 feet at intersection of Columbia Pike and the Route 27 ramps. The additional lane reduced queuing on the ramp from over 700 feet to under 400 feet.
4. The pedestrian signal warrant analysis for the crosswalk at Columbia Pike and the AFM established the need of a PHB signal to improve safety and to better serve pedestrians crossing to and from the new Operations Complex. Pedestrians would be provided a 7-second walk interval and a 14-second flash-don't-walk interval followed by clearance interval to cross four lanes of traffic.
5. The new Operations Complex has the capacity to process vehicles through the inspection points with at most 10 percent of the vehicles flagged for further inspection during the AM peak hour. The capacity is based on the processing times and the number of lanes for the gate. A higher percentage of vehicles flagged could result in queue spillback onto South Joyce Street.

APPENDIX A: Interim Parking Analysis Technical Memo

ARLINGTON NATIONAL CEMETERY

Southern Expansion Project

Tech Memo: New Operations Complex Parking Demand

Introduction

This interim technical brief is a component document of the forthcoming traffic study deliverable. To design the site south of Columbia Pike it is necessary to define the parking requirements for the Southern Expansion Project. This brief highlights the parking requirements to be accommodated south of Columbia Pike and west of S. Joyce Street.

Purpose

The purpose of this summary is to develop an understanding of the future parking needs for the proposed relocation of the Arlington National Cemetery (ANC) Operations Complex.

To develop an understanding of the needs of existing personnel working at ANC, a survey was undertaken to determine their travel patterns and parking location choices. This will help guide the parking needs of a new parking facility (assumed to be a parking structure). In addition, the proposed parking structure will need to accommodate parking for visitors to the Southern Expansion and the Air Force Memorial, as its existing parking lot will be converted into pedestrian use, internal bus/trolley circulation and interment space.

Commuter Pattern Survey

In the first half of January 2019, a survey of ANC personnel, consisting of federal employees and contractors, was undertaken. The purpose of this survey was to obtain travel patterns of these personnel, information gathered included:

- Mode choice (i.e. how do they get to work: drive alone, take bus, carpool, etc.)
- For those driving,
 - Gate used to access ANC
 - Where they park
 - Typical arrival and departing time
 - Routes used to reach ANC
 - Work location on ANC
 - Whether they are a contractor or federal employee

The survey was distributed to the various departments of ANC, and survey results were compiled by each department prior to submitting to the study team. A total of 374 respondents completed the survey, across 26 departments. The size of each department varies from 1 person to 65 persons. It should be noted that totals for each question may not add up to total respondents, as personnel may not have answered each question.

1. How do you generally (the majority of workdays) get from home to work?

Mode	Respondents
I drive to the cemetery, alone or with passengers.	268
I take the Metro then walk to the cemetery.	40
I take a bus to the Pentagon, then walk to the cemetery.	3
I take a bus to the cemetery.	0
I walk to the cemetery from my home.	0
I bike to the cemetery.	1
I carpool or vanpool to the cemetery.	22
I carpool/vanpool to the Pentagon, then walk to the cemetery.	5
Other (explain)	0
TOTAL	339

totals may not add up to total number of personnel responding as some may not have responded.

The preferred mode choice of ANC personnel is to drive (alone or as driver of a carpool). Given the proximity of the Welcome Center to the Metrorail Station, this mode is the second-ranked mode choice of personnel.

2. Which gate do you use?

Gate	Respondents
Memorial Avenue	108
Building 123 Gate	210
110 Gate	5
JBMM Gate/Old Post Chapel Gate	4
Ord & Weitzel Gate (by Iwo Jima Memorial)	5
TOTAL	332

The Building 123 Gate, off Columbia Pike is the preferred access point into ANC, followed by Memorial Avenue. This is as expected as these two access points are the closest points to the existing Service Complex and Welcome Center.

3. Where do you most frequently park your POV while you are at work?

Parking location	Respondents
On Memorial Drive	1
Visitor Parking Garage (by Welcome Center)	81
New Staff lot (adjacent to Halsey Dr, by Welcome Center)	51
Existing Service Complex (off of Columbia Pike)	109
Along Southgate Road	0
TOTAL	242
Contractor lot/area and Section 57	85

The key parking areas are adjacent to the existing Service Complex and Welcome Center. It is interesting to note that the split between access points (63 percent Building 123 Gate, and 33 percent Memorial Avenue) is not consistent with the split between parking areas (45 percent existing Service Complex, and 54 percent Welcome Center parking areas). This supports the observation that some personnel use Building 123 Gate to access ANC, but then park in the Welcome Center parking areas. It should be noted that ANC personnel responding to this survey indicate they do not use Southgate Road to park.

4. What time do you typically:

Report to work:	Respondents
Before 0600	69
0600-0630	61
0630-0700	28
0700-0730	89
0730-0800	72
after 0800	22
TOTAL	341
Leave work:	Respondents
before 1500	48
1500-1530	18
1530-1600	43
1600-1630	82
1630-1700	78
1700-1730	33
after 1730	38
TOTAL	340

Arrival pattern is centered around two points, before 0630 and between 0700 to 0800. For departure times, key hour is 1600 to 1700.

5. What route(s) do you most frequently use on your way to work (i.e., before your shift) (check all that apply):

Route	Respondents
Columbia Pike	80
Route 27	17
VA-110	12
I-66	16
I-395	74
George Washington Memorial Parkway	38
Memorial Bridge	76
14th St Bridge	25
TOTAL	338

Multiple answers permitted.

Key routes used by personnel to reach ANC are Columbia Pike, I-395 and Memorial Bridge. This is similar to the key routes used by personnel to return home at the end of the work day.

6. What route(s) do you most frequently use on your way from work (i.e., after your shift) (check all that apply):

Route	Respondents
Columbia Pike	80
Route 27	15
VA-110	13
I-66	15
I-395	80
George Washington Memorial Parkway	35
Memorial Bridge	79
14th St Bridge	25
TOTAL	342

Multiple answers permitted.

7. Where do you work at ANC?

Work Location	Respondents
Welcome Center	111
Admin	44
123 Complex	93
117 Complex	12
Amphitheater	6
USACE Trailer	0
TOTAL	266

The Administration/Welcome Center, followed by the 117/123 Complexes, are the primary work locations for ANC personnel. It should be noted that the horticultural contractors are separate from the listing above, as they work throughout ANC based on assignments.

8. Are you a contractor or federal employee?

Personnel Status	Respondents
Contractor	143
Federal employee	207
TOTAL	350

Sixty percent of ANC personnel surveyed are federal employees, while forty percent are contractors.

Parking Supply

A tally of the number of parking spaces, using aerial imagery, was developed to understand where parking supply exist throughout ANC.

Estimate of Parking supply at Arlington National Cemetery and Air Force Memorial

Location	Numbers
Lot off Halsey Drive ¹	119
Lot off King Drive ¹	20
Building 117 (for GOV) ²	10
Building 117/123 visitor and GOV	18
Building 123 Employee Lot	95
Building 123 service area ²	49
Bus bays at Visitor Parking Garage (by Welcome Center)	45
Visitor Parking Garage ³ (by Welcome Center)	450
Air Force Memorial	18
Air Force Memorial bus drop-off ⁴	5
TOTAL⁵	829

1-includes spaces for handicap, employees and government vehicles (GOV)

2-excludes spaces within service buildings as spaces are for maintenance, not parking

3-includes spaces underground, values estimated based on square footage from aerial and above ground spaces

4-observations indicate buses only drop-off and pick-up passengers; buses may stage on the circle after dropping off passengers

5-excludes contractor yard/lot and Section 57

The Building 123 service area is typically used for maintenance vehicles and equipment storage, and not employee parking. It is not known if maintenance workers (Building 123 service area) park their personal vehicles here.

Parking Needs

The existing Service Complex will be relocating from its current location along the north side of Columbia Pike (near the Route 27 interchange) to the south side of Columbia Pike (west of S. Joyce Street). In addition to the current employees at the existing Service Complex, some employees within the Administration/Welcome Center buildings will be relocating. Separate from the above survey, the Study Team met with ANC staff to identify departments that will be relocating to the new Operations Complex, versus those that will remain at the Administration/Welcome Center buildings, refer to **Appendix A** for the listing by department.

The commuter pattern survey provides insight into the travel pattern of personnel that work at ANC. This provides information that will be used in developing parking needs for the new Operations Complex to be located on the southside of Columbia Pike, which will include personnel to be relocated from the Welcome Center. Of the 374 respondents, a total of 157 personnel will be located at the new Operations Complex (excludes 85 contractors, which have separate parking area). Based on the survey, only 127 of these 157 personnel currently park at ANC. The other 33 employees use Metro, use bus or carpool to work. The existing parking to total employees' ratio is a little more than 4 spaces for every 5 employees.

Current Parking Demand for Departments relocating to the new Operations Complex

Parking location	Respondents
Visitor Parking Garage (by Welcome Center)	34
New Staff lot (adjacent to Halsey Dr)	3
Existing Service Complex (off Columbia Pike)	90
TOTAL	127

*contractor yard/lot and Section 57 tallied separately as area is on-site contractor parking (85 spaces)

One of the departments relocating to the New Operations complex will be expanding. Total personnel level will be 167, with a parking requirement of 137 spaces if maintaining the existing parking ratio for affected employees.

The Southern Expansion of ANC will remove on-street parking along Southgate Road; these spaces will be relocated to the new Operations Complex Parking Structure. The inventory of existing spaces in the westbound direction (uphill) indicated that there is an equivalent of a 159 passenger car spaces.

NCPC Guidance

NCPC guidelines indicate that federal facilities that are outside of the Central Employment Area, but within the Historic District of Columbia boundaries, the parking ratio should not exceed one space for every four employees (1:4). These policies limit parking supply in areas where transit accessibility is high and employee carpooling is more likely. The proposed Operations Complex would be located approximately 0.75 miles from the Pentagon Metrorail station, and would be well served by transit along Columbia Pike. Per NCPC guidance, ANC Operations Complex Employee parking should be limited to 42 spaces.

Findings

The proposed parking area is intended to supplement the main visitor parking complex at the Welcome Center, as well as to accommodate the Operations Complex and Air Force Memorial parking needs. It is assumed that the main parking complex at the Welcome Center will remain in its current form. Lost parking spaces along Southgate Road will be replaced in the garage. The Air Force Memorial parking (employees and visitors) will be provided at the same levels as existing. The Air Force Memorial and Southern Expansion area will be a common destination for visitors, as the Air Force Memorial site will be integrated with the Southern Expansion. The Visitor Parking is expected to be paid parking.

Parking Demand for new Operations Complex Parking Structure

Section	Spaces needed
ANC Employees ¹	42
Replacement for parking along Southgate Road	159
AFM Visitors and Employees	18
Operations Complex Visitors	5
Area for Government Motor Pool	20
TOTAL³	244

1-Considers potential expansion of number of employees at the Operations Complex, spaces limited to NCPC guidelines

2- Per note from ANC that garage to accommodate 20 vehicles, remaining GOV to be in surface lot

3-Excludes storage for maintenance vehicles and equipment, and buses

The parking and laydown area needs for the maintenance operations are not considered in the above totals. Currently, the number of spaces within the middle of the maintenance area is estimated to be approximately 50. Parking or drop off area for buses will not be provided.

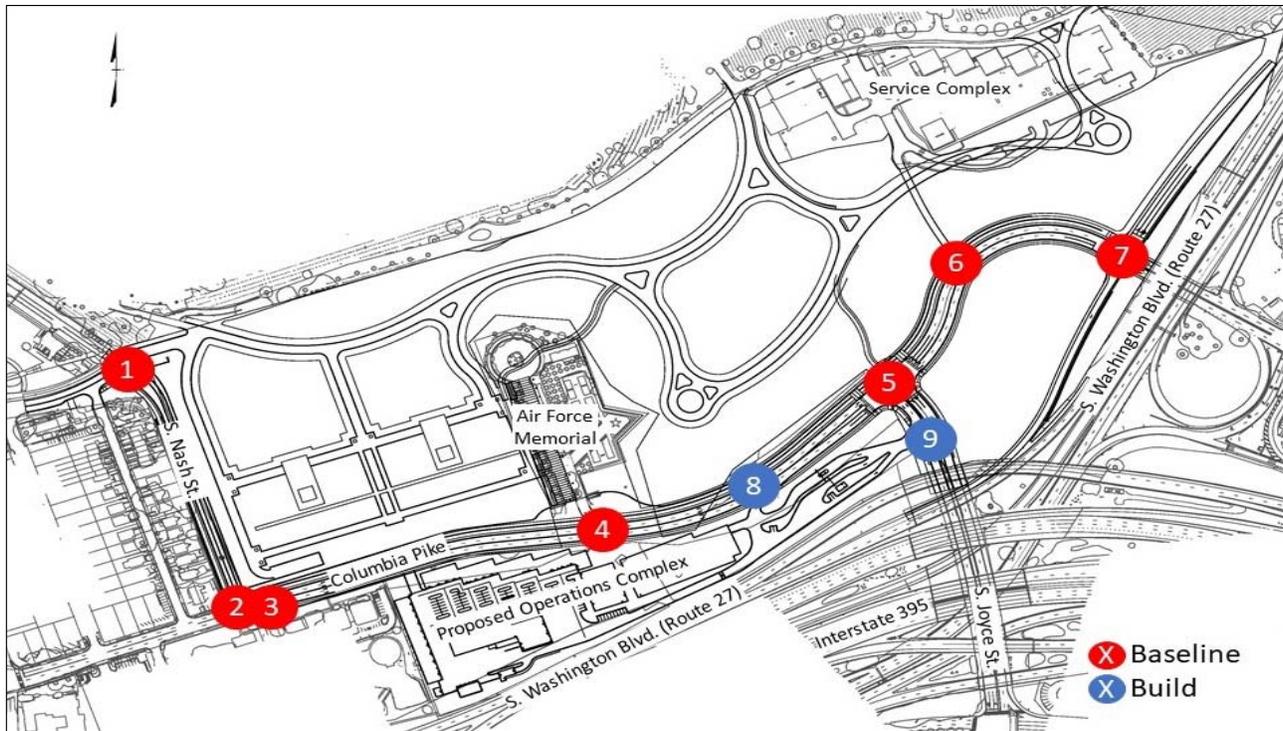
Recommendation: to accommodate future needs of the Operations Complex, and future visitors to ANC and AFM, 244 spaces will be needed.

APPENDIX B: Traffic Volume Diagrams and Intersection Geometry

Arlington National Cemetery - Southern Expansion: Traffic Study

2040 Baseline Traffic Volumes

<p>1 Hobson Drive</p> <table border="1"> <tr> <td>Southgate Road</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>111 (425)</td> <td>118 (313)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> </table> <p>ANC Gate</p> <p>South Nash Street</p>	Southgate Road	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		111 (425)	118 (313)	0 (0)	0 (0)	0 (0)	<p>2 South Nash Street</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>2 (82)</td> <td>109 (343)</td> <td>113 (303)</td> <td>440 (1425)</td> </tr> <tr> <td></td> <td>5 (10)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>777 (587)</td> <td></td> <td></td> <td></td> </tr> </table> <p>Columbia Pike</p>	Columbia Pike	2 (82)	109 (343)	113 (303)	440 (1425)		5 (10)					777 (587)				<p>3</p> <table border="1"> <tr> <td>Columbia Pike</td> <td></td> <td></td> <td>551 (1726)</td> <td>2 (2)</td> <td>2 (2)</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>884 (928)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>2 (2)</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>Columbia Pike</p> <p>VDOT Driveway</p>	Columbia Pike			551 (1726)	2 (2)	2 (2)								884 (928)						2 (2)					<p>4 Air Force Memorial</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>1 (2)</td> <td>2 (7)</td> <td>3 (6)</td> <td>552 (1726)</td> </tr> <tr> <td></td> <td>3 (4)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>883 (926)</td> <td></td> <td></td> <td></td> </tr> </table> <p>Columbia Pike</p>	Columbia Pike	1 (2)	2 (7)	3 (6)	552 (1726)		3 (4)					883 (926)			
Southgate Road	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)																																																																												
	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)																																																																												
	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)																																																																												
	111 (425)	118 (313)	0 (0)	0 (0)	0 (0)																																																																												
Columbia Pike	2 (82)	109 (343)	113 (303)	440 (1425)																																																																													
	5 (10)																																																																																
	777 (587)																																																																																
Columbia Pike			551 (1726)	2 (2)	2 (2)																																																																												
	884 (928)																																																																																
	2 (2)																																																																																
Columbia Pike	1 (2)	2 (7)	3 (6)	552 (1726)																																																																													
	3 (4)																																																																																
	883 (926)																																																																																
<p>5</p> <table border="1"> <tr> <td>Columbia Pike</td> <td></td> <td></td> <td>230 (912)</td> <td>140 (240)</td> </tr> <tr> <td></td> <td>568 (485)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>317 (448)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>325 (820)</td> <td></td> <td>473 (517)</td> </tr> </table> <p>Columbia Pike</p> <p>South Joyce Street</p>	Columbia Pike			230 (912)	140 (240)		568 (485)					317 (448)						325 (820)		473 (517)	<p>6 ANC Service Complex</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>2 (25)</td> <td>4 (11)</td> <td>20 (3)</td> <td>368 (1127)</td> </tr> <tr> <td></td> <td>12 (18)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>1029 (984)</td> <td></td> <td></td> <td></td> </tr> </table> <p>Columbia Pike</p>	Columbia Pike	2 (25)	4 (11)	20 (3)	368 (1127)		12 (18)					1029 (984)				<p>7 Route 27 Offramp</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>160 (757)</td> <td>134 (119)</td> <td>228 (373)</td> <td>88 (128)</td> </tr> <tr> <td></td> <td>889 (738)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>144 (257)</td> <td></td> <td></td> <td></td> </tr> </table> <p>Columbia Pike</p> <p>Route 27 Onramp</p>	Columbia Pike	160 (757)	134 (119)	228 (373)	88 (128)		889 (738)					144 (257)																																
Columbia Pike			230 (912)	140 (240)																																																																													
	568 (485)																																																																																
	317 (448)																																																																																
		325 (820)		473 (517)																																																																													
Columbia Pike	2 (25)	4 (11)	20 (3)	368 (1127)																																																																													
	12 (18)																																																																																
	1029 (984)																																																																																
Columbia Pike	160 (757)	134 (119)	228 (373)	88 (128)																																																																													
	889 (738)																																																																																
	144 (257)																																																																																

