APPENDIX A – AGENCY COORDINATION

Request for Early Input

Environmental Assessment
Proposed Action and Alternatives for the Distribution Center at
Fort Belvoir, Virginia

All Interested Parties: The U.S. Army Garrison, Fort Belvoir, Virginia is preparing an Environmental Assessment (EA) for the construction and operation of a distribution center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia, pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality (CEQ) regulations that implement NEPA (40 Code of Federal Regulations [CFR] 1500-1508), and 32 CFR Part 651, *Environmental Analysis of Army Actions*. An EA is used as a planning document to assess environmental impacts, evaluate their significance, develop alternatives and mitigation measures, and allow for agency and public participation (32 CFR 651.20).

The EA is being prepared to evaluate the environmental impacts associated with the **Proposed Action** to build and operate a distribution center at FBNA. The project will modernize logistical operations and address safety, security, and operational concerns specific to the warehouse and its administrative functions. The project is needed to support the delivery and receipt of materials within and across the Washington Metropolitan Area, requiring a site within the National Capital Region to achieve distribution efficiencies.

The **Proposed Action** involves the construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage at FBNA for approximately 600 personnel. The hours of operation will typically be between 6am and 4pm. The proposed site location is in a forested area surrounded by industrial land use, keeping the same type of activity that already exists within the FBNA fence line.

The EA will also consider a **No Action Alternative**, which would involve no construction and no distribution center. Although the **No Action Alternative** would not meet the purpose and need for the action, CEQ requires the analysis of the **No Action Alternative**, as it also provides a benchmark for enabling decision-makers to compare the magnitude of environmental effects of the **Proposed Action**.

In accordance with 40 CFR 1500-1508, the Army invites you to provide early input on the **Proposed Action** to be considered in our analysis of each alternative in the forthcoming EA. This notice is being distributed to organizations that may have an interest in the project. Information on the **Proposed Action** can be found on the project website at https://www.nab.usace.army.mil/FBNA/. Comments on the **Proposed Action** can be submitted through the project website or via email to FBNA@usace.army.mil.

Additionally, once the draft EA is completed, agencies and the public will have an opportunity to review and provide comments during a 30-day public review period, which will be announced in a notice published in local newspapers, the project website shown above, and the Fort Belvoir website at https://home.army.mil/belvoir/index.php/about/Garrison/directorate-public-works/environmental-division. Printed copies of the draft EA will be available in the local libraries: Fort Belvoir Library, Lorton Library, Kingstowne Library, Sherwood Regional Library, and Richard Byrd Library.

We appreciate your attention to this matter. Early input will be accepted for a period of 15 days,

beginning on the date of this notice. Should you require any additional information or have any questions, please contact the Fort Belvoir Directorate of Public Works-Environmental Division (DPW-ED) via phone at (703) 806-3193 or (703) 806-0020, during normal working business hours, Monday through Friday, 8:00 a.m. to 4:00 p.m.

December 22, 2021

Marc Holma
State Historic Preservation Officer
Office of Review and Compliance
Virginia Department of Historic Resources
2801 Kensington Avenue
Richmond, VA 23221

Re: Proposed Distribution Center on Fort Belvoir North Area (FBNA), Fort Belvoir, Virginia

Dear Mr. Holma:

U.S. Army Garrison Fort Belvoir would like to initiate formal Section 106 consultation with your office in accordance with Section 36 CFR § 800.3 of the Advisory Council on Historic Preservation's regulations implementing Section 106.

A project proponent is proposing the construction of a distribution center on FBNA, Fort Belvoir, Fairfax County, Virginia. The purpose of the project is to construct an approximately 525,000 square foot distribution center consolidated complex consisting of a high bay warehouse, a two-story administrative building, a truck maintenance/ refueling building, covered/enclosed storage buildings and an entry control facility (gate house and vehicle inspection). This facility will support the delivery and receipt of materials within and across the Washington Metropolitan Area, requiring close proximity within the National Capital Region to achieve distribution efficiencies. The action would also provide for compliance with Office of Management and Budget (OMB) guidance to identify "good stewardship of taxpayer resources" and increase joint site usage. The distribution center expects minimal truck traffic compared to a typical industrial distribution center.

The Area of Potential Effect (APE) for an undertaking generally includes the boundaries for ground disturbance for the project and the view shed. At this early stage in the analysis, the geographic boundaries of the APE for this undertaking are conservatively estimated to be the project boundary depicted in Figure 1-2, an approximately 160-acre site on the western portion of FBNA. The Army anticipates the APE would include areas where the construction and operation of the building may directly or indirectly cause changes in the character or use of historic properties.

Much of the area within the undertaking's limits of disturbance has been disturbed by previous construction. A comprehensive archaeological survey was completed for the FBNA (formerly known as the Engineering Proving Grounds) area in 1993, and no archaeological properties were present. Only one archaeological resource, an isolated prehistoric artifact, has been discovered on FBNA but evaluated as not eligible for the NRHP. A comprehensive architectural survey of all extant properties on FBNA was completed in 2006 and none were eligible for the National Register, nor listed on any state or local resister. Historic architectural resource surveys conducted

in support of the Fort Belvoir 2016 ICRMP have determined there were no architectural resources eligible for listing in the National Register on FBNA.

No known cultural or historic sites would be impacted by this undertaking. Should archaeological artifacts or features be encountered during construction, all construction activities in the immediate vicinity of the discovery would stop and VDHR would be contacted immediately to determine appropriate treatment.

Pursuant to Section 106 of the National Historic Preservation Act, 36 Code of Federal Regulations § 800, we request your participation and comments on the proposed undertaking.

Please provide written comments within 30 days from the date of this letter to Fort Belvoir contact information. If you need further information, please contact Catherine Roberts, Cultural Resource Program Manager, at 703-806-XXXX.

Belvoir Env office chief signature block

Enclosures:
Figure 1-1: Location Map of Fort Belvoir
Figure 1-2: Project Area for Proposed Action on FBNA

Figure 1-1 Fort Belvoir, Virginia

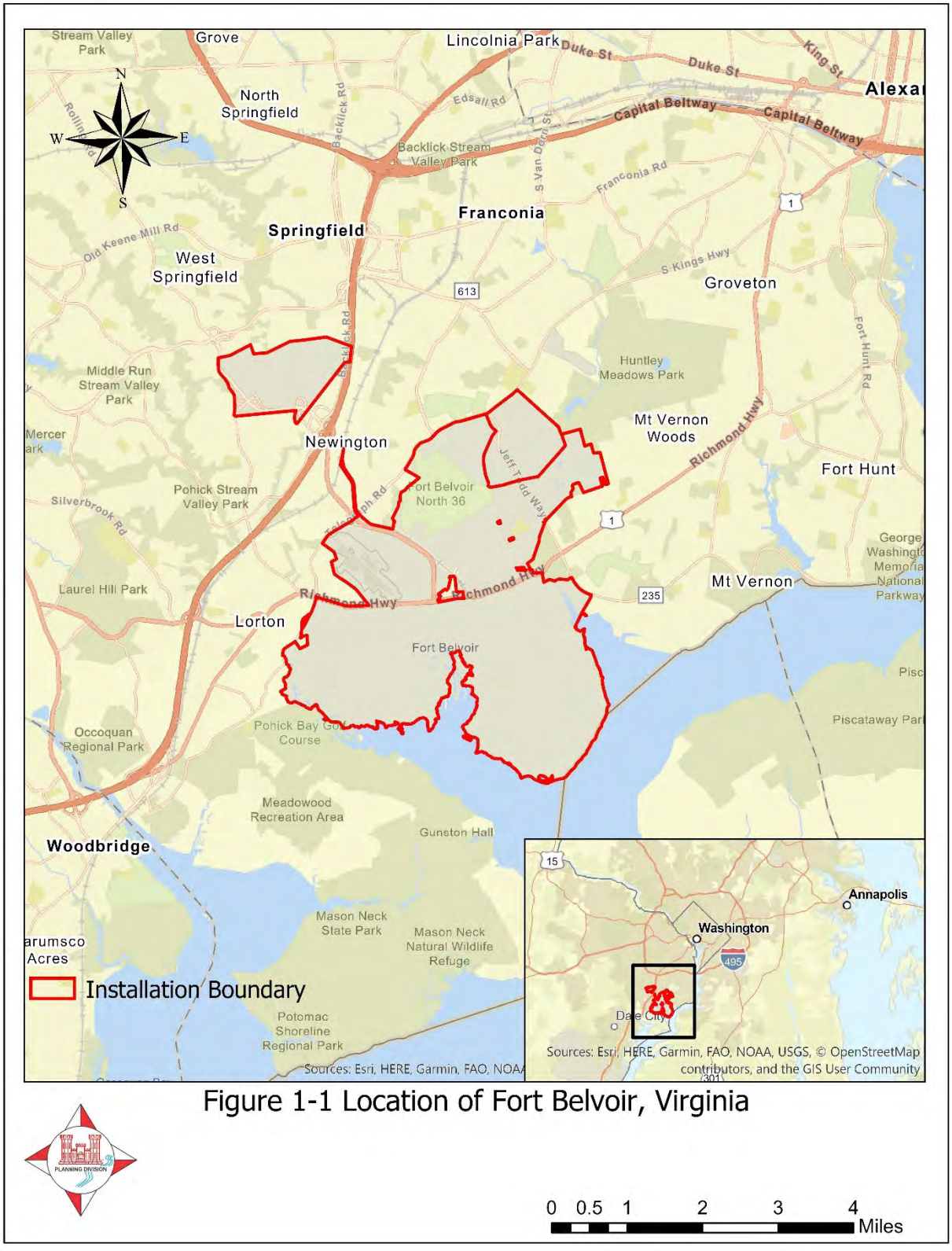


Figure 1-1 Location of Fort Belvoir, Virginia

Figure 1-2 Project Area for Proposed Action on FBNA

COMMONWEALTH of VIRGINIA

Department of Historic Resources

Travis A. Voyles
Acting Secretary of Natural and Historic Resources

2801 Kensington Avenue, Richmond, Virginia 23221

Julie V. Langan
Director
Tel: (804) 482-6446
Fax: (804) 367-2391
www.dhr.virginia.gov

MEMORANDUM

DATE: 21 June 2022 **DHR File #** 2022-4056

TO: Ms Catherine Roberts
ARMY

FROM: Marc E. Holma, Architectural Historian (804) 482-6090
Review and Compliance Division

PROJECT: Fort Belvoir North Area Distribution Center Draft Environmental Assessment
Fort Belvoir, Fairfax County

___ This project will have an effect on historic resources. Based on the information provided, the effect will not be adverse.

___ This project will have an adverse effect on historic properties. Further consultation with DHR is needed under Section 106 of the NHPA.

___ Additional information is needed before we will be able to determine the effect of the project on historic resources. **Please see below.**

_X_ No further identification efforts are warranted. No historic properties will be affected by the project. Should unidentified historic properties be discovered during implementation of the project, please notify DHR.

___ We have previously reviewed this project. Attached is a copy of our correspondence.

___ Other (Please see comments below)

COMMENTS:

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

Eastern Region Office
2801 Kensington Avenue
Richmond, VA 23221
Tel: (804) 367-2323
Fax: (804) 367-2391

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

Directorate of Public Works

Principal Chief Richard Sneed
Eastern Band of Cherokee Indians
P.O. Box 1927
Cherokee, NC 28719

Dear Chief Sneed:

The Army recognizes its responsibilities to maintain Government-to-Government relationship with all tribes affected by activities on Army Installations and our federal trust responsibility for those lands. In the interest of early and frequent communication under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, pursuant to 36 Code of Federal Regulations (CFR) Part 800.3(f)(2) and as part of the Department of Defense's policy for Government-to-Government consultation with Native American tribes, I am writing to inform you that the Army is beginning the scoping process to prepare an Environmental Assessment (EA) for the proposed construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage on Fort Belvoir's North Area (FBNA), Fort Belvoir, Virginia.

The Army will be preparing the EA under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500–1508), and the Army's regulations implementing NEPA (32 CFR Part 651). This project is in the early stages of planning. As soon as more detailed project information has been developed, formal tribal consultation will be initiated. Current information about the Proposed Action can be found on our website at the following: https://www.nab.usace.army.mil/ERCA/.

The purpose of this EA is to inform decision-makers, tribes, stakeholders, and the public of the potential environmental consequences and any associated mitigations, as applicable. Affected Native American tribes and interested persons, organizations, and agencies will have multiple opportunities to provide input on the proposed project. The following resources are evaluated in this EA: land use; airspace; noise; air quality; water resources; biological resources; cultural resources; geology, topography, and soils; hazardous and toxic materials and waste (HTMW); traffic and transportation; infrastructure and utilities; socioeconomics, environmental justice, and protection of children; and human health and safety.

Please note that scoping for the EA is expected to be conducted virtually due to the ongoing coronavirus (COVID-19) pandemic. Informational materials will be posted on the project website at https://www.nab.usace.army.mil/ERCA/.

At this early stage in the analysis, the geographic boundaries of the Area of Potential Effects (APE) for this undertaking are conservatively estimated to be the project boundary depicted in Figure 1. The Army anticipates the APE would include areas where the construction and operation of the building may directly or indirectly cause changes in the character or use of historic properties.

As we are beginning the analysis of the above-referenced resource areas, I would like to invite your input on the anticipated APE for this undertaking. As discussed previously, more information about specific project plans will be provided for review as they are developed to better assist in evaluating the impacts the proposed project may create. I understand that information that you provide on tribal religious or cultural items will be offered voluntarily in the spirit of assisting with our decision making for the project. Based on the available information regarding the proposed action, we welcome any information you would like to share that might be relevant to potential impacts and should be evaluated in the EA.

Any information pertaining to whether this action has the potential to affect tribal trust, subsistence, and/or cultural resources or if tribal rights and/or any protected resources may be affected by this proposed action would be greatly appreciated. Any general comments you may have on the proposed action and proposed alternatives, including discussing possible actions that would benefit your tribe, would also be welcome. I would be happy to answer any questions you may have about the project at this stage. Feel free to connect with me about the project via the contact information listed below. All information provided will be treated with the utmost confidentiality and in accordance with your wishes of how and whether this information can be used. I am also interested in locating any official tribal histories or historical reference materials that are more accurate and/or preferred by your tribe.

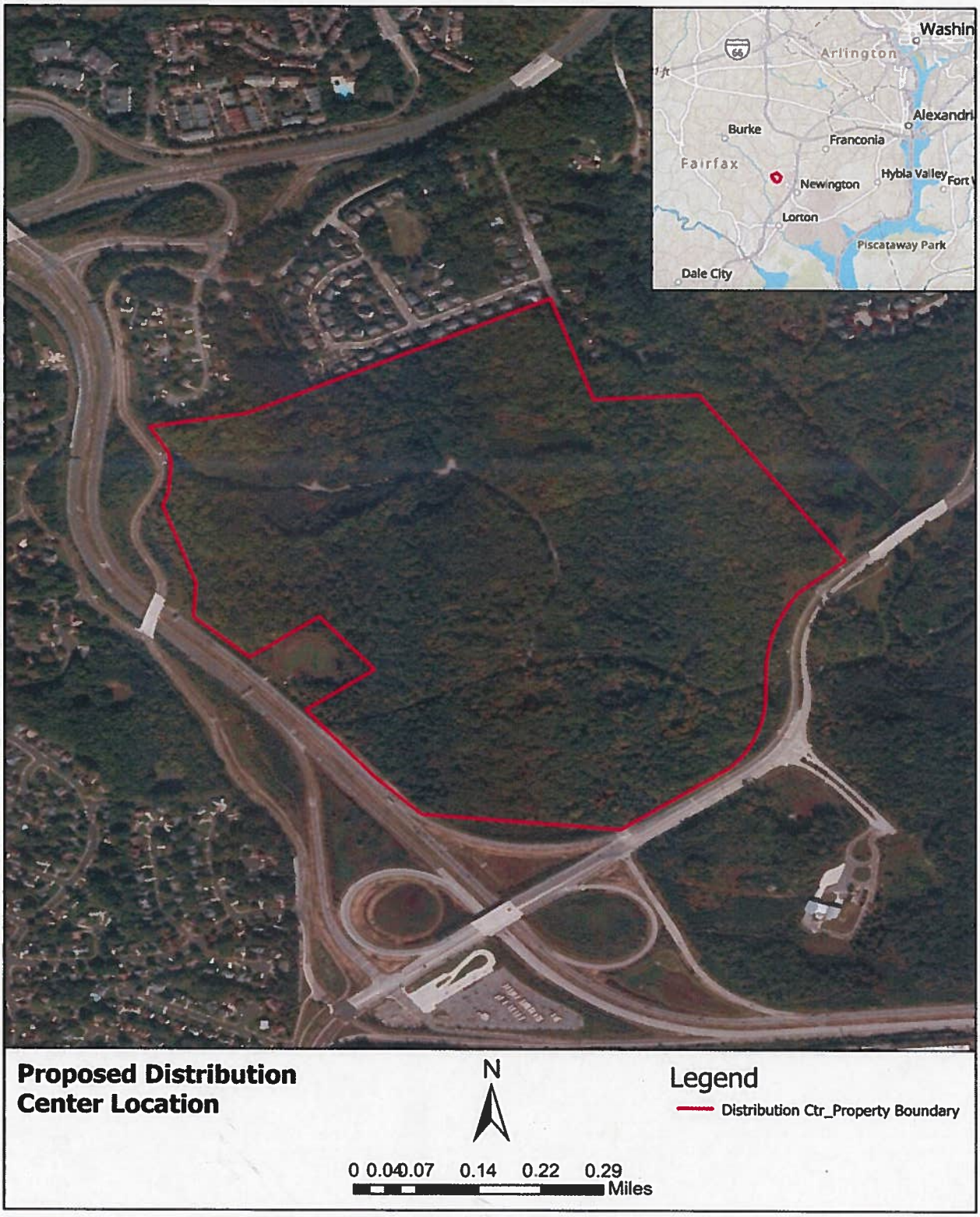
Determinations on the Army's process to identify historic properties within the APE and evaluation and effects determinations made in accordance with Section 106 of the NHPA will be made in consultation with all affected Native American tribes, as well as the State Historic Preservation Offices, and the interested public.

If you have questions or concerns, or require further information, please feel free to contact the Director of Public Works, Bradford Britain at bradford.d.britain.civ@army.mil or at (703) 806-3017.

Sincerely,

Joshua P. SeGraves
Colonel, U.S. Army
Commanding

Figure 1: Project Location Map



DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

Directorate of Public Works

Chief Kenneth Branham
Monacan Indian Nation
111 Highview Drive
Madison Heights, VA 24572

Dear Chief Branham:

The Army recognizes its responsibilities to maintain Government-to-Government relationship with all tribes affected by activities on Army Installations and our federal trust responsibility for those lands. In the interest of early and frequent communication under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, pursuant to 36 Code of Federal Regulations (CFR) Part 800.3(f)(2) and as part of the Department of Defense's policy for Government-to-Government consultation with Native American tribes, I am writing to inform you that the Army is beginning the scoping process to prepare an Environmental Assessment (EA) for the proposed construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage on Fort Belvoir's North Area (FBNA), Fort Belvoir, Virginia.

The Army will be preparing the EA under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500–1508), and the Army's regulations implementing NEPA (32 CFR Part 651). This project is in the early stages of planning. As soon as more detailed project information has been developed, formal tribal consultation will be initiated. Current information about the Proposed Action can be found on our website at the following: https://www.nab.usace.army.mil/ERCA/.

The purpose of this EA is to inform decision-makers, tribes, stakeholders, and the public of the potential environmental consequences and any associated mitigations, as applicable. Affected Native American tribes and interested persons, organizations, and agencies will have multiple opportunities to provide input on the proposed project. The following resources are evaluated in this EA: land use; airspace; noise; air quality; water resources; biological resources; cultural resources; geology, topography, and soils; hazardous and toxic materials and waste (HTMW); traffic and transportation; infrastructure and utilities; socioeconomics, environmental justice, and protection of children; and human health and safety.

Please note that scoping for the EA is expected to be conducted virtually due to the ongoing coronavirus (COVID-19) pandemic. Informational materials will be posted on the project website at https://www.nab.usace.army.mil/ERCA/.

At this early stage in the analysis, the geographic boundaries of the Area of Potential Effects (APE) for this undertaking are conservatively estimated to be the project boundary depicted in Figure 1. The Army anticipates the APE would include areas where the construction and operation of the building may directly or indirectly cause changes in the character or use of historic properties.

As we are beginning the analysis of the above-referenced resource areas, I would like to invite your input on the anticipated APE for this undertaking. As discussed previously, more information about specific project plans will be provided for review as they are developed to better assist in evaluating the impacts the proposed project may create. I understand that information that you provide on tribal religious or cultural items will be offered voluntarily in the spirit of assisting with our decision making for the project. Based on the available information regarding the proposed action, we welcome any information you would like to share that might be relevant to potential impacts and should be evaluated in the EA.

Any information pertaining to whether this action has the potential to affect tribal trust, subsistence, and/or cultural resources or if tribal rights and/or any protected resources may be affected by this proposed action would be greatly appreciated. Any general comments you may have on the proposed action and proposed alternatives, including discussing possible actions that would benefit your tribe, would also be welcome. I would be happy to answer any questions you may have about the project at this stage. Feel free to connect with me about the project via the contact information listed below. All information provided will be treated with the utmost confidentiality and in accordance with your wishes of how and whether this information can be used. I am also interested in locating any official tribal histories or historical reference materials that are more accurate and/or preferred by your tribe.

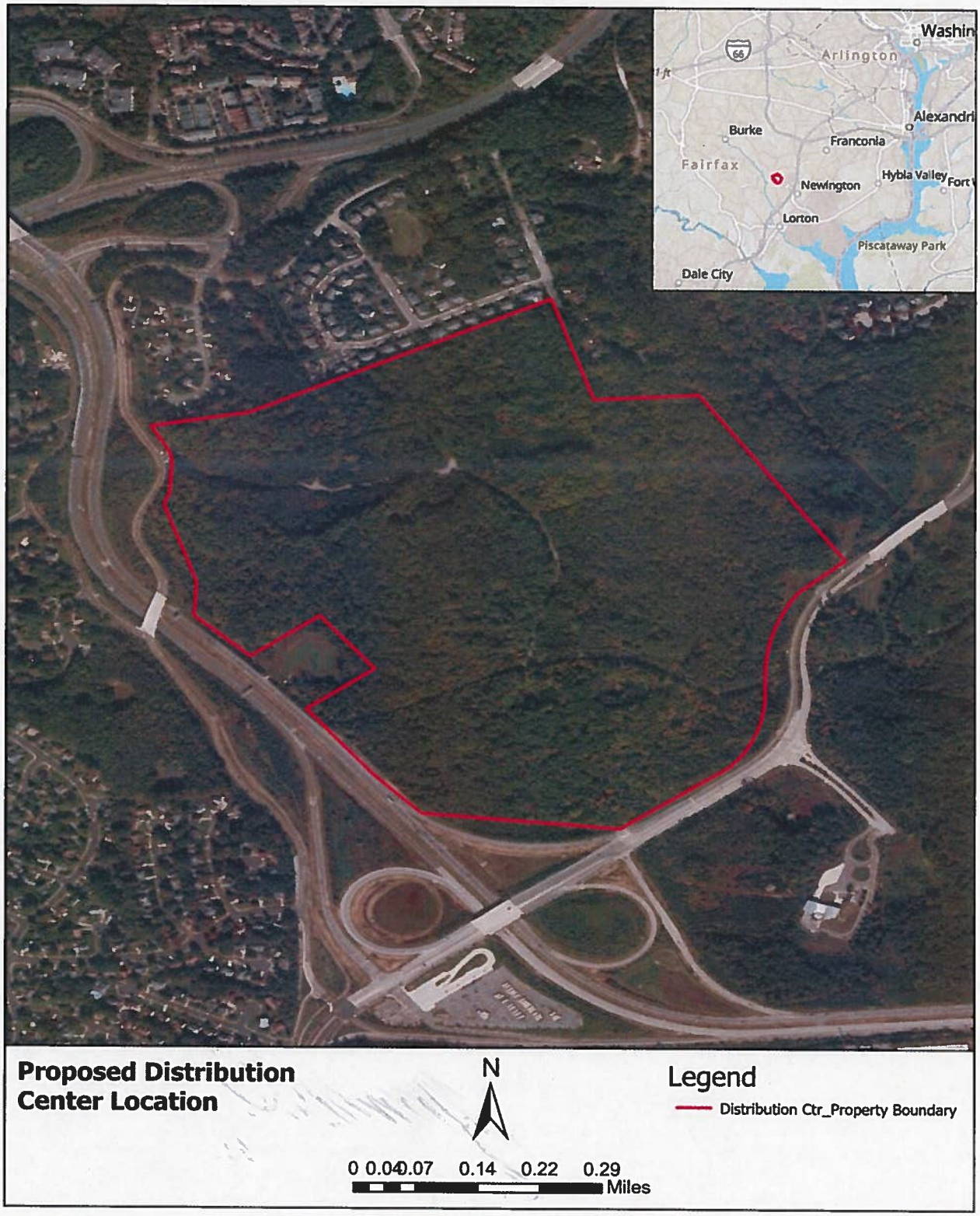
Determinations on the Army's process to identify historic properties within the APE and evaluation and effects determinations made in accordance with Section 106 of the NHPA will be made in consultation with all affected Native American tribes, as well as the State Historic Preservation Offices, and the interested public.

If you have questions or concerns, or require further information, please feel free to contact the Director of Public Works, Bradford Britain at bradford.d.britain.civ@army.mil or at (703) 806-3017.

Sincerely,

Joshua P. SeGraves
Colonel, U.S. Army
Commanding

Figure 1: Project Location Map



DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

Directorate of Public Works

Chief Earl L. Bass
Nansemond Indian Nation
1001 Pembroke Lane
Suffolk, VA 23434

Dear Chief Bass:

The Army recognizes its responsibilities to maintain Government-to-Government relationship with all tribes affected by activities on Army Installations and our federal trust responsibility for those lands. In the interest of early and frequent communication under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, pursuant to 36 Code of Federal Regulations (CFR) Part 800.3(f)(2) and as part of the Department of Defense's policy for Government-to-Government consultation with Native American tribes, I am writing to inform you that the Army is beginning the scoping process to prepare an Environmental Assessment (EA) for the proposed construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage on Fort Belvoir's North Area (FBNA), Fort Belvoir, Virginia.

The Army will be preparing the EA under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500–1508), and the Army's regulations implementing NEPA (32 CFR Part 651). This project is in the early stages of planning. As soon as more detailed project information has been developed, formal tribal consultation will be initiated. Current information about the Proposed Action can be found on our website at the following: https://www.nab.usace.army.mil/ERCA/.

The purpose of this EA is to inform decision-makers, tribes, stakeholders, and the public of the potential environmental consequences and any associated mitigations, as applicable. Affected Native American tribes and interested persons, organizations, and agencies will have multiple opportunities to provide input on the proposed project. The following resources are evaluated in this EA: land use; airspace; noise; air quality; water resources; biological resources; cultural resources; geology, topography, and soils; hazardous and toxic materials and waste (HTMW); traffic and transportation; infrastructure and utilities; socioeconomics, environmental justice, and protection of children; and human health and safety.

Please note that scoping for the EA is expected to be conducted virtually due to the ongoing coronavirus (COVID-19) pandemic. Informational materials will be posted on the project website at https://www.nab.usace.army.mil/ERCA/.

At this early stage in the analysis, the geographic boundaries of the Area of Potential Effects (APE) for this undertaking are conservatively estimated to be the project boundary depicted in Figure 1. The Army anticipates the APE would include areas where the construction and operation of the building may directly or indirectly cause changes in the character or use of historic properties.

As we are beginning the analysis of the above-referenced resource areas, I would like to invite your input on the anticipated APE for this undertaking. As discussed previously, more information about specific project plans will be provided for review as they are developed to better assist in evaluating the impacts the proposed project may create. I understand that information that you provide on tribal religious or cultural items will be offered voluntarily in the spirit of assisting with our decision making for the project. Based on the available information regarding the proposed action, we welcome any information you would like to share that might be relevant to potential impacts and should be evaluated in the EA.

Any information pertaining to whether this action has the potential to affect tribal trust, subsistence, and/or cultural resources or if tribal rights and/or any protected resources may be affected by this proposed action would be greatly appreciated. Any general comments you may have on the proposed action and proposed alternatives, including discussing possible actions that would benefit your tribe, would also be welcome. I would be happy to answer any questions you may have about the project at this stage. Feel free to connect with me about the project via the contact information listed below. All information provided will be treated with the utmost confidentiality and in accordance with your wishes of how and whether this information can be used. I am also interested in locating any official tribal histories or historical reference materials that are more accurate and/or preferred by your tribe.

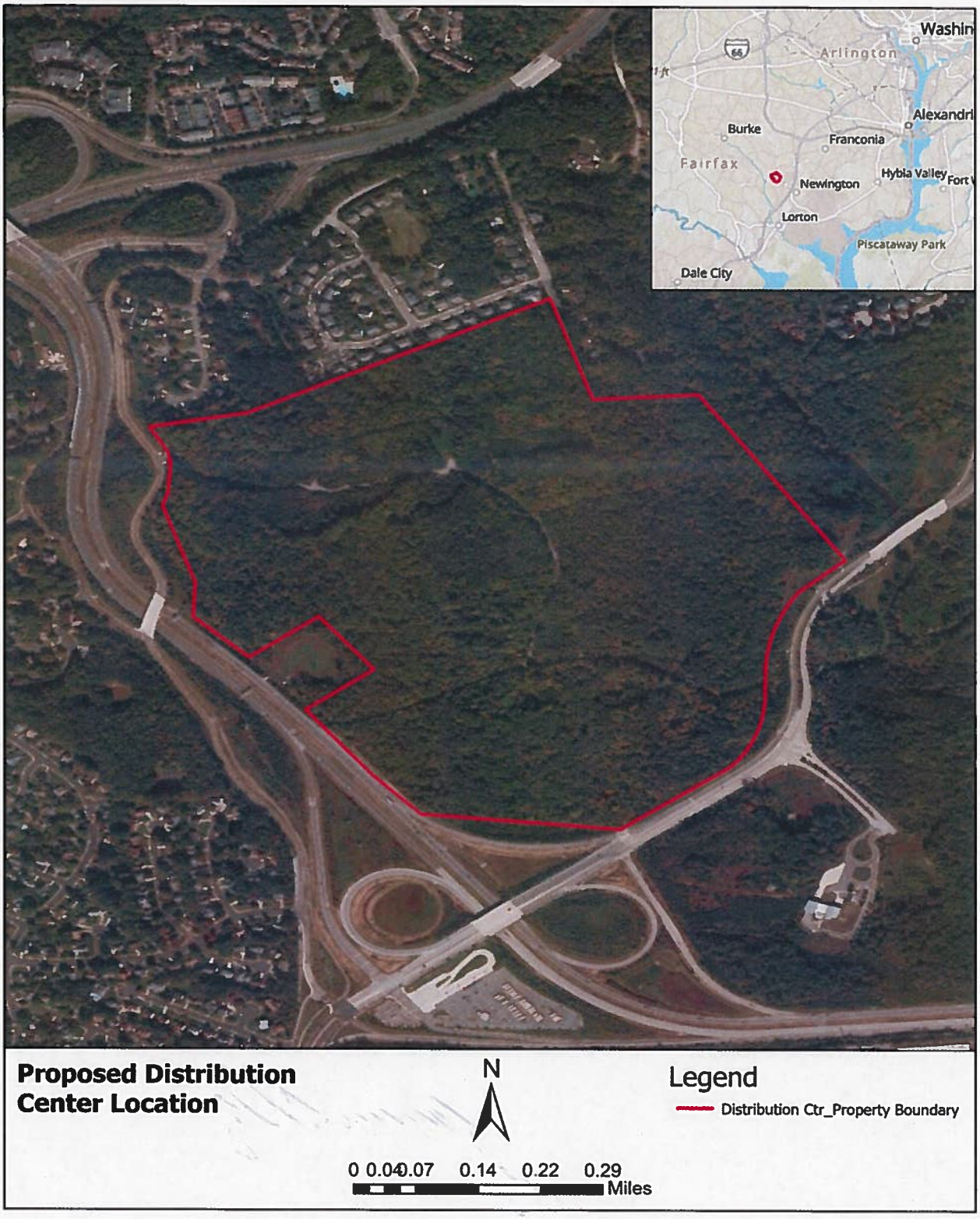
Determinations on the Army's process to identify historic properties within the APE and evaluation and effects determinations made in accordance with Section 106 of the NHPA will be made in consultation with all affected Native American tribes, as well as the State Historic Preservation Offices, and the interested public.

If you have questions or concerns, or require further information, please feel free to contact the Director of Public Works, Bradford Britain at bradford.d.britain.civ@army.mil or at (703) 806-3017.

Sincerely,

Joshua P. SeGraves
Colonel, U.S. Army
Commanding

Figure 1: Project Location Map



DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

Directorate of Public Works

Chief Robert Gray
Pamunkey Indian Tribe
1054 Pocahontas Trail
King William, VA 23086

Dear Chief Gray:

The Army recognizes its responsibilities to maintain Government-to-Government relationship with all tribes affected by activities on Army Installations and our federal trust responsibility for those lands. In the interest of early and frequent communication under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, pursuant to 36 Code of Federal Regulations (CFR) Part 800.3(f)(2) and as part of the Department of Defense's policy for Government-to-Government consultation with Native American tribes, I am writing to inform you that the Army is beginning the scoping process to prepare an Environmental Assessment (EA) for the proposed construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage on Fort Belvoir's North Area (FBNA), Fort Belvoir, Virginia.

The Army will be preparing the EA under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500–1508), and the Army's regulations implementing NEPA (32 CFR Part 651). This project is in the early stages of planning. As soon as more detailed project information has been developed, formal tribal consultation will be initiated. Current information about the Proposed Action can be found on our website at the following: https://www.nab.usace.army.mil/ERCA/.

The purpose of this EA is to inform decision-makers, tribes, stakeholders, and the public of the potential environmental consequences and any associated mitigations, as applicable. Affected Native American tribes and interested persons, organizations, and agencies will have multiple opportunities to provide input on the proposed project. The following resources are evaluated in this EA: land use; airspace; noise; air quality; water resources; biological resources; cultural resources; geology, topography, and soils; hazardous and toxic materials and waste (HTMW); traffic and transportation; infrastructure and utilities; socioeconomics, environmental justice, and protection of children; and human health and safety.

Please note that scoping for the EA is expected to be conducted virtually due to the ongoing coronavirus (COVID-19) pandemic. Informational materials will be posted on the project website at https://www.nab.usace.army.mil/ERCA/.

At this early stage in the analysis, the geographic boundaries of the Area of Potential Effects (APE) for this undertaking are conservatively estimated to be the project boundary depicted in Figure 1. The Army anticipates the APE would include areas where the construction and operation of the building may directly or indirectly cause changes in the character or use of historic properties.

As we are beginning the analysis of the above-referenced resource areas, I would like to invite your input on the anticipated APE for this undertaking. As discussed previously, more information about specific project plans will be provided for review as they are developed to better assist in evaluating the impacts the proposed project may create. I understand that information that you provide on tribal religious or cultural items will be offered voluntarily in the spirit of assisting with our decision making for the project. Based on the available information regarding the proposed action, we welcome any information you would like to share that might be relevant to potential impacts and should be evaluated in the EA.

Any information pertaining to whether this action has the potential to affect tribal trust, subsistence, and/or cultural resources or if tribal rights and/or any protected resources may be affected by this proposed action would be greatly appreciated. Any general comments you may have on the proposed action and proposed alternatives, including discussing possible actions that would benefit your tribe, would also be welcome. I would be happy to answer any questions you may have about the project at this stage. Feel free to connect with me about the project via the contact information listed below. All information provided will be treated with the utmost confidentiality and in accordance with your wishes of how and whether this information can be used. I am also interested in locating any official tribal histories or historical reference materials that are more accurate and/or preferred by your tribe.

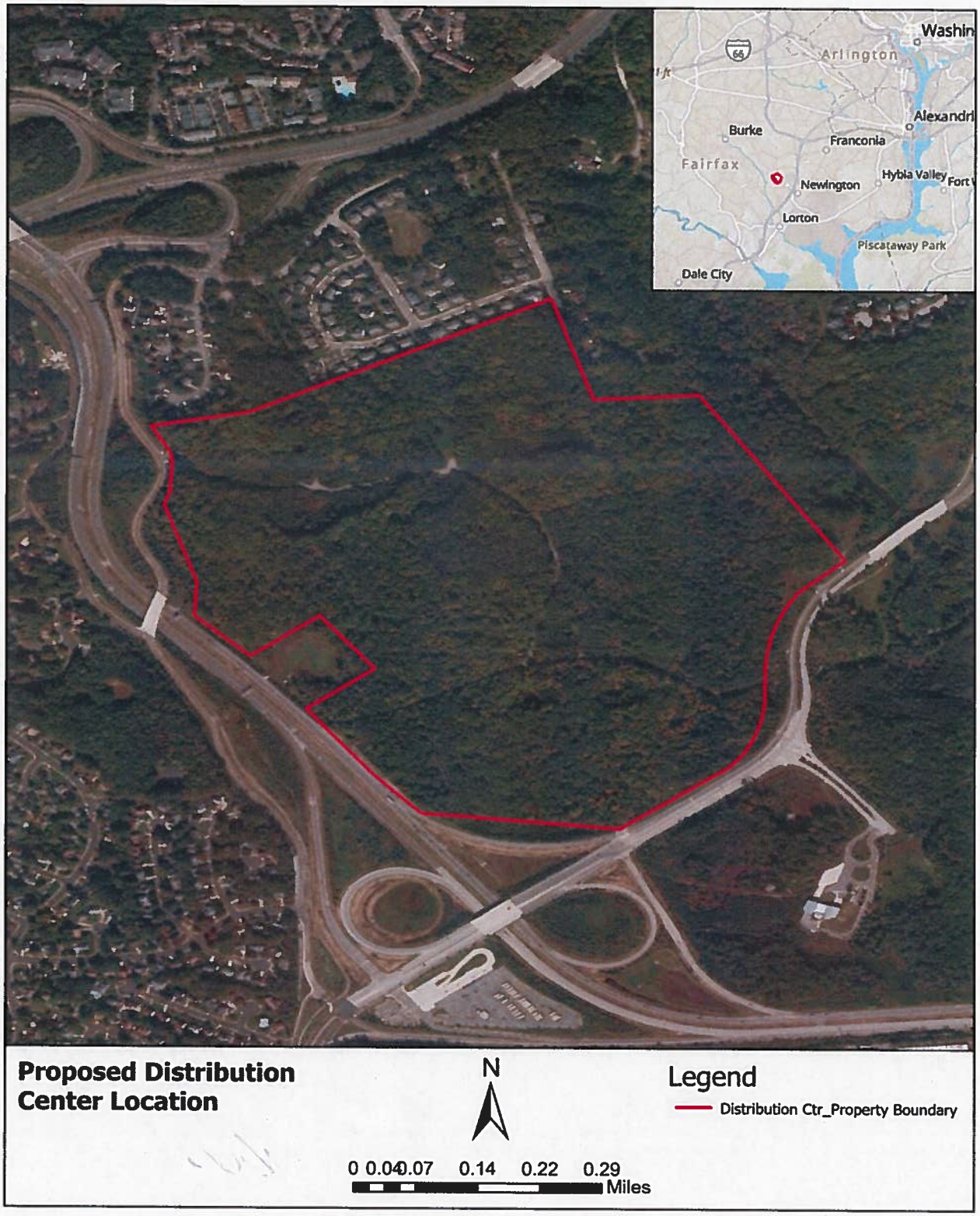
Determinations on the Army's process to identify historic properties within the APE and evaluation and effects determinations made in accordance with Section 106 of the NHPA will be made in consultation with all affected Native American tribes, as well as the State Historic Preservation Offices, and the interested public.

If you have questions or concerns, or require further information, please feel free to contact the Director of Public Works, Bradford Britain at bradford.d.britain.civ@army.mil or at (703) 806-3017.

Sincerely,

Joshua P. SeGraves
Colonel, U.S. Army
Commanding

Figure 1: Project Location Map



DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT BELVOIR
9820 FLAGLER ROAD, SUITE 213
FORT BELVOIR, VIRGINIA 22060-5928

Directorate of Public Works

Chief W. Frank Adams
Upper Mattaponi Tribe
13476 King William Road
King William, VA 23086

Dear Chief Adams:

The Army recognizes its responsibilities to maintain Government-to-Government relationship with all tribes affected by activities on Army Installations and our federal trust responsibility for those lands. In the interest of early and frequent communication under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, pursuant to 36 Code of Federal Regulations (CFR) Part 800.3(f)(2) and as part of the Department of Defense's policy for Government-to-Government consultation with Native American tribes, I am writing to inform you that the Army is beginning the scoping process to prepare an Environmental Assessment (EA) for the proposed construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage on Fort Belvoir's North Area (FBNA), Fort Belvoir, Virginia.

The Army will be preparing the EA under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500–1508), and the Army's regulations implementing NEPA (32 CFR Part 651). This project is in the early stages of planning. As soon as more detailed project information has been developed, formal tribal consultation will be initiated. Current information about the Proposed Action can be found on our website at the following: https://www.nab.usace.army.mil/ERCA/.

The purpose of this EA is to inform decision-makers, tribes, stakeholders, and the public of the potential environmental consequences and any associated mitigations, as applicable. Affected Native American tribes and interested persons, organizations, and agencies will have multiple opportunities to provide input on the proposed project. The following resources are evaluated in this EA: land use; airspace; noise; air quality; water resources; biological resources; cultural resources; geology, topography, and soils; hazardous and toxic materials and waste (HTMW); traffic and transportation; infrastructure and utilities; socioeconomics, environmental justice, and protection of children; and human health and safety.

Please note that scoping for the EA is expected to be conducted virtually due to the ongoing coronavirus (COVID-19) pandemic. Informational materials will be posted on the project website at https://www.nab.usace.army.mil/ERCA/.

At this early stage in the analysis, the geographic boundaries of the Area of Potential Effects (APE) for this undertaking are conservatively estimated to be the project boundary depicted in Figure 1. The Army anticipates the APE would include areas where the construction and operation of the building may directly or indirectly cause changes in the character or use of historic properties.

As we are beginning the analysis of the above-referenced resource areas, I would like to invite your input on the anticipated APE for this undertaking. As discussed previously, more information about specific project plans will be provided for review as they are developed to better assist in evaluating the impacts the proposed project may create. I understand that information that you provide on tribal religious or cultural items will be offered voluntarily in the spirit of assisting with our decision making for the project. Based on the available information regarding the proposed action, we welcome any information you would like to share that might be relevant to potential impacts and should be evaluated in the EA.

Any information pertaining to whether this action has the potential to affect tribal trust, subsistence, and/or cultural resources or if tribal rights and/or any protected resources may be affected by this proposed action would be greatly appreciated. Any general comments you may have on the proposed action and proposed alternatives, including discussing possible actions that would benefit your tribe, would also be welcome. I would be happy to answer any questions you may have about the project at this stage. Feel free to connect with me about the project via the contact information listed below. All information provided will be treated with the utmost confidentiality and in accordance with your wishes of how and whether this information can be used. I am also interested in locating any official tribal histories or historical reference materials that are more accurate and/or preferred by your tribe.

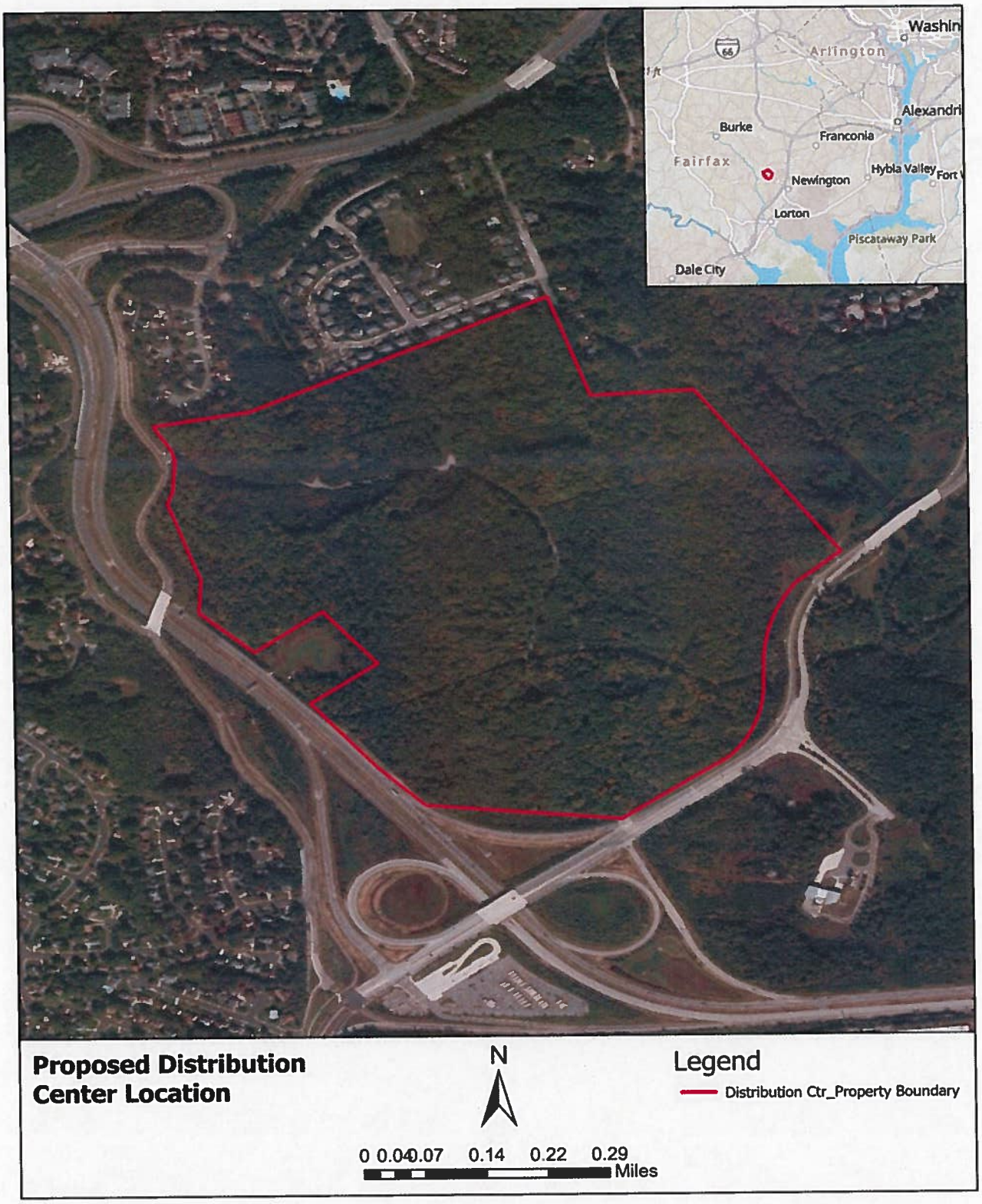
Determinations on the Army's process to identify historic properties within the APE and evaluation and effects determinations made in accordance with Section 106 of the NHPA will be made in consultation with all affected Native American tribes, as well as the State Historic Preservation Offices, and the interested public.

If you have questions or concerns, or require further information, please feel free to contact the Director of Public Works, Bradford Britain at bradford.d.britain.civ@army.mil or at (703) 806-3017.

Sincerely,

Joshua P. SeGraves
Colonel, U.S. Army
Commanding

Figure 1: Project Location Map



FORT BELVOIR LETTERHEAD

December 22, 2021

Ms. Genevieve LaRouche
Field Supervisor
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401

Dear Ms. LaRouche,

The purpose of this letter is to initiate consultation with your office under Section 7 of the Endangered Species Act for a proposed undertaking by a project proponent to construct a distribution center on Fort Belvoir's North Area, Fort Belvoir, Fairfax County, Virginia (Enclosure 1).

The purpose of the project is to construct an approximately 525,000 square foot distribution center consolidated complex consisting of a high bay warehouse, a two-story administrative building, a truck maintenance/ refueling building, covered/enclosed storage buildings and an entry control facility (gate house and vehicle inspection) (Figure 1). The project will also require new electrical, water, gas, sanitary sewer lines; information systems distribution; lighting; parking; curb and gutter; sidewalks; storm drainage; landscaping; and other site improvements.

This facility will support the delivery and receipt of materials within and across the Washington Metropolitan Area, requiring close proximity within the National Capital Region to achieve distribution efficiencies. The action would also provide for compliance with Office of Management and Budget (OMB) guidance to identify "good stewardship of taxpayer resources" and increase joint site usage. The distribution center expects minimal truck traffic compared to a typical industrial distribution center.

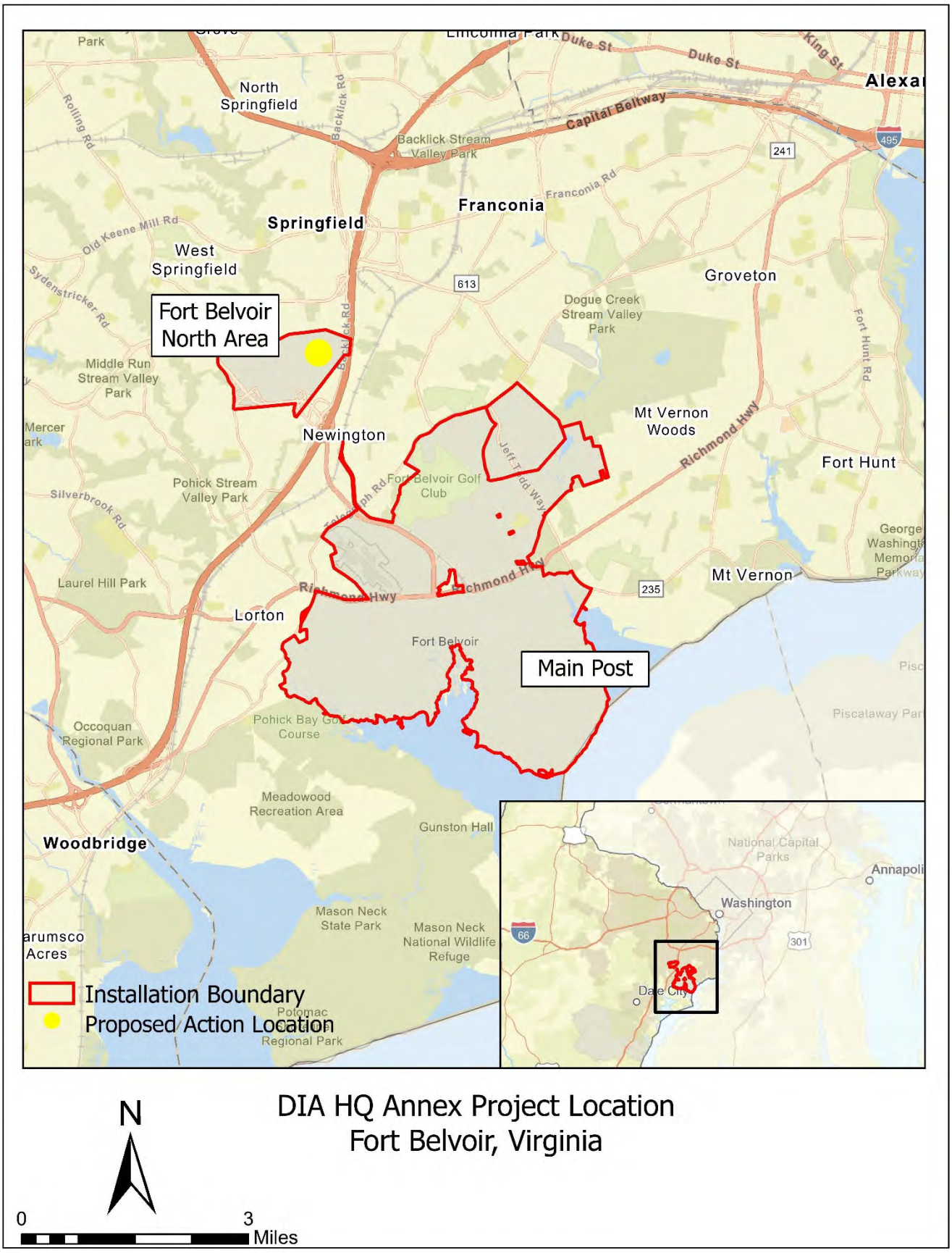
Fort Belvoir obtained an Official Species List and Self-Certification Letter from the U.S. Fish & Wildlife Service's Information for Planning and Consultation (IPaC) website for the proposed project (Enclosures 3 and 4). We request any additional information your office may have on the presence of federally protected animal and plant species listed by the Fish and Wildlife Coordination Act and Section 7 of the Endangered Species Act for the project areas shown on the enclosed site location map.

Please provide written comments within 30 days from the date of this letter to Wilamena Harback, Chief, Environmental Division, Directorate of Public Works, Building 1442, 9430 Jackson Loop, Fort Belvoir, Virginia 22060, or by email to wilamena.g.harback.civ@mail.mil. If you need further information, please contact Janesse Colon-Ruiz at 703-806-4008.

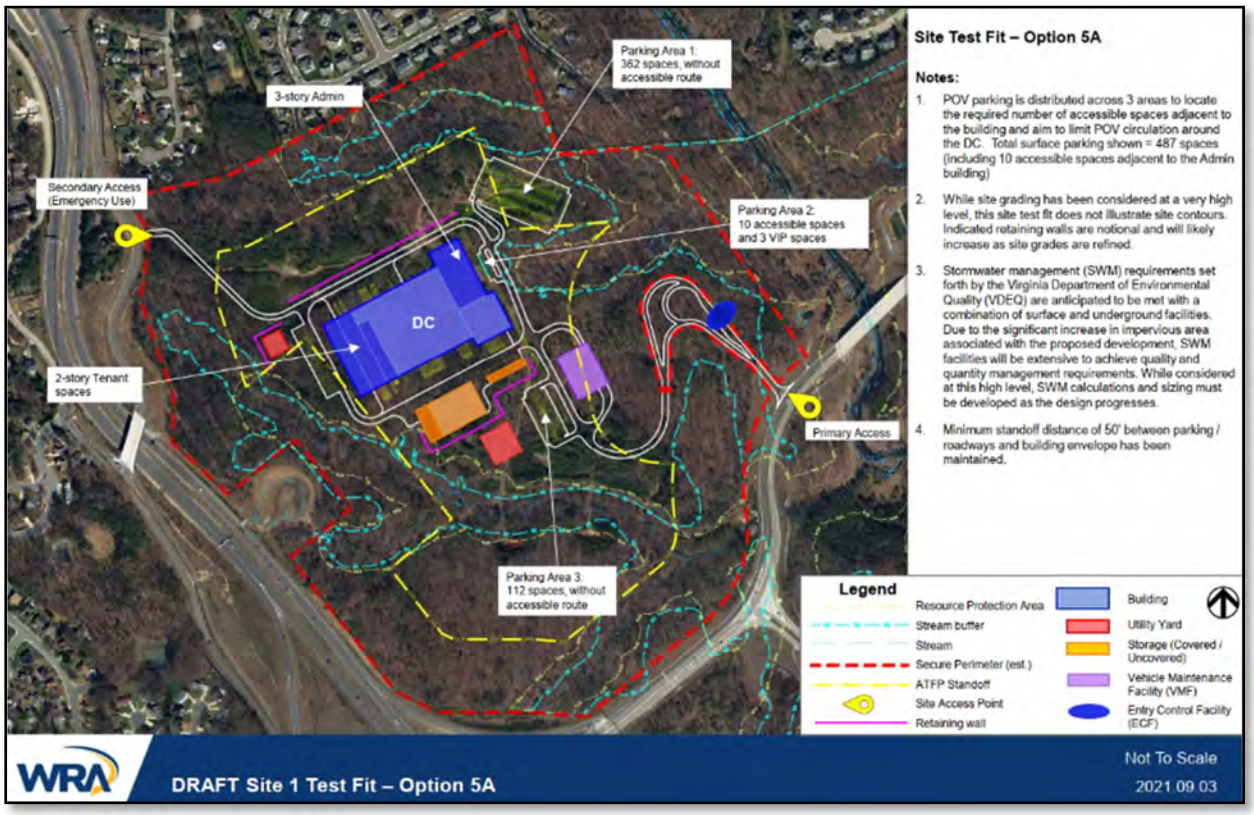
Fort Belvoir Env Office Chief Signature block

Enclosure 1: Site Location Map
Enclosure 2: FBNA Conceptual Site Layout
Enclosure 3: U.S. Fish & Wildlife Service's (IPaC) Official Species List
Enclosure 4: Verification Letter for Northern Long-Eared Bat

Enclosure 1:


Fort Belvoir North Area
Main Post
Installation Boundary
Proposed Action Location
DIA HQ Annex Project Location
Fort Belvoir, Virginia
N
0
3
Miles
North Springfield
Springfield
West Springfield
Franconia
Groveton
Newington
Lorton
Fort Belvoir
Mt Vernon
Mt Vernon Woods
Fort Hunt
Woodbridge
Occoquan Regional Park
Laurel Hill Park
Pohick Stream Valley Park
Middle Run Stream Valley Park
Dogue Creek Stream Valley Park
Backlick Stream Valley Park
Meadowood Recreation Area
Gunston Hall
Mason Neck State Park
Mason Neck National Wildlife Refuge
Fort Belvoir Golf Club
Pohick Bay Golf Course
Capital Beltway
Duke St
Richmond Hwy
Franconia Rd
Backlick Rd
Fort Hunt Rd
Rolling Rd
Old Keene Mill Rd
Silverbrook Rd
Jeff Todd Way
National Capital Parks
Washington
Annapolis
Dale City

Enclosure 2:


Site Test Fit – Option 5A
Notes:
1. POV parking is distributed across 3 areas to locate the required number of accessible spaces adjacent to the building and aim to limit POV circulation around the DC. Total surface parking shown = 487 spaces (including 10 accessible spaces adjacent to the Admin building)
2. While site grading has been considered at a very high level, this site test fit does not illustrate site contours. Indicated retaining walls are notional and will likely increase as site grades are refined.
3. Stormwater management (SWM) requirements set forth by the Virginia Department of Environmental Quality (VDEQ) are anticipated to be met with a combination of surface and underground facilities. Due to the significant increase in impervious area associated with the proposed development, SWM facilities will be extensive to achieve quality and quantity management requirements. While considered at this high level, SWM calculations and sizing must be developed as the design progresses.
4. Minimum standoff distance of 50' between parking / roadways and building envelope has been maintained.
Parking Area 1: 362 spaces, without accessible route
3-story Admin
Secondary Access (Emergency Use)
Parking Area 2: 10 accessible spaces and 3 VIP spaces
DC
2-story Tenant spaces
Primary Access
Parking Area 3: 112 spaces, without accessible route
Legend
Resource Protection Area
Stream buffer
Stream
Secure Perimeter (est.)
ATFP Standoff
Site Access Point
Retaining wall
Building
Utility Yard
Storage (Covered / Uncovered)
Vehicle Maintenance Facility (VMF)
Entry Control Facility (ECF)
WRA
DRAFT Site 1 Test Fit – Option 5A
Not To Scale
2021.09.03

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:
Project Code: 2022-0011272
Project Name: FNBA Distribution Center

February 22, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location 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

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

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 Project Code 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
- Migratory Birds

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

Project Code: 2022-0011272
Event Code: None
Project Name: FNBA Distribution Center
Project Type: Military Development
Project Description: Construction and Operation of a new distribution facility at Fort Belvoir North Area
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.7531398,-77.20868067034789,14z

Counties: Fairfax County, Virginia

Endangered Species Act Species

There is a total of 3 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 Fisheries[1], 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.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Small Whorled Pogonia *Isotria medeoloides* Population: No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1890	Threatened

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.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12

(0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

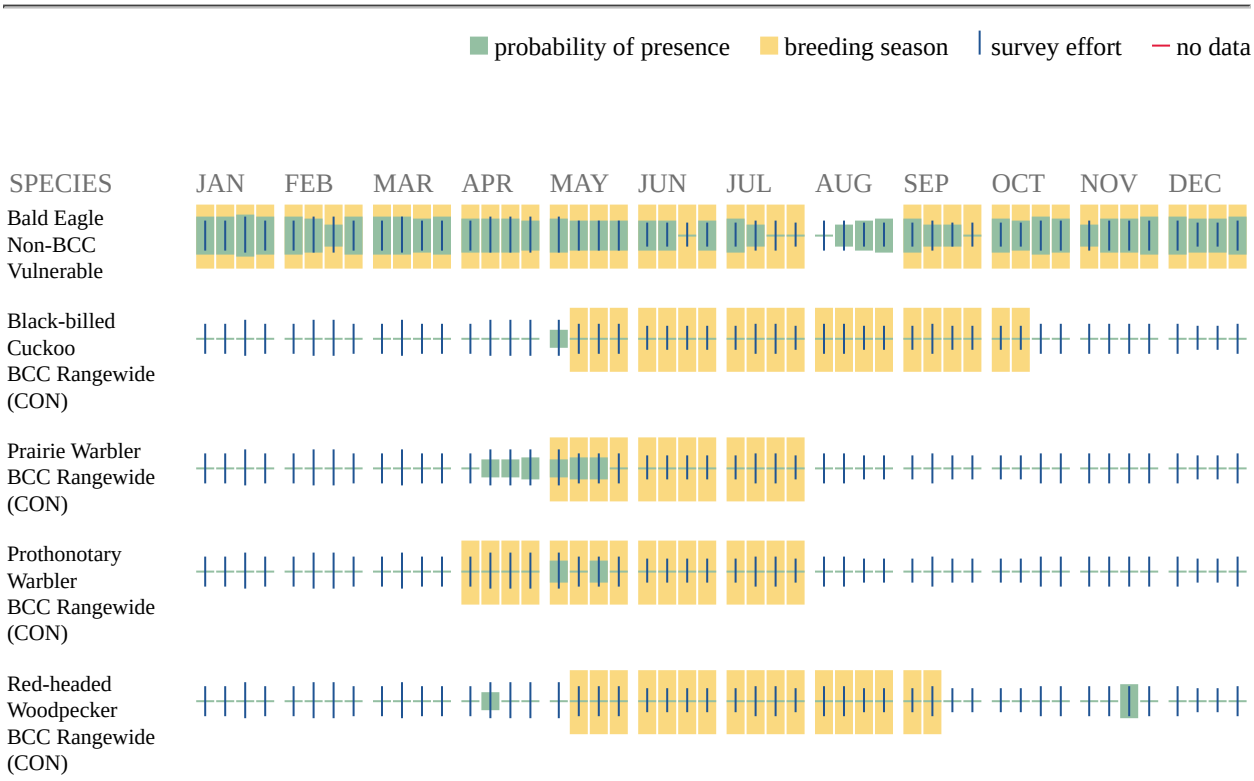
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

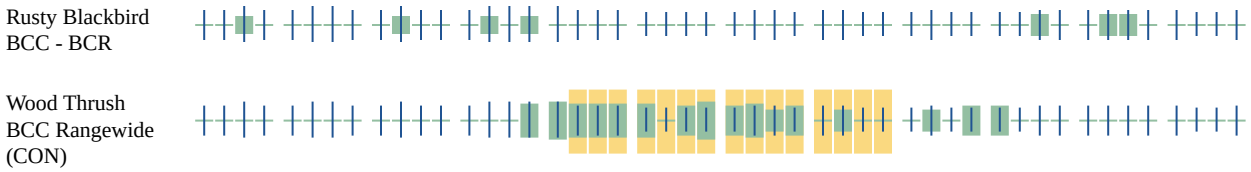
Breeding Season (▪)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical

Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

IPaC User Contact Information

Name: Christina Olson
Address: 2 Hopkins Plaza
City: Baltimore
State: MD
Zip: 21201
Email christina.a.olson@usace.army.mil
Phone: 5412702878

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

In Reply Refer To:
Project Code: 2022-0058752
Project Name: FBNA Distribution Center

June 28, 2022

Subject: List of threatened and endangered species that may occur in your proposed project location 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

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

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 Project Code 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
- Migratory Birds

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

Project Code: 2022-0058752
Event Code: None
Project Name: FBNA Distribution Center
Project Type: Military Development
Project Description: The purpose of the project is to construct an approximately 525,000 square foot distribution center consolidated complex consisting of a high bay warehouse, a two-story administrative building, a truck maintenance/ refueling building, covered/enclosed storage buildings and an entry control facility (gate house and vehicle inspection).