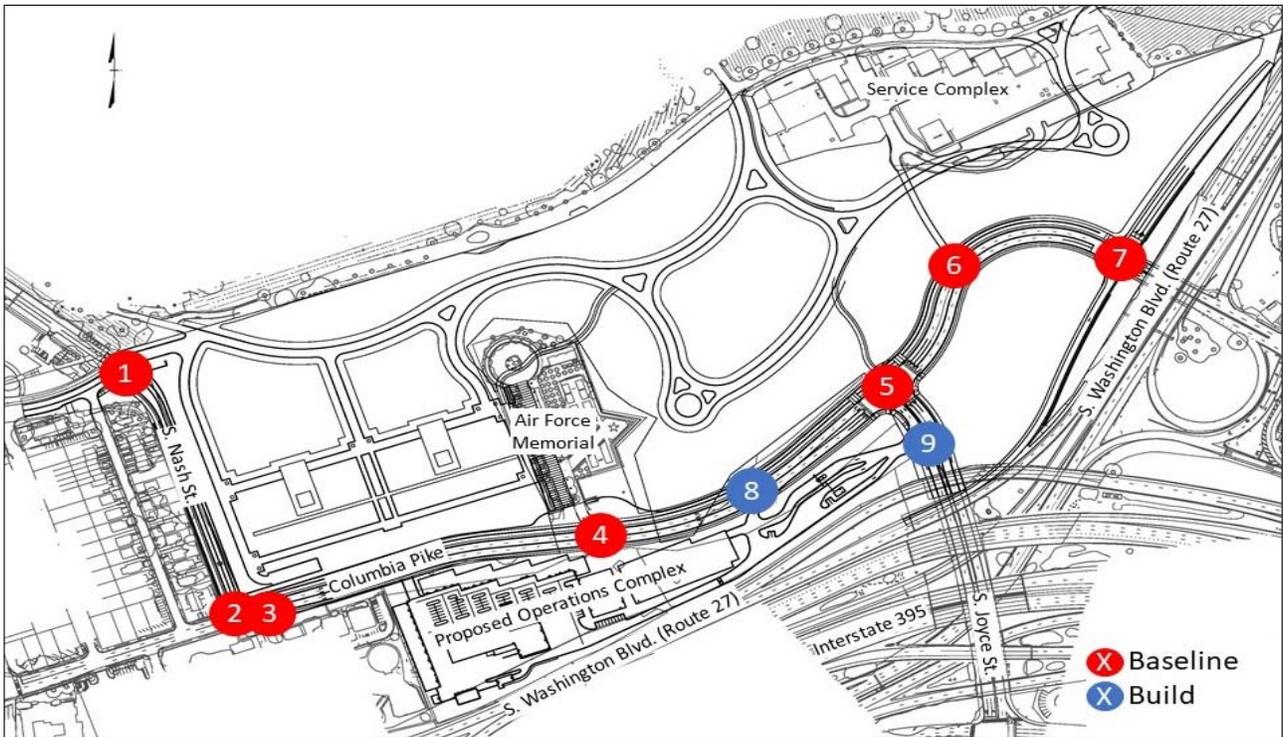


Arlington National Cemetery - Southern Expansion: Traffic Study

2040 Build Scenario 1 Traffic Volumes

<p>1</p> <table border="1"> <tr> <td colspan="2">Southgate Road</td> <td colspan="2">Hobson Drive</td> <td colspan="2">ANC Gate</td> </tr> <tr> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td>111 (425)</td> <td>118 (313)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td colspan="2">South Nash Street</td> <td colspan="2">ANC Gate</td> <td colspan="2">South Nash Street</td> </tr> </table>	Southgate Road		Hobson Drive		ANC Gate		0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	111 (425)	118 (313)	0 (0)	0 (0)	0 (0)	0 (0)	South Nash Street		ANC Gate		South Nash Street		<p>2</p> <table border="1"> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">South Nash Street</td> <td colspan="2">Columbia Pike</td> </tr> <tr> <td>2 (82)</td> <td>109 (343)</td> <td>113 (303)</td> <td>437 (1398)</td> <td>5 (10)</td> <td>812 (589)</td> </tr> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">South Nash Street</td> <td colspan="2">Columbia Pike</td> </tr> </table>	Columbia Pike		South Nash Street		Columbia Pike		2 (82)	109 (343)	113 (303)	437 (1398)	5 (10)	812 (589)	Columbia Pike		South Nash Street		Columbia Pike		<p>3</p> <table border="1"> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">VDOT Driveway</td> <td colspan="2">Columbia Pike</td> </tr> <tr> <td>919 (930)</td> <td>2 (2)</td> <td>548 (1699)</td> <td>2 (2)</td> <td>2 (2)</td> <td>2 (2)</td> </tr> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">VDOT Driveway</td> <td colspan="2">Columbia Pike</td> </tr> </table>	Columbia Pike		VDOT Driveway		Columbia Pike		919 (930)	2 (2)	548 (1699)	2 (2)	2 (2)	2 (2)	Columbia Pike		VDOT Driveway		Columbia Pike		<p>4</p> <table border="1"> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">Air Force Memorial</td> <td colspan="2">Columbia Pike</td> </tr> <tr> <td>0 (0)</td> <td>921 (932)</td> <td>0 (0)</td> <td>550 (1701)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">Air Force Memorial</td> <td colspan="2">Columbia Pike</td> </tr> </table>	Columbia Pike		Air Force Memorial		Columbia Pike		0 (0)	921 (932)	0 (0)	550 (1701)	0 (0)	0 (0)	Columbia Pike		Air Force Memorial		Columbia Pike	
Southgate Road		Hobson Drive		ANC Gate																																																																																									
0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)																																																																																								
0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)																																																																																								
0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)																																																																																								
111 (425)	118 (313)	0 (0)	0 (0)	0 (0)	0 (0)																																																																																								
South Nash Street		ANC Gate		South Nash Street																																																																																									
Columbia Pike		South Nash Street		Columbia Pike																																																																																									
2 (82)	109 (343)	113 (303)	437 (1398)	5 (10)	812 (589)																																																																																								
Columbia Pike		South Nash Street		Columbia Pike																																																																																									
Columbia Pike		VDOT Driveway		Columbia Pike																																																																																									
919 (930)	2 (2)	548 (1699)	2 (2)	2 (2)	2 (2)																																																																																								
Columbia Pike		VDOT Driveway		Columbia Pike																																																																																									
Columbia Pike		Air Force Memorial		Columbia Pike																																																																																									
0 (0)	921 (932)	0 (0)	550 (1701)	0 (0)	0 (0)																																																																																								
Columbia Pike		Air Force Memorial		Columbia Pike																																																																																									
<p>5</p> <table border="1"> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">South Joyce Street</td> <td colspan="2">Columbia Pike</td> </tr> <tr> <td>565 (590)</td> <td>367 (472)</td> <td>325 (820)</td> <td>473 (517)</td> <td>225 (881)</td> <td>209 (254)</td> </tr> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">South Joyce Street</td> <td colspan="2">Columbia Pike</td> </tr> </table>	Columbia Pike		South Joyce Street		Columbia Pike		565 (590)	367 (472)	325 (820)	473 (517)	225 (881)	209 (254)	Columbia Pike		South Joyce Street		Columbia Pike		<p>7</p> <table border="1"> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">Route 27 Onramp</td> <td colspan="2">Columbia Pike</td> </tr> <tr> <td>190 (760)</td> <td>134 (119)</td> <td>245 (375)</td> <td>88 (128)</td> <td>893 (810)</td> <td>145 (298)</td> </tr> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">Route 27 Onramp</td> <td colspan="2">Columbia Pike</td> </tr> </table>	Columbia Pike		Route 27 Onramp		Columbia Pike		190 (760)	134 (119)	245 (375)	88 (128)	893 (810)	145 (298)	Columbia Pike		Route 27 Onramp		Columbia Pike		<p>8</p> <table border="1"> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">New Operations Complex</td> <td colspan="2">Columbia Pike</td> </tr> <tr> <td>921 (932)</td> <td>11 (130)</td> <td>550 (1701)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td colspan="2">Columbia Pike</td> <td colspan="2">New Operations Complex</td> <td colspan="2">Columbia Pike</td> </tr> </table>	Columbia Pike		New Operations Complex		Columbia Pike		921 (932)	11 (130)	550 (1701)	0 (0)	0 (0)	0 (0)	Columbia Pike		New Operations Complex		Columbia Pike		<p>9</p> <table border="1"> <tr> <td colspan="2">New Ops. Complex</td> <td colspan="2">South Joyce Street</td> <td colspan="2">future PMVEC</td> </tr> <tr> <td>119 (38)</td> <td>457 (688)</td> <td>798 (1337)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td colspan="2">New Ops. Complex</td> <td colspan="2">South Joyce Street</td> <td colspan="2">future PMVEC</td> </tr> </table>	New Ops. Complex		South Joyce Street		future PMVEC		119 (38)	457 (688)	798 (1337)	0 (0)	0 (0)	0 (0)	New Ops. Complex		South Joyce Street		future PMVEC																			
Columbia Pike		South Joyce Street		Columbia Pike																																																																																									
565 (590)	367 (472)	325 (820)	473 (517)	225 (881)	209 (254)																																																																																								
Columbia Pike		South Joyce Street		Columbia Pike																																																																																									
Columbia Pike		Route 27 Onramp		Columbia Pike																																																																																									
190 (760)	134 (119)	245 (375)	88 (128)	893 (810)	145 (298)																																																																																								
Columbia Pike		Route 27 Onramp		Columbia Pike																																																																																									
Columbia Pike		New Operations Complex		Columbia Pike																																																																																									
921 (932)	11 (130)	550 (1701)	0 (0)	0 (0)	0 (0)																																																																																								
Columbia Pike		New Operations Complex		Columbia Pike																																																																																									
New Ops. Complex		South Joyce Street		future PMVEC																																																																																									
119 (38)	457 (688)	798 (1337)	0 (0)	0 (0)	0 (0)																																																																																								
New Ops. Complex		South Joyce Street		future PMVEC																																																																																									

Note: Intersection #6 closed

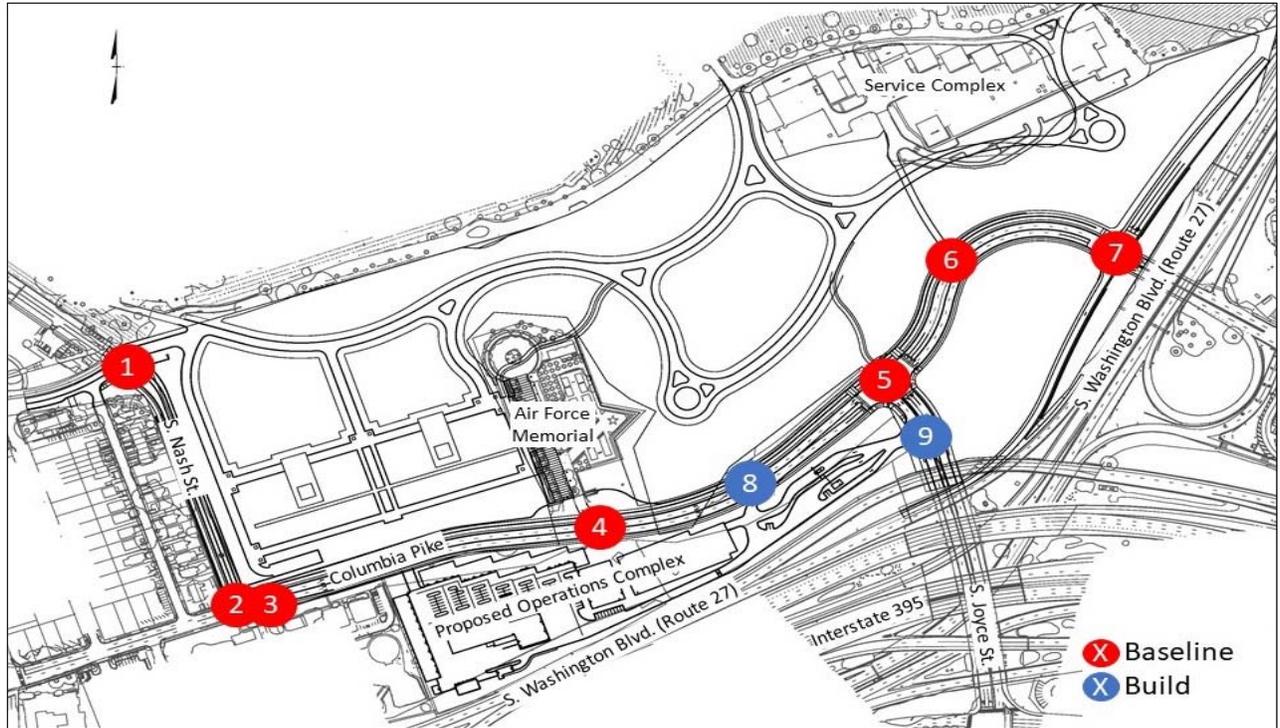


Arlington National Cemetery - Southern Expansion: Traffic Study

2040 Build Scenario 2 Traffic Volumes

<p>1</p> <p>Hobson Drive</p> <table border="1"> <tr> <td>Southgate Road</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>0 (0)</td> <td>118 (313)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>111 (425)</td> <td>0 (0)</td> <td>0 (0)</td> <td>0 (0)</td> </tr> </table> <p>South Nash Street</p>	Southgate Road	0 (0)	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	0 (0)		0 (0)	118 (313)	0 (0)	0 (0)		111 (425)	0 (0)	0 (0)	0 (0)	<p>2</p> <p>South Nash Street</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>2 (82)</td> <td>109 (343)</td> <td>113 (303)</td> <td>441 (1448)</td> </tr> <tr> <td></td> <td>5 (10)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>812 (589)</td> <td></td> <td></td> <td></td> </tr> </table>	Columbia Pike	2 (82)	109 (343)	113 (303)	441 (1448)		5 (10)					812 (589)				<p>3</p> <table border="1"> <tr> <td>Columbia Pike</td> <td></td> <td>552 (1749)</td> <td>2 (2)</td> </tr> <tr> <td></td> <td>919 (930)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>2 (2)</td> <td></td> <td></td> </tr> </table> <p>VDOT Driveway</p>	Columbia Pike		552 (1749)	2 (2)		919 (930)				2 (2)			<p>4</p> <p>Air Force Memorial</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>0 (0)</td> <td>554 (1751)</td> </tr> <tr> <td></td> <td>0 (0)</td> <td></td> </tr> <tr> <td></td> <td>921 (932)</td> <td></td> </tr> </table>	Columbia Pike	0 (0)	554 (1751)		0 (0)			921 (932)	
Southgate Road	0 (0)	0 (0)	0 (0)	0 (0)																																																							
	0 (0)	0 (0)	0 (0)	0 (0)																																																							
	0 (0)	118 (313)	0 (0)	0 (0)																																																							
	111 (425)	0 (0)	0 (0)	0 (0)																																																							
Columbia Pike	2 (82)	109 (343)	113 (303)	441 (1448)																																																							
	5 (10)																																																										
	812 (589)																																																										
Columbia Pike		552 (1749)	2 (2)																																																								
	919 (930)																																																										
	2 (2)																																																										
Columbia Pike	0 (0)	554 (1751)																																																									
	0 (0)																																																										
	921 (932)																																																										
<p>5</p> <table border="1"> <tr> <td>Columbia Pike</td> <td></td> <td>225 (881)</td> <td>209 (254)</td> </tr> <tr> <td></td> <td>561 (540)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>367 (472)</td> <td>325 (820)</td> <td>473 (517)</td> </tr> </table> <p>South Joyce Street</p>	Columbia Pike		225 (881)	209 (254)		561 (540)				367 (472)	325 (820)	473 (517)	<p>7</p> <p>Route 27 Offramp</p> <table border="1"> <tr> <td>Columbia Pike</td> <td>190 (760)</td> <td>134 (119)</td> <td>245 (375)</td> <td>88 (128)</td> </tr> <tr> <td></td> <td>890 (778)</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>144 (279)</td> <td></td> <td></td> <td></td> </tr> </table> <p>Route 27 Onramp</p>	Columbia Pike	190 (760)	134 (119)	245 (375)	88 (128)		890 (778)					144 (279)				<p>8</p> <table border="1"> <tr> <td>Columbia Pike</td> <td></td> <td>550 (1701)</td> </tr> <tr> <td></td> <td>921 (932)</td> <td></td> </tr> <tr> <td></td> <td>4 (50)</td> <td>7 (80)</td> </tr> </table> <p>Operations Complex</p>	Columbia Pike		550 (1701)		921 (932)			4 (50)	7 (80)	<p>9</p> <p>South Joyce Street</p> <table border="1"> <tr> <td>Operations Complex</td> <td>119 (38)</td> <td>457 (688)</td> <td>0 (0)</td> </tr> <tr> <td></td> <td>0 (0)</td> <td></td> <td></td> </tr> <tr> <td></td> <td>798 (1337)</td> <td>0 (0)</td> <td></td> </tr> </table> <p>future PMVEC</p>	Operations Complex	119 (38)	457 (688)	0 (0)		0 (0)				798 (1337)	0 (0)									
Columbia Pike		225 (881)	209 (254)																																																								
	561 (540)																																																										
	367 (472)	325 (820)	473 (517)																																																								
Columbia Pike	190 (760)	134 (119)	245 (375)	88 (128)																																																							
	890 (778)																																																										
	144 (279)																																																										
Columbia Pike		550 (1701)																																																									
	921 (932)																																																										
	4 (50)	7 (80)																																																									
Operations Complex	119 (38)	457 (688)	0 (0)																																																								
	0 (0)																																																										
	798 (1337)	0 (0)																																																									

Note: Intersection #6 closed



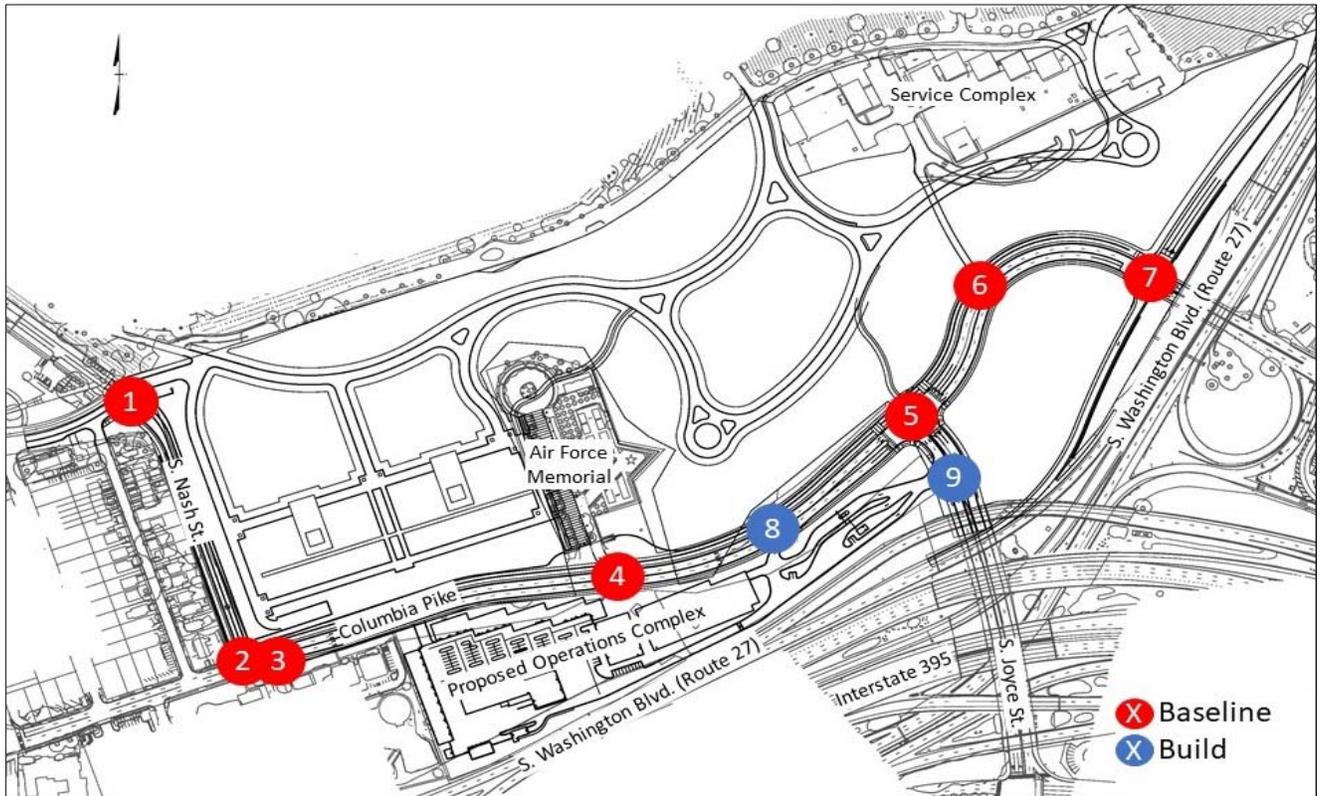
APPENDIX C: Traffic Operations Analysis Results

**2040 Baseline Condition
Measures of Effectiveness**

Arlington National Cemetery - Southern Expansion: Traffic Study

Scenario: 2040 AM Baseline - Movement Delay and LOS

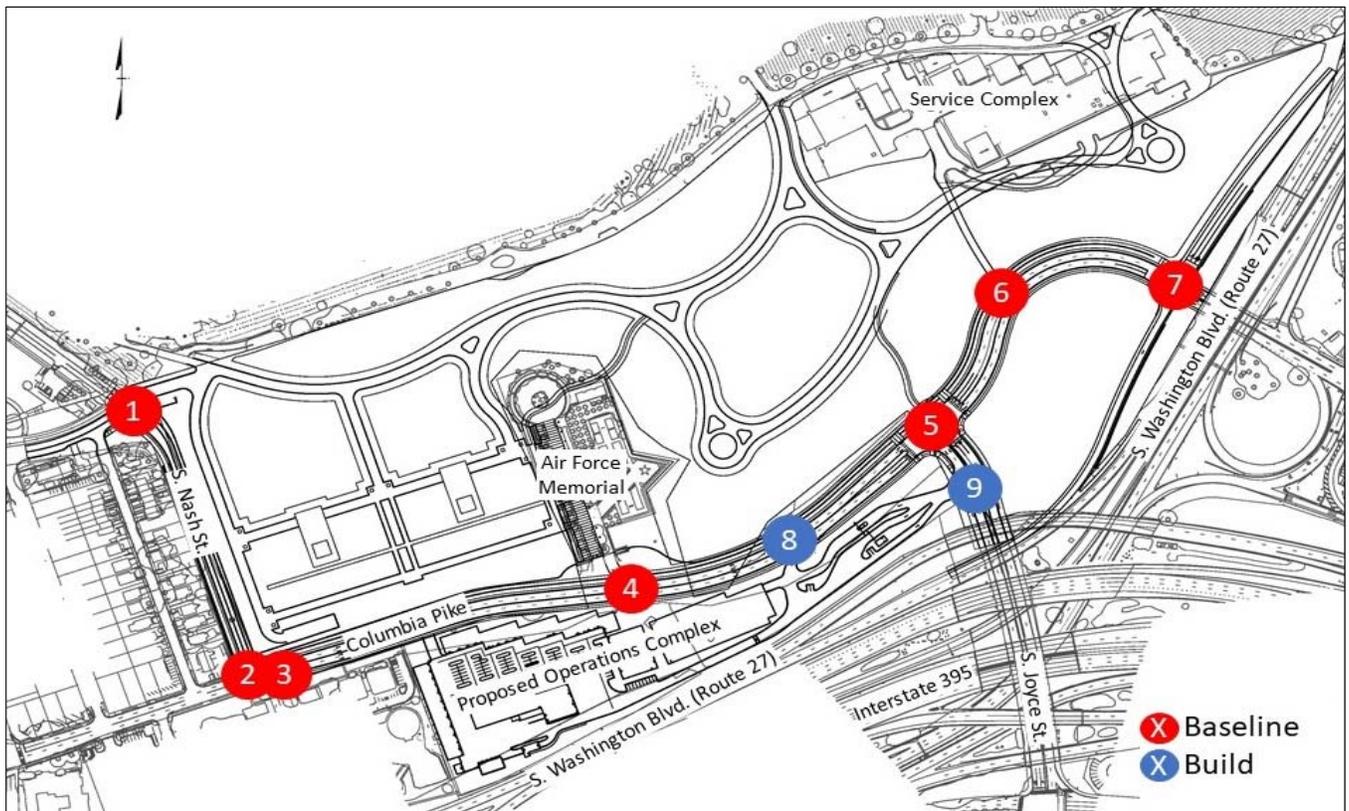
<p>1</p> <p>Hobson Drive</p> <p>Southgate Road</p> <p>South Nash Street</p>	<p>2</p> <p>South Nash Street</p> <p>Columbia Pike</p> <p>Columbia Pike</p>	<p>3</p> <p>Columbia Pike</p> <p>VDOT Driveway</p>	<p>4</p> <p>Air Force Memorial</p> <p>Columbia Pike</p> <p>Columbia Pike</p>
<p>5</p> <p>Columbia Pike</p> <p>South Joyce Street</p>	<p>6</p> <p>ANC Service Complex</p> <p>Columbia Pike</p> <p>Columbia Pike</p>	<p>7</p> <p>Route 27 Offramp</p> <p>Columbia Pike</p> <p>Route 27 Onramp</p>	



Arlington National Cemetery - Southern Expansion: Traffic Study

Scenario: 2040 PM Baseline - Movement Delay and LOS

<p>1 Hobson Drive</p> <p>South Nash Street</p>	<p>2 South Nash Street</p> <p>ANC Gate</p>	<p>3 VDOT Driveway</p> <p>Columbia Pike</p>	<p>4 Air Force Memorial</p> <p>Columbia Pike</p>
<p>5 South Joyce Street</p> <p>Columbia Pike</p>	<p>6 ANC Service Complex</p> <p>Columbia Pike</p>	<p>7 Route 27 Onramp</p> <p>Columbia Pike</p>	



2040 Baseline - Lane Group LOS and Movement Queue																					
Synchro ID	Intersection (#)	Volume	Lane Group Delay	Lane Group LOS	AM				PM												
					Approach Delay	Approach LOS	Storage (ft)	95th Percentile Queue (ft)	Volume	Delay	LOS	Approach Delay	Approach LOS	Storage (ft)	95th Percentile Queue (ft)						
5	Nash Street, Southgate Road, and Hobson Drive (1)	Unsignalized	EBL	0	7.1	A	7.1	A	200	-	0	12.4	B	12.4	B	200	-				
			EBT	0						-	0						-				
			EBR	111						-	425						-				
			WBL	0	8.2	A	8.2	A	700	-	-	313	13.1	B	13.1	B	700	-			
			WBR	0														-	0	-	
			NBL	118														-	0	-	
			NBT	0	780							0						780	-		
			NBR	0															-	0	-
			SBL	0															-	0	-
			SBT	0																	
SBR	0																				
Int.	Overall	7.7	A					Overall	12.7	B											
19	Columbia Pike and S. Nash Street (2)	Signalized	EBL	5	3.9	A	3.9	A	220	128	10	11.5	B	11.5	B	220	160				
			EBT	777					-	-	587					-	-				
			WBT	440	1.2	A	1.2	A	1,000	7	1425	15.1	B	15.1	B	1,000	654				
			WBR	113					-	-	303					-	-				
			SBL	109	55.9	E	55.9	E	700	146	343	66.9	E	66.9	E	700	#531				
			SBR	2					-	-	82					-	-				
			Int.	Overall	6.9	A					Overall	22.3	C								
3	Columbia Pike and East Driveway (VDOT) (3)	Unsignalized	EBT	884	0	A	0	A	-	-	928	0	A	0	A	-	-				
			EBR	2	0	A			-	-	2	0	A			-	-				
			WBL	2	0.1	A			-	-	2	0.1	A			-	-				
			WBT	551	0	A	0	A	-	-	1726	0	A	0	A	-	-				
			NBL	2	17.9	C	17.9	C	75	1	2	39.2	E	39.2	E	75	3				
			NBR	2					-	-	2					-	-				
			Int.	Overall	0.1	A					Overall	0.1	A								
8	Columbia Pike and Airforce Memorial (4)	Unsignalized	EBT	3	0.1	A	0.1	A	750	0	4	0.4	A	0.4	A	750	1				
			EBR	883					-	-	926					-	-				
			WBT	552	0	A	0	A	1,000	0	1726	0	A	0	A	1,000	0				
			WBR	3	17.5	C	17.5	C	-	-	6	84.3	F	84.5	F	-	-				
			SBL	2					380	1	7					-	-				
			SBR	1	-	-	2	-	-												
			Int.	Overall	0.1	A					Overall	0.3	A								
1	Columbia Pike and Joyce Street (5)	Signalized	EBT	568	20.1	C	20.1	C	1,100	341	485	21	C	21	C	1,100	m273				
			EBR	317					-	-	448					-	-				
			WBL	140	14.9	B	10.7	C	300	76	240	30	C	18.1	C	300	m155				
			WBT	230	8.2	A			330	50	912	15	B			330	m275				
			NBL	325	39.1	D	36.7	C	200 *	169	820	54	D	42.4	D	200 *	#451				
			NBR	473	35.1	D			1,600	335	517	24.2	C			1,600	334				
			Int.	Overall	24.9	C					Overall	28.4	C								
9	Columbia Pike and ANC Service Complex (6)	Unsignalized	EBL	12	0.4	A	0.4	A	310	1	18	1.1	A	1.1	A	310	3				
			EBT	1029					-	-	984					-	-				
			WBT	368	0	A	0	A	150	0	1127	0	A	0	A	150	0				
			WBR	20	14.7	C	14.7	C	-	-	3	30	D	30	D	-	-				
			SBL	4					150	1	11					30	D	150	20		
			SBR	2	-	-	25	-	-												
			Int.	Overall	0.2	A					Overall	0.7	A								
26	Columbia Pike and Southbound Route 27 Ramps (7)	Signalized	EBT	889	5.3	A	5.3	A	750	180	738	22.3	C	22.3	C	750	399				
			EBR	144					-	-	257					-	-				
			WBL	88	4.6	A	4.6	A	-	-	128	27.9	C	27.9	C	-	-				
			WBT	228					350	63	373					350	252				
			SBL	134	56.5	E	51.2	D	550	171	119	21.2	C	50.3	D	550	97				
			SBR	160	46.7	D			400	0	757	54.9	D			400	#704				
			Int.	Overall	13.4	B					Overall	33.8	C								

Legend: # 95th Percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signal
* length of left turn pocket, other left turn lane is continuous back to Army Navy Drive

**2040 Baseline Condition
AM Synchro Reports**

HCM Signalized Intersection Capacity Analysis

1: Columbia Pike & S Joyce Street

04/10/2019



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	325	473	568	317	140	230
Future Volume (vph)	325	473	568	317	140	230
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	10	10
Total Lost time (s)	7.0	7.0	7.0		7.0	7.0
Lane Util. Factor	0.97	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.95		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	1531	3237		1652	3303
Flt Permitted	0.95	1.00	1.00		0.19	1.00
Satd. Flow (perm)	3433	1531	3237		328	3303
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	353	514	617	345	152	250
RTOR Reduction (vph)	0	68	51	0	0	0
Lane Group Flow (vph)	353	446	911	0	152	250
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	8	1 8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	28.4	47.4	58.6		77.6	77.6
Effective Green, g (s)	28.4	47.4	58.6		77.6	77.6
Actuated g/C Ratio	0.24	0.39	0.49		0.65	0.65
Clearance Time (s)	7.0		7.0		7.0	7.0
Vehicle Extension (s)	2.0		3.0		2.0	3.0
Lane Grp Cap (vph)	812	604	1580		344	2135
v/s Ratio Prot	0.10	c0.29	c0.28		0.04	0.08
v/s Ratio Perm					0.24	
v/c Ratio	0.43	0.74	0.58		0.44	0.12
Uniform Delay, d1	39.0	31.0	21.9		11.7	8.1
Progression Factor	1.00	1.00	0.85		1.25	1.00
Incremental Delay, d2	0.1	4.1	1.5		0.3	0.1
Delay (s)	39.1	35.1	20.1		14.9	8.2
Level of Service	D	D	C		B	A
Approach Delay (s)	36.7		20.1			10.7
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

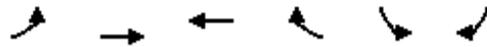
Description: Columbia Pike / Southgate Rd / S Joyce St

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

19: Columbia Pike & S. Nash Street

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↕↔	
Traffic Volume (vph)	5	777	440	113	109	2
Future Volume (vph)	5	777	440	113	109	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	0.97		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		3538	3431		1771	
Flt Permitted		0.95	1.00		0.95	
Satd. Flow (perm)		3370	3431		1771	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	845	478	123	118	2
RTOR Reduction (vph)	0	0	11	0	1	0
Lane Group Flow (vph)	0	850	590	0	119	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		6	2		8	
Permitted Phases	6					
Actuated Green, G (s)		94.6	94.6		13.4	
Effective Green, g (s)		94.6	94.6		13.4	
Actuated g/C Ratio		0.79	0.79		0.11	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		2656	2704		197	
v/s Ratio Prot			0.17		c0.07	
v/s Ratio Perm		c0.25				
v/c Ratio		0.32	0.22		0.60	
Uniform Delay, d1		3.6	3.2		50.8	
Progression Factor		1.00	0.33		1.00	
Incremental Delay, d2		0.3	0.2		5.2	
Delay (s)		3.9	1.2		55.9	
Level of Service		A	A		E	
Approach Delay (s)		3.9	1.2		55.9	
Approach LOS		A	A		E	

Intersection Summary

HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

26: Columbia Pike & Route 27 ramps

04/10/2019



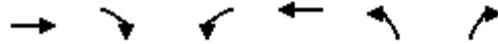
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR	
Lane Configurations		↑↑			↑↑				↑		↑	
Traffic Volume (vph)	0	889	144	88	228	0	0	0	134	0	160	
Future Volume (vph)	0	889	144	88	228	0	0	0	134	0	160	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		7.0			7.0				7.0		7.0	
Lane Util. Factor		0.95			0.95				1.00		1.00	
Frt		0.98			1.00				1.00		0.85	
Flt Protected		1.00			0.99				0.95		1.00	
Satd. Flow (prot)		3465			3491				1770		1583	
Flt Permitted		1.00			0.57				0.95		1.00	
Satd. Flow (perm)		3465			2027				1770		1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	966	157	96	248	0	0	0	146	0	174	
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	152	
Lane Group Flow (vph)	0	1115	0	0	344	0	0	0	146	0	22	
Turn Type		NA		Perm	NA				Prot		Prot	
Protected Phases		2			6				8		8	
Permitted Phases				6								
Actuated Green, G (s)		90.8			90.8				15.2		15.2	
Effective Green, g (s)		90.8			90.8				15.2		15.2	
Actuated g/C Ratio		0.76			0.76				0.13		0.13	
Clearance Time (s)		7.0			7.0				7.0		7.0	
Vehicle Extension (s)		3.0			3.0				3.0		3.0	
Lane Grp Cap (vph)		2621			1533				224		200	
v/s Ratio Prot		c0.32							c0.08		0.01	
v/s Ratio Perm					0.17							
v/c Ratio		0.43			0.22				0.65		0.11	
Uniform Delay, d1		5.2			4.3				49.9		46.4	
Progression Factor		0.94			1.00				1.00		1.00	
Incremental Delay, d2		0.4			0.3				6.6		0.2	
Delay (s)		5.3			4.6				56.5		46.7	
Level of Service		A			A				E		D	
Approach Delay (s)		5.3			4.6		0.0			51.2		
Approach LOS		A			A		A			D		
Intersection Summary												
HCM 2000 Control Delay			13.4								HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio			0.46									
Actuated Cycle Length (s)			120.0								Sum of lost time (s)	14.0
Intersection Capacity Utilization			60.4%								ICU Level of Service	B
Analysis Period (min)			15									

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

3: VDOT driveway & Columbia Pike

04/10/2019

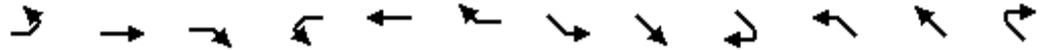


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	
Traffic Volume (veh/h)	884	2	2	551	2	2
Future Volume (Veh/h)	884	2	2	551	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	961	2	2	599	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	56					
pX, platoon unblocked			0.93		0.93	0.93
vC, conflicting volume			963		1266	482
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			817		1141	301
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		99	100
cM capacity (veh/h)			753		181	649
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	641	322	202	399	4	
Volume Left	0	0	2	0	2	
Volume Right	0	2	0	0	2	
cSH	1700	1700	753	1700	283	
Volume to Capacity	0.38	0.19	0.00	0.23	0.01	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.1	0.0	17.9	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.0		17.9	
Approach LOS					C	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			34.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Southgate Road & Hobson Drive

04/10/2019

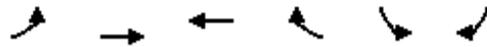


Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	0	111	0	0	0	0	0	0	118	0	0
Future Volume (vph)	0	0	111	0	0	0	0	0	0	118	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	121	0	0	0	0	0	0	128	0	0
Direction, Lane #	EB 1	WB 1	SE 1	NW 1								
Volume Total (vph)	121	0	0	128								
Volume Left (vph)	0	0	0	128								
Volume Right (vph)	121	0	0	0								
Hadj (s)	-0.57	0.00	0.00	0.23								
Departure Headway (s)	3.6	4.3	4.3	4.4								
Degree Utilization, x	0.12	0.00	0.00	0.16								
Capacity (veh/h)	955	810	818	796								
Control Delay (s)	7.1	7.3	7.3	8.2								
Approach Delay (s)	7.1	0.0	0.0	8.2								
Approach LOS	A	A	A	A								
Intersection Summary												
Delay			7.7									
Level of Service			A									
Intersection Capacity Utilization			20.1%	ICU Level of Service								A
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Columbia Pike & AFM

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕	↗	↘↘	
Traffic Volume (veh/h)	3	883	552	3	2	1
Future Volume (Veh/h)	3	883	552	3	2	1
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	960	600	3	2	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		921	993			
pX, platoon unblocked					0.97	
vC, conflicting volume	603				1086	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	603				1017	300
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	971				225	696
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	323	640	300	300	3	3
Volume Left	3	0	0	0	0	2
Volume Right	0	0	0	0	3	1
cSH	971	1700	1700	1700	1700	291
Volume to Capacity	0.00	0.38	0.18	0.18	0.00	0.01
Queue Length 95th (ft)	0	0	0	0	0	1
Control Delay (s)	0.1	0.0	0.0	0.0	0.0	17.5
Lane LOS	A					C
Approach Delay (s)	0.0		0.0			17.5
Approach LOS						C
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			36.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

9: Columbia Pike & ANC Service Complex

04/10/2019

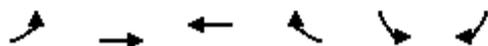


Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (veh/h)	12	1029	368	20	4	2
Future Volume (Veh/h)	12	1029	368	20	4	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	1118	400	22	4	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		525	337			
pX, platoon unblocked					0.90	
vC, conflicting volume	422				996	211
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	422				767	211
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	100
cM capacity (veh/h)	1134				300	794
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SE 1	
Volume Total	386	745	267	155	6	
Volume Left	13	0	0	0	4	
Volume Right	0	0	0	22	2	
cSH	1134	1700	1700	1700	379	
Volume to Capacity	0.01	0.44	0.16	0.09	0.02	
Queue Length 95th (ft)	1	0	0	0	1	
Control Delay (s)	0.4	0.0	0.0	0.0	14.7	
Lane LOS	A				B	
Approach Delay (s)	0.1		0.0		14.7	
Approach LOS					B	
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			46.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbia Pike

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	0	1023	316	209	0	0
Future Volume (Veh/h)	0	1023	316	209	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1112	343	227	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		339				
pX, platoon unblocked					0.89	
vC, conflicting volume	570				1012	285
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	570				777	285
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	999				298	712
Direction, Lane #	EB 1	EB 2	WB 1	WB 2		
Volume Total	556	556	229	341		
Volume Left	0	0	0	0		
Volume Right	0	0	0	227		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.33	0.33	0.13	0.20		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			31.6%		ICU Level of Service	A
Analysis Period (min)			15			

Queues

1: Columbia Pike & S Joyce Street

04/10/2019



Lane Group	WBL	WBR	NET	SWL	SWT
Lane Group Flow (vph)	353	514	962	152	250
v/c Ratio	0.43	0.76	0.59	0.44	0.12
Control Delay	40.3	31.0	19.9	15.2	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	31.0	19.9	15.2	8.8
Queue Length 50th (ft)	114	267	141	47	40
Queue Length 95th (ft)	169	335	341	76	50
Internal Link Dist (ft)	771		913		445
Turn Bay Length (ft)	200			330	
Base Capacity (vph)	854	873	1630	532	2213
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.41	0.59	0.59	0.29	0.11

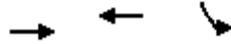
Intersection Summary

Description: Columbia Pike / Southgate Rd / S Joyce St

Queues

19: Columbia Pike & S. Nash Street

04/10/2019



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	850	601	120
v/c Ratio	0.32	0.22	0.61
Control Delay	4.2	1.2	62.5
Queue Delay	0.0	0.0	0.0
Total Delay	4.2	1.2	62.5
Queue Length 50th (ft)	80	26	89
Queue Length 95th (ft)	128	7	146
Internal Link Dist (ft)	573	1	687
Turn Bay Length (ft)			
Base Capacity (vph)	2655	2714	458
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.32	0.22	0.26
Intersection Summary			

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1123	344	146	174
v/c Ratio	0.43	0.22	0.65	0.22
Control Delay	5.6	5.1	62.8	0.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.6	5.1	62.8	0.7
Queue Length 50th (ft)	167	35	109	0
Queue Length 95th (ft)	180	63	171	0
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	2628	1534	413	883
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.22	0.35	0.20
Intersection Summary				

**2040 Baseline Condition
PM Synchro Reports**

HCM Signalized Intersection Capacity Analysis

1: Columbia Pike & S Joyce Street

04/10/2019



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	820	517	485	448	240	912
Future Volume (vph)	820	517	485	448	240	912
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	10	10
Total Lost time (s)	7.0	7.0	7.0		7.0	7.0
Lane Util. Factor	0.97	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.93		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	1531	3175		1652	3303
Flt Permitted	0.95	1.00	1.00		0.12	1.00
Satd. Flow (perm)	3433	1531	3175		209	3303
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	891	562	527	487	261	991
RTOR Reduction (vph)	0	69	128	0	0	0
Lane Group Flow (vph)	891	493	886	0	261	991
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	8	1 8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	34.1	59.3	46.7		71.9	71.9
Effective Green, g (s)	34.1	59.3	46.7		71.9	71.9
Actuated g/C Ratio	0.28	0.49	0.39		0.60	0.60
Clearance Time (s)	7.0		7.0		7.0	7.0
Vehicle Extension (s)	2.0		3.0		2.0	3.0
Lane Grp Cap (vph)	975	756	1235		344	1979
v/s Ratio Prot	c0.26	0.32	0.28		c0.12	0.30
v/s Ratio Perm					c0.34	
v/c Ratio	0.91	0.65	0.72		0.76	0.50
Uniform Delay, d1	41.5	22.7	31.1		24.6	13.8
Progression Factor	1.00	1.00	0.58		1.03	1.05
Incremental Delay, d2	12.4	1.5	3.1		4.7	0.5
Delay (s)	54.0	24.2	21.0		30.0	15.0
Level of Service	D	C	C		C	B
Approach Delay (s)	42.4		21.0			18.1
Approach LOS	D		C			B

Intersection Summary

HCM 2000 Control Delay	28.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	D
Analysis Period (min)	15		

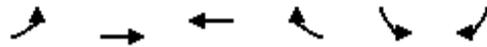
Description: Columbia Pike / Southgate Rd / S Joyce St

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

19: Columbia Pike & S. Nash Street

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↕↔	
Traffic Volume (vph)	10	587	1425	303	343	82
Future Volume (vph)	10	587	1425	303	343	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	0.97		0.97	
Flt Protected		1.00	1.00		0.96	
Satd. Flow (prot)		3536	3446		1744	
Flt Permitted		0.86	1.00		0.96	
Satd. Flow (perm)		3055	3446		1744	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	638	1549	329	373	89
RTOR Reduction (vph)	0	0	14	0	7	0
Lane Group Flow (vph)	0	649	1864	0	455	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		6	2		8	
Permitted Phases	6					
Actuated Green, G (s)		74.4	74.4		33.6	
Effective Green, g (s)		74.4	74.4		33.6	
Actuated g/C Ratio		0.62	0.62		0.28	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1894	2136		488	
v/s Ratio Prot			c0.54		c0.26	
v/s Ratio Perm		0.21				
v/c Ratio		0.34	0.87		0.93	
Uniform Delay, d1		11.0	18.9		42.1	
Progression Factor		1.00	0.59		1.00	
Incremental Delay, d2		0.5	3.9		24.8	
Delay (s)		11.5	15.1		66.9	
Level of Service		B	B		E	
Approach Delay (s)		11.5	15.1		66.9	
Approach LOS		B	B		E	

Intersection Summary

HCM 2000 Control Delay	22.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑
Traffic Volume (vph)	0	738	257	128	373	0	0	0	119	0	757
Future Volume (vph)	0	738	257	128	373	0	0	0	119	0	757
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		1.00
Frt		0.96			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3402			3495				1770		1583
Flt Permitted		1.00			0.50				0.95		1.00
Satd. Flow (perm)		3402			1787				1770		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	802	279	139	405	0	0	0	129	0	823
RTOR Reduction (vph)	0	27	0	0	0	0	0	0	0	0	181
Lane Group Flow (vph)	0	1054	0	0	544	0	0	0	129	0	642
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		54.5			54.5				51.5		51.5
Effective Green, g (s)		54.5			54.5				51.5		51.5
Actuated g/C Ratio		0.45			0.45				0.43		0.43
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		1545			811				759		679
v/s Ratio Prot		c0.31							0.07		c0.41
v/s Ratio Perm					0.30						
v/c Ratio		0.68			1.09dl				0.17		0.95
Uniform Delay, d1		25.9			25.7				21.1		32.9
Progression Factor		0.79			1.00				1.00		1.00
Incremental Delay, d2		1.8			2.2				0.1		22.0
Delay (s)		22.3			27.9				21.2		54.9
Level of Service		C			C				C		D
Approach Delay (s)		22.3			27.9		0.0		50.3		
Approach LOS		C			C		A		D		

Intersection Summary			
HCM 2000 Control Delay	33.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		
dl Defacto Left Lane. Recode with 1 though lane as a left lane.			
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

3: VDOT driveway & Columbia Pike

04/10/2019

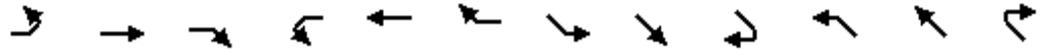


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	
Traffic Volume (veh/h)	928	2	2	1726	2	2
Future Volume (Veh/h)	928	2	2	1726	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1009	2	2	1876	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	56					
pX, platoon unblocked			0.92		0.92	0.92
vC, conflicting volume			1011		1952	506
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			827		1855	275
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		97	100
cM capacity (veh/h)			732		60	661
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	673	338	627	1251	4	
Volume Left	0	0	2	0	2	
Volume Right	0	2	0	0	2	
cSH	1700	1700	732	1700	109	
Volume to Capacity	0.40	0.20	0.00	0.74	0.04	
Queue Length 95th (ft)	0	0	0	0	3	
Control Delay (s)	0.0	0.0	0.1	0.0	39.2	
Lane LOS			A		E	
Approach Delay (s)	0.0		0.0		39.2	
Approach LOS					E	
Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			59.1%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

5: Southgate Road & Hobson Drive

04/10/2019

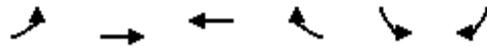


Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	0	425	0	0	0	0	0	0	313	0	0
Future Volume (vph)	0	0	425	0	0	0	0	0	0	313	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	462	0	0	0	0	0	0	340	0	0
Direction, Lane #	EB 1	WB 1	SE 1	NW 1								
Volume Total (vph)	462	0	0	340								
Volume Left (vph)	0	0	0	340								
Volume Right (vph)	462	0	0	0								
Hadj (s)	-0.57	0.00	0.00	0.23								
Departure Headway (s)	4.3	5.4	5.5	5.2								
Degree Utilization, x	0.55	0.00	0.00	0.49								
Capacity (veh/h)	802	606	591	651								
Control Delay (s)	12.4	8.4	8.5	13.1								
Approach Delay (s)	12.4	0.0	0.0	13.1								
Approach LOS	B	A	A	B								
Intersection Summary												
Delay			12.7									
Level of Service			B									
Intersection Capacity Utilization			50.3%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

8: Columbia Pike & AFM

04/10/2019

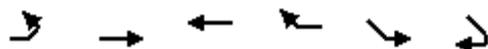


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕	↗	↘↘	
Traffic Volume (veh/h)	4	926	1726	6	7	2
Future Volume (Veh/h)	4	926	1726	6	7	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	1007	1876	7	8	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		919	989			
pX, platoon unblocked	0.84				0.87	0.84
vC, conflicting volume	1883				2388	938
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1672				1993	549
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				82	100
cM capacity (veh/h)	320				45	403
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	SB 1
Volume Total	340	671	938	938	7	10
Volume Left	4	0	0	0	0	8
Volume Right	0	0	0	0	7	2
cSH	320	1700	1700	1700	1700	55
Volume to Capacity	0.01	0.39	0.55	0.55	0.00	0.18
Queue Length 95th (ft)	1	0	0	0	0	15
Control Delay (s)	0.4	0.0	0.0	0.0	0.0	84.3
Lane LOS	A					F
Approach Delay (s)	0.1		0.0			84.3
Approach LOS						F
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			57.7%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

9: Columbia Pike & ANC Service Complex

04/10/2019

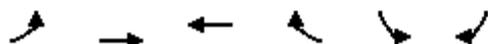


Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (veh/h)	18	984	1127	3	11	25
Future Volume (Veh/h)	18	984	1127	3	11	25
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	1070	1225	3	12	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		526	331			
pX, platoon unblocked	0.93				0.93	0.93
vC, conflicting volume	1228				1802	614
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1087				1706	425
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				84	95
cM capacity (veh/h)	590				74	535
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SE 1	
Volume Total	377	713	817	411	39	
Volume Left	20	0	0	0	12	
Volume Right	0	0	0	3	27	
cSH	590	1700	1700	1700	183	
Volume to Capacity	0.03	0.42	0.48	0.24	0.21	
Queue Length 95th (ft)	3	0	0	0	20	
Control Delay (s)	1.1	0.0	0.0	0.0	30.0	
Lane LOS	A				D	
Approach Delay (s)	0.4		0.0		30.0	
Approach LOS					D	
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			50.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

28: Columbia Pike

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	0	857	501	112	0	0
Future Volume (Veh/h)	0	857	501	112	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	932	545	122	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		339				
pX, platoon unblocked					0.77	
vC, conflicting volume	667				1072	334
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	667				511	334
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	919				381	662
Direction, Lane #	EB 1	EB 2	WB 1	WB 2		
Volume Total	466	466	363	304		
Volume Left	0	0	0	0		
Volume Right	0	0	0	122		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.27	0.27	0.21	0.18		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			27.0%		ICU Level of Service	A
Analysis Period (min)			15			

Queues

1: Columbia Pike & S Joyce Street

04/10/2019



Lane Group	WBL	WBR	NET	SWL	SWT
Lane Group Flow (vph)	891	562	1014	261	991
v/c Ratio	0.91	0.68	0.75	0.76	0.50
Control Delay	55.8	20.8	18.5	29.7	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	55.8	20.8	18.5	29.7	15.5
Queue Length 50th (ft)	331	228	212	129	257
Queue Length 95th (ft)	#451	334	m273	m155	m275
Internal Link Dist (ft)	770		909		446
Turn Bay Length (ft)	200			330	
Base Capacity (vph)	1012	875	1361	413	1988
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.88	0.64	0.75	0.63	0.50

Intersection Summary

Description: Columbia Pike / Southgate Rd / S Joyce St

95th percentile volume exceeds capacity, queue may be longer.