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.75327195,-77.2086156714428,14z

Counties: Fairfax County, Virginia

Endangered Species Act Species

There is a total of 2 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 Fisheries[1], 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.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

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.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

---

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10

NAME	BREEDING SEASON
Cerulean Warbler *Dendroica cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 28 to Jul 20
Kentucky Warbler *Oporornis formosus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee

was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

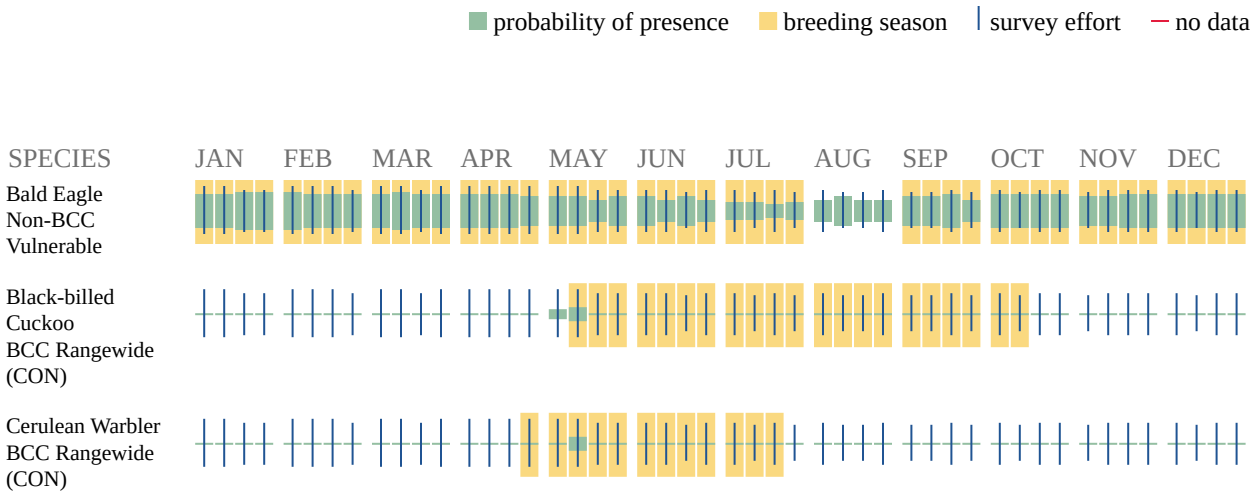
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

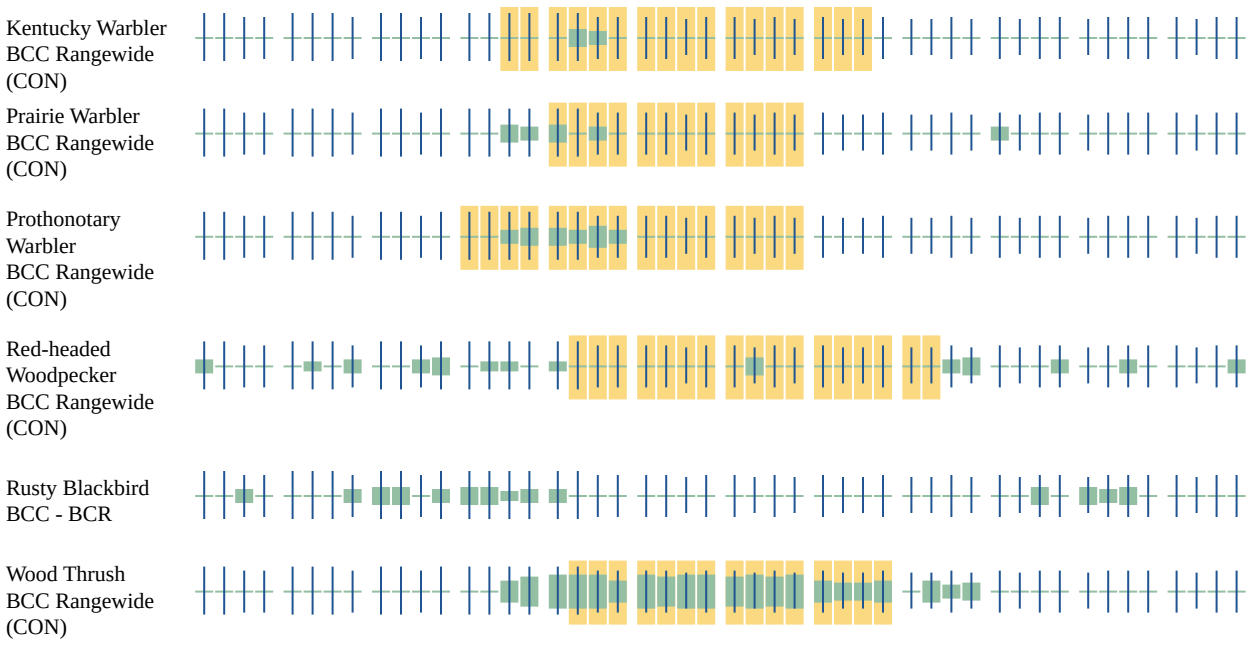
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?
The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report
The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

IPaC User Contact Information

Agency: Army Corps of Engineers
Name: Connie Ramsey
Address: 2 Hopkins Plaza
City: Baltimore
State: MD
Zip: 21201
Email connie.l.ramsey@usace.army.mil
Phone: 4109627783

Lead Agency Contact Information

Lead Agency: Army
Name: John Pilcicki
Email: john.l.pilcicki.civ@army.mil
Phone: 7038053968

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:
Project code: 2022-0011272
Project Name: FNBA Distribution Center

March 04, 2022

Subject: Verification letter for the 'FNBA Distribution Center' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Christina Olson:

The U.S. Fish and Wildlife Service (Service) received on March 04, 2022 your effects determination for the 'FNBA Distribution Center' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The 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). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Monarch Butterfly *Danaus plexippus* Candidate
- Small Whorled Pogonia *Isotria medeoloides* Threatened

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

FNBA Distribution Center

2. Description

The following description was provided for the project 'FNBA Distribution Center':

> Construction and Operation of a new distribution facility at Fort Belvoir North Area

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.75327195,-77.2086156714428,14z

Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may

affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

   No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

   No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

    No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type ‘0’ in questions 1-3.

1. Estimated total acres of forest conversion:

160

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type ‘0’ in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type ‘0’ in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type ‘0’ in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: Army Corps of Engineers
Name: Christina Olson
Address: 2 Hopkins Plaza
City: Baltimore
State: MD
Zip: 21201
Email christina.a.olson@usace.army.mil
Phone: 5412702878

Lead Agency Contact Information

Lead Agency: Army
Name: John John Pilcicki
Email: john.l.pilcicki.civ@army.mil
Phone: 7038053968

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

In Reply Refer To:
Project code: 2022-0058752
Project Name: FBNA Distribution Center

June 29, 2022

Subject: Verification letter for the 'FBNA Distribution Center' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Connie Ramsey:

The U.S. Fish and Wildlife Service (Service) received on June 29, 2022 your effects determination for the 'FBNA Distribution Center' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The 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). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- Monarch Butterfly *Danaus plexippus* Candidate

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

FBNA Distribution Center

2. Description

The following description was provided for the project 'FBNA Distribution Center':

> The purpose of the project is to construct an approximately 525,000 square foot distribution center consolidated complex consisting of a high bay warehouse, a two-story administrative building, a truck maintenance/ refueling building, covered/enclosed storage buildings and an entry control facility (gate house and vehicle inspection).

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.75327195,-77.2086156714428,14z

Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/media/nleb-roost-tree-and-hibernacula-state-specific-data-links-0.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

   No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

   No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

    No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type ‘0’ in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type ‘0’ in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type ‘0’ in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type ‘0’ in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: Army Corps of Engineers
Name: Connie Ramsey
Address: 2 Hopkins Plaza
City: Baltimore
State: MD
Zip: 21201
Email connie.l.ramsey@usace.army.mil
Phone: 4109627783

Lead Agency Contact Information

Lead Agency: Army
Name: John Pilcicki
Email: john.l.pilcicki.civ@army.mil
Phone: 7038053968

From:	Atkinson, Kelly
To:	FBNA
Subject:	[URL Verdict: Neutral][Non-DoD Source] FW: FBNA Distribution Center Request for Early Input Notice
Date:	Tuesday, April 19, 2022 3:28:40 PM
Attachments:	image001.png NCPC Fort Belvoir North Post Area Development - December 2021_.pdf NCPC Fort Belvoir North Post Area Development-signed.pdf

Good afternoon,

Please find below Fairfax County's early input comments on the Draft EA. Fairfax County requests the opportunity to comment on the Draft EA once published.

- Fairfax County previously commented on the FBNA Area Development Plan Master Plan at the request of NCPC (please see attached letters). In the most recent submission reviewed (December 2021), the FBNA Area Development Plan depicted development in three growth boundary areas. The proposed Distribution Center and associated parking/infrastructure should be located in one of the three growth boundaries and take into consideration the natural features of the site and minimize any increase in impervious area and removal of large areas of mature vegetation. Mitigation measures including tree replacement; maximizing building heights/minimizing building footprints; phased parking structures instead of surface parking; Transportation Management Plan; water quantity and quality measures above minimum requirements (to include Low Impact Development techniques versus SWM ponds); and stormwater/stream restoration should be considered.
- The development proposal should promote walkability and cluster buildings where possible. To encourage pedestrian movement throughout the site, sidewalks, lighting, shade, signage and wayfinding, green space and an overall aesthetically pleasing environment should be considered, which will also mitigate environmental and transportation impacts. A pedestrian circulation plan should be included.
- Does the proposed Distribution Center need to be located on the west side of the creek? It was the County's understanding the Army would prioritize development east of the creek first.
- Impacts to Resource Protection Areas, floodplains, wetlands, and rare, threatened, and endangered species should be avoided or minimized to the greatest extent feasible.
- Will the building obtain LEED certification and if so, at what level? Fairfax County projects are encouraged to obtain LEED Gold along with the installation of solar arrays and electric vehicle charging stations and provide an on site renewable energy component. The Fairfax County Board of Supervisors also has policies on energy performance targets; Greenhouse Gas emissions; and Net Zero Energy for our own buildings that perhaps the Army could consider.
- Any access at Rolling Road should be restricted to emergency only and any existing pedestrian networks in the area maintained.
- Any undisturbed and unsurveyed areas that are planned for development should undergo a Phase I archaeological survey. If potentially significant sites are found, it is recommended the Army undergo Phase II archaeological testing to determine Fairfax County significance and/or eligibility for inclusion onto the National Register of Historic Places. If sites are found to be significant or eligible, avoidance or Phase III data recovery is recommended.

Fairfax County has provided these comments to provide early input on the proposed action to be considered in the forthcoming EA. These comments are subject to change based on the County's formal review of the forthcoming EA and represent staff analysis and do not necessarily reflect the opinion of the Fairfax County Board of Supervisors.

Thank you,
Kelly Atkinson

Kelly M. Atkinson, AICP (she/her/hers)
Branch Chief, Environment and Development Review Branch
Fairfax County Department of Planning and Development
12055 Government Center Parkway, 7th Floor
Fairfax, VA 22035
(703) 324-1380 (Main)
(571) 595-4238 (Mobile)

Note: My working hours may not be the same as your working hours. Please do not feel obligated to reply outside of your current work schedule.

From: FBNA <FBNA@usace.army.mil>
Sent: Wednesday, April 13, 2022 5:13 PM
Subject: FBNA Distribution Center Request for Early Input Notice

All Interested Parties:

The U.S. Army Garrison, Fort Belvoir, Virginia is preparing an Environmental Assessment (EA) for the construction and operation of a distribution center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia, pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality (CEQ) regulations that implement NEPA (40 Code of Federal Regulations [CFR] 1500-1508), and 32 CFR Part 651, *Environmental Analysis of Army Actions*. An EA is used as a planning document to assess environmental impacts, evaluate their significance, develop alternatives and mitigation measures, and allow for agency and public participation (32 CFR 651.20).

The EA is being prepared to evaluate the environmental impacts associated with the Proposed Action to build and operate a distribution center at FBNA. The project will modernize logistical operations and address safety, security, and operational concerns specific to the warehouse and its administrative functions. The project is needed to support the delivery and receipt of materials within and across the Washington Metropolitan Area, requiring a site within the National Capital

Region to achieve distribution efficiencies.

In accordance with 40 CFR 1500-1508, the Army invites you to provide early input on the Proposed Action to be considered in our analysis of each alternative in the forthcoming EA. This notice is being distributed to organizations and the public that may have an interest in the project. Information on the Proposed Action can be found on the project website at https://www.nab.usace.army.mil/FBNA/. Comments on the Proposed Action can be submitted through the project website or via email to FBNA@usace.army.mil. Once the draft EA is completed, organizations and the public will have an opportunity to review the document and provide comments during a 30-day public review period.

We appreciate your attention to this matter. Early input will be accepted for a period of 15 days, beginning on the date of this notice. Should you require any additional information or have any questions, please contact the Fort Belvoir Directorate of Public Works-Environmental Division (DPW-ED) via phone at (703) 806-3193 or (703) 806-0020, during normal working business hours, Monday through Friday, 8:00 a.m. to 4:00 p.m.

July 30, 2021

Stephanie Free
National Capital Planning Commission
401 9th Street NW, Suite 500
Washington, DC 20004

RE: NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan

Dear Stephanie Free:

Thank you for the opportunity to comment on the draft environmental assessment (EA) for Fort Belvoir North Post Area Development Plan, located at the northwest quadrant of Interstate 95 and Fairfax County Parkway. The plan proposes to establish the development framework for functions of the Fort Belvoir North Area (FBNA), a non-contiguous 804-acre parcel, located north of the main installation of Fort Belvoir and separated to the west by Interstate 95, in Springfield, Virginia. Fairfax County understands that three alternatives for the site were reviewed and range in intensity from minimal improvements of only planned projects to maximum capacity based on the remainder of land available; the maximum capacity alternative is the preferred alternative according to the FBNA stakeholders. The Department of Planning and Development (DPD), in collaboration with the Fairfax County Department of Transportation (FCDOT) and Fairfax County Park Authority (FCPA) has reviewed the above-mentioned draft environmental assessment and provides the comments below.

COORDINATION WITH OTHER COUNTY AGENCIES

Transportation Impacts

FCDOT staff did not have any specific comments regarding this proposal as the site has good highway access via Interstate 95 and the Fairfax County Parkway. Staff did want to make Fort Belvoir aware of an ongoing study of the Fairfax County/Franconia-Springfield Parkways. There are no recommendations yet; however, the following questions are being considered, which could impact access to Fort Belvoir North Area:

- The degree to which existing intersections should be considered for conversion to interchanges or under/overpasses;
- How transit should be integrated into the corridor;
- Whether tolling and or HOV lanes on the Parkways should be planned; and
- Bicycle/pedestrian mobility.

PLANNING & DEVELOPMENT

Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

More information can be found at: Fairfax County & Franconia-Springfield Parkways Alternatives Analysis and Long Term Planning Study | Transportation.

Finally, FCDOT notes that Fairfax Connector Routes 340 and 341 began in 2017 and directly linked the FBNA to the Franconia Metrorail / VRE station. Both routes had low ridership pre-COVID and FCDOT is currently in the process of working with Fort Belvoir to rectify this situation. More information on the Fairfax Connector routes can be found at: Fairfax Connector Routes 340 and 341 (fairfaxcounty.gov).

Recreational and Heritage Resources

FCPA staff offered comments regarding the inclusion of a stream valley trail; request to perform a survey of rare, threatened, and endangered bat species; a request that a pedestrian circulation plan be included in the draft EA for evaluation; and requests to review all future documents related to the Accotink Stream Valley Park and Rolling Woods School site at the earliest opportunity.

Staff also recommends that any undisturbed and unsurveyed areas that are planned for development undergo a Phase I archaeological survey. If potentially significant sites are found, it is recommended they undergo Phase II archaeological testing to determine Fairfax County significance and/or eligibility for inclusion onto the National Register of Historic Places. FCPA comments are included in attachment to the letter. If sites are found to be significant or eligible, avoidance or Phase III data recovery is recommended.

ENVIRONMENTAL ASSESSMENT

The sections listed below include an overview of the applicable Comprehensive Plan policies and potential impacts within the project study area.

Water Resources Protection and Stormwater Management/Best Management Practices

The Environment Element of the Comprehensive Plan Policy Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. In order to minimize the impacts that new development and redevelopment projects may have on county streams, the Comprehensive Plan encourages the protection of stream channels, buffer areas along stream channels, and restoration of degraded stream channels and riparian buffer areas. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 7-9).

New development and redevelopment are also expected to result in high quality site design, pursue use of low impact development (LID) techniques and *"pursue commitments to reduce stormwater runoff volumes and peak flows, to increase groundwater recharge, and to increase preservation of undisturbed areas."* Some or all of the following practices should be considered in order to minimize the impacts that new development and redevelopment projects may have on the county's streams:

- *"Minimize the amount of impervious surface created …*
- *Site buildings to minimize impervious cover …*
- *Where feasible, convey drainage from impervious areas into pervious areas …*
- *Encourage cluster development …*
- *Encourage the preservation of wooded areas and steep slopes adjacent to stream valley EQC areas …*
- *Where appropriate, use protective easements in areas outside of private residential lots as a mechanism to protect wooded areas and steep slopes.*
- *Encourage the use of open ditch road sections …*
- *Encourage the use of innovative BMPs and infiltration techniques of stormwater management …*
- *Apply nonstructural best management practices and bioengineering practices …*
- *Encourage shared parking …*
- *Encourage the use of pervious parking surfaces in low-use parking areas …*
- *Maximize the use of infiltration landscaping within streetscapes consistent with county and state requirements."*

(Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 7-9).

The proposed project will add a significant amount of impervious cover to the site under the maximum development potential alternative. With a greater amount of impervious surface, more runoff and pollutants reach the county streams. Higher levels of runoff from increased imperviousness accelerate stream channel erosion causing increased sedimentation. Deicing salt applied to roads and parking lots is the primary source of chloride in streams. The above listed practices would be applicable to the study and design of the development plan and should be incorporated to the greatest extent feasible.

County policies also state that stormwater design for all stormwater facilities should be closely coordinated with county staff to avoid degradation of impacted streams. The area development plan improvements should provide stormwater quality and quantity controls above the minimum requirements to minimize impacts to adjacent streams and, at a minimum, meet the water quantity detention requirements in Chapter 124 of the Fairfax County Code. County policies state that the county will maintain a best management practices (BMP) program for water quality and will ensure that new development and redevelopment complies with the county's best management practice (BMP) requirements. BMP requirements are to be updated as newer, more effective strategies become available.

Staff also recommends the avoidance of significant ecological resources to the maximum extent feasible; incorporation of linear stormwater controls into the facility designs to address stormwater requirements while minimizing the disturbance of ecological resources and open spaces; incorporation of ecological enhancements into any pond design to replace the ecological functionality of disturbed areas; integration of stream protection measures; demonstration that there will be no adverse impacts to downstream waterways, infrastructure, or property; assessment of the cumulative impact of multiple outfalls directed into a stream in the same general vicinity; incorporation of natural channel design, where applicable; incorporation of constructed wetlands as an alternative to the proposed pond designs; consideration of the retrofitting of existing wet ponds to meet stormwater requirements; adherence to current pollutant removal criteria for any dry ponds; restoration and monitoring of disturbed areas; and management of invasives to be considered in the project study.

Resource Protection Area (RPA), Floodplain and Environmental Quality Corridor (EQC)

Floodplain, RPA, and areas that qualify for designation as EQC exist on the site as shown in Attachment A, an environmental map of the Fort Belvoir North Area prepared by the Department of Planning and Development. Fairfax County recognizes that the Department of the Army is not subject to the provisions of the Chesapeake Bay Preservation Ordinance (CBPO) or County policies. However, Fairfax County continues to encourage the Army to meet the County's CBPO as described in Chapter 118 of the County Code, including conformance with the requirements for areas designated as RPAs and Resource Management Areas. Fairfax County also encourages the Army to minimize any impact to 100-year floodplains and/or wetlands, to the greatest extent feasible. Any mitigation/compensation of wetlands should occur as close to the area of impact as possible. Fairfax County encourages these areas to be protected consistent with county policy and regulations. EQCs as defined in Policy Plan Element of Fairfax County's Comprehensive Plan should also be considered for preservation. Land area that includes all 100-year floodplains, areas of 15% or greater slopes adjacent to the floodplain, and all wetlands qualify as designation of Environmental Quality Corridors and should be considered. This designation would protect and preserve habitat

quality, protect streams, reduce pollutants from entering the water, and provide a connected segment of open space to facilitate the movement of wildlife in the area as well as with the Accotink Creed EQC to the north of the property.
(Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 15-18).

Soils

The Comprehensive Plan encourages new development to either avoids problem soil areas, or implement appropriate engineering measures to protect existing and new structures from unstable soils. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Page 13).

This property contains Marine Clay and problem class soils surrounding Accotink Creek and its tributaries. Staff recommends the Army cluster development away from problem class soils and complete a geotechnical study for the proposed development in the areas that exhibit problem class soils.

Forest Resources Policies and Impacts

The Comprehensive Plan anticipates that new development will include an urban forestry program and be designed in a manner that retains and restores meaningful amounts of tree cover, consistent with planned land use and good silvicultural practices. Good quality vegetation should be preserved and enhanced and lost vegetation restored through replanting. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 17-18).

The project has the potential to disturb a large amount of mature tree cover. Tree planting should be incorporated extensively into the project design for all disturbed areas. In order to ensure the viability of the proposed plantings, staff recommends tree protection, to include adequate supervision during construction, to ensure that tree protection measures are implemented as planned. Additionally, staff recommends that all development plans avoid the following: significant changes to elevations (both “cut” and “fill” operations); changes to water flow; and excavation within the critical root zones of all trees to be protected. Additionally, staff recommends planting schemes featuring native and non-invasive trees, shrubs, perennial grasses and grass-like plants, and forbs for each planting area in the project design. For all new planting areas and for areas in which existing pavement is to be removed, staff recommends soil rebuilding in the project design, which would help ensure the viability of the proposed plantings.

Together, these measures would minimize impacts to ecological resources, increase the viability of the existing tree cover, increase the habitat value of the project, promote water infiltration, improve air quality and provide shade, consistent with the intent of the Comprehensive Plan.

Green Building

Fairfax County encourages commercial building development to incorporate green building measures into the design of all projects. Example green building measures can be derived from the U.S. Green Building Council's Leadership in Energy and Environmental Design for New Construction [LEED-NC®] or the U.S. Green Building Council's Leadership in Energy and Environmental Design for Core and Shell [LEED-CS®] or an equivalent program with independent third-party verification. Additional examples of measures that can be considered for the interior design are: Energy STAR fixtures, low flush toilets, high efficiency light, recycling of non-hazardous renovation materials, etc. Fairfax County also encourages the incorporation of electric vehicle charging into development proposals.
(Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 20-22).

Thank you again for the opportunity to comment on this proposal. If you have any questions about the comments, please contact Ellen Huber with the Department of Planning and Development at Ellen.Huber@fairfaxcounty.gov or 703-324-1364.

Sincerely,

Leanna H O'Donnell

Leanna H. O'Donnell, Director, Planning Division
Department of Planning and Development

LHO:EKH

Attachment A: Environmental Map of the Fort Belvoir North Area
Attachment B: Fairfax County Park Authority Memorandum

cc: Board of Supervisors
Bryan Hill, County Executive
Rachel Flynn, Deputy County Executive
Barbara Byron, Director, DPD
Kelly M. Atkinson, Chief, Environment and Development Review Branch, DPD

December 20, 2021

Stephanie Free
National Capital Planning Commission
401 9th Street NW, Suite 500
Washington, DC 20004

RE: NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Dated December 2021

Dear Stephanie Free:

Thank you for the opportunity to comment on the revised Fort Belvoir North Area Development Plan (FBNADP), dated December 2021. Fort Belvoir North Area (FBNA) is located at the northwest quadrant of Interstate 95 and the Fairfax County Parkway. The FBNADP proposes to establish the development framework for functions of the FBNA, a non-contiguous 804-acre parcel, located north of the main installation of Fort Belvoir.

In June 2021, Fairfax County provided you with comments on three development alternatives planned for the site which ranged in intensity from minimal improvements of only planned projects to maximum capacity based on the remainder of land available; the maximum capacity alternative was the preferred alternative according to the FBNA stakeholders. The maximum capacity alternative did not take into consideration the natural features of the site and would result in a significant increase in impervious area on site, as well as the removal of large areas of mature vegetation. Fairfax County identified several concerns and recommended mitigation measures that could be implemented in the final design to minimize the impact of the proposed development on environmentally sensitive areas (see Attachment 1). While some of those concerns have been better addressed with the most recent submission, Fairfax County continues to support our previous comments in Attachment 1, in addition to these additional comments on the current submission.

Growth Boundaries

In response to comments received on the June 2021 plan, Fort Belvoir conducted additional quantitative analyses with affected stakeholders to identify potential development areas within FBNA. This included an analysis of areas of the site that were prohibited for development due to cost or jurisdictional requirements; extent of mitigation required; soils; areas of existing

PLANNING & DEVELOPMENT

Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

development; and areas of existing vegetation, some of which would require additional mitigation if impacted. Additionally, consideration was made to ensure any future development would not conflict with the existing National Geospatial-Intelligence Agency (NGA) located on the eastern portion of the site. These constraints were then used to identify three growth boundaries that balance Fort Belvoir's expanded mission capacity while taking into consideration the need for a secure campus on the western portion of the site and preservation of natural features. The three growth boundaries are shown in Figure 1 and total 238 acres. As stated in the current plan, the intent of the growth boundaries is to establish a dense walkable campus in areas of prior disturbance to the extent possible, with a priority on the eastern portion of the site. As proposed, the area of development has been reduced by approximately 51 acres on the western portion of the site, including one area entirely that was located between the two western growth boundaries. The revised growth boundaries result in the preservation of approximately 90 additional acres of vegetation. While the plan still proposes 90 acres of tree removal, this has been reduced from 154 acres proposed with the June 2021 submission. Fairfax County appreciates the applicant's commitment to minimize the areas of development and minimize tree removal and disturbance by focusing development within three growth boundaries, which is consistent with County policies.

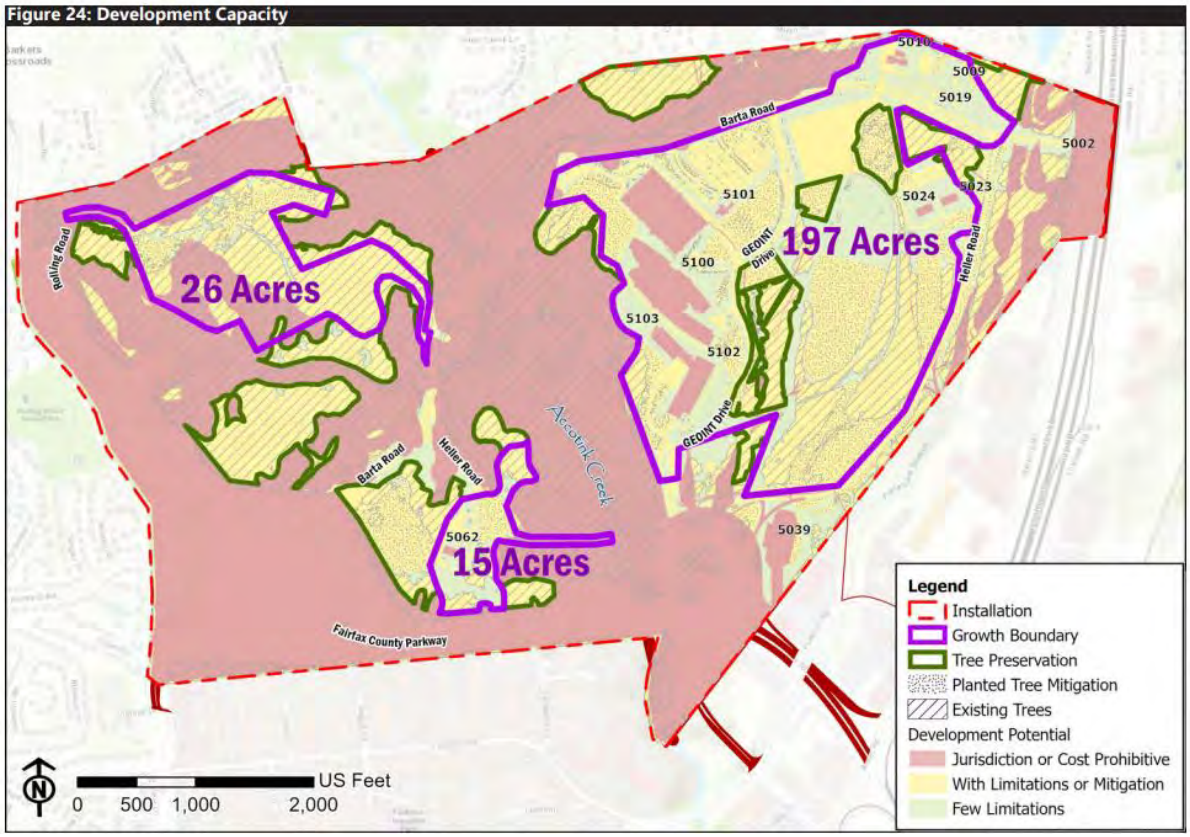
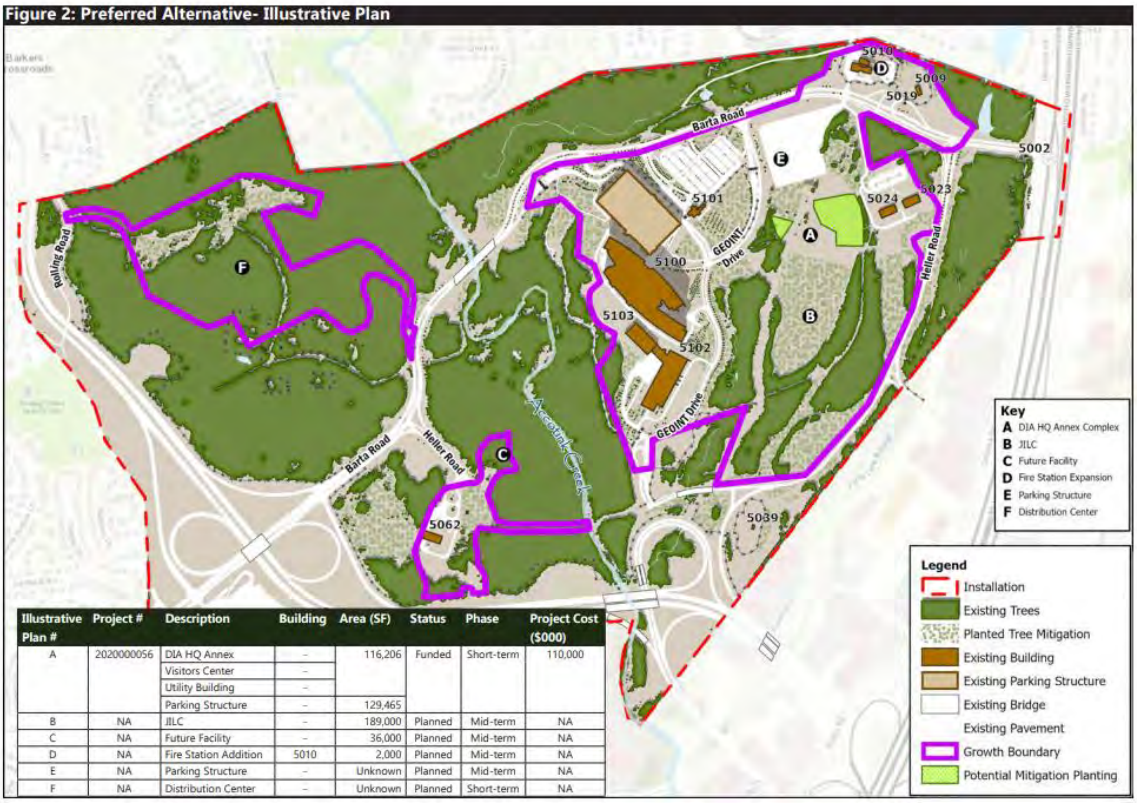


Figure 1: Development Capacity, Source: FBNADP December 2021, Page 53

Illustrative Plan

Figure 2 below depicts the proposed Illustrative Plan. The most significant change between the June and December plans is the removal of the proposed buildings on the western portion of the property. It is Fairfax County's understanding that any near-term development would first be concentrated on the eastern portion of the property, in the vicinity of the NGA, assuming there are no security concerns. Additionally, Fairfax County understands that currently, there are no end users for development on the western portion of the site; therefore, the depiction of buildings, parking areas and roads is premature and would be subject to further review by NCPC, as well as Fairfax County, at such time a user is identified. However, any development potential would be limited to the growth boundary. Building heights for future buildings have also been increased from one to three stories to three to eight stories to minimize building footprint. The current plan depicts a future Parking Structure (identified as "E" in Figure 2) to replace an existing overflow, surface parking lot. This will ensure adequate parking can be provided in a smaller footprint and result in less land disturbance. The current plan promotes density and multi-story buildings whenever feasible, which promotes walkability. To encourage pedestrian movement throughout the site, sidewalks, lighting, shade, signage and wayfinding, green space and an overall aesthetically pleasing environment are now proposed, which will also mitigate environmental and transportation impacts. Fairfax County finds this an improvement over the previous submission and consistent with County policies that seek to cluster development in pedestrian friendly developments.



Illustrative Plan #	Project #	Description	Building	Area (SF)	Status	Phase	Project Cost ($000)
A	2020000056	DIA HQ Annex	–	116,206	Funded	Short-term	110,000
		Visitors Center	–				
		Utility Building	–				
		Parking Structure	–	129,465			
B	NA	JILC	–	189,000	Planned	Mid-term	NA
C	NA	Future Facility	–	36,000	Planned	Mid-term	NA
D	NA	Fire Station Addition	5010	2,000	Planned	Mid-term	NA
E	NA	Parking Structure	–	Unknown	Planned	Mid-term	NA
F	NA	Distribution Center	–	Unknown	Planned	Short-term	NA

Figure 2: Development Capacity, Source: FBNADP December 2021, Page 10

<u>Forest Resources, Water Resources and Sustainability</u>

While Fort Belvoir has made efforts to focus growth in designated areas, preserve more vegetation, and minimize tree removal, the current plan continues to result in the potential for significant additions of impervious area and impacts to natural features. Therefore, the current plan now proposes compensation measures to include:

- 2:1 tree replanting on- or off-Post;
- Installation of additional solar/PV cells and/or wind power generation in the project, or elsewhere on-Post;
- Stream restoration along the tributaries affecting Fort Belvoir, both on- or off-Post; and
- Stormwater restoration and mitigation measures throughout Post.

Fairfax County supports these mitigation measures as they are consistent with the Environment Element of the Policy Plan that recommends the restoration of meaningful amounts of tree cover and the protection and restoration of the ecological integrity of streams. Fairfax County

recommends any tree replanting be prioritized at a ratio of 2:1 and located on-Post to the greatest extent feasible to provide a more direct benefit adjacent to disturbed areas. If the full replanting cannot be accommodated on-Post, Fairfax County would support a 2:1 tree planting in areas within the County near the site. Alternatives could include contributions into a County Tree Preservation and Planting Fund to support the County's replanting efforts in the South County area of Fairfax County, or a joint partnership between the County and FBNA to identify areas in South County suitable for replanting by FBNA.

Fairfax County supports Fort Belvoir's efforts to complete steam restoration on site. The Environment Element of the Policy Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. In order to minimize the impacts that new development and redevelopment projects may have on county streams, the Comprehensive Plan encourages the protection of stream channels, buffer areas along stream channels, and commitments to the restoration of degraded stream channels and riparian buffer areas. In addition, Fairfax County continues to recommend water quantity and quality measures be provided above any minimum requirements to minimize impact to adjacent streams. Finally, Fairfax County appreciates the removal of several stormwater management ponds and replacement with several low impact development (LID) measures for water quantity and quality. This is consistent with County policies that expects new development and redevelopment to result in high quality site design using LID techniques.

Fairfax County encourages commercial building development to incorporate green building measures into the design of all projects. Example green building measures can be derived from the U.S. Green Building Council's Leadership in Energy and Environmental Design for New Construction [LEED-NC®] or the U.S. Green Building Council's Leadership in Energy and Environmental Design for Core and Shell [LEED-CS®] or an equivalent program with independent third-party verification. Additionally, Fairfax County expects new County facilities to be designed and constructed to obtain LEED-Gold certification; incorporate solar and electric-vehicle readiness features; provide an on-site renewable energy generation component; obtain energy performance improvement; reduce greenhouse gas emissions; and ultimately achieve net zero energy (for projects designed in FY 2031 or later). Fairfax County understands that any new facilities constructed with this plan have been designed to achieve LEED-Silver; however, the NGA building has obtained LEED-Gold certification. The County recommends any new facilities on site also obtain LEED-Gold certification, which is consistent with the County's policy for new County facilities. Fairfax County also continues to recommend a minimum of 2-percent of any parking spaces on site be equipped with Level-2, universal electric vehicle charging facilities, fully wired and functional, consistent with County policies.

Finally, the current plan notes that any development on the western portion of the site include environmentally responsible development opportunities, to include solar arrays on roofs to

enhance long-term benefits of renewable energy usage. This is consistent with the policy regarding renewable energy production for new County facilities.

Transportation

The circulation plan remains largely unchanged from the June 2021 submission, except for one change which was made to address a comment made by a Fairfax County resident. The previous proposal depicted a new road that would provide a connection from Rolling Road to Barta Road on the western portion of the property. This access could impact the existing, off-site pedestrian networks in the area. In response, this access at Rolling Road has been restricted to emergency only and any existing pedestrian networks in the area would be maintained. Fairfax County appreciates Fort Belvoir's response to this concern.

Fort Belvoir is required to maintain a Transportation Management Plan (TMP) to inform employees on transportation options for travelling to and from FBNA. Strategies include the use of structured parking at a ratio of 1:1.5; phased structured parking to ensure parking demands are constantly assessed; maximize structured parking over surface lots; secure and unsecured parking; single-occupancy vehicle reduction techniques; and annual review of the TMP. Fairfax County recommends similar measures for large redevelopment proposals in the County.

The June 2021 plan identified the use of parking maximums as an effective method of transportation demand management (TDM) for dense urban areas. The plan provided a range of parking ratios based on various sources applicable to similar sites. It was noted that while these ratios may be appropriate for other projects, they could not be achieved for FBNA. Reasons include not being adequately served by public transportation; unique security requirements; and a specialized workforce who sees adequate parking as a benefit. For these reasons, a 90% factor was used to determine parking requirements.

The December 2021 restates this concern; however, now offers additional suggestions to better meet the TDM requirements based on ten years of experience provided by the NGA and the TDM strategies implemented with that project, which include Ride-Sharing, Carpool, Vanpool, Guaranteed Ride Home, Ridematching Services, Ride-Sharing Marketing, Alternative Work Schedules, Telework (when applicable), Transit Subsidy, Bicycle/ Walking, and Mass Transit Education programs. Based on FBNA's experience with the NGA site, the current plan now proposes a 67% factor and the parking ratios are more aligned with the TMP.

Summary

Fairfax County appreciates the opportunity to comment on the revised Fort Belvoir North Area Development Plan dated December 2021. Overall, Fairfax County finds the proposed revisions an improvement over the June 2021 submission. The current plan more adequately balances the needs of the mission while protecting environmental resources. The identification of growth boundaries clearly defines where future development is expected, and the proposed mitigation will help address some of the proposed impacts. Fairfax County continues to recommend the applicant refine the proposed development as final plans progress and requests to review any revised plans developed for the site.

Thank you again for the opportunity to comment on this proposal. If you have any questions about the comments, please contact Kelly Atkinson with the Department of Planning and Development at Kelly.Atkinson@fairfaxcounty.gov or 703-324-1259.

Sincerely,

Leanna H O'Donnell

Leanna H. O'Donnell, Director, Planning Division
Department of Planning and Development

LHO:KMA

Attachment 1: NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Letter Dated July 30, 2021

cc: Board of Supervisors
Bryan Hill, County Executive
Rachel Flynn, Deputy County Executive
Barbara Byron, Director, DPD
Vance Zavela, Partnership Developer, Fort Belvoir

From:	Burke, Thomas W
To:	FBNA
Cc:	Atkinson, Kelly; Hermann, Jeffrey C.; Garcia, Michael W; Felschow, Michael; Kang, Hejun
Subject:	[URL Verdict: Neutral][Non-DoD Source] RE: FBNA Distribution Center Request for Early Input Notice
Date:	Thursday, April 28, 2022 4:14:37 PM
Attachments:	image001.png

Good morning,

Following up on Kelly Atkinson's comments from April 19, 2022, Fairfax County Department of Transportation just wanted to add a couple additional transportation-related notes, pertaining to the proposed development at Fort Belvoir North Area.

- Fairfax County has completed its **Fairfax County & Franconia-Springfield Parkways Alternatives Analysis & Long-Term Planning Study**. We are currently in the process of incorporating new long-term recommendations into the Comprehensive Plan. Public hearings for this Comprehensive Plan Amendment are anticipated for this Summer.
    - We are recommending that the Fairfax County Parkway be widened from 4 to 6 general purpose lanes, between the Barta Road interchange and John J Kingman Road.
    - We are recommending continuous, connected, multi-use trails on both sides of the Parkway.
    - We are recommending interchange modifications at Fairfax County Parkway and I-95.

Note that these are long-range, high-level, planning recommendations that will require additional outreach and analysis before concepts, alignments and cross sections are ultimately designed, engineered and constructed.

- Please note that Fairfax Connector is currently in the process of developing its Transit Strategic Plan (TSP). This is an ongoing effort, with draft recommendations. Final recommendations will need to be cost constrained and have yet to be confirmed.
    - Project website: https://www.fairfaxcounty.gov/connector/tsp.
    - Fairfax Connector Routes that serve the FBNA and nearby Saratoga Park & Ride, including Routes 340, 341, 393 and 394, are under consideration for potential changes.
        - Route 341 will remain the same; The team is currently working on several service options for Route 340, coordinating with agencies in the Fort Belvoir North Area.
    - Other routes nearby are also being assessed.
        - Route 371, which provides access to Franconia-Springfield VRE/Metrorail and Lorton VRE Stations, running on Rolling Road and Fullerton Road, will improve the rush-hour frequency to 15 mins. The improvements will be funded through the recently awarded Northern Virginia Transportation Commission (NVTC) grant.
    - New routes are also under consideration.
        - New Route 990 is under consideration that would connect the Herndon

Metrorail Station to FBNA via the Fairfax County Parkway, and on to the Franconia-Springfield VRE/Metrorail Station. It would potentially operate on weekdays, from 6:00am to 7:00pm with 20 minute frequency during the peak and 30 minute off-peak.

Final recommendations for the TSP will be submitted to the Board of Supervisors later this year or early next year for approval;
Implementation for any service change will depend on future funding and approval of the Board.

Please let us know if you have any additional questions.

-Tom

Thomas W. Burke, P.E., AICP
Senior Transportation Planner IV
Transportation Planning Section

Fairfax County Department of Transportation
4050 Legato Road, Suite 400
Fairfax, VA 22033
(703) 877-5600 (Main) (703) 877-5681 (Direct) (703) 877-5697 (Fax)

www.FairfaxCounty.gov/Transportation

From: Atkinson, Kelly
Sent: Tuesday, April 19, 2022 3:27 PM
To: FBNA@usace.army.mil
Subject: FW: FBNA Distribution Center Request for Early Input Notice

Good afternoon,

Please find below Fairfax County's early input comments on the Draft EA. Fairfax County requests the opportunity to comment on the Draft EA once published.

- Fairfax County previously commented on the FBNA Area Development Plan Master Plan at the request of NCPC (please see attached letters). In the most recent submission reviewed (December 2021), the FBNA Area Development Plan depicted development in three growth boundary areas. The proposed Distribution Center and associated parking/infrastructure should be located in one of the three growth boundaries and take into consideration the natural features of the site and minimize any increase in impervious area and removal of large areas of mature vegetation. Mitigation measures including tree replacement; maximizing building heights/minimizing building footprints; phased parking structures instead of surface parking; Transportation Management Plan; water quantity and quality measures above

minimum requirements (to include Low Impact Development techniques versus SWM ponds); and stormwater/stream restoration should be considered.

- The development proposal should promote walkability and cluster buildings where possible. To encourage pedestrian movement throughout the site, sidewalks, lighting, shade, signage and wayfinding, green space and an overall aesthetically pleasing environment should be considered, which will also mitigate environmental and transportation impacts. A pedestrian circulation plan should be included.
- Does the proposed Distribution Center need to be located on the west side of the creek? It was the County's understanding the Army would prioritize development east of the creek first.
- Impacts to Resource Protection Areas, floodplains, wetlands, and rare, threatened, and endangered species should be avoided or minimized to the greatest extent feasible.
- Will the building obtain LEED certification and if so, at what level? Fairfax County projects are encouraged to obtain LEED Gold along with the installation of solar arrays and electric vehicle charging stations and provide an on site renewable energy component. The Fairfax County Board of Supervisors also has policies on energy performance targets; Greenhouse Gas emissions; and Net Zero Energy for our own buildings that perhaps the Army could consider.
- Any access at Rolling Road should be restricted to emergency only and any existing pedestrian networks in the area maintained.
- Any undisturbed and unsurveyed areas that are planned for development should undergo a Phase I archaeological survey. If potentially significant sites are found, it is recommended the Army undergo Phase II archaeological testing to determine Fairfax County significance and/or eligibility for inclusion onto the National Register of Historic Places. If sites are found to be significant or eligible, avoidance or Phase III data recovery is recommended.

Fairfax County has provided these comments to provide early input on the proposed action to be considered in the forthcoming EA. These comments are subject to change based on the County's formal review of the forthcoming EA and represent staff analysis and do not necessarily reflect the opinion of the Fairfax County Board of Supervisors.

Thank you,
Kelly Atkinson

Kelly M. Atkinson, AICP (she/her/hers)
Branch Chief, Environment and Development Review Branch
Fairfax County Department of Planning and Development
12055 Government Center Parkway, 7th Floor
Fairfax, VA 22035
(703) 324-1380 (Main)
(571) 595-4238 (Mobile)

Note: My working hours may not be the same as your working hours. Please do not feel obligated to reply outside of your current work schedule.

From: FBNA <FBNA@usace.army.mil>
Sent: Wednesday, April 13, 2022 5:13 PM
Subject: FBNA Distribution Center Request for Early Input Notice

All Interested Parties:

The U.S. Army Garrison, Fort Belvoir, Virginia is preparing an Environmental Assessment (EA) for the construction and operation of a distribution center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia, pursuant to the National Environmental Policy Act (NEPA) of 1969 (42 United States Code Section 4321 *et seq.*), the Council on Environmental Quality (CEQ) regulations that implement NEPA (40 Code of Federal Regulations [CFR] 1500-1508), and 32 CFR Part 651, *Environmental Analysis of Army Actions*. An EA is used as a planning document to assess environmental impacts, evaluate their significance, develop alternatives and mitigation measures, and allow for agency and public participation (32 CFR 651.20).

The EA is being prepared to evaluate the environmental impacts associated with the Proposed Action to build and operate a distribution center at FBNA. The project will modernize logistical operations and address safety, security, and operational concerns specific to the warehouse and its administrative functions. The project is needed to support the delivery and receipt of materials within and across the Washington Metropolitan Area, requiring a site within the National Capital Region to achieve distribution efficiencies.

In accordance with 40 CFR 1500-1508, the Army invites you to provide early input on the Proposed Action to be considered in our analysis of each alternative in the forthcoming EA. This notice is being distributed to organizations and the public that may have an interest in the project. Information on the Proposed Action can be found on the project website at https://www.nab.usace.army.mil/FBNA/. Comments on the Proposed Action can be submitted through the project website or via email to FBNA@usace.army.mil. Once the draft EA is completed, organizations and the public will have an opportunity to review the document and provide comments during a 30-day public review period.

We appreciate your attention to this matter. Early input will be accepted for a period of 15 days, beginning on the date of this notice. Should you require any additional information or have any questions, please contact the Fort Belvoir Directorate of Public Works-Environmental Division (DPW-ED) via phone at (703) 806-3193 or (703) 806-0020, during normal working business hours, Monday through Friday, 8:00 a.m. to 4:00 p.m.

National Capital Planning Commission
401 9th Street, NW North Lobby, Suite 500 Washington, DC 20004 Tel 202.482.7200 Fax 202.482.7272 www.ncpc.gov

IN REPLY REFER TO:
NCPC FILE No. MP020A

MAY 2, 2022

Ms. Heather Cisar
United States Army Corps of Engineers
Baltimore District, Maryland 21203

Re: Fort Belvoir North Area Distribution Center Scoping (Early Input) Comments

Dear Ms. Cisar:

Thank you for the opportunity to offer early input as part of the Fort Belvoir North Area (FBNA) distribution center's environmental review process under the National Environmental Policy Act (NEPA). As the federal government's planning agency for the National Capital Region, NCPC has advisory review authority over the project under the National Capital Planning Act (40 U.S.C. §§ 8722 (b)(1)). Our comments are based on policies from the Federal Elements of the NCPC Comprehensive Plan and in follow-up to our previous FBNA Area Development Plan review. For your reference, you may access a videotape of the meeting through NCPC's website at www.ncpc.gov/videos, as well as the Commission Action in the Appendix of this letter, which provides guidance that applies to the distribution center project.

Fort Belvoir North Area Final Area Development Plan

NCPC recently approved of the distribution center use for Area D with the following applicable guidance:

- The distribution center is required to be located on previously disturbed land to the greatest extent possible;
- Renewable energy is a priority for future FBNA projects including the distribution center; and
- The forested western campus (Area D) is for potential development by missions that are not compatible with other campus core area (Area A) development.

As the initial project within Area D, the new distribution center's layout and orientation are critical, not only to maximize its potential passive solar energy gain and to minimize its use of undisturbed land, but the new development will influence other future on-site projects as well. Thus, the EA should assess a design that aligns with these objectives and consider more than one project footprint to ensure an optimal future layout. In addition, the Army Corps of Engineers (USACE) should minimize future on-site parking as much as possible to help FBNA eventually attain its overall long-term 1:2 parking goal.

Future Environmental Assessment

We understand the EA assumes the future project would encompass an area of approximately 525,000 square feet (consisting of a warehouse and administrative building) to accommodate an additional six hundred personnel, with enhanced security measures, and space for 640 personal vehicles and twelve trucks daily. The new center would support delivery and receipt of materials for FBNA and other federal campuses throughout the National Capital Region. As part of the EA process, we recommend the USACE analyze the following impact topic areas:

- Travel and parking characteristics on-site and in the surrounding area;
- Vehicular and pedestrian circulation, and site security;
- Views/visual quality in and around the site;
- Energy and potable water use;
- Total impervious surface area changes;
- Stormwater runoff volumes;
- Stream health, function, and water quality;
- 100 and 500-year floodplain impacts;
- Vegetation, tree canopy area, and number of on-site trees;
- Habitat and functions of natural resources; and
- Effects on historic properties and resources.

Finally, the EA should include all existing and planned unbuilt projects in its evaluation of the project's cumulative impacts as requested in our March 2022 Commission Action.

Project Review Process

We recommend early consultation with NCPC staff to review the project's concept design (10-20%) to ensure the project would meet Commission expectations. The concept design should include proposed road, development configurations, stormwater management areas, parking, and proposed tree removal/mitigation information to include:

- A survey of existing trees that identifies forest cover acreage, species, composition, age, condition, location, and areas of natural regrowth;
- Prioritized on- and off-site tree replanting areas prior to implementing other alternative environmental compensation measures;
- Alternative environmental compensation measures early in the design process to maximize feasibility of their implementation;
- Quantitative data that demonstrates the proposed alternative environmental compensation measures would equate to at least one of the benefits provided by the net acreage of trees removed (e.g., carbon sequestration, stormwater capture, etc.); and
- Any alternative environmental compensation measures in addition to applicable federal, state, and local regulations already required.

The USACE should anticipate two separate project submissions (Preliminary and Final) to our Commission when plans are at an adequate level of detail. Please consult our agency website at www.ncpc.gov/review/guidelines for more information about our submission guidelines. Finally,

we encourage the USACE to continue to coordinate the new distribution center project with Fairfax County during the NEPA process and later design stages.

We appreciate the opportunity to provide these staff comments and we look forward to reviewing the future draft EA and project submissions. If you have any questions, please contact Michael Weil at 240-575-0212, or michael.weil@ncpc.gov.

Sincerely,

Diane Sullivan

Diane Sullivan, Director
Urban Design and Plan Review Division

Attached: Fort Belvoir North Area – Final Area Development Plan Commission Action (March 3, 2022)

Commission Action

March 3, 2022

PROJECT
Fort Belvoir North Area
Final Area Development Plan
Fort Belvoir
7500 GEO International Drive
Springfield, Virginia

SUBMITTED BY
United States Department of Defense
Department of the Army

REVIEW AUTHORITY
Approval of Master Plans for use by the Commission
per 40 U.S.C. § 8722(a) and (b)(1)

NCPC FILE NUMBER
MP020A

NCPC MAP FILE NUMBER
2205.10(05.00)45430

APPLICANT'S REQUEST
Approval of final master plan

ACTION TAKEN
Approved final master plan with comments

The Commission:

Notes the Fort Belvoir North Area (FBNA) master plan includes known future development, such as the Defense Intelligence Agency (DIA) Headquarters Annex, in addition to capacity planning with defined growth boundaries for possible future missions unknown at this time. Therefore;

Approves the following components of the Fort Belvoir North Area (FBNA) final master plan:

- The planning principles for determining the location of new missions;
- The defined growth boundaries for the Areas A and B;
- The location of the future DIA Headquarters, visitor's center, utility plant, and near-term DIA parking garage within the Area A growth boundary;
- The proposed mid-term fire station addition and Joint Intelligence Logistics Center (JILC) located in Area A and an undisclosed tenant facility located in Area B; and
- The proposed distribution center use within the growth boundary labeled Area D.

Defers review of the following until more is known about future development:

- The mid-term parking garage in Area A, and
- Additional development of Area D other than the distribution center.

Notes the following comments and future requirements regarding development; environmental impacts; renewable energy; and transportation.

Development Framework

Finds the Army responded to the Commission's comments on the draft master plan by reducing disturbance to undeveloped areas; defining tree preservation areas; increasing building heights;

eliminating new surface parking; and incorporating low impact development stormwater management techniques.

Notes the Army used a qualitative analysis to define future growth boundaries, which reduced the total developable land area from 289 acres in the draft master plan to 238 acres currently proposed.

Notes the final master plan proposes to prioritize development of the campus core and identifies the forested western campus as developable only for potential missions that are not compatible with missions in the campus core.

Requires the distribution center within Area D to be located on previously disturbed land to the greatest extent possible.

Requires the Army to seek early consultation with NCPC staff and include proposed road and development configurations for the respective growth boundaries with future site and building plan submissions.

Environmental Impacts

Finds that the development framework has improved and now preserves 90 more acres of trees compared to the draft submission. However, significant environmental impacts are still anticipated with full build-out of the plan.

Notes that in total, approximately 78 acres of potential tree removal is anticipated with full development of the growth area boundaries and there is limited space for additional planting on-site.

Notes that in the near-term, the Army has identified approximately four on-site acres of tree planting in addition to off-site stream restoration to mitigate impacts from the proposed DIA Headquarters and parking garage, which is generally consistent with the intent of NCPC's policies and will be further refined during project review.

Notes the Army has committed to the following alternative environmental compensation measures to mitigate tree loss as a result of future development at the FBNA:

- Evaluate locations off-site to replant trees at a 2:1 ratio;
- Consider solar and/or wind power generation installations on- and off-post;
- Implement stream restoration along tributaries affecting Fort Belvoir; and
- Integrate stormwater restoration and mitigation measures throughout the post.

Finds that additional detail is necessary in the project site and building plan submissions to determine if the alternative compensation measures proposed are comparable mitigation for the remaining amount of tree removal, and

Requires that for future project submissions the Army should:

- Complete a survey of existing trees that identifies forest cover acreage, species, composition, age, condition, location, and areas of natural regrowth;
- Prioritize on- and off-site tree replanting prior to implementing other alternative environmental compensation measures;
- Incorporate alternative environmental compensation measures early in the design process to maximize feasibility of their implementation;
- Provide quantitative data that demonstrates the proposed alternative environmental compensation measures will equate to at least one of the benefits provided by the net acreage of trees removed (e.g., carbon sequestration, stormwater capture, etc.); and
- Provide any alternative environmental compensation measures in addition to applicable federal, state, and local regulations already required.

Requests the National Environmental Policy Act (NEPA) process for each future project include existing and planned, unbuilt projects in the evaluation of cumulative impacts and includes NCPC in the NEPA scoping periods.

Renewable Energy

Notes the Department of Defense's (DoD) Climate Action Plan (CAP) creates a strategic framework to meet the directives of Executive Order (E.O.) 14008 and is also acting on requirements in several other E.O.s with a commitment to achieving carbon free electricity and net-zero installations.

Notes the final master plan indicates that solar panels may be installed on parking structure rooftops, existing surface parking lots, covered walkways, and new facilities evaluated through the Leadership in Energy and Environmental Design (LEED) design process.

Recommends the FBNA prioritize LEED's renewable energy credit points to achieve green building certification of its facilities.

Finds that additional effort is needed for individual projects to meet the larger goals of the DoD's CAP and goals related to carbon free electricity and net-zero installations at the FBNA.

Requests renewable energy is a priority for future FBNA projects including the DIA Headquarters and the future distribution center.

Transportation Near-term

Notes the proposed FBNA Transportation Management Plan (TMP) incorporates the NGA Transportation Demand Management (TDM) strategies, as previously requested by the Commission.

Notes the original NGA Headquarters TMP was approved with a parking ratio of 1:1.5 in 2015. The current parking ratio is approximately 1:1.7, due to an increase in employees and visitor events at the campus.

Notes NCPC revised the parking ratio for this area in 2017 to 1:2 as part of the *2017 National Capital Region Federal Parking Study.*

Notes the proposed DIA Headquarters garage will provide 1,547 spaces to serve NGA employees, DIA employees, and visitors. This garage will maintain the current parking ratio of 1:1.7 for the campus core.

Finds that compared to other installations of similar distance to Metro, NGA has done well in meeting NCPC's earlier parking ratio goal and has implemented many of the TDM strategies outlined in the existing NGA Headquarters TMP.

Finds there are a number of unique constraints that support a deviation from the 1:2 ratio at this time, including:

- Near-zero ability to telework among all employees because of the highest security requirements, and
- Overlapping shifts.

Finds the 1,380 parking spaces dedicated for an anticipated 2,650 visitor population is supported by 120 special events per month that occur at the conference center and NGA College.

Notes that if additional funding becomes available, the Army would like to increase the number of spaces in the DIA garage so that the near-term employee parking ratio for the campus core would decrease to a 1:1.5 ratio.

Notes the Commission is only approving the DIA garage sized for a 1:1.7 campus parking ratio at this time.

Finds more specific TMP data (see below) would be needed for the Commission to consider a decrease to the current campus parking ratio. If the Commission were to find a decrease to the near-term parking ratio justified, mid and long-term parking projects would need to bring the overall campus to a 1:2 parking ratio.

Transportation Mid and Long-term

Notes that the applicant intends to prepare a more robust TMP for the FBNA. Additional time is necessary to seek funding, coordinate with various missions, understand post-pandemic transportation, and realize the potential campus population associated with future development.

Notes the Army has stated they will work towards a 1:2 parking ratio goal over the long-term but the above constraints will prevent near and mid-term projects from reaching this goal.

Notes the mid-term garage will be sized in accordance with a future TMP to be reviewed by the Commission.

Requests the applicant return to the Commission in approximately two years, or when early planning begins for the next master plan project after the DIA Headquarters, with an update to the FBNA TMP. The update should identify:

- Specific mode split data;
- Existing parking utilization rates;
- Additional information about the need for, and amount of, overlapping shifts;
- TDM strategies and steps necessary to incrementally improve the campus parking ratio and an analysis of action items necessary to achieve a long-term parking ratio of 1:2;
- Outcome of efforts to reinstate the FBNA shuttle service between the Franconia-Springfield Metro Station and the campus; and
- Capabilities to bus visitors to/from the FBNA during special events, such as conferences.

Additional Coordination

Requests the Army continue coordination with Fairfax County as individual project implementation proceeds. Coordination should include, but not be limited to, the NEPA scoping process.

Julia Koster 03/04/2022

Julia A. Koster
Secretary to the National Capital Planning Commission

From:	Traver, Carrie
To:	FBNA
Cc:	Nevshehirlian, Stepan
Subject:	[URL Verdict: Neutral][Non-DoD Source] Environmental Assessment for the Construction and Operation of a Distribution Center at the Fort Belvoir North Area
Date:	Wednesday, May 4, 2022 6:31:02 PM

Thank you for providing the notice that the U.S. Army Garrison, Fort Belvoir is preparing an Environmental Assessment (EA) for the construction and operation of a distribution center at the Fort Belvoir North Area (FBNA). In response, the Environmental Protection Agency (EPA) has recommendations for your consideration in the development of the EA in compliance with the National Environmental Policy Act (NEPA) of 1969, the CEQ regulations implementing NEPA (40 CFR 1500-1508) and Section 309 of the Clean Air Act.

Purpose and Need, Alternatives

The Request for Early Input indicates that the project is needed to support the delivery and receipt of materials within and across the Washington Metropolitan Area and will "modernize logistical operations and address safety, security, and operational concerns." EPA recommends that the EA clearly identify the need for the project.

- The Purpose and Need section in the EA should describe the underlying problems or deficiencies and identify how the Proposed Action will resolve these issues.

- The purpose and need should inform the discussion of reasonable alternatives. We recommend discussing alternatives, including alternative sites at FBNA or other locations in the Washington Metropolitan Area that may have been evaluated, and other functional alternatives (e.g., multiple buildings, using existing facilities, etc.).

Aquatic Resources

EPA recommends that the Study evaluate any potential aquatic resource impacts, including direct fill and the potential for additional water quality degradation.

- To assess and avoid impacts, we recommend that the boundaries of any streams and wetlands present on or immediately surrounding the site be delineated.

- In accordance with the Clean Water Act Section 404, we recommend avoiding and minimizing impacts to Waters of the United States. If impacts to aquatic resources are proposed, we recommend including detailed data regarding resource type, size, condition, and functions and a plan to offset the functions of these resources in the watershed.

Water Quality and Stormwater

Existing water quality degradation has been documented in the Accotink Creek watershed. The creek is impaired, and Total Maximum Daily Loads (TMDLs) have been developed for pollutants such as sediment, chlorides, and E. coli. The Virginia Wetland Condition Assessment Tool (WetCAT) data viewer gives an indication of existing stressors from a GIS-based landscape assessment. WetCAT shows two mapped freshwater forested/shrub wetlands on

the site. Based on 2016 landcover data, the wetland to the north of the site is rated as Severely Stressed for water quality and habitat and the larger one to the center/west was rated as Somewhat Severely Stressed for habitat and water quality. (See https://cmap2.vims.edu/WetCAT/WetCAT_Viewer/WetCAT_VA_2D.html)

The Proposed Action involves the construction and operation of an approximately 525,000 square foot warehouse and administrative building with associated parking and covered storage for approximately 600 personnel. According to the Accotink Creek Watershed Management Plan (approved in 2010), the watershed consists of 27% impervious surface. While impacts may occur under a range of impervious area, water quality impairment is generally evident as impervious cover rises above 10%. Above 25% impervious cover, significant degradation is generally expected. As the proposed construction is on a currently undeveloped site in a highly developed watershed with water quality impairments, we recommend minimizing the construction of new impervious area and reducing the impact as much as possible.

- If the Proposed Action is selected, careful planning according to principles of low impact development (LID) and use of green infrastructure will be critical in reducing potential impacts. LID uses and mimics natural processes that result in the infiltration, evapotranspiration, and use of stormwater in order to protect water quality and associated aquatic habitat. LID employs principles such as preserving natural landscape features, minimizing effective imperviousness, and treating stormwater as a resource. A number of resources for implementing green infrastructure practices and LID can be found at https://www.epa.gov/nps/urban-runoff-additional-resources.

- EPA recommends that the EA clearly indicate how the Proposed Action will avoid contributing to existing water quality impairments, including expected measures such as minimizing site grading and preserving and enhancing natural vegetation. EPA encourages the Army to maintain or enhance a riparian buffer for Accotink Creek for water quality, habitat, and climate resilience.

- Where possible, please consider exploring opportunities to minimize impervious areas from buildings, parking, and other appurtenances. We suggest evaluating structured parking and multiple floors for buildings where possible. Where it is not feasible to reduce the size of the roof area, options such as green roof installation or rainwater harvesting could help offset effects. Water collection and storage from roofs could be used for purposes such as landscape irrigation or flushing toilets to reduce water consumption from the facility. Green roof space can also be used as a building amenity and can make buildings more visually appealing.

- We recommend incorporating green infrastructure into parking, sidewalks, and roadways. We recommend considering permeable pavement for sidewalks and trails and vegetated stormwater best management practices (BMPs) to reduce volume and pollution from runoff. Vegetation-based BMPs such as tree pits or trenches, rain gardens, bioswales, planter boxes, and constructed wetlands have a number of co-

benefits, including shade, aesthetic enhancement, and habitat.

EPA's Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act can be found at: https://19january2017snapshot.epa.gov/sites/production/files/2015-09/documents/eisa-438.pdf

Greenhouse Gases, Energy Efficiency and Climate Change

EPA recommends that greenhouse gas (GHG) emissions associated with the Proposed Action be estimated and impacts evaluated. This includes emissions from site clearing and preparation, construction and conversion of the vegetated site, and emissions associated with operation and maintenance of the proposed facilities. We encourage minimizing GHG emissions where possible.

The Fourth National Climate Assessment (2018) indicates that many southeastern cities are particularly vulnerable to climate change. Resources, infrastructure, and human health are increasingly at risk from heat, flooding, and vector-borne disease linked to a changing climate. We recommend that the EA include a discussion of how the facility is planned to be resilient and contribute to resiliency efforts locally, given expected climate change impacts such as increased precipitation and extreme storm events.

As part of these efforts, we encourage incorporating energy efficiency into the building design and construction. For a large building, roof area is a key consideration. Roof treatments may impact energy efficiency; cool roof technologies may reduce air conditioning needs and green roofs may reduce energy use overall. Roof areas may also be suitable for installation of solar arrays to generate energy.

Please also consider recommendations such as those included in the LEED (Leadership in Energy and Environmental Design) Green Building Rating System for developing high-performance, sustainable buildings. http://www.usgbc.org/leed.

Wildlife and Vegetation

Impacts to the range of potential species should be evaluated from the Proposed Action. As this is a tract of undeveloped land in a generally residential and industrial area, it may provide a substantial habitat for local fauna.

We recommend discussing the vegetation to be cleared in detail. The acreage of each community type to be impacted should be assessed. For trees, species, community, and approximate age and size is useful to describe the impacts to vegetation and the habitat provided.

We suggest that the EA consider minimizing wildlife impacts in the design and maintenance of the facility. For example, migratory bird mortality may be caused by windows or reflective surfaces and lighting. (See https://www.audubon.org/magazine/november-december-2008/making-buildings-safe-birds) We suggest considering landscaping enhancements that

may provide for habitat and management of invasive species.

Air Quality - General Conformity
In the discussion of air quality, EPA recommends that the EA specifically identify each National Ambient Air Quality Standard for which the site is or has been in nonattainment or maintenance.

A general conformity rule analysis should be conducted according to the guidance provided in Determining Conformity of General Federal Actions to State or Federal Implementation Plans. Under the general conformity rule, reasonably foreseeable emissions associated with all operational and construction activities, both direct and indirect, must be quantified and compared to the annual de minimis levels for those pollutants in nonattainment or maintenance for that area.

Noise
Based on aerial imagery of the area, it appears that residential development is located to the north. The study would benefit from a full evaluation of potential noise impacts to residences or other sensitive receptors from both construction and operation.

- We recommend identifying the distance to the nearest sensitive receptors and considering the equipment used, vegetation and/or topography, and planned BMPs to evaluate potential impacts. As the expected operation is 6AM to 4PM, we recommend including an assessment of potential noise during early morning hours.

- Other surrounding areas may be less-noise sensitive; for example, it appears that industrial land uses are located to the south and east. However, the EA would benefit from an assessment of the potential for construction noise effects on other facilities or businesses in the vicinity.