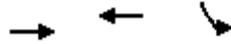
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues

19: Columbia Pike & S. Nash Street

04/10/2019



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	649	1878	462
v/c Ratio	0.34	0.87	0.94
Control Delay	11.8	15.6	68.6
Queue Delay	0.0	0.0	0.0
Total Delay	11.8	15.6	68.6
Queue Length 50th (ft)	123	153	337
Queue Length 95th (ft)	160	654	#531
Internal Link Dist (ft)	573	1	688
Turn Bay Length (ft)			
Base Capacity (vph)	1894	2152	515
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.34	0.87	0.90

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1081	544	129	823
v/c Ratio	0.69	1.09dl	0.17	0.96
Control Delay	22.4	32.1	20.6	42.2
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	22.4	32.1	20.6	42.2
Queue Length 50th (ft)	299	183	56	396
Queue Length 95th (ft)	399	252	97	#704
Internal Link Dist (ft)	251	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	1583	817	816	901
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.68	0.67	0.16	0.91

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

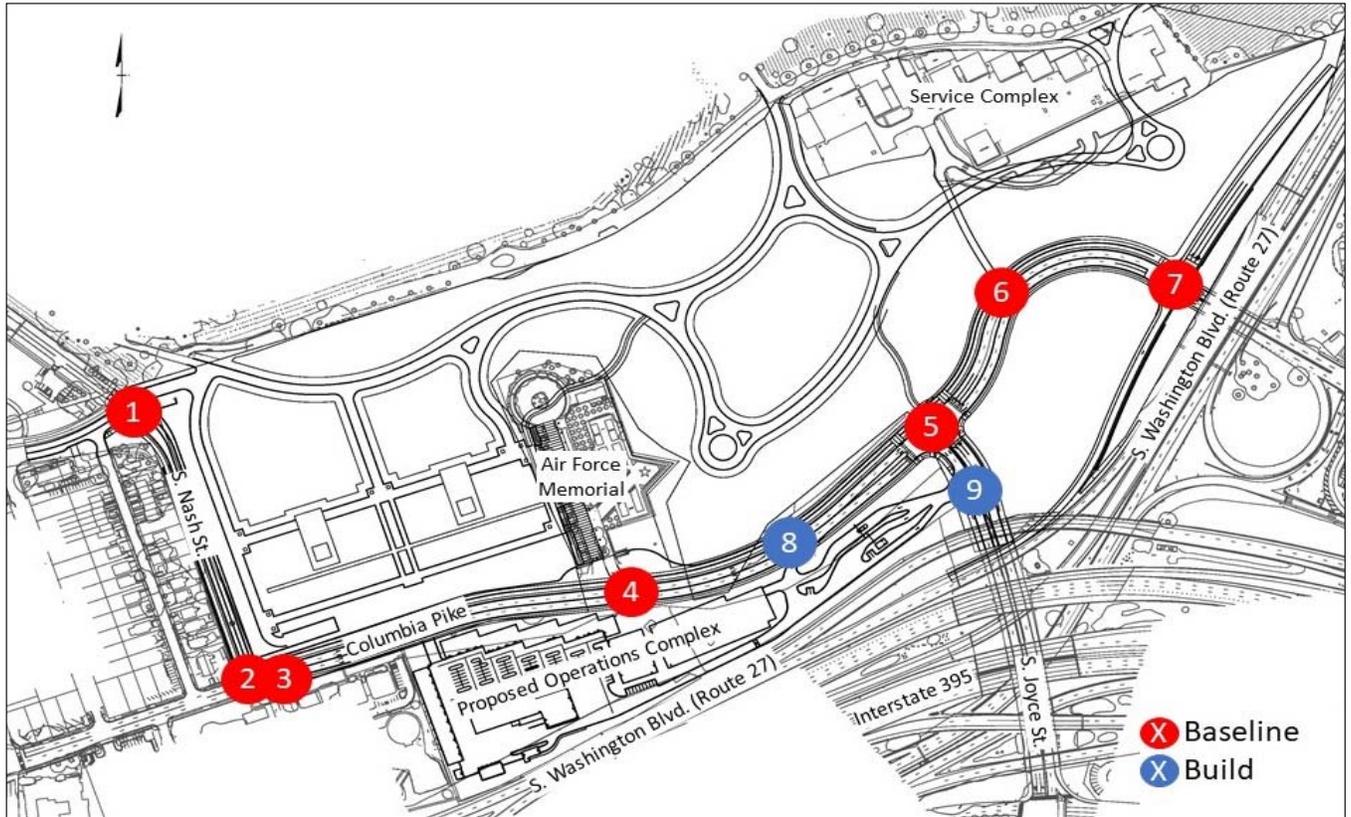
**2040 Build Scenario 1 Condition
Measures of Effectiveness**

Arlington National Cemetery - Southern Expansion: Traffic Study

Scenario: 2040 AM Build Scenario 1 - Movement Delay and LOS

<p>1</p> <p>Hobson Drive</p> <p>Southgate Road</p> <p>ANC Gate</p> <p>South Nash Street</p>	<p>2</p> <p>South Nash Street</p> <p>Columbia Pike</p> <p>Columbia Pike</p>	<p>3</p> <p>Columbia Pike</p> <p>VDOT Driveway</p>	<p>4</p> <p>Air Force Memorial</p> <p>Columbia Pike</p> <p>Columbia Pike</p>
<p>5</p> <p>Columbia Pike</p> <p>South Joyce Street</p>	<p>7</p> <p>Route 27 Offramp</p> <p>Columbia Pike</p> <p>Route 27 Onramp</p>	<p>8</p> <p>Columbia Pike</p> <p>Operations Complex</p>	<p>9</p> <p>South Joyce Street</p> <p>Operations Complex</p> <p>South Joyce Street</p> <p>future PMVEC</p>

Note: Intersection #6 closed

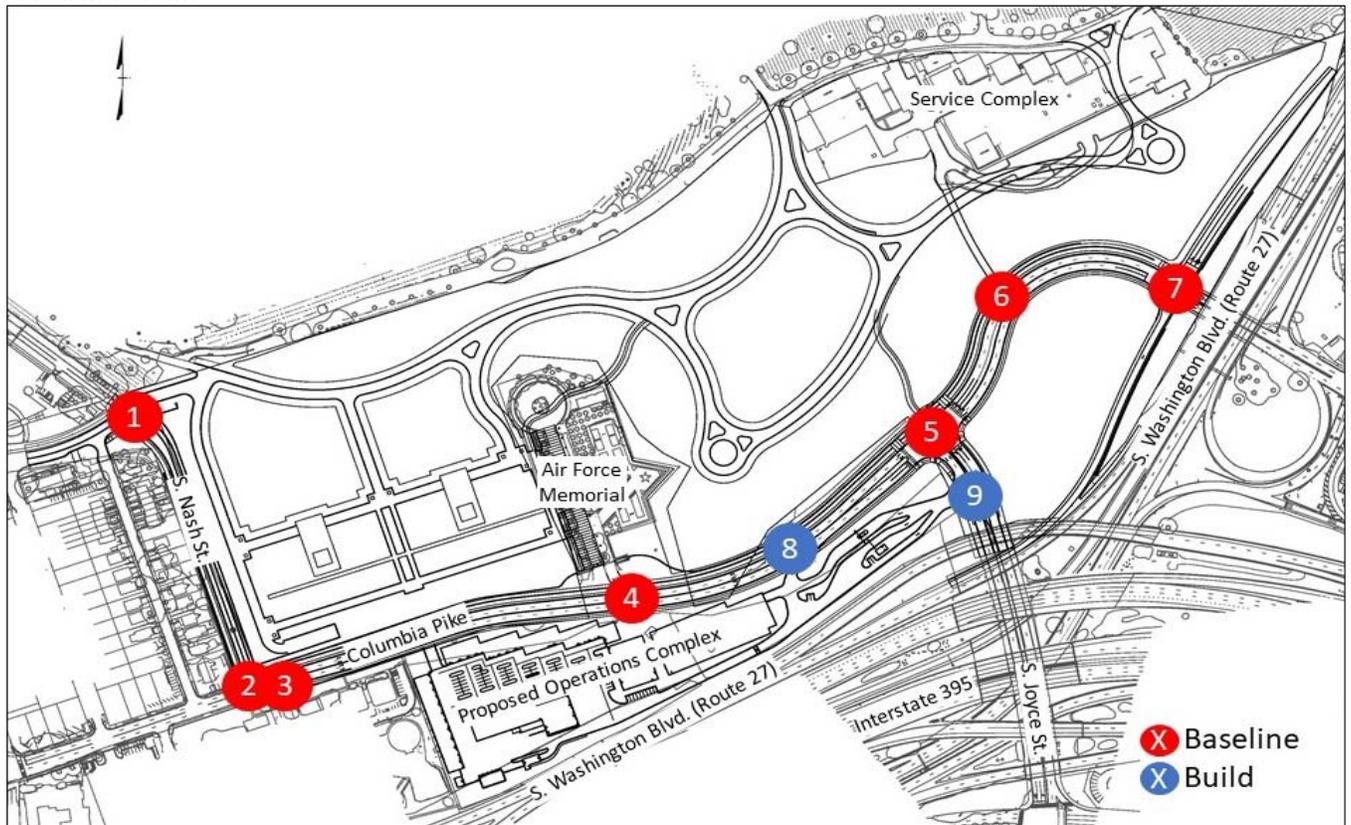


Arlington National Cemetery - Southern Expansion: Traffic Study

Scenario: 2040 PM Build Scenario 1 - Movement Delay and LOS

<p>1</p> <p>Hobson Drive</p> <p>Southgate Road</p> <p>ANC Gate</p> <p>South Nash Street</p> <p>12.4 (B)</p> <p>13.1 (B)</p> <p>0</p> <p>B</p>	<p>2</p> <p>South Nash Street</p> <p>Columbia Pike</p> <p>ANC Gate</p> <p>11.5 (B)</p> <p>66.9 (E)</p> <p>28.2 (C)</p> <p>C</p>	<p>3</p> <p>VDOT Driveway</p> <p>Columbia Pike</p> <p>0 (A)</p> <p>0 (A)</p> <p>0 (A)</p> <p>0.1 (A)</p> <p>15.8 (C)</p> <p>A</p>	<p>4</p> <p>Air Force Memorial</p> <p>Columbia Pike</p> <p>11.6 (B)</p> <p>17.9 (B)</p> <p>B</p>
<p>5</p> <p>South Joyce Street</p> <p>Columbia Pike</p> <p>40.8 (D)</p> <p>14.7 (B)</p> <p>49.7 (D)</p> <p>55.5 (E)</p> <p>25.2 (C)</p> <p>D</p>	<p>7</p> <p>Route 27 Onramp</p> <p>Columbia Pike</p> <p>22.3 (C)</p> <p>58.5 (E)</p> <p>22.2 (C)</p> <p>28.6 (C)</p> <p>C</p>	<p>8</p> <p>Operations Complex</p> <p>Columbia Pike</p> <p>0 (A)</p> <p>0 (A)</p> <p>11 (B)</p> <p>A</p>	<p>9</p> <p>South Joyce Street</p> <p>Operations Complex</p> <p>future PMVEC</p> <p>0 (A)</p> <p>0 (A)</p> <p>0 (A)</p> <p>A</p>

Note: Intersection #6 closed



2040 Build Scenario 1 - Lane Group LOS and Movement Queue																			
Synchro ID	Intersection (#)	AM							PM										
		Volume	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS	Storage (ft)	95 th Percentile Queue (ft)	Volume	Delay	LOS	Approach Delay	Approach LOS	Storage (ft)	95 th Percentile Queue (ft)				
5	Nash Street, Southgate Road, and Hobson Drive (1)	Unsignalized	EBL	0	7.1	A	7.1	A	200	-	0	12.4	B	12.4	B	200	-		
			EBT	0						-	0						-		
			EBR	111						-	425						-		
		Unsignalized	WBL	0	8.2	A	8.2	A	700	-	0	13.1	B	13.1	B	700	-		
			WBR	0						-	0						-		
			NBL	118						-	313						-		
		Unsignalized	NBT	0	780					-	0					780	-		
			NBR	0						-	0						-		
			SBL	0						-	0						-		
		Unsignalized	SBT	0	-	0	-	-	-	-	0	-	-	-	-	-	-		
			SBR	0	-	0	-	-	-	-	0	-	-	-	-	-	-		
Int.	Overall		7.7	A				Overall	12.7	B									
19	Columbia Pike and S. Nash Street (2)	Signalized	EBL	5	4	A	4	A	220	135	10	11.5	B	11.5	B	220	160		
			EBT	812					-	-	589					-	-	-	
			WBT	437					0.2	A	0.2					A	1,000	0	1398
		Signalized	WBR	113	55.9	E	55.9	E	700	-	-	303	66.9	E	66.9	E	-	-	
			SBL	109						700	146	343					700	#531	
			SBR	2						-	-	82					-	-	
		Signalized	Int.	Overall	6.5	A				Overall	30.6	C							
			Unsignalized	EBT	919	0	A	0	A	-	-	930	0	A	0	A	-	-	
				EBR	2	0	A	0	A	-	-	2	0	A	0	A	-	-	
		WBL		2	0.1	A	0	A	-	-	2	0.1	A	0	A	-	-		
		Unsignalized	WBT	548	0	A	0	A	-	-	1699	0	A	0	A	-	-		
NBL	2		16.9	C	16.9	C	75	1	2	15.8	C	15.8	C	75	1				
NBR	2						-	-	2					-	-				
Int.	Overall	0.1					A								Overall	0	A		
8	Columbia Pike and Airforce Memorial (4)	Pedestrian Signal	EBL	0	6.5	A	6.5	A	750	152	0	11.6	B	11.6	B	750	m321		
			EBT	921					-	-	932					-	-		
			WBT	550					2.8	A	2.8					A	1,000	23	1701
		Pedestrian Signal	WBR	0						-	-	0					-	-	
			SBL	0						380	0	0					380	-	
			SBR	0						-	-	0					-	0	
		Pedestrian Signal	Int.	Overall	5.1	A				Overall	15.7	B							
			Unsignalized	EBT	921	0	A	0	A	350	0	932	0	A	0	A	350	0	
				WBT	550	0	A	0	A	500	0	1701	0	A	0	A	500	0	
		NBR		11	9.9	A	9.9	A	40	1	130	11	B	11	B	40	17		
		Unsignalized	Int.	Overall	0.1	A				Overall	0.5	A							
Signalized	EBT		565	14.3	B	14.3	B	1,100	232	590	40.8	D	40.8	D	1,100	#317			
	EBR		367					-	-	472					-	-			
	WBL	209	22.1					C	16	B					300	144	254	49.7	D
Signalized	WBT	225	10.4	B	36.2	D	330	72	881	14.7	B	43.7	D	330	m257				
	NBL	325	40.6	D	200 *	169	820	55.5	E	200 *	#451								
	NBR	473	33.2	C	1,600	334	517	25.2	C	1,600	380								
Signalized	Int.	Overall	22.7	C				Overall	36	D									
	Unsignalized	EBR	0	0	A	0	A	350	0	0	0	A	0	A	350	0			
		NBT	798	0	A	0	A	-	-	1337	0	A	0	A	-	-			
SBT		457	0	A	0	A	-	-	688	0	A	0	A	-	-				
Unsignalized	SBR	119	0	A	0	A	-	-	38	0	A	0	A	-	-				
	Int.	Overall	0	A				Overall	0	A									
	Unsignalized	EBL	0	0	A	0	A	310	0	0	0	A	0	A	310	0			
EBT		1038	-					-	1107	-					-				
WBT		434	0					A	0	A					150	0	1135	0	A
Unsignalized	WBR	0					-	-	0					-	-				
	SBL	0					150	0	0					150	0				
	SBR	0					-	-	0					-	0				
Unsignalized	Int.	Overall	0	A				Overall	0	A									
	Signalized	EBT	893	3.7	A	3.7	A	750	102	810	22.3	C	22.3	C	750	m463			
		EBR	145					-	-	298					-	-			
WBL		88	4.7					A	4.7	A					350	66	375	28.6	C
Signalized	WBT	245	50.8	E	50.8	D	550	171	119	22.2	C	53.6	D	550	102				
	SBL	134					46.8	D	400					0	760	58.5	E	400	#712
	SBR	190					-	-	0					-	0				
Signalized	Int.	Overall	12.9	B				Overall	34.6	C									

Legend: # 95th Percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signa
* length of left turn pocket, other left turn lane is continuous back to Army Navy Drive

**2040 Build Scenario 1 Condition
AM Synchro Reports**

HCM Signalized Intersection Capacity Analysis

1: Columbia Pike & S Joyce Street

04/10/2019



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	325	473	565	367	209	225
Future Volume (vph)	325	473	565	367	209	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	10	10
Total Lost time (s)	7.0	7.0	7.0		7.0	7.0
Lane Util. Factor	0.97	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.94		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	1531	3219		1652	3303
Flt Permitted	0.95	1.00	1.00		0.17	1.00
Satd. Flow (perm)	3433	1531	3219		291	3303
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	353	514	614	399	227	245
RTOR Reduction (vph)	0	71	74	0	0	0
Lane Group Flow (vph)	353	443	939	0	227	245
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	8	1 8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	26.7	48.6	57.4		79.3	79.3
Effective Green, g (s)	26.7	48.6	57.4		79.3	79.3
Actuated g/C Ratio	0.22	0.41	0.48		0.66	0.66
Clearance Time (s)	7.0		7.0		7.0	7.0
Vehicle Extension (s)	2.0		3.0		2.0	3.0
Lane Grp Cap (vph)	763	620	1539		361	2182
v/s Ratio Prot	0.10	c0.29	0.29		0.08	0.07
v/s Ratio Perm					c0.34	
v/c Ratio	0.46	0.71	0.61		0.63	0.11
Uniform Delay, d1	40.4	29.9	23.1		13.4	7.5
Progression Factor	1.00	1.00	0.55		1.47	1.38
Incremental Delay, d2	0.2	3.3	1.7		2.4	0.1
Delay (s)	40.6	33.2	14.3		22.1	10.4
Level of Service	D	C	B		C	B
Approach Delay (s)	36.2		14.3			16.0
Approach LOS	D		B			B

Intersection Summary

HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	68.3%	ICU Level of Service	C
Analysis Period (min)	15		

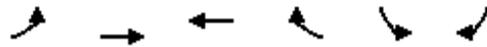
Description: Columbia Pike / Southgate Rd / S Joyce St

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Columbia Pike & AFM

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕			
Traffic Volume (vph)	0	921	550	0	0	0
Future Volume (vph)	0	921	550	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0			
Lane Util. Factor		0.95	0.95			
Frt		1.00	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		3539	3539			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		3539	3539			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1001	598	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1001	598	0	0	0
Turn Type		NA	NA			
Protected Phases		2	6			
Permitted Phases	2					
Actuated Green, G (s)		85.0	85.0			
Effective Green, g (s)		85.0	85.0			
Actuated g/C Ratio		0.71	0.71			
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		2506	2506			
v/s Ratio Prot		c0.28	0.17			
v/s Ratio Perm						
v/c Ratio		0.40	0.24			
Uniform Delay, d1		7.1	6.1			
Progression Factor		0.84	0.42			
Incremental Delay, d2		0.5	0.2			
Delay (s)		6.5	2.8			
Level of Service		A	A			
Approach Delay (s)		6.5	2.8	0.0		
Approach LOS		A	A	A		

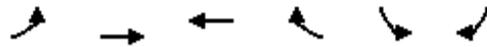
Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

19: Columbia Pike & S. Nash Street

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (vph)	5	812	437	113	109	2
Future Volume (vph)	5	812	437	113	109	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	0.97		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		3538	3430		1771	
Flt Permitted		0.95	1.00		0.95	
Satd. Flow (perm)		3370	3430		1771	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	883	475	123	118	2
RTOR Reduction (vph)	0	0	12	0	1	0
Lane Group Flow (vph)	0	888	586	0	119	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		6	2		8	
Permitted Phases	6					
Actuated Green, G (s)		94.6	94.6		13.4	
Effective Green, g (s)		94.6	94.6		13.4	
Actuated g/C Ratio		0.79	0.79		0.11	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		2656	2703		197	
v/s Ratio Prot			0.17		c0.07	
v/s Ratio Perm		c0.26				
v/c Ratio		0.33	0.22		0.60	
Uniform Delay, d1		3.7	3.2		50.8	
Progression Factor		1.00	0.01		1.00	
Incremental Delay, d2		0.3	0.2		5.2	
Delay (s)		4.0	0.2		55.9	
Level of Service		A	A		E	
Approach Delay (s)		4.0	0.2		55.9	
Approach LOS		A	A		E	
Intersection Summary						
HCM 2000 Control Delay			6.5		HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio			0.37			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			42.1%		ICU Level of Service	A
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑
Traffic Volume (vph)	0	893	145	88	245	0	0	0	134	0	190
Future Volume (vph)	0	893	145	88	245	0	0	0	134	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		1.00
Frt		0.98			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3465			3493				1770		1583
Flt Permitted		1.00			0.58				0.95		1.00
Satd. Flow (perm)		3465			2037				1770		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	971	158	96	266	0	0	0	146	0	207
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	181
Lane Group Flow (vph)	0	1121	0	0	362	0	0	0	146	0	26
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		90.8			90.8				15.2		15.2
Effective Green, g (s)		90.8			90.8				15.2		15.2
Actuated g/C Ratio		0.76			0.76				0.13		0.13
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		2621			1541				224		200
v/s Ratio Prot		c0.32							c0.08		0.02
v/s Ratio Perm					0.18						
v/c Ratio		0.43			0.23				0.65		0.13
Uniform Delay, d1		5.3			4.3				49.9		46.5
Progression Factor		0.64			1.00				1.00		1.00
Incremental Delay, d2		0.4			0.4				6.6		0.3
Delay (s)		3.7			4.7				56.5		46.8
Level of Service		A			A				E		D
Approach Delay (s)		3.7			4.7		0.0			50.8	
Approach LOS		A			A		A			D	

Intersection Summary

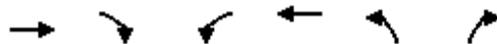
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

3: VDOT driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	
Traffic Volume (veh/h)	919	2	2	548	2	2
Future Volume (Veh/h)	919	2	2	548	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	999	2	2	596	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	56			865		
pX, platoon unblocked				0.93	0.94	0.93
vC, conflicting volume				1001	1302	500
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				848	1076	309
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	99	100
cM capacity (veh/h)				729	201	638
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	666	335	201	397	4	
Volume Left	0	0	2	0	2	
Volume Right	0	2	0	0	2	
cSH	1700	1700	729	1700	306	
Volume to Capacity	0.39	0.20	0.00	0.23	0.01	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.1	0.0	16.9	
Lane LOS				A	C	
Approach Delay (s)	0.0		0.0		16.9	
Approach LOS					C	
Intersection Summary						
Average Delay				0.1		
Intersection Capacity Utilization				35.5%	ICU Level of Service	A
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis

5: Southgate Road & Hobson Drive

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	0	111	0	0	0	0	0	0	118	0	0
Future Volume (vph)	0	0	111	0	0	0	0	0	0	118	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	121	0	0	0	0	0	0	128	0	0

Direction, Lane #	EB 1	WB 1	SE 1	NW 1
Volume Total (vph)	121	0	0	128
Volume Left (vph)	0	0	0	128
Volume Right (vph)	121	0	0	0
Hadj (s)	-0.57	0.00	0.00	0.23
Departure Headway (s)	3.6	4.3	4.3	4.4
Degree Utilization, x	0.12	0.00	0.00	0.16
Capacity (veh/h)	955	810	818	796
Control Delay (s)	7.1	7.3	7.3	8.2
Approach Delay (s)	7.1	0.0	0.0	8.2
Approach LOS	A	A	A	A

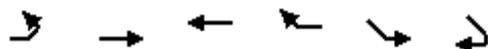
Intersection Summary

Delay	7.7
Level of Service	A
Intersection Capacity Utilization	20.1%
ICU Level of Service	A
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis

9: Columbia Pike & ANC Service Complex

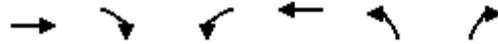
04/10/2019



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (veh/h)	0	1038	434	0	0	0
Future Volume (Veh/h)	0	1038	434	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1128	472	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		525	337			
pX, platoon unblocked						
vC, conflicting volume	472				1036	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	472				1036	236
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1086				227	766
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SE 1	
Volume Total	376	752	315	157	0	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	0	
cSH	1086	1700	1700	1700	1700	
Volume to Capacity	0.00	0.44	0.19	0.09	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		0.0	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			32.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 12: Operations Complex Driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	921	0	0	550	0	11
Future Volume (Veh/h)	921	0	0	550	0	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1001	0	0	598	0	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	475			516		
pX, platoon unblocked				0.88	0.88	0.88
vC, conflicting volume				1001	1300	500
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				736	1074	169
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	100	98
cM capacity (veh/h)				764	189	747
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	500	500	299	299	12	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	12	
cSH	1700	1700	1700	1700	747	
Volume to Capacity	0.29	0.29	0.18	0.18	0.02	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.0	0.0	9.9	
Lane LOS						A
Approach Delay (s)	0.0		0.0		9.9	
Approach LOS						A
Intersection Summary						
Average Delay				0.1		
Intersection Capacity Utilization				35.5%	ICU Level of Service	A
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis
 14: Operations Complex Driveway & S Joyce Street