Environmental Justice
EPA recommends that an assessment be conducted to identify whether areas of potential environmental justice (EJ) concern are present and may be disproportionately impacted by project activities. The assessment should fully consider potential traffic and transportation impacts that may affect communities of EJ concern. Such an assessment should consider if communities that may be impacted by additional traffic to the facility are already burdened with air quality and health impacts from existing traffic proximity, potential safety impacts, and potential disruption or delays to transportation networks.

- EPA's screening tool, EJSCREEN (https://www.epa.gov/ejscreen) may be a good starting point to enable analyses of populations potentially experiencing adverse environmental impacts. In addition to demographic data for communities of color and low-income populations, the tool provides data regarding linguistic isolation, education, and age, and stressors such as traffic proximity. Please note that EPA recommends starting evaluation at the census block group level as it is the most refined data available from the US Census.

- Please consider referring to "Promising Practices for EJ Methodologies in NEPA Reviews": https://www.epa.gov/environmentaljustic/ej-iwg-promising-practices-ej-methodologies-nepa-reviews.

- We recommend that the identification of potential populations of EJ concern inform outreach to affected communities to assure that communication regarding the project reaches citizens in an appropriate way. For example, EPA encourages posting notices of public meetings, and other resources at frequently visited community locations. These locations may include, but may not be limited to, schools, churches, community centers, barbershops, salons, and medical facilities. For communities that may include a number of non-English speaking residents, materials published in other languages may be needed for full engagement. We recommend documenting efforts to inform and engage potentially impacted communities in the EA.

Socioeconomic and Community Impacts

We recommend that potential socioeconomic and community impacts of the facility and additional personnel and its effect on local housing, employment, schools, businesses, housing prices and availability, property values, etc. be assessed. This should include an evaluation of potential beneficial and negative community impacts during construction and operation of the facility.

Traffic and Transportation

Given the expected increase in vehicles to the site, EPA recommends that the EA thoroughly address traffic and transportation, including an evaluation of the impacts associated with construction and expected conditions for the completed project.

- We suggest as part of the traffic evaluation, the EA discuss existing public transit, ride sharing, and pedestrian and bike access to the facility.

- We recommend that opportunities to reduce use of single occupancy vehicles be evaluated to reduce congestion in the surrounding transportation network, emissions, and the need for parking. Such measures could include improved access via public transit, trail/sidewalk access, bicycle facilities, and incentives for public transit and ride sharing.
- EPA suggests developing a Transportation Management Plan for the facility.

Hazardous Wastes and Contamination

We recommend that the Study include an analysis of any hazardous sites or materials in the vicinity.

- Any known soil or groundwater contamination on the site should be described in the document; this should include the known extent of the pollution and any remediation actions that may have been taken or are planned in the project area. If contamination is

present, please describe how earth-disturbing activities will be conducted to prevent the potential mobilization of contaminants.

- If contamination will be investigated, it would be helpful to indicate when studies are expected to be conducted.

Utilities
The Study would benefit from a discussion of whether existing infrastructure has sufficient capacity for project needs. Potential impacts from utility installation or upgrades should be assessed.

Please feel free to reach out to me if you have any questions on the topics listed above. I also request that you provide a copy or link to the EA by email when it is available for review.

Thank you,
Carrie

Carrie Traver
Life Scientist
Office of Communities, Tribes, & Environmental Assessment
U.S. Environmental Protection Agency, Region 3
1650 Arch Street – 3RA12
Philadelphia, PA 19103
215-814-2772
traver.carrie@epa.gov

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482 FAX (804) 698-4178
www.deq.virginia.gov

Travis A. Voyles
Acting Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director
(804) 698-4020

April 14, 2022

Fort Belvoir Directorate of Public Works-Environmental Division (DPW-ED)
FBNA@usace.army.mil

RE: Construction and operation of a distribution center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia

To Whom it May Concern:

This letter is in response to the scoping request for the above-referenced project.

As you may know, the Department of Environmental Quality, through its Office of Environmental Impact Review (DEQ-OEIR), 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. Similarly, DEQ-OEIR coordinates Virginia's review of federal consistency 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 Virginia Coastal Zone Management (CZM) Program.

DOCUMENT SUBMISSIONS

In order to ensure an effective coordinated review of the environmental documents, notification should be sent directly to OEIR. We request that you submit one electronic to eir@deq.virginia.gov (25 MB maximum) or make the documents available for download at a website, file transfer protocol (ftp) site or the VITA LFT file share system (Requires an "invitation" for access. An invitation request should be sent to eir@deq.virginia.gov.). We request that the review of these documents be done concurrently, if possible.

The environmental documents should include U.S. Geological Survey topographic maps as part of their information. We strongly encourage you to issue shape files with the NEPA document. In addition, project details should be adequately described for the benefit of the reviewers.

From:	Fulcher, Valerie
To:	rr dgif-ESS Projects; Keith Tignor; rr DCR-PRR Environmental Review; odwreview (VDH); Carlos Martinez; Kotur Narasimhan; Lawrence Gavan; Bob Lazaro; Terrance Lasher; Roger Kirchen; rr EIR Coordination; Mark Miller; Atkinson, Kelly
Cc:	FBNA
Subject:	[Non-DoD Source] NEW SCOPING FT BELVOIR NORTH AREA
Date:	Tuesday, May 3, 2022 2:23:54 PM
Attachments:	FNBA Distribution Center_Request for Early Input Notice (1).pdf Ft Belvoir Distribution Center Scoping Response.pdf

---

Good afternoon—attached is a request for scoping comments on the following:

> **Construction and operation of a distribution center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia**

If you choose to make comments, please send them directly to the project sponsor (FBNA@usace.army.mil) and copy the DEQ Office of Environmental Impact Review: eir@deq.virginia.gov. We will coordinate a review when the environmental document is completed.

DEQ-OEIR's scoping response is also attached.

If you have any questions regarding this request, please email our office at eir@deq.virginia.gov.

Valerie

--

Valerie A. Fulcher, CAP, OM, Admin/Data Coordinator Senior

Department of Environmental Quality

Environmental Enhancement - Office of Environmental Impact Review

1111 East Main Street

Richmond, VA 23219

NEW PHONE NUMBER: 804-659-1550

Email: Valerie.Fulcher@deq.virginia.gov

https://www.deq.virginia.gov/permits-regulations/environmental-impact-review

OUR ENFORCEABLE POLICIES HAVE BEEN UPDATED FOR 2021: https://www.deq.virginia.gov/permits-regulations/environmental-impact-review/federal-consistency

For program updates and public notices please subscribe to Constant Contact: https://lp.constantcontact.com/su/MVcCump/EIR

From:	Warren, Arlene
To:	FBNA
Cc:	rr Environmental Impact Review
Subject:	[Non-DoD Source] Re: NEW SCOPING FT BELVOIR NORTH AREA
Date:	Thursday, May 5, 2022 1:58:15 PM

Project Name: Expedited - NEW SCOPING FT BELVOIR NORTH AREA
Project #: N/A
UPC #: N/A
Location: Springfield VA

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.

The following surface water intakes are located within a 5 mile radius of the project site:

PWS ID Number	System Name	Facility Name
6059501	FAIRFAX COUNTY WATER AUTHORITY	OCCOQUAN RESERVOIR INTAKE

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

Best Management Practices should be employed, including Erosion & Sedimentation Controls and Spill Prevention Controls & Countermeasures on the project site.

Materials should be managed while on site and during transport to prevent impacts to nearby surface water.

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

Best Regards,

Arlene F. Warren
GIS Program Support Technician
Virginia Department of Health, Office of Drinking Water
109 Governor Street, 6th Floor
Richmond, VA 23219
804-356-6658 (office/cell/text)

On Tue, May 3, 2022 at 2:16 PM Fulcher, Valerie <valerie.fulcher@deq.virginia.gov> wrote:

Good afternoon—attached is a request for scoping comments on the following:

> **Construction and operation of a distribution center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia**

If you choose to make comments, please send them directly to the project sponsor (FBNA@usace.army.mil) and copy the DEQ Office of Environmental Impact Review: eir@deq.virginia.gov. We will coordinate a review when the environmental document is completed.

DEQ-OEIR's scoping response is also attached.

If you have any questions regarding this request, please email our office at eir@deq.virginia.gov.

Valerie

--

Valerie A. Fulcher, CAP, OM, Admin/Data Coordinator Senior

Department of Environmental Quality

Environmental Enhancement - Office of Environmental Impact Review

1111 East Main Street

Richmond, VA 23219

NEW PHONE NUMBER: 804-659-1550

Email: Valerie.Fulcher@deq.virginia.gov

https://www.deq.virginia.gov/permits-regulations/environmental-impact-review

OUR ENFORCEABLE POLICIES HAVE BEEN UPDATED FOR 2021: https://www.deq.virginia.gov/permits-regulations/environmental-impact-review/federal-consistency

For program updates and public notices please subscribe to Constant Contact: https://lp.constantcontact.com/su/MVcCump/EIR

From:	Steward, Accotink Creek
To:	FBNA
Cc:	phillip@prknetwork.org; Renee Grebe; Susan Bonney; Ann Bennett
Subject:	[URL Verdict: Neutral][Non-DoD Source] Fort Belvoir North Area Distribution Center Early Input
Date:	Tuesday, May 3, 2022 10:12:03 PM
Attachments:	1651629000540.png 1651629079543.png

RE: Fort Belvoir North Area Distribution Center - Early Input of the Friends of Accotink Creek

These comments include the larger issues of the Fort Belvoir North Area Final Area Development Plan (ncpc.gov)

Who was invited to the April 19th public meeting or how was it announced? We were unaware.

We request site visits by concerned stakeholders be arranged.

Go for the Gold – LEED Gold. The National Geospatial Agency did it, so can all other buildings on Fort Belvoir North Area.

Neither our country nor the world can meet climate goals by cutting down more forests and hoping the climate will not notice. Forward-thinking and difficult choices must be made and we all must make them.
"*To keep the nation secure, we must tackle the existential threat of climate change. The unprecedented scale of*
wildfires, floods, droughts, typhoons, and other extreme weather events of recent months and years have damaged our
installations and bases, constrained force readiness and operations, and contributed to instability around the world." - Lloyd J. Austin III, Secretary of Defense, Department of Defense Climate Risk Analysis, Report Submitted to National Security Council, October 2021.

It is not facetious to suggest that we preserve the tree canopy and instead use the Fort Belvoir golf course for building or for reforestation.

2-to-1 tree replanting somewhere offsite? The likelihood of anyone offering their parking lot or playing field for this purpose seems vanishingly dim. Further, only mature trees will be counted (typically those above 8" diameter in the survey). Figuring in the expected survival rate of any replacement saplings will inevitably yield a lower tree population than what was sacrificed.

Digging up the earlier remediation tree plantings already? Really? Was there no planning involved in the selection of their locations? Will re-remediation plantings now be proposed that are truly protected?

Fort Belvoir North Area is not too far from Metro for improved Complete Street enhancements to provide climate reduction pedestrian and bicycle travel options to commuting personnel, such as:

- Possibly add bike lanes and shared use path along Backlick Road in addition to the existing

sidewalk

- Possibly extend Backlick Road sidewalk south from Barta Road to connect with existing sidewalk
- Possibly a connection to the Fairfax County Parkway Trail via Constantine Avenue or Beverley Park Drive
- Possibly a pedestrian bridge across I-95 connecting to Loisdale Road bicycle facilities

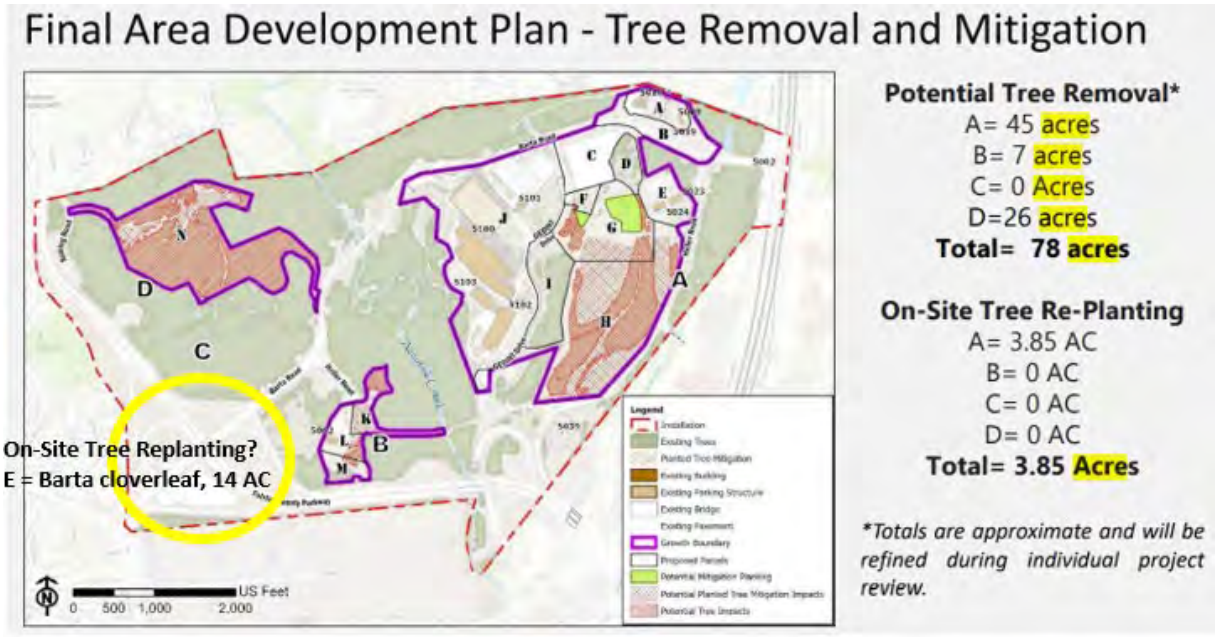
Possibilities for environmental remediation:

Stream remediation projects could focus on Field Lark Branch on the eastern boundary of Fort Belvoir North Area) and the small unnamed tributaries on Fort Belvoir North Area itself, in collaboration with Fairfax County Stormwater Planning Division

The Accotink Gorge Chinese wisteria removal project would benefit from the support of Fort Belvoir and its naturalist staff. The Accotink Gorge is immediately south of Fort Belvoir North Area and the Chinese wisteria infestation extends upstream along Accotink Creek onto the base.

Acquire land nearby for parks or conservation easements, possibly immediately to the north or south along Accotink Creek, perhaps even completing a protected park corridor from North Area to Main Base along the creek.

Replant the Fairfax County Parkway. The Barta Road cloverleaf alone would provide about 14 acres never replanted after the Parkway extension across Fort Belvoir North Area in 2010. This area is now partly colonized by exotic invasives, a sad successor to the mature forests that were lost.



Solarize everything that does not move.

Final Area Development Plan - Renewable Energy

- Project costs anticipate LEED Silver ratings GOLD! and Low Impact Development (LID) techniques.
- New facilities are intended to support on-site renewable energy production and will be considered on a case-by-case basis.
- Solar arrays considered for:
  - Parking structure rooftops
  - Surface lots
  - Covered walkways
  - New facility rooftops will be evaluated for potential during the LEED design process and against mission and security requirements

Parking Structure Photovoltaic Shade Structures

Pedestrian Photovoltaic Shade Structures

Sincerely,

Philip Latasa : : steward@accotink.org
Friends of Accotink Creek : : www.accotink.org : :

><((((º>`·.¸¸.·´¯`·.¸><((((º> *"Find just one other person who cares."* ><((((º>`·.¸¸.·´¯`·.¸><((((º>¸.·´¯`·.¸ ><((((º>

#SaveCinderBedWoods

Matthew S. Wells
Director

Frank N. Stovall
Deputy Director for Operations

Darryl Glover
Deputy Director for Dam Safety, Floodplain Management and Soil and Water Conservation

Laura Ellis
Interim Deputy Director for Administration and Finance

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

June 2, 2022

Heather Cisar
USACE-Planning Division
2 Hopkins Plaza
Baltimore, MD 21201

Re: Fort Belvoir North Area Distribution Center

Dear Ms. Cisar:

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 Fort Belvoir Proving Ground Conservation Site is located within the project site. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Fort Belvoir Proving Ground Conservation Site has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resource of concern at this site is:

Isotria medeoloides	Small whorled pogonia	G2?/S2/LT/LE

Small whorled pogonia is a perennial orchid that grows in a variety of woodland habitats in Virginia, but tends to favor mid-aged woodland habitats on gently north or northeast facing slopes often within small draws. It is quite natural for plants of this species to remain dormant in the soil for long periods of time. Direct destruction, as well as habitat loss and alteration, are principle reasons for the species' decline (Ware, 1991). The Virginia Field Office of the U.S. Fish and Wildlife Service (USFWS) recommends that field surveys for this species be conducted in areas of Virginia south of Caroline County from May 25 through July 15 and in areas of Virginia from Caroline County and north from June 1 through July 20 (K. Mayne, pers. com. 1999). Please note that this species is currently classified as threatened by the USFWS and as endangered by the Virginia Department of Agriculture and Consumer Services (VDACS).

Furthermore, according to a DCR biologist and predicted suitable habitat modeling, there is potential for additional populations of Small whorled pogonia to occur in the project area if suitable habitat exists on site.

To minimize adverse impacts to the documented occurrence of Small whorled pogonia, DCR recommends avoidance of the conservation site. Due to the potential for this site to support additional populations of Small whorled pogonia, DCR recommends an inventory for the resource in the study area. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources.

DCR-Division of Natural Heritage biologists are qualified to conduct inventories for rare, threatened, and endangered species. Please contact Anne Chazal, Natural Heritage Chief Biologist, at anne.chazal@dcr.virginia.gov or 804-786-9014 to discuss availability and rates for field work. A list of other individuals who are qualified to conduct inventories may be obtained from the USFWS.

Due to the legal status of Small whorled pogonia, DCR also recommends coordination with USFWS to ensure compliance with protected species legislation.

In addition, the proposed project may impact Ecological Cores **(C5)** as identified in the Virginia Natural Landscape Assessment (https://www.dcr.virginia.gov/natural-heritage/vaconvisvnla). Mapped cores in the project area can be viewed via the Virginia Natural Heritage Data Explorer, available here: http://vanhde.org/content/map.

Ecological Cores are areas of at least 100 acres of continuous interior, natural cover that provides habitat for a wide range of species, from interior-dependent forest species to habitat generalists, as well as species that utilize marsh, dune, and beach habitats. Interior core areas begin 100 meters inside the nearest core edges and continue to the deepest parts of cores. Cores also provide natural and economic benefits of open space, recreation, water quality (including drinking water recharge and protection, and erosion prevention), and air quality (including carbon sequestration and oxygen production). Cores are ranked from C1 to C5 (C5 being the least significant) using nine prioritization criteria, including the habitats of natural heritage resources they contain.

Impacts to cores occur when their natural cover is partially or completely converted permanently to developed land uses. Habitat conversion to development results in changes that reduce ecosystem processes, biodiversity, population viability and habitat quality due to limited recolonization, increased predation, and increased introduction and establishment of invasive species.

Therefore, avoiding or minimizing core impacts is a key mitigation measure that will reduce deleterious effects and preserve the area and connectivity of habitats that are key components of biodiversity. DCR recommends efforts to minimize edge in remaining habitat fragments, retain natural corridors that allow movement between fragments and design the intervening landscape to support native wildlife (natural cover versus lawns).

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. Survey results should be coordinated with DCR-DNH and USFWS. Upon review of the results, if it is determined the species is present, and there is a likelihood of a negative impact on the species, DCR-DNH will recommend coordination with VDACS to ensure compliance with Virginia's Endangered Plant and Insect Species Act.

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 Wildlife Resources (VDWR) 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 Amy Martin at (804-367-2211) or amy.martin@dwr.virginia.gov.

Should you have any questions or concerns, please contact me at 804-225-2429. Thank you for the opportunity to comment on this project.

Sincerely,

Tyler Meader
Natural Heritage Locality Liaison

CC : Troy Andersen, USFWS

Literature Cited

Ware, D.M.E. 1991. Small whorled pogonia. In Virginia's Endangered Species: Proceedings of a Symposium. K. Terwilliger ed. The McDonald and Woodward Publishing Company, Blacksburg, Virginia.

From: Harper, John - NRCS, Richmond, VA <john.harper@usda.gov>
Sent: Thursday, June 30, 2022 1:44 PM
To: FBNA <FBNA@usace.army.mil>
Cc: Martinez, Edwin - NRCS, Richmond, VA <edwin.martinez@usda.gov>
Subject: [URL Verdict: Neutral][Non-DoD Source] RE: Notice of the Availability (NOA) for the Draft Environmental Assessment (EA) for the proposed construction of a distribution center on Fort Belvoir's North Area (FBNA) in Fairfax County, Virginia

This area is exempt from Farmland Protection Policy Act (FPPA) because on military base land and in Urban area.
Please contact me if there are questions.

J. David Harper
State Soil Scientist
State Resource Inventory Coordinator
1606 Santa Rosa Road, Suite 209
Richmond, Virginia 23229
804-287-1647

U.S. Army Garrison Fort Belvoir,
9430 Jackson Loop,
Fort Belvoir, Virginia 22060-5116

Desk: 703-806-3766
DSN: 656-3766
NIPR: daniel.d.dobbins.civ@army.mil

From: Larry Zaragoza <larry.zaragoza@yahoo.com>
Sent: Tuesday, July 5, 2022 3:43 PM
To: Dobbins, Daniel D CIV USARMY ID-SUSTAINMENT (USA) <daniel.d.dobbins.civ@army.mil>
Cc: E&R <chair.er@mvcca.org>
Subject: [Non-DoD Source] Questions

Hi Daniel,

This is Larry Zaragoza, we just spoke. I am the policy advisor for the Environment and Recreation of the Mount Vernon Council of Citizens' Associations. Our membership included about 50 community associations within the Mount Vernon District.

As we discussed, we have a meeting tomorrow night and we were hoping to have someone attend our meeting (by zoom) if possible or get some questions answered to better understand this EA.

Page 53 identifies contaminants of concern and UXO that have contaminated soils and groundwater. As a result of the contamination, there are land use controls on the groundwater and the EA also states that additional controls may be needed for subsurface construction. Usually whenever new construction is taking place, I always ask. if it the waste should be removed because the contamination poses a risk to humans and the environment and because there is a cost to maintaining effective land use controls (I would also note that effective land use controls are more expensive that the imposition of any/minimal controls). *Request: Please provide the full list of land use controls and explain how they will be adequate to prevent the spread of contamination and address risks to people and the envirnment.*

There are surface waters, including wetlands onsite and the presence of contaminants pose a threat to the surface water and wetlands. However, the location of contamination and UXO are not clear from the materials reviewed. It would also be helpful to show the location of the various land use controls. *Request: How the land use controls will protect surface waters and wetlands?*

Page 3-53 describes how emissions from construction under the proposed action would constitute less than 0.003 percent of the total carbon dioxide emissions produced by the state, which seems to be an inappropriate comparison. *Request: Given that Fairfax County and the state of Virginia are moving towards carbon neutrality by 2050, what is Fort Belvoir doing to reach carbon neutrality?*

The EA does not appear to identify the level of LEED certification that is being sought.

Request: What level of LEED certification be sought for this project?

Request: Given that we are working towards a goal of carbon neutrality by 2050, why isn't this project employing renewable energy, such as solar, to meet the power needs of this project? Also, shouldn't the project rely upon EVs that are powered by renewable energy?

Additional questions may come up. Sorry for the delay in getting these to you. I have an internet outage at home.

Larry Zaragoza
703-577-7466

From: Wenonah Haire <wenonah.haire@catawba.com>
Sent: Thursday, July 7, 2022 11:44 PM
To: FBNA <FBNA@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] Re: Notice of the Availability (NOA) for the Draft Environmental Assessment (EA) for the proposed construction of a distribution center on Fort Belvoir's North Area (FBNA) in Fairfax County, Virginia

Sorry but we have to have a hard copy sent in care of Caitlin Rogers@ [redacted], Rock Hill, SC. 29730.

Sincerely,
Wenonah Haire, THPO

Sent from my iPhone

From: Free, Stephanie <stephanie.free@ncpc.gov>
Sent: Wednesday, July 13, 2022 4:29 PM
To: FBNA <FBNA@usace.army.mil>
Cc: Sullivan, Diane <diane.sullivan@ncpc.gov>
Subject: [URL Verdict: Neutral][Non-DoD Source] FBNA Distribution Center: Draft EA Comment Letter

Good afternoon,

Thank you for the opportunity to comment on the draft Environmental Assessment (EA) for the proposed Distribution Center at the Fort Belvoir North Area. Attached you will find comments prepared by the National Capital Planning Commission staff. We look forward to working with you as this project progresses and the EA is finalized.

Thank you,

Stephanie Free, PLA, LEED GA
Urban Planner | Urban Design & Plan Review Division
National Capital Planning Commission
401 9th Street, NW | Suite 500 | Washington, DC 20004
Direct: 202.482.7209 | Main: 202.482.7200
www.ncpc.gov | Facebook | Twitter | Instagram

National Capital Planning Commission
401 9th Street, NW North Lobby, Suite 500 Washington, DC 20004 Tel 202.482.7200 Fax 202.482.7272 www.ncpc.gov

IN REPLY REFER TO:

NCPC FILE NO. 8383

July 12, 2022

U.S. Army Fort Belvoir Directorate of Public Works
Environmental Division
9430 Jackson Loop, Building 1442, Rm #226
Fort Belvoir, VA 22060-5116

RE: Fort Belvoir North Area (FBNA) Distribution Center Draft Environmental Assessment (EA)

To Whom This May Concern:

Thank you for the opportunity to comment on the draft EA prepared by the Department of the Army for the proposed Distribution Center located at the FBNA in Springfield, Virginia. As the federal government's central planning agency in the National Capital Region, the National Capital Planning Commission (NCPC) has advisory review authority over projects at Fort Belvoir under the National Capital Planning Act t ((40 USC § 8722 (b) (1))[1]. We note that NCPC approved the final FBNA Area Development Plan (ADP) at its March 3, 2022 meeting and comments on concept plans for the Distribution Center at its July 7, 2022 meeting. The final FBNA ADP and Federal Elements of the Comprehensive Plan for the Nation's capital are the basis for the Commission's review of the FBNA Distribution Center. Preliminary plans for the Distribution Center should be reviewed by the Commission as soon as possible to ensure that the project meets the policies of the Comprehensive Plan and so that any changes requested by the Commission can be evaluated fully by the National Environmental Policy Act (NEPA) process.

The draft EA evaluates a reasonable range of alternatives for the Proposed Action and staff generally supports the location of the proposed Distribution Center within "Area D" as indicated in the FBNA ADP. In general, the draft EA demonstrates that the Proposed Action seeks to avoid or minimize adverse effects upon the quality of the human environment through evaluation of associated environmental impacts. However, NCPC staff has identified topics that require further evaluation and encourages the Department of the Army to consider the following comments in preparation of the final EA and future submissions to the Commission.

Tree Removal and Replacement

The final FBNA ADP indicates approximately 26 acres of forest clearing in Area D is required to construct the proposed Distribution Center. However, the draft EA indicates approximately 30 acres of forest will be removed to implement the Proposed Action, and the concept plans reviewed by the Commission on July 7, 2022 indicate that approximately 37-40 acres of forest clearing is required. The difference in tree clearing between the final ADP and the proposed concept plans is significant and the Army should evaluate how more trees can be preserved in better alignment with the FBNA ADP. Opportunities to preserve more trees

[1] The Planning Act Requires federal agencies to advise and consult with NCPC in the preparation of agency plans prior to preparation of construction plans.

may exist by reducing the size and/or configuration of the proposed perimeter roads, building footprints, and parking areas, including consideration for replacing surface parking with structured parking. Further, the total acreage of proposed tree removal should be consistent in the proposed plans and the EA.

The draft EA also notes compliance with Fort Belvoir's Tree Removal and Replacement Policy which includes on- and off-site replanting and alternative environmental compensation measures as an option to fulfill tree replacement requirements should physical space be limited to replant the required quantity of replacement trees. However, more information is needed to understand the total effect of the tree replacement strategy, including how the tree replacement ratio will be met with on- and off-site replanting (e.g., the quantity of replacement trees and their locations) and an analysis of how the alternative environmental compensation measures compare to the environmental benefits lost by removing the trees. This analysis should quantify how the alternative environmental compensation measures will equate to at least one of the environmental benefits provided by the net acreage of trees removed (e.g., carbon sequestration, stormwater capture, etc.).

In addition, the draft EA should consider the environmental impacts of the proposed perimeter fence and associated lighting, monitoring equipment, and patrol path. The draft EA describes a need for a 30-foot wide forest clearing and stream crossings to construct these security measures. However, these security measures were not identified in the FBNA ADP and it is unclear why an additional fence is needed within an already secure campus. Moreover, the Army should study how the perimeter security proposal could be altered to reduce the amount of tree loss and impacts to streams and wetlands.

Stormwater Management

The draft EA indicates that the Proposed Action would add approximately 23.6 acres of impervious area to the FBNA. It further states that the Proposed Action would meet all applicable stormwater management regulations, ensuring consistent and measurable steps to minimize detrimental impacts to water quality in downstream waters. The final FBNA ADP indicates that Low Impact Development (LID) techniques would be implemented to manage stormwater, such as bioretention facilities, permeable paving, and native vegetation, which provides an effective alternative to more traditional stormwater management approaches that rely on engineered structures. However, the Distribution Center's concept plans indicate the use of below-grade manufactured treatment devices to manage stormwater and it is unclear if LID measures are included in the Proposed Action. Since the Proposed Action is one of many future projects that will increase impervious surfaces and potentially adversely impact water resources at the FBNA, the Army is strongly encouraged to coordinate with Fairfax County staff and the Virginia Department of Environmental Quality on a comprehensive stormwater management plan for the entire campus that utilizes LID techniques integrated with the landscape and building designs. Stormwater ponds and manufactured treatment devices should be limited.

Transportation

The draft EA includes a Traffic Impact Study (TIS) to evaluate existing conditions and potential cumulative impacts of the Distribution Center and the future Defense Intelligence Agency (DIA) Headquarters Annex. The draft EA determines that long-term, minor, adverse impacts on traffic would be expected as a result of daily commutes and operations of the two facilities and would be alleviated by traffic flow improvements due to Fairfax County Parkway widening and other improvements. The analysis assumes each additional staff member generates 0.9 additional AM and PM peak hour trips for the 600 additional staff at the Distribution Center and 650 additional staff at the DIA Annex. NCPC notes the standard for suburban federal facilities is 1:2 per the policies of the Federal Transportation Element of the Comprehensive Plan for the National Capital and reminds the Army that the Commission's March 2022 approval of the FBNA ADP included a near-term parking ratio of 1:1.7 and requested that the Army return to the Commission in

two years with an updated Transportation Management Plan (TMP) and Transportation Demand Management (TDM) strategies to help the installation achieve a 1:2 parking ratio in the long term. The impacts discussed in the draft EA do not include a trip reduction credit, which would assume implementation of TDM strategies, such as carpooling, to reduce single occupancy vehicle (SOV) trips and parking demand. Staff acknowledges the analysis' intent to study the most extreme or "worst case" scenario; however, the EA and Distribution Center plans should account for implementing TDM strategies at the FBNA to reduce SOV trips and meet the transportation policies of the Comprehensive Plan.

Renewable Energy

The Distribution Center concept plans reviewed on July 7, 2022 include solar panels on the building rooftops and solar canopies over surface parking areas. This approach is consistent with the FBNA ADP and the Commission commended the Army for prioritizing renewable energy in the Distribution Center plans. As such, the EA should consider the impact of the proposed renewable energy systems on the facility's operations including energy use and carbon emissions.

NCPC Review

As noted above, the Commission reviewed concept plans for the FBNA Distribution Center at its July 7, 2022 meeting. Comments and feedback provided at this meeting will further guide development of the Distribution Center. Staff strongly recommends the Army account for the Commission's recommendations prior to finalizing the EA so that they may be considered as part of the NEPA analysis as necessary.
NCPC appreciates the opportunity to provide these comments as part of this important project. We look forward to continued involvement in the NEPA process, and the review of the final master plan. If you have any questions, please contact Stephanie Free at (202) 482-7209 or stephanie.free@ncpc.gov, or consult our agency website for further information about the Comprehensive Plan or Submission Guidelines.

Sincerely,

Diane Sullivan

Diane Sullivan, Director
Urban Design and Plan Review Division

Enclosed:
Commission Action – Final FBNA ADP (March 3, 2022)
Commission Action - Comments on Concept Plans (July 7, 2022)

Commission Action

March 3, 2022

PROJECT
Fort Belvoir North Area
Final Area Development Plan
Fort Belvoir
7500 GEO International Drive
Springfield, Virginia

SUBMITTED BY
United States Department of Defense
Department of the Army

REVIEW AUTHORITY
Approval of Master Plans for use by the Commission
per 40 U.S.C. § 8722(a) and (b)(1)

NCPC FILE NUMBER
MP020A

NCPC MAP FILE NUMBER
2205.10(05.00)45430

APPLICANT'S REQUEST
Approval of final master plan

ACTION TAKEN
Approved final master plan with comments

The Commission:

Notes the Fort Belvoir North Area (FBNA) master plan includes known future development, such as the Defense Intelligence Agency (DIA) Headquarters Annex, in addition to capacity planning with defined growth boundaries for possible future missions unknown at this time. Therefore;

Approves the following components of the Fort Belvoir North Area (FBNA) final master plan:

- The planning principles for determining the location of new missions;
- The defined growth boundaries for the Areas A and B;
- The location of the future DIA Headquarters, visitor's center, utility plant, and near-term DIA parking garage within the Area A growth boundary;
- The proposed mid-term fire station addition and Joint Intelligence Logistics Center (JILC) located in Area A and an undisclosed tenant facility located in Area B; and
- The proposed distribution center use within the growth boundary labeled Area D.

Defers review of the following until more is known about future development:

- The mid-term parking garage in Area A, and
- Additional development of Area D other than the distribution center.

Notes the following comments and future requirements regarding development; environmental impacts; renewable energy; and transportation.

Development Framework

Finds the Army responded to the Commission's comments on the draft master plan by reducing disturbance to undeveloped areas; defining tree preservation areas; increasing building heights;

eliminating new surface parking; and incorporating low impact development stormwater management techniques.

Notes the Army used a qualitative analysis to define future growth boundaries, which reduced the total developable land area from 289 acres in the draft master plan to 238 acres currently proposed.

Notes the final master plan proposes to prioritize development of the campus core and identifies the forested western campus as developable only for potential missions that are not compatible with missions in the campus core.

Requires the distribution center within Area D to be located on previously disturbed land to the greatest extent possible.

Requires the Army to seek early consultation with NCPC staff and include proposed road and development configurations for the respective growth boundaries with future site and building plan submissions.

Environmental Impacts

Finds that the development framework has improved and now preserves 90 more acres of trees compared to the draft submission. However, significant environmental impacts are still anticipated with full build-out of the plan.

Notes that in total, approximately 78 acres of potential tree removal is anticipated with full development of the growth area boundaries and there is limited space for additional planting on-site.

Notes that in the near-term, the Army has identified approximately four on-site acres of tree planting in addition to off-site stream restoration to mitigate impacts from the proposed DIA Headquarters and parking garage, which is generally consistent with the intent of NCPC's policies and will be further refined during project review.

Notes the Army has committed to the following alternative environmental compensation measures to mitigate tree loss as a result of future development at the FBNA:

- Evaluate locations off-site to replant trees at a 2:1 ratio;
- Consider solar and/or wind power generation installations on- and off-post;
- Implement stream restoration along tributaries affecting Fort Belvoir; and
- Integrate stormwater restoration and mitigation measures throughout the post.

Finds that additional detail is necessary in the project site and building plan submissions to determine if the alternative compensation measures proposed are comparable mitigation for the remaining amount of tree removal, and

Requires that for future project submissions the Army should:

- Complete a survey of existing trees that identifies forest cover acreage, species, composition, age, condition, location, and areas of natural regrowth;
- Prioritize on- and off-site tree replanting prior to implementing other alternative environmental compensation measures;
- Incorporate alternative environmental compensation measures early in the design process to maximize feasibility of their implementation;
- Provide quantitative data that demonstrates the proposed alternative environmental compensation measures will equate to at least one of the benefits provided by the net acreage of trees removed (e.g., carbon sequestration, stormwater capture, etc.); and
- Provide any alternative environmental compensation measures in addition to applicable federal, state, and local regulations already required.

Requests the National Environmental Policy Act (NEPA) process for each future project include existing and planned, unbuilt projects in the evaluation of cumulative impacts and includes NCPC in the NEPA scoping periods.

Renewable Energy

Notes the Department of Defense's (DoD) Climate Action Plan (CAP) creates a strategic framework to meet the directives of Executive Order (E.O.) 14008 and is also acting on requirements in several other E.O.s with a commitment to achieving carbon free electricity and net-zero installations.

Notes the final master plan indicates that solar panels may be installed on parking structure rooftops, existing surface parking lots, covered walkways, and new facilities evaluated through the Leadership in Energy and Environmental Design (LEED) design process.

Recommends the FBNA prioritize LEED's renewable energy credit points to achieve green building certification of its facilities.

Finds that additional effort is needed for individual projects to meet the larger goals of the DoD's CAP and goals related to carbon free electricity and net-zero installations at the FBNA.

Requests renewable energy is a priority for future FBNA projects including the DIA Headquarters and the future distribution center.

Transportation Near-term

Notes the proposed FBNA Transportation Management Plan (TMP) incorporates the NGA Transportation Demand Management (TDM) strategies, as previously requested by the Commission.

Notes the original NGA Headquarters TMP was approved with a parking ratio of 1:1.5 in 2015. The current parking ratio is approximately 1:1.7, due to an increase in employees and visitor events at the campus.

Notes NCPC revised the parking ratio for this area in 2017 to 1:2 as part of the *2017 National Capital Region Federal Parking Study.*

Notes the proposed DIA Headquarters garage will provide 1,547 spaces to serve NGA employees, DIA employees, and visitors. This garage will maintain the current parking ratio of 1:1.7 for the campus core.

Finds that compared to other installations of similar distance to Metro, NGA has done well in meeting NCPC's earlier parking ratio goal and has implemented many of the TDM strategies outlined in the existing NGA Headquarters TMP.

Finds there are a number of unique constraints that support a deviation from the 1:2 ratio at this time, including:

- Near-zero ability to telework among all employees because of the highest security requirements, and
- Overlapping shifts.

Finds the 1,380 parking spaces dedicated for an anticipated 2,650 visitor population is supported by 120 special events per month that occur at the conference center and NGA College.

Notes that if additional funding becomes available, the Army would like to increase the number of spaces in the DIA garage so that the near-term employee parking ratio for the campus core would decrease to a 1:1.5 ratio.

Notes the Commission is only approving the DIA garage sized for a 1:1.7 campus parking ratio at this time.

Finds more specific TMP data (see below) would be needed for the Commission to consider a decrease to the current campus parking ratio. If the Commission were to find a decrease to the near-term parking ratio justified, mid and long-term parking projects would need to bring the overall campus to a 1:2 parking ratio.

Transportation Mid and Long-term

Notes that the applicant intends to prepare a more robust TMP for the FBNA. Additional time is necessary to seek funding, coordinate with various missions, understand post-pandemic transportation, and realize the potential campus population associated with future development.

Notes the Army has stated they will work towards a 1:2 parking ratio goal over the long-term but the above constraints will prevent near and mid-term projects from reaching this goal.

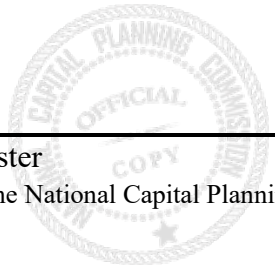
Notes the mid-term garage will be sized in accordance with a future TMP to be reviewed by the Commission.

Requests the applicant return to the Commission in approximately two years, or when early planning begins for the next master plan project after the DIA Headquarters, with an update to the FBNA TMP. The update should identify:

- Specific mode split data;
- Existing parking utilization rates;
- Additional information about the need for, and amount of, overlapping shifts;
- TDM strategies and steps necessary to incrementally improve the campus parking ratio and an analysis of action items necessary to achieve a long-term parking ratio of 1:2;
- Outcome of efforts to reinstate the FBNA shuttle service between the Franconia-Springfield Metro Station and the campus; and
- Capabilities to bus visitors to/from the FBNA during special events, such as conferences.

Additional Coordination

Requests the Army continue coordination with Fairfax County as individual project implementation proceeds. Coordination should include, but not be limited to, the NEPA scoping process.



Julia A. Koster
Secretary to the National Capital Planning Commission

Commission Action

July 7, 2022

PROJECT
Fort Belvoir North Area Distribution Center
Fort Belvoir North Area
Fort Belvoir, Virginia

SUBMITTED BY
United States Department of Defense
Department of the Army

REVIEW AUTHORITY
Federal Projects in the Environs
per 40 U.S.C. § 8722(b)(1)

NCPC FILE NUMBER
8383

NCPC MAP FILE NUMBER
2204.10(00.00)45527

APPLICANT'S REQUEST
Approval of comments on concept plans

ACTION TAKEN
Approved comments on concept plans

The Commission:

Supports the following elements of the Distribution Center complex which is located in the southwest portion of the Fort Belvoir North Area in Fairfax County, Virginia:

- The high bay warehouse
- Three story administrative building
- Truck maintenance/refueling building
- Covered/enclosed storage buildings
- Utility Yard

Defers support for the two surface parking lots with 450 spaces, the entry control facility, and the perimeter fence until additional information is submitted for review (see below).

Finds that the significant size of the new distribution center and ancillary buildings preclude its siting in the preferred development Areas of A, B, and C on the campus.

Finds the development has been sited to avoid impacting any nearby delineated wetlands or stream valleys.

Notes this project is located generally within the 26-acre boundary that was outlined in the 2022 area development plan with the exception of the entry control facility, which appears to exceed the boundary of Area D.

Tree Removal/Replacement

Finds that while the approved Area Development Plan (ADP) noted the removal of 26 acres of trees in Area D, this proposal describes the removal of up to 40 acres of trees and the difference is significant.

Notes the additional tree removal is necessary to accommodate a vehicle entry control facility, one surface parking lot, and the perimeter fence.

Notes the perimeter fencing was not detailed in the ADP, appears to be a new element on the campus and will likely result in impacts to trees, stream valleys and wetlands.

Requests the Army to provide additional information on the perimeter fence regarding:

- Why it is needed in an already secure campus;
- The number of trees that will be removed for the fence;
- How the fence proposal could be altered to reduce the amount of tree loss and impacts on streams and wetlands.

Notes the Army is in coordination with Fairfax County and has identified Accotink Lake as potentially an offsite tree replanting location, in addition to the one acre of on-site replanting identified in the ADP**.**

Notes the Army submitted a Forest Stand Delineation Report but has not submitted a Tree Replacement Plan.

Requests the Army reevaluate how more trees can be preserved, either by reducing the size and configuration of the parking lots, interior roads and/or building footprints.

Requests the Army submit a tree replacement plan, a requirement for the Commission's preliminary review, that addresses the following:

- The numbers of trees removed and how the replacement ratio of two trees per every tree removed will be met on and off the site with a priority for on-site planting.
- Identification of on-site preservation areas and areas for replanting
- An analysis that demonstrates how additional environmental compensation measures equal the loss of trees removed.

Renewable Energy

Supports the Army's prioritization of renewable energy by incorporating rooftop solar panels on the high-bay warehouse portions of the distribution center, solar panel canopies for the surface parking areas EV charging stations for eight percent of the passenger vehicle parking spaces.

Transportation

Notes the ADP approved in March identified 650 employees for this facility and 436 parking spaces in the near term and 390 in the long-term which was part of an overall approach to reach a 1:1.7 parking ratio in the near term for the campus.

Notes the current proposal is consistent with the ADP in that the Army is proposing 400 employee spaces and 50 government vehicle spaces; however, there will only be 600 employees at this facility resulting in a parking ratio of 1:1.5 for this individual project. There may be a need to reduce other proposed parking in the future to meet the overall 1:2 ratio.

Reminds the Army that the Commission's March approval requested the Army to return in two years with an update to the Transportation Management Plan to demonstrate, among other things, Transportation Demand Management strategies to help the installation achieve a 1:2 parking ratio in the long term.

Julia A. Koster
Secretary to the National Capital Planning Commission

From: Purdy, Jeannine <Jeannine.Purdy@fairfaxcounty.gov>
Sent: Thursday, July 21, 2022 8:25 AM
To: FBNA <FBNA@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] Distribution Center

Good morning.
What would the distribution center distribute?
Jeannine

FAIRFAX COUNTY DEPARTMENT OF FAMILY SERVICES

Jeannine Deem Purdy, MSW
Pronouns: She/ Her/ Hers
Regional Volunteer Coordinator-
South County, Volunteer Solutions
Jeannine.purdy@fairfaxcounty.gov
8350 Richmond Highway, Suite 227
Alexandria, VA 22309
Phone: 703-704-6075, TTY 711,
Fax 703-653-6618
Area Agency on Aging
Check out the **Volunteer Solutions' Caring Community Updates**

Our Values: People-Focused
Equity Accountability
Partnership Innovation

to report **Abuse**, **Exploitation**, or **Neglect** of an adult who is **60 years or older** or is **18 years and older and incapacitated**. Reports can be filed for people who live alone or with relatives or who are residents in nursing homes, assisted living facilities, hospitals, or group homes.

From: Charles Redman <[redacted]>
Sent: Thursday, July 21, 2022 4:21 PM
To: FBNA <FBNA@usace.army.mil>
Cc: Cisar, Heather R CIV USARMY CENAB (USA) <Heather.R.Cisar@usace.army.mil>
Subject: [Non-DoD Source] Formal Comments on Proposed Distribution Center at FBNA

To Whom it May Concern,

As original homeowners in the Presidential Hills community, our property will be directly impacted by the future Fort Belvoir North Area's distribution center. Our property line is a mere 400-500 feet from the most northern building. (Fig 3.1 of EA)

For twenty years, we have enjoyed a peaceful existence and fear this will change with the new FBNA plans.

Concerns, Questions, and Proposed Solutions:

1) With less than a 500 foot distance between our property line and what has been described to us as FBNA storage buildings, **it is our hope that tree removal will be kept at an absolute minimum.**

Question: When the project is complete, what will be the tree buffer (in footage) between our property line and the storage buildings?

2) With the loss of tree acreage, it's our understanding that a tree mitigation program becomes effective (3-22 of EA). We propose that this include an evergreen **screening between the project and our community to enhance privacy, which will be lost during winter months when the lush tree buffer loses its leaves.**

3) With increased noise pollution to our community with trucks, forklifts, and daily commuters, **we propose an environmental noise barrier between the storage buildings and tree buffer.**

4) Lastly, and VERY important: We echo the National Capital Planning Committee's concerns (Letter to U.S. Army dated July 12, 2022) regarding the proposed new perimeter fence.

Question: What is the need for replacing the existing fence that runs along our rear property line, which was installed during the FNBA development of the National Geospatial Intelligence Agency?

Question: Why does Fort Belvoir feel compelled to add an elaborate perimeter fence with extreme security measures for storage buildings and a distribution center? If security is such an issue, the fence should be immediately adjacent to the distribution center, not at the perimeter of the FBNA.

The newly proposed fence to include lighting, a 30 foot wide forest clearing, stream crossings, monitoring equipment, and patrol path would not only destroy excessive vegetation and displace wildlife (and as mentioned in NCPC's letter of concerns, possibly impact streams and wetlands), it would ruin the quality of life of those who live next to the FBNA.

The proposed perimeter fence would be **an invasion of our privacy and irreparably harm our property value. No homeowner wants a lit fence with monitoring equipment and patrol path in their backyard.**

We strongly request that the existing fence remain, which is an innocuous yet effective barrier.

Thank you for your time and consideration.

Charles Redman
Virginia Redman
[redacted]

From: Steward, Accotink Creek <steward@accotink.org>
Sent: Monday, July 25, 2022 5:07 PM
To: FBNA <FBNA@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] FBNA Distribution Center Environmental

Assessment Comments

Fort Belvoir North Area Distribution Center Environmental Assessment
Comments of the Friends of Accotink Creek

The Friends of Accotink Creek oppose the construction of the Distribution Center in a forested location with inevitable loss of carbon capture and habitat fragmentation.

1. Climate

"*To keep the nation secure, we must tackle the existential threat of climate change. The unprecedented scale of wildfires, floods, droughts, typhoons, and other extreme weather events of recent months and years have damaged our installations and bases, constrained force readiness and operations, and contributed to instability around the world*."
- Lloyd J. Austin III, Secretary of Defense, Department of Defense Climate Risk Analysis, Report Submitted to National Security Council, October 2021.

"Accounting for the Benefits of Reducing Climate Pollution. (a) It is essential that agencies capture the full costs of greenhouse gas emissions as accurately as possible, including by taking global damages into account."
- Executive Order 13990 of January 20, 2021

"…place the climate crisis at the forefront of this Nation's foreign policy and national security planning…"
- Executive Order 14008 of January 27, 2021

"*DoD has committed to reduce GHG emissions from non-combat activities 42 percent by 2025*"
- Distribution Center Environmental Assessment, p. 3-50

How does the Distribution Center project tackle the existential threat of climate change? The chart on p. 3-52 indicates annual CO2e emissions of over 4000 tons per year, despite the LEED silver certification. Compare this with an estimated 750 tons per year of carbon capture by the 30 acres of mature forest to be cleared. Clearly this is an increase, not a decrease, in CO2e emissions. If a compensating decrease in emissions from other sources is planned, we did not see it in the Environmental Assessment.

The changing climate will not give us points for good intentions and future plans. Climate change is happening now. We must all of us act yesterday to make the difficult choices needed to diminish the level of catastrophe. No one else will do it for us.

"…operational emissions would represent less than 0.005 percent of the total CO2 emissions from the state. As such, air emissions produced during operation of the warehouse and administrative building would not meaningfully contribute to the potential effects of climate change… "
- Distribution Center Environmental Assessment, p. 3-53

We all of us make contributions to CO2 emissions that do not "meaningfully contribute" to climate change. Yet the cumulative effect (including the other buildings planned on FBNA) is changing the Earth. The time has come to make contributions to emissions reductions, however small, that cumulatively will "meaningfully contribute" to the solution.

2. Habitat

"*Any fragmentation of ecological cores will result in an obligatory loss of benefits… Planners should strive to protect ecological cores in their entirety in order to retain these benefits not only for plant and animal populations, but for human communities.*"

- Virginia Conservation Vision Natural Landscape Needs Assessment

We appreciate the efforts described in the Environmental Assessment to avoid the Accotink Creek Conservation Corridor and other environmentally sensitive areas. Yet the existence on and around this site of the Conservation Corridor, the DCR Ecological Core designation, and the Fort Belvoir Proving Ground Conservation Site (DCR) are all red flags warning us to spare these prime habitats along this beleaguered stream. Again, the effects are cumulative, including all the other buildings planned for FBNA, including the loss of much of this area to the extension of the Fairfax County Parkway.

3. Other

We refer to the recommendations of our early input comments, especially to:

- Improve non-motorized transportation routes to Metro and Springfield
- Focus mitigation efforts nearby

"If not us, who? If not now, when?" - John Kennedy

Sincerely,

Philip Latasa : : steward@accotink.org
Friends of Accotink Creek : : www.accotink.org : :
><((((º>`·.¸¸.·´¯`·.¸><((((º> *"Find just one other person who cares."* ><((((º>`·.¸¸.·´¯`·.¸><((((º>¸.·´¯`·.¸. ><((((º>
#SaveCinderBedWoods

From: Galusha, Andrew <Andrew.Galusha@fairfaxcounty.gov>
Sent: Thursday, July 28, 2022 4:07 PM
To: FBNA <FBNA@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] Draft Environmental Assessment (EA) for the proposed distribution center on Fort Belvoir's North Area (FBNA)

The Fairfax County Park Authority has reviewed the documentation provided on the Draft Environmental Assessment (EA) for the proposed construction of a distribution center on Fort Belvoir's North Area (FBNA). The proposed project includes the construction of a 525,000 square foot warehouse and administrative building with associated parking and covered storage for approximately 600 personnel completely contained within Fort Belvoir's North Area.

Page 3-19, of the Draft EA references that seeding is to be provided in conformance with the Virginia Erosion and Sediment Control Handbook, Edition 1992. Tables 3.31 and 3.32 of the handbook for temporary and permanent stabilization include species such as Phragmites australis (Common Reed), Lespedeza cuneata (Chinese Lespedeza), Lotus corniculatus (Birdsfoot Trefoil), Dactylis glomerata (Orchard Grass), Agrostis alba (Redtop), Eragrostis curvula (Weeping Lovegrass), Coronilla varia (Crownvetch), and Festuca arundinacea (Tall Fescue) which have been identified as invasive. Additionally, Phalaris arundinacea (Reed Canarygrass) has shown invasive tendencies in the region. Due to the proximity of parkland and with the guidance of the Virginia Department of Conservation and Recreation (DCR), these species should be excluded from the various seed mixes. A DCR information sheet that provides some suggested alternatives can be found at http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml.

Thank you for the opportunity to comment on this Draft EA. We look forward to participating in the study as it moves forward. The Park Authority's point of contact for this project is Andy Galusha, Park Planner who can be reached at 703-324-8755 or at Andrew.Galusha@fairfaxcounty.gov.

Best,

Andy Galusha
Landscape Architect/Park Planner, Planning & Development Division
Fairfax County Park Authority
703.324.8755 (office)
Andrew.Galusha@fairfaxcounty.gov
www.fairfaxcounty.gov/parks

From: Hunt, Janice L. <Janice.Hunt@fairfaxcounty.gov>
Sent: Friday, August 5, 2022 9:25 AM
To: FBNA <FBNA@usace.army.mil>
Cc: BOS-Board of Supervisors <BOS-BoardofSupervisors@fairfaxcounty.onmicrosoft.com>; Chairman <Chairman@fairfaxcounty.gov>; Hill, Bryan J. <Bryan.Hill@fairfaxcounty.gov>; Flynn, Rachel <Rachel.Flynn@fairfaxcounty.gov>; Strunk, Tracy <Tracy.Strunk@fairfaxcounty.gov>; O'Donnell, Leanna <Leanna.O'Donnell@fairfaxcounty.gov>; Garcia, Michael W <Michael.Garcia3@fairfaxcounty.gov>; Torgersen, Catherine S <Catherine.Torgersen@fairfaxcounty.gov>; Zavela, Vance S. <Vance.Zavela@fairfaxcounty.gov>; Morin, Christine A <Christine.Morin@fairfaxcounty.gov>; Amos, Anthony <Anthony.Amos@fairfaxcounty.gov>; Renninger, Matthew <Matthew.Renninger@fairfaxcounty.gov>; stephanie.free@ncpc.gov; Hermann, Katherine <Katherine.Hermann@fairfaxcounty.gov>
Subject: [Non-DoD Source] Fort Belvoir North Area Distribution Center Environmental Assessment - Fort Belvoir, Fairfax County, VA

Good Morning,

Attached are Fairfax County's comments regarding the Fort Belvoir North Area Distribution Center Environmental Assessment along with previous comments which were sent to the National Capital Planning Commission. Please let us know if you have any questions.

Janice Hunt, Administrative Assistant IV
Fairfax County Department of Planning & Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, VA 22035
Main: 703-324-1380 – Direct: 703-324-1340
Janice.hunt@fairfaxcounty.gov

County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods and diverse communities of Fairfax County

August 5, 2022

Fort Belvoir Environmental Division
Directorate of Public Works
Building 1442
9430 Jackson Loop
Fort Belvoir, VA 22060
Email: FBNA@usace.army.mil

RE: Fort Belvoir North Area Distribution Center Environmental Assessment - Fort Belvoir, Fairfax County, VA

Dear Fort Belvoir Environmental Division:

Thank you for the opportunity to comment on the Environmental Assessment regarding the construction of the Fort Belvoir North Area (FBNA) Distribution Center. It is our understanding from the submission that this future facility would support the delivery and receipt of materials within and across the Washington Metropolitan Area and National Capital Region (NCR) to achieve distribution efficiencies. It is an anticipated that this facility would be a 525,000 square foot distribution center complex within a 30-acre site consisting of:

- One high-bay warehouse;
- One two-story administrative building;
- One truck maintenance/refueling building;
- Several covered/enclosed storage buildings;
- An entry control facility, including gate house and vehicle inspection;
- One emergency backup generator; and
- Enhanced security measures along the fenceline, including a new fence, an approximately 30-foot clear zone around the fence, and a maintenance and patrol path.

The distribution center is located generally within the 26-acre growth boundary Area D that was approved in 2022 as part of the Fort Belvoir North Area Development Plan, except for the entry control facility. The intent of the approved growth boundary areas was to establish a dense walkable campus and minimize tree removal and disturbance. The distribution center expects minimal truck traffic compared to a typical industrial distribution center. The expected daily traffic flow is estimated to be approximately 640 car trips and 12 truck trips. The operational hours would typically be between 6:00 AM and 4:00 PM. The proposed project would add approximately 23.6 acres of impervious area within the Accotink Creek watershed.

In collaboration with the Department of Public Works and Environmental Services (DPWES) and the Fairfax County Department of Transportation (FCDOT), the Fairfax County Park

PLANNING & DEVELOPMENT

Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

Authority (FCPA) and the Department of Planning and Development (DPD) reviewed the documents, prepared the attached environmental conditions map for the proposed development, and offers the following comments below.

Stormwater Management and Water Resources

According to the Environmental Assessment, the Fort Belvoir Distribution Center project would convert 23.6 acres of mostly forested area to impervious cover. The site drains to Accotink Creek, which is listed by the Virginia Department of Environmental Quality as impaired for benthic macroinvertebrate bioassessments and chloride. Increases in impervious cover contribute to these impairments by introducing more runoff and pollutants, including road salt, into the stream.

The Environment Element of the Fairfax County Comprehensive Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. In order to minimize the impacts that new development and redevelopment projects may have on county streams, the Comprehensive Plan encourages the protection of stream channels and buffer areas along stream channels, and commitments to the restoration of degraded stream channels and riparian buffer areas. In addition, Fairfax County continues to recommend that water quantity and quality improvement measures be provided above any minimum requirements to minimize the impact to adjacent streams.

Fairfax County recognizes that the Department of the Army is not subject to the provisions of the Chesapeake Bay Preservation Ordinance (CBPO) or County policies. However, Fairfax County continues to encourage the Army to meet the County's CBPO (Chapter 118 of the County Code), including conformance with the requirements for areas designated as RPAs and Resource Management Areas. Fairfax County also encourages the Army to minimize any impact to wetlands to the greatest extent feasible. Any mitigation/compensation of wetlands should occur as close to the area of impact as possible. Fairfax County encourages the protection of these areas consistent with County policy and regulations. Environmental Quality Corridors (EQCs) as defined in the Environment Element of Fairfax County's Comprehensive Plan should also be considered for preservation. Areas of 100-year floodplains, 15% or greater slopes adjacent to floodplains, and wetlands qualify for designation as EQCs.

Additionally, there are approximately 2.33 acres of mapped wetlands within the project area. The U.S. Army Garrison Fort Belvoir would avoid these wetlands by relocating the perimeter fence alignment or have the fence positioned over streams and their associated wetlands. Stormwater generated from within the project site during construction would be managed through erosion and sediment control measures required through the permitting process in order to preclude the adverse effects of sedimentation on downstream receiving waters, which include wetlands.

Fort Belvoir North Area (FBNA) Distribution Center – Surface Waters

Source: Environmental Assessment; U.S. Army Garrison Fort Belvoir

The U.S. Army Garrison Fort Belvoir proposes to use erosion and sediment control measures during construction and long-term low impact development (LIDs) to mitigate stormwater run-

off impacts to Accotink Creek. The U.S. Army Garrison Fort Belvoir states that unavoidable crossings of the Accotink Creek Conservation Corridor would be mitigated through the incorporation of one or any combination of the following measures: tree planting within the project area or stream buffer enhancement plantings elsewhere on FBNA along the Accotink Creek Corridor; oversized box culverts for wildlife crossings with grates to allow light into the culverts; streamside management zones; storm drains; bioretention and infiltration ponds; and green roofs, permeable pavements, and vegetated swales. Any work within the stream corridor and RPA, as necessary to construct roadways, parking features, and security fencing, would be permitted through federal permitting agencies. Permanent stormwater management features would maintain pre- development levels of stormwater discharge. Therefore, Fairfax County recommends the following be provided:

- A demonstration of how the proposed project would minimize and/or mitigate impacts to impaired local streams.
- Water quantity and quality measures above the minimum requirements that prioritize LID techniques and stormwater/stream restoration versus traditional gray stormwater infrastructure designs.
- The addition of RPA and EQC designations to environmental plans to encourage the protection and preservation of habitat and streams, reduce pollutants from entering the water, and encourage a connected segment of open space to facilitate the movement of wildlife in the area.
- Given the number of parking spaces proposed, a reconsideration of surface lot parking areas in lieu of a parking structure to minimize the amount of impervious cover and impacts to on-site and adjacent lands, vegetation, and waters.
- An explanation of the need for an interior fence for this center would be beneficial since a larger fence exists on the perimeter of the property and was not contemplated with the 2022 Fort Belvoir North Area Development Plan. An additional interior fence may impact local wildlife movement.

<u>Landscaping</u>
The Comprehensive Plan anticipates that new development will include an urban forestry program and be designed in a manner that retains and restores meaningful amounts of tree cover, consistent with planned land use and good silvicultural practices. Good quality vegetation should be preserved and enhanced and lost vegetation restored through replanting. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 11-9-2021, Pages 17-18). Fairfax County recommends the following be provided:

- Fairfax County recommends that new landscaping and all planting schemes incorporate native plant communities of overstory trees; understory trees; shrubs; and perennial grasses, grass-like plants, and forbs. Additionally, Fairfax County recently published Technical Bulletin 22-04, regarding seeding guidelines, to promote the use of native plant species and to limit the use of invasive plant species in seeding applications for soil

stabilization, restoration, agriculture, turf, and landscaping. (see Fairfax County Seeding Guidelines).

- The property is proposed for a highly impervious industrial use. The proposal would be enhanced through an increase in tree canopy. Increasing the number of trees would help improve air quality within the area. Buffers should be enhanced along all lot lines with additional plantings. The viability of planting areas would be improved through robust commitments to soil preparation for all planting areas, to include aeration of the soil to a depth of 24 inches, the incorporation of compost into the soil profile, covering of the soil surface with additional compost, protection of all planting areas from compaction, and supervision of all plantings by a qualified individual, such as a landscape architect or forester.
- The proposed project would benefit from monitoring and spill prevention strategies to protect surface and groundwater resources related to a proposed on-site exterior hazardous material storage and refuse locker.

Forestry Resources Policies and Impacts

Construction of the Distribution Center, Administration Building, and other structures on the site would require the removal of approximately 30 acres of forest within the larger Action Site Boundary of 161 acres. There have been an estimated increase in the number of trees to be removed from what was originally shown on the approved Fort Belvoir North Area Development Plan, primarily due to the addition of the vehicle entry control facility, parking lot and perimeter fence. The Fort Belvoir Forest Inventory of August 2021 revealed that a majority of the Action Site Boundary area is comprised of "Priority 1" Stands (as described in the Maryland State Forest Conservation Technical Manual), which include wetlands and specimen trees that are 30 inches diameter-at-breast-height (dbh) or greater. Furthermore, the inventory revealed low invasive species impact within this area. Such healthy stands of unmanaged forest are rare within the confines of Fairfax County.

Also, existing single-family homes abut the north Action Site Boundary. These homes are located on Beechwood Drive, Rose Garden Lane, and Barkers Court. Consideration should be given to the quality of life of these residents and the preservation of existing vegetation to serve as screening for the proposed use. Fairfax County recommends the following:

- The proposal should be reconfigured to confirm the acres of trees impacted; preservation of areas designated as high-quality woodlands should be a priority.
- The U.S. Army Garrison Fort Belvoir should provide transitional screening that meets or exceeds the requirements of the County Zoning Ordinance (ZO 5108.6). This can be achieved through the preservation of the existing forest buffer area between the site and the adjacent single-family homes and the supplementation of these areas with native understory trees, shrubs, and perennials, where appropriate.
- The U.S. Army Garrison Fort Belvoir should continue to coordinate with the Urban Forest Management Division (UFMD) and Park Authority of Fairfax County to develop and execute a Tree Replacement Strategy plan for the replanting associated with the project.

- The U.S. Army Garrison Fort Belvoir should work with a certified arborist to field locate the perimeter fence to minimize the loss of trees and impacts to environmentally sensitive features.

Soils

This property contains Marine Clay and problem class soils surrounding Accotink Creek and its tributaries. Fairfax County recommends that the development be clustered away from problem class soils and that a geotechnical study be completed for areas with problem soils.

Green Building

Fairfax County encourages commercial developments to incorporate green building measures and to seek certification through the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) for New Construction (LEED-NC®), LEED Core and Shell (LEED-CS®), or an equivalent program with independent third-party verification. Additionally, Fairfax County expects new County facilities to be designed and constructed to obtain LEED-Gold certification; incorporate solar and electric-vehicle features; provide an on-site renewable energy generation component; obtain energy performance improvements; reduce greenhouse gas emissions; and, ultimately, achieve net zero energy (for projects designed in FY 2031 or later). Fairfax County understands that any new facilities constructed with this plan have been designed to achieve LEED-Silver. However, the recent National Geospatial-Intelligence Agency (NGA) building obtained LEED-Gold certification. The County recommends that new facilities constructed as part of this project also obtain LEED-Gold certification, which is consistent with the County's policy for new County facilities. Fairfax County does appreciate the Army's commitment to incorporate rooftop solar panels on the high-bay warehouse portions of the distribution center and solar panel canopies for the surface parking areas. Additionally, Fairfax County supports the inclusion of electric-vehicle charging stations for eight percent of the passenger vehicle parking spaces and would encourage these be equipped with Level-2, universal electric vehicle charging facilities and be fully wired and functional.

Fairfax County Department of Transportation

A majority of FCDOT comments from previous review phases and discussions have been addressed. However, Fairfax County requests that the U.S. Army Garrison Fort Belvoir clarify whether the Rolling Road entrance, which is anticipated to be used as an emergency-only entrance/exit, would utilize a barrier system to keep vehicles and pedestrians from using the entrance when there is not an emergency. Fairfax County recommends the provision of a barrier system to minimize any impacts to the existing, off-site pedestrian networks in the area.

Fairfax County Park Authority

Page 3-19, of the Draft EA references that seeding is to be provided in conformance with the Virginia Erosion and Sediment Control Handbook, Edition 1992. Tables 3.31 and 3.32 of the handbook for temporary and permanent stabilization include species such as Phragmites australis (Common Reed), Lespedeza cuneata (Chinese Lespedeza), Lotus corniculatus (Birdsfoot Trefoil), Dactylis glomerata (Orchard Grass), Agrostis alba (Redtop), Eragrostis

curvula (Weeping Lovegrass), Coronilla varia (Crownvetch), and Festuca arundinacea (Tall Fescue) which have been identified as invasive. Additionally, Phalaris arundinacea (Reed Canarygrass) has shown invasive tendencies in the region. Due to the proximity of parkland and with the guidance of the Virginia Department of Conservation and Recreation (DCR), these species should be excluded from the various seed mixes. A DCR information sheet that provides some suggested alternatives can be found at http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml.

Noise

Section 108.1-1-2 of the County Code (Noise Ordinance) states that *"The Board hereby finds and declares that certain noise is a hazard to the public health, welfare, peace and safety and the quality of life of the citizens of Fairfax County; that the people have a right to and should be ensured of an environment free from sound that jeopardizes the public health, welfare, peace and safety or degrades the quality of life; and that it is the policy of the Board to prevent such noise to the extent such action is not inconsistent with Federal or State law."*

Federal agencies with noise mitigation planning responsibilities have worked with the health community to establish maximum acceptable levels of exposure. The County's Noise Ordinance limits continuous sound for impacted receivers to a continuous daytime limit of 60 dBA and a continuous nighttime limit of 55 dBA for residential uses. The County's Comprehensive Plan guidelines state that sound pressure levels should not exceed DNL 65 dBA (day-night average level, decibels, A-weighted) for outdoor activity areas, DNL 50 dBA for indoor office environments, and DNL 45 dBA for the interior of residences and other noise-sensitive uses.

In order to assess the noise impacts associated with the proposed use and to determine consistency with the provisions of the Noise Ordinance, the U.S. Army Garrison Fort Belvoir completed a noise study to assess potential noise impacts to nearby existing development. The proposed project would generate new noise sources that would be created by automobiles, trucks, electric forklifts, rooftop HVAC units, transformers, a diesel fire pump, and generators. The proposed generators were not included in the typical operations noise model as they would only operate during emergency conditions and for maintenance events. Maintenance events associated with the generators would only occur between the hours of 7:00 a.m. and 9:00 p.m. with a total duration not to exceed two hours in any one day. Based on the modeled noise, a maximum daytime noise limit of 60 dBA and a maximum nighttime limit of 55 dBA would not be reached or exceeded, so noise is not expected to have a significant impact on the neighboring uses during routine operations. Fairfax County notes that sound produced by generators during emergency use is exempted from the County's Noise Ordinance, along with routine testing for less than two hours in any one day.

Fairfax County recommends that the noise study assess the expected noise impacts at surrounding property boundaries with both HVAC and back-up generators operating. In order to minimize noise impacts from generator testing and emergency use, Fairfax County recommends that each generator be housed in a sound attenuating enclosure to limit periodic

noise impacts to surrounding uses. Such enclosures may also protect on-site employees from excessive and unhealthful sound.

Other Comments
The following issues were reviewed, but would solicit no further actions:

- The proposed project is not located in a Fairfax County Historic Overlay District and there are no resources in the immediate area listed on the Fairfax County Inventory of Historic Sites.
- The U.S. Army Garrison Fort Belvoir acknowledges that this site has a history of equipment storage and materials testing, dating back to the 1940s. Investigations and clean-up activities have been ongoing and have included the removal of munitions debris and explosive compounds. All debris, underground storage tanks, and buildings were removed, and the remediated sites were issued No Further Action Reports.

Thank you again for the opportunity to comment on this proposal. If you have any questions about the comments, please contact Katie Hermann with the Department of Planning and Development at Katherine.Hermann@fairfaxcounty.gov.

Sincerely,

Kelly M. Atkinson, AICP, Chief, Environment and Development Review Branch
Planning Division, Department of Planning and Development

KMA: KHH

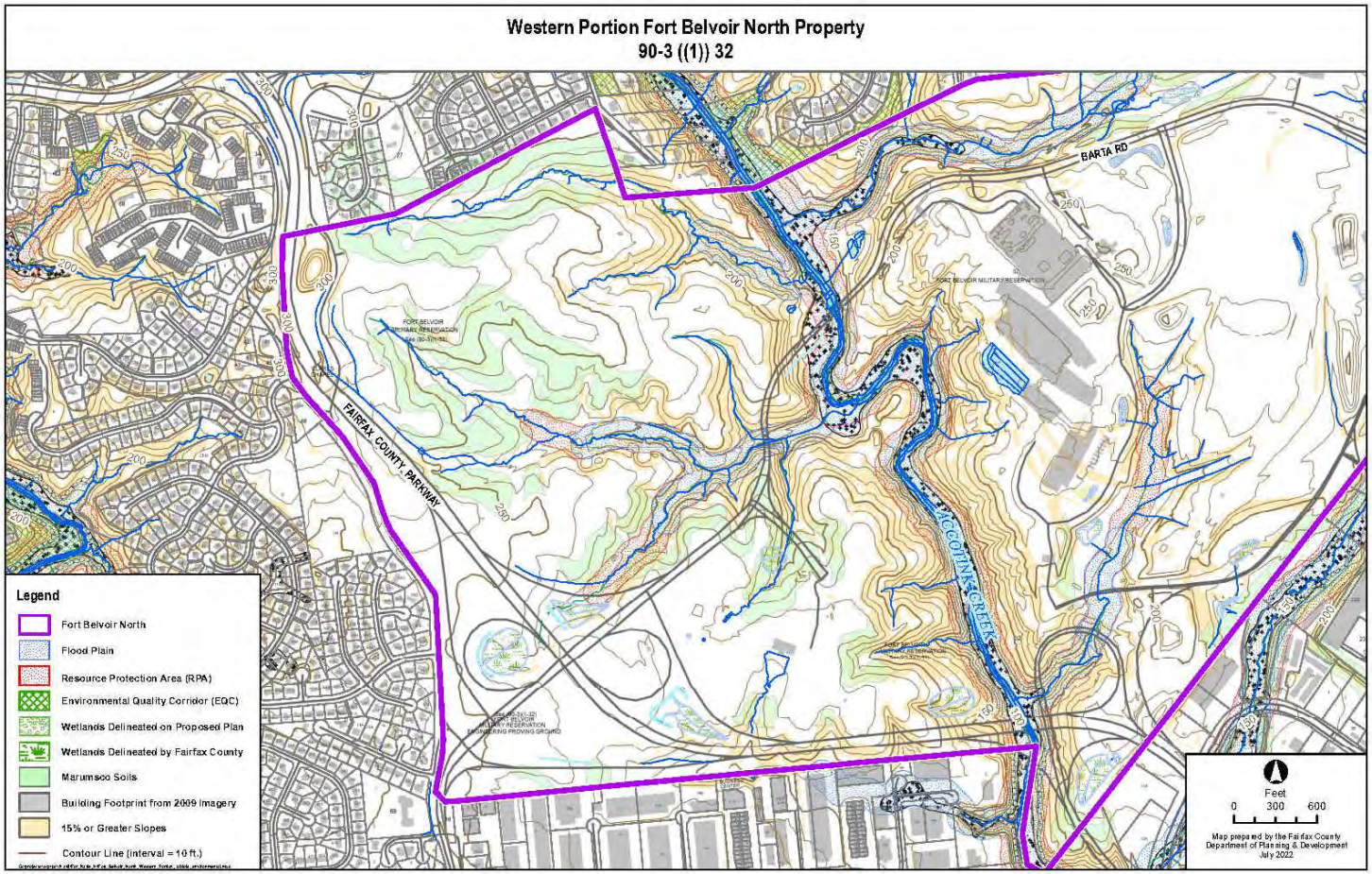
Attachments: Environmental Conditions Map
NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Letter Dated July 30, 2021
NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Dated December 20, 2021

cc: Board of Supervisors
Bryan J. Hill, County Executive
Rachel O'Dwyer Flynn, Deputy County Executive
Tracy Strunk, Acting Director, DPD
Leanna O'Donnell, Director, Planning Division, DPD
Michael Garcia, Transportation Planning, FCDOT
Catherine Torgersen, DPWES
Vance Zavela, Partnership Developer, Economic Initiatives

Christin Morin, Chief of Staff, Mount Vernon Supervisor District
Anthony Amos, Land Use Aide, Springfield District
Matthew Renninger, Land Use Aide, Lee District
Stephanie Free, Urban Planner, National Capital Planning Commission (NCPC)

County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods and diverse communities of Fairfax County



Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

December 20, 2021

Stephanie Free
National Capital Planning Commission
401 9th Street NW, Suite 500
Washington, DC 20004

RE: NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Dated December 2021

Dear Stephanie Free:

Thank you for the opportunity to comment on the revised Fort Belvoir North Area Development Plan (FBNADP), dated December 2021. Fort Belvoir North Area (FBNA) is located at the northwest quadrant of Interstate 95 and the Fairfax County Parkway. The FBNADP proposes to establish the development framework for functions of the FBNA, a non-contiguous 804-acre parcel, located north of the main installation of Fort Belvoir.

In June 2021, Fairfax County provided you with comments on three development alternatives planned for the site which ranged in intensity from minimal improvements of only planned projects to maximum capacity based on the remainder of land available; the maximum capacity alternative was the preferred alternative according to the FBNA stakeholders. The maximum capacity alternative did not take into consideration the natural features of the site and would result in a significant increase in impervious area on site, as well as the removal of large areas of mature vegetation. Fairfax County identified several concerns and recommended mitigation measures that could be implemented in the final design to minimize the impact of the proposed development on environmentally sensitive areas (see Attachment 1). While some of those concerns have been better addressed with the most recent submission, Fairfax County continues to support our previous comments in Attachment 1, in addition to these additional comments on the current submission.

Growth Boundaries

In response to comments received on the June 2021 plan, Fort Belvoir conducted additional quantitative analyses with affected stakeholders to identify potential development areas within FBNA. This included an analysis of areas of the site that were prohibited for development due to cost or jurisdictional requirements; extent of mitigation required; soils; areas of existing

PLANNING & DEVELOPMENT

Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

development; and areas of existing vegetation, some of which would require additional mitigation if impacted. Additionally, consideration was made to ensure any future development would not conflict with the existing National Geospatial-Intelligence Agency (NGA) located on the eastern portion of the site. These constraints were then used to identify three growth boundaries that balance Fort Belvoir's expanded mission capacity while taking into consideration the need for a secure campus on the western portion of the site and preservation of natural features. The three growth boundaries are shown in Figure 1 and total 238 acres. As stated in the current plan, the intent of the growth boundaries is to establish a dense walkable campus in areas of prior disturbance to the extent possible, with a priority on the eastern portion of the site. As proposed, the area of development has been reduced by approximately 51 acres on the western portion of the site, including one area entirely that was located between the two western growth boundaries. The revised growth boundaries result in the preservation of approximately 90 additional acres of vegetation. While the plan still proposes 90 acres of tree removal, this has been reduced from 154 acres proposed with the June 2021 submission. Fairfax County appreciates the applicant's commitment to minimize the areas of development and minimize tree removal and disturbance by focusing development within three growth boundaries, which is consistent with County policies.

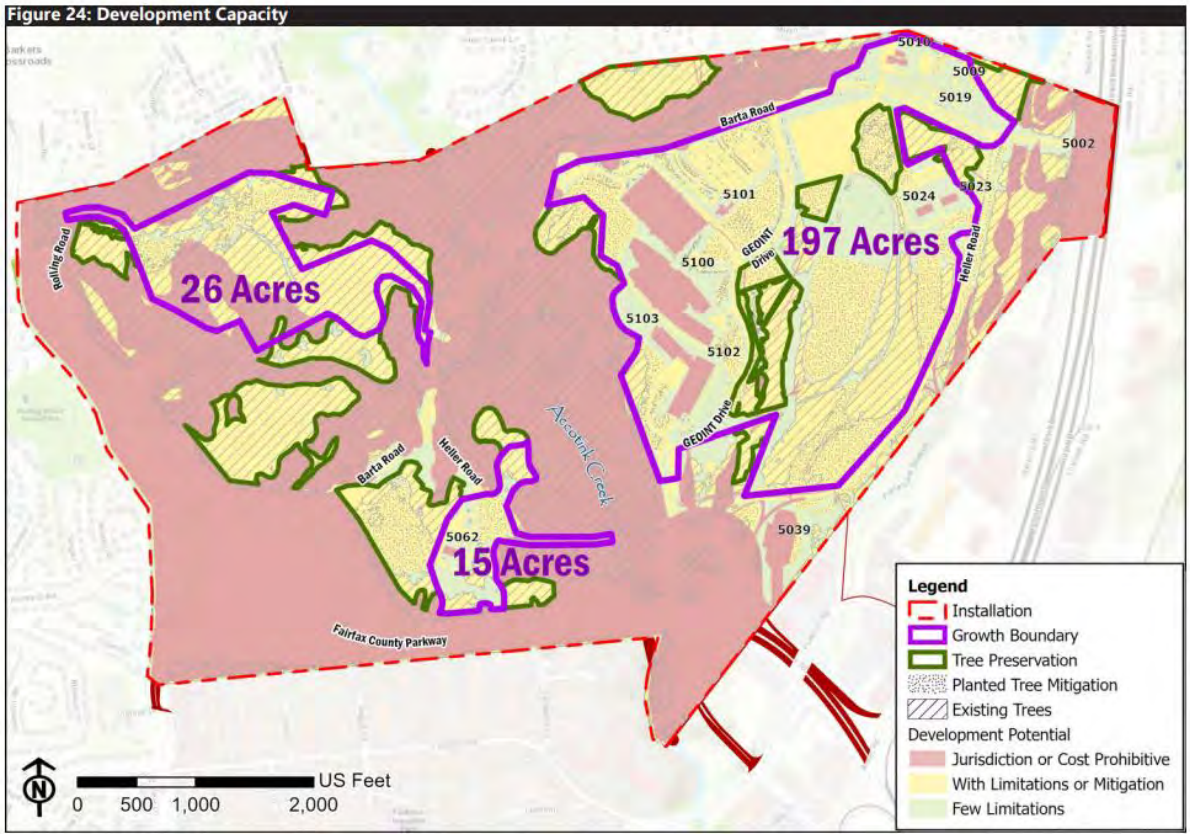
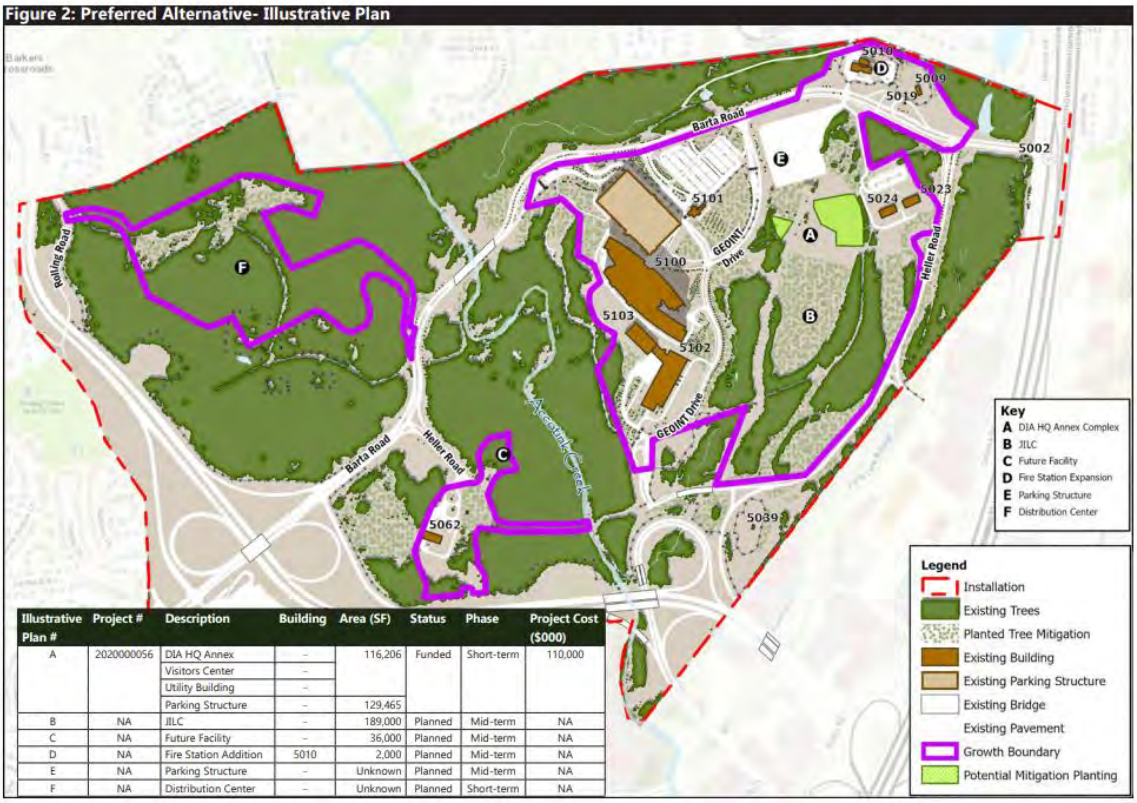


Figure 1: Development Capacity, Source: FBNADP December 2021, Page 53

Illustrative Plan

Figure 2 below depicts the proposed Illustrative Plan. The most significant change between the June and December plans is the removal of the proposed buildings on the western portion of the property. It is Fairfax County's understanding that any near-term development would first be concentrated on the eastern portion of the property, in the vicinity of the NGA, assuming there are no security concerns. Additionally, Fairfax County understands that currently, there are no end users for development on the western portion of the site; therefore, the depiction of buildings, parking areas and roads is premature and would be subject to further review by NCPC, as well as Fairfax County, at such time a user is identified. However, any development potential would be limited to the growth boundary. Building heights for future buildings have also been increased from one to three stories to three to eight stories to minimize building footprint. The current plan depicts a future Parking Structure (identified as "E" in Figure 2) to replace an existing overflow, surface parking lot. This will ensure adequate parking can be provided in a smaller footprint and result in less land disturbance. The current plan promotes density and multi-story buildings whenever feasible, which promotes walkability. To encourage pedestrian movement throughout the site, sidewalks, lighting, shade, signage and wayfinding, green space and an overall aesthetically pleasing environment are now proposed, which will also mitigate environmental and transportation impacts. Fairfax County finds this an improvement over the previous submission and consistent with County policies that seek to cluster development in pedestrian friendly developments.



Illustrative Plan #	Project #	Description	Building	Area (SF)	Status	Phase	Project Cost ($000)
A	2020000056	DIA HQ Annex	–	116,206	Funded	Short-term	110,000
		Visitors Center	–				
		Utility Building	–				
		Parking Structure	–	129,465			
B	NA	JILC	–	189,000	Planned	Mid-term	NA
C	NA	Future Facility	–	36,000	Planned	Mid-term	NA
D	NA	Fire Station Addition	5010	2,000	Planned	Mid-term	NA
E	NA	Parking Structure	–	Unknown	Planned	Mid-term	NA
F	NA	Distribution Center	–	Unknown	Planned	Short-term	NA

Figure 2: Development Capacity, Source: FBNADP December 2021, Page 10

<u>Forest Resources, Water Resources and Sustainability</u>

While Fort Belvoir has made efforts to focus growth in designated areas, preserve more vegetation, and minimize tree removal, the current plan continues to result in the potential for significant additions of impervious area and impacts to natural features. Therefore, the current plan now proposes compensation measures to include:

- 2:1 tree replanting on- or off-Post;
- Installation of additional solar/PV cells and/or wind power generation in the project, or elsewhere on-Post;
- Stream restoration along the tributaries affecting Fort Belvoir, both on- or off-Post; and
- Stormwater restoration and mitigation measures throughout Post.

Fairfax County supports these mitigation measures as they are consistent with the Environment Element of the Policy Plan that recommends the restoration of meaningful amounts of tree cover and the protection and restoration of the ecological integrity of streams. Fairfax County

recommends any tree replanting be prioritized at a ratio of 2:1 and located on-Post to the greatest extent feasible to provide a more direct benefit adjacent to disturbed areas. If the full replanting cannot be accommodated on-Post, Fairfax County would support a 2:1 tree planting in areas within the County near the site. Alternatives could include contributions into a County Tree Preservation and Planting Fund to support the County's replanting efforts in the South County area of Fairfax County, or a joint partnership between the County and FBNA to identify areas in South County suitable for replanting by FBNA.

Fairfax County supports Fort Belvoir's efforts to complete steam restoration on site. The Environment Element of the Policy Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. In order to minimize the impacts that new development and redevelopment projects may have on county streams, the Comprehensive Plan encourages the protection of stream channels, buffer areas along stream channels, and commitments to the restoration of degraded stream channels and riparian buffer areas. In addition, Fairfax County continues to recommend water quantity and quality measures be provided above any minimum requirements to minimize impact to adjacent streams. Finally, Fairfax County appreciates the removal of several stormwater management ponds and replacement with several low impact development (LID) measures for water quantity and quality. This is consistent with County policies that expects new development and redevelopment to result in high quality site design using LID techniques.

Fairfax County encourages commercial building development to incorporate green building measures into the design of all projects. Example green building measures can be derived from the U.S. Green Building Council's Leadership in Energy and Environmental Design for New Construction [LEED-NC®] or the U.S. Green Building Council's Leadership in Energy and Environmental Design for Core and Shell [LEED-CS®] or an equivalent program with independent third-party verification. Additionally, Fairfax County expects new County facilities to be designed and constructed to obtain LEED-Gold certification; incorporate solar and electric-vehicle readiness features; provide an on-site renewable energy generation component; obtain energy performance improvement; reduce greenhouse gas emissions; and ultimately achieve net zero energy (for projects designed in FY 2031 or later). Fairfax County understands that any new facilities constructed with this plan have been designed to achieve LEED-Silver; however, the NGA building has obtained LEED-Gold certification. The County recommends any new facilities on site also obtain LEED-Gold certification, which is consistent with the County's policy for new County facilities. Fairfax County also continues to recommend a minimum of 2-percent of any parking spaces on site be equipped with Level-2, universal electric vehicle charging facilities, fully wired and functional, consistent with County policies.

Finally, the current plan notes that any development on the western portion of the site include environmentally responsible development opportunities, to include solar arrays on roofs to

enhance long-term benefits of renewable energy usage. This is consistent with the policy regarding renewable energy production for new County facilities.

Transportation

The circulation plan remains largely unchanged from the June 2021 submission, except for one change which was made to address a comment made by a Fairfax County resident. The previous proposal depicted a new road that would provide a connection from Rolling Road to Barta Road on the western portion of the property. This access could impact the existing, off-site pedestrian networks in the area. In response, this access at Rolling Road has been restricted to emergency only and any existing pedestrian networks in the area would be maintained. Fairfax County appreciates Fort Belvoir's response to this concern.

Fort Belvoir is required to maintain a Transportation Management Plan (TMP) to inform employees on transportation options for travelling to and from FBNA. Strategies include the use of structured parking at a ratio of 1:1.5; phased structured parking to ensure parking demands are constantly assessed; maximize structured parking over surface lots; secure and unsecured parking; single-occupancy vehicle reduction techniques; and annual review of the TMP. Fairfax County recommends similar measures for large redevelopment proposals in the County.

The June 2021 plan identified the use of parking maximums as an effective method of transportation demand management (TDM) for dense urban areas. The plan provided a range of parking ratios based on various sources applicable to similar sites. It was noted that while these ratios may be appropriate for other projects, they could not be achieved for FBNA. Reasons include not being adequately served by public transportation; unique security requirements; and a specialized workforce who sees adequate parking as a benefit. For these reasons, a 90% factor was used to determine parking requirements.

The December 2021 restates this concern; however, now offers additional suggestions to better meet the TDM requirements based on ten years of experience provided by the NGA and the TDM strategies implemented with that project, which include Ride-Sharing, Carpool, Vanpool, Guaranteed Ride Home, Ridematching Services, Ride-Sharing Marketing, Alternative Work Schedules, Telework (when applicable), Transit Subsidy, Bicycle/ Walking, and Mass Transit Education programs. Based on FBNA's experience with the NGA site, the current plan now proposes a 67% factor and the parking ratios are more aligned with the TMP.

Summary

Fairfax County appreciates the opportunity to comment on the revised Fort Belvoir North Area Development Plan dated December 2021. Overall, Fairfax County finds the proposed revisions an improvement over the June 2021 submission. The current plan more adequately balances the needs of the mission while protecting environmental resources. The identification of growth boundaries clearly defines where future development is expected, and the proposed mitigation will help address some of the proposed impacts. Fairfax County continues to recommend the applicant refine the proposed development as final plans progress and requests to review any revised plans developed for the site.

Thank you again for the opportunity to comment on this proposal. If you have any questions about the comments, please contact Kelly Atkinson with the Department of Planning and Development at Kelly.Atkinson@fairfaxcounty.gov or 703-324-1259.

Sincerely,

Leanna H O'Donnell

Leanna H. O'Donnell, Director, Planning Division
Department of Planning and Development

LHO:KMA

Attachment 1: NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Letter Dated July 30, 2021

cc: Board of Supervisors
Bryan Hill, County Executive
Rachel Flynn, Deputy County Executive
Barbara Byron, Director, DPD
Vance Zavela, Partnership Developer, Fort Belvoir

July 30, 2021

Stephanie Free
National Capital Planning Commission
401 9th Street NW, Suite 500
Washington, DC 20004

RE: NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan

Dear Stephanie Free:

Thank you for the opportunity to comment on the draft environmental assessment (EA) for Fort Belvoir North Post Area Development Plan, located at the northwest quadrant of Interstate 95 and Fairfax County Parkway. The plan proposes to establish the development framework for functions of the Fort Belvoir North Area (FBNA), a non-contiguous 804-acre parcel, located north of the main installation of Fort Belvoir and separated to the west by Interstate 95, in Springfield, Virginia. Fairfax County understands that three alternatives for the site were reviewed and range in intensity from minimal improvements of only planned projects to maximum capacity based on the remainder of land available; the maximum capacity alternative is the preferred alternative according to the FBNA stakeholders. The Department of Planning and Development (DPD), in collaboration with the Fairfax County Department of Transportation (FCDOT) and Fairfax County Park Authority (FCPA) has reviewed the above-mentioned draft environmental assessment and provides the comments below.

COORDINATION WITH OTHER COUNTY AGENCIES

Transportation Impacts

FCDOT staff did not have any specific comments regarding this proposal as the site has good highway access via Interstate 95 and the Fairfax County Parkway. Staff did want to make Fort Belvoir aware of an ongoing study of the Fairfax County/Franconia-Springfield Parkways. There are no recommendations yet; however, the following questions are being considered, which could impact access to Fort Belvoir North Area:

- The degree to which existing intersections should be considered for conversion to interchanges or under/overpasses;
- How transit should be integrated into the corridor;
- Whether tolling and or HOV lanes on the Parkways should be planned; and
- Bicycle/pedestrian mobility.

PLANNING & DEVELOPMENT

Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

More information can be found at: Fairfax County & Franconia-Springfield Parkways Alternatives Analysis and Long Term Planning Study | Transportation.

Finally, FCDOT notes that Fairfax Connector Routes 340 and 341 began in 2017 and directly linked the FBNA to the Franconia Metrorail / VRE station. Both routes had low ridership pre-COVID and FCDOT is currently in the process of working with Fort Belvoir to rectify this situation. More information on the Fairfax Connector routes can be found at: Fairfax Connector Routes 340 and 341 (fairfaxcounty.gov).

Recreational and Heritage Resources

FCPA staff offered comments regarding the inclusion of a stream valley trail; request to perform a survey of rare, threatened, and endangered bat species; a request that a pedestrian circulation plan be included in the draft EA for evaluation; and requests to review all future documents related to the Accotink Stream Valley Park and Rolling Woods School site at the earliest opportunity.

Staff also recommends that any undisturbed and unsurveyed areas that are planned for development undergo a Phase I archaeological survey. If potentially significant sites are found, it is recommended they undergo Phase II archaeological testing to determine Fairfax County significance and/or eligibility for inclusion onto the National Register of Historic Places. FCPA comments are included in attachment to the letter. If sites are found to be significant or eligible, avoidance or Phase III data recovery is recommended.

ENVIRONMENTAL ASSESSMENT

The sections listed below include an overview of the applicable Comprehensive Plan policies and potential impacts within the project study area.

Water Resources Protection and Stormwater Management/Best Management Practices

The Environment Element of the Comprehensive Plan Policy Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. In order to minimize the impacts that new development and redevelopment projects may have on county streams, the Comprehensive Plan encourages the protection of stream channels, buffer areas along stream channels, and restoration of degraded stream channels and riparian buffer areas. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 7-9).

New development and redevelopment are also expected to result in high quality site design, pursue use of low impact development (LID) techniques and *"pursue commitments to reduce stormwater runoff volumes and peak flows, to increase groundwater recharge, and to increase preservation of undisturbed areas."* Some or all of the following practices should be considered in order to minimize the impacts that new development and redevelopment projects may have on the county's streams:

- *"Minimize the amount of impervious surface created …*
- *Site buildings to minimize impervious cover …*
- *Where feasible, convey drainage from impervious areas into pervious areas …*
- *Encourage cluster development …*
- *Encourage the preservation of wooded areas and steep slopes adjacent to stream valley EQC areas …*
- *Where appropriate, use protective easements in areas outside of private residential lots as a mechanism to protect wooded areas and steep slopes.*
- *Encourage the use of open ditch road sections …*
- *Encourage the use of innovative BMPs and infiltration techniques of stormwater management …*
- *Apply nonstructural best management practices and bioengineering practices …*
- *Encourage shared parking …*
- *Encourage the use of pervious parking surfaces in low-use parking areas …*
- *Maximize the use of infiltration landscaping within streetscapes consistent with county and state requirements."*

(Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 7-9).

The proposed project will add a significant amount of impervious cover to the site under the maximum development potential alternative. With a greater amount of impervious surface, more runoff and pollutants reach the county streams. Higher levels of runoff from increased imperviousness accelerate stream channel erosion causing increased sedimentation. Deicing salt applied to roads and parking lots is the primary source of chloride in streams. The above listed practices would be applicable to the study and design of the development plan and should be incorporated to the greatest extent feasible.

County policies also state that stormwater design for all stormwater facilities should be closely coordinated with county staff to avoid degradation of impacted streams. The area development plan improvements should provide stormwater quality and quantity controls above the minimum requirements to minimize impacts to adjacent streams and, at a minimum, meet the water quantity detention requirements in Chapter 124 of the Fairfax County Code. County policies state that the county will maintain a best management practices (BMP) program for water quality and will ensure that new development and redevelopment complies with the county's best management practice (BMP) requirements. BMP requirements are to be updated as newer, more effective strategies become available.

Staff also recommends the avoidance of significant ecological resources to the maximum extent feasible; incorporation of linear stormwater controls into the facility designs to address stormwater requirements while minimizing the disturbance of ecological resources and open spaces; incorporation of ecological enhancements into any pond design to replace the ecological functionality of disturbed areas; integration of stream protection measures; demonstration that there will be no adverse impacts to downstream waterways, infrastructure, or property; assessment of the cumulative impact of multiple outfalls directed into a stream in the same general vicinity; incorporation of natural channel design, where applicable; incorporation of constructed wetlands as an alternative to the proposed pond designs; consideration of the retrofitting of existing wet ponds to meet stormwater requirements; adherence to current pollutant removal criteria for any dry ponds; restoration and monitoring of disturbed areas; and management of invasives to be considered in the project study.

Resource Protection Area (RPA), Floodplain and Environmental Quality Corridor (EQC)

Floodplain, RPA, and areas that qualify for designation as EQC exist on the site as shown in Attachment A, an environmental map of the Fort Belvoir North Area prepared by the Department of Planning and Development. Fairfax County recognizes that the Department of the Army is not subject to the provisions of the Chesapeake Bay Preservation Ordinance (CBPO) or County policies. However, Fairfax County continues to encourage the Army to meet the County's CBPO as described in Chapter 118 of the County Code, including conformance with the requirements for areas designated as RPAs and Resource Management Areas. Fairfax County also encourages the Army to minimize any impact to 100-year floodplains and/or wetlands, to the greatest extent feasible. Any mitigation/compensation of wetlands should occur as close to the area of impact as possible. Fairfax County encourages these areas to be protected consistent with county policy and regulations. EQCs as defined in Policy Plan Element of Fairfax County's Comprehensive Plan should also be considered for preservation. Land area that includes all 100-year floodplains, areas of 15% or greater slopes adjacent to the floodplain, and all wetlands qualify as designation of Environmental Quality Corridors and should be considered. This designation would protect and preserve habitat

quality, protect streams, reduce pollutants from entering the water, and provide a connected segment of open space to facilitate the movement of wildlife in the area as well as with the Accotink Creed EQC to the north of the property.
(Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 15-18).

Soils

The Comprehensive Plan encourages new development to either avoids problem soil areas, or implement appropriate engineering measures to protect existing and new structures from unstable soils. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Page 13).

This property contains Marine Clay and problem class soils surrounding Accotink Creek and its tributaries. Staff recommends the Army cluster development away from problem class soils and complete a geotechnical study for the proposed development in the areas that exhibit problem class soils.

Forest Resources Policies and Impacts

The Comprehensive Plan anticipates that new development will include an urban forestry program and be designed in a manner that retains and restores meaningful amounts of tree cover, consistent with planned land use and good silvicultural practices. Good quality vegetation should be preserved and enhanced and lost vegetation restored through replanting. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 17-18).

The project has the potential to disturb a large amount of mature tree cover. Tree planting should be incorporated extensively into the project design for all disturbed areas. In order to ensure the viability of the proposed plantings, staff recommends tree protection, to include adequate supervision during construction, to ensure that tree protection measures are implemented as planned. Additionally, staff recommends that all development plans avoid the following: significant changes to elevations (both “cut” and “fill” operations); changes to water flow; and excavation within the critical root zones of all trees to be protected. Additionally, staff recommends planting schemes featuring native and non-invasive trees, shrubs, perennial grasses and grass-like plants, and forbs for each planting area in the project design. For all new planting areas and for areas in which existing pavement is to be removed, staff recommends soil rebuilding in the project design, which would help ensure the viability of the proposed plantings.

Together, these measures would minimize impacts to ecological resources, increase the viability of the existing tree cover, increase the habitat value of the project, promote water infiltration, improve air quality and provide shade, consistent with the intent of the Comprehensive Plan.

Green Building

Fairfax County encourages commercial building development to incorporate green building measures into the design of all projects. Example green building measures can be derived from the U.S. Green Building Council's Leadership in Energy and Environmental Design for New Construction [LEED-NC®] or the U.S. Green Building Council's Leadership in Energy and Environmental Design for Core and Shell [LEED-CS®] or an equivalent program with independent third-party verification. Additional examples of measures that can be considered for the interior design are: Energy STAR fixtures, low flush toilets, high efficiency light, recycling of non-hazardous renovation materials, etc. Fairfax County also encourages the incorporation of electric vehicle charging into development proposals.
(Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 12-3-2019, Pages 20-22).

Thank you again for the opportunity to comment on this proposal. If you have any questions about the comments, please contact Ellen Huber with the Department of Planning and Development at Ellen.Huber@fairfaxcounty.gov or 703-324-1364.

Sincerely,

Leanna H O'Donnell

Leanna H. O'Donnell, Director, Planning Division
Department of Planning and Development

LHO:EKH

Attachment A: Environmental Map of the Fort Belvoir North Area
Attachment B: Fairfax County Park Authority Memorandum

cc: Board of Supervisors
Bryan Hill, County Executive
Rachel Flynn, Deputy County Executive
Barbara Byron, Director, DPD
Kelly M. Atkinson, Chief, Environment and Development Review Branch, DPD

From: Gillespie, Joy <Gillespie.Joy@epa.gov>
Sent: Friday, July 29, 2022 1:01 PM
To: FBNA <FBNA@usace.army.mil>
Cc: Nevshehirlian, Stepan <Nevshehirlian.Stepan@epa.gov>; Traver, Carrie <Traver.Carrie@epa.gov>
Subject: [Non-DoD Source] FBNA Distribution Center Draft EA- EPA Comments

The U.S. Environmental Protection Agency (EPA) reviewed the draft Environmental Assessment (EA or Study) for the proposed Fort Belvoir North Area Distribution Center in Fairfax County, Virginia.

The Proposed Action as stated in the Study includes the construction of an approximately 525,000 square foot distribution center consolidated complex consisting of a high bay warehouse; two-story administrative building; truck maintenance/refueling building; covered/enclosed storage buildings; entry control facility, including gate house and vehicle inspection; emergency backup generator; and enhanced security measures along the fence line, including a new fence, an approximately 30-foot clear zone around the fence, and a maintenance and patrol path. Associated utility infrastructure will also be included in the Proposed Action.

EPA has several recommendations for your consideration in the development of the Final EA in compliance with the National Environmental Policy Act (NEPA) of 1969, the CEQ regulations implementing NEPA (40 CFR 1500-1508), and Section 309 of the Clean Air Act.

Purpose and Need

The Final EA should include a clear justification of the purpose and need for the Proposed Action. The purpose and need statement is essential to understanding why the Proposed Action is being undertaken and what objectives the project intends to achieve. The purpose of the Proposed Action is typically the specific objective of the activity. The need should explain the underlying problem for why the project is necessary. The alternatives are developed in response to the purpose and need. EPA finds the purpose and need statement provided in the Draft EA does not adequately describe the purpose and need for the Proposed Action. Instead, with regard to purpose, the statement describes the Proposed Action and the need appears to be the purpose. We recommend revising the Purpose and Need Statement to be consistent with the NEPA CEQ Regulations.

Interagency/Intergovernmental Coordination and Consultation

On page 1-4, under 1.4.2 Government to Government Consultations, the EA states, "The Native American tribal governments that were coordinated or consulted with regarding these actions are listed in Appendix A." EPA did not find a list of Native American tribal governments that were coordinated or consulted with but instead found copies of a letter notifying federally recognized tribes that are historically affiliated with the Fort Belvoir geographic region of the action. EPA recommends the Final EA include an outcome summary of the said Native American tribal governments coordination and consultation.

Affected Environment and Environmental Consequences

EPA appreciates the thoroughness of the site background and resource baseline information provided as well as regulatory context.

EPA understands that the Proposed Action is in the conceptual phase and many details may be unknown; however, if possible, we believe it would benefit the Study to include the Limits of

Disturbance (LOD) boundary on the maps provided in the Environmental Consequences sections when discussing impacts. The maps in the Draft EA appear to only have the outline of the permanent structures, after construction. Seeing the LOD in relationship to the natural resources within the Proposed Action Site would clarify the potential impacts associated with the Proposed Action.

Under the *Environmental Consequence* sections the terms "short-term" and "long-term" are used periodically to describe the duration of potential impacts. EPA recommends including in the Final EA a description of what would constitute a short-term and long- term impact. For example, the Federal Energy Regulatory Commission (FERC) describes duration as follows:

> *"The environmental consequences of the Project would vary in duration. Four levels of impact duration would occur: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction with the resource returning to preconstruction condition almost immediately afterward. Short-term impacts could continue between two to five years following construction. Impacts were considered long-term if the resource would require more than 5 years to recover. A permanent impact could occur as a result of any activity that modifies a resource to the extent that it would be affected for the life of the Project."*

When discussing the threshold of significance for water and biological resources impacts, the terms substantial and substantially are used several times as a qualifying word. The threshold of significance would be exceeded if the impacts result in "substantial" degradation or "substantial" alterations occur. It is not clear from the information provided, how substantial is defined. Resource impacts are noted in the Study, but it is unclear how the "substantial" threshold was applied. It would be helpful to identify the impacts that may occur and detail why they are, or are not, considered substantial. EPA recommends using measurable metrics, such as limits and ranges wherever possible.

<u>Water Resources</u>

On page 3-13, under 3.3.1.4 *Wetlands*, the EA indicates six wetlands were delineated within the Proposed Action Site, amounting to 2.33 acres, followed by a more detailed characterization of each wetland individually. To fully understand the extent of potential wetlands impact on site, EPA recommends including in the individual wetland characterization the size (acre) of each wetland being discussed.

When referencing impacts of Proposed Action on surface waters (page 3-17 and 18), the EA indicated the Proposed Action could involve minimal construction in, on or over surface waters. EPA recommends providing in the Final EA more context to what "minimal construction" and "in, on or over" would entail. More detail would provide a better understanding of the potential impacts to surface waters when the project moves beyond the conceptual design phase.

On page 3-18, under *Wetlands*, it indicates the project would continue to avoid wetlands by relocating the perimeter fence or have the fence traverse over the stream and associated wetland. It is not clear how traversing over the stream or wetland would avoid these water resources. EPA recommends providing more information in the Final EA to clarify this statement.

EPA notes the project design may include road-stream crossings where permanent culverts will be installed. EPA recommends the use of bottomless culverts for road-stream crossings that will accommodate aquatic organism passage, provide for more natural channel function, and maximize the long-term stability of the structure.

Biological Resources

On Page 3-24 under 3.4.3.1 *Federally Listed Species,* the EA includes a discussion on the northern long-eared bat (Myotis septentrionalis) (NLEB), which is listed as a threatened species under the Endangered Species Act. It is noted that NLEB may occur in forested areas on or near the Proposed Action Site. It is further noted that on May 24, 2022, a field survey was conducted, and results can be found in Appendix F. EPA recommends including a brief discussion of the results of the survey in the Final EA and referencing Appendix F for more information.

EPA recommends developing an invasive species management plan for the site. Please provide a description in the Final EA of how invasive species will be managed during operation of the Proposed Action. If herbicides will be used for native and nonnative invasive plant species management, please explain how the herbicide will be applied and what measures will be taken to prevent the herbicide from entering surface waters.

Air Quality

On page 3-51, under section 3.9.2.1 Threshold of Significance, its states, "The threshold of significance for air quality impacts would be exceeded if the Proposed Action were to result in any of the following: Exceedance of the applicable General Conformity Rule de minimis level thresholds; Increase of criteria pollutant emissions to levels above permitted source thresholds; or Meaningful contributions to the potential effects of global climate change". To enhance the assessment and understanding of the potential climate change impacts that may result from the Proposed Action, EPA recommends explaining how "meaningful contributions" is determined. We suggest including what would be meaningful contribution for reference. Furthermore, a discussion of mitigation measures to be taken to reduce potential climate change impacts during construction should be included in the Final EA. EPA recommends identifying practicable energy efficiency measures and project-specific best practices to reduce methane and CO2 emissions during construction and operation.

Again, thank you for the opportunity to provide comments for your consideration in the development of the Study. If you would like to discuss any of these recommendations, please don't hesitate to contact me.

Thank you,

Joy

_____
Joy M. Gillespie, Life Scientist
office: 215.814.2793

Office of Communities, Tribes & Environmental Assessment
National Environmental Policy Act (NEPA)
U.S. EPA Region III
1600 JFK Boulevard (3RA12)
Philadelphia, PA 19103
www.epa.gov

July 28, 2022

Fort Belvoir Environmental Division,
Directorate of Public Works,
Building 1442, 9430 Jackson Loop,
Fort Belvoir, VA 22060
FBNA@usace.army.mil

SUBJECT: Draft Environmental Assessment (EA) for the proposed distribution center on Fort Belvoir's North Area (FBNA)

As per instruction provided with project documentation, the following comments were provided through the project email filing system at: FBNA@usace.army.mil, July 29, 2022.

The Fairfax County Park Authority has reviewed the documentation provided on the Draft Environmental Assessment (EA) for the proposed construction of a distribution center on Fort Belvoir's North Area (FBNA). The proposed project includes the construction of a 525,000 square foot warehouse and administrative building with associated parking and covered storage for approximately 600 personnel completely contained within Fort Belvoir's North Area.

Page 3-19, of the Draft EA references that seeding is to be provided in conformance with the Virginia Erosion and Sediment Control Handbook, Edition 1992. Tables 3.31 and 3.32 of the handbook for temporary and permanent stabilization include species such as Phragmites australis (Common Reed), Lespedeza cuneata (Chinese Lespedeza), Lotus corniculatus (Birdsfoot Trefoil), Dactylis glomerata (Orchard Grass), Agrostis alba (Redtop), Eragrostis curvula (Weeping Lovegrass), Coronilla varia (Crownvetch), and Festuca arundinacea (Tall Fescue) which have been identified as invasive. Additionally, Phalaris arundinacea (Reed Canarygrass) has shown invasive tendencies in the region. Due to the proximity of parkland and with the guidance of the Virginia Department of Conservation and Recreation (DCR), these species should be excluded from the various seed mixes. A DCR information sheet that provides some suggested alternatives can be found at http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml.

Thank you for the opportunity to comment on this Draft EA. We look forward to participating in the study as it moves forward. The Park Authority's point of contact for this project is Andy Galusha, Park Planner who can be reached at 703-324-8755 or at Andrew.Galusha@fairfaxcounty.gov.

Sincerely,

Samantha Hudson, Manager, Park Planning Branch, PDD

eCopy: Aimee Vosper, Deputy Director/CBD
John Burke, Manager, Natural Resources Branch
Samantha Hudson, Manager, Park Planning Branch
Randall Farren, Development Review Section Chief, Park Planning Branch, PDD
Lynne Johnson, Planning Tech, Park Planning Branch
Katie Hermann, Zoning Coordinator, DPD
Andy Galusha, Park Planner, Park Planning Branch

\\ffx\ffxdfs\AppShare\FCPA_Parks\Park Planning\Development Plan Review\Environmental Impact Reviews\EA-Fort Belvoir North Area (FBNA)\FBNA Distribution Center_Draft EA - FCPA.docx

From: Susan Bachor <sbachor@DelawareTribe.onmicrosoft.com>
Sent: Thursday, August 11, 2022 3:56 PM
To: FBNA <FBNA@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] Re: Notice of the Availability (NOA) for the Draft Environmental Assessment (EA) for the proposed construction of a distribution center on Fort Belvoir's North Area (FBNA) in Fairfax County, Virginia

Wanishi! We appreciate you reaching out to the Delaware Tribe regarding this project. Fairfax, Virginia is currently outside our area of interest.
Best,
Susan Bachor, M.A.
Deputy THPO & Archaeologist
Delaware Tribe Historic Preservation
126 University Circle
Stroud Hall, Rm. 437
East Stroudsburg PA 18301
NEW ***cell-1.539.529.1671***
sbachor@delawaretribe.onmicrosoft.com - electronic submissions preferred
Please call for appointment.

confidential electronic mailing in error, please notify the sender by a "reply to the sender only: message, delete the email immediately and destroy all electronic and hard copies of the communication, including attachments.

FOR ALL OTHER EMAILS:
- ATTENTION: The email message, including any attachments, is for the sole use of the intended recipient(s) and may contain confidential and privileged information. Any unauthorized review, use, disclosure, or distribution is prohibited. If you are not the intended recipient, please contact the sender by reply email and destroy all copies of the original message.

From: Chris Landgraf <clandgraf@novaregion.org>
Sent: Wednesday, July 6, 2022 3:13 PM
To: Harback, Wilamena G CIV USARMY ID-SUSTAINMENT (USA) <wilamena.g.harback.civ@army.mil>; Vega, Sybille R CIV USARMY ID-SUSTAINMENT (USA) <sybille.r.vega.civ@army.mil>
Cc: Peggy Tadej <peggy.tadej@novaregion.org>
Subject: [Non-DoD Source] FBNA Distribution Center EA Comments

Willy and Sybille,

Please review the attached comments and let me know if we can discuss them next week. I am interested to hear if your team has already made the same comments or if my concerns were addressed in previous discussions with the Corps.

Thank you for your time and review, have a great weekend!

Chris Landgraf
NVRC Program Manager
Military Installation Resilience
(703) 642-4641
clandgraf@novaregion.org

Page 1-6, Table 1-1: Why are EO 14008 and 14057 not included in the list of documents? Why isn't the Army or DoD Climate Strategy listed as a reference?

Page 2-1: Why isn't the fence with patrol road and clear zone shown on the plan? The impacts could be almost 7.5 acres.

Page 3-1: The reference of the distance of FBNA to the Main Post is not consistent with the information on Page 1-1.

Page 3-3, Figure 3-1: Why doesn't the project boundary match the fence line? Are the areas outside the project boundary being analyzed?

Page 3-5, Table 3-1: Were soil samples taken to identify bedrock? If not, how can you say the soils are well drained? How can soils with defined wetlands be considered non-hydric?

Page 3-6: The sentence "The proposed buildings and parking areas would be located on the site's topographic highs and not on the steep slopes of the surface water drainages" is not correct. The southwest corner of the proposed building is in an area with 15-25% slopes that are adjacent to a stream corridor.

Page 3-6: Does the 30 acres referenced on line 23 include the fence and perimeter road clearing? The fence and perimeter road may require 7.5 acres of clearing and require at least three creek crossings.

Page 3-6: According to Fairfax County, Accotink Creek watershed is 51 square miles, not 52.

Page 3-15: Why aren't stormwater basins shown on the plans? Discharge points should be part of the wetland impacts analysis. Stormwater basin acreage should be part of the overall impacts analysis.

Page 3-18: Lines 1-3 discuss the impacts of the perimeter fence and road in general terms. The statement indicates the impacts will be minimal, but the construction of the perimeter road is not clearly shown on the plans. Some of the stream valleys are very steep where the fence is shown. How will the road shoulder be stabilized? How will road runoff be treated? Culvert crossings and road construction will impact wetlands and RPAs and the impacts are not being analyzed.

Page 3-18: The construction of stormwater ponds is mentioned on lines 11 and 12, but ponds are not shown on the plans. How will pre-development levels be achieved if there is bedrock that prohibits infiltration or minimizes the depth of the ponds?

Page 3-19: The acreage of impervious surface for the proposed action is listed as 23.6 acres. Does this include the perimeter road and fence construction?

Page 3-25: Line 33 states that 7.25 acres of suitable small whorled pogonia habitat was identified. The location of suitable habitat has the perimeter fence crossing through the habitat. Will the perimeter fence and patrol road be designed to avoid the suitable habitat?

Page 3-28: Lines 39, Thresholds of Significance, Will the perimeter fence and road negatively impact the identified rare ecological communities? Without proper mapping of the road how can the impacts be analyzed?

Page 3-30: Line 18 discusses the replanting of trees on other areas on Fort Belvoir. In 2020 Fort Belvoir had limited areas available for replanting. Other restoration options should be pursued.

Page 3-36: Lines 41-43 imply that Dominion Energy has ownership of the electrical system on FBNA. Dominion Energy does not have a privatization contract in place for FBNA. Dominion Energy maintains the substation in the southeast corner of FBNA and the substation at the intersection of Barta Road and Backlick Road. They do not maintain the electrical systems past the substation.

Page 3-37: The 1.5-million-gallon water tank mentioned in lines 14 and 15 is not active. The tank was constructed but failed to be activated.

Page 3-37: Lines 18 and 19 imply there is a sewer line that will service the project area. There is not an active sewer line within the project area. The impacts of a sewer line connection to the county line along Accotink Creek should be part of the EA. A sewer line connection may impact wetland habitat.

Page 3-37: Lines 26-28 imply that there is a gas line within the project area. There is not a gas line within the project area. Establishing a connection and determining a route for gas to the facility should be part of the EA.

Page 3-37: Line 43 states that the electrical distribution system is new and in good condition. This is a true statement for the electrical system, but there is no electrical distribution within the project boundary. Determination of an electrical system connection and possible route to the facility should be part of the EA.

Page 3-38: Connecting to the existing water line (lines 10-12) along Cissna Road and the subsequent water distribution system should be evaluated as part of the EA. The water line connection to the facility could impact RPAs and wetlands.

Page 3-38: The county wastewater systems mentioned in lines 14-16 do have capacity for build out at FBNA, however, accessing the county sewer line is difficult. Possible routes for access to the wastewater system should be considered in this EA. The routes may have significant wetland or slope impacts.

Page 3-38: The natural gas system mentioned in lines 22-26 should have adequate capacity for this project, however, routing a gas line to the site could have significant impacts to the forest and wetland habitats identified. Possible routes for the gas line should be evaluated in this EA.

Page 3-61: The current NGA population is closer to 10,000 personnel. Not 8,600 personnel as referenced in line 38.

Page 3-64: The cumulative effects of the perimeter fence, corresponding security road, and numerous utility connections inside and outside the project area need to be evaluated. This EA is not identifying or evaluating possible utility connection routes that could impact wetlands, streams, or steep slopes within or adjacent to the project site.

Page 4-2, Water Resources: What is the threshold for less-than-significant adverse impacts? Figure 3-4 shows impacts to the RPA around wetland 2 and to wetland 2. The perimeter road and fence have not been clearly delineated, so how can all impacts be evaluated. Utility connections have not been proposed or evaluated; how can all impacts be quantified?

Page 4-2, Biological Resources: The effects of the perimeter road on small whorled pogonia habitat have not been fully identified since the road is not clearly marked. The effects of utility crossings on

vegetation, wildlife, and RTE species has not been determined since proposed routes for utility connections have not been identified.

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482 FAX (804) 698-4178
www.deq.virginia.gov

Travis A. Voyles
Acting Secretary of Natural and Historic Resources

Michael S. Rolband, PE, PWD, PWS Emeritus
Director
(804) 698-4020

August 26, 2022

Fort Belvoir Environmental Division
C/O Mr. Bradford D. Britain
Directorate of Public Works, Building 1442
9430 Jackson Loop
Fort Belvoir, Virginia 22060
Via email. fbna@usace.army.mil

RE: Draft Environmental Assessment and Federal Consistency Determination, Fort Belvoir North Area Distribution Center, Department of the Army, Fairfax County, (DEQ 22-121F)

Dear Mr. Britain:

The Commonwealth of Virginia has completed its review of the above-referenced project. The Department of Environmental Quality is responsible for coordinating Virginia's review of federal environmental documents submitted under the National Environmental Policy Act (NEPA) and responding to appropriate federal officials on behalf of the Commonwealth. DEQ is also responsible for coordinating Virginia's review of federal consistency documents submitted pursuant to the Coastal Zone Management Act (CZMA) and providing the state's response. This is in response to the June 2022 Draft Environmental Assessment (EA) and Federal Consistency Determination (FCD) (received June 30, 2022) submitted for the proposed project by the Department of the Army. The following agencies and locality participated in the review of this proposal:

Department of Environmental Quality
Department of Conservation and Recreation
Department of Wildlife Resources
Department of Health
Department of Historic Resources
Fairfax County

In addition, Virginia Marine Resources Commission, Department of Agriculture and Consumer Services, Department of Forestry, Department of Transportation, and the Northern Virginia Regional Commission were invited to comment on the proposal.

PROJECT DESCRIPTION

The Department of the Army (Army or applicant) proposes to construction and operation of a new distribution center at the Fort Belvoir North Area (FBNA) in Fairfax County, Virginia. FBNA is located in the Springfield area, approximately 3 miles northwest of Fort Belvoir's main installation. The proposed site location on FBNA is a forested area bordered to the west by the Fairfax County Parkway and to the east by Accotink Creek. A portion of the proposed site was previously used as former munitions training ranges. The Proposed Action is to construct an approximately 525,000-square-foot distribution center consolidated complex consisting of a high bay warehouse; two-story administrative building; truck maintenance/refueling building; covered/enclosed storage buildings; entry control facility, including gate house and vehicle inspection; emergency backup generator; and enhanced security measures along the fenceline, including a new fence, an approximately 30-foot clear zone around the fence, and a maintenance and patrol path. The distribution center expects minimal truck traffic compared to a typical industrial distribution center. The expected daily truck traffic flow is estimated to be about 640 cars and 12 trucks. The operational hours would typically be between 6:00 am and 4:00 pm. This facility would support the delivery and receipt of materials within and across the Washington Metropolitan Area and National Capital Region (NCR) to achieve distribution efficiencies. The Proposed Action is needed to modernize logistical operations and address safety, security, and operational concerns specific to the distribution center and its administrative functions.

CONCLUSION UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT

Provided activities are performed in accordance with the recommendations which follow in the Environmental Impacts and Mitigation section of this report, the Proposed Action is unlikely to have significant effects on ambient air quality, important farmland, forest resources, and wetlands. It is unlikely to adversely affect species of plants or insects listed by state agencies as rare, threatened, or endangered.

ENVIRONMENTAL IMPACTS AND MITIGATION

1. Surface Waters and Wetlands. The EA (page 3-7) notes that the Proposed Action Site is located within the northwestern half of FBNA, just west of Accotink Creek. According to the EA (page 3-13), six wetlands were delineated within the Proposed Action Site, amounting to approximately 2.33 acres. Implementation of the Proposed Action under the current conceptual plan, the project would avoid wetlands and have less-than-significant adverse impacts (EA, page 3-18). However, there are approximately 2.33 acres of mapped wetlands within the project, and since the project plans are in the early stages of development, the project would continue to avoid these wetlands by relocating the perimeter fence alignment or have the fence traverse over the stream and associated wetland. Prior to construction, any unavoidable impacts would be permitted through federal and state wetland permitting programs.

1(a) Agency Jurisdiction. The State Water Control Board promulgates Virginia's water regulations covering a variety of permits to include the Virginia Pollutant Discharge Elimination System Permit regulating point source discharges to surface waters, Virginia Pollution Abatement Permit regulating sewage sludge, storage and land application of biosolids, industrial wastes (sludge and wastewater), municipal wastewater, and animal wastes, the Surface and Groundwater Withdrawal Permit, and the Virginia Water Protection (VWP) Permit regulating impacts to streams, wetlands, and other surface waters. The VWP permit is a state permit which governs wetlands, surface water, and surface water withdrawals and 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 Permit Program is under the Office of Wetlands and Stream Protection, within the DEQ Division of Water Permitting. In addition to central office staff that review and issue VWP permits for transportation and water withdrawal projects, the six DEQ regional offices perform permit application reviews and issue permits for the covered activities:

- Clean Water Act, §401;
- Section 404(b)(i) Guidelines Mitigation Memorandum of Agreement (2/90);
- State Water Control Law, Virginia Code section 62.1-44.15:20 *et seq*.; and
- State Water Control *Regulations*, 9 VAC 25-210-10.

1(b) Agency Findings. The VWP Permit program at the DEQ Northern Regional Office (NRO) finds that a VWP Individual Permit may be required should the Proposed Action impact jurisdictional waters.

1(c) Requirements. If construction activities will occur in or along streams (perennial, intermittent, or ephemeral), open water, or wetlands, the Army should contact the DEQ-NRO VWP Permit program staff prior to commencing work to determine the need for a permit. Upon receipt of a Joint Permit Application (JPA) for any proposed surface water impacts, DEQ will review the proposed project in accordance with the VWP Permit program regulations and program guidance. DEQ will provide comment upon receipt of a JPA, and when a wetland delineation has been conducted and a jurisdiction determination is made by the U.S. Army Corps of Engineers (Corps).

The Corps is the authority for an official confirmation of whether there are federal jurisdictional waters, including wetlands, which may be impacted by the Proposed Action. DEQ may confirm additional waters as jurisdictional beyond those under federal authority. Even if there will be no intentional placement of fill material in jurisdictional waters, potential water quality impacts resulting from construction site surface runoff must be minimized. This can be achieved by using Best Management Practices (BMPs). Measures should be taken to avoid and minimize impacts to surface waters and wetlands during construction.

1(d) CZMA Federal Consistency. The Proposed Action is consistent to the maximum extent practicable with the tidal and nontidal wetlands enforceable policy of the Virginia Coastal Zone Management (CZM) Program provided any necessary permits are

obtained (see Federal Consistency under the CZMA (pages 21-23) for additional information).

2. Point Source Discharges. According to the EA (page 3-20), the project and any construction activities associated with it has the potential to discharge pollutants in surface waters to a monitored/permitted Industrial Stormwater Outfall (ISW RO-031 and RO-032). Construction BMPs would be implemented in accordance with federal, state, and local Fort Belvoir regulations, including Fort Belvoir's MS4 Program and VPDES Permit VA0400093, to protect downstream waters from sediment migration by ensuring adequate perimeter controls and buffers are used, including silt fencing, synthetic hay bales, and similar measures.

2(a) Agency Jurisdiction. The Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) program to limit pollutants getting into streams, rivers and bays. DEQ administers the program as the Virginia Pollutant Discharge Elimination System (VPDES). The agency issues permits for: all point source discharges to surface waters, dischargers of stormwater from Municipal Separate Storm Sewer Systems (MS4s), and dischargers of stormwater from Industrial Activities.

2(b) Agency Findings. The VPDES program at DEQ-NRO notes that the project may require permit coverage (VAG83) for discharges from petroleum contaminated sites, groundwater remediation, hydrostatic tests, or for any dewatering during construction if petroleum contamination is encountered.

2(c) CZMA Federal Consistency. The Proposed Action is consistent to the maximum extent practicable with the point source water pollution enforceable policy of the Virginia Coastal Zone Management (CZM) Program, provided a VPDES permit is obtained prior to construction, if applicable (see Federal Consistency under the CZMA (pages 21-23) for additional information).

3. Erosion and Sediment Control and Stormwater Management. The EA (pages 3-19 and 3-20) states that because the project is located within a Chesapeake Bay Preservation Area and would disturb more than 2,500 square feet, the construction contractor would be required to prepare an erosion and sediment control plan in compliance with the Virginia Erosion and Sediment Control Law (9 VAC 43 25-840) and in conformance with the Virginia Erosion and Sediment Control Handbook, Third Edition, 1992. The plan would be submitted to Fort Belvoir's Stormwater Permit Manager for review and approved by DEQ's Northern Regional Office, and routine inspections would be conducted throughout construction to ensure compliance with these permits. The contractor would also obtain a Construction General Permit and prepare and implement a construction SWPPP to minimize sedimentation to downstream receiving water bodies.

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

- Virginia Erosion and Sediment Control (ECS) Law (§ 62.1-44.15:51 *et seq*.) and Regulations (9 VAC 25-840);
- Virginia Stormwater Management Act (§ 62.1-44.15:24 *et seq*.);
- Virginia Stormwater Management Program (VSMP) regulation (9 VAC 25-870); and
- 2014 General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-880).

In addition, DEQ is responsible for the Virginia Stormwater Management Program (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 (9 VAC 25-890-40).

3(b) Requirements.

(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 the Virginia Erosion and Sediment Control Law and Regulations (VESCL&R) and Virginia Stormwater Management Law and Regulations (VSWML&R), 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, federal consistency under the Coastal Zone Management Act). 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 (2,500 square feet in Chesapeake Bay Preservation Area) 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.

Land-disturbing activities that result in the total land disturbance of equal to or greater than 1 acre (2,500 square feet in Chesapeake Bay Preservation Area) would be regulated by VSWML&R. Accordingly, the applicant must prepare and implement a Stormwater Management (SWM) Plan to ensure compliance with state law and regulations.

The ESC and SWM Plans are submitted to the DEQ Northern Regional Office (NRO) 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*.]

(ii) General VPDES Permit for Discharges of Stormwater from Construction Activities (VAR10)

The owner or operator of projects involving land-disturbing activities of equal to or greater than one acre is required to apply for registration coverage under the General Permit for Discharges of Stormwater from Construction Activities and develop a project-specific stormwater pollution prevention plan (SWPPP). Construction activities requiring registration also include land disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan of development will collectively disturb equal to or greater than one acre.

- The SWPPP must be prepared prior to submission of the registration statement for coverage under the General Permit.
- 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 Construction General Permit webpage. [Reference: Virginia Stormwater Management Act 62.1-44.15 *et seq.*; VSMP Permit Regulations 9 VAC 25-880 *et seq.*].

3(c) Recommendations. DEQ-NRO recommends the use of permeable paving for parking areas and walkways where appropriate, and denuded areas should be promptly revegetated following construction work.

3(d) CZMA Federal Consistency. The Proposed Action is consistent to the maximum extent practicable with the nonpoint source water pollution enforceable policy of the Virginia Coastal Zone Management (CZM) Program, provided all required erosion and sediment control and stormwater management permits and approvals are obtained from DEQ-NRO prior to construction (see Federal Consistency under the CZMA (pages 21-23) for additional information).

4. Chesapeake Bay Preservation Areas. According to the EA (page 3-10), two tributaries and associated wetlands in the Proposed Action Site are denoted as a Resource Protection Area (RPA) on Fort Belvoir's Integrated Natural Resource Management Program (INRMP) mapping. The proposed roadway entering the project site from Barta Road would be constructed through a portion of the RPA, but would not cross the stream itself. A proposed parking feature south of the proposed warehouse and administrative building would be constructed slightly within the RPA for perennial stream R3. The installation of a perimeter security fence, which could involve minimal construction in, on, or over surface waters and could result in the disturbance, alteration, or filling of the adjacent RPAs in multiple areas within FBNA. Any work within the stream and RPA, as necessary to construct roadways, parking features, and security fencing would be appropriately permitted through the Corps and the Commonwealth of Virginia.

4(a) Agency Jurisdiction. The DEQ Office of Watersheds and Local Government

Assistance Programs (OWLGAP) administers the Chesapeake Bay Preservation Act (Virginia Code §62.1-44.15:67 *et seq*.) and *Chesapeake Bay Preservation Area Designation and Management Regulations* (9 VAC 25-830-10 *et seq*.). Each Tidewater locality must adopt a program based on the Bay Act and *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.

4(b) Chesapeake Bay Preservation Areas. In Fairfax County, the areas protected by the Chesapeake Bay Preservation Act (Bay Act), as locally implemented, require conformance with performance criteria. These areas include Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) as designated by the locality. RPAs include:

- tidal wetlands;
- certain non-tidal wetlands;
- tidal shores; and
- 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.

RMAs, which require less stringent performance criteria, include those areas of the County not included in the RPAs.

4(c) Agency Findings. DEQ-OWLGAP notes that an extensive network of roads, starting with sole site access/egress on Barta Road on the east side of the proposed development, would result in four specific encroachments into designated RPA buffers. The most significant of these encroachments would occur with a perpendicular, north-south routing of roadway along the east side of the main warehouse structure, where Wetland 2 and 2A are located. RPA encroachments resulting from roadway crossings of potential lesser impacts appear to be proposed on the north and south ends of Wetland 3.

4(d) Requirements.