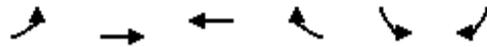
04/10/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕	↕	↘
Traffic Volume (veh/h)	0	0	0	798	457	119
Future Volume (Veh/h)	0	0	0	798	457	119
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	867	497	129
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						270
pX, platoon unblocked						
vC, conflicting volume	995	313	626			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995	313	626			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	242	683	952			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	434	434	331	295	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	129	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.26	0.26	0.19	0.17	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	0.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	25.4%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 28: Columbia Pike

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	0	1027	333	209	0	0
Future Volume (Veh/h)	0	1027	333	209	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1116	362	227	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		339				
pX, platoon unblocked					0.89	
vC, conflicting volume	589				1034	294
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	589				799	294
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	982				289	702
Direction, Lane #	EB 1	EB 2	WB 1	WB 2		
Volume Total	558	558	241	348		
Volume Left	0	0	0	0		
Volume Right	0	0	0	227		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.33	0.33	0.14	0.20		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			31.7%		ICU Level of Service	A
Analysis Period (min)			15			

Queues

1: Columbia Pike & S Joyce Street

04/10/2019



Lane Group	WBL	WBR	NET	SWL	SWT
Lane Group Flow (vph)	353	514	1013	227	245
v/c Ratio	0.46	0.74	0.63	0.63	0.11
Control Delay	42.3	29.1	13.5	22.4	10.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.3	29.1	13.5	22.4	10.9
Queue Length 50th (ft)	117	251	212	99	41
Queue Length 95th (ft)	169	334	232	144	72
Internal Link Dist (ft)	190		436		445
Turn Bay Length (ft)	200			330	
Base Capacity (vph)	804	844	1614	509	2214
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.44	0.61	0.63	0.45	0.11

Intersection Summary

Description: Columbia Pike / Southgate Rd / S Joyce St

Queues

8: Columbia Pike & AFM

04/10/2019

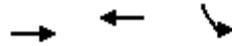


Lane Group	EBT	WBT
Lane Group Flow (vph)	1001	598
v/c Ratio	0.40	0.24
Control Delay	6.5	2.8
Queue Delay	0.0	0.0
Total Delay	6.5	2.8
Queue Length 50th (ft)	125	15
Queue Length 95th (ft)	152	23
Internal Link Dist (ft)	785	395
Turn Bay Length (ft)		
Base Capacity (vph)	2506	2506
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.40	0.24
Intersection Summary		

Queues

19: Columbia Pike & S. Nash Street

04/10/2019



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	888	598	120
v/c Ratio	0.33	0.22	0.61
Control Delay	4.3	0.2	62.5
Queue Delay	0.0	0.0	0.0
Total Delay	4.3	0.2	62.5
Queue Length 50th (ft)	85	0	89
Queue Length 95th (ft)	135	0	146
Internal Link Dist (ft)	573	1	687
Turn Bay Length (ft)			
Base Capacity (vph)	2655	2714	443
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.33	0.22	0.27
Intersection Summary			

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1129	362	146	207
v/c Ratio	0.43	0.23	0.65	0.27
Control Delay	3.9	5.2	62.9	0.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	3.9	5.2	62.9	0.9
Queue Length 50th (ft)	54	37	109	0
Queue Length 95th (ft)	128	66	171	0
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	2629	1542	398	860
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.23	0.37	0.24
Intersection Summary				

**2040 Build Scenario 1 Condition
PM Synchro Reports**

HCM Signalized Intersection Capacity Analysis

1: Columbia Pike & S Joyce Street

04/10/2019



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	820	517	590	472	254	881
Future Volume (vph)	820	517	590	472	254	881
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	10	10
Total Lost time (s)	7.0	7.0	7.0		7.0	7.0
Lane Util. Factor	0.97	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.93		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	1531	3193		1652	3303
Flt Permitted	0.95	1.00	1.00		0.08	1.00
Satd. Flow (perm)	3433	1531	3193		133	3303
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	891	562	641	513	276	958
RTOR Reduction (vph)	0	52	114	0	0	0
Lane Group Flow (vph)	891	510	1040	0	276	958
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	8	1 8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	33.8	59.0	47.0		72.2	72.2
Effective Green, g (s)	33.8	59.0	47.0		72.2	72.2
Actuated g/C Ratio	0.28	0.49	0.39		0.60	0.60
Clearance Time (s)	7.0		7.0		7.0	7.0
Vehicle Extension (s)	2.0		3.0		2.0	3.0
Lane Grp Cap (vph)	966	752	1250		310	1987
v/s Ratio Prot	c0.26	0.33	0.33		c0.13	0.29
v/s Ratio Perm					c0.40	
v/c Ratio	0.92	0.68	0.83		0.89	0.48
Uniform Delay, d1	41.8	23.3	32.9		35.8	13.4
Progression Factor	1.00	1.00	1.05		0.97	1.06
Incremental Delay, d2	13.6	1.9	6.3		14.8	0.4
Delay (s)	55.5	25.2	40.8		49.7	14.7
Level of Service	E	C	D		D	B
Approach Delay (s)	43.7		40.8			22.5
Approach LOS	D		D			C

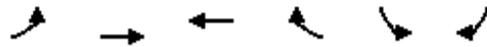
Intersection Summary

HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	86.4%	ICU Level of Service	E
Analysis Period (min)	15		
Description: Columbia Pike / Southgate Rd / S Joyce St			
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

8: Columbia Pike & AFM

04/10/2019

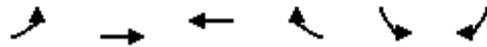


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕			
Traffic Volume (vph)	0	932	1701	0	0	0
Future Volume (vph)	0	932	1701	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0			
Lane Util. Factor		0.95	0.95			
Frt		1.00	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		3539	3539			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		3539	3539			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1013	1849	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1013	1849	0	0	0
Turn Type		NA	NA			
Protected Phases		2	6			
Permitted Phases	2					
Actuated Green, G (s)		85.0	85.0			
Effective Green, g (s)		85.0	85.0			
Actuated g/C Ratio		0.71	0.71			
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		2506	2506			
v/s Ratio Prot		0.29	c0.52			
v/s Ratio Perm						
v/c Ratio		0.40	0.74			
Uniform Delay, d1		7.2	10.7			
Progression Factor		1.57	1.54			
Incremental Delay, d2		0.4	1.4			
Delay (s)		11.6	17.9			
Level of Service		B	B			
Approach Delay (s)		11.6	17.9	0.0		
Approach LOS		B	B	A		
Intersection Summary						
HCM 2000 Control Delay			15.7	HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio			0.59			
Actuated Cycle Length (s)			120.0	Sum of lost time (s)		14.0
Intersection Capacity Utilization			52.9%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis

19: Columbia Pike & S. Nash Street

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (vph)	10	589	1398	303	343	82
Future Volume (vph)	10	589	1398	303	343	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	0.97		0.97	
Flt Protected		1.00	1.00		0.96	
Satd. Flow (prot)		3536	3445		1744	
Flt Permitted		0.87	1.00		0.96	
Satd. Flow (perm)		3092	3445		1744	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	640	1520	329	373	89
RTOR Reduction (vph)	0	0	15	0	7	0
Lane Group Flow (vph)	0	651	1834	0	455	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		6	2		8	
Permitted Phases	6					
Actuated Green, G (s)		74.4	74.4		33.6	
Effective Green, g (s)		74.4	74.4		33.6	
Actuated g/C Ratio		0.62	0.62		0.28	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1917	2135		488	
v/s Ratio Prot			c0.53		c0.26	
v/s Ratio Perm		0.21				
v/c Ratio		0.34	0.86		0.93	
Uniform Delay, d1		11.0	18.5		42.1	
Progression Factor		1.00	1.35		1.00	
Incremental Delay, d2		0.5	3.2		24.8	
Delay (s)		11.5	28.2		66.9	
Level of Service		B	C		E	
Approach Delay (s)		11.5	28.2		66.9	
Approach LOS		B	C		E	
Intersection Summary						
HCM 2000 Control Delay			30.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.88			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			82.3%		ICU Level of Service	E
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019

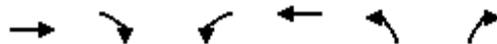


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR	
Lane Configurations		↑↑			↑↑				↑		↑	
Traffic Volume (vph)	0	810	298	125	375	0	0	0	119	0	760	
Future Volume (vph)	0	810	298	125	375	0	0	0	119	0	760	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		7.0			7.0				7.0		7.0	
Lane Util. Factor		0.95			0.95				1.00		1.00	
Frt		0.96			1.00				1.00		0.85	
Flt Protected		1.00			0.99				0.95		1.00	
Satd. Flow (prot)		3396			3496				1770		1583	
Flt Permitted		1.00			0.50				0.95		1.00	
Satd. Flow (perm)		3396			1776				1770		1583	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	880	324	136	408	0	0	0	129	0	826	
RTOR Reduction (vph)	0	30	0	0	0	0	0	0	0	0	197	
Lane Group Flow (vph)	0	1174	0	0	544	0	0	0	129	0	629	
Turn Type		NA		Perm	NA				Prot		Prot	
Protected Phases		2			6				8		8	
Permitted Phases				6								
Actuated Green, G (s)		56.1			56.1				49.9		49.9	
Effective Green, g (s)		56.1			56.1				49.9		49.9	
Actuated g/C Ratio		0.47			0.47				0.42		0.42	
Clearance Time (s)		7.0			7.0				7.0		7.0	
Vehicle Extension (s)		3.0			3.0				3.0		3.0	
Lane Grp Cap (vph)		1587			830				736		658	
v/s Ratio Prot		c0.35							0.07		c0.40	
v/s Ratio Perm					0.31							
v/c Ratio		0.74			1.33dl				0.18		0.96	
Uniform Delay, d1		26.0			24.5				22.1		34.0	
Progression Factor		0.78			1.00				1.00		1.00	
Incremental Delay, d2		1.9			4.0				0.1		24.5	
Delay (s)		22.3			28.6				22.2		58.5	
Level of Service		C			C				C		E	
Approach Delay (s)		22.3			28.6		0.0			53.6		
Approach LOS		C			C		A			D		
Intersection Summary												
HCM 2000 Control Delay			34.6								HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			120.0								Sum of lost time (s)	14.0
Intersection Capacity Utilization			72.7%								ICU Level of Service	C
Analysis Period (min)			15									
dl Defacto Left Lane. Recode with 1 though lane as a left lane.												
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis

3: VDOT driveway & Columbia Pike

04/10/2019

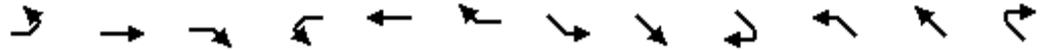


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Volume (veh/h)	930	2	2	1699	2	2
Future Volume (Veh/h)	930	2	2	1699	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1011	2	2	1847	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	56			865		
pX, platoon unblocked	0.92			0.64	0.92	
vC, conflicting volume	1013			1940	506	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	829			734	275	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	100			99	100	
cM capacity (veh/h)	731			226	661	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	674	339	618	1231	4	
Volume Left	0	0	2	0	2	
Volume Right	0	2	0	0	2	
cSH	1700	1700	731	1700	337	
Volume to Capacity	0.40	0.20	0.00	0.72	0.01	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.1	0.0	15.8	
Lane LOS	A			C		
Approach Delay (s)	0.0	0.0		15.8		
Approach LOS				C		
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	58.4%			ICU Level of Service	B	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

5: Southgate Road & Hobson Drive

04/10/2019

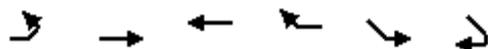


Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	0	425	0	0	0	0	0	0	313	0	0
Future Volume (vph)	0	0	425	0	0	0	0	0	0	313	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	462	0	0	0	0	0	0	340	0	0
Direction, Lane #	EB 1	WB 1	SE 1	NW 1								
Volume Total (vph)	462	0	0	340								
Volume Left (vph)	0	0	0	340								
Volume Right (vph)	462	0	0	0								
Hadj (s)	-0.57	0.00	0.00	0.23								
Departure Headway (s)	4.3	5.4	5.5	5.2								
Degree Utilization, x	0.55	0.00	0.00	0.49								
Capacity (veh/h)	802	606	591	651								
Control Delay (s)	12.4	8.4	8.5	13.1								
Approach Delay (s)	12.4	0.0	0.0	13.1								
Approach LOS	B	A	A	B								
Intersection Summary												
Delay			12.7									
Level of Service			B									
Intersection Capacity Utilization			50.3%	ICU Level of Service	A							
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Columbia Pike & ANC Service Complex

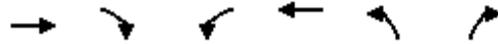
04/10/2019



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕↕	↕↔		↘↘	
Traffic Volume (veh/h)	0	1107	1135	0	0	0
Future Volume (Veh/h)	0	1107	1135	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1203	1234	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		525	337			
pX, platoon unblocked	0.93				0.93	0.93
vC, conflicting volume	1234				1836	617
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1098				1746	434
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	586				72	529
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SE 1	
Volume Total	401	802	823	411	0	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	0	
cSH	586	1700	1700	1700	1700	
Volume to Capacity	0.00	0.47	0.48	0.24	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		0.0	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			34.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 12: Operations Complex Driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑		↗
Traffic Volume (veh/h)	932	0	0	1701	0	130
Future Volume (Veh/h)	932	0	0	1701	0	130
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1013	0	0	1849	0	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	475			516		
pX, platoon unblocked			0.88	0.90	0.88	
vC, conflicting volume			1013	1938	506	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			744	1224	169	
tC, single (s)			4.1	6.8	6.9	
tC, 2 stage (s)						
tF (s)			2.2	3.5	3.3	
p0 queue free %			100	100	81	
cM capacity (veh/h)			757	154	745	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	506	506	924	924	141	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	141	
cSH	1700	1700	1700	1700	745	
Volume to Capacity	0.30	0.30	0.54	0.54	0.19	
Queue Length 95th (ft)	0	0	0	0	17	
Control Delay (s)	0.0	0.0	0.0	0.0	11.0	
Lane LOS					B	
Approach Delay (s)	0.0		0.0		11.0	
Approach LOS					B	
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			52.9%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 14: Operations Complex Driveway & S Joyce Street

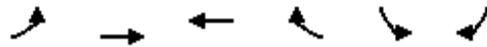
04/10/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	1337	688	38
Future Volume (Veh/h)	0	0	0	1337	688	38
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1453	748	41
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)	270					
pX, platoon unblocked						
vC, conflicting volume	1495	394	789			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1495	394	789			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	114	605	827			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	726	726	499	290	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	41	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.43	0.43	0.29	0.17	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	0.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	40.3%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 28: Columbia Pike

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	0	929	501	112	0	0
Future Volume (Veh/h)	0	929	501	112	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1010	545	122	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		339				
pX, platoon unblocked					0.74	
vC, conflicting volume	667				1111	334
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	667				441	334
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	919				402	662
Direction, Lane #	EB 1	EB 2	WB 1	WB 2		
Volume Total	505	505	363	304		
Volume Left	0	0	0	0		
Volume Right	0	0	0	122		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.30	0.30	0.21	0.18		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			29.0%		ICU Level of Service	A
Analysis Period (min)			15			

Queues

1: Columbia Pike & S Joyce Street

04/10/2019



Lane Group	WBL	WBR	NET	SWL	SWT
Lane Group Flow (vph)	891	562	1154	276	958
v/c Ratio	0.92	0.70	0.85	0.89	0.48
Control Delay	57.4	23.6	36.5	48.4	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	57.4	23.6	36.5	48.4	15.1
Queue Length 50th (ft)	340	253	239	166	230
Queue Length 95th (ft)	#451	380	#317	m200	m257
Internal Link Dist (ft)	190		436		445
Turn Bay Length (ft)	200			330	
Base Capacity (vph)	1001	818	1364	346	1988
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.89	0.69	0.85	0.80	0.48

Intersection Summary

Description: Columbia Pike / Southgate Rd / S Joyce St

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues

8: Columbia Pike & AFM

04/10/2019



Lane Group	EBT	WBT
Lane Group Flow (vph)	1013	1849
v/c Ratio	0.40	0.74
Control Delay	11.7	18.3
Queue Delay	0.0	0.0
Total Delay	11.7	18.4
Queue Length 50th (ft)	266	510
Queue Length 95th (ft)	m321	622
Internal Link Dist (ft)	785	395
Turn Bay Length (ft)		
Base Capacity (vph)	2506	2506
Starvation Cap Reductn	0	17
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.40	0.74

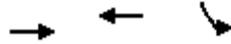
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues

19: Columbia Pike & S. Nash Street

04/10/2019



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	651	1849	462
v/c Ratio	0.34	0.86	0.94
Control Delay	11.8	28.8	68.6
Queue Delay	0.0	0.0	0.0
Total Delay	11.8	28.8	68.6
Queue Length 50th (ft)	123	554	337
Queue Length 95th (ft)	160	635	#531
Internal Link Dist (ft)	573	1	687
Turn Bay Length (ft)			
Base Capacity (vph)	1918	2151	515
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.34	0.86	0.90

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1204	544	129	826
v/c Ratio	0.74	1.33dl	0.18	0.97
Control Delay	22.2	30.1	22.0	44.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	22.2	30.1	22.0	44.1
Queue Length 50th (ft)	349	178	58	395
Queue Length 95th (ft)	466	241	102	#712
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	1632	837	774	881
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.74	0.65	0.17	0.94

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

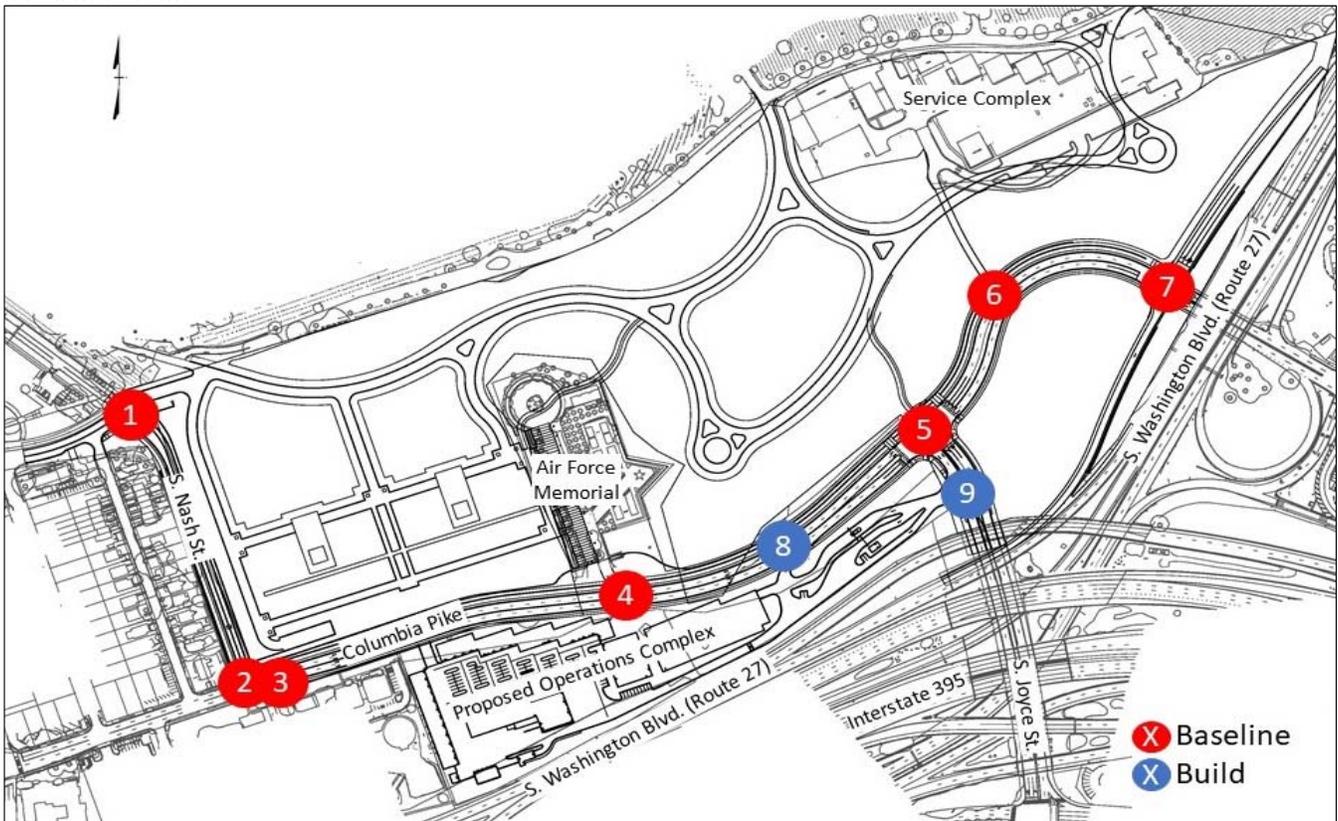
**2040 Build Scenario 2 Condition
Measures of Effectiveness**

Arlington National Cemetery - Southern Expansion: Traffic Study

Scenario: 2040 AM Build Scenario 2 - Movement Delay and LOS

<p>1</p> <p>Hobson Drive</p> <p>Southgate Road</p> <p>ANC Gate</p> <p>South Nash Street</p> <p>7.1 (A)</p> <p>8.2 (A)</p> <p>A</p>	<p>2</p> <p>South Nash Street</p> <p>Columbia Pike</p> <p>ANC Gate</p> <p>Columbia Pike</p> <p>4 (A)</p> <p>55.9 (E)</p> <p>0.2 (A)</p> <p>A</p>	<p>3</p> <p>Columbia Pike</p> <p>Columbia Pike</p> <p>VDOT Driveway</p> <p>0 (A)</p> <p>0 (A)</p> <p>16.9 (C)</p> <p>A</p>	<p>4</p> <p>Air Force Memorial</p> <p>Columbia Pike</p> <p>Columbia Pike</p> <p>6.5 (A)</p> <p>2.8 (A)</p> <p>A</p>
<p>5</p> <p>Columbia Pike</p> <p>South Joyce Street</p> <p>14.1 (B)</p> <p>40.6 (D)</p> <p>33.2 (C)</p> <p>10.7 (B)</p> <p>22.3 (C)</p> <p>C</p>	<p>7</p> <p>Route 27 Offramp</p> <p>Columbia Pike</p> <p>Columbia Pike</p> <p>Route 27 Onramp</p> <p>3.8 (A)</p> <p>46.8 (D)</p> <p>56.5 (E)</p> <p>4.7 (A)</p> <p>B</p>	<p>8</p> <p>Columbia Pike</p> <p>Columbia Pike</p> <p>Operations Complex</p> <p>0 (A)</p> <p>24.4 (C)</p> <p>9.9 (A)</p> <p>A</p>	<p>9</p> <p>South Joyce Street</p> <p>Operations Complex</p> <p>future PMVEC</p> <p>South Joyce Street</p> <p>0 (A)</p> <p>0 (A)</p> <p>A</p>