(i) Roads and Driveways

Per 9 VAC 25-830-140 1(v) of the *Regulations*, a road or driveway crossing is allowed in the RPA if each of the following conditions are met:

1) it is determined that there are no reasonable alternatives to aligning the road or driveway in or across the RPA;
2) the alignment and design of the road or driveway are optimized, consistent with other applicable requirements, to minimize (i) encroachment into the RPA and (ii) adverse effects on water quality;
3) the design and proposed construction of the road or driveway includes submission of a Water Quality Impact Assessment (WQIA) to the DEQ Office of Watersheds and Local Government Assistance Programs prior to commencement of any land-disturbing activities, and;
4) the local government (Fairfax County) reviews the plan for the proposed roadway in or across the RPA in coordination with local site plan, subdivision and plan of development approvals. (Staff of the Fairfax County Department of Planning and Development-Environment and Development Review Branch provided the following early input comments in an April 19, 2022 email to FBNA: *"Impacts to RPA, floodplains, wetlands…should be avoided or minimized to the greatest extent feasible."* The email ends with this: *"These comments are subject to change based on the County's formal review of the forthcoming EA and represent staff analysis and do not necessarily reflect the opinion of the Fairfax County Board of Supervisors.")*

In addition to the above requirements for encroachments in to the RPA, the staging of heavy equipment for all construction and land disturbing activities must be carried out in such a way as to avoid any physical encroachment into the RPA.

(ii) General Performance Criteria

Land disturbance and development within the RMA portion of the project site must be consistent with the general performance criteria provisions of 9 VAC 25-830-130 of the *Regulations*, which includes:

- disturbing no more land than necessary to provide for the proposed use,
- minimizing impervious cover, and
- preserving indigenous vegetation to the maximum extent practicable consistent with the proposed use.

In addition, all land-disturbing activity exceeding 2,500 square feet must comply with the requirements of the *Virginia Erosion and Sediment Control Handbook,* Third Edition, 1992. Finally, stormwater management criteria consistent with the water quality protection provisions of the *Virginia Stormwater Management Regulations,* 9 VAC 25-870-51 and 9 VAC 25-870-103, shall be satisfied.

4(e) CZMA Federal Consistency. The Proposed Action is consistent to the maximum extent practicable with the Chesapeake Bay Preservation Areas enforceable policy of the Virginia Coastal Zone Management (CZM) Program, provided the applicant complies with the above requirements (see Federal Consistency under the CZMA (pages 21-23) for additional information).

5. Floodplain Management. The EA (page 3-19) states that under the Proposed Action, no adverse effects are expected to occur on floodplains. The Proposed Action is not located within a floodplain.

5(a) Agency Jurisdiction. The DCR Division of Dam Safety and Floodplain Management (DSFM) is the lead coordinating agency for the Commonwealth's floodplain management program and the National Flood Insurance Program (Executive Oder 45). The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), and communities who elect to participate in this voluntary program manage and enforce the program on the local level through that community's local floodplain ordinance. Each local floodplain ordinance must comply with the minimum standards of the NFIP, outlined in 44 CFR 60.3; however, local communities may adopt more restrictive requirements in their local floodplain ordinance, such as regulating the 0.2% annual chance flood zone (shaded Zone X).

5(b) Requirements. All development within a Special Flood Hazard Area (SFHA) or floodplain, as shown on the locality's Flood Insurance Rate Map (FIRM), must be permitted and comply with the requirements of the local floodplain ordinance. Projects conducted by federal agencies within the SFHA must comply with federal Executive Order 11988: Floodplain Management.

DCR's Floodplain Management Program does not have regulatory authority for projects in the SFHA. The applicant/developer must contact the local floodplain administrator for an official floodplain determination and comply with the community's local floodplain ordinance, including receiving a local permit. Failure to comply with the local floodplain ordinance could result in enforcement action from the locality. The Army is encouraged to reach out to the local floodplain administrator to ensure compliance with the local floodplain ordinance.

5(c) Recommendations. DCR recommends the applicant access the Virginia Flood Risk Information System (VFRIS) to find flood zone information.

For additional information, contact DCR-DSFM, Angela Davis at (804) 371-6135 or angela.davis@dcr.virginia.gov.

6. Air Pollution Control. The EA (page 3-51) finds that short-term, minor, adverse impacts on air quality would result from the construction of the warehouse and administrative building. In accordance with 9 VAC 5-40-90, construction contractors would be required to take reasonable precautions to prevent particulate matter from becoming airborne. Long-term, negligible, adverse impacts on air quality would occur from operational air emissions associated with the Proposed Action (EA, page 3-52). Operational air emissions would be produced from the natural gas-fired boilers for the proposed buildings and from the emergency generators near the warehouse and entry control facility.

6(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.

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 major State projects are:

- Open burning: 9 VAC 5-130 *et seq.*
- Fugitive dust control: 9 VAC 5-50-60 *et seq.*
- Permits for fuel-burning equipment: 9 VAC 5-80-1100 *et seq.*

6(b) Agency Findings. According to the DEQ Air Division, the project site is located in a designated ozone nonattainment area and an emission control area for the control of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs).

6(c) Recommendation. The Army should take all reasonable precautions to limit emissions of NO_x and VOCs, principally by controlling or limiting the burning of fossil fuels.

6(d) Requirements.

(i) Fugitive Dust

During construction, fugitive dust must be kept to a minimum by using control methods outlined in 9 VAC 5-50-60 *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, of water or chemicals for dust control;
- Installation and use of hoods, fans, and fabric filters to enclose and vent the handling of dusty materials;
- Covering of open equipment for conveying materials; and
- Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion.

(ii) Asphalt Paving

In accordance with 9 VAC 5-45-780, 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. Moreover, there are time-of-year restrictions on its use during the months of April through October in VOC emission control areas.

(iii) Open Burning

If project activities include the open burning of construction or demolition material or the use of special incineration devices, this activity must meet the requirements under 9 VAC 5-130 *et seq.* of the *Regulations* for open burning, and may require a permit. The *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The Army should contact Fairfax County fire officials to determine what local requirements, if any, exist.

6(e) CZMA Federal Consistency. The Proposed Action is consistent to the maximum extent practicable with the point source air pollution enforceable policy of the Virginia Coastal Zone Management (CZM) Program, provided all required permits and/or authorizations are obtained prior to construction (see Federal Consistency under the CZMA (pages 21-23) for additional information).

7. Solid and Hazardous Wastes and Hazardous Materials. According to the EA (page 3-35), under the Proposed Action, no significant impacts would occur on hazardous material and waste. Soils excavated or otherwise disturbed during the project's construction phase would be tested in accordance with established Fort Belvoir policies and procedures. If concentrations of contaminants in soils are determined to exceed applicable regulatory thresholds for re-use on the site, any affected soils would be removed from the site and disposed of at a permitted facility off FBNA in accordance with *Virginia Solid Waste Disposal Regulations* as well as all other federal, state, and local laws and regulations. Prior to construction of the Proposed Action, munitions clearance would be conducted and coordinated with Fort Belvoir Department of Public Works (DPW) and DEQ.

7(a) Agency Jurisdiction. On behalf of the Virginia Waste Management Board, the DEQ Division of Land Protection and Revitalization (DEQ-DLPR) 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. DEQ-DLPR also administers laws and regulations on behalf of the State Water Control Board governing Petroleum Storage Tanks (Virginia Code §62.1-44.34:8 *et seq*.), including Aboveground Storage Tanks (9 VAC 25-91 *et seq*.) and Underground Storage Tanks (9 VAC 25-580 *et seq*. and 9 VAC 25-580-370 *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*, 9 VAC 20-81 (9 VAC 20-81-620 applies to asbestos-containing materials)
- *Virginia Hazardous Waste Management Regulations*, 9 VAC 20-60 (9 VAC 20-60-261 applies to lead-based paints)
- *Virginia Regulations for the Transportation of Hazardous Materials*, 9 VAC 20-110.

Federal:

- Resource Conservation and Recovery Act, 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*.

7(b) Agency Findings. DEQ-DLPR conducted a search of the project area of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity (200-foot radius) to the project site. The search did not identify waste sites within the project area which might impact the project.

7(c) Requirements.

(i) Solid and Hazardous 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. All construction waste must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to management at an appropriate facility.

(ii) Petroleum Contamination

If evidence of a petroleum release is discovered during construction, it must be reported to DEQ-NRO in accordance with Virginia Code § 62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*. Petroleum-contaminated soils and groundwater that is generated during project implementation must be characterized and disposed of properly.

(iii) Asbestos-Containing Materials and Lead-Based Paint

Any structures being demolished, renovated, or 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 9 VAC 20-81-620 (ACM) and 9 VAC 20-60-261 (LBP) must be followed.

7(d) Recommendation. 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.

Questions or requests for further information regarding the above waste comments may be directed to DEQ-DLPR, Carlos Martinez at (804) 350-9962 or carlos.martinez@deq.virginia.gov.

8. Pesticides and Herbicides. DEQ recommends that the use of herbicides or pesticides for construction or landscape maintenance should be in accordance with the principles of integrated pest management. The least toxic pesticides that are effective in controlling the target species should be used to the extent feasible. Contact the Department of Agriculture and Consumer Services at (804) 786-3501 for more information.

9. Natural Heritage Resources. According to the EA (pages 3-30 thru 3-32), the removal of approximately 30 acres of vegetation for construction of the facilities and infrastructure under the Proposed Action would result in short-term, minor, adverse effects on poplar/red maple and oak/hickory stand habitat on FBNA. Despite previous disturbance of the area, clearing of vegetation associated with construction under the Proposed Action could adversely impact protected species if pre-construction surveys are not conducted. While the small whorled pogonia has not been located on FBNA since 2005, suitable habitat has been identified within the Proposed Action Site and should be avoided to preserve the habitat of this species. Should wood turtle habitat be identified within the area, surveys for the presence of the wood turtle would be conducted prior to site clearing, and the results of these surveys coordinated with Fort Belvoir natural resources program staff and appropriate wildlife management agencies. To protect nesting bat species, no trees over three inches in diameter would be removed within the Proposed Action Site between 15 April and 15 September, in accordance with current USFWS guidelines and corresponding U.S. Army northern long-eared bat (NLEB) protection documents promulgated to protect the NLEB species.

9(a) Agency Jurisdiction.

(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), authorizes DCR to maintain a statewide database for conservation planning and project review, protect land for the conservation of biodiversity, and 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).

(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.

9(b) Agency Findings.

(i) Natural Heritage Resources

DCR-DNH searched its Biotics Data System (Biotics) for occurrences of natural heritage resources from the project area. According to the information currently in Biotics, natural heritage resources have not been documented within the project boundary including a 100 foot buffer. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. In addition, the project boundary does not intersect any of the predictive models identifying potential habitat for natural heritage resources.

(ii) Ecological Core

The proposed project will impact an Ecological Core (C5) as identified in the Virginia Natural Landscape Assessment. Mapped cores in the project area can be viewed via the Virginia Natural Heritage Data Explorer.

Ecological Cores are areas of at least 100 acres of continuous interior, natural cover that provide habitat for a wide range of species, from interior-dependent forest species to habitat generalists, as well as species that utilize marsh, dune, and beach habitats. Interior core areas begin 100 meters inside core edges and continue to the deepest parts of cores. Cores also provide the natural, economic, and quality of life benefits of open space, recreation, thermal moderation, water quality (including drinking water recharge and protection, and erosion prevention), and air quality (including sequestration of carbon, absorption of gaseous pollutants, and production of oxygen). Cores are ranked from C1 to C5 (C5 being the least significant) using nine prioritization criteria, including the habitats of natural heritage resources they contain.

Impacts to cores occur when their natural cover is partially or completely converted permanently to developed land uses. Habitat conversion to development causes reductions in ecosystem processes, native biodiversity, and habitat quality due to habitat loss; less viable plant and animal populations; increased predation; and increased introduction and establishment of invasive species.

(iii) State-listed Plant and Insect Species

DCR-DNH finds that the Proposed Action will not affect any documented state-listed threatened and endangered plant or insect species.

(iv) State Natural Area Preserves

DCR finds that there are no State Natural Area Preserves under the agency's jurisdiction in the project vicinity.

9(c) Recommendation.

(i) Ecological Core

DCR-DNH recommends avoidance of impacts to Cores. When avoidance cannot be achieved, minimize the area of impacts overall and concentrate the impacted area at the edges of cores, so that the most interior remains intact.

(ii) Natural Heritage Resources

Contact DCR-DNH to secure updated information on natural heritage resources if the scope of the project changes and/or six months passes before the project is implemented, since new and updated information is continually added to the Biotics Data System.

9(d) CZMA Federal Consistency. The Proposed Action is consistent to the maximum extent practicable with the commonwealth lands enforceable policy of the Virginia Coastal Zone Management (CZM) Program under DCR's jurisdiction (see Federal Consistency under the CZMA (pages 21-23) for additional information).

10. Wildlife Resources and Protected Species. According to the EA (pages 3-30 and 3-31), during construction of the Proposed Action, equipment noise, ground disturbance, and vegetation removal would temporarily displace individuals of common wildlife species residing in the LOD. Under the Proposed Action, short-term, less-than-significant adverse effects would occur to rare, threatened, and endangered (RTE) species. While the small whorled pogonia has not been located on FBNA since 2005, suitable habitat has been identified within the Proposed Action Site and should be avoided to preserve the habitat of this species. Should wood turtle habitat be identified within the area, surveys for the presence of the wood turtle would be conducted prior to site clearing, and the results of these surveys coordinated with Fort Belvoir natural resources program staff and appropriate wildlife management agencies. To protect nesting bat species, no trees over three inches in diameter would be removed within the Proposed Action Site between 15 April and 15 September, in accordance with current USFWS guidelines and corresponding U.S. Army NLEB protection documents promulgated to protect the NLEB species. Under the Proposed Action, short-term, less-than-significant adverse effects would occur on Breeding Birds of Management

Concern.

10(a) Agency Jurisdiction. The Virginia Department of Wildlife Resources (DWR) (formerly the Department of Game and Inland Fisheries), 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). DWR 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. DWR 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 DWR website.

10(b) Agency Findings. DWR finds that the Accotink and Pohick Creeks in the project area are both designated confirmed Anadromous Fish Use Streams; known to support several species of anadromous fish. Based on the materials provided, it appears that several perennial, intermittent, and ephemeral streams transect the project area and ultimately connect with Accotink Creek. Portions of the project area also model out as potential habitat for the state-listed Threatened Wood turtle.

In addition to the listed species and wildlife resources mentioned above, a number of species designated as Species of Greatest Conservation Need in Virginia's Wildlife Action Plan are likely to occur, if suitable habitat exists, in and around the project area.

10(c) Recommendations.

(i) Anadromous Fish Use Areas *

DWR recommends a time-of-year restriction from February 15 through June 30 of any year on any instream work in tributaries to the Accotink Creek performed within one river mile of Accotink Creek to protect anadromous fish from project activities.

(ii) Wood Turtle *

Prior to the commencement of work all contractors should be made aware of the possibility of encountering Wood turtles on site and become familiar with their appearance, status and life history. An appropriate information sheet/field observation form to distribute to contractors and employees is attached.

If Wood Turtles are encountered and are in jeopardy during the development or construction of the project, they should be relocated within the same stream no further than a 1/4 mile up or downstream from the project site. Any relocations should be reported to DWR, J.D. Kleopfer at john.kleopfer@dwr.virginia.gov and a Wood Turtle Observation Form with accompanying photos should be completed and emailed within 72 hours.

(iii) Protection of Aquatic Resources

DWR recommends the following measures for the protection of aquatic resources.

- Conduct instream activities during low or no-flow conditions.
- Use non-erodible cofferdams or turbidity curtains to isolate the construction area.
- Block no more than 50% of the streamflow at any given time (minimal overlap of construction footprint notwithstanding).
- Stockpile excavated material in a manner that prevents reentry into the stream.
- Restore original streambed and streambank contours.
- Revegetate barren areas with native vegetation.
- Implement erosion and sediment control measures.
- Design and perform instream work in a manner that minimizes impacts upon natural streamflow and movement of resident aquatic species.
- Use dam and pump-around, if necessary, for as limited a time as possible and return water to the stream free of sediment and excess turbidity.
- Use erosion control matting made from natural/organic materials such as coir fiber, jute, and/or burlap to minimize potential wildlife entanglements resulting from use of synthetic/plastic matting.
- Install concrete (e.g. Tremie method, grout bags, and traditional pouring of concrete) only “in the dry.” This allows the concrete to harden and cure prior to contact with open water to minimize harm to the aquatic environment and organism.
- Construct stream crossings via clear-span bridges due to future maintenance costs associated with culverts, and the loss of riparian and aquatic habitat. However, if this is not possible, countersink culverts below the streambed at least 6 inches or use bottomless culverts to allow passage of aquatic organisms.
- Install floodplain culverts to carry bankfull discharges

(iv) General Protection of Wildlife Resources

The following general recommendations should be considered to minimize the impact of project construction on wildlife resources:

- Avoid and minimize impacts to undisturbed forest, wetlands, and streams to the fullest extent practicable. Avoidance and minimization of impact may include relocating stream channels as opposed to filling or channelizing as well as using, and incorporating into the development plan, a natural stream channel design and forested riparian buffers.
- 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.
- Maintain wooded lots to the fullest extent possible.
- Design stormwater controls 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 (TOYR) for tree removal and ground clearing that is protective of resident and migratory songbird nesting from March 15 through August 15 of any year.
- Adhere to erosion and sediment controls during ground disturbance.

(v) Species of Greatest Conservation Need

DWR recommends that the Virginia Wildlife Action Plan be reviewed to determine what threats are known to these species, what constitutes suitable habitat for these species, and how to protect them and their habitats from harm.

10(d) CZMA Federal Consistency. The Proposed Action consistent to the maximum extent practicable with the wildlife and inland fisheries and commonwealth lands enforceable policies of the Virginia CZM Program under DWR's jurisdiction, provided project activities adhere to the recommendations above marked with ***** (see Federal Consistency under the CZMA (pages 21-23) for additional information).

11. Public Water Supply. According to the EA (page 3-19), the Proposed Action would add approximately 23.6 acres of impervious area within the Accotink Creek watershed, resulting in an increase in stormwater volume from impervious surfaces that could cause an increase in erosion and sedimentation if not appropriately controlled. The Proposed Action would meet all applicable stormwater management regulations, ensuring consistent and measurable steps to minimize detrimental impacts to water quality in downstream waters. Potable water and fire suppression will be supplied by at least an 8-inch diameter service pipe and a redundant 6-inch diameter pipe (EA, page 3-38).

In addition, the EA (page 3-7) states that the former firing and training range resulted in the disposal of munitions and explosion debris within the project site and the contaminated area was designated as an area of potential concern (AOPC-21). In March 2013, explosives and chlorinated solvent compounds were detected in surface water and sediment samples collected at AOPC-21 and included 1,3-dinotrobenzene, 2,4- dinitrotoluene (DNT), 2,6-DNT, 1-nitroso-3,5-dinitro-1,3,5-triazacyclohexane, 1,3,5-triazine (RDX), octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), cis-1,2-dichloroethylene, and trichloroethylene (TCE). Long-term groundwater monitoring is ongoing at munitions site areas AOPC-21 and solid waste management units (SWMUs) M-32 and M-33 within the Proposed Action Site. Evaluation of potential risks associated with contaminated groundwater will be conducted based on the current monitoring results.

11(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). VDH administers both federal and state laws governing waterworks operation.

11(b) Agency Findings. VDH-ODW finds that there are no public groundwater wells located within a 1-mile radius of the project site and no surface water intakes located within a 5-mile radius of the project site. The proposed project is not within the watershed of any public surface water intakes. VDH-ODW did not indicate that the Proposed Action would involve the installation of septic systems under its jurisdiction.

The VDH Office of Environmental Epidemiology (OEE) notes that there is a polychlorinated biphenyl fish advisory for Accotink Creek in the area of the FBNA.

11(c) Recommendations. The VDH-OEE recommends that the site be completely characterized as to where contaminants are located, and should be removed from the environment to the level of EPA/DEQ regional screening levels.

11(d) CZMA Federal Consistency. The Proposed Action consistent to the maximum extent practicable with the shoreline sanitation enforceable policy of the Virginia CZM Program (see Federal Consistency under the CZMA (pages 21-23) for additional information).

For additional information, contact VDH-ODW, Arlene Fields Warren at (804) 864-7781 or arlene.warren@vdh.virginia.gov.

12. Historic Resources. According to the EA (pages 3-59 and 3-60), no effects on cultural resources are anticipated from the Proposed Action. The Proposed Action Site has been previously disturbed, as a result of its use for testing activities and munitions ranges, since its inception as a testing ground in the 1940s with subsequent ground disturbance from contamination testing and removal actions. No eligible archaeological or architectural resources exist within the area of potential effect (APE) for the Proposed Action on FBNA.

12(a) Agency Jurisdiction. The Virginia Department of Historic Resources (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. The DHR Review and Compliance Division has additional information on applicable state and federal laws and how to submit an application for review.

12(b) Agency Findings. DHR notes that Fort Belvoir previously consulted with DHR on this undertaking pursuant to Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation 36 CFR Part 800. DHR concludes that no historic properties listed in or eligible for the National Register of Historic Places or Virginia Landmarks Register will be affected by this undertaking.

For additional information, contact DHR, Marc Holma at (804) 482-6090 or marc.holma@dhr.virginia.gov.

13. Local Review.

13(a) Agency Jurisdiction. In accordance with CFR 930, Subpart A, § 930.6(b) of the *Federal Consistency Regulations*, DEQ, on behalf of the state, is responsible for securing necessary review and comment from other state agencies, the public, regional government agencies, and local government agencies, in determining the Commonwealth's concurrence or objection to a federal consistency determination.

13(b) Agency Findings. The Department of Planning and Development (DPD) reviewed the EA for the Proposed Action in collaboration with the Department of Public Works and Environmental Services (DPWES) and the Fairfax County Department of Transportation (FCDOT), the Fairfax County Park Authority (FCPA), and responded to the Army on August 5, 2022 (letter attached). The county's response includes recommendations with regard to stormwater management water resources, landscaping, forest resources, soils, green building, transportation, noise, and other matters. The county expressed no opposition to the Proposed Action, provided the Army obtains and complies with required federal, state and local authorizations, and the county's recommendations for the mitigation of anticipated environmental impacts.

For additional information and further coordination, contact the Fairfax DPD, Katie Hermann at katherine.hermann@fairfaxcounty.gov.

14. Pollution Prevention. DEQ advocates that principles of pollution prevention 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 techniques also include decisions related to construction materials, design, and operational procedures that will facilitate the reduction of wastes at the source.

14(a) Recommendations. We have several pollution prevention recommendations that may be helpful in the construction of this project and in the operation of the facility:

- Consider development of an effective Environmental Management System (EMS). An effective EMS will ensure that the Army is committed to minimizing its environmental impacts, setting environmental goals, and achieving improvements in its environmental performance. DEQ offers EMS development

assistance and it recognizes facilities with effective Environmental Management Systems through its Virginia Environmental Excellence Program.

- 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 (such as an EMS) 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 infrastructure construction and design. These could include asphalt and concrete containing recycled materials, and integrated pest management in landscaping, among other things.
- Integrate pollution prevention techniques into utility maintenance and operation, to include the following: inventory control (record-keeping and centralized storage for hazardous materials), product substitution (use of non-toxic cleaners), and source reduction (fixing leaks, energy-efficient HVAC and equipment). Maintenance facilities should be designed with sufficient and suitable space to allow for effective inventory control and preventative maintenance.

DEQ's Office of Pollution Prevention provides information and technical assistance relating to pollution prevention techniques and EMS. For more information, contact DEQ's Office of Pollution Prevention, Meghann Quinn at (804) 774-9076 or meghann.quinn@deq.virginia.gov.

15. Water Conservation. The following recommendations will result in reduced water use associated with the operation of the facility:

- Grounds should be landscaped with hardy native plant species to conserve water as well as lessen the need to use fertilizers and pesticides.
- Convert turf to low water-use landscaping such as drought resistant grass, plants, shrubs and trees.
- Low-flow toilets should be installed in new facilities.
- Consider installing low flow restrictors and aerators to faucets.
- Improve irrigation practices by:
    - upgrading sprinkler clock; water at night, if possible, to reduce evapotranspiration (lawns need only 1 inch of water per week, and do not need to be watered daily; overwatering causes 85% of turf problems);
    - installing a rain shutoff device; and
    - collecting rainwater with a rain bucket or cistern system with drip lines.
- Check for and repair leaks (toilets and faucets) during regular routine maintenance activities.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the Coastal Zone Management Act of 1972, as amended, and federal consistency regulations (15 CFR Part 930, Sub-part C, § 930.30 *et seq*.), all federal

agency activities affecting any coastal use or resource will be undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Zone Management (CZM) Program. The Virginia CZM Program consists of a network of programs administered by several agencies. DEQ coordinates the review of Federal Consistency Determinations with agencies administering the enforceable policies and advisory policies of the Virginia CZM Program. In order to be consistent with the Virginia CZM Program, all the applicable permits and approvals listed under the enforceable policies must be obtained prior to commencing the project.

A Federal Consistency Determination for the Proposed Action (EA, APPENDIX C) was submitted that includes an analysis of the enforceable policies of the Virginia CZM Program. Pursuant to 15 CFR §930.41(a), DEQ is allowed up to sixty days to conduct a coordinated review and respond to submitted consistency determinations. The sixty-day review period for the Army's FCD began June 20, 2022 and ends August 29, 2022.

FEDERAL CONSISTENCY PUBLIC PARTICIPATION

In accordance with Title 15, Code of Federal Regulations (CFR), §930.2, the public was invited to participate in the review of the FCD submitted for the proposal. Public notice of this proposed action was published in OEIR's Program Newsletter and on the DEQ website from August 11, 2022 through August 25, 2022. No public comments were received in response to the notice.

FEDERAL CONSISTENCY ANALYSIS

According to information provided in the FCD and EA, the construction and operation of the Proposed Action would have no effect on the following enforceable policies: subaqueous lands, dunes and beaches, marine fisheries, plant pests and noxious weeds, commonwealth lands, point source water pollution, and shoreline sanitation. The state agencies responsible for the administration of the enforceable policies of the Virginia CZM Program generally agree with the findings of the FCD. The Army must ensure that the Proposed Action is consistent with the aforementioned policies. In addition, in accordance with 15 CFR, Subpart C, §930.39(c), DEQ encourages the Army to consider project impacts on the advisory policies of the Virginia CZM Program.

FEDERAL CONSISTENCY CONCURRENCE

Based on our review of the FCD, EA, and the comments and recommendations submitted by agencies administering the enforceable policies of the Virginia CZM Program, DEQ concurs that the Proposed Action is consistent with the Virginia CZM Program, provided the Army obtains and complies with all applicable permits and approvals associated with the enforceable policies of the Virginia CZM Program. If, prior to construction, project activities should change significantly and any of the enforceable policies of the Virginia CZM Program would be affected, pursuant to 15 CFR §930.46(a), the Army must submit supplemental consistency determination to DEQ for review and concurrence. Other state approvals which may apply to this project are not

included in this FCD. Therefore, the Army must ensure that the Proposed Action is constructed and operated in accordance with all applicable federal, state, and local laws and regulations.

REGULATORY AND COORDINATION NEEDS

1. Surface Waters and Wetlands.

1(a) Virginia Water Protection Permit. Surface water and wetland impacts associated with the Proposed Action may require VWP Permit authorization from DEQ-NRO pursuant to Virginia Code §62.1-44.15:20. A Joint Permit Application may be obtained from and submitted to the VMRC which serves as a clearinghouse for the joint permitting process involving the VMRC, DEQ, Corps, and local wetlands boards. For additional information and coordination, contact DEQ-NRO, Christoph Quansey at (571) 719-0843 or christoph.quansey@deq.virginia.gov. Questions or coordination for potential impacts to tidal wetlands under VMRC jurisdiction may be directed to Mark Eversole at (757) 247-8028 or mark.eversole@mrc.virginia.gov.

1(b) Virginia Pollutant Discharge Elimination System. Contact the VPDES program at DEQ-NRO, Edward Stuart at (571) 866-6184 or edward.stuart@deq.virginia.gov, to determine the need for permit coverage under VAG83 for any discharges from petroleum contamination, groundwater remediation, hydrostatic tests for any new piping installed, or for any dewatering during construction if petroleum contamination is encountered.

2. Erosion and Sediment Control and Stormwater Management.

2(a) Erosion and Sediment Control and Stormwater Management. The Proposed Action must comply with Virginia's *Erosion and Sediment Control Law* (Virginia Code § 62.1-44.15:61) and *Regulations* (9 VAC 25-840-30 *et seq*.) and *Stormwater Management Law* (Virginia Code § 62.1-44.15:31) and *Regulations* (9 VAC 25-870-210 *et seq*.) as administered by DEQ. Activities that disturb 2,500 square feet or more in CBPAs would be regulated by *VESCL&R* and *VSWML&R*. Erosion and sediment control, and stormwater management requirements should be coordinated with DEQ-NRO, Mark Remsberg at (703) 583-3874 or mark.remmsberg@deq.virginia.gov.

2(b) General Permit for Stormwater Discharges from Construction Activities (VAR10). For land-disturbing activities of equal to or greater than one acre, the applicant is required to apply for registration coverage under the Virginia Stormwater Management Program General Permit for Discharges of Stormwater from Construction Activities (9 VAC 25-880-1 *et seq.*). Specific questions regarding the Stormwater Management Program requirements should be directed to DEQ-NRO, Mark Remsberg at (703) 583-3874 or mark.remsberg@deq.virginia.gov

3. Chesapeake Bay Preservation Areas. The Proposed Action must be constructed and operated in a manner consistent with 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 9 VAC 25-830-10 *et seq*.) as administered by DEQ. The Proposed Action is subject to the conditions for the construction of roads found in 9 VAC 25-830-140 1(v) of the *Regulations* and the general performance criteria of 9 VAC 25-830-130 for construction in lands analogous to RMA. To ensure project consistency with the Chesapeake Bay Preservation Areas enforceable policy of the Virginia CZM Program, contact DEQ-OWLGAP, Daniel Moore at (804) 774-9577 or daniel.moore@deq.virginia.gov.

4. Floodplain Management. The Proposed Action must comply with the local floodplain ordinance. Local floodplain administrator contact information may be found in DCR's Local Floodplain Management Directory.

5. Air Emissions. This project is subject to air regulations administered by DEQ. The following sections of the Code of Virginia and Virginia Administrative Code are applicable:

- fugitive dust and emissions control (9 VAC 5-50-60 *et seq*.);
- asphalt paving operations (9 VAC 5-45-780 *et seq*.) and
- open burning restrictions (9 VAC 5-130).

Contact Fairfax County fire officials for information on any local requirements pertaining to open burning. For more information and coordination contact DEQ-NRO, David Hartshorn at (571) 408-1778 or r.david.hartshorn@deq.virginia.gov.

6. Solid and Hazardous Wastes.

6(a) Solid and Hazardous Waste Management Regulations. All solid waste, hazardous waste, and hazardous materials must be managed in accordance with all applicable federal, state, and local environmental regulations. For additional information concerning location and availability of suitable waste management facilities in the project area or if free product, discolored soils, or other evidence of contaminated soils are encountered, contact DEQ-NRO, Richard Doucette at (571) 866-6063 or richard.doucette@deq.virginia.gov.

6(b) Asbestos-Containing Material. The owner or operator, prior to the commencement of the activity, is responsible to thoroughly inspect affected structures for the presence of asbestos, including Category I and Category II nonfriable asbestos containing material (ACM). Upon classification as friable or non-friable, all waste ACM shall be disposed of in accordance with the Virginia Solid Waste Management Regulations (9 VAC 20-80-640), and transported in accordance with the Virginia regulations governing Transportation of Hazardous Materials (9 VAC 20-110-10 et seq.). Contact the DEQ-NRO, Richard Doucette at (571) 866-6063 or richard.doucette@deq.virginia.gov and the Department of Labor and Industry, Doug Wiggins (540) 562-3580 ext. 131 for additional information.

6(c) Lead-Based Paint. This project must comply with the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) regulations, and with the Virginia Lead-Based Paint Activities Rules and Regulations. For additional information regarding these requirements, contact the Department of Professional and Occupational Regulation at (804) 367-8500.

6(d) Petroleum Contamination. In accordance with Virginia Code §§ 62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*., site activities involving excavation or disturbance of petroleum contaminated soils and or groundwater must be reported to DEQ-NRO, Randy Chapman at (571) 866-6517 or randy.chapman@deq.virginia.gov.

7. Natural Heritage Resources.

(i) Ecological Core

Recommendations on the avoidance and minimization of impacts to Ecological Core (C5) may be coordinated with DCR-DNH, Rene Hypes at (804) 371-2708 or rene.hypes@dcr.virginia.gov.

(ii) Natural Heritage Resources

Contact DCR-DNH, Rene Hypes at (804) 371-2708 or rene.hypes@dcr.virginia.gov, to secure updated information on natural heritage resources if the scope of the project changes and/or six months passes before the project is implemented, since new and updated information is continually added to the Biotics Data System.

8. Wildlife Resources and Protected Species. Contact DWR, Lee Brann at (804) 367-1295 or lee.brann@dwr.virginia.gov, for additional information regarding DWR recommendations for the protection of wildlife resources and listed species.

Thank you for the opportunity to review the Environmental Assessment and Federal Consistency Determination for the Fort Belvoir North Area Distribution Center in Fairfax County. Detailed comments of reviewing agencies are attached for your review. Please contact me at (804) 659-1915 or John Fisher at (804) 659-1919 for clarification of these comments.

Sincerely,

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

Enclosures

Ec: Lee Brann, DWR
Allison Tillett, DCR
Claire Gorman, VMRC
Arlene Warren, VDH
Roger Kirchen, DHR
Karl Didier, DOF
Kirk Millikan, VDOT
Keith Tignor, VDACS
Kelly Atkinson, Fairfax County
Robert Lazaro, NVRC
Heather Cisar, Corps

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F

1 message

Miller, Mark <mark.miller@deq.virginia.gov> Wed, Aug 24, 2022 at 10:25 AM
To: John Fisher <john.fisher@deq.virginia.gov>

Northern Regional Office comments regarding the environmental assessment request for *Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F ,* 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. For additional Land Ptotection/Waste questions, please contact the regional waste program manager Richard Doucette at 571.866.6063 or richard.doucette@deq.virginia.gov.

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. For additional air questions please contact the regional air compliance manager David Hartshorn at 571.408.1778 or r.david.hartshorn@deq.virginia.gov.

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. Measures should be taken to avoid and minimize impacts to surface waters and wetlands during construction activities. The disturbance of surface waters or wetlands may require prior approval by DEQ and/or the U.S. Army Corps of Engineers. The Army Corps of Engineers is the authority for an official confirmation of whether there are federal jurisdictional waters, including wetlands, which may be impacted by the proposed project. DEQ may confirm additional waters as jurisdictional beyond those under federal authority. Review of National Wetland Inventory maps or topographic maps for locating wetlands or streams may not be sufficient; there may need to be a site-specific review of the site by a qualified professional. Even if there will be no intentional placement of fill material in jurisdictional waters, potential water quality impacts resulting from construction site surface runoff must be minimized. This can be achieved by using Best Management Practices (BMPs). If construction activities will occur in or along any streams (perennial, intermittent, or ephemeral), open water or wetlands, the applicant should contact DEQ-NRO VWPP staff to determine the need for any permits prior to commencing work that could impact surface waters or wetlands. 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. VWPP staff reserve the right to provide comment upon receipt of a permit application requesting authorization to impact state surface waters, and at such time that a wetland delineation has been conducted and associated jurisdiction determination made by the U.S. Army Corps of Engineers. For additional water protection questions please contact the regional water protection program manager Christoph Quansey at 571.719.0843 or christoph.quansey@deq.virginia.gov.

Erosion and Sediment Control, 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. For additional storm water construction questions please contact the regional storm water program manager Mark Remsberg at 703.583.3874 or mark.remmsberg@deq.virginia.gov.

Other VPDES Permitting – A construction project may require coverage under the VAG83 permit for discharges from petroleum contaminated sites, groundwater remediation, and hydrostatic tests for any hydrostatics tests on any new piping installed, or for any potential dewatering during construction if petroleum contamination is encountered. For additional water permitting/compliance questions please contact the regional water compliance manager Edward Stuart at 571.866.6184 or edward.stuart@deq.virginia.gov.

Mark Miller
Environmental Manager II
Enforcement/Pollution Response/Environmental Review
VDEQ-NRO
13901 Crown Ct, Woodbridge, VA 22193
Main# 703.583.3800; Cell# 571.866.6487
Email: mark.miller@deq.virginia.gov

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT EXPEDITED REVIEW Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F

1 message

Gavan, Lawrence <larry.gavan@deq.virginia.gov> Tue, Aug 9, 2022 at 2:21 PM
To: "Fisher, John" <john.fisher@deq.virginia.gov>

(a) Agency Jurisdiction. The Department of Environmental Quality (DEQ) administers the *Virginia Erosion and Sediment Control Law and Regulations* (*VESCL&R*) and *Virginia Stormwater Management Law and Regulations* (*VSWML&R*).

(b) 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 *VSWML&R*, 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, federal consistency under the Coastal Zone Management Act). 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 (2,500 square feet in Chesapeake Bay Preservation Area) 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. Land-disturbing activities that result in the total land disturbance of equal to or greater than 1 acre (2,500 square feet in Chesapeake Bay Preservation Area) would be regulated by *VSWML&R*. Accordingly, the Applicant must prepare and implement a Stormwater Management (SWM) plan to ensure compliance with state law and regulations. The ESC/SWM 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.]

(c) General Permit for Stormwater Discharges from Construction Activities (VAR10). DEQ is responsible for the issuance, denial, revocation, termination and enforcement of the Virginia Stormwater Management Program (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.

The owner or operator of projects involving land-disturbing activities 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. Construction activities requiring registration also include land disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan of development will collectively disturb equal to or greater than one acre 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*.
[Reference: Virginia Stormwater Management Act 62.1-44.15 et seq.; VSMP Permit Regulations *9*VAC25-880 *et seq.]*

Commonwealth of Virginia

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1111 E. Main Street, Suite 1400, Richmond, Virginia 23219
P.O. Box 1105, Richmond, Virginia 23218
(800) 592-5482 FAX (804) 698-4178
www.deq.virginia.gov

Travis A. VoylesMichael S. Rolband, PE, PWD, PWS Emeritus
Secretary of Natural and Historic ResourcesDirector
(804) 698-4020

MEMORANDUM

TO: John Fisher, DEQ Office of Environmental Impact Review

FROM: Daniel Moore, DEQ Principal Environmental Planner

DATE: August 10, 2022

SUBJECT: DEQ #22-121F: ARMY – Ft. Belvoir North Area Distribution Center Project – Fairfax County

We have reviewed the Draft Environmental Assessment (EA) submittal for the above-referenced project and offer the following comments regarding consistency with the provisions of the *Chesapeake Bay Preservation Area Designation and Management Regulations* (Regulations):

In Fairfax 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 the local government. 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. RMAs, which require less stringent performance criteria, include those areas of the County not included in the RPAs.

Under the Federal Consistency Regulations of the *Coastal Zone Management Act of 1972*, federal actions in Virginia must be conducted in a manner "consistent to the maximum extent practicable" with the enforceable policies of the Virginia Coastal Zone Management Program. Those enforceable policies are administered through the Chesapeake Bay Preservation Act and 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 RPAs and RMAs, as provided in §9VAC25-830-130 and 140 of the Regulations, including the requirement to minimize land disturbance (including access and staging areas), retain existing vegetation and minimize impervious cover as well as including compliance with the requirements of the *Virginia Erosion and Sediment Control Handbook,* and stormwater management criteria consistent with water quality protection provisions of the *Virginia*

Stormwater Management Regulations." For land disturbance over 2,500 square feet, the project must comply with the requirements of the *Virginia Erosion and Sediment Control Handbook.*

The project proposes development of a 525,000 square foot warehouse and administration building on a heavily wooded 161-acre Proposed Action Site (PAS) bound by Fairfax County Parkway to the west, Accotink Creek to the east and Barta Road to the south. The PAS includes hardwood and pine forests with wetland seeps and perennial and intermittent streams with 100-foot RPA buffers, as shown on page 3-9 (Figure 3-4: Surface Waters.) An extensive network of roads, starting with sole site access/egress on Barta Road on the east side of the proposed development, would result in four specific encroachments into designated RPA buffers. The most significant of these encroachments would occur with a perpendicular, north-south routing of roadway along the east side of the main warehouse structure, where Wetland 2 and 2A are located. RPA encroachments resulting from roadway crossings of potential lesser impacts appear to be proposed on the north and south ends of Wetland 3. Per §9VAC25-830-140 1 (v) of the Regulations, a road or driveway crossing is allowed in the RPA if each of the following conditions are met:

1) it is determined that there are no reasonable alternatives to aligning the road or driveway in or across the RPA;
2) the alignment and design of the road or driveway are optimized, consistent with other applicable requirements, to minimize (i) encroachment into the RPA and (ii) adverse effects on water quality;
3) the design and proposed construction of the road or driveway includes submission of a Water Quality Impact Assessment (WQIA) to the DEQ Office of Watersheds and Local Government Assistance Programs prior to commencement of any land-disturbing activities, and;
4) the local government (Fairfax County) reviews the plan for the proposed roadway in or across the RPA in coordination with local site plan, subdivision and plan of development approvals. (Staff of the Fairfax County Department of Planning and Development – Environment and Development Review Branch provided the following early input comments in an April 19, 2022 email to FBNA: *"Impacts to RPA, floodplains, wetlands… should be avoided or minimized to the greatest extent feasible."* The email ends with this: *"These comments are subject to change based on the County's formal review of the forthcoming EA and represent staff analysis and do not necessarily reflect the opinion of the Fairfax County Board of Supervisors."*)

In addition to the above requirements for encroachments in to the RPA, the staging of heavy equipment for all construction and land disturbing activities must be carried out in such a way as to avoid any physical encroachment into the RPA.

Land disturbance and development within the RMA portion of the project site must be consistent with the general performance criteria provisions of §9VAC25-830-130 of the Regulations, which includes disturbing no more land than necessary to provide for the proposed use, minimizing impervious cover, and preserving indigenous vegetation to the maximum extent practicable consistent with the proposed use. All land disturbing activity exceeding 2,500 square feet must comply with the requirements of the *Virginia Erosion and Sediment Control Handbook*, Third Edition, 1992. Finally, stormwater management criteria consistent with the water quality

protection provisions of the *Virginia Stormwater Management Regulations*, §9VAC25-870-51 and 9 VAC25-870-103, shall be satisfied.

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

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Fwd: NEW PROJECT EXPEDITED REVIEW Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F

1 message

Holma, Marc <marc.holma@dhr.virginia.gov> Tue, Aug 23, 2022 at 3:36 PM
To: John Fisher <john.fisher@deq.virginia.gov>

John,

Please let this email be DHR's official response to DEQ's request for our review and comment on the above referenced project. Fort Belvoir previously consulted with DHR on this undertaking pursuant to Section 106 of the National Historic Preservation Act, as amended, and its implementing regulation 36 CFR Part 800. No historic properties listed in or eligible for the NRHP or VLR will be affected by this undertaking.

Sincerely,
Marc Holma

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

ESSLog# 42410_22-121F_Army Ft. Belvoir North Area Distribution Center_DWR_HLB20220826

1 message

Brann, LEE <lee.brann@dwr.virginia.gov> Fri, Aug 26, 2022 at 10:27 AM
To: John Fisher <john.fisher@deq.virginia.gov>
Cc: rr nhreview <nhreview@dcr.virginia.gov>, Tamara Doucette <tamara.doucette@dwr.virginia.gov>, "Martin, Amy" <amy.martin@dwr.virginia.gov>, John Kleopfer <john.kleopfer@dwr.virginia.gov>, Jaime Sajecki <jaime.sajecki@dwr.virginia.gov>, Stephen Reeser <steve.reeser@dwr.virginia.gov>

Mr. Fisher,

We have reviewed the project that proposes to build a warehouse and administrative building, along with associated infrastructure, at the Fort Belvoir North Area in Fairfax County. Accotink Creek and Pohick Creek in the project area are both designated confirmed Anadromous Fish Use Streams, known to support several species of anadromous fish. Portions of the project area also model out as potential habitat for State Threatened Wood Turtles.

Based on the materials provided, it appears that several perennial, intermittent, and ephemeral streams transect the project area and ultimately connect with Accotink Creek. To best protect anadromous fish in Accotink Creek from activities associated with this project, we recommend a time of year restriction from February 15 through June 30 of any year on any instream work in tributaries to the Accotink Creek performed within one river mile of Accotink Creek.

We recommend that prior to the commencement of work all contractors associated with work at this site be made aware of the possibility of encountering Wood Turtles on site and become familiar with their appearance, status and life history. An appropriate information sheet / field observation form to distribute to contractors and employees is attached. If any Wood Turtles are encountered and are in jeopardy during the development or construction of this project, they should be relocated within the same stream no further than a 1/4 mile up or downstream from the project site. Any relocations should be reported to J.D. Kleopfer and the Wood Turtle Observation Form with accompanying photos completed and emailed to John (J.D.) Kleopfer at John.Kleopfer@dwr.virginia.gov within 72 hours.

We recommend conducting any in-stream activities during low or no-flow conditions, using non-erodible cofferdams or turbidity curtains to isolate the construction area, blocking no more than 50% of the streamflow at any given time (minimal overlap of construction footprint notwithstanding), stockpiling excavated material in a manner that prevents reentry into the stream, restoring original streambed and streambank contours, revegetating barren areas with native vegetation, and implementing strict erosion and sediment control measures. We recommend that instream work be designed and performed in a manner that minimizes impacts upon natural streamflow and movement of resident aquatic species. If a dam and pump-around must be used, we recommend it be used for as limited a time as possible and that water returned to the stream be free of sediment and excess turbidity. To minimize potential wildlife entanglements resulting from use of synthetic/plastic erosion and sediment control matting, we recommend use of matting made from natural/organic materials such as coir fiber, jute, and/or burlap. To minimize harm to the aquatic environment and its residents resulting from use of the Tremie method to install concrete, installation of grout bags, and traditional pouring of concrete, we recommend that such activities occur only in the dry, allowing all concrete to harden prior to contact with open water. Due to future maintenance costs associated with culverts, and the loss of riparian and aquatic habitat, we prefer stream crossings to be constructed via clear-span bridges. However, if this is not possible, we recommend countersinking any culverts below the streambed at least 6 inches, or the use of bottomless culverts, to allow passage of aquatic organisms. We also recommend the installation of floodplain culverts to carry bankfull discharges.

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. Avoidance and minimization of impact may include relocating stream channels as opposed to filling or channelizing as well as using, and incorporating into the development plan, a natural stream channel design and forested riparian buffers. 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 maintaining wooded lots to the fullest extent possible. We generally do not support proposals to mitigate wetland impacts through the construction of stormwater management ponds, nor do we support the creation of in-stream stormwater management ponds.

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 (TOYR) 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.

In addition to the listed species and wildlife resources mentioned above, a number of species designated as Species of Greatest Conservation Need in Virginia's Wildlife Action Plan are likely to occur, if suitable habitat exists, in and around the project area. We recommend that the Virginia Wildlife Action Plan (available through www.bewildvirginia.gov) be reviewed to determine what threats are known to these species, what constitutes suitable habitat for these species, and how to best protect them and their habitats from harm.

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 protection of these resources.

Assuming adherence to our recommendations for the protection of listed species and/or designated resources under our jurisdiction, as depicted in **bolded font** above, and assuming strict adherence to best management practices for erosion and sediment control is maintained, we find this project to be consistent with the Wildlife and Inland Fisheries and Commonwealth Lands Enforceable Policies of the Coastal Zone Management Program.

Thank you,

--

Lee Brann
Environmental Services Biologist
Wildlife Information and Environmental Services
he/him/his
P 804.367.1295
Department of Wildlife Resources
CONSERVE. CONNECT. PROTECT.
A 7870 Villa Park Drive, P.O. Box 90778, Henrico, VA 23228
www.VirginiaWildlife.gov

2 attachments

Wood-Turtle-Field-Information-Sheet.pdf
629K

Wood-Turtle-Field-Observation-Form.pdf
1143K

Wood Turtle: *Glyptemys insculpta*
State Threatened

Note the sculptured scales of the top of shell (carapace).


Bottom view (plastron) of a male Wood Turtle. The concaved plastron is characteristic of a male.

Wood turtles are medium-sized (6-9" adult shell length) semi-terrestrial turtles found in streams or in riparian uplands on norther/northwestern Virginia. Their dull brown upper shell is very rough, and each section of the shell reflects growth rings that form an irregular pyramid. There is great variation in this trait, however, and the upper shell of older turtles may appear smooth. The bottom shell is yellow with black marginal blotches. Wood turtles have a black head, and dark brown extremities with characteristic yellow to burnt-orange skin patches on the neck and leg sockets.

Wood Turtles overwinter instream in deep pools with sandy bottoms and under submerged roots, branches, or logs. During warmer months, they wander the uplands mate-seeking, nesting, and foraging. In Virginia, females typically lay clutches of 7-14 eggs. Hatchlings typically emerge from June through August.

The wood turtle eats both animal and plant food items, including berries, herbs, algae, moss, fungi, grass, insects, mollusks, earthworms, dead fish, tadpoles, newborn mice and other turtles' eggs. It will forage on the ground, in the water, in herbaceous vegetation, and on logs.

If you have any questions concerning Wood Turtles, please contact John Kleopfer, Virginia Department of Wildlife Resources, at 804-829-6703 or John.Kleopfer@dwr.virginia.gov.

The Wood Turtle is a protected species in Virginia.
It is unlawful to HARM, COLLECT, OR POSSESS THESE TURTLES unless one is permitted to do so.

To apply for a permit please contact Shirl Dressler at 804-367-6913.

Wood Turtle: *Glyptemys insculpta*
State Threatened

Field Observation Form

June 14, 2021

Note: The Wood Turtle is a protected species in Virginia. It is unlawful to harm, collect, possess and/or disturb these animals without a permit. Wood Turtles found in uplands within a project/work area during construction should be moved out of the project area to locations within the nearest stream (adjacent to project area, within same watershed) no further than a 1/4 mile up or downstream from the project site. Any relocations should be reported to J.D. Kleopfer and the Wood Turtle Observation Form with accompanying photos completed and emailed to John (J.D.) Kleopfer at John.Kleopfer@dwr.virginia.gov within 72 hours. If you must fax or send the form, use the information below.

Virginia Department of Wildlife Resources
Attn: John Kleopfer
3801 J.T. Memorial Highway
Charles City, Virginia 23030
FAX 804-829-6788

Distribution: Wood Turtles are found primarily in the northeastern United States and parts of southeastern Canada, reaching the southern limit of its range in northern Virginia. In Virginia, it has been documented in Warren, Rockingham, Shenandoah, Frederick, Loudoun, Fairfax, Clark, and Page counties.

Species Description: Wood Turtles are a semi-aquatic turtle usually found in or near streams, but not in ponds, reservoirs, or lakes. The shell length of an adult Wood Turtle can reach 9 inches. The plastron (bottom-half of the shell) is NOT hinged and the carapace (top-half of the shell) is flattened. The legs and tail are usually reddish to orange in color. Females are sometimes less colorful.

Wood Turtles may be confused with Eastern Box Turtles (*Terrapene carolina carolina*). Eastern Box Turtles are mainly terrestrial and only seldom are found in water. Eastern Box Turtles have a high domed shell with a hinged plastron which allows for it to completely enclose itself. The shell length of an adult Eastern Box Turtle is rarely over 5 inches. See the following page for images and detailed descriptions of Wood Turtles and Eastern Box Turtles.

Your name: _____

TE Collection Permit#, if applicable:_____

Your address:_____

Your phone number (optional): _____

Location of observation (GPS coordinates, nearest stream):_____

_____

Comments: _____

_____

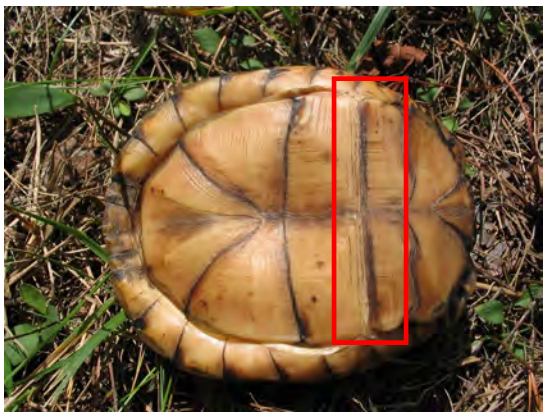
WOOD TURTLE

Note the sculptured scales of the top of shell (carapace).

Bottom view (plastron) of a male Wood Turtle. The concave plastron is characteristic of a male. Note the distinct black markings and brightly colored legs and tail.

EASTERN BOX TURTLE

Note the high domed shell and lack of sculptured scales. Males usually have an orange or yellowish face and are more brightly colored than females.



Note the hinged plastron and no markings. The concave plastron is also characteristic of male box turtles.

The plastron of Eastern Box Turtles will often turn black.

Unlike Wood Turtles, Eastern Box Turtles can completely enclose themselves within their shell.

County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods and diverse communities of Fairfax County

August 5, 2022

Fort Belvoir Environmental Division
Directorate of Public Works
Building 1442
9430 Jackson Loop
Fort Belvoir, VA 22060
Email: FBNA@usace.army.mil

RE: Fort Belvoir North Area Distribution Center Environmental Assessment - Fort Belvoir, Fairfax County, VA

Dear Fort Belvoir Environmental Division:

Thank you for the opportunity to comment on the Environmental Assessment regarding the construction of the Fort Belvoir North Area (FBNA) Distribution Center. It is our understanding from the submission that this future facility would support the delivery and receipt of materials within and across the Washington Metropolitan Area and National Capital Region (NCR) to achieve distribution efficiencies. It is an anticipated that this facility would be a 525,000 square foot distribution center complex within a 30-acre site consisting of:

- One high-bay warehouse;
- One two-story administrative building;
- One truck maintenance/refueling building;
- Several covered/enclosed storage buildings;
- An entry control facility, including gate house and vehicle inspection;
- One emergency backup generator; and
- Enhanced security measures along the fenceline, including a new fence, an approximately 30-foot clear zone around the fence, and a maintenance and patrol path.

The distribution center is located generally within the 26-acre growth boundary Area D that was approved in 2022 as part of the Fort Belvoir North Area Development Plan, except for the entry control facility. The intent of the approved growth boundary areas was to establish a dense walkable campus and minimize tree removal and disturbance. The distribution center expects minimal truck traffic compared to a typical industrial distribution center. The expected daily traffic flow is estimated to be approximately 640 car trips and 12 truck trips. The operational hours would typically be between 6:00 AM and 4:00 PM. The proposed project would add approximately 23.6 acres of impervious area within the Accotink Creek watershed.

In collaboration with the Department of Public Works and Environmental Services (DPWES) and the Fairfax County Department of Transportation (FCDOT), the Fairfax County Park

PLANNING & DEVELOPMENT

Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

Authority (FCPA) and the Department of Planning and Development (DPD) reviewed the documents, prepared the attached environmental conditions map for the proposed development, and offers the following comments below.

Stormwater Management and Water Resources

According to the Environmental Assessment, the Fort Belvoir Distribution Center project would convert 23.6 acres of mostly forested area to impervious cover. The site drains to Accotink Creek, which is listed by the Virginia Department of Environmental Quality as impaired for benthic macroinvertebrate bioassessments and chloride. Increases in impervious cover contribute to these impairments by introducing more runoff and pollutants, including road salt, into the stream.

The Environment Element of the Fairfax County Comprehensive Plan states that the protection and restoration of the ecological integrity of streams is expected in Fairfax County. In order to minimize the impacts that new development and redevelopment projects may have on county streams, the Comprehensive Plan encourages the protection of stream channels and buffer areas along stream channels, and commitments to the restoration of degraded stream channels and riparian buffer areas. In addition, Fairfax County continues to recommend that water quantity and quality improvement measures be provided above any minimum requirements to minimize the impact to adjacent streams.

Fairfax County recognizes that the Department of the Army is not subject to the provisions of the Chesapeake Bay Preservation Ordinance (CBPO) or County policies. However, Fairfax County continues to encourage the Army to meet the County's CBPO (Chapter 118 of the County Code), including conformance with the requirements for areas designated as RPAs and Resource Management Areas. Fairfax County also encourages the Army to minimize any impact to wetlands to the greatest extent feasible. Any mitigation/compensation of wetlands should occur as close to the area of impact as possible. Fairfax County encourages the protection of these areas consistent with County policy and regulations. Environmental Quality Corridors (EQCs) as defined in the Environment Element of Fairfax County's Comprehensive Plan should also be considered for preservation. Areas of 100-year floodplains, 15% or greater slopes adjacent to floodplains, and wetlands qualify for designation as EQCs.

Additionally, there are approximately 2.33 acres of mapped wetlands within the project area. The U.S. Army Garrison Fort Belvoir would avoid these wetlands by relocating the perimeter fence alignment or have the fence positioned over streams and their associated wetlands. Stormwater generated from within the project site during construction would be managed through erosion and sediment control measures required through the permitting process in order to preclude the adverse effects of sedimentation on downstream receiving waters, which include wetlands.

Fort Belvoir North Area (FBNA) Distribution Center – Surface Waters

Source: Environmental Assessment; U.S. Army Garrison Fort Belvoir

The U.S. Army Garrison Fort Belvoir proposes to use erosion and sediment control measures during construction and long-term low impact development (LIDs) to mitigate stormwater run-

off impacts to Accotink Creek. The U.S. Army Garrison Fort Belvoir states that unavoidable crossings of the Accotink Creek Conservation Corridor would be mitigated through the incorporation of one or any combination of the following measures: tree planting within the project area or stream buffer enhancement plantings elsewhere on FBNA along the Accotink Creek Corridor; oversized box culverts for wildlife crossings with grates to allow light into the culverts; streamside management zones; storm drains; bioretention and infiltration ponds; and green roofs, permeable pavements, and vegetated swales. Any work within the stream corridor and RPA, as necessary to construct roadways, parking features, and security fencing, would be permitted through federal permitting agencies. Permanent stormwater management features would maintain pre- development levels of stormwater discharge. Therefore, Fairfax County recommends the following be provided:

- A demonstration of how the proposed project would minimize and/or mitigate impacts to impaired local streams.
- Water quantity and quality measures above the minimum requirements that prioritize LID techniques and stormwater/stream restoration versus traditional gray stormwater infrastructure designs.
- The addition of RPA and EQC designations to environmental plans to encourage the protection and preservation of habitat and streams, reduce pollutants from entering the water, and encourage a connected segment of open space to facilitate the movement of wildlife in the area.
- Given the number of parking spaces proposed, a reconsideration of surface lot parking areas in lieu of a parking structure to minimize the amount of impervious cover and impacts to on-site and adjacent lands, vegetation, and waters.
- An explanation of the need for an interior fence for this center would be beneficial since a larger fence exists on the perimeter of the property and was not contemplated with the 2022 Fort Belvoir North Area Development Plan. An additional interior fence may impact local wildlife movement.

<u>Landscaping</u>
The Comprehensive Plan anticipates that new development will include an urban forestry program and be designed in a manner that retains and restores meaningful amounts of tree cover, consistent with planned land use and good silvicultural practices. Good quality vegetation should be preserved and enhanced and lost vegetation restored through replanting. (Fairfax County Comprehensive Plan, 2019 Edition, Policy Plan, Environment, Amended through 11-9-2021, Pages 17-18). Fairfax County recommends the following be provided:

- Fairfax County recommends that new landscaping and all planting schemes incorporate native plant communities of overstory trees; understory trees; shrubs; and perennial grasses, grass-like plants, and forbs. Additionally, Fairfax County recently published Technical Bulletin 22-04, regarding seeding guidelines, to promote the use of native plant species and to limit the use of invasive plant species in seeding applications for soil

stabilization, restoration, agriculture, turf, and landscaping. (see Fairfax County Seeding Guidelines).

- The property is proposed for a highly impervious industrial use. The proposal would be enhanced through an increase in tree canopy. Increasing the number of trees would help improve air quality within the area. Buffers should be enhanced along all lot lines with additional plantings. The viability of planting areas would be improved through robust commitments to soil preparation for all planting areas, to include aeration of the soil to a depth of 24 inches, the incorporation of compost into the soil profile, covering of the soil surface with additional compost, protection of all planting areas from compaction, and supervision of all plantings by a qualified individual, such as a landscape architect or forester.
- The proposed project would benefit from monitoring and spill prevention strategies to protect surface and groundwater resources related to a proposed on-site exterior hazardous material storage and refuse locker.

Forestry Resources Policies and Impacts

Construction of the Distribution Center, Administration Building, and other structures on the site would require the removal of approximately 30 acres of forest within the larger Action Site Boundary of 161 acres. There have been an estimated increase in the number of trees to be removed from what was originally shown on the approved Fort Belvoir North Area Development Plan, primarily due to the addition of the vehicle entry control facility, parking lot and perimeter fence. The Fort Belvoir Forest Inventory of August 2021 revealed that a majority of the Action Site Boundary area is comprised of "Priority 1" Stands (as described in the Maryland State Forest Conservation Technical Manual), which include wetlands and specimen trees that are 30 inches diameter-at-breast-height (dbh) or greater. Furthermore, the inventory revealed low invasive species impact within this area. Such healthy stands of unmanaged forest are rare within the confines of Fairfax County.

Also, existing single-family homes abut the north Action Site Boundary. These homes are located on Beechwood Drive, Rose Garden Lane, and Barkers Court. Consideration should be given to the quality of life of these residents and the preservation of existing vegetation to serve as screening for the proposed use. Fairfax County recommends the following:

- The proposal should be reconfigured to confirm the acres of trees impacted; preservation of areas designated as high-quality woodlands should be a priority.
- The U.S. Army Garrison Fort Belvoir should provide transitional screening that meets or exceeds the requirements of the County Zoning Ordinance (ZO 5108.6). This can be achieved through the preservation of the existing forest buffer area between the site and the adjacent single-family homes and the supplementation of these areas with native understory trees, shrubs, and perennials, where appropriate.
- The U.S. Army Garrison Fort Belvoir should continue to coordinate with the Urban Forest Management Division (UFMD) and Park Authority of Fairfax County to develop and execute a Tree Replacement Strategy plan for the replanting associated with the project.

- The U.S. Army Garrison Fort Belvoir should work with a certified arborist to field locate the perimeter fence to minimize the loss of trees and impacts to environmentally sensitive features.

Soils

This property contains Marine Clay and problem class soils surrounding Accotink Creek and its tributaries. Fairfax County recommends that the development be clustered away from problem class soils and that a geotechnical study be completed for areas with problem soils.

Green Building

Fairfax County encourages commercial developments to incorporate green building measures and to seek certification through the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) for New Construction (LEED-NC®), LEED Core and Shell (LEED-CS®), or an equivalent program with independent third-party verification. Additionally, Fairfax County expects new County facilities to be designed and constructed to obtain LEED-Gold certification; incorporate solar and electric-vehicle features; provide an on-site renewable energy generation component; obtain energy performance improvements; reduce greenhouse gas emissions; and, ultimately, achieve net zero energy (for projects designed in FY 2031 or later). Fairfax County understands that any new facilities constructed with this plan have been designed to achieve LEED-Silver. However, the recent National Geospatial-Intelligence Agency (NGA) building obtained LEED-Gold certification. The County recommends that new facilities constructed as part of this project also obtain LEED-Gold certification, which is consistent with the County's policy for new County facilities. Fairfax County does appreciate the Army's commitment to incorporate rooftop solar panels on the high-bay warehouse portions of the distribution center and solar panel canopies for the surface parking areas. Additionally, Fairfax County supports the inclusion of electric-vehicle charging stations for eight percent of the passenger vehicle parking spaces and would encourage these be equipped with Level-2, universal electric vehicle charging facilities and be fully wired and functional.

Fairfax County Department of Transportation

A majority of FCDOT comments from previous review phases and discussions have been addressed. However, Fairfax County requests that the U.S. Army Garrison Fort Belvoir clarify whether the Rolling Road entrance, which is anticipated to be used as an emergency-only entrance/exit, would utilize a barrier system to keep vehicles and pedestrians from using the entrance when there is not an emergency. Fairfax County recommends the provision of a barrier system to minimize any impacts to the existing, off-site pedestrian networks in the area.

Fairfax County Park Authority

Page 3-19, of the Draft EA references that seeding is to be provided in conformance with the Virginia Erosion and Sediment Control Handbook, Edition 1992. Tables 3.31 and 3.32 of the handbook for temporary and permanent stabilization include species such as Phragmites australis (Common Reed), Lespedeza cuneata (Chinese Lespedeza), Lotus corniculatus (Birdsfoot Trefoil), Dactylis glomerata (Orchard Grass), Agrostis alba (Redtop), Eragrostis

curvula (Weeping Lovegrass), Coronilla varia (Crownvetch), and Festuca arundinacea (Tall Fescue) which have been identified as invasive. Additionally, Phalaris arundinacea (Reed Canarygrass) has shown invasive tendencies in the region. Due to the proximity of parkland and with the guidance of the Virginia Department of Conservation and Recreation (DCR), these species should be excluded from the various seed mixes. A DCR information sheet that provides some suggested alternatives can be found at http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml.

Noise

Section 108.1-1-2 of the County Code (Noise Ordinance) states that *"The Board hereby finds and declares that certain noise is a hazard to the public health, welfare, peace and safety and the quality of life of the citizens of Fairfax County; that the people have a right to and should be ensured of an environment free from sound that jeopardizes the public health, welfare, peace and safety or degrades the quality of life; and that it is the policy of the Board to prevent such noise to the extent such action is not inconsistent with Federal or State law."*

Federal agencies with noise mitigation planning responsibilities have worked with the health community to establish maximum acceptable levels of exposure. The County's Noise Ordinance limits continuous sound for impacted receivers to a continuous daytime limit of 60 dBA and a continuous nighttime limit of 55 dBA for residential uses. The County's Comprehensive Plan guidelines state that sound pressure levels should not exceed DNL 65 dBA (day-night average level, decibels, A-weighted) for outdoor activity areas, DNL 50 dBA for indoor office environments, and DNL 45 dBA for the interior of residences and other noise-sensitive uses.

In order to assess the noise impacts associated with the proposed use and to determine consistency with the provisions of the Noise Ordinance, the U.S. Army Garrison Fort Belvoir completed a noise study to assess potential noise impacts to nearby existing development. The proposed project would generate new noise sources that would be created by automobiles, trucks, electric forklifts, rooftop HVAC units, transformers, a diesel fire pump, and generators. The proposed generators were not included in the typical operations noise model as they would only operate during emergency conditions and for maintenance events. Maintenance events associated with the generators would only occur between the hours of 7:00 a.m. and 9:00 p.m. with a total duration not to exceed two hours in any one day. Based on the modeled noise, a maximum daytime noise limit of 60 dBA and a maximum nighttime limit of 55 dBA would not be reached or exceeded, so noise is not expected to have a significant impact on the neighboring uses during routine operations. Fairfax County notes that sound produced by generators during emergency use is exempted from the County's Noise Ordinance, along with routine testing for less than two hours in any one day.