Note: Intersection #6 closed

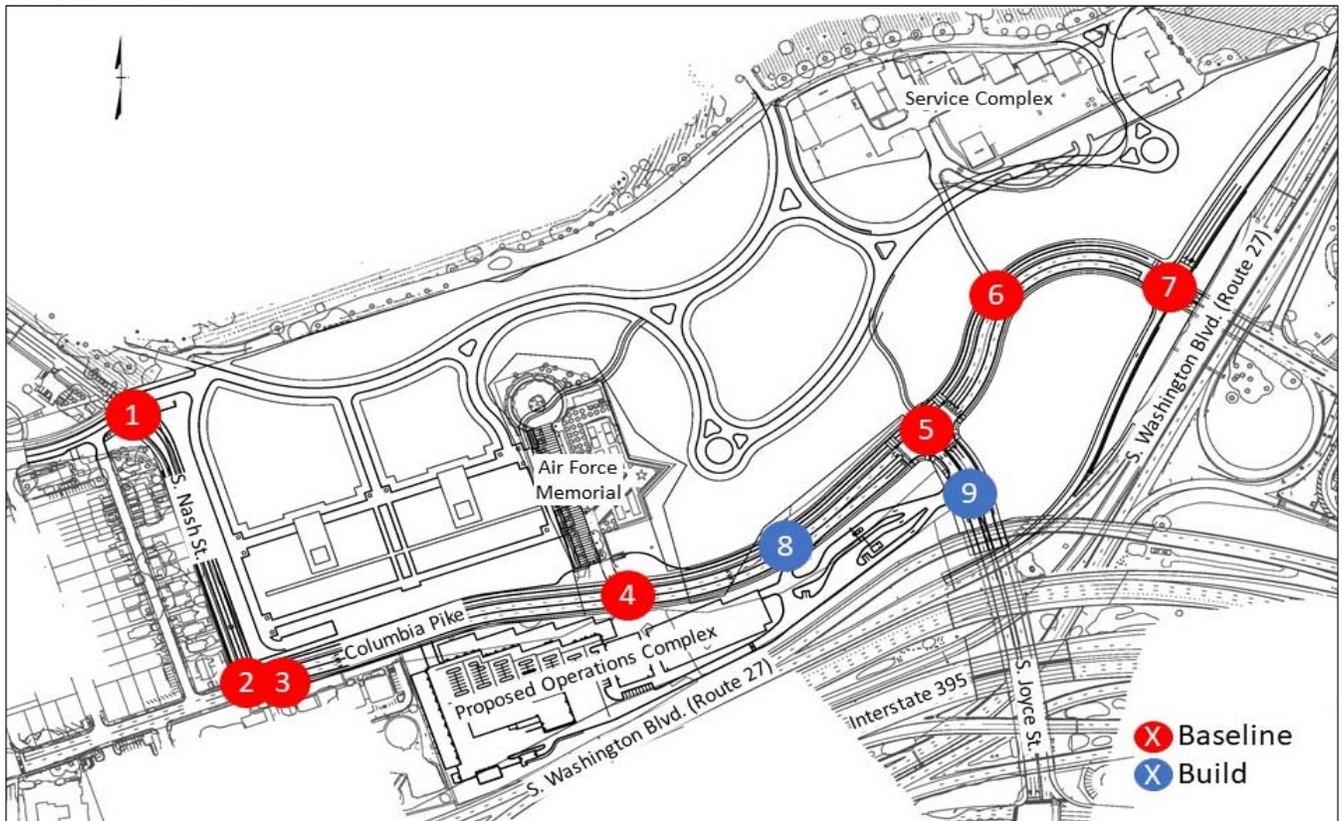


Arlington National Cemetery - Southern Expansion: Traffic Study

Scenario: 2040 PM Build Scenario 2 - Movement Delay and LOS

<p>1</p> <p>Hobson Drive</p> <p>Southgate Road</p> <p>ANC Gate</p> <p>South Nash Street</p> <p>12.4 (B)</p> <p>13.1 (B)</p> <p>0</p> <p>B</p>	<p>2</p> <p>South Nash Street</p> <p>Columbia Pike</p> <p>ANC Gate</p> <p>11.6 (B)</p> <p>66.9 (E)</p> <p>29.6 (C)</p> <p>C</p>	<p>3</p> <p>Columbia Pike</p> <p>Columbia Pike</p> <p>VDOT Driveway</p> <p>0 (A)</p> <p>0 (A)</p> <p>0.1 (A)</p> <p>15 (C)</p> <p>A</p>	<p>4</p> <p>Air Force Memorial</p> <p>Columbia Pike</p> <p>Columbia Pike</p> <p>11.6 (B)</p> <p>17.9 (B)</p> <p>B</p>
<p>5</p> <p>Columbia Pike</p> <p>South Joyce Street</p> <p>42 (D)</p> <p>14.3 (B)</p> <p>42.7 (D)</p> <p>55.5 (E)</p> <p>24.6 (C)</p> <p>D</p>	<p>7</p> <p>Route 27 Offramp</p> <p>Columbia Pike</p> <p>Route 27 Onramp</p> <p>21.7 (C)</p> <p>57 (E)</p> <p>21.9 (C)</p> <p>29.3 (C)</p> <p>C</p>	<p>8</p> <p>Columbia Pike</p> <p>Operations Complex</p> <p>0 (A)</p> <p>0 (A)</p> <p>40.4 (E)</p> <p>10.5 (B)</p> <p>A</p>	<p>9</p> <p>South Joyce Street</p> <p>Operations Complex</p> <p>South Joyce Street</p> <p>0 (A)</p> <p>0 (A)</p> <p>0 (A)</p> <p>A</p> <p>future PMVEC</p>

Note: Intersection #6 closed



2040 Build Scenario 2 - Lane Group LOS and Movement Queue																										
Synchro ID	Intersection (#)	AM						PM																		
		Volume	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS	Storage (ft)	95 th Percentile Queue (ft)	Volume	Delay	LOS	Approach Delay	Approach LOS	Storage (ft)	95 th Percentile Queue (ft)											
5	Nash Street, Southgate Road, and Hobson Drive (1)	Unsignalized	EBL	0	7.1	A	7.1	A	200	-	0	12.4	B	12.4	B	200	-									
			EBT	0						-	0						-									
			EBR	111						-	425						-									
		Unsignalized	WBL	0	8.2	A	8.2	A	700	-	0	13.1	B	13.1	B	700	-									
			WBR	0						-	0						-									
			NBL	118						-	313						-									
		Unsignalized	NBT	0	780					-	0					780	-									
			NBR	0						-	0						-									
			SBL	0						-	0						-									
		Unsignalized	SBT	0	-		-		-	0	-		-		-		-									
			SBR	0	-		-		-	0	-		-		-		-									
Int.	Overall		7.7	A				Overall	12.7	B																
19	Columbia Pike and S. Nash Street (2)	Signalized	EBL	5	4	A	4	A	220	135	10	11.6	B	11.6	B	220	161									
			EBT	812					-	589	-					-										
			WBT	441					0.2	A	0.2					A	1,000	0	1448	29.6	C	29.6	C	1,000	659	
			WBR	113					-	-	-					303	-	-								
		Signalized	SBL	109	55.9	E	55.9	E	700	146	343	66.9	66.9	E	66.9	E	700	#531								
			SBR	2						-	-	82					-	-								
			Int.	Overall						6.5	A							Overall	31.4	C						
			EBT	919						0	A							-	-	930	0	A			-	-
3	Columbia Pike and East Driveway (VOOT) (3)	Unsignalized	EBR	2	0	A	0	A	-	-	2	0	A	0	A	-	-									
			WBL	2					0.1	A	0					A	-	-	2	0.1	A	-	-			
			WBT	552					0	A	0					A	-	-	1749	0	A	-	-			
		Unsignalized	NBL	2	16.9	C	16.9	C		75	1	2	15	C	15	C	75	1								
			NBR	2						-	-	2					-	-								
			Int.	Overall						0.1	A							Overall	0	A						
8	Columbia Pike and Airforce Memorial (4)	Pedestrian Signal	EBL	0	6.5	A	6.5	A	750	152	0	11.6	B	11.6	B	750	m321									
			EBT	921					-	-	932					-	-									
			WBT	554					2.8	A	2.8					A	1,000	23	1751	17.9	B	17.9	B	1,000	647	
		Pedestrian Signal	WBR	0	-	-	0	-	-																	
			SBL	0	-	-	380	0	0	-	-	380	-	-												
			SBR	0	-	-	-	-	0	-	-	-	-	0												
Int.	Overall	5.1	A			Overall	15.7	B																		
12	Col. Pike and Ops. Complex Driveway (8)	Unsignalized	EBT	921	0	A	0	A	350	0	932	0	A	0	A	350	0									
			WBT	550	0	A	0	A	500	0	1701	0	A	0	A	500	0									
			NBL	4	24.4	C	14.7	B	40	2	50	40.4	E		C	40	36									
			NBR	7	9.9	A			40	1	80	10.5	B	22	C	40	10									
		Int.	Overall	0.1	A			Overall	1	A																
1	Columbia Pike and Joyce Street (5)	Unsignalized	EBT	561	14.1	B	14.1	B	1,100	228	540	42	D	42	D	1100	292									
			EBR	367					-	-	472					-	-									
			WBL	209					22.3	C	16.2					B	300	146	254	42.7	D	20.7	C	300	m190	
		Signalized	WBT	225	10.7	B			330	73	881	14.3	B			330	m257									
			NBL	325	40.6	D	36.2	D	200 *	169	820	55.5	E	45.2	D	200 *	#451									
			NBR	473	33.2	C			1,600	334	517	24.6	C			1,600	364									
			Int.	Overall	22.7	C			Overall	35.6	D															
14	Joyce St. and Ops. Complex Driveway (9)	Unsignalized	EBR	0	0	A	0	A	350	0	0	0	A	0	A	350	0									
			NBT	798					-	-	1337					-	-									
			SBT	457					-	-	688					-	-									
			SBR	119					-	-	38					-	-									
Int.	Overall	0	A			Overall	0	A																		
9	Columbia Pike and ANC Service Complex (6)	Unsignalized	EBL	0	0	A	0	A	310	0	0	0	A	0	A	310	0									
			EBT	1034					-	-	1057					-	-									
			WBT	434					0	A	0					A	150	0	1135	0	A	0	A	150	0	
		Unsignalized	WBR	0	-	-	0	-	-																	
			SBL	0	-	-	0	-	-																	
			SBR	0	-	-	150	0	0	-	-	150	0													
Int.	Overall	0	A			Overall	0	A																		
26	Columbia Pike and Southbound Route 27 Ramps (7)	Signalized	EBT	890	3.8	A	3.8	A	750	123	778	21.7	C	21.7	C	750	423									
			EBR	144					-	-	279					-	-									
			WBL	88					-	-	128					-	-									
		Signalized	WBT	245	4.7	A	4.7	A	350	66	375	29.3	C	29.3	C	350	243									
			SBL	134	56.5	E	50.8	D	550	171	119	21.9	C	52.2	D	550	102									
			SBR	190	46.8	D			400	0	760	57	E			400	#713									
			Int.	Overall	13	B			Overall	34.3	C															

Legend: # 95th Percentile volume exceeds capacity, queue may be longer
m Volume for 95th percentile queue is metered by upstream signa
* length of left turn pocket, other left turn lane is continuous back to Army Navy Drive

**2040 Build Scenario 2 Condition
AM Synchro Reports**

HCM Signalized Intersection Capacity Analysis

1: Columbia Pike & S Joyce Street

04/10/2019



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	325	473	561	367	209	225
Future Volume (vph)	325	473	561	367	209	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	10	10
Total Lost time (s)	7.0	7.0	7.0		7.0	7.0
Lane Util. Factor	0.97	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.94		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	1531	3218		1652	3303
Flt Permitted	0.95	1.00	1.00		0.17	1.00
Satd. Flow (perm)	3433	1531	3218		294	3303
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	353	514	610	399	227	245
RTOR Reduction (vph)	0	72	74	0	0	0
Lane Group Flow (vph)	353	442	935	0	227	245
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	8	1 8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	26.7	48.5	57.5		79.3	79.3
Effective Green, g (s)	26.7	48.5	57.5		79.3	79.3
Actuated g/C Ratio	0.22	0.40	0.48		0.66	0.66
Clearance Time (s)	7.0		7.0		7.0	7.0
Vehicle Extension (s)	2.0		3.0		2.0	3.0
Lane Grp Cap (vph)	763	618	1541		361	2182
v/s Ratio Prot	0.10	c0.29	0.29		0.08	0.07
v/s Ratio Perm					c0.34	
v/c Ratio	0.46	0.72	0.61		0.63	0.11
Uniform Delay, d1	40.4	30.0	22.9		13.3	7.5
Progression Factor	1.00	1.00	0.54		1.50	1.41
Incremental Delay, d2	0.2	3.3	1.7		2.4	0.1
Delay (s)	40.6	33.2	14.1		22.3	10.7
Level of Service	D	C	B		C	B
Approach Delay (s)	36.2		14.1			16.2
Approach LOS	D		B			B

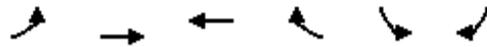
Intersection Summary

HCM 2000 Control Delay	22.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
Description: Columbia Pike / Southgate Rd / S Joyce St			
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

8: Columbia Pike & AFM

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔			
Traffic Volume (vph)	0	921	554	0	0	0
Future Volume (vph)	0	921	554	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0			
Lane Util. Factor		0.95	0.95			
Frt		1.00	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		3539	3539			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		3539	3539			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1001	602	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1001	602	0	0	0
Turn Type		NA	NA			
Protected Phases		2	6			
Permitted Phases	2					
Actuated Green, G (s)		85.0	85.0			
Effective Green, g (s)		85.0	85.0			
Actuated g/C Ratio		0.71	0.71			
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		2506	2506			
v/s Ratio Prot		0.28	0.17			
v/s Ratio Perm						
v/c Ratio		0.40	0.24			
Uniform Delay, d1		7.1	6.2			
Progression Factor		0.84	0.42			
Incremental Delay, d2		0.5	0.2			
Delay (s)		6.5	2.8			
Level of Service		A	A			
Approach Delay (s)		6.5	2.8	0.0		
Approach LOS		A	A	A		

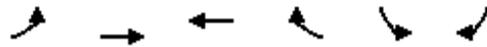
Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	35.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

19: Columbia Pike & S. Nash Street

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↕↔	
Traffic Volume (vph)	5	812	441	113	109	2
Future Volume (vph)	5	812	441	113	109	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	0.97		1.00	
Flt Protected		1.00	1.00		0.95	
Satd. Flow (prot)		3538	3431		1771	
Flt Permitted		0.95	1.00		0.95	
Satd. Flow (perm)		3370	3431		1771	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	883	479	123	118	2
RTOR Reduction (vph)	0	0	11	0	1	0
Lane Group Flow (vph)	0	888	591	0	119	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		6	2		8	
Permitted Phases	6					
Actuated Green, G (s)		94.6	94.6		13.4	
Effective Green, g (s)		94.6	94.6		13.4	
Actuated g/C Ratio		0.79	0.79		0.11	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		2656	2704		197	
v/s Ratio Prot			0.17		c0.07	
v/s Ratio Perm		c0.26				
v/c Ratio		0.33	0.22		0.60	
Uniform Delay, d1		3.7	3.2		50.8	
Progression Factor		1.00	0.01		1.00	
Incremental Delay, d2		0.3	0.2		5.2	
Delay (s)		4.0	0.2		55.9	
Level of Service		A	A		E	
Approach Delay (s)		4.0	0.2		55.9	
Approach LOS		A	A		E	

Intersection Summary

HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑
Traffic Volume (vph)	0	890	144	88	245	0	0	0	134	0	190
Future Volume (vph)	0	890	144	88	245	0	0	0	134	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		1.00
Frt		0.98			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3465			3493				1770		1583
Flt Permitted		1.00			0.58				0.95		1.00
Satd. Flow (perm)		3465			2040				1770		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	967	157	96	266	0	0	0	146	0	207
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	181
Lane Group Flow (vph)	0	1116	0	0	362	0	0	0	146	0	26
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		90.8			90.8				15.2		15.2
Effective Green, g (s)		90.8			90.8				15.2		15.2
Actuated g/C Ratio		0.76			0.76				0.13		0.13
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		2621			1543				224		200
v/s Ratio Prot		c0.32							c0.08		0.02
v/s Ratio Perm					0.18						
v/c Ratio		0.43			0.23				0.65		0.13
Uniform Delay, d1		5.2			4.3				49.9		46.5
Progression Factor		0.64			1.00				1.00		1.00
Incremental Delay, d2		0.4			0.4				6.6		0.3
Delay (s)		3.8			4.7				56.5		46.8
Level of Service		A			A				E		D
Approach Delay (s)		3.8			4.7		0.0			50.8	
Approach LOS		A			A		A			D	

Intersection Summary

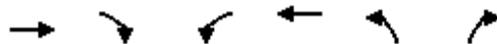
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

3: VDOT driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Volume (veh/h)	919	2	2	552	2	2
Future Volume (Veh/h)	919	2	2	552	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	999	2	2	600	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	56			865		
pX, platoon unblocked	0.93			0.94	0.93	
vC, conflicting volume	1001			1304	500	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	848			1075	309	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	100			99	100	
cM capacity (veh/h)	729			201	638	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	666	335	202	400	4	
Volume Left	0	0	2	0	2	
Volume Right	0	2	0	0	2	
cSH	1700	1700	729	1700	306	
Volume to Capacity	0.39	0.20	0.00	0.24	0.01	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.1	0.0	16.9	
Lane LOS	A			C		
Approach Delay (s)	0.0		0.0	16.9		
Approach LOS				C		
Intersection Summary						
Average Delay	0.1					
Intersection Capacity Utilization	35.5%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

5: Southgate Road & Hobson Drive

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	0	111	0	0	0	0	0	0	118	0	0
Future Volume (vph)	0	0	111	0	0	0	0	0	0	118	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	121	0	0	0	0	0	0	128	0	0

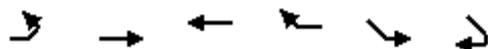
Direction, Lane #	EB 1	WB 1	SE 1	NW 1
Volume Total (vph)	121	0	0	128
Volume Left (vph)	0	0	0	128
Volume Right (vph)	121	0	0	0
Hadj (s)	-0.57	0.00	0.00	0.23
Departure Headway (s)	3.6	4.3	4.3	4.4
Degree Utilization, x	0.12	0.00	0.00	0.16
Capacity (veh/h)	955	810	818	796
Control Delay (s)	7.1	7.3	7.3	8.2
Approach Delay (s)	7.1	0.0	0.0	8.2
Approach LOS	A	A	A	A

Intersection Summary			
Delay		7.7	
Level of Service		A	
Intersection Capacity Utilization	20.1%		ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis

9: Columbia Pike & ANC Service Complex

04/10/2019



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕↕	↕↔		↔↕	
Traffic Volume (veh/h)	0	1034	434	0	0	0
Future Volume (Veh/h)	0	1034	434	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1124	472	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		525	337			
pX, platoon unblocked						
vC, conflicting volume	472				1034	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	472				1034	236
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1086				228	766
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SE 1	
Volume Total	375	749	315	157	0	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	0	
cSH	1086	1700	1700	1700	1700	
Volume to Capacity	0.00	0.44	0.19	0.09	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		0.0	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			31.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

12: Operations Complex Driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	↗
Traffic Volume (veh/h)	921	0	0	550	4	7
Future Volume (Veh/h)	921	0	0	550	4	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1001	0	0	598	4	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	473			515		
pX, platoon unblocked				0.88	0.88	0.88
vC, conflicting volume				1001	1300	500
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				736	1074	169
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	98	99
cM capacity (veh/h)				764	189	747
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	500	500	299	299	4	8
Volume Left	0	0	0	0	4	0
Volume Right	0	0	0	0	0	8
cSH	1700	1700	1700	1700	189	747
Volume to Capacity	0.29	0.29	0.18	0.18	0.02	0.01
Queue Length 95th (ft)	0	0	0	0	2	1
Control Delay (s)	0.0	0.0	0.0	0.0	24.4	9.9
Lane LOS					C	A
Approach Delay (s)	0.0		0.0		14.7	
Approach LOS					B	
Intersection Summary						
Average Delay				0.1		
Intersection Capacity Utilization				35.5%	ICU Level of Service	A
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis
 14: Operations Complex Driveway & S Joyce Street

04/10/2019

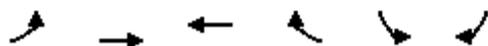


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕	↕	↘
Traffic Volume (veh/h)	0	0	0	798	457	119
Future Volume (Veh/h)	0	0	0	798	457	119
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	867	497	129
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						270
pX, platoon unblocked						
vC, conflicting volume	995	313	626			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	995	313	626			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	242	683	952			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	434	434	331	295	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	129	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.26	0.26	0.19	0.17	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	0.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	25.4%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

28: Columbia Pike

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	0	1024	333	209	0	0
Future Volume (Veh/h)	0	1024	333	209	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1113	362	227	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		339				
pX, platoon unblocked					0.89	
vC, conflicting volume	589				1032	294
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	589				799	294
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	982				289	702
Direction, Lane #	EB 1	EB 2	WB 1	WB 2		
Volume Total	556	556	241	348		
Volume Left	0	0	0	0		
Volume Right	0	0	0	227		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.33	0.33	0.14	0.20		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			31.6%		ICU Level of Service	A
Analysis Period (min)			15			

Queues

1: Columbia Pike & S Joyce Street

04/10/2019



Lane Group	WBL	WBR	NET	SWL	SWT
Lane Group Flow (vph)	353	514	1009	227	245
v/c Ratio	0.46	0.74	0.62	0.63	0.11
Control Delay	42.3	29.0	13.3	22.4	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	42.3	29.0	13.3	22.4	11.2
Queue Length 50th (ft)	117	250	204	99	42
Queue Length 95th (ft)	169	334	228	146	73
Internal Link Dist (ft)	190		435		445
Turn Bay Length (ft)	200			330	
Base Capacity (vph)	805	846	1617	511	2214
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.44	0.61	0.62	0.44	0.11

Intersection Summary

Description: Columbia Pike / Southgate Rd / S Joyce St

Queues

8: Columbia Pike & AFM

04/10/2019

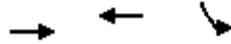


Lane Group	EBT	WBT
Lane Group Flow (vph)	1001	602
v/c Ratio	0.40	0.24
Control Delay	6.5	2.8
Queue Delay	0.0	0.0
Total Delay	6.5	2.8
Queue Length 50th (ft)	125	16
Queue Length 95th (ft)	152	23
Internal Link Dist (ft)	785	393
Turn Bay Length (ft)		
Base Capacity (vph)	2506	2506
Starvation Cap Reductn	0	0
Spillback Cap Reductn	0	0
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.40	0.24
Intersection Summary		

Queues

19: Columbia Pike & S. Nash Street

04/10/2019



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	888	602	120
v/c Ratio	0.33	0.22	0.61
Control Delay	4.3	0.2	62.5
Queue Delay	0.0	0.0	0.0
Total Delay	4.3	0.2	62.5
Queue Length 50th (ft)	85	0	89
Queue Length 95th (ft)	135	0	146
Internal Link Dist (ft)	573	1	687
Turn Bay Length (ft)			
Base Capacity (vph)	2655	2714	443
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.33	0.22	0.27
Intersection Summary			

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1124	362	146	207
v/c Ratio	0.43	0.23	0.65	0.27
Control Delay	3.9	5.2	62.9	0.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	3.9	5.2	62.9	0.9
Queue Length 50th (ft)	59	37	109	0
Queue Length 95th (ft)	123	66	171	0
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	2629	1542	398	860
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.23	0.37	0.24
Intersection Summary				