Fairfax County recommends that the noise study assess the expected noise impacts at surrounding property boundaries with both HVAC and back-up generators operating. In order to minimize noise impacts from generator testing and emergency use, Fairfax County recommends that each generator be housed in a sound attenuating enclosure to limit periodic

noise impacts to surrounding uses. Such enclosures may also protect on-site employees from excessive and unhealthful sound.

Other Comments
The following issues were reviewed, but would solicit no further actions:

- The proposed project is not located in a Fairfax County Historic Overlay District and there are no resources in the immediate area listed on the Fairfax County Inventory of Historic Sites.
- The U.S. Army Garrison Fort Belvoir acknowledges that this site has a history of equipment storage and materials testing, dating back to the 1940s. Investigations and clean-up activities have been ongoing and have included the removal of munitions debris and explosive compounds. All debris, underground storage tanks, and buildings were removed, and the remediated sites were issued No Further Action Reports.

Thank you again for the opportunity to comment on this proposal. If you have any questions about the comments, please contact Katie Hermann with the Department of Planning and Development at Katherine.Hermann@fairfaxcounty.gov.

Sincerely,

Kelly M. Atkinson, AICP, Chief, Environment and Development Review Branch
Planning Division, Department of Planning and Development

KMA: KHH

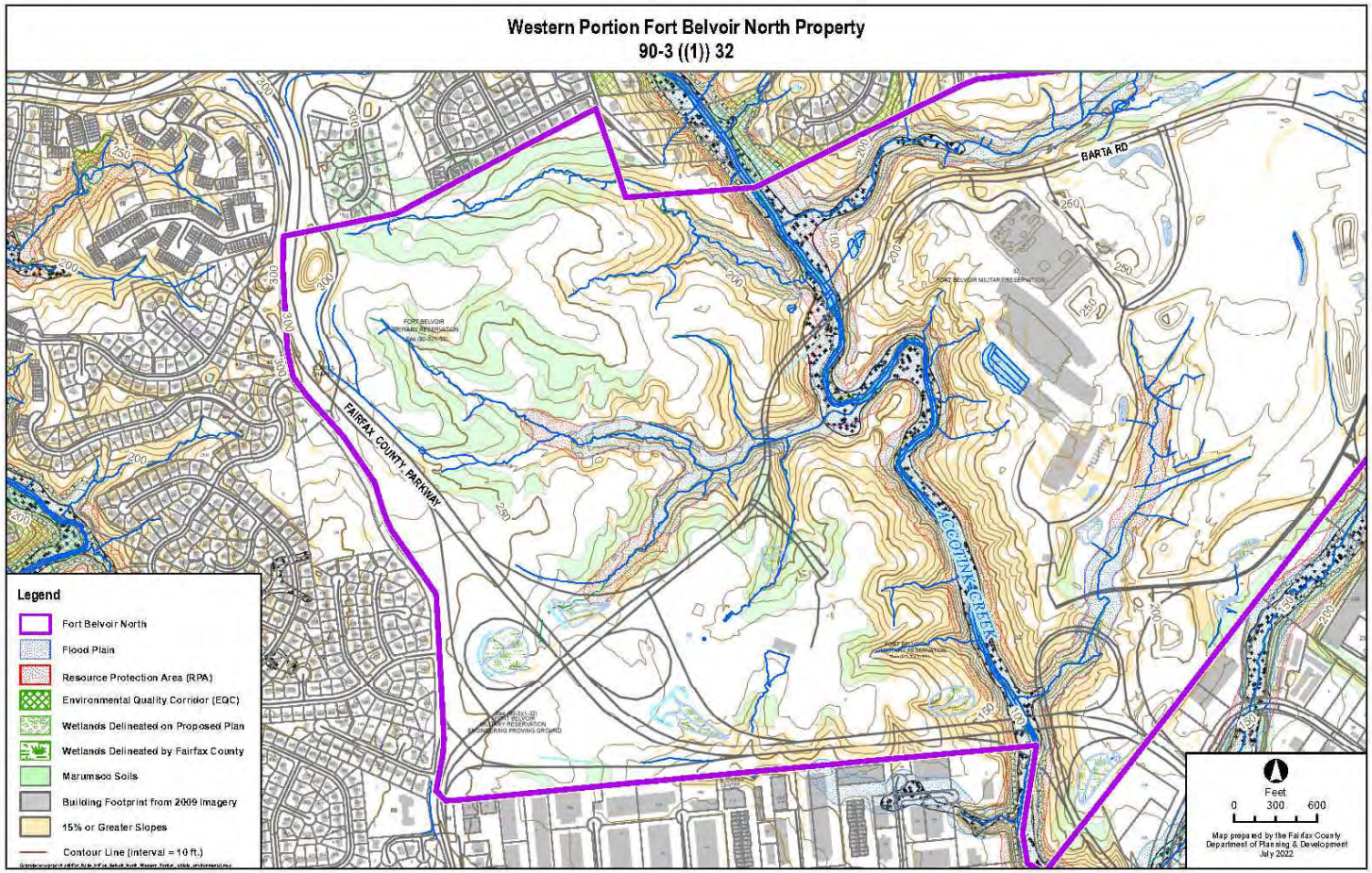
Attachments: Environmental Conditions Map
NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Letter Dated July 30, 2021
NCPC Project Referral - MP020A - Fort Belvoir North Post Area Development Plan, Dated December 20, 2021

cc: Board of Supervisors
Bryan J. Hill, County Executive
Rachel O'Dwyer Flynn, Deputy County Executive
Tracy Strunk, Acting Director, DPD
Leanna O'Donnell, Director, Planning Division, DPD
Michael Garcia, Transportation Planning, FCDOT
Catherine Torgersen, DPWES
Vance Zavela, Partnership Developer, Economic Initiatives

Christin Morin, Chief of Staff, Mount Vernon Supervisor District
Anthony Amos, Land Use Aide, Springfield District
Matthew Renninger, Land Use Aide, Lee District
Stephanie Free, Urban Planner, National Capital Planning Commission (NCPC)

County of Fairfax, Virginia

To protect and enrich the quality of life for the people, neighborhoods and diverse communities of Fairfax County



Department of Planning and Development
Planning Division
12055 Government Center Parkway, Suite 730
Fairfax, Virginia 22035-5507
Phone 703-324-1380
Fax 703-653-9447
www.fairfaxcounty.gov/planning-development

Commonwealth of Virginia

Fisher, John <john.fisher@deq.virginia.gov>

Re: NEW PROJECT EXPEDITED REVIEW Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F

1 message

Warren, Arlene <arlene.warren@vdh.virginia.gov> Tue, Aug 16, 2022 at 1:41 PM
To: John Fisher <john.fisher@deq.virginia.gov>
Cc: rr Environmental Impact Review <eir@deq.virginia.gov>

Project Name: Fort Belvoir North Area Distribution Center
Project #: 22-121 F
UPC #: N/A
Location: Fairfax Co.

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.

- **Comments from Environmental Epidemiology, Mr. Dwight Flammia, Ph.D. State Public Health Toxicologist** *were "I understand that long-term surface water monitoring is in place. However:*

1. Has the site been completely characterized as to where contaminants listed on page 3-7 are located?
2. Contaminants should be removed from the environment to the level of EPA/DEQ regional screening levels?
3. There is a polychlorinated biphenyl fish advisory for Accotink Creek - is the base a source of this? I don't have anything else at this time."

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

Best Regards,

Arlene F. Warren
GIS Program Support Technician
Virginia Department of Health, Office of Drinking Water
109 Governor Street, 6th Floor
Richmond, VA 23219
804-356-6658 (office/cell/text)

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: August 23, 2022

TO: John Fisher

FROM: Allison Tillett, Environmental Impact Review Coordinator

Matthew S. Wells
Director
for Management and Conservation
for Operations

SUBJECT: DEQ 22-121F, Fort Belvoir North Area Distribution Center

Division of Planning and Recreation Resources

The Department of Conservation and Recreation (DCR), Division of Planning and Recreational Resources (PRR), develops the *Virginia Outdoors Plan* and coordinates a broad range of recreational and environmental programs throughout Virginia. These include the Virginia Scenic Rivers program; Trails, Greenways, and Blueways; Virginia State Park Master Planning and State Park Design and Construction. PRR also administers the Land & Water Conservation Fund (LWCF) program in Virginia.

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.

According to the information currently in Biotics, natural heritage resources have not been documented within the submitted project boundary including a 100 foot buffer. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. In addition, the project boundary does not intersect any of the predictive models identifying potential habitat for natural heritage resources.

In addition, the proposed project will impact an Ecological Core (C5) as identified in the Virginia Natural Landscape Assessment (https://www.dcr.virginia.gov/natural-heritage/vaconvisvnla). Mapped cores in the project area can be viewed via the Virginia Natural Heritage Data Explorer, available here: http://vanhde.org/content/map.

Ecological Cores are areas of at least 100 acres of continuous interior, natural cover that provide habitat for a wide range of species, from interior-dependent forest species to habitat generalists, as well as species that utilize marsh, dune, and beach habitats. Interior core areas begin 100 meters inside core edges and continue to the deepest parts of cores. Cores also provide the natural, economic, and quality of life benefits of open space, recreation, thermal moderation, water quality (including drinking water recharge and protection, and erosion prevention), and air quality (including sequestration of carbon, absorption of gaseous pollutants, and production of oxygen). Cores are ranked from C1 to C5 (C5 being the least

significant) using nine prioritization criteria, including the habitats of natural heritage resources they contain.

Impacts to cores occur when their natural cover is partially or completely converted permanently to developed land uses. Habitat conversion to development causes reductions in ecosystem processes, native biodiversity, and habitat quality due to habitat loss; less viable plant and animal populations; increased predation; and increased introduction and establishment of invasive species.

DCR recommends avoidance of impacts to cores. When avoidance cannot be achieved, DCR recommends minimizing the area of impacts overall and concentrating the impacted area at the edges of cores, so that the most interior remains intact.

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 Wildlife Resources (VDWR) 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 Amy Martin at (804-367-2211) or amy.martin@dwr.virginia.gov.

Division of State Parks

DCR's Division of State Parks is responsible for acquiring and managing, state parks. Park development and master planning are managed by the Division of Planning and Recreation Resources. Master plans are required prior to a parks opening and are updated every ten years (Virginia Code § 10.1-200 *et seq.*).

Division of Dam Safety and Floodplain Management

Dam Safety Program:
The Dam Safety program was established to provide proper and safe design, construction, operation and maintenance of dams to protect public safety. Authority is bestowed upon the program according to *The Virginia Dam Safety Act*, Article 2, Chapter 6, Title 10.1 (10.1-604 et seq) of the Code of Virginia and Dam Safety Impounding Structure Regulations (Dam Safety Regulations), established and published by the Virginia Soil and Water Conservation Board (VSWCB).

Floodplain Management Program:
The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), and communities who elect to participate in this voluntary program manage and enforce

the program on the local level through that community's local floodplain ordinance. Each local floodplain ordinance must comply with the minimum standards of the NFIP, outlined in 44 CFR 60.3; however, local communities may adopt more restrictive requirements in their local floodplain ordinance, such as regulating the 0.2% annual chance flood zone (Shaded X Zone).

All development within a Special Flood Hazard Area (SFHA), as shown on the locality's Flood Insurance Rate Map (FIRM), must be permitted and comply with the requirements of the local floodplain ordinance.

State Agency Projects Only

Executive Order 45, signed by Governor Northam and effective on November 15, 2019, establishes mandatory standards for development of state-owned properties in Flood-Prone Areas, which include Special Flood Hazard Areas, Shaded X Zones, and the Sea Level Rise Inundation Area. These standards shall apply to all state agencies.

1. Development in Special Flood Hazard Areas and Shaded X Zones
    A. All development, including buildings, on state-owned property shall comply with the locally-adopted floodplain management ordinance of the community in which the state-owned property is located and any flood-related standards identified in the Virginia Uniform Statewide Building Code.
    B. If any state-owned property is located in a community that does not participate in the NFIP, all development, including buildings, on such state-owned property shall comply with the NFIP requirements as defined in 44 CFR §§ 60.3, 60.4, and 60.5 and any flood-related standards identified in the Virginia Uniform Statewide Building Code.
        (1) These projects shall be submitted to the Department of General Services (DGS), for review and approval.
        (2) DGS shall not approve any project until the State NFIP Coordinator has reviewed and approved the application for NFIP compliance.
        (3) DGS shall provide a written determination on project requests to the applicant and the State NFIP Coordinator. The State NFIP Coordinator shall maintain all documentation associated with the project in perpetuity.
    C. No new state-owned buildings, or buildings constructed on state-owned property, shall be constructed, reconstructed, purchased, or acquired by the Commonwealth within a Special Flood Hazard Area or Shaded X Zone in any community unless a variance is granted by the Director of DGS, as outlined in this Order.

The following definitions are from Executive Order 45:

Development for NFIP purposes is defined in 44 CFR § 59.1 as "Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials."

The Special Flood Hazard Area may also be referred to as the 1% annual chance floodplain or the 100-year floodplain, as identified on the effective Flood Insurance Rate Map and Flood Insurance Study. This includes the following flood zones: A, AO, AH, AE, A99, AR, AR/AE, AR/AO, AR/AH, AR/A, VO, VE, or V.

The Shaded X Zone may also be referred to as the 0.2% annual chance floodplain or the 500- year floodplain, as identified on the effective Flood Insurance Rate Map and Flood Insurance Study.

The Sea Level Rise Inundation Area referenced in this Order shall be mapped based on the National Oceanic and Atmospheric Administration Intermediate-High scenario curve for 2100, last updated in 2017, and is intended to denote the maximum inland boundary of anticipated sea level rise.

"State agency" shall mean all entities in the executive branch, including agencies, offices, authorities, commissions, departments, and all institutions of higher education.

"Reconstructed" means a building that has been substantially damaged or substantially improved, as defined by the NFIP and the Virginia Uniform Statewide Building Code.

Federal Agency Projects Only
Projects conducted by federal agencies within the SFHA must comply with federal Executive Order 11988: Floodplain Management.

DCR's Floodplain Management Program does not have regulatory authority for projects in the SFHA. The applicant/developer must reach out to the local floodplain administrator for an official floodplain determination and comply with the community's local floodplain ordinance, including receiving a local permit. Failure to comply with the local floodplain ordinance could result in enforcement action from the locality. For state projects, DCR recommends that compliance documentation be provided prior to the project being funded. For federal projects, the applicant/developer is encouraged reach out to the local floodplain administrator and comply with the community's local floodplain ordinance.

To find flood zone information, use the Virginia Flood Risk Information System (VFRIS): www.dcr.virginia.gov/vfris

To find community NFIP participation and local floodplain administrator contact information, use DCR's Local Floodplain Management Directory: www.dcr.virginia.gov/dam-safety-and-floodplains/floodplain-directory

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

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR PROGRAM COORDINATION

ENVIRONMENTAL REVIEW COMMENTS APPLICABLE TO AIR QUALITY

TO: John Fisher

We thank **OEIR** for providing DEQ-AIR an opportunity to review the following project: Accordingly, I am providing following comments for consideration.

Document Type: Federal Consistency Determination
Project Sponsor: Department of the Army
Project Title: Fort Belvoir North Area Distribution Center
Project Number: DEQ #22-121F

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

REGULATORY REQUIREMENTSMAY BE APPLICABLE TO: **X 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. **X** **9 VAC 5-130 et seq. – Open Burning**
4. **X** **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: August 12, 2022**

MEMORANDUM

TO: John Fisher, DEQ/EIR Environmental Program Planner

FROM: Carlos A. Martinez, Division of Land Protection & Revitalization Review Coordinator

DATE: August 12, 2022

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

SUBJECT: Environmental Impact Review: 22-121F Fort Belvoir North Area Distribution Center in Fairfax County, Virginia.

The Division of Land Protection & Revitalization (DLPR) has completed its review of the Department of the Army's August 10, 2022 EIR for Fort Belvoir North Area Distribution Center in Fairfax County, Virginia.

DLPR staff conducted a search (200 ft. radius) of the project area of solid and hazardous waste databases (including petroleum releases) to identify waste sites in close proximity to the project area. DLPR search did not identify any waste sites within the project area which might impact the project.

DLPR staff has reviewed the submittal and offers the following comments:

***Hazardous Waste/RCRA Facilities* – none in close proximity to the project area**

***CERCLA Sites* – none in close proximity to the project area**

***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* – none in close proximity to the project area**

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 the DEQ's Northern Regional Office at (703) 583-3800.

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 Carlos A. Martinez by phone at (804) 350-9962 or email Carlos.Martinez@DEQ.Virginia.Gov.

From: Fisher, John <john.fisher@deq.virginia.gov>
Sent: Monday, August 29, 2022 9:05 AM
To: Cisar, Heather R CIV USARMY CENAB (USA) <Heather.R.Cisar@usace.army.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] Fwd: NEW PROJECT EXPEDITED REVIEW Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F

Good morning Heather:

FYI. Sending you the VDOT comments below which arrived after the state's review response was finalized.

John

John E. Fisher
Virginia Department of Environmental Quality
Division of Environmental Enhancement
Office of Environmental Impact Review
1111 East Main Street, Suite 1400
Richmond, Virginia 23219
(804) 659-1919 *New Contact Number*
john.fisher@deq.virginia.gov

For program updates and public notices please subscribe to Constant Contact

---------- Forwarded message ---------
From: **Mitchell, Halie** <halie.mitchell@vdot.virginia.gov>
Date: Fri, Aug 26, 2022 at 3:38 PM
Subject: Fwd: NEW PROJECT EXPEDITED REVIEW Army Ft. Belvoir North Area Distribution Center, DEQ 22-121F
To: <John.Fisher@deq.virginia.gov>
Cc: rr EIR Coordination <eir.coordination@vdot.virginia.gov>, Shahpar, Amirhossein <amir.shahpar@vdot.virginia.gov>, Trivedi, Rahul <rahul.trivedi@vdot.virginia.gov>, Fatemeh Allahdoust <fatemeh.allahdoust@vdot.virginia.gov>

Good afternoon,

Thank you for the opportunity to provide comments on the Fort Belvoir North Area Distribution Center EA. The project does not directly affect VDOT-maintained roadways. The project will require VDOT land use permits if any work or land disturbing activities occur within VDOT right of way, if any lane closures are required on VDOT roadways, or if a construction entrance or ingress/egress from a VDOT roadway is required.

Please let me know if you have any questions. Thank you,

Halie Mitchell, AICP
Multimodal Transportation Planner, Transportation Planning and Investment
Virginia Department of Transportation, NOVA District
703-259-1929
halie.mitchell@vdot.virginia.gov
Twitter | LinkedIn | Facebook | Instagram

ENVIRONMENTAL REVIEW UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT: PROJECT SCOPING AND AGENCY INVOLVEMENT

As you may know, NEPA (PL 91-190, 1969) and its implementing regulations (Title 40, *Code of Federal Regulations*, Parts 1500-1508) requires a draft and final Environmental Impact Statement (EIS) for federal activities or undertakings that are federally licensed or federally funded which will or may give rise to significant impacts upon the human environment. An EIS carries more stringent public participation requirements than an Environmental Assessment (EA) and provides more time and detail for comments and public decision-making. The possibility that an EIS may be required for the proposed project should not be overlooked in your planning for this project. Accordingly, we refer to "NEPA document" in the remainder of this letter.

While this Office does not participate in scoping efforts beyond the advice given herein, other agencies are free to provide scoping comments concerning the preparation of the NEPA document. Accordingly, we are providing notice of your scoping request to several state agencies and those localities and Planning District Commissions, including but not limited to:

Department of Environmental Quality:
- DEQ Regional Office*
- Air Division*
- Office of Wetlands and Stream Protection*
- Office of Local Government Programs*
- Division of Land Protection and Revitalization
- Office of Stormwater Management*

Department of Conservation and Recreation
Department of Health*
Department of Agriculture and Consumer Services
Department of Wildlife Resources*
Virginia Marine Resources Commission*
Department of Historic Resources
Department of Mines, Minerals, and Energy
Department of Forestry
Department of Transportation

Note: The agencies noted with a star (*) administer one or more of the enforceable policies of the Virginia CZM Program.

FEDERAL CONSISTENCY UNDER THE COASTAL ZONE MANAGEMENT ACT

Pursuant to the federal Coastal Zone Management Act of 1972, as amended, and its implementing regulations in Title 15, *Code of Federal Regulations*, Part 930, federal activities, including permits, licenses, and federally funded projects, located in Virginia's Coastal Management Zone or those that can have reasonably foreseeable effects on Virginia's coastal uses or coastal resources must be conducted in a manner which is consistent, to the maximum extent practicable, with the Virginia CZM Program.

Additional information on the Virginia's review for federal consistency documents can be found online at https://www.deq.virginia.gov/permits-regulations/environmental-impact-review/federal-consistency

DATA BASE ASSISTANCE

Below is a list of databases that may assist you in the preparation of a NEPA document:

- DEQ Online Database: Virginia Environmental Geographic Information Systems

  Information on Permitted Solid Waste Management Facilities, Impaired Waters, Petroleum Releases, Registered Petroleum Facilities, Permitted Discharge (Virginia Pollution Discharge Elimination System Permits) Facilities, Resource Conservation and Recovery Act (RCRA) Sites, Water Monitoring Stations, National Wetlands Inventory:
  - www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx

- DEQ Virginia Coastal Geospatial and Educational Mapping System (GEMS)

  Virginia's coastal resource data and maps; coastal laws and policies; facts on coastal resource values; and direct links to collaborating agencies responsible for current data:
  - http://128.172.160.131/gems2/

- MARCO Mid-Atlantic Ocean Data Portal

  The Mid-Atlantic Ocean Data Portal is a publicly available online toolkit and resource center that consolidates available data and enables users to visualize and analyze ocean resources and human use information such as fishing grounds, recreational areas, shipping lanes, habitat areas, and energy sites, among others.

  http://portal.midatlanticocean.org/visualize/#x=-73.24&y=38.93&z=7&logo=true&controls=true&basemap=Ocean&tab=data&legends=false&layers=true

- DHR Data Sharing System.

  Survey records in the DHR inventory:

  - www.dhr.virginia.gov/archives/data_sharing_sys.htm

- DCR Natural Heritage Search

  Produces lists of resources that occur in specific counties, watersheds or physiographic regions:
  - www.dcr.virginia.gov/natural_heritage/dbsearchtool.shtml

- DWR Fish and Wildlife Information Service

  Information about Virginia's Wildlife resources:
  - http://vafwis.org/fwis/

- Total Maximum Daily Loads Approved Reports
  - https://www.deq.virginia.gov/programs/water/waterqualityinformationtmdls/tmdl/tmdldevelopment/approvedtmdlreports.aspx

- Virginia Outdoors Foundation: Identify VOF-protected land
  - http://vof.maps.arcgis.com/home/index.html

- Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Database: Superfund Information Systems

  Information on hazardous waste sites, potentially hazardous waste sites and remedial activities across the nation, including sites that are on the National Priorities List (NPL) or being considered for the NPL:
  - www.epa.gov/superfund/sites/cursites/index.htm

- EPA RCRAInfo Search

  Information on hazardous waste facilities:
  - www.epa.gov/enviro/facts/rcrainfo/search.html

- EPA Envirofacts Database

  EPA Environmental Information, including EPA-Regulated Facilities and Toxics Release Inventory Reports:
  - www.epa.gov/enviro/index.html

- EPA NEPAssist Database

  Facilitates the environmental review process and project planning:
  http://nepaassisttool.epa.gov/nepaassist/entry.aspx

If you have questions about the environmental review process and/or the federal consistency review process, please feel free to contact me (telephone (804) 659-1915 or e-mail bettina.rayfield@deq.virginia.gov).

I hope this information is helpful to you.

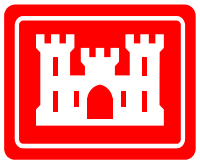
Sincerely,

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

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B – WETLAND DELINEATION REPORT

WETLAND DELINEATION REPORT
Distribution Center
Fort Belvoir North Area
Fort Belvoir, Virginia



Prepared for:

U.S. Army Corps of Engineers
Baltimore District, RSFO

Prepared by:

U.S. Army Corps of Engineers
Baltimore District, Planning Division
2 Hopkins Plaza
Baltimore, Maryland 21201

December 2021

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

THIS PAGE INTENTIONALLY LEFT BLANK

1 INTRODUCTION

1.1 STUDY PURPOSE

The U.S. Army Corps of Engineers (USACE), Baltimore District, Planning Division prepared this report at the request of the RSFO to identify and delineate waters of the U.S. (WUS) (i.e., wetlands and streams) found within the proposed site boundaries.

A project proponent proposes to design and construct a new distribution center on Fort Belvoir North Area (FBNA), Fort Belvoir, Fairfax County, Virginia. The facility will include a two-story warehouse building with associated parking, stormwater management facilities, and infrastructure. The building will provide warehouse storage, vehicle maintenance, and shipping and receiving areas. It will also contain offices, open office space, conference rooms, storage spaces and support spaces to serve approximately 90 occupants.

The study purpose was achieved through (1) collection and synthesis of existing wetlands and waters of the U.S. information; (2) a site visit to conduct routine wetland delineations as prescribed in the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region*; and (3) preparation of a report of findings.

1.2 STUDY AREA

The proposed project area is approximately 180 acres, is currently forested, and situated in the northwestern half of FBNA, west of Accotink Creek. It is bounded by Accotink Creek to the east, Barta Road to the south, a residential neighborhood to the north, and Fairfax County Parkway to the west (Appendix A). In general, surface water appears to drain from the northwest to the southeast in the area as part of the Accotink Creek watershed.

FBNA is located near the transition between the Eastern Piedmont and the Coastal Plain Physiographic Provinces and therefore exhibits characteristics of both. Piedmont areas consist largely of Precambrian metamorphic and Cambrian igneous rock formations, whereas Coastal Plain areas consist of an eastward thickening wedge of unconsolidated sediments of gravel, sand, silt, and clay from the Cretaceous to Tertiary periods (Fort Belvoir 2014).

The topography of FBNA is gently rolling, except for steep slopes bordering Accotink Creek. Accotink Creek enters FBNA from the north at an elevation of approximately 120 feet above mean sea level and descends to an elevation of approximately 100 feet above mean sea level before exiting FBNA to the south. Steep slopes rise from both the eastern and western banks of Accotink Creek and its unnamed tributaries located to the west within the proposed project area. The grades on the slopes range between 20 and 30 percent at most locations (Fort Belvoir 2014). Elevation of the site ranges from 300 to 200 feet above mean sea level and slopes slightly from northwest to southeast.

2 METHODS

2.1 DATA COLLECTION AND ANALYSIS

Existing wetland information and GIS data was collected from various sources for preliminary analysis and identification of potential wetland areas within the study area. Sources of data include: U.S. Geological Survey (USGS) topographic quadrangles (USGS, 1977), U.S. Department of Agriculture (USDA) Web Soil Survey (USDA, 2021), the U.S. Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) maps (including aerial photography) (USFWS, 2015), and mapping found within the Draft Fort Belvoir Integrated Natural Resources Management Plan (INRMP), 2018-2023 (Belvoir, 2017).

2.2 WETLAND DELINEATION

The wetland delineation was performed pursuant to the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region*, as Federal and state agencies require use of these documents for jurisdictional investigations. The delineation field work was conducted 9-10 October and 19-20 November 2021. All delineations were conducted by a team from USACE, Baltimore District, Planning Division. Data points were completed for each wetland. Wetland boundaries were marked with consecutively numbered pink survey flagging. Photographs of the wetlands are included in Appendix C.

2.3 GLOBAL POSITIONING SYSTEM (GPS) METHODOLOGY

The field survey was completed using a Carlson handheld Global Positioning System (GPS). The objective of the GPS survey was to collect location data for each wetland delineation flag and soil sample point. This survey horizontally references the North American Datum of 1983 (NAD83). This data was then transferred into ArcGIS Pro 2.6.1 for analysis and mapping.

3 RESULTS

3.1 GENERAL WETLAND FINDINGS

Wetlands are defined by the presence of three parameters: hydrophytic vegetation, hydric soils, and wetland hydrology. Methods for determining if each of the three parameters are met are described in the 1987 *Corps of Engineers Wetland Delineation Manual* and the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region*.

Preliminary analysis of topographic maps, soils, and INRMP and NWI wetland mapping indicated the presence of wetlands and streams within the study area.

The USACE team placed numbered flags along the limits of six wetlands and one WUS within the study area. The flags were located using GPS survey methods. The wetland areas amount to over

78 acres of wetlands (Tables 3-2 and 3-3, Section 3.2). The maps of wetlands delineated within the study area are shown in Figures 1 and 2, Appendix A.

3.1.1 VEGETATION

For purposes of wetland identification, many plants are assigned an indicator status by the USFWS, which is useful for determining the probability of their occurrence in wetlands. Wetlands delineated within the study area were dominated by plants normally expected to occur within wetlands. No plant species observed on the site are listed as rare, threatened, or endangered at either a Federal or state level.

3.1.2 GENERAL SOIL CHARACTERISTICS

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

Drainage class refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized: excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained.

While the USDA web soil survey (USDA, 2021) identifies 29 soil series within the study area, soils within the wetlands are predominantly Sassafras-Marumsco complex, Nathalie gravelly loam or Rhodhiss sandy loam. Appendix D contains the full soil report. Table 3-1 lists a summary of the soils within the wetland perimeters, including name, the drainage class, and hydric status.

Table 3-1. Soils within the Wetlands

Soil Name	Map Symbol	Drainage Class	Hydric
Glenelg silt loam, 7 to 15 percent slopes	39B	Well drained	No
Nathalie gravelly loam, 7 to 15 percent slopes	79C	Well drained	No
Rhodhiss sandy loam, 15 to 25 percent slopes	87D	Well drained	No
Sassafras-Marumsco complex, 7 to 15 percent slopes	91C	Well drained	No
Sassafras-Marumsco, 15 to 25 percent slopes	91D	Well drained	Yes

3.1.3 HYDROLOGY

Evidence of wetland hydrology was observed in the areas identified as wetlands during the site investigation, and included water-stained leaves, oxidized rhizospheres along living roots, surface water, saturation, sparsely vegetated concave surface, and geomorphic position.

3.2 STREAMS

Several unnamed tributaries originate within the study area and flow in a generally west-to-east direction to their confluence with Accotink Creek off-site. Accotink Creek is the dominant hydrologic feature of FBNA, roughly bisecting the approximately 800-acre area (see Figure 1). The unnamed perennial stream originating out of Wetland 1 was flagged during the field investigations and found to be consistent with previous mapping associated with the INRMP. As such, and to expedite the field investigations, the remaining streams were not flagged but were walked to compare their general shape and extent to that found in the INRMP mapping. All streams exhibited signs of recent erosion such as collapsed, unvegetated banks and steep incision, particularly as they progressed further downstream towards the eastern half of the study area.

3.3 WETLANDS

Six wetlands were delineated within the proposed project areas, amounting to approximately 2.33 acres. Wetland data forms are located in Appendix B.

Plants found in and around the wetlands are classified by a regional wetland indicator status based on USDA's National Wetland Plant List. Indicator categories found in the wetlands on this site include:

FAC: Facultative Hydrophyte - Sometimes found in wetlands (34-66% frequency)
FACW: Facultative Wet Hydrophyte - Usually found in wetlands (66-99% frequency)
OBL: Obligate Hydrophyte - Almost always found in wetlands (99+% frequency)
NI: No Indicator – USDA has not assigned an indicator status for the species

Wetland 1 is a riparian, forested wetland that forms the headwaters of an unnamed, perennial tributary that discharges to Accotink Creek off-site to the east of the study area. The wetland borders merge into the narrow banks of the stream, which becomes progressively more incised as it travels downstream (see photos in Appendix C). This wetland is classified as a palustrine forested wetland with broad-leaved deciduous vegetation and a temporary flood regime (PFO1A). Dominant vegetation includes blackgum (*Nyssa sylvatica*), red maple (*Acer rubrum*) and bitternut hickory (*Carya* cordiformis) in the canopy, musclewood (*Carpinus caroliniana*) and sweetgum (*Liquidambar styraciflua*) in the understory, and cinnamon fern (*Osmundastrum* cinnamomeum) and Japanese stiltgrass (*Microstegium vimineum*) in the herbaceous layer. The soil matrix was predominantly a sandy loam with a 7.5 YR 4/1 color and redoximorphic concentrations in the matrix of 7.5 YR 4/6 and 10 YR 5/8. This chroma meets a depleted matrix hydric soil indicator.

Wetland 2 is a palustrine emergent wetland with persistent vegetation and a flood regime classified as seasonally flooded/saturated (PEM1E). The dominant vegetation observed included Japanese stiltgrass, false nettle (*Boehmeria cylindrica*), New York fern (*Thelypteris noveboracensis*), *Carex* spp. and common greenbrier (*Similar rotundifolia*). The soil matrix was a silt loam 0-4 inches from the surface, with a matrix color of 10 YR 4/1 and 10 YR 6/8 redoximorphic features. Below the top 4 inches the soil became extremely compacted with a mixture of clay and gravel, except for the small depressional portion that sits above the relict

unpaved road bed. The matrix color was 10 YR 6/1 with 10 YR 5/8 redoximorphic features. This soil matrix met the depleted matrix hydric soil indicator.

Note: The hydrology of this small wetland appears to originate from a hillside seep, which is a common wetland type found within Fort Belvoir. The groundwater daylights in the depression upslope from the relic road bed, then flows downslope along its compacted surface. The hydrology is such that hydric soil characteristics are noted in the near-surface layers and hydrophytic vegetation predominates; however, there lacks a distinct and discrete discharge feature to the incised stream located to the north and downslope from this wetland.

Wetland 3 is classified as a palustrine forested wetland with broad-leaved deciduous vegetation and a temporary flood regime (PFO1A). Wetland 3 is a slope wetland that discharges into an unnamed tributary to Accotink Creek. The dominant canopy species observed was highbush blueberry (*Vaccinium corymbosum*). Dominant understory vegetation observed was sensitive fern (*Onoclea sensibilis*), deer tongue (*Dichanthelium clandestinum*) and common greenbrier. The soil matrix was primarily a 10 YR 4/2 fine sandy loam with 7.5 YR 5/6 redoximorphic features. The matrix meets the hydric soil indicator for a depleted matrix.

Wetland 4 is classified as a palustrine forested wetland with broad-leaved deciduous vegetation and a temporary flood regime (PFO1A). Wetland 4 is a riparian wetland located further upstream of Wetland 3's discharge point into the same unnamed tributary. The dominant canopy species observed were sweet gum, red maple, white oak and tulip poplar (*Liriodendron tulipifera*). The dominant understory vegetation consists of American holly (*Ilex opaca*) and highbush blueberry, and the herbaceous layer was dominated by cinnamon fern, southern lady fern (*Athyrium asplenioides*), whorled wood aster (*Oclemena acuminata***)** and common greenbrier. The soil matrix was predominantly a 10 YR 4/1 sandy clay loam with redoximorphic features of 7.5 YR 5/8 which meets the hydric soil criteria for a depleted matrix.

Wetland 5 is classified as a palustrine forested wetland with broad-leaved deciduous vegetation and a temporary flood regime (PFO1A). Wetland 5 is a riparian wetland that drains into the unnamed tributary to Accotink Creek downstream (south) of the culvert crossing under Cissna Road. The canopy dominant species observed was tulip poplar with sweet gum and American holly in the sapling layer. The dominant understory species observed were Japanese stiltgrass, New York fern, soft rush (*Juncus effusus*), three-way sedge (*Dulichium arundinaceum*) and clearweed (*Pilea pumila*). The soil matrix was primarily a sandy loam with a 10 YR 5/2 color with redoximorphic features of 7.5 YR 5/8. These colors meet the hydric soil depleted matrix indicator.

Wetland 6 is classified as a palustrine emergent wetland with persistent vegetation and a temporary flood regime (PEM1A). This small, depressional wetland is located adjacent to an unnamed tributary to Accotink Creek. The dominant vegetation observed was Japanese stiltgrass, mountain laurel (*Kalmia latifolia*) and highbush blueberry. The soil matrix was predominantly a 10 YR 2/1 sandy loam with 10 YR 5/8 redoximorphic features. These soils met the depleted matrix hydric soil indicator.

Descriptions of each wetland are provided in Table 3.3. A Cowardin classification key can be found in Appendix E.

Table 3-2. Wetlands in the Study Area

Wetland	Cowardin Classification	Total Acreage	Connection to Navigable Waters
Wetland 1	PFO1A	1.56	Drains to perennial tributary to Accotink Creek
Wetland 2	PEM 1E	0.04	Isolated wetland (see Note above)
Wetland 3	PFO1A	0.45	Drains to perennial tributary to Accotink Creek
Wetland 4	PFO1A	0.24	Drains to same perennial tributary to Accotink Creek as Wetland 3
Wetland 5	PFO1A	0.01	Drains to perennial tributary to Accotink Creek
Wetland 6	PEM1A	0.03	Drains to perennial tributary to Accotink Creek.
		2.33 Acres	

4 CONCLUSIONS

Six wetlands were delineated by USACE, Baltimore District, Planning Division, within the study area on Fort Belvoir's North Area. The delineation was performed over several days between October-November 2021.

The jurisdiction of the wetlands included in this report have **not** been verified by USACE-Regulatory Branch or the Virginia Department of Environmental Quality (DEQ). Any future design or construction that may impact these wetlands or the wetland buffers will require coordination with the USACE and DEQ, specifically in regard to potential permitting actions within Section 404, Section 10, and all other potential permitting actions.

THIS PAGE INTENTIONALLY LEFT BLANK

REFERENCES

Cowardin, Lewis M., et. al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Office of Biological Services. Washington, DC.

Munsell Color. 1992. *Munsell Color Charts – 1992 Revised Edition*. Kollmorgen Corporation. Baltimore, MD. Not paginated.

Reed, Porter B., Jr. 1988. National List of Plant Species that Occur in Wetlands: Northeast (Region 1). U.S. Fish and Wildlife Service, National Ecology Research Center. Biological Report 88(26.1). Fort Collins, CO. 111p.

U.S. Department of Agriculture Natural Resources Conservation Service. 2018. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed December 2021.

U.S. Department of Agriculture Natural Resources Conservation Service. Updated frequently. National Plants Database, available at http://plants.usda.gov/index.html

U.S. Department of the Army, Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Final Report. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station. St. Petersburg, FL.

U.S. Department of the Army, Environmental Laboratory. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0)*. Technical Report 10-20. U.S. Army Engineer Research and Development Center. Vicksburg, MS.

U.S. Fish and Wildlife Service. 2015. National Wetlands Inventory, Conterminous 48 States. Washington, D.C. Updated continuously.

THIS PAGE INTENTIONALLY LEFT BLANK

5 ACRONYMS AND ABBREVIATIONS

BARC	Beltsville Agricultural Research Center
BEP	Bureau of Engraving and Printing
CPF	Currency Production Facility
EIS	Environmental Impact Statement
FAC	Facultative Hydrophyte
FACW	Facultative Wet Hydrophyte
FBNA	Fort Belvoir North Area
GPS	Global Positioning System
INRMP	Integrated Natural Resources Management Plan
NAD83	North American Datum of 1983
NI	No Indicator
NTCHS	National Technical Committee for Hydric Soils
NWI	National Wetland Inventory
OBL	Obligate Hydrophyte
RSFO	
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
WUS	Waters of the U.S.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A
Figures

Figure 1 – FBNA Study Area Overview

Figure 2: Wetlands – Northern Portion of Study Area

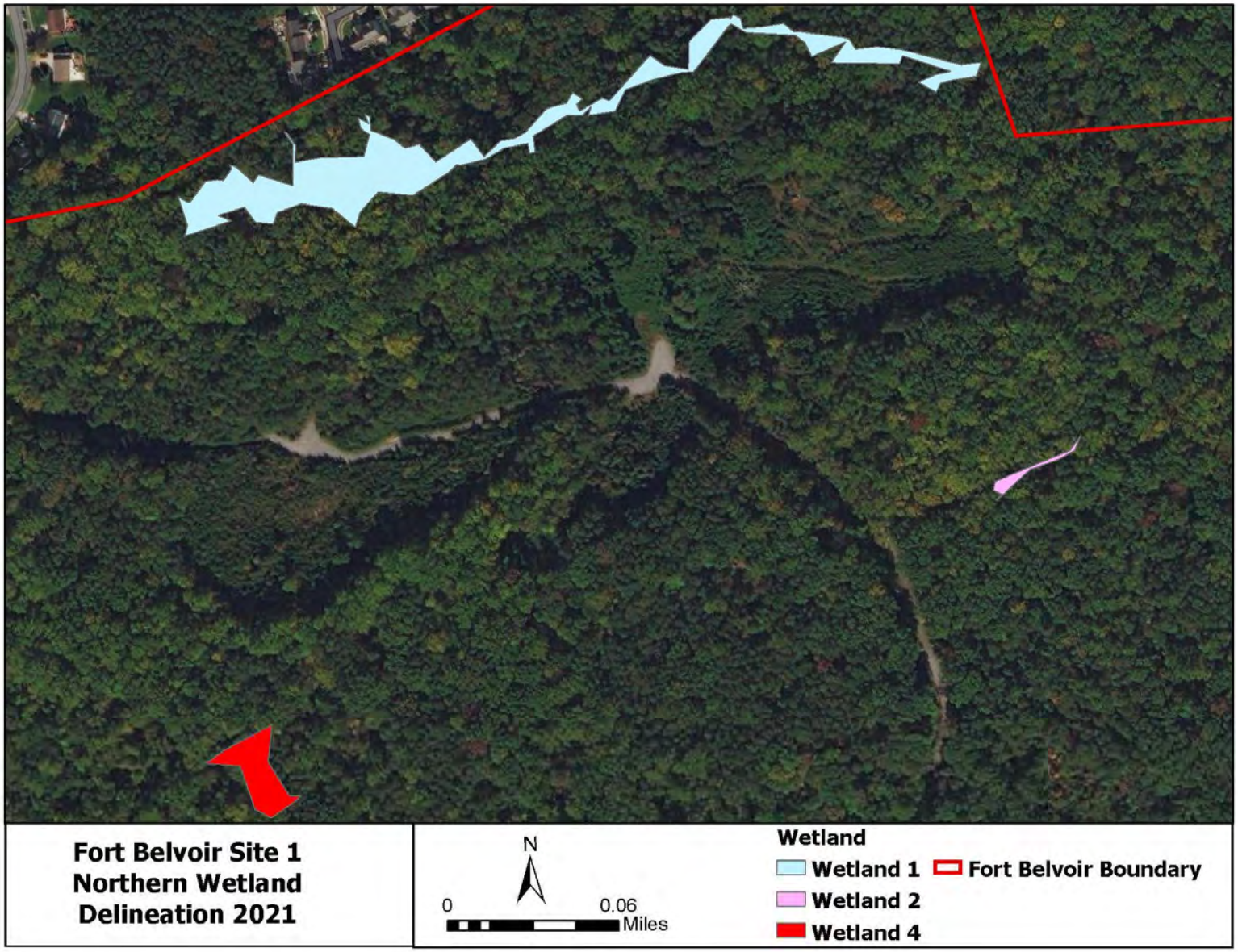
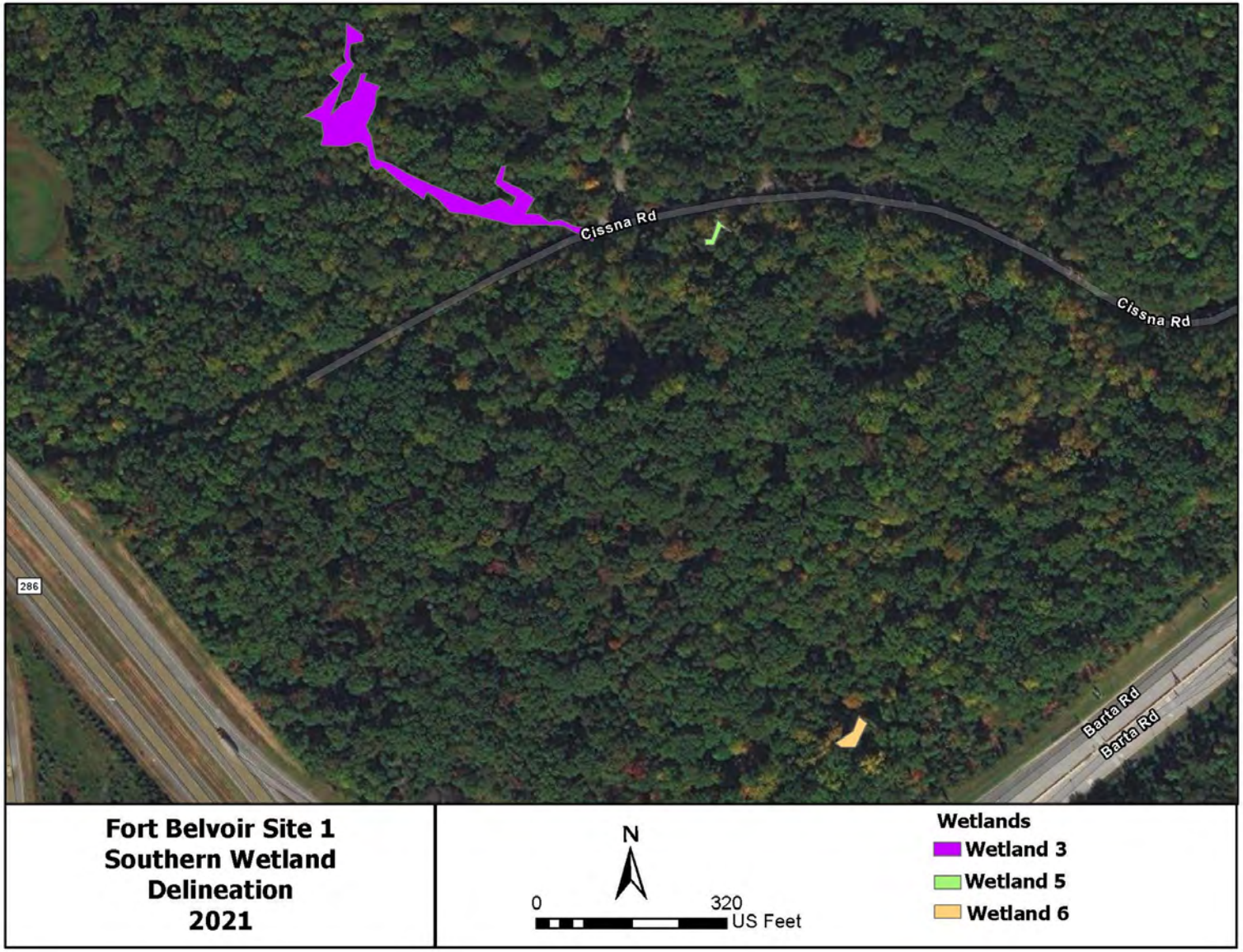


Figure 2: Wetlands – Southern Portion of Study Area



THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B
Routine Wetland Data Forms

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C
Photographs

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D
Cowardin Classification Key

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E
Wetlands and Deepwater Habitats Classification

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C – COASTAL ZONE MANAGEMENT ACT FEDERAL CONSISTENCY DETERMINATION

APPENDIX C
Determination of Consistency with Virginia's Coastal Resources Management Program

This document provides the Commonwealth of Virginia with the Fort Belvoir Consistency Determination under the Coastal Zone Management Act Section 307(c)(1) and 15 Code of Federal Regulations (CFR) Part 930, Subpart C, for the Fort Belvoir North Area Distribution Center, Fort Belvoir, Virginia. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39.

This document represents an analysis of project activities in light of established Virginia Coastal Resources Management Program (CRMP) Enforceable Policies and Programs. Furthermore, submission of this consistency determination reflects the commitment of the U.S. Department of the Army (Army) to comply with those Enforceable Policies and Programs. The Proposed Action would be implemented in a manner that is consistent with the Virginia CRMP. The Army has determined that the construction and operation of the FBNA Distribution Center would have a negligible impact on any land and water uses or natural resources of the Commonwealth of Virginia's coastal zone.

C1 Description of Proposed Action

The Proposed Action involves the construction of a distribution center within Fort Belvoir's North Area (FBNA) (see Figure 1). The proposed distribution center warehouse and administrative building would be approximately 525,000 square feet (SF) and would include associated parking, covered storage, and a perimeter security fence, all to support approximately 600 personnel. This facility would support the delivery and receipt of materials within and across the Washington Metropolitan Area, requiring close proximity within the National Capital Region to achieve distribution efficiencies. The action would also provide compliance with Office of Management and Budget guidance that encourages "good stewardship of taxpayer resources" and increasing joint site usage.

C2 Assessment of Probable Effects

The Army has prepared a draft Environmental Assessment (EA) to evaluate the potential environmental impacts from the FBNA distribution center in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S. Code 4321-4347), and 32 CFR Part 651, Environmental Analysis of Army Actions.

The Army intends to obtain all applicable permits required for implementation of the Proposed Action. A review of the permits and/or approvals required under the enforceable policies is being conducted. The Army has evaluated the construction of the FBNA distribution center for its foreseeable effects on the following enforceable policies:

Fisheries – The Proposed Action has no foreseeable impacts on fish or shellfish resources and would not affect the promotion of, or access to, commercial or recreational fisheries.

The proposed site is located approximately 4.5 miles northwest of the Potomac River and just west of Accotink Creek. The closest water features near the proposed site are unnamed tributaries to Accotink Creek and associated riparian wetlands. Compliance with the installation's Municipal Separate Storm Sewer System (MS4) Permit and the Virginia Erosion and Sediment Control regulations would minimize the risk of sediment being transported off the site to the Potomac River Fishery. Best management practices recommended by the Virginia Departments of Conservation and Recreation and Forestry would be employed when necessary.

Subaqueous Lands Management – The Virginia Marine Resources Commission, pursuant to Virginia Administrative Code (VAC) Section 28.2-1204, has jurisdiction over encroachments in, on, or over any State-owned rivers, streams and creeks. The project would have no foreseeable impacts on subaqueous resources.

Tidal and Non-tidal Wetlands Management – The Proposed Action would not affect any tidal wetlands. Potential impacts to non-tidal wetlands within the project area would be avoided, minimized and, if necessary, mitigated in accordance with applicable Virginia laws.

Dunes Management – The Proposed Action would not affect any coastal primary sand dunes.

Non-Point Source Water Pollution Control – Typically, a Proposed Action that is greater than 2,500 SF would require an erosion and sediment control (ESC) plan and a stormwater management plan to be developed. The ESC plan would include temporary erosion and sediment control measures. The ESC plan and stormwater management plan would be prepared utilizing the requirements for water quality and quantity found in the Virginia Technical Criteria Part IIB (9VAC25-870-62 through 9VAC25-870-92). The Proposed Action would disturb approximately 30 acres of soil; therefore, an ESC plan and stormwater management plan are required. A construction general permit in accordance with 9VAC25-830-130 would also be required. Short-term, minor, adverse impacts would occur from the Proposed Action on surface water with regard to water quality. Appropriate temporary erosion and sediment control measures and stormwater Best Management Practices (BMP) would be employed to minimize impacts to water quality from earth disturbance and potential erosion during construction.

Point Source Water Pollution Control – The Proposed Action would not result in point source water discharge.

Shoreline Sanitation – The Proposed Action is not located on or near a shoreline. The Proposed Action would therefore have no impact on shoreline sanitation.

Air Pollution Control – The proposed site is located within an ozone (O_3) non-attainment area, triggering the need to analyze emissions and determine the applicability of General Conformity Rule under the Clean Air Act. A construction emissions estimate indicates that construction and operation activity would not generate sufficient emissions to trigger a need for a full General Conformity Analysis.

The estimated emissions associated with the construction and operation of this project are very low. The temporary impacts to air quality would be short-term, minor impacts that would not be regionally or locally significant.

Coastal Lands Management – Resource Protection Areas (RPAs) are associated with Accotink Creek, its tributaries, and its associated tidal and non-tidal wetlands. Short-term, minor, adverse impacts to the RPAs associated with unnamed tributaries to Accotink Creek and the adjacent riparian, non-tidal wetlands are anticipated in the project area (see Figure 2). Avoidance and minimization of impacts to this area would be fully considered as the project design progresses. Any unavoidable impacts would be addressed through applicable permitting pursuant to Section 404 of the Clean Water Act and the Virginia Water Protection Permit Program (9 VAC 25-210-10 et seq.). Appropriate temporary erosion and sediment control measures and stormwater BMPs would be employed at the construction site to minimize downstream impacts to Accotink Creek from earth disturbance associated with construction activities.

C3 Summary of Findings

Based on the above analysis, which is elaborated on in the EA, Fort Belvoir personnel would: (1) ensure that the construction contractor uses and maintains appropriate temporary erosion and sediment controls; and (2) obtain the requisite permits and approvals. The Army finds that the proposed distribution center construction is fully consistent to the maximum extent practicable with the federally approved enforceable provisions of the Virginia CRMP, pursuant to the Coastal Zone Management Act of 1972, as amended and in accordance with 15 CFR 930.30.

Pursuant to 15 CFR Part 930.41, the Virginia CRMP has 60 days from receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 CFR Part 930.41(b). Virginia's concurrence will be presumed if its response is not received by the Army on the 60th day from receipt of this determination. The state's response should be sent to U.S. Army Garrison Fort Belvoir, 9430 Jackson Loop, Suite 200, Fort Belvoir, VA 22060-5116.

_____

Joseph V. Messina
Colonel, US Army
Commanding

Figure 1: Proposed Project Location at FBNA

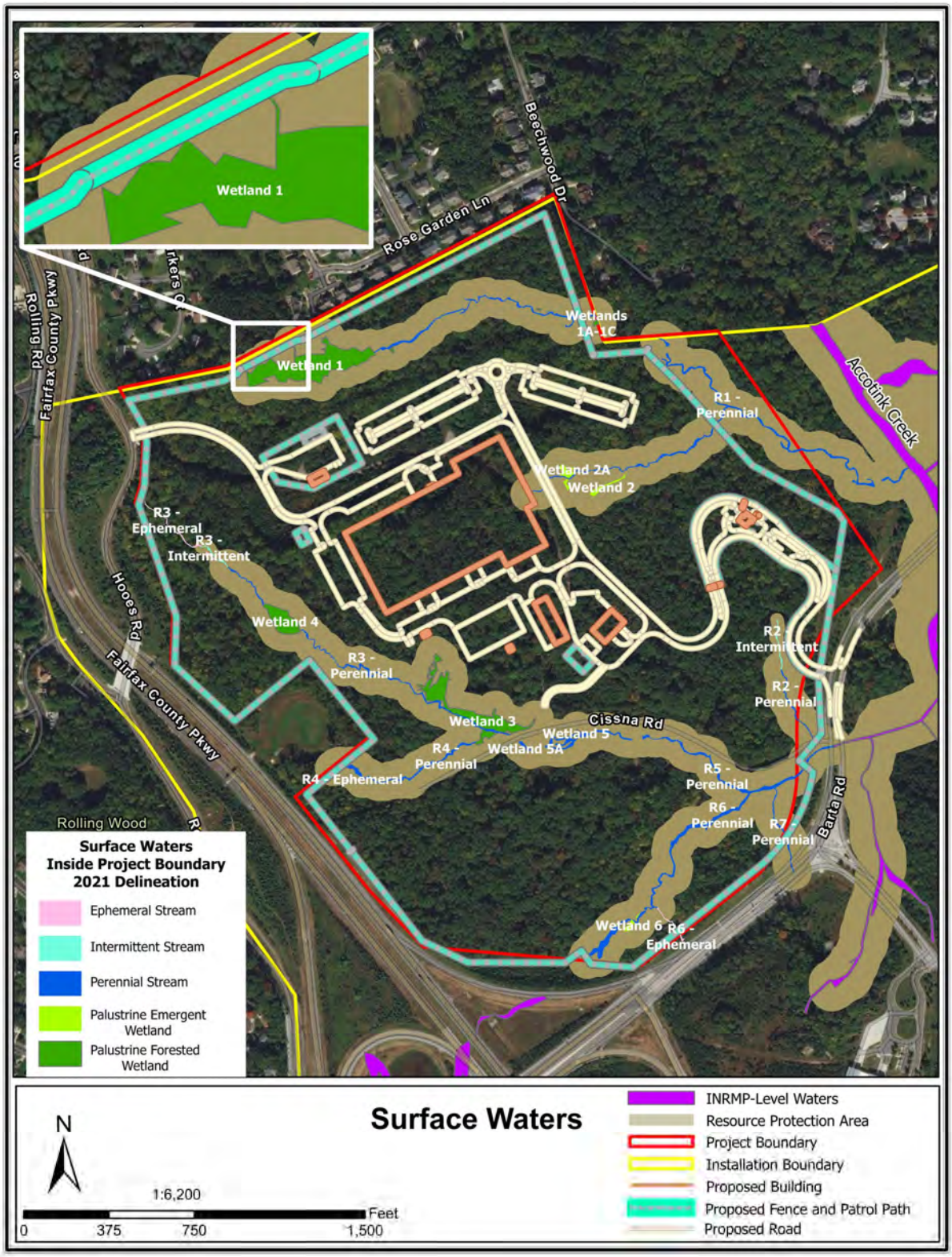


Figure 2: Surface Waters

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D – FOREST STAND DELINEATION REPORT

FOREST STAND DELINEATION REPORT
FOR
PROPOSED DISTRIBUTION CENTER
FORT BELVOIR NORTH AREA
FORT BELVOIR, VIRGINIA

DECEMBER 2021

PREPARED FOR:
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT, RSFO

PREPARED BY:
U.S. ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT, PLANNING DIVISION
2 HOPKINS PLAZA
BALTIMORE, MARYLAND 21201

Daniel R. Cockerham,
Maryland Department of Natural Resources Forest Conservation Qualified Professional
ISA Certified Arborist

TABLE OF CONTENTS

FOREST STAND DELINEATION REPORT FOR
PROPOSED DISTRIBUTION CENTER
FORT BELVOIR NORTH AREA

I. Introduction

A project proponent proposes to design and construct a new distribution center on Fort Belvoir North Area (FBNA), Fort Belvoir, Fairfax County, Virginia. The facility will include a two-story warehouse building with associated parking, stormwater management facilities, and infrastructure. The building will provide warehouse storage, vehicle maintenance, and shipping and receiving areas. It will also contain offices, open office space, conference rooms, storage spaces and support spaces to serve approximately 90 occupants.

II. Site Description

The proposed project area is approximately 180 acres, is currently forested, and situated in the northwestern half of FBNA, west of Accotink Creek. It is bounded by Accotink Creek to the east, Barta Road to the south, a residential neighborhood to the north, and Fairfax County Parkway to the west (Appendix A).

FBNA is located near the transition between the Eastern Piedmont and the Coastal Plain Physiographic Provinces and therefore exhibits characteristics of both. Piedmont areas consist largely of Precambrian metamorphic and Cambrian igneous rock formations, whereas Coastal Plain areas consist of an eastward thickening wedge of unconsolidated sediments of gravel, sand, silt, and clay from the Cretaceous to Tertiary periods (Fort Belvoir 2014).

The topography of FBNA is gently rolling, except for steep slopes bordering Accotink Creek. Accotink Creek enters FBNA from the north at an elevation of approximately 120 feet above mean sea level and descends to an elevation of approximately 100 feet above mean sea level before exiting FBNA to the south. Steep slopes rise from both the eastern and western banks of Accotink Creek and its unnamed tributaries located to the west within the proposed project area. The grades on the slopes range between 20 and 30 percent at most locations (Fort Belvoir 2014).

Elevation of the site ranges from 300 to 200 feet above mean sea level and slopes slightly from northwest to southeast. Soils within western FBNA include Beltsville silt loam (7B), the Sassafras-Marumsco Complex (91D) and Nathalie gravelly loam (79C).

III. Methodology

Prior to field investigations, topographic maps, soil surveys and digital aerial photographs were reviewed to identify probable forest stand boundaries. A full Forest Stand Delineation was conducted on 17 and 23-25 August 2021. A 1/10-acre fixed plot sampling technique was used to assess forest stand conditions and forest structure. Forest stands were distinguished primarily by differences in species composition and successional stage. Sample plots were chosen so as to be evenly distributed throughout the stand. A stick flag was placed in the center of each plot and along the perimeter of the circular plot in each of the four cardinal directions. The plot center was marked in the field with red

flagging and the stand and plot number labeled with a black marker. All additional forest stand and forest structure procedures for data collection follow guidelines of the Maryland State Forest Conservation Technical Manual (MDNR 1997). Although this method is not a regulatory requirement in Virginia, it provides an efficient and comprehensive approach for cataloging and prioritizing forest resources. Forest stands are ranked as Priority 1, 2, or 3 according to the guidelines in the Technical Manual. Priority 1 stands have wetlands, specimen trees of 30" diameter at breast height (dbh) or greater, intermittent or perennial streams, steep slopes, and/or other sensitive areas. Priority 2 may contain some elements listed for Priority 1 and/or have a designation of priority in a local land use plan, local forest conservation program, or other criteria adopted by a local forest conservation program. Priority 3 areas have evidence of increasing levels of human disturbance compared to Priority 1 and 2 areas. In some cases a stand can have a sensitive area within its boundaries, but be a low quality stand based upon quality of vegetation, presence of invasive species or other values. This is noted in the stand descriptions where applicable.

Stand priority rankings help inform decisions on what areas should receive more consideration for on-site preservation and influence how an overall development site is designed.

IV. Results

Eight forest stands were identified within the study area (Appendix A). Dominant cover types include tulip poplar/red maple and oak/hickory. Stand variations result from changes in topographic position, degree of slope, and amount and type of historical human disturbance. Forest stand conditions and forest structure were assessed at sample plots within the stand as detailed in the following stand descriptions (see also Appendix B). The Forest Stand Mapping in Appendix A depicts the approximate location of the sampling plots and boundary of forest cover type within the study area. A brief description of each forest stand follows, and representative photographs can be found in Appendix C:

Stand 1

Sample Plots: **4**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Tulip Poplar**

Stand 1 is dominated by tulip poplar (*Liriodendron tulipifera*) of size class 20-29.9" diameter at breast height (dbh), with approximately 80% canopy closure. The plots within this stand contain a specimen-sized (>30" dbh) tulip poplar and scarlet oak (*Quercus coccinea*). Trees in the sub-canopy included red maple (*Acer rubrum*), American beech (*Fagus grandiflora*), black gum (*Nyssa sylvatica*), Northern red oak (*Quercus rubrum*), mockernut hickory (*Carya tomentosa*), sassafras (*Sassafras albidum*), American holly (*Ilex opaca*) and sweetgum (*Liquidambar styraciflua*). The understory from 3' to 20' tall averages 80% coverage, and includes mountain laurel (*Kalmia latifolia*), black gum, American holly, American beech, sweetgum and muscadine grape vine (*Vitus rotundifolia*). Common herbaceous and woody species 0' to 3' tall consist of mountain laurel, partridgeberry (*Mitchella repens*), common greenbrier (*Smilax rotundifolia*), glaucous-leaved

greenbrier (*Smilax glauca*), Virginia creeper (*Parthenocissus quinquefolia*), highbush blueberry (*Vaccinium corymbosum*), hay-scented fern (*Dennstaedtia punctilobula*), stout wood reed (*Cinna arundinacea*), Jack-in-the-pulpit (*Arisaema triphyllum*), false nettle (*Boehmeria cylindrica*), and poison ivy (*Toxicodendron radicans*) with approximately 100% coverage. Invasive species observed in the stand were multiflora rose (*Rosa multiflora*), Asiatic bittersweet (*Celastrus orbiculatus*), Japanese stilt grass (*Microstegium vimineum*) and Japanese honeysuckle (*Lonicera japonica*) with approximately 80% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of soft mast and seeds, with water sources available in adjacent areas. The stand is rated Priority 1 as there are wetlands within its boundary and it contains specimen trees. It is contiguous with other forest stands found within the western half of FBNA but separated from off-site forests by the Fairfax County Parkway and residential/commercial development.

Environmental Features
Stand 1 contains wetlands and specimen trees, with only one plot (out of 4) containing a high occurrence of invasive species. Adjacent land uses include neighborhoods, roads (including Fairfax County Parkway and Barta Road), and contiguous forest.

Stand 2

Sample Plots: **1**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Tulip Poplar**

Stand 2 is dominated by tulip poplar (*Liriodendron tulipifera*) of size class >30" dbh, with approximately 80% canopy closure. Plot 1 contains two specimen-sized (>30" dbh) tulip poplar. Trees in the sub-canopy included red maple (*Acer rubrum*) and American beech (*Fagus grandiflora*). The understory from 3' to 20' tall averages 20% coverage, and includes sweetgum (*Liquidambar styraciflua*) and pawpaw (*Asimina triloba*). Common herbaceous and woody species 0' to 3' tall consist of common greenbrier (*Smilax rotundifolia*), Virginia creeper (*Parthenocissus quinquefolia*), highbush blueberry (*Vaccinium corymbosum*), huckleberry (*Vaccinium membranaceum*), wild yam (*Dioscorea villosa*), Jack-in-the-pulpit (*Arisaema triphyllum*), false nettle (*Boehmeria cylindrica*), cinnamon fern (*Osmundastrum cinnamomeum*) and fan clubmoss (*Diphasiastrum digitatum*) with approximately 100% coverage. Invasive species observed in the stand were Asiatic bittersweet (*Celastrus orbiculatus*), Japanese stilt grass (*Microstegium vimineum*) and Japanese honeysuckle (*Lonicera japonica*) with approximately 5% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in adjacent areas. The stand is rated Priority 1 as it contains specimen trees, a perennial stream and a low occurrence of invasive species. It is contiguous with forest stands found within the western half of FBNA and very similar to Stands 1 and 3.