**2040 Build Scenario 2 Condition
PM Synchro Reports**

HCM Signalized Intersection Capacity Analysis

1: Columbia Pike & S Joyce Street

04/10/2019



Movement	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	820	517	540	472	254	881
Future Volume (vph)	820	517	540	472	254	881
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	11	11	11	10	10
Total Lost time (s)	7.0	7.0	7.0		7.0	7.0
Lane Util. Factor	0.97	1.00	0.95		1.00	0.95
Frt	1.00	0.85	0.93		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	1531	3182		1652	3303
Flt Permitted	0.95	1.00	1.00		0.09	1.00
Satd. Flow (perm)	3433	1531	3182		161	3303
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	891	562	587	513	276	958
RTOR Reduction (vph)	0	63	125	0	0	0
Lane Group Flow (vph)	891	499	975	0	276	958
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	8	1 8	2		1	6
Permitted Phases					6	
Actuated Green, G (s)	33.8	59.1	46.9		72.2	72.2
Effective Green, g (s)	33.8	59.1	46.9		72.2	72.2
Actuated g/C Ratio	0.28	0.49	0.39		0.60	0.60
Clearance Time (s)	7.0		7.0		7.0	7.0
Vehicle Extension (s)	2.0		3.0		2.0	3.0
Lane Grp Cap (vph)	966	754	1243		324	1987
v/s Ratio Prot	c0.26	0.33	0.31		c0.13	0.29
v/s Ratio Perm					c0.38	
v/c Ratio	0.92	0.66	0.78		0.85	0.48
Uniform Delay, d1	41.8	22.9	32.1		32.2	13.4
Progression Factor	1.00	1.00	1.16		1.01	1.04
Incremental Delay, d2	13.6	1.7	4.7		10.4	0.4
Delay (s)	55.5	24.6	42.0		42.7	14.3
Level of Service	E	C	D		D	B
Approach Delay (s)	43.5		42.0			20.7
Approach LOS	D		D			C

Intersection Summary

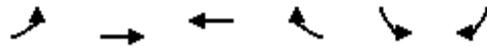
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	21.0
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		

Description: Columbia Pike / Southgate Rd / S Joyce St
 c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

8: Columbia Pike & AFM

04/10/2019



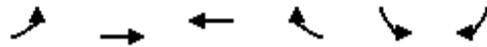
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↕			
Traffic Volume (vph)	0	932	1751	0	0	0
Future Volume (vph)	0	932	1751	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0	7.0			
Lane Util. Factor		0.95	0.95			
Frt		1.00	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		3539	3539			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		3539	3539			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1013	1903	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	1013	1903	0	0	0
Turn Type		NA	NA			
Protected Phases		2	6			
Permitted Phases	2					
Actuated Green, G (s)		85.0	85.0			
Effective Green, g (s)		85.0	85.0			
Actuated g/C Ratio		0.71	0.71			
Clearance Time (s)		7.0	7.0			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		2506	2506			
v/s Ratio Prot		0.29	c0.54			
v/s Ratio Perm						
v/c Ratio		0.40	0.76			
Uniform Delay, d1		7.2	11.0			
Progression Factor		1.56	1.47			
Incremental Delay, d2		0.4	1.7			
Delay (s)		11.6	17.9			
Level of Service		B	B			
Approach Delay (s)		11.6	17.9	0.0		
Approach LOS		B	B	A		
Intersection Summary						
HCM 2000 Control Delay			15.7	HCM 2000 Level of Service		B
HCM 2000 Volume to Capacity ratio			0.61			
Actuated Cycle Length (s)			120.0	Sum of lost time (s)		14.0
Intersection Capacity Utilization			57.0%	ICU Level of Service		B
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis

19: Columbia Pike & S. Nash Street

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (vph)	10	589	1448	303	343	82
Future Volume (vph)	10	589	1448	303	343	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		0.95	0.95		1.00	
Frt		1.00	0.97		0.97	
Flt Protected		1.00	1.00		0.96	
Satd. Flow (prot)		3536	3447		1744	
Flt Permitted		0.85	1.00		0.96	
Satd. Flow (perm)		3023	3447		1744	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	640	1574	329	373	89
RTOR Reduction (vph)	0	0	14	0	7	0
Lane Group Flow (vph)	0	651	1889	0	455	0
Turn Type	Perm	NA	NA		Prot	
Protected Phases		6	2		8	
Permitted Phases	6					
Actuated Green, G (s)		74.4	74.4		33.6	
Effective Green, g (s)		74.4	74.4		33.6	
Actuated g/C Ratio		0.62	0.62		0.28	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		1874	2137		488	
v/s Ratio Prot			c0.55		c0.26	
v/s Ratio Perm		0.22				
v/c Ratio		0.35	0.88		0.93	
Uniform Delay, d1		11.0	19.2		42.1	
Progression Factor		1.00	1.35		1.00	
Incremental Delay, d2		0.5	3.8		24.8	
Delay (s)		11.6	29.6		66.9	
Level of Service		B	C		E	
Approach Delay (s)		11.6	29.6		66.9	
Approach LOS		B	C		E	
Intersection Summary						
HCM 2000 Control Delay			31.4		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.90			
Actuated Cycle Length (s)			120.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			83.7%		ICU Level of Service	E
Analysis Period (min)			15			

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑
Traffic Volume (vph)	0	778	279	128	375	0	0	0	119	0	760
Future Volume (vph)	0	778	279	128	375	0	0	0	119	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		1.00
Frt		0.96			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3399			3495				1770		1583
Flt Permitted		1.00			0.50				0.95		1.00
Satd. Flow (perm)		3399			1773				1770		1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	846	303	139	408	0	0	0	129	0	826
RTOR Reduction (vph)	0	30	0	0	0	0	0	0	0	0	195
Lane Group Flow (vph)	0	1119	0	0	547	0	0	0	129	0	631
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		55.6			55.6				50.4		50.4
Effective Green, g (s)		55.6			55.6				50.4		50.4
Actuated g/C Ratio		0.46			0.46				0.42		0.42
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		1574			821				743		664
v/s Ratio Prot		c0.33							0.07		c0.40
v/s Ratio Perm					0.31						
v/c Ratio		0.71			1.22dl				0.17		0.95
Uniform Delay, d1		25.8			25.0				21.8		33.6
Progression Factor		0.77			1.00				1.00		1.00
Incremental Delay, d2		1.8			4.3				0.1		23.4
Delay (s)		21.7			29.3				21.9		57.0
Level of Service		C			C				C		E
Approach Delay (s)		21.7			29.3		0.0			52.2	
Approach LOS		C			C		A			D	

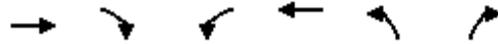
Intersection Summary			
HCM 2000 Control Delay	34.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
 3: VDOT driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↑↑	
Traffic Volume (veh/h)	930	2	2	1749	2	2
Future Volume (Veh/h)	930	2	2	1749	2	2
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1011	2	2	1901	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	56			865		
pX, platoon unblocked	0.92			0.59	0.92	
vC, conflicting volume	1013			1966	506	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	829			616	275	
tC, single (s)	4.1			6.8	6.9	
tC, 2 stage (s)						
tF (s)	2.2			3.5	3.3	
p0 queue free %	100			99	100	
cM capacity (veh/h)	731			250	661	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	674	339	636	1267	4	
Volume Left	0	0	2	0	2	
Volume Right	0	2	0	0	2	
cSH	1700	1700	731	1700	363	
Volume to Capacity	0.40	0.20	0.00	0.75	0.01	
Queue Length 95th (ft)	0	0	0	0	1	
Control Delay (s)	0.0	0.0	0.1	0.0	15.0	
Lane LOS	A			C		
Approach Delay (s)	0.0	0.0		15.0		
Approach LOS				C		
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	59.7%			ICU Level of Service	B	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis

5: Southgate Road & Hobson Drive

04/10/2019

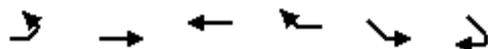


Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	0	0	425	0	0	0	0	0	0	313	0	0
Future Volume (vph)	0	0	425	0	0	0	0	0	0	313	0	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	462	0	0	0	0	0	0	340	0	0
Direction, Lane #	EB 1	WB 1	SE 1	NW 1								
Volume Total (vph)	462	0	0	340								
Volume Left (vph)	0	0	0	340								
Volume Right (vph)	462	0	0	0								
Hadj (s)	-0.57	0.00	0.00	0.23								
Departure Headway (s)	4.3	5.4	5.5	5.2								
Degree Utilization, x	0.55	0.00	0.00	0.49								
Capacity (veh/h)	802	606	591	651								
Control Delay (s)	12.4	8.4	8.5	13.1								
Approach Delay (s)	12.4	0.0	0.0	13.1								
Approach LOS	B	A	A	B								
Intersection Summary												
Delay			12.7									
Level of Service			B									
Intersection Capacity Utilization			50.3%		ICU Level of Service				A			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

9: Columbia Pike & ANC Service Complex

04/10/2019



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕↕	↕↔		↔↔	
Traffic Volume (veh/h)	0	1057	1135	0	0	0
Future Volume (Veh/h)	0	1057	1135	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1149	1234	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		525	337			
pX, platoon unblocked	0.93				0.93	0.93
vC, conflicting volume	1234				1808	617
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1097				1716	432
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	587				75	531
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SE 1	
Volume Total	383	766	823	411	0	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	0	
cSH	587	1700	1700	1700	1700	
Volume to Capacity	0.00	0.45	0.48	0.24	0.00	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS					A	
Approach Delay (s)	0.0		0.0		0.0	
Approach LOS					A	
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			34.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 12: Operations Complex Driveway & Columbia Pike

04/10/2019



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑			↑↑	↘	↗
Traffic Volume (veh/h)	932	0	0	1701	50	80
Future Volume (Veh/h)	932	0	0	1701	50	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1013	0	0	1849	54	87
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	473			515		
pX, platoon unblocked				0.88	0.90	0.88
vC, conflicting volume				1013	1938	506
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				744	1224	169
tC, single (s)				4.1	6.8	6.9
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	65	88
cM capacity (veh/h)				757	154	745
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	506	506	924	924	54	87
Volume Left	0	0	0	0	54	0
Volume Right	0	0	0	0	0	87
cSH	1700	1700	1700	1700	154	745
Volume to Capacity	0.30	0.30	0.54	0.54	0.35	0.12
Queue Length 95th (ft)	0	0	0	0	36	10
Control Delay (s)	0.0	0.0	0.0	0.0	40.4	10.5
Lane LOS					E	B
Approach Delay (s)	0.0		0.0		21.9	
Approach LOS					C	
Intersection Summary						
Average Delay				1.0		
Intersection Capacity Utilization				57.0%	ICU Level of Service	B
Analysis Period (min)				15		

HCM Unsignalized Intersection Capacity Analysis
 14: Operations Complex Driveway & S Joyce Street

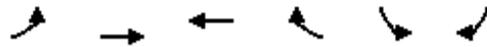
04/10/2019



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	1337	688	38
Future Volume (Veh/h)	0	0	0	1337	688	38
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	1453	748	41
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)	270					
pX, platoon unblocked						
vC, conflicting volume	1495	394	789			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1495	394	789			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	114	605	827			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	0	726	726	499	290	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	41	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.00	0.43	0.43	0.29	0.17	
Queue Length 95th (ft)	0	0	0	0	0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A					
Approach Delay (s)	0.0	0.0		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	40.3%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 28: Columbia Pike

04/10/2019



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑			
Traffic Volume (veh/h)	0	897	503	112	0	0
Future Volume (Veh/h)	0	897	503	112	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	975	547	122	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		339				
pX, platoon unblocked					0.76	
vC, conflicting volume	669				1096	334
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	669				479	334
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	917				389	661
Direction, Lane #	EB 1	EB 2	WB 1	WB 2		
Volume Total	488	488	365	304		
Volume Left	0	0	0	0		
Volume Right	0	0	0	122		
cSH	1700	1700	1700	1700		
Volume to Capacity	0.29	0.29	0.21	0.18		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.0	0.0	0.0	0.0		
Lane LOS						
Approach Delay (s)	0.0		0.0			
Approach LOS						
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			28.1%		ICU Level of Service	A
Analysis Period (min)			15			

Queues

1: Columbia Pike & S Joyce Street

04/10/2019



Lane Group	WBL	WBR	NET	SWL	SWT
Lane Group Flow (vph)	891	562	1100	276	958
v/c Ratio	0.92	0.69	0.80	0.85	0.48
Control Delay	57.4	22.1	36.3	41.4	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	57.4	22.1	36.3	41.4	14.7
Queue Length 50th (ft)	340	238	201	157	224
Queue Length 95th (ft)	#451	364	292	m190	m257
Internal Link Dist (ft)	190		435		445
Turn Bay Length (ft)	200			330	
Base Capacity (vph)	1001	830	1369	358	1988
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.89	0.68	0.80	0.77	0.48

Intersection Summary

Description: Columbia Pike / Southgate Rd / S Joyce St

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Queues

8: Columbia Pike & AFM

04/10/2019



Lane Group	EBT	WBT
Lane Group Flow (vph)	1013	1903
v/c Ratio	0.40	0.76
Control Delay	11.7	18.4
Queue Delay	0.0	0.0
Total Delay	11.7	18.5
Queue Length 50th (ft)	266	530
Queue Length 95th (ft)	m321	647
Internal Link Dist (ft)	785	393
Turn Bay Length (ft)		
Base Capacity (vph)	2506	2506
Starvation Cap Reductn	0	12
Spillback Cap Reductn	0	31
Storage Cap Reductn	0	0
Reduced v/c Ratio	0.40	0.77

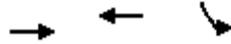
Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Queues

19: Columbia Pike & S. Nash Street

04/10/2019



Lane Group	EBT	WBT	SBL
Lane Group Flow (vph)	651	1903	462
v/c Ratio	0.35	0.88	0.94
Control Delay	11.9	30.1	68.6
Queue Delay	0.0	0.0	0.0
Total Delay	11.9	30.1	68.6
Queue Length 50th (ft)	124	577	337
Queue Length 95th (ft)	161	659	#531
Internal Link Dist (ft)	573	1	687
Turn Bay Length (ft)			
Base Capacity (vph)	1874	2152	515
Starvation Cap Reductn	0	0	0
Spillback Cap Reductn	0	0	0
Storage Cap Reductn	0	0	0
Reduced v/c Ratio	0.35	0.88	0.90

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1149	547	129	826
v/c Ratio	0.72	1.22dl	0.17	0.96
Control Delay	21.6	30.9	21.6	42.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.6	30.9	21.6	42.7
Queue Length 50th (ft)	335	185	56	382
Queue Length 95th (ft)	423	243	102	#713
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	1631	835	781	886
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.70	0.66	0.17	0.93

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

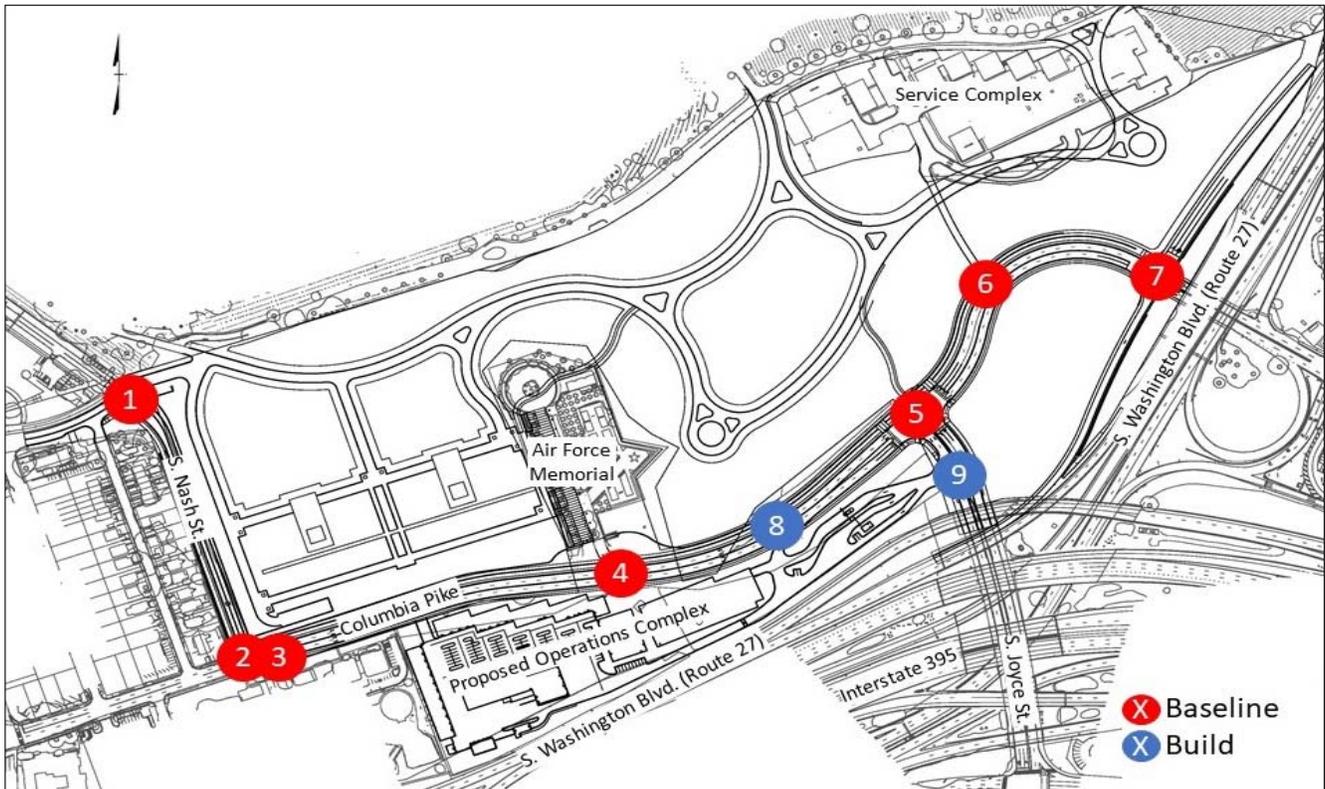
Queue shown is maximum after two cycles.

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

**2040 Mitigation Condition
Measures of Effectiveness**

Arlington National Cemetery - Southern Expansion: Traffic Study
 Scenario: 2040 Mitigation - Movement Delay and LOS

AM																																												
Baseline	Build Scenario 1	Build Scenario 2																																										
<table border="1"> <tr> <td rowspan="2">7</td> <td colspan="2">Route 27 Offramp</td> </tr> <tr> <td> Columbia Pike 49.9 (D) 56.5 (E) </td> <td>4.6 (A)</td> </tr> <tr> <td></td> <td>B</td> <td></td> </tr> <tr> <td></td> <td>5.3 (A)</td> <td></td> </tr> <tr> <td></td> <td colspan="2">Route 27 Onramp</td> </tr> </table>	7	Route 27 Offramp		Columbia Pike 49.9 (D) 56.5 (E)	4.6 (A)		B			5.3 (A)			Route 27 Onramp		<table border="1"> <tr> <td rowspan="2">7</td> <td colspan="2">Route 27 Offramp</td> </tr> <tr> <td> Columbia Pike 51.4 (D) 55.6 (E) </td> <td>4.8 (A)</td> </tr> <tr> <td></td> <td>B</td> <td></td> </tr> <tr> <td></td> <td>3.2 (A)</td> <td></td> </tr> <tr> <td></td> <td colspan="2">Route 27 Onramp</td> </tr> </table>	7	Route 27 Offramp		Columbia Pike 51.4 (D) 55.6 (E)	4.8 (A)		B			3.2 (A)			Route 27 Onramp		<table border="1"> <tr> <td rowspan="2">7</td> <td colspan="2">Route 27 Offramp</td> </tr> <tr> <td> Columbia Pike 51.8 (D) 56.1 (E) </td> <td>4.7 (A)</td> </tr> <tr> <td></td> <td>B</td> <td></td> </tr> <tr> <td></td> <td>3.8 (A)</td> <td></td> </tr> <tr> <td></td> <td colspan="2">Route 27 Onramp</td> </tr> </table>	7	Route 27 Offramp		Columbia Pike 51.8 (D) 56.1 (E)	4.7 (A)		B			3.8 (A)			Route 27 Onramp	
7		Route 27 Offramp																																										
	Columbia Pike 49.9 (D) 56.5 (E)	4.6 (A)																																										
	B																																											
	5.3 (A)																																											
	Route 27 Onramp																																											
7	Route 27 Offramp																																											
	Columbia Pike 51.4 (D) 55.6 (E)	4.8 (A)																																										
	B																																											
	3.2 (A)																																											
	Route 27 Onramp																																											
7	Route 27 Offramp																																											
	Columbia Pike 51.8 (D) 56.1 (E)	4.7 (A)																																										
	B																																											
	3.8 (A)																																											
	Route 27 Onramp																																											
PM																																												
Baseline	Build Scenario 1	Build Scenario 2																																										
<table border="1"> <tr> <td rowspan="2">7</td> <td colspan="2">Route 27 Offramp</td> </tr> <tr> <td> Columbia Pike 40.5 (D) 26.7 (C) </td> <td>20.1 (C)</td> </tr> <tr> <td></td> <td>C</td> <td></td> </tr> <tr> <td></td> <td>15.9 (B)</td> <td></td> </tr> <tr> <td></td> <td colspan="2">Route 27 Onramp</td> </tr> </table>	7	Route 27 Offramp		Columbia Pike 40.5 (D) 26.7 (C)	20.1 (C)		C			15.9 (B)			Route 27 Onramp		<table border="1"> <tr> <td rowspan="2">7</td> <td colspan="2">Route 27 Offramp</td> </tr> <tr> <td> Columbia Pike 41.7 (D) 27.1 (C) </td> <td>22 (C)</td> </tr> <tr> <td></td> <td>C</td> <td></td> </tr> <tr> <td></td> <td>18.8 (B)</td> <td></td> </tr> <tr> <td></td> <td colspan="2">Route 27 Onramp</td> </tr> </table>	7	Route 27 Offramp		Columbia Pike 41.7 (D) 27.1 (C)	22 (C)		C			18.8 (B)			Route 27 Onramp		<table border="1"> <tr> <td rowspan="2">7</td> <td colspan="2">Route 27 Offramp</td> </tr> <tr> <td> Columbia Pike 41.7 (D) 27.1 (C) </td> <td>21.7 (C)</td> </tr> <tr> <td></td> <td>C</td> <td></td> </tr> <tr> <td></td> <td>18 (B)</td> <td></td> </tr> <tr> <td></td> <td colspan="2">Route 27 Onramp</td> </tr> </table>	7	Route 27 Offramp		Columbia Pike 41.7 (D) 27.1 (C)	21.7 (C)		C			18 (B)			Route 27 Onramp	
7		Route 27 Offramp																																										
	Columbia Pike 40.5 (D) 26.7 (C)	20.1 (C)																																										
	C																																											
	15.9 (B)																																											
	Route 27 Onramp																																											
7	Route 27 Offramp																																											
	Columbia Pike 41.7 (D) 27.1 (C)	22 (C)																																										
	C																																											
	18.8 (B)																																											
	Route 27 Onramp																																											
7	Route 27 Offramp																																											
	Columbia Pike 41.7 (D) 27.1 (C)	21.7 (C)																																										
	C																																											
	18 (B)																																											
	Route 27 Onramp																																											



2040 Build Mitigated - Lane Group LOS and Movement Queue

Scenario	Synchro ID	Intersection (#)	AM							PM												
			Volume	Lane Group Delay	Lane Group LOS	Approach Delay	Approach LOS	Storage (ft)	95 th Percentile Queue (ft)	Volume	Delay	LOS	Approach Delay	Approach LOS	Storage (ft)	95 th Percentile Queue (ft)						
Baseline	26	Columbia Pike and Southbound Route 27 Ramps (7)	Signalized	EBT	889	5.3	A	5.3	A			738	15.9	B	15.9	B						
				EBR	144							257										
				WBL	88	4.6	A	4.6	A			128	20.1	C	20.1	C						
				WBT	228							373										
				SBL	134	56.5	E	52.9	D	550	171	119	26.7	C	38.7	D	550	102				
				SBR	160	49.9	D					757	40.5	D				400	366			
				Int.	Overall	13.7	B	Overall	25.2	C												
				Scenario 1	26	Columbia Pike and Southbound Route 27 Ramps (7)	Signalized	EBT	893	3.2	A	3.2	A			810	18.8	B	18.8	B		
								EBR	145							298						
								WBL	88	4.8	A	4.8	A			128	22	C	22	C		
WBT	245	375																				
SBL	134	55.6	E					53.1	D	550	170	119	27.1	C	39.7	D	550	103				
SBR	190	51.4	D									760	41.7	D				400	374			
Int.	Overall	12.4	B					Overall	26.8	C												
Scenario 2	26	Columbia Pike and Southbound Route 27 Ramps (7)	Signalized					EBT	890	3.8	A	3.8	A			778	18	B	18	C		
								EBR	144							279						
								WBL	88	4.7	A	4.7	A			128	21.7	C	21.7	C		
				WBT	245	375																
				SBL	134	56.1	E	53.6	D	550	171	119	27.1	C	39.7	D	550	103				
				SBR	190	51.8	D					760	41.7	D				400	374			
				Int.	Overall	13.5	B	Overall	26.6	C												