Environmental Features
Stand 2 contains specimen trees, a perennial stream and a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

Stand 3

Sample Plots: **1**
Successional Stage: **Mature**
Priority: **2**
Cover Type: **Tulip Poplar**

Stand 3 is co-dominated by tulip poplar (*Liriodendron tulipifera*), white oak (*Quercus alba*) and scarlet oak (*Quercus coccinea*) of size class 20-29.9" dbh, with approximately 100% canopy closure. Trees in the sub-canopy included red maple (*Acer rubrum*), American beech, and black gum (*Nyssa sylvatica*). The understory from 3' to 20' tall averages 100% coverage and includes black gum and muscle wood (*Carpinus caroliniana*). Common herbaceous and woody species 0' to 3' tall consist of common greenbrier (*Smilax rotundifolia*), huckleberry (*Vaccinium membranaceum*), rattlesnake plantain (*Goodyera oblongifolia*), Indian cucumber root (*Medeola virginiana*), Solomon's seal (*Polygonatum* spp.), tick trefoil (*Desmodium* spp.), and fan clubmoss (*Diphasiastrum digitatum*) with approximately 100% coverage. No invasive species were observed in the stand. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in adjacent areas. The stand is rated Priority 2 as it contains a low occurrence of invasive species (none were observed). It is contiguous with forest stands found within the western half of FBNA and very similar to Stands 1 and 2.

Environmental Features
Stand 3 contains a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

Stand 4

Sample Plots: **4**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Tulip Poplar**

Stand 4 is co-dominated by tulip poplar, white oak, black oak and red maple of size class 12-19.9" dbh, with approximately 100% canopy closure. Trees in the sub-canopy included American beech, black gum, northern red oak, southern red oak (*Quercus falcata*), American holly, sassafras and mockernut hickory. The understory from 3' to 20' tall averages 80% coverage and includes beech, black gum and holly. Common herbaceous and woody species 0' to 3' tall consist of common greenbrier, huckleberry highbush blueberry, partridgeberry, black gum, red maple, mockernut hickory, white oak, holly, mountain laurel, beech, trefoil, Indian cucumber-root (*Medeola virginiana*), saw-toothed viburnum (*Viburnum betulifolium),* Christmas fern (*Polystichum acrostichoides*) and hog peanut (*Amphicarpaea bracteata*) with approximately 40% coverage. Invasive species observed in the stand were Asiatic bittersweet and wisteria (*Wisteria sinensis*) with approximately 5-10% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in adjacent areas. The stand is rated

Priority 1 as it contains perennial streams, a small seep wetland, areas with steep slopes, and a low occurrence of invasive species. It is contiguous with forest stands found within the western half of FBNA.

Environmental Features
Stand 4 contains perennial streams, a small seep wetland, areas with steep slopes, and a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

Stand 5

Sample Plots: **5**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Oak Hickory**

Stand 5 is dominated by scarlet oak of size class 20-29.9" dbh, and co-dominated by tulip poplar, northern red oak, white oak, black oak (*Quercus velutina*), Virginia pine (*Pinus virginiana*), Loblolly pine (*Pinus taeda*) and red maple of size class 12-19.9" dbh, with approximately 100% canopy closure. Trees in the sub-canopy included American beech, Eastern red cedar (*Juniperus virginiana*), and mockernut hickory. The understory from 3' to 20' tall averages 80% coverage and includes beech, mountain laurel, black gum, red maple, mockernut hickory and holly. Common herbaceous and woody species 0' to 3' tall consist of glaucous-leaved greenbrier, common greenbrier, huckleberry, highbush blueberry, partridgeberry, black gum, red maple, sassafras, white oak, holly, mountain laurel, beech, trefoil, Indian cucumber-root, saw-toothed viburnum, Virginia creeper (*Parthenocissus quinquefolia*), partridgeberry and pawpaw with approximately 40% coverage. Invasive species observed in the stand were Japanese stilt grass with less than 1% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in adjacent areas. The stand is rated Priority 1 as it contains a stream and a low occurrence of invasive species. It is contiguous with forest stands found within the western half of FBNA, but differs in species composition from Stand 4, likely a result of geomorphic position on an adjacent ridgeline.

Environmental Features
Stand 5 contains a stream and a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

Stand 6

Sample Plots: **7**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Oak Hickory**

Stand 6 is co-dominated by tulip poplar, white oak, scarlet oak, red maple and Virginia pine of size class 20-29.9" dbh, with approximately 80% canopy closure. Trees in the sub-canopy included American beech, black gum, northern red oak, southern red oak, black oak, chestnut oak and mockernut hickory. The understory from 3' to 20' tall averages 60% coverage and includes beech, mountain laurel, black gum, tulip poplar, holly, sassafras and red maple. Common herbaceous and woody species 0' to 3' tall consist of highbush blueberry, huckleberry, common pogonia, sassafras, mountain laurel, willow oak, white oak, deer tongue (*Dichanthelium clandestinum)*, muscle wood partridgeberry, glaucous-leaved greenbrier, and Virginia creeper with approximately 60% coverage. Invasive species observed in the stand were Japanese stilt grass with approximately 1-2% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in the form of two streams that join together within the stand, ultimately connecting into Accotink Creek. The stand is rated Priority 1 as it contains streams and a low occurrence of invasive species. It is contiguous with forest stands found within the western half of FBNA.

Environmental Features
Stand 6 contains streams and a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

Stand 7

Sample Plots: **3**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Oak Hickory**

Stand 7 is dominated by one Virginia pine in size class 20-29.9" dbh, and co-dominated by Virginia pine, tulip poplar, and scarlet oak of size class 12-19.9" dbh, with approximately 70% canopy closure. Trees in the sub-canopy include black oak, northern red oak, scarlet oak, black gum, red maple and mockernut hickory. The understory from 3' to 20' tall averages 80% coverage and includes beech, mountain laurel, sassafras, and black gum. Common herbaceous and woody species 0' to 3' tall consist of highbush blueberry, huckleberry, common pogonia, sassafras, mountain laurel, willow oak (*Quercus phellos*), white oak, deer tongue, black gum, red maple, holly, muscle wood, hay-scented fern, common greenbrier, glaucous-leaved greenbrier, saw-tooth viburnum, (*Viburnum dentatum*) Virginia pine and Indian cucumber-root creeper with approximately 50% coverage. Invasive species observed in the stand were Japanese stilt grass with approximately 2% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in the form of an unnamed tributary stream that connects into Accotink Creek off-site. The stand is rated Priority 1 as it contains streams/wetlands and a low occurrence of invasive species. The slopes adjacent to the riparian zone of the unnamed tributary to Accotink Creek were identified as suitable habitat for the federally-endangered small-whorled pogonia (SWP) (*Isotria medeoloides*) during a July 21, 2021 site visit by a biologist certified for SWP surveys. While this designation is not synonymous with critical habitat, it should be considered in the

ranking process and subsequent decisions for on-site preservation. The stand is contiguous with forest stands found within the western half of FBNA.

Environmental Features
Stand 7 contains a stream and riparian wetlands, suitable habitat for SWP and a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

Stand 8

Sample Plots: **3**
Successional Stage: **Mature**
Priority: **1**
Cover Type: **Oak Hickory**

Stand 8 is dominated by tulip poplar in size classes >30" dbh and 20-29.9" dbh with approximately 70% canopy closure. Trees in the sub-canopy include American beech, black gum, northern red oak, southern red oak, mockernut hickory, Virginia pine, scarlet oak, willow oak and red maple. The understory from 3' to 20' tall averages 100% coverage and includes beech, mountain laurel, black gum, and red maple. Common herbaceous and woody species 0' to 3' tall consist of highbush blueberry, huckleberry, common greenbrier, cinnamon fern, Loblolly pine, Virginia pine, hay-scented fern, Christmas fern, Virginia creeper, sensitive fern, fan clubmoss, white oak, sweet gum, muscle wood partridgeberry, glaucous-leaved greenbrier, and Virginia creeper with approximately 70% coverage. Invasive species observed in the stand were Japanese stilt grass and Japanese honeysuckle with approximately 30% coverage. The wildlife value of the stand is moderate due to the presence of cover and forage, mostly in the form of hard mast and seeds, with water sources available in adjacent areas. The stand is rated Priority 1 as it contains specimen trees, a stream and wetlands, and a somewhat low occurrence of invasive species. The slopes adjacent to the unnamed stream support suitable habitat for the SWP, contiguous with the habitat found in Stand 7. The stand is contiguous with forest stands found within the western half of FBNA.

Environmental Features
Stand 8 contains specimen trees, a stream and wetlands, suitable SWP habitat and a low occurrence of invasive species. Adjacent land uses include neighborhoods, roads, and contiguous forest.

V. CONCLUSIONS

Eight forest stands were delineated and assessed on the site. The two dominant cover types included tulip poplar/red maple and oak-hickory. Areas of high previous disturbance associated with former ranges were dominated by a thick shrub-level coverage of Virginia pine (and not included in any stands). Unused bunker sites off Cissna Road are also characterized by a virtual monoculture of young Virginia pine. Remaining forested areas support mature trees and most contain wetlands, perennial streams and steep slopes. Invasive species coverage is high in some areas of the ground cover layers but overall remains relatively low.

Stands 1, 2 and 4-8 rated Priority 1 and Stand 3 was rated Priority 2 (summarized in table below). Priority 1 stands should be given particular consideration for on-site preservation where practicable. Stands 1 and 2 provide an additional service as a visual buffer between the proposed project site and the adjacent residential neighborhood to the north. Stand 4 provides a continuous forested habitat that connects directly into the Accotink Creek floodplain off-site. Stand 6 has streams running through it and also provides a good visual buffer between the project site and adjacent developed areas. Stands 7 and 8 support a stream, wetlands and suitable habitat for SWP, important when considering steps to eliminate or minimize potential adverse effects of the project in accordance with the Endangered Species Act (ESA).

Stand	Low Invasive Coverage	Specimen Trees	Wetlands/ Stream	Successional Stage	Ranking
1	Y	Y	Y	Mature	1
2	Y	Y	Y	Mature	1
3	Y	N	N	Mature	2
4	Y	N	Y	Mature	1
5	Y	N	Y	Mature	1
6	Y	N	Y	Mature	1
7	Y	N	Y	Mature	1
8	Y	Y	Y	Mature	1

REFERENCES

Eyre, F.H. 1980. Forest Cover Types of the United States and Canada. Society of American Foresters, Washington, D.C. 148 pp.

Maryland Dept. of Natural Resources (MDNR), 3rd ed., 1997. State Forest Conservation Technical Manual. Dept. of Natural Resources, Annapolis, Maryland. Available online at https://mdstatedocs.slrc.info/digital/collection/mdgov/id/11130/.

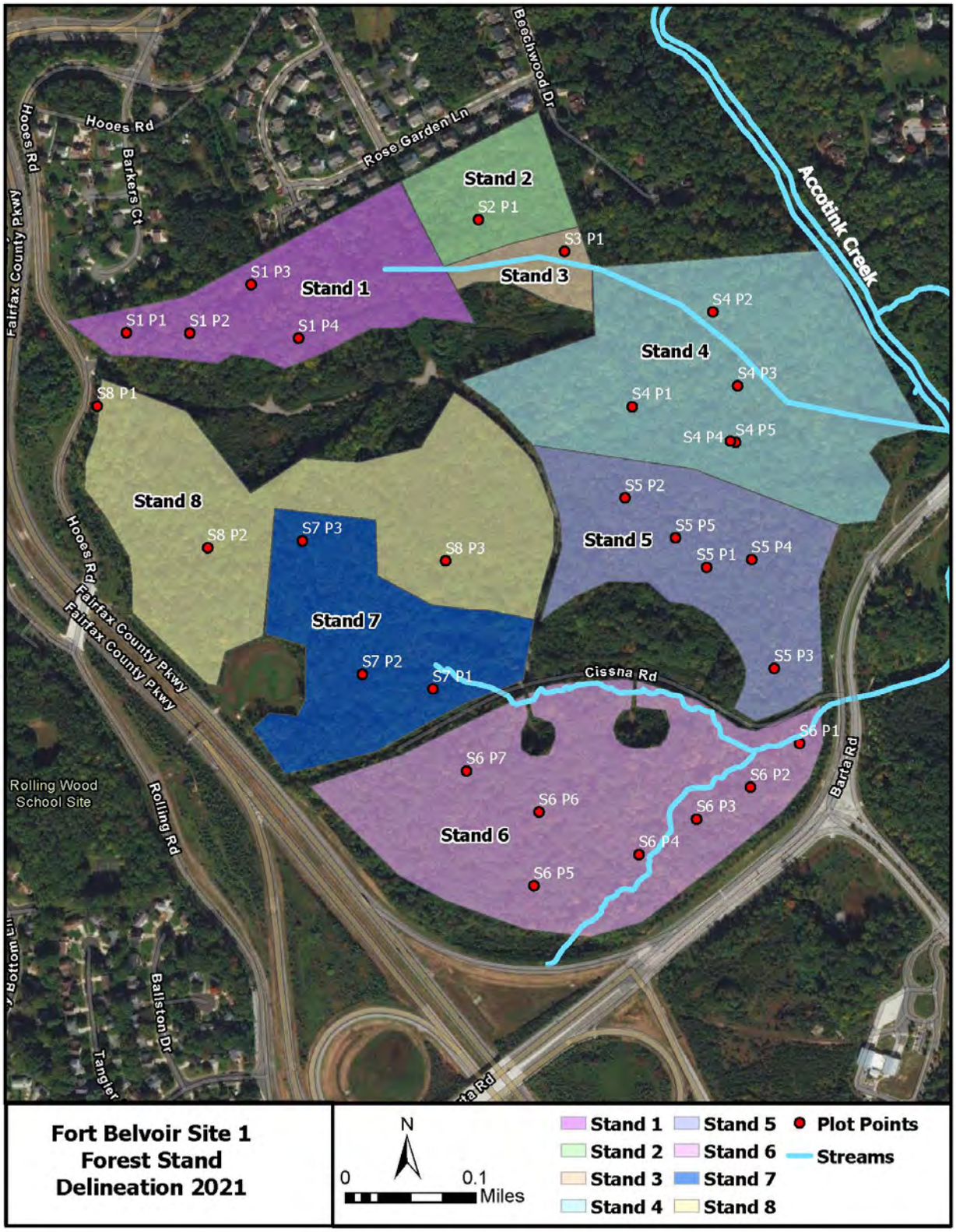
U.S. Army Garrison Fort Belvoir (Fort Belvoir). 2014. *Draft Environmental Impact Statement, Real Property Master Plan Update and Short-term Projects, US Army Garrison Fort Belvoir, Fairfax County, Virginia.* Prepared by AECOM.

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service. 2021. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/.

U.S. Fish and Wildlife Service. 2020. National Wetlands Inventory, Conterminous 48 States. Washington, D.C. Updated continuously.

APPENDIX A

Forest Stand Mapping


Hooes Rd
Barkers Ct
Rose Garden Ln
Beechwood Dr
Accotink Creek
Fairfax County Pkwy
Stand 1
Stand 2
Stand 3
Stand 4
Stand 5
Stand 6
Stand 7
Stand 8
S1 P1
S1 P2
S1 P3
S1 P4
S2 P1
S3 P1
S4 P1
S4 P2
S4 P3
S4 P4
S4 P5
S5 P1
S5 P2
S5 P3
S5 P4
S5 P5
S6 P1
S6 P2
S6 P3
S6 P4
S6 P5
S6 P6
S6 P7
S7 P1
S7 P2
S7 P3
S8 P1
S8 P2
S8 P3
Cissna Rd
Barta Rd
Rolling Wood
School Site
Rolling Rd
Ballston Dr
Tangler
Fort Belvoir Site 1
Forest Stand
Delineation 2021
N
0
0.1
Miles
Stand 1
Stand 2
Stand 3
Stand 4
Stand 5
Stand 6
Stand 7
Stand 8
Plot Points
Streams

APPENDIX B

Field Sampling Data Sheets

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 1** | **Plot #: 1**
Forest Cover Type: Tulip poplar | **Date:** 17 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 90	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1 Tulip poplar			1			1		2		6							10
2 Red maple						1											1
3 American beech			2														2
4 Mockernut hickory			1			1											2
5 Black gum			3														3
6																	0
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			7			3			2			6					18
Number & Size of Standing Dead Trees																	0

List of Woody Plant Species 3'-20':
American holly and beech

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 5%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
mountain laurel, partridgeberry, bittersweet, highbush blueberry, Virginia creeper, blackberry, Christmas fern, hay-scented fern, common greenbrier, poison ivy (cont)

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):
Asiatic bittersweet, Japanese honeysuckle, Japanese stilt grass

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? light
Downed woody debris: light

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Downed Woody Debris:

C	N	E	S	W	%
N	N	Y	Y	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover, wetlands present in adjcent stands

Stand corridor/patch? Patch

FUNCTION: Where is stand in relation to sensitive areas on site? adjacent to forested wetlands

Comments:

Understory (continued): maple leaf viburnum, black gum, Virginia pine and sassafras

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 1** | **Plot #: 2**
Forest Cover Type: Tulip poplar | **Date:** 17 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 100	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar			2			1		1					1				5
2	Red maple						2											2
3	American beech			1														1
4	Mockernut hickory			1														1
5	Black gum			4														4
6	Sassafras			1														1
7	Black oak								1									1
8	American holly			1														1
9																		0
	Total Number of Trees per Size Class			10			3			2			0			1		16
	Number & Size of Standing Dead Trees	1																1

List of Woody Plant Species 3'-20':
mountian laurel and black gum

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 5-10%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
partridgeberry, Virginia creeper, highbush blueberry, Rhus spp., common greenbrier, NY fern, holly, glaucous-leaved greenbrier, black oak, beech, (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers): Japanese honeysuckle, Japanese stilt grass

Rare, etc. Species? No
Specimen Trees? Yes
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? light
Downed woody debris: light

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	N	Y	Y	Y	80

Downed Woody Debris:

C	N	E	S	W	%
N	N	N	N	N	0

HABITAT: What species present? white-tailed deer, raccoon

Habitat size, location, configuration: stand surrounded by contiguous forest

Wildlife cover/food/water? food and cover, wetlands present in adjcent stands

Stand corridor/patch? Patch

FUNCTION: Where is stand in relation to sensitive areas on site? adjacent to forested wetlands

Comments:

Tulip poplar specimen measured at 40" dbh

Understory (continued): maple leaf viburnum, poison ivy, white wood aster

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 1** | **Plot #: 3**
Forest Cover Type: Tulip poplar | **Date:** 17 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 100	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1 Tulip poplar								2		1							3
2 Red maple			1			1					1						3
3 Sweet gum			1														1
4 Mockernut hickory			2						1								3
5 Northern red oak						1											1
6																	0
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			4			2			3			2					11
Number & Size of Standing Dead Trees								3			3						6

List of Woody Plant Species 3'-20':
beech, sweet gum, holly, ironwood, muscadine grape

Canopy Closure:

C	N	E	S	W	%
N	Y	Y	N	Y	60

Percent of Invasive Cover per Plot (all layers): 90%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
false nettle, stout wood reed, Jack-in-the-pulpit, common greenbrier, sensitive fern, Virginia creeper, Virginia chain fern, hog peanut, wild yam, cinnamon fern

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):
Japanese honeysuckle, Japanese stilt grass, Asisatic bittersweet, multiflora rose

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? N
Downed woody debris: light

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Downed Woody Debris:

C	N	E	S	W	%
N	N	Y	Y	N	40

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover, wetlands present in adjcent stands

Stand corridor/patch? Patch

FUNCTION: Where is stand in relation to sensitive areas on site? forested wetland

Comments:

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 1** | **Plot #: 4**
Forest Cover Type: Tulip poplar | **Date:** 17 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 160	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar			2			2		8		1							13
2	Red maple			1			5											6
3	Scarlet oak													1				1
4	Black gum			1														1
5	Southern red oak						1											1
6	Sassafras			1														1
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			5			8			8			1			1		23
	Number & Size of Standing Dead Trees	1																1

List of Woody Plant Species 3'-20':

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): <5%

Plot Successional Stage: Mature

List of Understory Species 0'-3': partridgeberry, sassafras, common greenbrier, highbush blueberry, red maple, holly, NY fern, sweet gum, mountain laurel, hog peanut, pawpaw

Understory Cover 3'-20':

C	N	E	S	W	%
N	N	Y	Y	Y	60

List of Major Invasive Species per Plot (All Layers): Japanese stilt grass

Rare, etc. Species? No
Specimen Trees? Yes
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: light

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	N	Y	Y	Y	80

Downed Woody Debris:

C	N	E	S	W	%
N	N	N	N	Y	20

HABITAT: What species present? white-tailed deer, raccoon

Habitat size, location, configuration: stand surrounded by contiguous forest

Wildlife cover/food/water? food and cover, wetlands present in adjcent stands

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site? forested wetland

Comments:

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 2** | **Plot #: 1**
Forest Cover Type: Tulip poplar | **Date:** 17 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 100	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar											1		2				3
2	Red maple						6			2		1						9
3	American beech						2											2
4																		0
5																		0
6																		0
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class						8			2			2			2		14
	Number & Size of Standing Dead Trees																	0

List of Woody Plant Species 3'-20':
sweet gum and pawpaw

Canopy Closure:

C	N	E	S	W	%
N	Y	Y	Y	Y	80

Percent of Invasive Cover per Plot (all layers): 5%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
cinnamon fern, huckleberry, fan clubmoss, pawpaw, common greenbrier, highbush blueberry, Jack-in-the-pulpit, Virginia creeper, white oak, wild yam, sweet gum,

Understory Cover 3'-20':

C	N	E	S	W	%
N	N	N	Y	N	20

List of Major Invasive Species per Plot (All Layers):
Japanese stilt grass, Japanese honeysuckle, Asiatic bittersweet

Rare, etc. Species? No
Specimen Trees? Yes
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: light

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	N	N	60

Downed Woody Debris:

C	N	E	S	W	%
Y	Y	N	Y	Y	80

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover, wetlands present in adjcent stands

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site? forested wetland adjacent

Comments:

Dense understory (3-20' height) of sweet gum in portion of this stand. Although contiguous with Stand 1, the vegetative composition does noticeably shift from an oak assemblage to red maple/sweet gum.

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 3** | **Plot #: 1**
Forest Cover Type: Tulip poplar | **Date:** 17 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 90

SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT

	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar			1			2			4		2						9
2	Red maple			2			1			1								4
3	American beech			1														1
4	White oak											1						1
5	Scarlet oak											1						1
6	Black gum			1														1
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			5			3			5			4			0		17
	Number & Size of Standing Dead Trees																	0

List of Woody Plant Species 3'-20':
black gum and iron wood

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers):

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
huckleberry, rattlesnake plantain, common greenbrier, tick trifoil, false Solomon's seed, Indian cucumber, red maple, sweet gum, fan clubmoss

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: light

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Downed Woody Debris:

C	N	E	S	W	%
N	N	Y	Y	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Similar to Stand 1 (may be considered a continuation of Stand 1, with Stand 2 an inclusion).

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 4** | **Plot #: 1**
Forest Cover Type: Tulip poplar | **Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 80

SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT

	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar			3			1			6								10
2	Black gum			2			1											3
3	American beech			2			1											3
4	White oak			3														3
5																		0
6																		0
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			10			3			6						0		19
	Number & Size of Standing Dead Trees						1											1

List of Woody Plant Species 3'-20':
black gum

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 0%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
maple leaf viburnum, common greenbrier, beech, deer tongue, holly, blueberry, black gum, Virginia creeper, partridgeberry, sawtooth viburnum, hog peanut (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):
N/A

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: moderate

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	N	Y	80

Downed Woody Debris:

C	N	E	S	W	%
N	Y	N	N	N	20

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Undertstory (continued):
poison ivy, iron wood, Solomon's, white avens, Virginia pine, mockernut hickory, Christmas fern

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 4** | **Plot #: 2**
Forest Cover Type: Tulip poplar | **Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 50

SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT

	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar						2			1		1						4
2	Red maple			5			1											6
3	American holly			1														1
4	White oak			1														1
5	Mockernut hickory			2														2
6	Northern red oak						1											1
7	Sassafras			1														1
8																		0
9																		0
	Total Number of Trees per Size Class			10			4			1			1			0		16
	Number & Size of Standing Dead Trees																	0

List of Woody Plant Species 3'-20':
beech

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 10%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
sassafras, Christmas fern, common greenbrier, white oak, black gum, hay-scented fern, mountain laurel, glaucous-leaved greenbrier, hog peanut (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
N	N	Y	Y	Y	60

List of Major Invasive Species per Plot (All Layers):
bittersweet and wisteria

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: moderate

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	N	Y	60

Downed Woody Debris:

C	N	E	S	W	%
N	Y	N	Y	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Undertstory (continued):
holly, blueberry, wild yam, partridgeberry, iron wood, trifoil, bittersweet, pawpaw, creeping strawberry

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 4** **Plot #: 3**
Forest Cover Type: Tulip poplar	**Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

Basal Area in Square Feet per Acre: 80	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1 Tulip poplar			1			2		3									6
2 Red maple			4					2									6
3 Beech						1											1
4 White oak						1		1									2
5 Black gum			1														1
6 Southern red oak			1														1
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			7			4			6			0			0		17
Number & Size of Standing Dead Trees			2						1								3

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 5%**	**Plot Successional Stage:**
beech, holly	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	Y	Y	Y	Y	100		Mid

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Blueberry, black gum, hog peanut, white oak, sassafras, bittersweet, northern red oak, Christmas fern, red maple, mockernut hickory, trifoil, Indian cucumber (cont.)	**C**	**N**	**E**	**S**	**W**	**%**	
	Y	Y	Y	Y	Y	100	bittersweet

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No							
Historic Sites?	No	Y	N	Y	N	Y	60	**Habitat size, location, configuration:**
Disease?	No							stand surrounded by contiguous forest
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	Yes	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	moderate	Y	N	N	N	N	20	food and cover
Downed woody debris:	moderate							**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:
Some prior disturbance from road. More red maple than other plots in Stand 4, but still predominantly tulip stand.
Undertstory (continued):
mountain laurel, holly

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 4** **Plot #: 4**
Forest Cover Type: Tulip poplar	**Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

Basal Area in Square Feet per Acre: 100	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1 Tulip poplar						2			4								6
2 White oak						1			2								3
3 Beech			2														2
4 Black oak									1								1
5 Northern red oak						1											1
6 Red maple			3														3
7 American holly			1														1
8 Black gum			1														1
9																	0
Total Number of Trees per Size Class			7			4			7			0			0		18
Number & Size of Standing Dead Trees								1									1

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 0%**	**Plot Successional Stage:**
beech	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	Y	Y	Y	N	80		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Blueberry, partridgeberry, common greenbrier, black gum, red maple, mockernut hickory, white oak, holly, beech, mountain laurel	**C**	**N**	**E**	**S**	**W**	**%**	
	Y	Y	Y	Y	Y	100	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No							**Habitat size, location, configuration:**
Historic Sites?	No	Y	N	Y	N	Y	60	stand surrounded by contiguous forest
Disease?	No							
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	Yes	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	light							food and cover
Downed woody debris:	moderate	N	N	Y	Y	N	40	**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments**:**

More mature, more species diversity, less understory

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 5** | **Plot #: 1**
Forest Cover Type: Oak/Hickory | **Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 120	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	White oak						1		1									2
2	Scarlet oak								2		1							3
3	Red maple			1			3											4
4	Black gum			2														2
5	Northern red oak								2									2
6	Tulip poplar								1									1
7	Virginia pine								1									1
8	Black oak								1									1
9																		0
	Total Number of Trees per Size Class			3			4			6			1					16
	Number & Size of Standing Dead Trees					3												3

List of Woody Plant Species 3'-20':
beech and mountain laurel

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 0%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
Blueberry, red maple, common greenbrier, glaucous-leaved greenbrier, holly, huckleberry, white oak, Virginia pine

Understory Cover 3'-20':

C	N	E	S	W	%
N	Y	Y	Y	Y	80

List of Major Invasive Species per Plot (All Layers):

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: moderate

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
N	Y	Y	N	N	40

Downed Woody Debris:

C	N	E	S	W	%
Y	N	N	Y	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Higher elevation

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 5** | **Plot #: 2**
Forest Cover Type: Oak/Hickory | **Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 90	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	White oak			1			3			1								5
2	Scarlet oak						2											2
3	Red maple			4			4											8
4	Loblolly pine									1								1
5	Tulip poplar			1						2								3
6	Mockernut hickory			3			2											5
7	Northern red oak			1			1											2
8	Virginia pine									2								2
9	American beech						1											1
	Total Number of Trees per Size Class			10			13			6			0			0		29
	Number & Size of Standing Dead Trees																	0

List of Woody Plant Species 3'-20':
mountain laurel

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 0%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
Maple leaf viburnum, northern red oak, black gum, partridgeberry, sawtooth viburnum, huckleberry, pawpaw, common greenbrier

Understory Cover 3'-20':

C	N	E	S	W	%
Y	N	Y	Y	Y	80

List of Major Invasive Species per Plot (All Layers): N/A

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: low

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	N	Y	N	Y	60

Downed Woody Debris:

C	N	E	S	W	%
Y	N	N	Y	N	40

HABITAT: What species present? white-tailed deer, raccoon

Habitat size, location, configuration: stand surrounded by contiguous forest

Wildlife cover/food/water? food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Very little groundcover, abundance of small (<2' dbh understory trees).

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 5** | **Plot #: 3**
Forest Cover Type: Oak/Hickory | **Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 100	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	White oak			1			1											2
2	Scarlet oak								2									2
3	Red maple			5			2											7
4	Northern red oak								1									1
5	Tulip poplar						1											1
6																		0
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			6			4			3			0			0		13
	Number & Size of Standing Dead Trees								2									2

List of Woody Plant Species 3'-20':
holly

Canopy Closure:

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

Percent of Invasive Cover per Plot (all layers): 1%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
Common greenbrier, black oak, white oak, maple leaf viburnum, red maple, sawtooth viburnum, Virginia pine, blueberry, sassafras, black gum, mountain laurel (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	N	N	60

List of Major Invasive Species per Plot (All Layers):
Japanese stilt grass

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? low
Downed woody debris: low

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	N	N	N	N	20

Downed Woody Debris:

C	N	E	S	W	%
Y	N	N	Y	N	40

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

East of bunkers, north of Barta Road, south of Cissna Road and stream, on higher ground.

Understory (continued):
Virginia creeper

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 5** **Plot #: 4**
Forest Cover Type: Oak/Hickory	**Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

	Basal Area in Square Feet per Acre: 90	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
	TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
	Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1	White oak			2			1											3
2	Scarlet oak									1								1
3	Red maple			4			1			1								6
4	Northern red oak									1								1
5	Tulip poplar									2								2
6	American beech			1														1
7	Virginia pine						1											1
8	Black gum			2														2
9																		0
	Total Number of Trees per Size Class			9			3			5			0			0		17
	Number & Size of Standing Dead Trees		1			1						1						3

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 0%**	**Plot Successional Stage:**
holly, mockernut hickory, black gum, red maple	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	Y	Y	Y	Y	100		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Highbush blueberry, holly, red maple, white oak, black gum, partridgeberry, mountain laurel, northern red oak, Indian cucumber, glaucous-leaved greenbrier	**C**	**N**	**E**	**S**	**W**	**%**	
	Y	Y	Y	Y	Y	100	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No							
Historic Sites?	No	Y	N	N	Y	Y	60	**Habitat size, location, configuration:**
Disease?	No							stand surrounded by contiguous forest
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	Yes	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	high							food and cover
Downed woody debris:	moderate	Y	Y	N	Y	N	60	**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments**:**

Plot located on the slope of a small creek; large amount of tree fall.

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 5** **Plot #: 5**
Forest Cover Type: Oak/Hickory	**Date:** 23 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

Basal Area in Square Feet per Acre: 90	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1 Red maple			3			1											4
2 Virginia pine								1									1
3 Southern red oak						1											1
4 Eastern red cedar			1														1
5 Mockernut hickory						1											1
6 Scarlet oak						1											1
7 Black gum			1														1
8 White oak						1		2									3
9 Black oak								1									1
Total Number of Trees per Size Class			5			5			4			0			0		14
Number & Size of Standing Dead Trees		3															3

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 0%**	**Plot Successional Stage:**
mockernut hickory	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	Y	Y	Y	Y	100		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Highbush blueberry, holly, red maple, white oak, black gum, glaucous-leaved greenbrier, huckleberry	**C**	**N**	**E**	**S**	**W**	**%**	
	Y	Y	Y	Y	Y	100	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No							**Habitat size, location, configuration:**
Historic Sites?	No	Y	N	N	Y	Y	60	stand surrounded by contiguous forest
Disease?	No							
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	Yes	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	high							food and cover
Downed woody debris:	moderate	Y	Y	N	Y	N	60	**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments**:**

Less ground cover, with more small trees.

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 6** | **Plot #: 1**
Forest Cover Type: Oak/Hickory | **Date:** 24 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 70	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1 Red maple			6			2											8
2 Tulip poplar								1									1
3 White oak			3			1		1									5
4 Chestnut oak								1									1
5 Mockernut hickory						1											1
6																	0
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			9			4			3			0			0		16
Number & Size of Standing Dead Trees	1																1

List of Woody Plant Species 3'-20':
mountain laurel, red maple, beech

Canopy Closure:

C	N	E	S	W	%
Y	N	Y	Y	Y	80

Percent of Invasive Cover per Plot (all layers): 1%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
Highbush blueberry, white oak, red maple, Virginia pine, black gum, holly, mockernut hickory, chestnut oak, partridgeberry, mountain laurel, huckleberry, ironwood

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	N	Y	Y	80

List of Major Invasive Species per Plot (All Layers):
Japanese stilt grass

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: low

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
N	Y	Y	Y	Y	80

Downed Woody Debris:

C	N	E	S	W	%
N	Y	N	N	N	20

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Specimen white oak within stand but outside of plot. Not many large trees but a thick, well-developed layer of mountain laurel. Located on slope between Barta Road and stream.

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 6** **Plot #: 2**
Forest Cover Type: Oak/Hickory	**Date:** 24 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

Basal Area in Square Feet per Acre: 80	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1 Red maple			7			2											9
2 Tulip poplar						2			2								4
3 White oak			1								1						2
4 Scarlet oak						2					2						4
5 Northern red oak						1											1
6																	0
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			9			7			2			3			0		20
Number & Size of Standing Dead Trees																	0

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 0%**	**Plot Successional Stage:**
mountain laurel, red maple	**C**	**N**	**E**	**S**	**W**	**%**		
	N	Y	Y	Y	Y	80		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Highbush blueberry, red maple, sassafras, huckleberry, wintergreen, moutain laurel, iron wood, tulip poplar, Virginia pine, common greenbrier	**C**	**N**	**E**	**S**	**W**	**%**	
	Y	N	N	Y	Y	60	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No	N	Y	Y	N	Y	60	**Habitat size, location, configuration:**
Historic Sites?	No							stand surrounded by contiguous forest
Disease?	No	**Downed Woody Debris:**						
Insects/Infestation?	No	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Exotic Plants?	No	Y	Y	Y	Y	Y	100	food and cover
Leaf litter?	moderate							**Stand corridor/patch?** continuous forest
Downed woody debris:	moderate							

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 6** **Plot #: 3**
Forest Cover Type: Oak/Hickory	**Date:** 24 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

	Basal Area in Square Feet per Acre: 80	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
	TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
	Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1	Northern red oak						1											1
2	Tulip poplar			3						1		1						5
3	White oak											1		1				2
4	Black gum									1								1
5																		0
6																		0
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			3			1			2			2			1		9
	Number & Size of Standing Dead Trees					1												1

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 0%**	**Plot Successional Stage:**
mountain laurel, black gum, tulip poplar	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	Y	Y	Y	Y	100		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Highbush blueberry, red maple, sassafras, huckleberry, moutain laurel, iron wood, common greenbrier, black gum, Virginia creeper, common pogonia	**C**	**N**	**E**	**S**	**W**	**%**	
	N	N	Y	Y	N	40	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No							**Habitat size, location, configuration:**
Historic Sites?	No	Y	Y	Y	Y	N	80	stand surrounded by contiguous forest
Disease?	No							
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	No	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	moderate	N	N	N	Y	N	20	food and cover
Downed woody debris:	low							**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 6** | **Plot #: 4**
Forest Cover Type: Oak/Hickory | **Date:** 24 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 80

SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT

	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Red maple			4			2											6
2	Scarlet oak								1									1
3	Black oak						1											1
4	Tulip poplar								2									2
5	American beech						1											1
6	Northern red oak								2									2
7	White oak								1					1				2
8	Black gum			1														1
9																		0
	Total Number of Trees per Size Class			5			4			6			0			1		16
	Number & Size of Standing Dead Trees		1									1						2

List of Woody Plant Species 3'-20':
mountain laurel, holly, beech

Canopy Closure:

C	N	E	S	W	%
N	Y	Y	Y	Y	80

Percent of Invasive Cover per Plot (all layers): 0%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
Highbush blueberry, red maple, huckleberry, iron wood, common greenbrier, glaucous-leaved greenbrier, black gum, Virginia creeper, common pogonia (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
N	N	N	Y	Y	40

List of Major Invasive Species per Plot (All Layers):

Rare, etc. Species? No
Specimen Trees? Yes
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? 80
Leaf litter? moderate
Downed woody debris: low

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	N	Y	Y	80

Downed Woody Debris:

C	N	E	S	W	%
Y	Y	Y	Y	N	80

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Understory (Continued):
white oak, sassafras, holly, Virginia pine, partridgeberry, pawpaw

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 6** | **Plot #: 5**
Forest Cover Type: Oak/Hickory | **Date:** 24 August 2021
Plot Size: 1/10 Acre (37.5' radius)

	Basal Area in Square Feet per Acre: 70	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Red maple			4			3					1						8
2	White oak			4			3											7
3	Northern red oak						4											4
4	Virginia pine			1			2											3
5	Black gum			1														1
6	Tulip poplar								2									2
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			10			12			2			1			0		25
	Number & Size of Standing Dead Trees	1																1

List of Woody Plant Species 3'-20':	Canopy Closure:						Percent of Invasive Cover per Plot (all layers): 0%	Plot Successional Stage:
black gum, red maple	C	N	E	S	W	%		
	N	Y	Y	Y	Y	80		Mature

List of Understory Species 0'-3':	Understory Cover 3'-20':						List of Major Invasive Species per Plot (All Layers):
Red maple, northern red oak, willow oak, black gum, common greenbrier, hay-scented fern, sweet gum	C	N	E	S	W	%	
	N	N	N	Y	Y	40	

		Herbaceous & Woody Cover 0'-3':						HABITAT: What species present?
Rare, etc. Species?	No	C	N	E	S	W	%	white-tailed deer, raccoon
Specimen Trees?	No	Y	Y	N	Y	Y	80	Habitat size, location, configuration:
Historic Sites?	No							stand surrounded by contiguous forest
Disease?	No							
Insects/Infestation?	No	Downed Woody Debris:						
Exotic Plants?	No	C	N	E	S	W	%	Wildlife cover/food/water?
Leaf litter?	moderate	Y	Y	Y	Y	N	80	food and cover
Downed woody debris:	low							Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Less sloped than areas further east (downstream); little understory but similar canopy composition to other plots.

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 6** | **Plot #: 6**
Forest Cover Type: Oak/Hickory | **Date:** 24 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 70	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1 Red maple			2			2											4
2 White oak			1			3											4
3 Northern red oak						1											1
4 Virginia pine									3		1						4
5 Black gum			5			1											6
6 American Beech			2														2
7 Scarlet oak						1			1								2
8																	0
9																	0
Total Number of Trees per Size Class			10			12			2			1			0		23
Number & Size of Standing Dead Trees		1															1

List of Woody Plant Species 3'-20':
mountain laurel, beech, holly

Canopy Closure:

C	N	E	S	W	%
N	Y	N	N	Y	40

Percent of Invasive Cover per Plot (all layers): 0%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
Highbush blueberry, huckleberry, common greenbrier, sassafras, partridgeberry, mountain laurel, beech, white oak, strawberry, black gum, willow oak (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? No
Leaf litter? moderate
Downed woody debris: low

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	N	Y	80

Downed Woody Debris:

C	N	E	S	W	%
N	N	Y	Y	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Understory (continued):
Virginia pine, sweet gum

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 7** | **Plot #: 1**
Forest Cover Type: Oak/Hickory | **Date:** 25 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 120

SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT

	TREE SPECIES	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
	Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1	Tulip poplar			2			6			4								12
2	Virginia pine									1								1
3	White oak			1			3			3								7
4	Red maple			1						1								2
5	Black gum			1			1											2
6	Northern red oak									1								1
7	Mockernut hickory			1														1
8																		0
9																		0
	Total Number of Trees per Size Class			6			10			10			0			0		26
	Number & Size of Standing Dead Trees								1									1

List of Woody Plant Species 3'-20':
mountain laurel, beech, sassafras

Canopy Closure:

C	N	E	S	W	%
Y	N	Y	Y	Y	80

Percent of Invasive Cover per Plot (all layers): 2%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
Highbush blueberry, huckleberry, common pogonia, sassafras, mountain laurel, willow oak, white oak, deer tongue, black gum, red maple, holly, iron wood (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
N	Y	Y	N	Y	60

List of Major Invasive Species per Plot (All Layers):
Japanese stilt grass

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: moderate

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	Y	N	80

Downed Woody Debris:

C	N	E	S	W	%
Y	N	N	Y	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Lots of common pogonia and Indian cucumber root on the slope to stream.

Understory (continued):
Virginia pine, hay-scented fern, Indian cucumber root

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 7** **Plot #: 2**
Forest Cover Type: Oak/Hickory	**Date:** 25 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

	Basal Area in Square Feet per Acre: 100	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
	TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
	Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1	Scarlet oak									1								1
2	Red maple			1			3			1								5
3	Virginia pine									3								3
4	Tulip poplar						2			1								3
5	Black gum			1														1
6	Black oak													1				1
7	White oak						1											1
8																		0
9																		0
	Total Number of Trees per Size Class			2			6			6			0			1		15
	Number & Size of Standing Dead Trees											1						1

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 0%**	**Plot Successional Stage:**
mountain laurel, beech, black gum	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	N	Y	Y	Y	80		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Highbush blueberry, huckleberry, common greenbrier, glaucous-leaved greenbrier, sassafras, partridgeberry, black gum, Indian cucumber, common pogonia (cont.)	**C**	**N**	**E**	**S**	**W**	**%**	
	N	Y	Y	Y	Y	80	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	Yes							
Historic Sites?	No	Y	Y	Y	N	Y	80	**Habitat size, location, configuration:**
Disease?	No							stand surrounded by contiguous forest
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	Yes	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	moderate	Y	Y	N	N	Y	60	food and cover
Downed woody debris:	moderate							**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments**:**

Specimen black oak is a double trunk with one side dead.
Lots of blueberry in the understory.

Understory (continued): sawtooth viburnum

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 7** **Plot #: 3**
Forest Cover Type: Oak/Hickory	**Date:** 25 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

	Basal Area in Square Feet per Acre: 60	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
	TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
	Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1	Scarlet oak						1											1
2	Black gum			4														4
3	Virginia pine			1			2			2	1							6
4	Tulip poplar			1														1
5	Northern red oak						1											1
6	Black oak			1														1
7																		0
8																		0
9																		0
	Total Number of Trees per Size Class			7			4			2			1			0		14
	Number & Size of Standing Dead Trees					1												1

List of Woody Plant Species 3'-20':
mountain laurel, beech, black gum

Canopy Closure:

C	N	E	S	W	%
N	Y	N	Y	Y	60

Percent of Invasive Cover per Plot (all layers): 0%

Plot Successional Stage:
Mature

List of Understory Species 0'-3':
Highbush blueberry, huckleberry, common greenbrier, partridgeberry, black gum, white oak, black gum, holly, iron wood

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? Yes
Leaf litter? moderate
Downed woody debris: high

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	N	N	60

Downed Woody Debris:

C	N	E	S	W	%
Y	N	Y	N	Y	60

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Northern edge of stand before vegetation composotion change. Large amount of downed pines.

Understory (continued): sawtooth viburnum

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 8** **Plot #: 1**
Forest Cover Type: Tulip Poplar/Red Maple	**Date:** 25 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

Basal Area in Square Feet per Acre: 130	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1 Tulip poplar			1						7		1		2				11
2 American beech			1						1								2
3 Red maple			1			1			1								3
4 Black gum			2														2
5 Willow oak						1											1
6																	0
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			5			2			9			1			2		19
Number & Size of Standing Dead Trees	1						1										2

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 30%**	**Plot Successional Stage:**
	C	**N**	**E**	**S**	**W**	**%**		
	N	Y	N	Y	Y	60		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
	C	**N**	**E**	**S**	**W**	**%**	
Highbush blueberry, partidgeberry, common greenbrier, holly, fan clubmoss, pawpaw, white oak, Virginia pine, Loblolly pine, Virginia creeper, sensitive fern, black gum	Y	Y	Y	Y	Y	100	Japanese stilt grass; Japanese honeysuckle

		Herbaceous & Woody Cover 0'-3':						
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	**HABITAT: What species present?**
Specimen Trees?	Yes							white-tailed deer, raccoon
Historic Sites?	No	Y	Y	Y	N	N	60	**Habitat size, location, configuration:**
Disease?	No							stand surrounded by contiguous forest
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	Yes	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	low	Y	N	Y	N	Y	60	food and cover
Downed woody debris:	low							**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments**:**

Northern edge of stand before vegetation composotion change. Large amount of downed pines.

Understory (continued): sawtooth viburnum

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA) | **Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia | **Stand #: 8** | **Plot #: 2**
Forest Cover Type: Tulip Poplar/Red Maple | **Date:** 25 August 2021
Plot Size: 1/10 Acre (37.5' radius)

Basal Area in Square Feet per Acre: 100	SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT																
	Number of Trees 2-5.9" dbh			Number of Trees 6-11.9" dbh			Number of Trees 12-19.9" dbh			Number of Trees 20-29.9" dbh			Number of Trees >30" dbh			Average Tree Height (ft)	
TREE SPECIES																	
Crown Position	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other	Dom	CoD	Other		Total
1 Tulip poplar			1			4				3							8
2 Black gum			2			2											4
3 Red maple						1											1
4 American beech			1			2		1									4
5 Virginia pine						1		1									2
6 Mockernut hickory						1											1
7																	0
8																	0
9																	0
Total Number of Trees per Size Class			4			11			2			3			0		20
Number & Size of Standing Dead Trees									2								2

List of Woody Plant Species 3'-20':

Canopy Closure:

C	N	E	S	W	%
Y	Y	N	Y	N	60

Percent of Invasive Cover per Plot (all layers): 30%

Plot Successional Stage: Mature

List of Understory Species 0'-3':
Highbush blueberry, partidgeberry, common greenbrier, holly, fan clubmoss, white oak, hay-scented fern, black gum, Christmas fern, cinnamon fern, Rhus spp. (cont.)

Understory Cover 3'-20':

C	N	E	S	W	%
Y	Y	Y	Y	Y	100

List of Major Invasive Species per Plot (All Layers):

Rare, etc. Species? No
Specimen Trees? No
Historic Sites? No
Disease? No
Insects/Infestation? No
Exotic Plants? No
Leaf litter? low
Downed woody debris: high

Herbaceous & Woody Cover 0'-3':

C	N	E	S	W	%
Y	Y	Y	N	Y	80

Downed Woody Debris:

C	N	E	S	W	%
Y	N	Y	Y	Y	80

HABITAT: What species present?
white-tailed deer, raccoon

Habitat size, location, configuration:
stand surrounded by contiguous forest

Wildlife cover/food/water?
food and cover

Stand corridor/patch? continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments:

Specimen tulip poplar within stand, outside of plot.

Understory (continued): Virginia chain fern

FOREST STAND DELINEATION
Field Sampling Data Sheet

Property: Fort Belvoir North Area (FBNA)	**Prepared By: LJ/CLR**
Owner: U.S. Army, Fort Belvoir, Virginia	**Stand #: 8** **Plot #: 3**
Forest Cover Type: (Tulip Poplar/Red Maple	**Date:** 25 August 2021
Plot Size: 1/10 Acre (37.5' radius)	

Basal Area in Square Feet per Acre: 80	**SIZE CLASS OF TREES >20' HEIGHT WITHIN SAMPLE PLOT**																
TREE SPECIES	**Number of Trees 2-5.9" dbh**			**Number of Trees 6-11.9" dbh**			**Number of Trees 12-19.9" dbh**			**Number of Trees 20-29.9" dbh**			**Number of Trees >30" dbh**			**Average Tree Height (ft)**	
Crown Position	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**	**Dom**	**CoD**	**Other**		**Total**
1 Northern red oak									2								2
2 White oak						3			1								4
3 Tulip poplar									1		2						3
4 Scarlet oak									1								1
5 Black gum			3														3
6 Virginia pine									1								1
7 Southern red oak									1								1
8																	0
9																	0
Total Number of Trees per Size Class			3			3			7			2			0		15
Number & Size of Standing Dead Trees		2															2

List of Woody Plant Species 3'-20':	**Canopy Closure:**						**Percent of Invasive Cover per Plot (all layers): 30%**	**Plot Successional Stage:**
mountain laurel, black gum, red maple, beech	**C**	**N**	**E**	**S**	**W**	**%**		
	Y	Y	N	Y	Y	80		Mature

List of Understory Species 0'-3':	**Understory Cover 3'-20':**						**List of Major Invasive Species per Plot (All Layers):**
Highbush blueberry, holly, white oak, sweet gum, red maple, beech, iron wood, common greenbrier	**C**	**N**	**E**	**S**	**W**	**%**	
	Y	Y	Y	Y	Y	100	

		Herbaceous & Woody Cover 0'-3':						**HABITAT: What species present?**
Rare, etc. Species?	No	**C**	**N**	**E**	**S**	**W**	**%**	white-tailed deer, raccoon
Specimen Trees?	No							**Habitat size, location, configuration:**
Historic Sites?	No	Y	Y	N	N	N	40	stand surrounded by contiguous forest
Disease?	No							
Insects/Infestation?	No	**Downed Woody Debris:**						
Exotic Plants?	No	**C**	**N**	**E**	**S**	**W**	**%**	**Wildlife cover/food/water?**
Leaf litter?	moderate							food and cover
Downed woody debris:	moderate	N	Y	Y	N	Y	60	**Stand corridor/patch?** continuous forest

FUNCTION: Where is stand in relation to sensitive areas on site?

Comments**:**

This plot transitioning into more oak-dominated area.

APPENDIX C

Site Photographs

Stand 1, Plot 1

Stand 1, looking south with Virginia pine thicket (outside stand) in background.

Appendix C - Photos

Wetland within Stand 1

Stand 4

Appendix C - Photos

Stand 4

Stand 4, looking north toward Virginia pine thicket

Appendix C - Photos

Stand 5

Stand 5

Stand 6 – robust understory of mountain laurel in Plots 1 and 2

Appendix C - Photos

Stand 6

Stand 6, Plot 5 (western portion of stand with more open understory)

Stand 6

Stand 6

Stand 7

Appendix C - Photos

Stream within Stand 7

Stand 7, Plot 2 – large amount of downed woody debris

Stand 8 – Japanese stilt grass in understory

Appendix C - Photos

Stand 8

Stand 8 – Eastern edge

Appendix C - Photos

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E – SMALL WHORLED POGONIA FIELD STUDY

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, BALTIMORE DISTRICT
2 HOPKINS PLAZA
BALTIMORE, MARYLAND 21201-2930

CENAB-PL-I 4 August 2021

MEMORANDUM FOR: Robert Kobayashi, Senior Project Manager, Real Estate Field Office, U.S. Army Corps of Engineers, Baltimore District, (443) 615-0313, Robert.t.kobayashi@usace.army.mil

SUBJECT: Results of Field Survey for Small Whorled Pogonia on the Fort Belvoir North Area (FBNA), Fort Belvoir, Virginia

1. In support of National Environmental Policy Act (NEPA) documentation for a proposed building on FBNA, biologists from the USACE Planning Division, Fort Belvoir's Department of Public Works (DPW) Environmental Division, and Sean Sipple, a certified surveyor with Coastal Resources, Inc., conducted an overview survey of the approximately xx-acre portion of Fort Belvoir North Area west of Accotink Creek on July 20-21, 2021. The purpose of the field visit was to obtain as much updated information as possible on the current extent of potential suitable habitat, as well as locate the possible presence of small whorled pogonia (SWP) (*Isotria medeoloides*) itself.

2. A vital component of NEPA is compliance with Section 7 of the Endangered Species Act (ESA). The U.S. Fish and Wildlife Service (USFWS) is the agency responsible for administering the ESA for terrestrial species such as the SWP, a small orchid listed as threatened. The USFWS web-based Information for Planning and Consultation (IPaC) allows project proponents to screen for the potential presence of listed species. Through the IPaC and Fort Belvoir's Integrated Natural Resources Management Plan (INRMP), the western portion of FBNA has been identified as potential habitat for the SWP.

3. Consistent with standard practice in Virginia, the accepted survey window for SWP is between June 1 and July 20 of any given year. Given the time constraints of the proposed action, PL-ISB coordinated with the USFWS' Virginia Field Office regarding the acceptability of a limited survey to be conducted 20-21 July, as this was the soonest a certified surveyor could reasonably be mobilized to conduct fieldwork. It was agreed that the subsequent survey would not be represented to USFWS as an official, formal survey pursuant to the Virginia surveyor standards. Rather, the intent was to obtain as much information as possible to facilitate subsequent consultation as the project design and NEPA proceed, without the unacceptable delay of waiting for the 2022 survey window.

4. Prior to commencing the survey, the team of biologists conducted a site reconnaissance to identify areas that would be more suitable based on the habitat requirements of the SWP, thereby ruling out those areas that would be unsuitable and better focusing the investigation. Based on the reconnaissance, the team targeted slopes along existing stream corridors within the estimated project perimeter, as these areas support relatively mature forests dominated by mixed hardwood species. The team included 3 biologists the first day and 4 biologists the second day and

surveyed parallel transects along the stream corridors, spaced approximately 25 feet apart. Areas identified as suitable (see Enclosure 1) were surveyed closer to maximize detection. Any species observed that had a physical similarity to the small whorled pogonia (e.g., Indian cucumber root, *Medeola virginiana*, or common whorled pogonia, *Isotria verticillata*) were carefully inspected, positively identified, and noted. See Enclosure 2 for the CRI memorandum summarizing the field survey, including a list of vegetative species observed. See Enclosure 3 for photographs.

5. Based on habitat requirements from existing literature, habitat suitability was categorized as follows:

- **Unsuitable Habitat** - areas with little or no potential to support SWP due to the lack of forest, early succession stage, very dense understory and herbaceous cover, or presence of wetlands.
- **Marginal Habitat** – areas with some potential to support SWP. These areas were still mature forests but did not contain all of the other habitat requirements for suitable habitat.
- **Suitable Habitat** – areas with a high potential to support SWP, including mature forests on northerly or easterly facing slopes with flat to moderate topography; the presence of species associated with SWP; acidic, sandy soils with low nutrients; an open understory and herbaceous layer; and canopy openings such as a small stream, road, or dead/fallen trees that allow sunlight to reach the forest floor.

These areas are represented spatially in relation to the FBNA study area on Enclosure 1. In addition, another cover type was identified as Unsuitable with Marginal Inclusions. Due to the time constraints, extensive mapping to distinguish unsuitable from marginal within these areas was not feasible.

6. Although some suitable and marginal habitat was identified in the stream corridors, no small whorled pogonias were identified during the survey. Numerous colonies of common whorled pogonia were documented within the suitable small whorled pogonia habitat along the unnamed tributary that flows southeast across the southern portion of the study area.

7. Outside of the stream corridors, the study area consisted of regenerating or young forest dominated by Virginia pine (*Pinus virginiana*) and sweet gum (*Liquidambar styraciflua*) and young mixed hardwood forest with a relatively dense understory consisting of ericaceous shrubs. Most of these areas were considered unsuitable and were not surveyed or surveyed with less effort.

8. This memo does not complete the Section 7 consultation requirements of ESA. Rather, it is intended to provide information for the NEPA and for subsequent USFWS consultation.

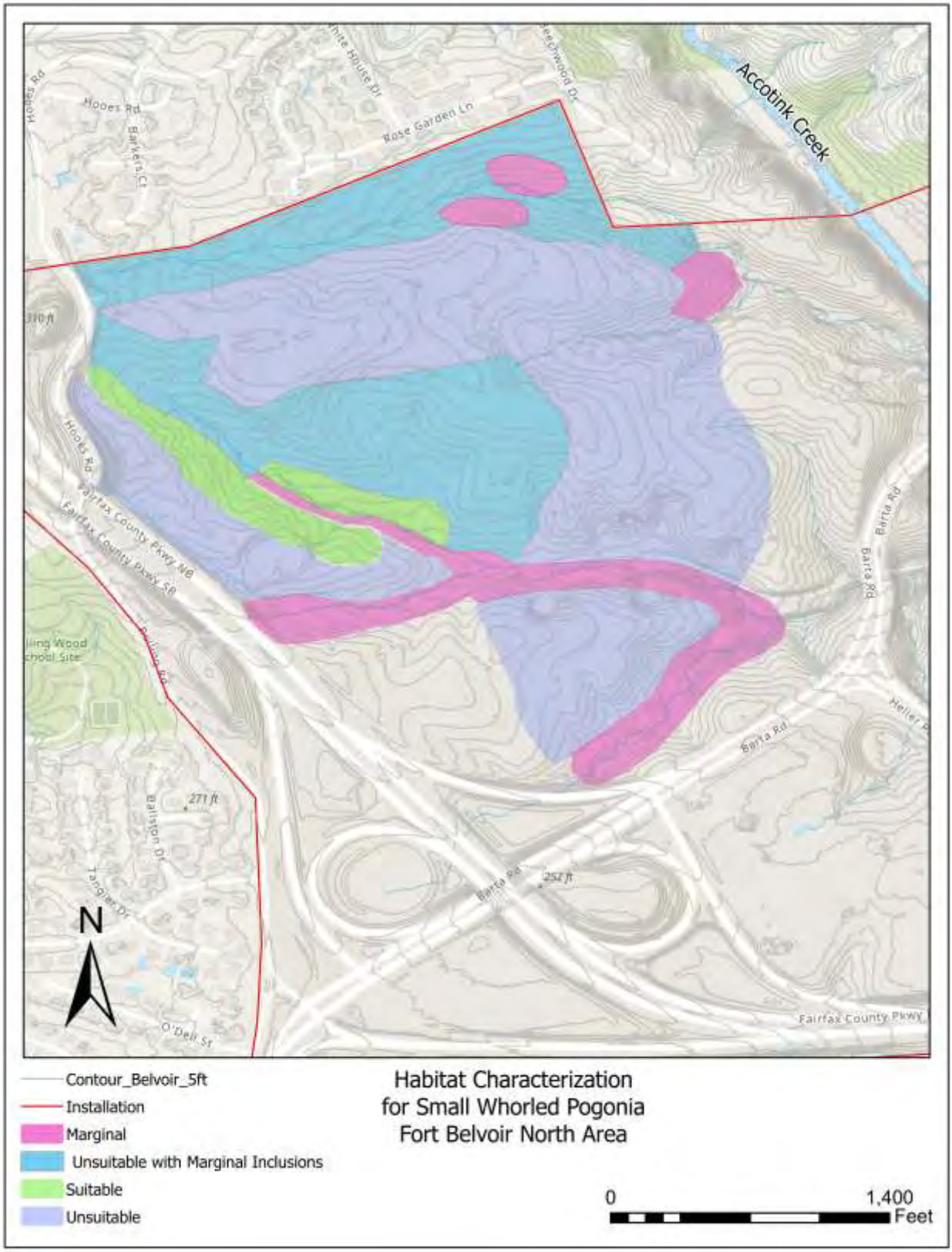
9. Please provide any questions or comments to Ms. Connie Ramsey at 410-962-7783.

MICHAEL J. SCHUSTER
Chief, Installation Support Branch
Planning Division

Encls:
1. Map of Survey Area
2. Memo from CRI dated July 22, 2021
3. Photographs

Enclosure 1:

Map of Survey Area


Accotink Creek
Rose Garden Ln
Hooes Rd
Barkers Ct
Fairfax County Pkwy NB
Fairfax County Pkwy SB
Barta Rd
Ballston Dr
Tangier Dr
O'Dell St
271 ft
252 ft
N
Contour_Belvoir_5ft
Installation
Marginal
Unsuitable with Marginal Inclusions
Suitable
Unsuitable
Habitat Characterization
for Small Whorled Pogonia
Fort Belvoir North Area
0
1,400
Feet

Enclosure 2:

Memo from CRI dated July 22, 2021

Enclosure 3:

Photographs

Common Whorled Pogonia

Indian Cucumber Root

An example of suitable habitat near an unnamed stream within the study area.

An example of marginal habitat.

An example of marginal habitat.

An example of unsuitable habitat.

An example of unsuitable habitat along the installation perimeter.

SMALL WHORLED POGONIA
(*Isotria medeoloides*) SURVEY REPORT

FORT BELVOIR NORTH AREA

FAIRFAX COUNTY, VIRGINIA

JULY 2022

Prepared For:

US Army Corps of Engineers®

Prepared By:

COASTAL RESOURCES INC.

25 Old Solomons Island Road, Annapolis, Maryland 21401

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

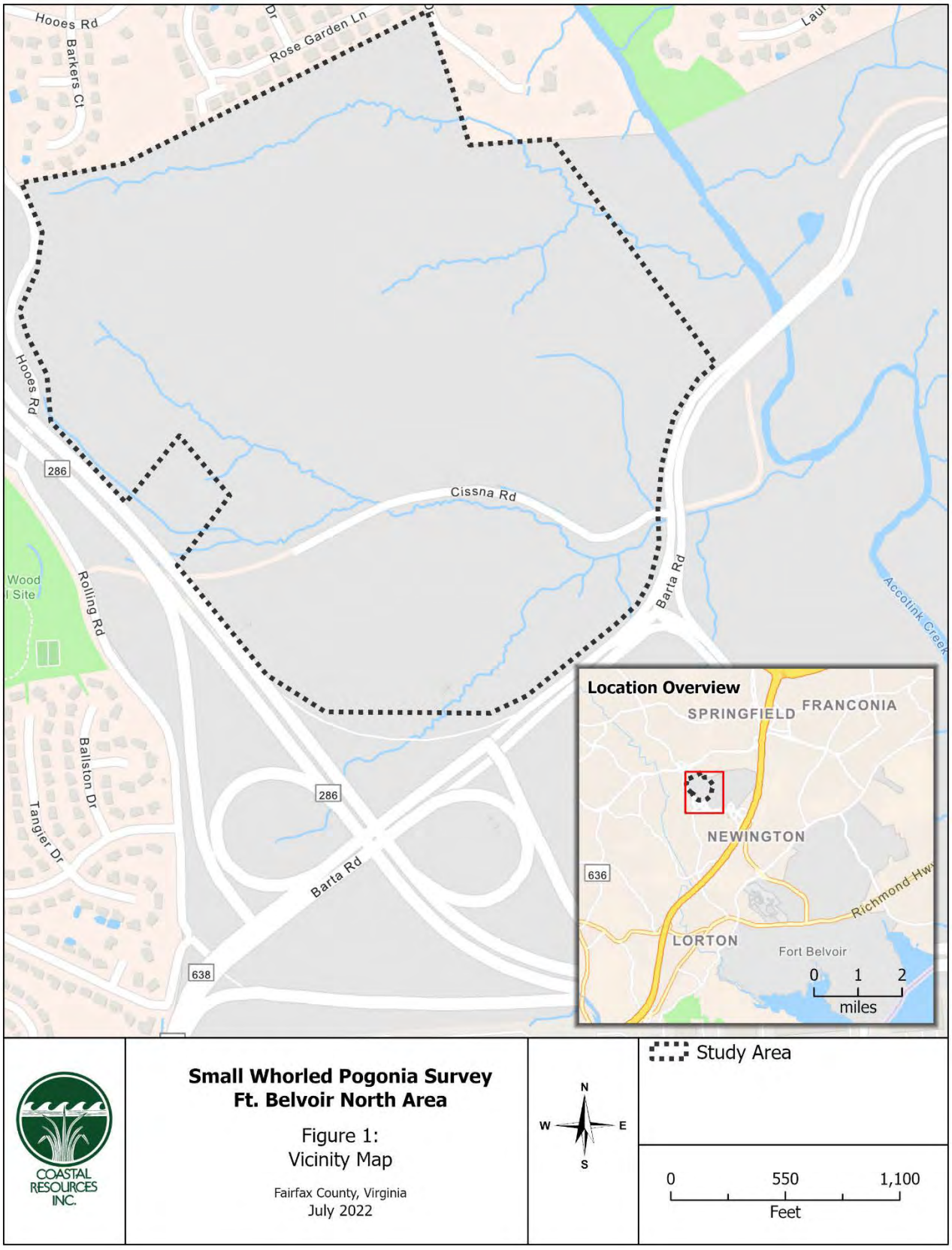
Coastal Resources, Inc. (CRI), under contract with Tehama, LLC, has conducted a search for the small whorled pogonia (*Isotria medeoloides*) within the Fort Belvoir North Area (FBNA) in Fort Belvoir, Fairfax County, Virginia (**Figure 1**). The search was conducted in 2022 within a 100-acre area targeted for a proposed building on FBNA.

The small whorled pogonia is a small terrestrial orchid that grows up to 25 cm, with a whitish-green, glaucous stem that bears a single whorl of 3-8 leaves (Weakley et al. 2012). It occurs in scattered populations in the United States (U.S.) from western Maine to southeastern Missouri and south to northeastern Georgia, but has also been recorded in Ontario, Canada (Fryer 2019). Despite being relatively widespread in the Eastern U.S., extant colonies consist of less than 25 individuals. As a result, the small whorled pogonia was added to the U.S. List of Endangered and Threatened Wildlife and Plants in 1982 as an endangered species but reclassified to threatened in 1994 (USFWS 1994). In Virginia, the small whorled pogonia is known mostly from the Piedmont and Coastal Plain regions but has also been documented in the Cumberland Plateau (Van Alstine et al. 1996). Due to its rarity in Virginia, the small whorled pogonia was listed as endangered in the state in 1985 (Terwilliger 1991).

Throughout its range, the small whorled pogonia grows in a variety of forest types, including mixed deciduous, mixed deciduous-coniferous, and coniferous woodlands and forests (Fryer 2019). In Virginia, the small whorled pogonia can be found in third growth upland forests on northerly or easterly facing slopes that range from being almost level to moderately sloping (Ware 1991). Sites supporting the small whorled pogonia have a distinctly open understory, often found near small forest openings adjacent to a small stream, road, or fallen/dead tree (Mehrhoff, 1989). Soils associated with the small whorled pogonia are acidic sandy loams with low to very low nutrient content (Ware 1991).