Legend: # 95th Percentile volume exceeds capacity, queue may be longer
 m Volume for 95th percentile queue is metered by upstream signal
 * length of left turn pocket, other left turn lane is continuous back to Army Navy Drive

**2040 Baseline Mitigation
AM Synchro Reports**

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑↑
Traffic Volume (vph)	0	889	144	88	228	0	0	0	134	0	160
Future Volume (vph)	0	889	144	88	228	0	0	0	134	0	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		0.88
Frt		0.98			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3465			3491				1770		2787
Flt Permitted		1.00			0.57				0.95		1.00
Satd. Flow (perm)		3465			2027				1770		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	966	157	96	248	0	0	0	146	0	174
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1115	0	0	344	0	0	0	146	0	174
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		90.8			90.8				15.2		15.2
Effective Green, g (s)		90.8			90.8				15.2		15.2
Actuated g/C Ratio		0.76			0.76				0.13		0.13
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		2621			1533				224		353
v/s Ratio Prot		c0.32							c0.08		0.06
v/s Ratio Perm					0.17						
v/c Ratio		0.43			0.22				0.65		0.49
Uniform Delay, d1		5.2			4.3				49.9		48.8
Progression Factor		0.94			1.00				1.00		1.00
Incremental Delay, d2		0.4			0.3				6.6		1.1
Delay (s)		5.3			4.6				56.5		49.9
Level of Service		A			A				E		D
Approach Delay (s)		5.3			4.6		0.0			52.9	
Approach LOS		A			A		A			D	

Intersection Summary

HCM 2000 Control Delay	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	60.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1123	344	146	174
v/c Ratio	0.43	0.22	0.65	0.49
Control Delay	5.6	5.1	62.8	52.7
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.6	5.1	62.8	52.7
Queue Length 50th (ft)	167	35	109	72
Queue Length 95th (ft)	180	63	171	107
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	2628	1534	413	650
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.22	0.35	0.27
Intersection Summary				

**2040 Baseline Mitigation
PM Synchro Reports**

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR	
Lane Configurations		↑↑			↑↑				↑		↑↑	
Traffic Volume (vph)	0	738	257	128	373	0	0	0	119	0	757	
Future Volume (vph)	0	738	257	128	373	0	0	0	119	0	757	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		7.0			7.0				7.0		7.0	
Lane Util. Factor		0.95			0.95				1.00		0.88	
Frt		0.96			1.00				1.00		0.85	
Flt Protected		1.00			0.99				0.95		1.00	
Satd. Flow (prot)		3402			3495				1770		2787	
Flt Permitted		1.00			0.52				0.95		1.00	
Satd. Flow (perm)		3402			1835				1770		2787	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	0	802	279	139	405	0	0	0	129	0	823	
RTOR Reduction (vph)	0	24	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	0	1057	0	0	544	0	0	0	129	0	823	
Turn Type		NA		Perm	NA				Prot		Prot	
Protected Phases		2			6				8		8	
Permitted Phases				6								
Actuated Green, G (s)		62.9			62.9				43.1		43.1	
Effective Green, g (s)		62.9			62.9				43.1		43.1	
Actuated g/C Ratio		0.52			0.52				0.36		0.36	
Clearance Time (s)		7.0			7.0				7.0		7.0	
Vehicle Extension (s)		3.0			3.0				3.0		3.0	
Lane Grp Cap (vph)		1783			961				635		1000	
v/s Ratio Prot		c0.31							0.07		c0.30	
v/s Ratio Perm					0.30							
v/c Ratio		0.59			0.57				0.20		0.82	
Uniform Delay, d1		19.7			19.3				26.6		35.0	
Progression Factor		0.76			1.00				1.00		1.00	
Incremental Delay, d2		1.1			0.8				0.2		5.6	
Delay (s)		15.9			20.1				26.7		40.5	
Level of Service		B			C				C		D	
Approach Delay (s)		15.9			20.1		0.0			38.7		
Approach LOS		B			C		A			D		
Intersection Summary												
HCM 2000 Control Delay			25.2								HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			120.0								Sum of lost time (s)	14.0
Intersection Capacity Utilization			64.2%								ICU Level of Service	C
Analysis Period (min)			15									

c Critical Lane Group

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1081	544	129	823
v/c Ratio	0.60	0.57	0.20	0.82
Control Delay	16.3	23.7	25.9	42.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	16.3	23.7	25.9	42.1
Queue Length 50th (ft)	243	144	68	326
Queue Length 95th (ft)	372	236	102	366
Internal Link Dist (ft)	251	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	1806	961	811	1277
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.60	0.57	0.16	0.64
Intersection Summary				

**2040 Scenario 1 Mitigation Condition
AM Synchro Reports**

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑↑
Traffic Volume (vph)	0	893	145	88	245	0	0	0	134	0	190
Future Volume (vph)	0	893	145	88	245	0	0	0	134	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		0.88
Frt		0.98			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3465			3493				1770		2787
Flt Permitted		1.00			0.58				0.95		1.00
Satd. Flow (perm)		3465			2035				1770		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	971	158	96	266	0	0	0	146	0	207
RTOR Reduction (vph)	0	5	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1124	0	0	362	0	0	0	146	0	207
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		90.5			90.5				15.5		15.5
Effective Green, g (s)		90.5			90.5				15.5		15.5
Actuated g/C Ratio		0.75			0.75				0.13		0.13
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		2613			1534				228		359
v/s Ratio Prot		c0.32							c0.08		0.07
v/s Ratio Perm					0.18						
v/c Ratio		0.43			0.24				0.64		0.58
Uniform Delay, d1		5.4			4.4				49.6		49.2
Progression Factor		0.52			1.00				1.00		1.00
Incremental Delay, d2		0.4			0.4				6.0		2.2
Delay (s)		3.2			4.8				55.6		51.4
Level of Service		A			A				E		D
Approach Delay (s)		3.2			4.8		0.0			53.1	
Approach LOS		A			A		A			D	

Intersection Summary		
HCM 2000 Control Delay	13.1	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.46	B
Actuated Cycle Length (s)	120.0	Sum of lost time (s)
Intersection Capacity Utilization	61.1%	14.0
Analysis Period (min)	15	ICU Level of Service
		B

c Critical Lane Group

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1129	362	146	207
v/c Ratio	0.43	0.24	0.64	0.58
Control Delay	3.4	5.3	61.8	54.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	3.4	5.3	61.8	54.9
Queue Length 50th (ft)	59	37	109	86
Queue Length 95th (ft)	99	67	170	124
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	2618	1534	708	1114
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.24	0.21	0.19
Intersection Summary				

**2040 Scenario 1 Mitigation Condition
PM Synchro Reports**

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑↑
Traffic Volume (vph)	0	810	298	128	375	0	0	0	119	0	760
Future Volume (vph)	0	810	298	128	375	0	0	0	119	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		0.88
Frt		0.96			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3396			3495				1770		2787
Flt Permitted		1.00			0.50				0.95		1.00
Satd. Flow (perm)		3396			1771				1770		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	880	324	139	408	0	0	0	129	0	826
RTOR Reduction (vph)	0	27	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1177	0	0	547	0	0	0	129	0	826
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		63.4			63.4				42.6		42.6
Effective Green, g (s)		63.4			63.4				42.6		42.6
Actuated g/C Ratio		0.53			0.53				0.36		0.36
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		1794			935				628		989
v/s Ratio Prot		c0.35							0.07		c0.30
v/s Ratio Perm					0.31						
v/c Ratio		0.66			0.97dl				0.21		0.84
Uniform Delay, d1		20.4			19.3				26.9		35.5
Progression Factor		0.86			1.00				1.00		1.00
Incremental Delay, d2		1.2			2.7				0.2		6.2
Delay (s)		18.8			22.0				27.1		41.7
Level of Service		B			C				C		D
Approach Delay (s)		18.8			22.0		0.0			39.7	
Approach LOS		B			C		A			D	

Intersection Summary			
HCM 2000 Control Delay	26.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	67.6%	ICU Level of Service	C
Analysis Period (min)	15		
dl Defacto Left Lane. Recode with 1 though lane as a left lane.			
c Critical Lane Group			

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1204	547	129	826
v/c Ratio	0.66	0.97dl	0.21	0.84
Control Delay	19.1	24.0	26.3	43.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	19.1	24.0	26.3	43.3
Queue Length 50th (ft)	285	146	69	330
Queue Length 95th (ft)	457	239	103	374
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	1822	935	767	1207
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.66	0.59	0.17	0.68

Intersection Summary

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

**2040 Scenario 2 Mitigation Condition
AM Synchro Reports**

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑↑
Traffic Volume (vph)	0	890	144	88	245	0	0	0	134	0	190
Future Volume (vph)	0	890	144	88	245	0	0	0	134	0	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		0.88
Frt		0.98			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3465			3493				1770		2787
Flt Permitted		1.00			0.58				0.95		1.00
Satd. Flow (perm)		3465			2039				1770		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	967	157	96	266	0	0	0	146	0	207
RTOR Reduction (vph)	0	8	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1116	0	0	362	0	0	0	146	0	207
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		90.7			90.7				15.3		15.3
Effective Green, g (s)		90.7			90.7				15.3		15.3
Actuated g/C Ratio		0.76			0.76				0.13		0.13
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		2618			1541				225		355
v/s Ratio Prot		c0.32							c0.08		0.07
v/s Ratio Perm					0.18						
v/c Ratio		0.43			0.23				0.65		0.58
Uniform Delay, d1		5.3			4.3				49.8		49.3
Progression Factor		0.64			1.00				1.00		1.00
Incremental Delay, d2		0.4			0.4				6.3		2.4
Delay (s)		3.8			4.7				56.1		51.8
Level of Service		A			A				E		D
Approach Delay (s)		3.8			4.7		0.0			53.6	
Approach LOS		A			A		A			D	

Intersection Summary		
HCM 2000 Control Delay	13.5	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.46	B
Actuated Cycle Length (s)	120.0	Sum of lost time (s)
Intersection Capacity Utilization	60.9%	14.0
Analysis Period (min)	15	ICU Level of Service
		B

c Critical Lane Group

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1124	362	146	207
v/c Ratio	0.43	0.23	0.65	0.58
Control Delay	3.9	5.2	62.6	55.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	3.9	5.2	62.6	55.5
Queue Length 50th (ft)	59	37	109	86
Queue Length 95th (ft)	123	66	171	125
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	2627	1541	398	627
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.43	0.23	0.37	0.33
Intersection Summary				

**2040 Scenario 2 Mitigation Condition
PM Synchro Reports**

HCM Signalized Intersection Capacity Analysis
 26: Columbia Pike & Route 27 ramps

04/10/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SWL2	SWL	SWR
Lane Configurations		↑↑			↑↑				↑		↑↑
Traffic Volume (vph)	0	778	279	128	375	0	0	0	119	0	760
Future Volume (vph)	0	778	279	128	375	0	0	0	119	0	760
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		7.0			7.0				7.0		7.0
Lane Util. Factor		0.95			0.95				1.00		0.88
Frt		0.96			1.00				1.00		0.85
Flt Protected		1.00			0.99				0.95		1.00
Satd. Flow (prot)		3399			3495				1770		2787
Flt Permitted		1.00			0.51				0.95		1.00
Satd. Flow (perm)		3399			1799				1770		2787
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	846	303	139	408	0	0	0	129	0	826
RTOR Reduction (vph)	0	26	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1123	0	0	547	0	0	0	129	0	826
Turn Type		NA		Perm	NA				Prot		Prot
Protected Phases		2			6				8		8
Permitted Phases				6							
Actuated Green, G (s)		63.4			63.4				42.6		42.6
Effective Green, g (s)		63.4			63.4				42.6		42.6
Actuated g/C Ratio		0.53			0.53				0.36		0.36
Clearance Time (s)		7.0			7.0				7.0		7.0
Vehicle Extension (s)		3.0			3.0				3.0		3.0
Lane Grp Cap (vph)		1795			950				628		989
v/s Ratio Prot		c0.33							0.07		c0.30
v/s Ratio Perm					0.30						
v/c Ratio		0.63			0.87dl				0.21		0.84
Uniform Delay, d1		19.9			19.2				26.9		35.5
Progression Factor		0.85			1.00				1.00		1.00
Incremental Delay, d2		1.1			2.5				0.2		6.2
Delay (s)		18.0			21.7				27.1		41.7
Level of Service		B			C				C		D
Approach Delay (s)		18.0			21.7		0.0			39.7	
Approach LOS		B			C		A			D	

Intersection Summary			
HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

c Critical Lane Group

Queues

26: Columbia Pike & Route 27 ramps

04/10/2019



Lane Group	EBT	WBT	SWL2	SWR
Lane Group Flow (vph)	1149	547	129	826
v/c Ratio	0.63	0.87dl	0.21	0.84
Control Delay	18.3	23.7	26.3	43.3
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	18.3	23.7	26.3	43.3
Queue Length 50th (ft)	267	146	69	330
Queue Length 95th (ft)	414	237	103	374
Internal Link Dist (ft)	257	259		
Turn Bay Length (ft)				300
Base Capacity (vph)	1821	950	767	1207
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.63	0.58	0.17	0.68

Intersection Summary

dl Defacto Left Lane. Recode with 1 though lane as a left lane.

APPENDIX D: Signal Warrant Analysis

Intersection 1 - Columbia Pike and Nash Street

Warrant 1: ADT Volumes
Average Daily Volume

Location	ADT				
	Direction	ADT 2015	Growth %	Growth Rate	ADT 2040
Columbia Pike West of Joyce	EB	5,267	1.80%	1.56	8,227
Columbia Pike West of Joyce	WB	5,087	1.94%	1.62	8,224
Southgate north of Col. Pike	SB	1,278	1.96%	1.62	2,076
Southgate north of Col. Pike	NB	1,349	1.10%	1.31	1,773

Warrant 1 (Condition B): Using Average Daily Traffic Estimate

Intersections (Major Street/ Minor Street)	Major Street No. of lanes	Minor Street No. of lanes	VPD on Major Street (Total Both Approaches)	VPD on Minor Street (one direction only)	Warrant 1 met (Y/N)
Columbia Pike and Nash	2	1	16,451	8,227	Y

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per day on major street (total of both approaches)				Vehicles per day on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	12,000	9,600	8,400	6,720	1,200	960	850	680
2 or more	1	14,400	11,520	10,080	8,064	1,200	960	850	680
2 or more	2 or more	14,400	11,520	10,080	8,064	1,600	1,280	1,120	896
1	2 or more	12,000	9,600	8,400	6,720	1,600	1,280	1,120	896

- Warrant provided by Virginia Supplement to the 2009 MUTCD – Revision 1

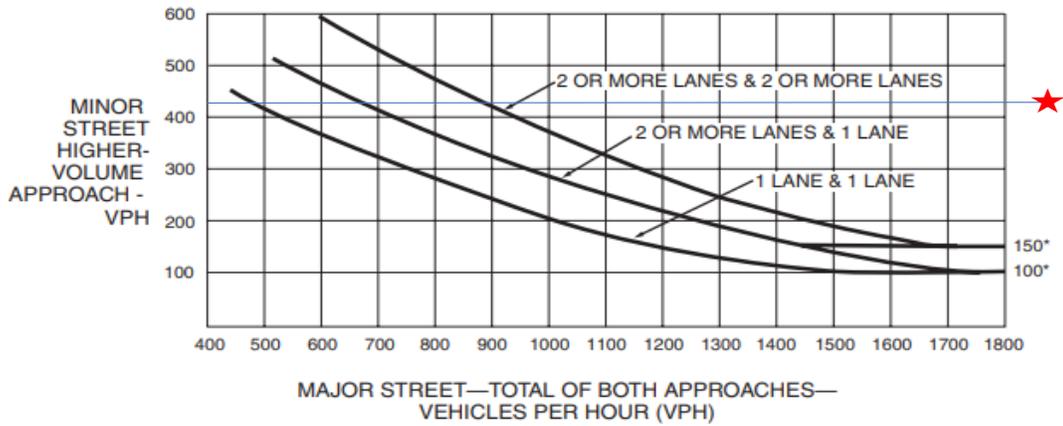
- Data obtained from Columbia Pike / Washington Boulevard Interchange Modification Report, August 2017.

Intersection 1 - Columbia Pike and Nash Street

Warrant 3: Peak Hour Volumes

Peak Hour Volume Information			
	Direction	Peak Hour	Volume
Columbia Pike and Nash	EB	PM	597
	WB	PM	1,728
	SB	PM	425

Intersections (Major Street/ Minor Street)	Major Street No. of lanes	Minor Street No. of lanes	Peak Hour Volume on Major Street (Total Both Approaches)	Peak Hour Volume on Minor Street (highest vol.)	Warrant 3 met (Y/N)
Columbia Pike and Nash	2	1	2,325	425	Y



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

- Warrant provided by Virginia Supplement to the 2009 MUTCD – Revision 1
- Data obtained from Columbia Pike / Washington Boulevard Interchange Modification Report, August 2017.

Warrant 1: ADT Volumes

Average Daily Volume					
Location	Direction	ADT 2015	Growth %	Growth Rate	ADT 2040
Columbia Pike East of Joyce	EB	6,640	0.82%	1.23	8,144
Columbia Pike East of Joyce	WB	4,600	1.82%	1.57	7,221
Columbia Pike/Wash. Boulevard Interchange SB	SB	28,093	0.40%	1.10	31,041

Warrant 1 (Condition B): Using Average Daily Traffic Estimate

Intersections (Major Street/ Minor Street)	Major Street No. of lanes	Minor Street No. of lanes	VPD on Major Street (Total Both Approaches)	VPD on Minor Street (one direction only)	Warrant 1 met (Y/N)
Columbia Pike and Route 27	2	2	15,365	31,041	Y

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per day on major street (total of both approaches)				Vehicles per day on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d
1	1	12,000	9,600	8,400	6,720	1,200	960	850	680
2 or more	1	14,400	11,520	10,080	8,064	1,200	960	850	680
2 or more	2 or more	14,400	11,520	10,080	8,064	1,600	1,280	1,120	896
1	2 or more	12,000	9,600	8,400	6,720	1,600	1,280	1,120	896

- Warrant provided by Virginia Supplement to the 2009 MUTCD – Revision 1

- Data obtained from Columbia Pike / Washington Boulevard Interchange Modification Report, August 2017.

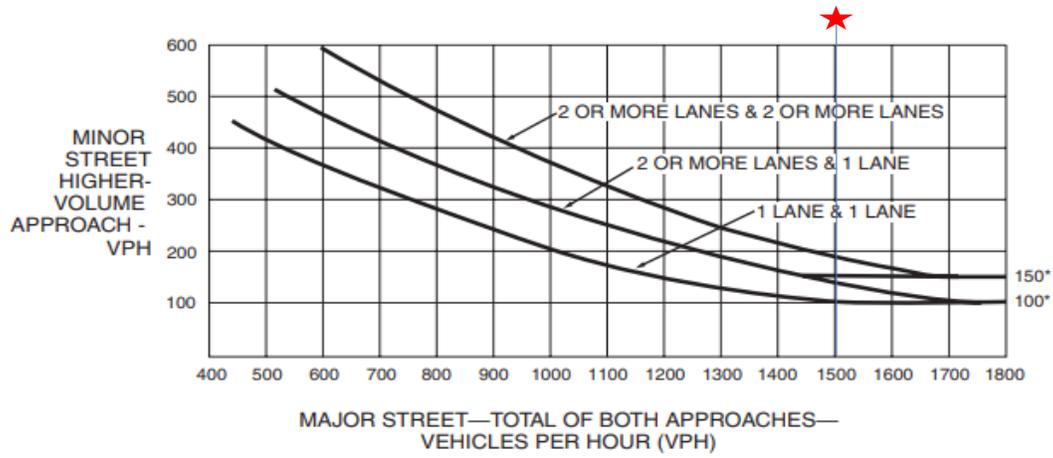
Prepared for Arlington County.

Intersection 7 - Columbia Pike and Route 27

Warrant 3: Peak Hour Volumes

Peak Hour Volume Information			
	Direction	Peak Hour	Volume
Columbia Pike and Route 27 ramps	EB	PM	999
	WB	PM	507
	SB	PM	888

Intersections (Major Street/ Minor Street)	Major Street No. of lanes	Minor Street No. of lanes	Peak Hour Volume on Major Street (Total Both Approaches)	Peak Hour Volume on Minor Street (highest vol.)	Warrant 3 met (Y/N)
Columbia Pike and Route 27	2	2	1,506	888	Y



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

- Warrant provided by Virginia Supplement to the 2009 MUTCD – Revision 1
 - Data obtained from Columbia Pike / Washington Boulevard Interchange Modification Report, August 2017.
- Prepared for Arlington County.

Intersection 4 - Crosswalk at Columbia Pike and AFM

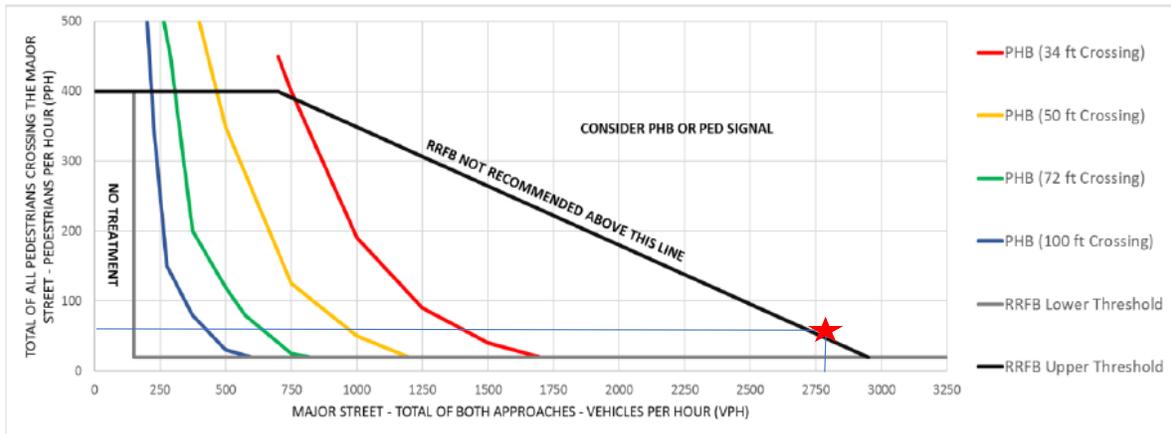
Pedestrian Hybrid Beacon Warrant

Peak Hour Volume			
	Direction	Period	Volume
Columbia Pike West of Joyce	EB	AM	932
		PM	1062
Columbia Pike West of Joyce	WB	AM	550
		PM	1701

Daily Volume		
	Direction	Volume
Columbia Pike West of Joyce	EB	8,227
	WB	8,224
	Total	16,451

VDOT Supplemental Guidelines (IIM-TE-384.0, Section 7.3)				
Intersections (Major Street/ Minor Street)	Major Street No. of lanes	Peak Hour (PM) Volume on Major Street (Total EB/WB)	Peak Hour Volume on Minor Street (pph)	Warrant met (Y/N)
Columbia Pike and AFM Crosswalk	2	2,763	50	Y

IIM-TE-384.0, Figure 1: Installation of RRFBs and PHBs on Low Speed Roadways (speed limit ≤ 35 mph)



- (RRFBs) Rectangular Rapid Flashing Beacons
- (PHBs) Pedestrian Hybrid Beacons