Due to the presence of the federally- and state-listed small whorled pogonia at Ft. Belvoir, the U.S. Army Corps of Engineers (USACE) requested that a survey be conducted within FBNA to addresses the Federal Endangered Species Act requirements for the proposed project. A habitat evaluation and limited small whorled pogonia survey was subsequently conducted by the CRI and several USACE personnel on July 20-21, 2021. Because the 2021 survey was conducted outside of the U.S. Fish and Wildlife Service (USFWS) survey window, it was not considered an official survey; rather, it was used to obtain as much information as possible to facilitate starting consultation with the USFWS. Although no small whorled pogonias were identified during the 2021 survey, a total of five areas of marginal or suitable habitat were identified within the stream corridors of FBNA. The results of the 2021 survey were summarized in a memorandum dated August 4, 2021 (USACE 2021). At the request of the USACE, CRI conducted an official survey for the small whorled pogonia in 2022, targeting areas considered marginal and suitable during the 2021 habitat evaluation. This report describes the small whorled pogonia survey methodology, as well as a discussion of the results from the 2022 survey.

Figure 1: Vicinity Map



2.0 Study Area

The study area consists of the entire 100-acre FBNA, including five habitat areas considered marginal or suitable during the 2021 habitat evaluation (**Figure 1**). The study area is gently to moderately sloping to the east towards several unnamed tributaries of Accotink Creek (**Appendix B**). Land cover within the study area consists of a mixture of relatively mature mixed hardwood forest, young mixed hardwood forest, and regenerating forest. Vegetation cover can be seen on the small whorled pogonia survey map include as **Appendix A**. Soils within the study area are mapped as Glenelg silt loam, Barkers Crossroads-Rhodhiss complex, Kingstowne-Sassafras complex, Nathalie gravelly loam, Rhodhiss sandy loam, Sassafras-Marumsco complex, and Beltsville silt loam (**Appendix C**).

3.0 Methods

The survey was conducted on June 21, 2022 during the USFWS optimal survey period for the small whorled pogonia (i.e., June 1 – July 20). The search was led by Sean D. Sipple (CRI), a USFWS Qualified Surveyor for the small whorled pogonia. Megan Niehaus and Megan Bolcar with CRI and John Pilcicki, Dan Cockerhan, and Christina Olson with the USACE assisted with the survey. CRI also visited a known population of small whorled pogonia in Prince William County to ensure that the species had sufficiently emerged, to examine its appearance in relation to other similar species (e.g., Indian cucumber (*Medeola virginiana*)), and to observe optimal habitat conditions. CRI observed multiple small whorled pogonia individuals at the known site in Prince William County (**Appendix D, Photo 17**).

During the FBNA survey, the six surveyors systematically searched areas within the study area previously determined to be suitable or marginal for small whorled pogonias. Suitable habitats consisted of areas with a high potential to support small whorled pogonias, including mature forests on northerly or easterly facing slopes with flat to moderate topography; the presence of species associated with small whorled pogonia; acidic, sandy soils with low nutrients; an open understory and herbaceous layer; and canopy openings such as a small stream, road, or dead/fallen trees that allow sunlight to reach the forest floor. Marginal habitats consisted of areas with some potential to support small whorled pogonias. These areas were still mature forests but did not contain all the other habitat requirements listed for suitable habitat. All other habitats were not surveyed since they were considered unsuitable. These areas had little or no potential to support small whorled pogonias due to the lack of forest, early succession stage, very dense understory and herbaceous cover, or presence of wetlands. Photos of unsuitable habitats not surveyed are included in **Appendix D**.

Habitats considered marginal or suitable were systematically searched for small whorled pogonias using parallel transects spaced between 15 and 25 feet apart, depending on suitability, to maximize detection. Any plant species morphologically similar to the small whorled pogonia, such as Indian cucumber and common whorled pogonia (*I. verticillata*), were carefully inspected and positively identified.

4.0 Results

No small whorled pogonias were documented within the five habitat areas surveyed in 2022. A summary of the plant community and dominant species observed within each habitat area are provided below. Site

photographs are included in **Appendix D**. **Appendix E** includes a list of the flora observed in each habitat area during the survey.

Marginal Habitat Areas

Habitat Area 1 consisted of a mature mixed deciduous forest dominated by white oak (*Quercus* alba) and tulip tree (*Liriodendron tulipifera*). Co-dominant trees included pignut hickory (*Carya glabra*) and red maple (*Acer rubrum*). The understory in this stand was relatively dense, dominated by American beech (*Fagus grandifolia*) and red maple. Soils in this area are mapped as Rhodhiss sandy loam, 25 to 45 percent slopes; Glenelg silt loam, 7 to 15 percent slopes; and Nathalie gravelly loam, 7 to 15 percent slopes. Soil pH values for these mapped soils range from 3.6 – 6.0, 4.5 – 6.5, and 3.6 – 6.5, respectively. 53 plant species were observed in this area, including numerous individuals of Indian cucumber (**Appendix E)**. Photo 1 in **Appendix D** depicts this marginal habitat area.

Habitat Area 2 consisted of a mature mixed deciduous forest dominated by red maple and tulip tree. The understory in this stand was relatively dense, with dominant species including river birch (*Betula nigra*), Virginia pine (*Pinus virginiana*), and sweetgum (*Liquidambar styraciflua*). Numerous individuals of Indian cucumber were also observed. Soils in this area are mapped as Sassafras-Marumsco complex, 25 to 45 percent slopes, with soil pH values ranging from 3.6 - 5.5. A total of 34 plant species were documented in this area (**Appendix E)**. Photo 3 in **Appendix D** depicts this marginal habitat area.

Habitat Area 3 consisted of a mature mixed deciduous forest dominated by tulip tree and white oak. The relatively dense understory in this stand was dominated by American beech, red maple, and pignut hickory. Soils in this area are mapped as Sassafras-Marumsco complex, 25 to 45 percent slopes; Beltsville silt loam, 2 to 7 percent slopes; Glenelg sit loam, 7 to 15 percent slopes; and Rhodhiss sandy loam, 25 to 45 percent slopes. Soil pH values range from 3.6 – 5.5, 4.0 – 5.5, 4.5 – 6.5, and 3.6 – 6.0, respectively. A total of 35 plant species were documented in this area, including numerous individuals of Indian cucumber (**Appendix E)**. Photo 5 in **Appendix D** depicts this marginal habitat area.

Habitat Area 4 also consisted of a mature mixed deciduous forest dominated by tulip tree and white oak, with a relatively dense understory dominated by American beech, red maple, and pignut hickory. Soils in this area are mapped as Glenelg silt loam, 7 to 15 percent slopes; Sassafras-Marumsco complex, 7 to 15 percent slopes; Sassafras-Marumsco complex, 15 to 25 percent slopes; Beltsville silt loam, 2 to 7 percent slopes; Rhodhiss sandy loam, 15 to 25 percent slopes; Rhodiss sandy loam, 25 to 45 percent slopes; and Nathalie gravelly loam, 7 to 15 percent slopes. Soil pH values for these mapped soils range from 4.5 – 6.5, 3.6 – 5.5, 3.6 – 5.5, 4.0 – 5.5, 3.6 – 6.0, 3.6 – 6.0, and 3.6 – 6.5, respectively. A total of 61 plant species were documented in this area, including numerous individuals of Indian cucumber and common whorled pogonia (**Appendix E)**. Photos 7 and 9 in **Appendix D** depict this marginal habitat area.

Suitable Habitat Areas

Habitat Area 5 consisted of a mature mixed deciduous forest dominated by tulip tree and white oak. The understory in this stand was dominated by black gum (*Nyssa sylvatica*) and red maple. Both the understory and ground cover within this area were relatively open. Soils in this area are mapped as Glenelg silt loam, 7 to 15 percent slopes; Sassafras-Marumsco complex, 7 to 15 percent slopes; and Sassafras-Marumsco complex, 15 to 25 percent slopes. Soil pH values range from 4.5 – 6.5, 3.6 – 5.5, and 3.6 – 5.5, respectively. A total of 48 plant species were observed in this area, including numerous

populations of Indian cucumber and common whorled pogonia (**Appendix E)**. Photos 10-12 in **Appendix D** depict this suitable habitat area.

5.0 Conclusions

A search for the small whorled pogonia was conducted on five habitat areas found within a 100-acre area targeted for a proposed building on FBNA in Fairfax County, Virginia. Although numerous common whorled pogonias were identified during the survey, no state- and federally listed small whorled pogonias were found. Surveys for the small whorled pogonia are valid for a period of two years based on USFWS guidelines.

6.0 Literature Cited

Fryer, Janet L. 2019. *Isotria medeoloides*, small whorled pogonia and *Isotria verticillata*, large whorled pogonia. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer). Available: www.fs.fed.us/database/feis/plants/forb/isospp/all.html

Mehrhoff, L. A. 1989. Reproductive Vigor and Environmental Factors in Populations of an Endangered North American Orchid, *Isotria medeoloides* (Pursh) Rafinesque. *Biological Conservation* 47:281-296.

Terwilliger, K. (coord.). 1991. *Virginia's Endangered Species: Proceedings of a Symposium.* The McDonald and Woodward Publishing Co., Blacksburg, VA. 672 pages.

U.S. Fish and Wildlife Service (USFWS). 1994. Endangered and Threatened Wildlife and Plants; Final Rule to Reclassify the Plant *Isotria medeoloides* (Small Whorled Pogonia) From Endangered to Threatened. *Federal Register* 59(193):50852-50857.

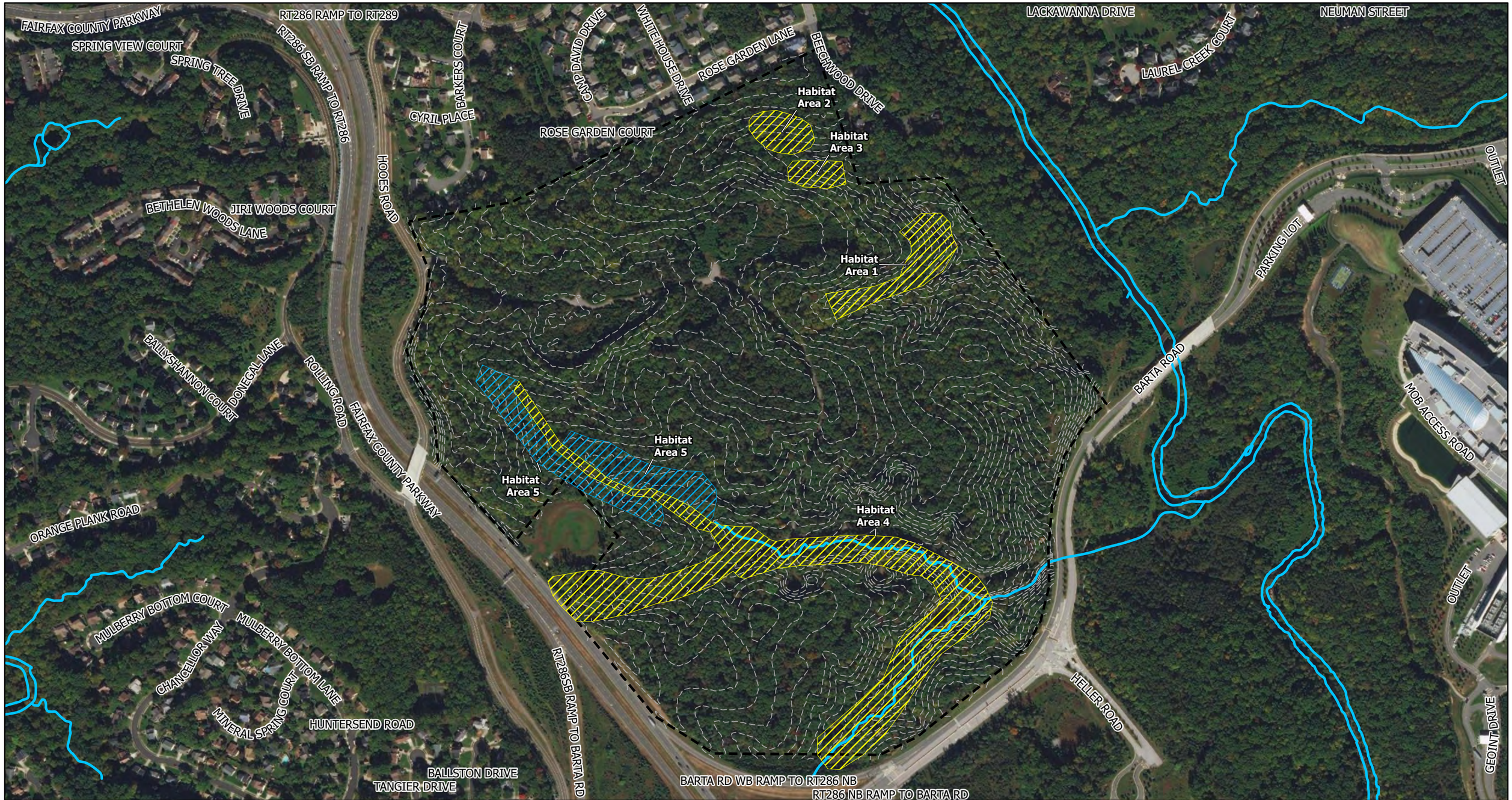
U.S. Army Corps of Engineers. 2021. Results of Field Survey for Small Whorled Pogonia on the Fort Belvoir North Area (FBNA), Fort Belvoir, Virginia. Prepared by the U.S. Army Corps of Engineers on August 4, 2021.

Van Alstine, Nancy E., W. H. Moorhead III, A. Belden, Jr., T. J. Rawinski, and J. C. Ludwig 1996. Recently Discovered Populations of Small Whorled Pogonia (*Isotria medeoloides*) in Virginia. *Banisteria* 7: 1-15.

Ware, D. M. E. 1991. Species Account: Small Whorled Pogonia. Pages 95-97 *in* K. Terwilliger (coord.), *Virginia's Endangered Species: Proceedings of a Symposium.* The McDonald and Woodward Publishing Co., Blacksburg, VA. 672 pages.

Weakley, A.S., J.C. Ludwig, and J.F. Townsend. 2012. Flora of Virginia. Bland Crowder, ed. Foundation of the Flora of Virginia Inc., Richmond. Fort Worth: Botanical Research Institute of Texas Press.

APPENDIX A: SMALL WHORLED POGONIA SURVEY MAP



COASTAL RESOURCES INC.

Small Whorled Pogonia Survey
Ft. Belvoir North Area

Appendix A:
Small Whorled Pogonia Survey Map

Fairfax County, Virginia
July 2022

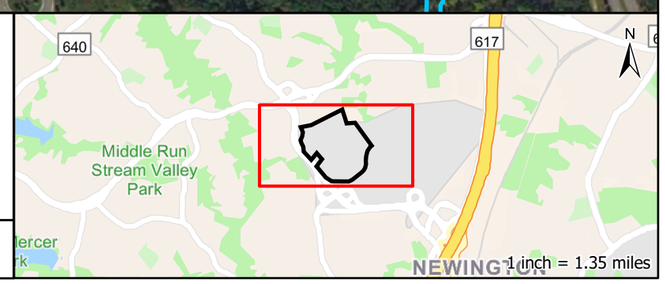
Study Area
5' Contour
Perennial Stream

Habitat Type
Suitable
Marginal

N
W E
S

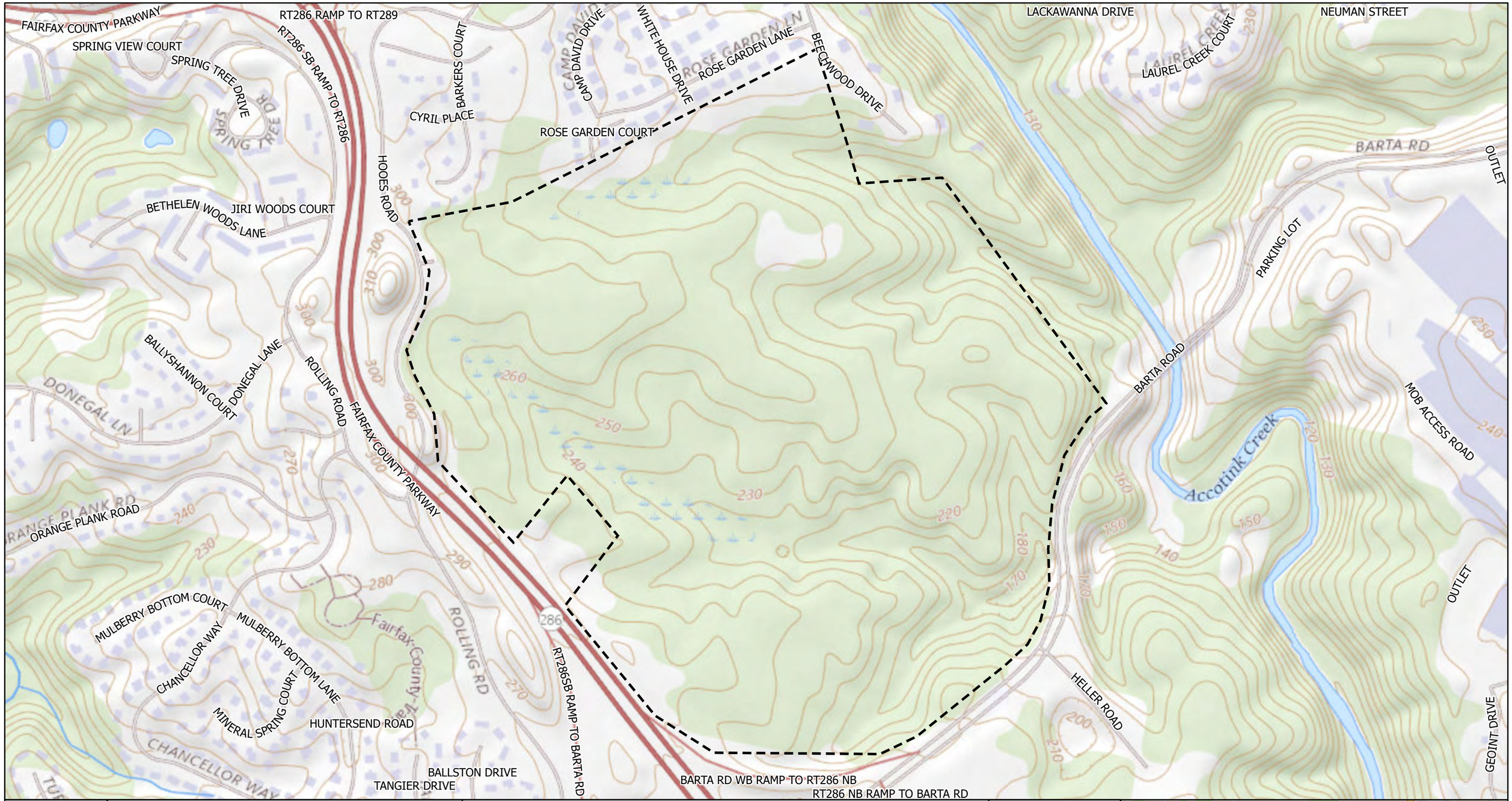
0 200 400
feet
1 inch = 435 feet

Map Center, NAD83
38.7533°, -77.209°



Source: Large-scale map: Esri, Maxar, Earthstar Geographics, and the GIS User Community. Received July 2022. Small-scale map: Esri, HERE, Garmin, FAO, NOAA, USGS, OpenStreetMap contributors, and the GIS user community. Received July 2022.

APPENDIX B: USGS TOPOGRAPHIC QUADRANGLE MAP



Small Whorled Pogonia Survey
Ft. Belvoir North Area

Appendix B:
USGS Topography Map

Fairfax County, Virginia
July 2022

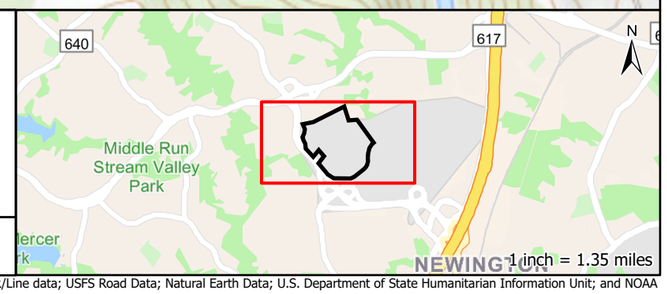
COASTAL RESOURCES INC.

Study Area

N
W E
S

0 200 400
feet
1 inch = 435 feet

Map Center, NAD83
38.7533°, -77.209°



Source: Large-scale map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed August, 2021. Received July 2022. Small-scale map: Esri, HERE, Garmin, FAO, NOAA, USGS, OpenStreetMap contributors, and the GIS user community. Received July 2022.

APPENDIX C: NRCS SOIL SURVEY MAP

Map Unit Symbol	Map Unit Name
39B	Glenelg silt loam, 2 to 7 percent slopes
39C	Glenelg silt loam, 7 to 15 percent slopes
5E	Barkers Crossroads-Rhodhiss complex, 25-45 percent slopes
70C	Kingstowne-Sassfras complex, 7 to 15 percent slopes
79B	Nathalie gravelly loam, 2 to 7 percent slopes
79C	Nathalie gravelly loam, 7 to 15 percent slopes
79D	Nathalie gravelly loam, 15 to 25 percent slopes
7B	Beltsville silt loam, 2 to 7 percent slopes
87D	Rhodhiss sandy loam, 15 to 25 percent slopes
87E	Rhodhiss sandy loam, 25 to 45 percent slopes
91C	Sassafras-Marumsco complex, 7 to 15 percent slopes
91D	Sassafras-Marumsco complex, 15 to 25 percent slopes
91E	Sassafras-Marumsco complex, 25 to 45 percent slopes
92B	Sassafras-Neabsco complex, 2 to 7 percent slopes

COASTAL RESOURCES INC.

Small Whorled Pogonia Survey
Ft. Belvoir North Area

Appendix C:
NRCS Soil Survey Map

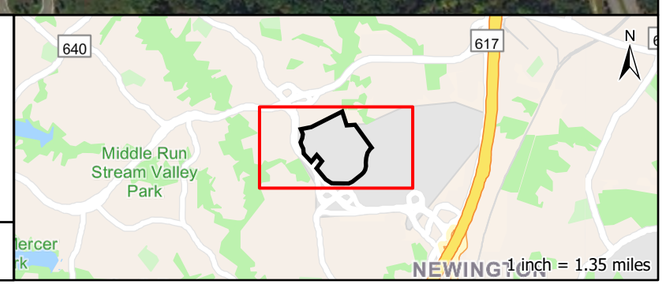
Fairfax County, Virginia
July 2022

Study Area NRCS Mapped Soil

N W E S

0 200 400
feet
1 inch = 435 feet

Map Center, NAD83
38.7533°, -77.209°



Source: Large-scale map: Esri, Maxar, Earthstar Geographics, and the GIS User Community. Received July 2022. Small-scale map: Esri, HERE, Garmin, FAO, NOAA, USGS, OpenStreetMap contributors, and the GIS user community. Received July 2022.

APPENDIX D: SITE PHOTOGRAPHS

Appendix D: Photo Log for Small Whorled Pogonia Survey

Photo 1 – Looking east at Habitat Area 1, which consists of marginal habitat for the small whorled pogonia on the northeastern portion of the study area.

Photo 2 – Indian cucumber root identified during the search in Habitat Area 1.

Appendix D: Photo Log for Small Whorled Pogonia Survey

Photo 3 – Looking northwest at marginal habitat in Habitat Area 2 on the northeastern portion of the study area.

Photo 4 – Looking southwest at unsuitable habitat bordering Area 2 on the northeastern portion of the study area.

Photo 5 – Looking east at marginal habitat within Area 3 on the northeastern portion of the study area.

Photo 6 – Looking north at unsuitable habitat on the northeastern portion of the study area.

Photo 7 – Looking northwest at marginal habitat in Habitat Area 4 on the southeastern portion of the study area.

Photo 8 – Common whorled pogonia found in marginal habitat in Habitat Area 4.

Photo 9 – Looking east at marginal habitat in Habitat Area 4 on the southeastern portion of the study area.

Photo 10 – Looking west at suitable habitat in Habitat Area 5 on the southwestern portion of the study area.

Photo 11 – Common whorled pogonia found in suitable habitat within Area 5.

Photo 12 – Looking southeast at suitable habitat in Area 5 on the southwestern portion of the study area.

Photo 13 – Looking north at unsuitable habitat on the south-central portion of the study area.

Photo 14 – Looking east at unsuitable habitat on the south-central portion of the study area.

Photo 15 – Looking south at unsuitable habitat on the north-central portion of the study area.

Photo 16 – Looking north at unsuitable habitat on the northwestern portion of the study area.

Photo 17 – Small whorled pogonia identified at the location of a known population in Prince William County, Virginia.

Photo 18 – Suitable habitat at the location of a known population of small whorled pogonia in Prince William County, Virginia.

APPENDIX E: LIST OF FLORA OBSERVED IN STUDY AREA

Appendix E - List of Flora Observed in Study Area						
		Habitat 1	Habitat 2	Habitat 3	Habitat 4	Habitat 5
Trees						
Acer rubrum	Red Maple	X	X	X	X	X
Amelanchier canadensis	Canada Service-Berry	X	X	X	X	X
Betula nigra	River birch		X			
Carpinus carolineana	American Hornbeam	X		X		
Carya glabra	Pignut Hickory	X		X	X	X
Carya tomentosa	Mockernut Hickory		X		X	
Cornus florida	Flowering Dogwood			X	X	
Diospyros virginiana	Persimmon	X				
Fagus grandifolia	American Beech	X	X	X	X	X
Fraxinus pennsylvanica	Green Ash	X				
Ilex opaca	American Holly	X	X	X	X	X
Liquidambar styraciflua	Sweetgum		X	X	X	X
Liriodendron tulipifera	Tuliptree	X	X	X	X	X
Nyssa sylvatica	Black Gum	X	X	X	X	X
Pinus virginiana	Virginia Pine	X	X	X	X	X
Prunus serotina	Black Cherry	X	X			
Quercus alba	White Oak	X	X	X	X	X
Quercus falcata	Southern Red Oak	X	X	X	X	X
Quercus phellos	Willow Oak	X	X		X	X
Quercus rubra	Northern Red Oak			X	X	
Quercus velutina	Black Oak	X	X	X		
Sassafras albidum	Sassafras	X	X	X	X	X
Shrubs						
Asimina triloba	Common Pawpaw	X	X		X	X
Berberis thunbergii	Japanese Barberry	X				
Chionanthus virginicus	White Fringetree				X	
Eubotrys racemosa	Swamp Deciduous-Doghobble				X	X
Euonymus americanus	American Strawberry-Bush	X		X	X	X
Gaylussacia boccata	Black Huckleberry				X	X
Gaylussacia frondosa	Blue Huckleberry					X
Ilex verticillata	Winterberry				X	X
Hamamelis virginiana	American Witch-Hazel				X	
Kalmia latifolia	Mountain-Laurel	X		X	X	X
Rhododendron sp.	Unknown Azalea	X			X	X
Rosa multiflora	Multiflora Rose	X				
Rubus phoenicolasius	Wine Raspberry	X				
Rubus sp.	Unknown Blackberry	X				
Vaccinium corymbosum	Highbush Blueberry	X	X	X	X	X
Vaccinium pallidum	Early Lowbush Blueberry	X	X	X	X	X
Vaccinium staminium	Deerberry		X	X		X
Viburnum acerifolium	Maple-leaf Arrow-wood	X	X	X	X	X
Viburnum dentatum	Southern Arrow-wood		X		X	
Viburnum nudum	Possum-haw				X	
Woody Vines						
Celastrus orbiculatus	Oriental bittersweet	X			X	
Lonicera japonica	Japanese Honeysuckle		X		X	
Parthenocissus quinquefolia	Virginia Creeper	X	X	X		X

Appendix E - List of Flora Observed in Study Area						
Smilax glauca	Catbrier	X	X		X	X
Smilax rotundifolia	Common Greenbrier	X	X	X	X	X
Toxicodendron radicans	Poison Ivy	X	X			X
Vitis labrusca	Fox Grape				X	
Wisteria sinensis	Chinese Wisteria	X				
Herbs						
Amphicarpaea bracteata	American Hog-Peanut	X		X	X	
Arisaema triphyllum	Jack-in-the-Pulpit	X			X	
Athyrium filix-femina	Common Ladyfern					X
Boehmeria cylindrica	Small-Spike False Nettle				X	
Carex intumescens	Greater Bladder Sedge				X	
Carex lurida	Shallow Sedge					X
Chasmanthium laxum	Slender Wood-Oats				X	X
Chimaphila maculata	Striped Wintergreen	X	X	X	X	X
Dennstaedtia punctilobula	Hay-Scented Fern	X	X			
Dichanthelium clandestinum	Deer-Tongue Rosette Grass	X		X	X	
Dioscorea villosa	Wild Yam	X			X	X
Diphasiastrum digitatum	Fan-creeping Cedar		X			X
Eurybia divaricata	White Wood Aster				X	
Galium circaezans	Licorice Bedstraw	X			X	
Glyceria striata	Fowl Mannagrass					X
Goodyera pubescens	Downy Rattlesnake-Plantain				X	
Isotria verticillata	Common Whorled Pogonia				X	X
Juncus effusus	Common Rush					X
Lactuca sp.	Lettuce sp.				X	
Leersia virginica	White Grass				X	X
Liparis liliifolia	Lily-leaved Twayblade				X	
Maianthemum racemosum	Feathery False Solomon's-Seal	X		X	X	X
Medeola virginiana	Indian Cucumber	X	X	X	X	X
Microstegium vimineum	Japanese Stiltgrass	X	X	X	X	X
Mitchella repens	Partridge-berry	X	X	X	X	X
Monotropa uniflora	One-Flower Indian-Pipe	X				
Osmundastrum cinnamomeum	Cinnamon Fern	X		X		X
Parathelypteris noveboracensis	New York Fern	X	X	X	X	X
Podophyllum peltatum	Mayapple	X			X	
Polygonatum biflorum	Solomon's Seal	X		X	X	X
Polypodium virginianum	Rock Polypody				X	
Polystichum acrostichoides	Christmas Fern	X		X		X
Salvia lyrata	Lyre-Leaf Sage				X	
Scirpus atrovirens	Dark-Green Bulrush				X	
Uvularia sessilifolia	Sessile-Leaf Bellwort	X			X	X
Viola hirsutula	Southern Wood Violet	X				
Woodwardia areolata	Netted Chain Fern					X

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F – NORTHERN LONG-EARED BAT STUDY

2022 Bat Survey of Northern Fort Belvoir, Virginia

Prepared for:

John Pilcicki
Fort Belvoir

Prepared by:

Eric Britzke, Ph.D.
Research Wildlife Biologist
US Army Engineer Research and Development Center
Building 3270, Room 1218
3909 Halls Ferry Road
Vicksburg, MS 39180

June 16, 2022

Introduction

Bat conservation and management has become a major concern on state, federal, and private lands throughout the United States. Bats represent an important component of many ecosystems and contribute significantly to an area's biodiversity. Bats have a higher proportion that are considered rare, sensitive, threatened or endangered within some regulatory or assessment framework than for any other group of mammals in North America. Reasons for these listings range from loss of roosting and/or foraging habitat, pesticides, persecution, and disturbance of hibernacula (Racey and Entwistle 2003).

Recently, wind energy development (Johnson et al. 2003, Fiedler 2004, Arnett et al. 2008) and White-nose Syndrome (WNS) have emerged as additional threats (USGS 2008). WNS is an emerging disease that is responsible for the death of over 6 million hibernating bats. These declines has resulted in the listing of the once common northern long-eared bat (*Myotis septentrionalis*) as federally endangered in 2015. Mortality rates observed at wind energy production facilities have been variable, but at 1 facility in West Virginia, > 40 bats per turbine per year have been killed, including the Lasurine or "tree" species not believed to be impacted by WNS (Arnett et al. 2008). As bat populations continue to experience stress from these sources, understanding of bat distributions becomes more important.

Bats in the eastern United States use echolocation to orient to their surroundings and to locate prey. Ultrasonic detectors are now widely available and allows researchers to detect echolocation calls to assist in studies of bat ecology. Research has shown the presence of species-specific echolocation calls exists for many species (Krusic and Neefus 1996, Britzke et al. 2011). Ultrasonic detectors have many advantages over mist netting, including detection of more species at a site than mist nets (Murray et al. 1999, O'Farrell and Gannon 1999), sampling

multiple sites without a researcher present, and sampling habitats that lack a constricted flyway necessary for traditional capture techniques. Use of ultrasonic detectors has the potential to increase detectability of some species, thereby improving the efficiency of bat surveys. This has prompted the US Fish and Wildlife Service to incorporate acoustic surveys into the survey guidance for federally listed bats species in the eastern United States.

Installations within the Department of Defense (DoD) are required to balance needs of the Mission as well as stewardship of natural resources. Recently, military installations have undertaken actions to inventory and manage bats on their lands. In order to assess potential regulatory impacts, installation managers must have an understanding of what bat species are present on proposed project areas.

Methods

Fort Belvoir covers approximately 8,650 acres in Fairfax County, VA. The proposed project area was sampled for presence of the northern long-eared bat using the USFWS 2021 Bat Survey guidance. Bat activity was recorded using Anabat Swift bat detector systems (Titley Scientific; www.titley-scientific.com). Prior to initial deployment, units were calibrated using an ultrasonic pest repeller following Larson and Hayes (2000). Sampling was only conducted on nights when temperatures were high enough to maintain bat activity, there was no precipitation, and wind speed was minimal.

Detectors were placed at 17 sites in the proposed project areas on Fort Belvoir in an attempt to conduct a complete bat survey of the property. Detectors were deployed on a tripod (Fig 1) and were set to record from sunset to sunrise. Some detectors were also housed in weatherproof boxes.

Figure 1. Example of Anabat Swift bat detector setup for recording at Fort Belvoir, Virginia during May 2022

Data analysis

Upon completion of 2-3 nights with suitable weather conditions (depending on the number of units deployed in each habitat block), equipment was picked up and the SD card was removed. Downloaded files were organized by site and analyzed using the Kaleidoscope v5.4.6 automated analysis program. The program filters files, extracts parameters, and classifies files based on statistical comparison to a known call library. The species set was picked to include all bat species that are possible on Fort Belvoir (Appendix A). An output file is created that summarizes the bat activity at the site as well as determines species presence using a maximum likelihood estimator (Britzke et al. 2002).

Results

A total of 17 sites were sampled for a total of 35 detector nights across the project area (Figure 2). Recording resulted in sampling of 4,692 files (mean = 130; range 3-458 files/night). A total of 2 bat species were determined to be present through manual vetting of recorded echolocation calls. Red bats were detected at all 17 sites, while big brown bats were detected at 11 sites. Due to the similarity of calls between big brown bats and silver-haired bats, these species were combined and called big brown because they are more common residents of the area during the summer maternity period.

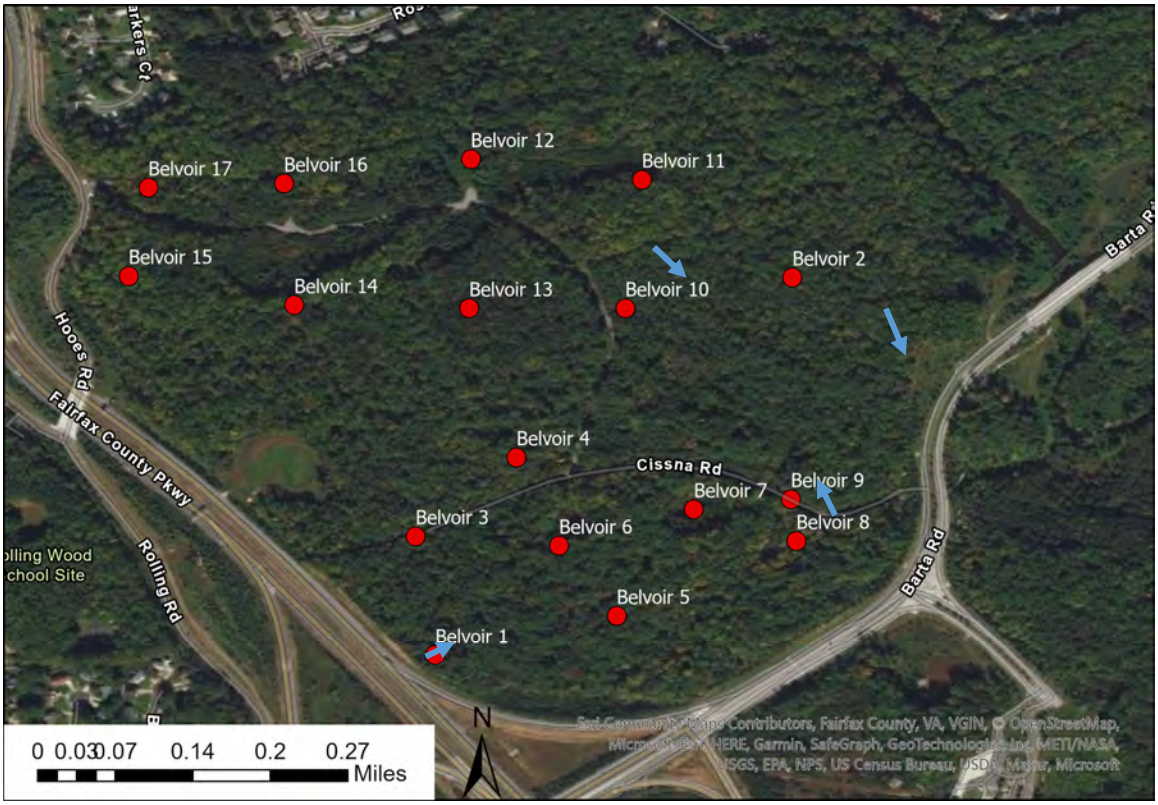


Figure 2. Location of the 17 sites sampled in May 2022 on Fort Belvoir.

Table 1. Results of the Anabat bat survey conducted at Fort Belvoir, Virginia in May 2022.

Location	Date	Total # of files	Bat species detected
Site1			
	5/24/2022	52	Eastern red
	5/25/2022	220	Big brown, Eastern red
Site2			
	5/24/2022	194	Eastern red
	5/25/2022	82	Big brown, Eastern red
Site3			
	5/24/2022	110	Big brown, Eastern red
	5/25/2022	108	Eastern red
Site4			
	5/24/2022	69	Eastern red
	5/25/2022	30	Eastern red
Site5			
	5/24/2022	11	Eastern red
	5/25/2022	118	Eastern red
Site6			
	5/24/2022	10	Big brown, Eastern red
	5/25/2022	107	Big brown, Eastern red
Site7			
	5/24/2022	Equip.	None
	5/25/2022	14	Eastern red
Site8			
	5/24/2022	84	Big brown, Eastern red
	5/25/2022	355	Big brown, Eastern red
Site9			
	5/24/2022	13	Eastern red
	5/25/2022	191	Big brown, Eastern red
Site10			
	5/24/2022	118	Eastern red
	5/25/2022	296	Eastern red
Site11			
	5/24/2022	3	None
	5/25/2022	38	Eastern red
	5/26/2022	270	Big brown, Eastern red
Site12			
	5/24/2022	31	Big brown, Eastern red
	5/25/2022	48	Big brown, Eastern red
	5/26/2022	49	Big brown, Eastern red
Site13			
	5/24/2022	8	Big brown, Eastern red
	5/25/2022	95	Big brown, Eastern red
	5/26/2022	458	Big brown, Eastern red

Site14			
	5/25/2022	59	Big brown, Eastern red
	5/26/2022	413	Eastern red
Site15			
	5/25/2022	150	Eastern red
	5/26/2022	276	Big brown, Eastern red
Site16			
	5/25/2022	128	Eastern red
	5/26/2022	89	Eastern red
Site17			
	5/25/2022	188	Eastern red
	5/26/2022	207	Eastern red

Discussion

Activity levels varied substantially throughout the sites sampled throughout the proposed project. Multiple sites included larger mature hardwood trees with numerous potential roost sites observed. However, likely due to the population declines from White Nose Syndrome, no listed bat species were detected in this survey. Detection of red bats and big browns bats was expected as these bat represent the vast majority of captures form mist nets and acoustic recording on Fort Belvoir in recent years (unpublished data).

Acknowledgements

This project was funded by the Baltimore District of the Corps of Engineers. John Pilcicki assisted with all aspects of the project including planning, locating sites, and serving as a guide.

Literature Cited

Arnett, E. B., K. Brown, W. P. Erickson, J. K. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. J. O'Connell, M. D. Piorkowski,

and R. D. Tankersley JR. 2008. Patterns of bat fatalities at wind energy facilities in North America. *Journal of Wildlife Management* 72:61-78.

Britzke, E. R., J. E. Duchamp, K. L. Murray, L. W. Robbins, and R. K. Swihart. 2011. Acoustic identification of bats in the eastern United States: A comparison of parametric and nonparametric methods. *Journal of Wildlife Management* 75:660-667.

Britzke, E. R., K. L. Murray, J. S. Heywood, and L. W. Robbins. 2002. Acoustic identification. Pp. 220-224 in The Indiana bat: biology and management of an endangered species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, TX.

Fiedler, J. K. 2004. *Assessment of Bat Mortality and Activity at Buffalo Mountain Windfarm, Eastern Tennessee*. University of Tennessee Knoxville, TN (MS thesis).

Johnson, G. D., W. P. Erickson, and M. D. Strickland. 2003. Mortality of bats at a large-scale wind power development at Buffalo Ridge, Minnesota. *American Midland Naturalist* 150:332-42.

Krusic, R. A. and C. D. Neefus. 1996. Habitat associations of bat species in the White Mountains National Forest. Pp. 185-198 in *Bats and Forest Symposium* (R. M. R. Barclay and R. M. Brigham, eds.). British Columbia Ministry of Forests, Victoria, British Columbia, Canada.

Larson D.J., and J.P. Hayes. 2000. Variability in sensitivity of Anabat II bat detectors and a method of calibration. *Acta Chiropterologica* 2:209-213.

Murray, K. L., E. R. Britzke, B. M. Hadley, and L. W. Robbins. 1999. Surveying bat communities: a comparison between mist nets and the Anabat II bat detector system. *Acta Chiropterologica* 1:105-112.

O'Farrell, M. J. and W. L. Gannon. 1999. A comparison of acoustic versus capture techniques for the inventory of bats. *Journal of Mammalogy* 80:24-30.

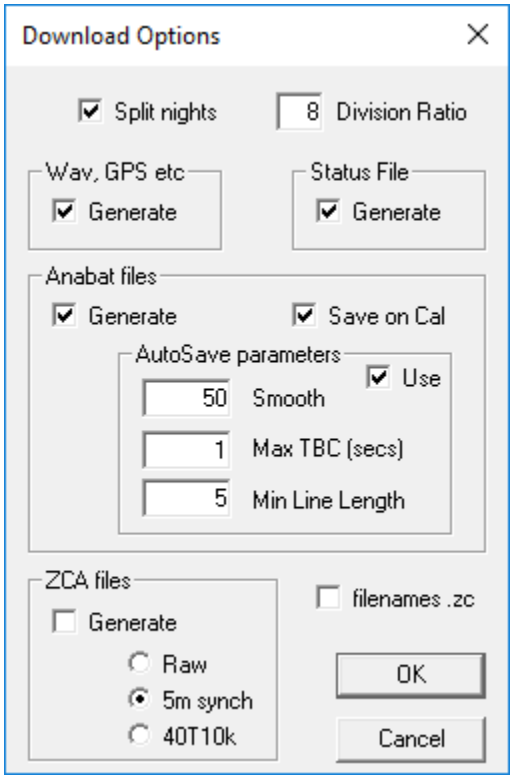
Racey, P. A. and A. C. Entwhistle. 2003. Conservation ecology of bats. Pp. 680-743 in (T. H. Kunz and M. B. Fenton, Eds) *Bat Ecology*. University of Chicago Press, Chicago, IL. 779 pp.

United States Geological Survey, National Wildlife Health Center (USGS). 2008. White Nose Syndrome (WNS). Available online at http://www.nwhc.usgs.gov/disease_information/white-nose_syndrome/index.jsp

Appendix A. Settings used for Anabat Swift bat detectors at Fort Belvoir , May 2022.

Setting	**Value**
ZC Division Ratio	8
Maximum file length	15 seconds
Analog high pass filter	On
Sensitivity	15
Trigger frequency	10-250 kHz
Minimum event	1 second
Trigger window	1 second
Recording mode	Night

Appendix B – Settings used in downloading files from CFC Read program.



Appendix C. GPS location of the 17 sites sampled for bats at Fort Belvoir during the summer of 2022.

Site	County	Lattitude	Longitude	Habitat
Belvoir 1	Fairfax	38.74921	-77.21011	Canopy opening
Belvoir 2	Fairfax	38.75399	-77.20558	Canopy opening
Belvoir 3	Fairfax	38.75072	-77.21036	Road flyway
Belvoir 4	Fairfax	38.75172	-77.20908	Canopy opening
Belvoir 5	Fairfax	38.74971	-77.20781	Canopy opening
Belvoir 6	Fairfax	38.7506	-77.20854	Canopy opening
Belvoir 7	Fairfax	38.75106	-77.20683	Forest edge
Belvoir 8	Fairfax	38.75066	-77.20553	Canopy opening
Belvoir 9	Fairfax	38.75119	-77.2056	Road flyway
Belvoir 10	Fairfax	38.7536	-77.2077	Canopy opening
Belvoir 11	Fairfax	38.75523	-77.20749	Canopy opening
Belvoir 12	Fairfax	38.75549	-77.20966	Forest edge
Belvoir 13	Fairfax	38.7536	-77.20968	Canopy opening
Belvoir 14	Fairfax	38.75364	-77.2119	Canopy opening
Belvoir 15	Fairfax	38.75401	-77.214	Canopy opening
Belvoir 16	Fairfax	38.75518	-77.21203	Canopy opening
Belvoir 17	Fairfax	38.75513	-77.21375	Road flyway

Appendix D. Pictures of the habitat from each of the 4 sites sampled during this survey.

Site 1


Site 2


Site 3


Site 4


Site 5


Site 6


Site 7


Site 8


Site 9


Site 10


Site 11


Site 12


Site 13

Site 14

Site 15

Site 16

Site 17

Appendix E. Breakdown of the maximum likelihood results from the analysis of bat echolocation calls recorded in May 2022 at Fort Belvoir, Virginia.

KALEIDOSCOPE 5.4.6 Bats of North America 5.4.0 S/A: 0		EPTFUS	LASBOR	LASCIN	LASNOC	MYOLUC	MYOSEP	MYOSOD	NYCHUM	PERSUB
Site1										
	5/24/2022	6E-07	1	1	1	0.091014	1	1	1	1
	5/25/2022	0	0	1	1	0	0.99929	1	1	0.634743
Site10										
	5/24/2022	1	0.754845	1	1	5.5E-06	1	0.780393	0.144783	1
	5/25/2022	7E-07	0.235795	0.715696	1	0	1	1	1	0.914266
Site11										
	5/24/2022	0.127859	1	1	1	0.008283	1	1	1	1
	5/25/2022	1E-07	0.168335	1	1	0.400234	0.000333	0.560192	1	0.335571
	5/26/2022	0	1	1	1	1	0	1	1	1
Site12										
	5/24/2022	0	0.028334	1	1	1	1	1	0.973394	0.590364
	5/25/2022	0	4E-07	1	1	0.998613	1	1	1	0.994387
	5/26/2022	0	2.3E-06	1	1	1	1	1	1	1
Site13										
	5/24/2022	6E-07	1	1	1	1	1	1	1	1
	5/25/2022	0	0.040229	1	1	0.057243	1	0.000113	1	1
	5/26/2022	0	0.046332	1	1	1E-07	0.655685	0.146516	1	0.680691
Site14										

	5/25/2022	0	0.000775	1	1	0.07029	1	0.574625	0.654628	0.062454
	5/26/2022	0	0	1	1	0.132308	1	0.59335	1	1
Site15										
	5/25/2022	0	0	1	1	0.002262	1	1	1	1
	5/26/2022	0	0	1	1	6.24E-05	0.172263	1	1	1
Site16										
	5/25/2022	0	0.406446	1	1	0.000652	1	1	1	1
	5/26/2022	0	1	1	1	0.137273	1	1	0.30262	1
Site17										
	5/25/2022	0	5.01E-05	1	1	0.012257	0.793266	0	1	1
	5/26/2022	0	0	1	1	1E-07	0.725947	1	1	0.838486
Site2										
	5/24/2022	6E-07	0	1	1	1E-07	1	1	0.003864	1
	5/25/2022	0	0.179508	1	1	0.377803	1	1	1	0.053397
Site3										
	5/24/2022	0	1.41E-05	1	1	1	1	1	1.9E-06	1
	5/25/2022	0	0.000205	1	1	0.561362	1	1	0.885486	0.529955
Site4										
	5/24/2022	0	0.3387	1	1	0.081354	1	1	0.799292	1
	5/25/2022	1	1	0.047889	1	1	1	1	1	1
Site5										
	5/24/2022	1	1	1	1	1	1	1	1	1
	5/25/2022	0	0.142277	1	1	5.9E-06	0.084033	0.875778	1	0.535519
Site6										
	5/24/2022	0.593691	6.8E-06	1	0.097603	1	1	1	1	1
	5/25/2022	0	0.008217	0.818691	1	1	1	1	0.776166	1
Site7										
	5/25/2022	0.016348	1	1	1	1	1	1	1	1

Site8										
	5/24/2022	0	0	1	0.072406	1	1	1	0.994336	1
	5/25/2022	0	0	1	1	1	1	1	1	1
Site9										
	5/24/2022	1	0.092454	1	1	1	1	1	1	1
	5/25/2022	0	7E-07	1	1	0.077945	1	0.573154	1	0.066645

Appendix F. Weather Data for Bat Surveys in May 2022 at Fort Belvoir, Virginia.

Date	Start	End	Moon Illumination (%)	Moon Phase	Min Temperature (°F)	Max Temperature (°F)	Average Temperature (°F)	Average Humidity (%)	Precipitation (in.)	Wind Direction	Average Wind Speed (mph)
5/23	2021	0551	42	Waning crescent	63	75	68.13	58.46	1.5	N	10.83
5/24	2022	0550	32	Waning crescent	59	64	61.55	79.4	.29	NE	10.47
5/25	0549	2023	23	Waning crescent	58	71	64.57	62.07	.03	E	9.96
5/26	0549	2024	15	Waning crescent	61	72	66.91	74.96	0	SE	5.79

Appendix G – Resume for Dr. Eric Britzke

Education

Ph.D., Environmental Sciences with Concentration in Biology, Tennessee Technological University, 2003.
M.S., Biology, Missouri State University, 1998.
B.S., Biology, Missouri State University, 1994.

Work Experience

United States Army Engineer Research and Development Center, 11/08 – Present. Research Wildlife Biologist.
Independent Consultant, 6/05 – 11/08. Biologist.
East Arkansas Community College, 9/04 – 6/05. Environmental Science Specialist.
Clemson University, 9/03 – 8/04. Post Doctoral Fellow.
Tennessee Technological University, 1/01 – 5/01. Instructor.
Tennessee Technological University, 5/99 – 5/03. Graduate Research Assistant.
United States Forest Service, 10/98 – 11/98; 5/99- 8/99. Biological Aid.
Missouri State University, 8/95 – 5/98. Graduate Teaching Assistant
Missouri State University, 2/95–10/95; 1/97 – 12/97; 2/98–10/98.
Graduate Research Assistant.

Organizations, Panels, Committees, and Awards

Conservation Research Award, National Military Fish and Wildlife Association, 2014
Achievement Medal for Civilian Service, 2013
DoD representative, WNS National Plan Steering committee
WNS Coordination Team, WNS National Plan
Chair, WNS Disease Surveillance Working Group
National Military Fish and Wildlife Association, 2009- Present
Central Regional Director, 2011-2013
Chair, Bat Working Group, 2012-2014
Southeastern Bat Diversity Network, 1999 – Present.
Member of the Board of Directors 2003-2007
American Society of Mammalogists, 1995 - 2012
Wildlife Society, 2004 – 2012
Student Presentation Award Sigma XI, 1995, 1st place.
Golden Key National Honor Society
Wings Across the Americas Bat Conservation Award, 2008
Wings Across the Americas Bat Conservation Award, 2010

Publications

Swift, J. F., R. F. Lance, X. Guan, E. R. Britzke, D. L. Lindsay, and C. E. Edwards. In Press. Multifaceted DNA metabarcoding: validation of a non-invasive, next-generation approach to studying bat populations. Evolutionary Applications. XX:XX-XXX.

Patriquin, K.J., M. L. Leonard, H. G. Broders, W. M. Ford, E. R. Britzke, and A. Silvis. 2016. Weather as a proximate explanation for fission–fusion dynamics in female northern long-eared bats. Animal Behaviour 122:47-57.

Silvis, A., W.M. Ford and E.R. Britzke. 2015. Day-roost tree selection by northern long-eared bats– What do random tree comparisons and one year of data really tell us? Global Ecology and Conservation 3:756-763.

Silvis, A., W.M. Ford, and E.R. Britzke. 2015. Effects of hierarchical roost removal on northern long-eared bat (*Myotis septentrionalis*) maternity colonies.). PLoS ONE DOI:10.1371/journal.pone.0116356. 17 p

Jefferson, D.M., M.C. Ferrari, A. Mathis, K.A. Hobson, E.R. Britzke, A.L. Crane, A.R. Blaustein, and D.P. Chivers. 2014. Shifty salamanders: transient trophic polymorphism and cannibalism within natural populations of larval ambystomatid salamanders. Frontiers in Zoology 11:76.

Jachowski, D.S., C.A. Dobony, L.S. Coleman, W.M. Ford, E.R. Britzke, and J.L. Rodrigue. 2014. Disease and community structure: white-nose syndrome alters spatial and temporal niche partitioning in sympatric bat species. Diversity and Distributions 20:1002–1015.

Coleman, L.S., W.M. Ford, C.A. Dobony, and E.R. Britzke. 2014. Comparison of radio-telemetric home-range analysis and acoustic detection for little brown bat habitat evaluation. Northeastern Naturalist 21:431-445.

Whitby, M.D., T.C. Carter, E.R. Britzke, and S.M. Bergeson. 2014. Evaluation of mobile acoustic transect techniques for bat population monitoring. Acta Chiropterologica 16:223-230.

Coleman, L.S., W.M. Ford, C.A. Dobony, and E.R. Britzke. 2014. Effect of passive acoustic sampling methodology on detecting bats after declines from white nose syndrome. Journal of Ecology and the Natural Environment 6:56-64.

Britzke E.R., M.W. Gumbert, M.G. Hohmann. 2014. Behavioral response of bats to passive integrated transponder tag reader arrays placed at cave entrances. Journal of Fish and Wildlife Management 5(1):146–150.

Silvis, A., W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014. Association, roost use and simulated disruption of *Myotis septentrionalis* maternity colonies. Behavioural Processes 103:283–290.

Britzke, E.R., E.H. Gillam, and K.L. Murray. 2013. Current state of understanding of ultrasonic detectors for the study of bat ecology. Acta Theriologica 58:109-117.

Britzke, E.R., S.C. Loeb, M.J. Vonhof, C. Romanek, and K.A. Hobson. 2012. Variation in catchment areas of Indiana bat (*Myotis sodalis*) hibernacula inferred from stable hydrogen (δ^2H) isotope analysis. Canadian Journal of Zoology 90:1243-1250.

Silvis, A., W.M. Ford, E.R. Britzke, N.R. Beane, and J.B. Johnson. 2012. Forest Succession and Maternity Day Roost Selection by *Myotis septentrionalis* in a Mesophytic Hardwood Forest. International Journal of Forestry Research 2012:148106.

Reeder, D. M., C. L. Frank, G. G. Turner, C. U. Meteyer, A. Kurta, E. R. Britzke, M. E. Vodzak, S. R. Darling, C. W. Stihler, A. C. Hicks, R. Jacob, L. E. Grieneisen, S. A. Brownlee, L. K. Muller, and D. S. Blehert. 2012. Frequent Arousal from

Hibernation Linked to Severity of Infection and Mortality in Bats with White-Nose Syndrome. PLoS ONE 7(6): e38920.

Dodd, L.E., M.J. Lacki, E.R. Britzke, D. A. Buehler, P.D. Keyser, J.L. Larkin, A.D. Rodewald, T.B. Wigley, P.B. Wigley, and L.K. Rieske. 2012. Forest structure affects trophic linkages: how silvicultural disturbance impacts bats and their insect prey. Forest Ecology and Management, 267: 262-270.

Ford, W.M., E.R. Britzke, C.A. Dobony, J.L. Rodrigue and J.B. Johnson. 2011. Patterns of acoustical activity of bats prior to and following White-nose Syndrome occurrence. Journal of Fish and Wildlife Management 2:125-134.

Britzke, E. R., J. E. Duchamp, K. L. Murray, L. W. Robbins, and R. K. Swihart. 2011. Acoustic identification of bats in the eastern United States: A comparison of parametric and nonparametric methods. Journal of Wildlife Management 75:660-667.

Loeb, S. C., and E. R. Britzke. 2010. Intra- and interspecific responses to Rafinesque's big-eared bat (*Corynorhinus rafinesquii*) social calls. Acta Chiropteroloigca 12:329-336.

Britzke, E. R., B. A. Slack, M. P. Armstrong, and S. C. Loeb. 2010. Effects of orientation and weatherproofing on the detection of bat echolocation calls. Journal of Fish and Wildlife Management 1:136-141.

Britzke, E. R., P. Sewell, M. G. Hohmann, R. Smith, and S. R. Darling. 2010. Use of temperature-sensitive transmitters to monitor the temperature profiles of hibernating bats affected with White-nose Syndrome. Northeastern Naturalist 17:239-246.

Wolff, J. M., L. Battaglia, T. C. Carter, L. B. Rodman, E. R. Britzke, and G. A. Feldhammer. 2009. Effects of tornado disturbance on bat communities in southern Illinois. Northeastern Naturalist 16:553-562.

Britzke, E. R., S. C. Loeb, M. J. Vonhof, C. Romanek, and K. A. Hobson. 2009. Using hydrogen isotopes to assign origins of bats in the eastern United States. Journal of Mammalogy 90:743-751.

Britzke, E. R., A. C. Hicks, S. L. von Oettingen, and S. R. Darling. 2006. Description of spring roosting trees used by female Indiana bats (*Myotis sodalis*) in the Lake Champlain Valley of Vermont and New York. American Midland Naturalist 155:181-187.

Britzke, E. R. 2005. Acoustic surveys of bats in the eastern United States. Pp. 63-68 *in* Proceedings of Indiana bat & coal mining: A technical interactive forum (K. C. Vories and A. Harrington, eds.). U.S. Department of Interior, Louisville, KY.

Britzke, E. R. 2004. Designing monitoring programs with frequency division bat detectors: active versus passive sampling. Pp. 79-83 in Bat echolocation research: tools, techniques, and analysis. (R. M. Brigham, E. K. V. Kalko, G. Jones, S. Parsons, H. J. G. A. Limpens, eds.). Bat Conservation International, Austin, TX.

Britzke, E. R., M. J. Harvey, and S. C. Loeb. 2003. Indiana bat, *Myotis sodalis*, maternity roosts in the southern United States. Southeastern Naturalist 2:235-242.

Britzke, E. R., K. L. Murray, J. S. Heywood, and L. W. Robbins. 2002. Acoustic identification. Pp. 220-224 in The Indiana bat: biology and management of an

endangered species (A. Kurta and J. Kennedy, eds.). Bat Conservation International, Austin, TX.
Britzke, E. R., and L. W. Robbins. 2002. Current distribution of the eastern woodrat, *Neotoma floridana*, in Missouri. Southwestern Naturalist 47:125-127.
Tomasi, T. E., J. Ashcraft, and E. Britzke. 2001. Effects of fungicides on thyroid function, metabolism, and thermoregulation in cotton rats. Environmental Toxicology and Chemistry 20:1709-1715.
Murray, K. L., E. R. Britzke, and L. W. Robbins. 2001. Variation in search-phase calls of bats. Journal of Mammalogy 82:728-737.
Frese, P. W., and E. R. Britzke. 2001. *Siren intermedia* (western lesser siren) predation. Herpetological Review 32:99.
Britzke, E. R., and K. L. Murray. 2000. A quantitative method for selection of identifiable search-phase calls using the Anabat system. Bat Research News 41:33-36.
Britzke, E. R., K. L. Murray, B. M. Hadley, and L. W. Robbins. 1999. Measuring bat activity using the Anabat II bat detector system. Bat Research News 40:1-3.
Robbins, L. W., and E. R. Britzke. 1999. Discriminating *Myotis sodalis* from *M. lucifugus* with Anabat: a critique. Bat Research News 40:75-76.
Murray, K. L., E. R. Britzke, B. M. Hadley, and L. W. Robbins. 1999. Surveying bat communities: a comparison between mist nets and the Anabat II bat detector system, Acta Chiropterologica 1:105-112.
Mathis, S. A., and E. R. Britzke. 1999. The roles of body size and experience in agonistic displays by the Ozark zigzag salamander, *Plethodon angusticlavius*. Herpetologica 55:344-352.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX G – RECORD OF NON-APPLICABILITY

GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Project/Action Name:	**Distribution Center and Administrative Building, Fort Belvoir North Area, Fairfax County, Virginia**
Project/Action Point of Contact:	**Carolyn Hein (484) 612-1060 Contractor, HDR**

Construction Begin Date (Anticipated): October 2022
Construction End Date (Anticipated): June 2024

The Proposed Action involves the construction of a distribution center within the Fort Belvoir North Area (FBNA). The proposed 525,000 square foot distribution center would consist of a high bay warehouse; a two-story administrative building; an entry control facility, including gate house and vehicle inspection; and enhanced security measures along the fence line including a new fence, an approximately 30-foot clear zone around the fence, and a maintenance and patrol path. The warehouse and administrative building would also include associated parking and covered storage for approximately 600 personnel. Estimated annual air emissions that would be produced from the Proposed Action are included in **Table 1**.

Table 1. Estimated Annual Air Emissions from Construction and Operation of a Distribution Center and Administrative Building[1]

Year	VOC	NO_x	CO[2]	SO_x[2]	PM_{10}[2]	$PM_{2.5}$[2]	CO_2e[2]
2022 Construction of Distribution Center and Administrative Building	0.439	2.772	2.385	0.007	65.188	0.113	691.8
2023 Construction of Distribution Center and Administrative Building	0.900	6.138	5.390	0.017	65.231	0.226	1,735.2
2024 Construction of Distribution Center and Administrative Building Heating for Buildings Operation of Emergency Generators	6.875	3.265	2.890	0.016	0.191	0.189	2,507.3
2025 and later Heating for Buildings Operation of Emergency Generators	0.198	3.616	2.944	0.024	0.270	0.270	4,153.3

Notes:

[1] All values are in tons per year (tpy).

[2] The Record of Non-Applicability does not apply to emissions of CO, SO_X, PM_{10}, $PM_{2.5}$, and CO_2e.

Key: VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; CO2e = carbon dioxide equivalent.

The Fort Belvoir North Area is in Fairfax County, Virginia, which is within the National Capital Interstate Air Quality Control Region (District of Columbia, Maryland, and Virginia) (40 CFR §81.12). The county is designated by the U.S. Environmental Protection Agency as marginal nonattainment for the 2015 8-hour ozone standard and as maintenance for the 2008 8-hour ozone standard. Ozone forms when nitrogen oxides (NO_X) and volatile organic compounds (VOCs) react in the presence of sunlight. Fairfax County is designated unclassifiable/attainment for all other criteria pollutant standards including carbon monoxide (CO), sulfur dioxide (SO_2), suspended particulate matter (measured less than or equal to 10 microns in diameter [PM_{10}] and measured less than or equal to 2.5 microns in diameter [$PM_{2.5}$]), and lead. As such, the General Conformity Rule is potentially applicable to emissions of VOCs and NO_X and is not applicable to all other criteria pollutants. The General Conformity Rule applicability thresholds for VOCs and NO_X are 50 tons per year (tpy) and 100 tpy, respectively.

General Conformity under the Clean Air Act, Section 176 has been evaluated for the Proposed Action according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this action because the highest annual emissions from this action have been estimated to be under the applicability thresholds.

Supporting documentation and emissions estimates are attached.

_____ _____

Wilamena Harback Date
Chief, Environmental Division

RECORD OF NON-APPLICABILITY (RONA)
SUPPORTING DOCUMENTATION
For Distribution Center and Administrative Building
Fort Belvoir North Area, Fairfax County, Virginia

The purpose of this documentation is to support General Conformity applicability determinations under the Clean Air Act, Section 176 for a new distribution center at the Fort Belvoir North Area (FBNA), Fairfax County, Virginia. This document provides an estimate of worst-case emissions from the proposed construction and operation of the new distribution center and administrative building. The emission estimates for which this documentation was developed were based on the following assumptions:

Project Characteristics and Construction Assumptions

- Construction and operation of a 525,000 square foot warehouse and administrative building with associated parking and covered storage at FBNA for approximately 600 personnel. Construction would include the high bay warehouse, two-story administrative building, truck maintenance/refueling building, covered/enclosed storage buildings, entry control facility, and enhanced security measures along the fenceline. The total square footage of all building was estimated to be 565,500 square feet. The height of the high bay warehouse and two-story administrative building was assumed to be 50 feet, which was conservatively estimated to be the height of all buildings.

- The proposed site for the new distribution center contains approximately 161 acres. The total area of added impervious surfaces (buildings and pavements) was estimated to be 26.1 acres. For the purposes of this analysis, it was conservatively estimated that site grading would occur on approximately 40 acres (1,742,000 square feet).

- Site grading would include clearing of all vegetation, topsoil, and unsuitable material in order to prepare the site for construction. It was estimated that 11,400 cubic yards of material would be hauled off site. Remaining topsoil and other material would be reused in place and would not be hauled off site.

- Construction would include the high bay warehouse, two-story administrative building, truck maintenance/refueling building, covered/enclosed storage buildings, entry control facility, and enhanced security measures along the fenceline. The total square footage of all buildings was estimated to be 565,500 square feet. The height of the high bay warehouse and two-story administrative building was assumed to be 50 feet, which was conservatively estimated to be the height of all buildings.

- Trenching for underground utility duct banks was estimated to be 3,800 linear feet. Duct bank depth was estimated to be 3 feet.

- Architectural coatings would be applied to all buildings, for a total of approximately 565,500 square feet.

- Paving for the covered and uncovered storage areas, parking areas, and roads would occur on an area totaling approximately 135,000 square feet.

- The approximately 600 personnel that would be assigned to the distribution center would relocate from other areas of Fort Belvoir and would not be new to Fairfax County.

- Construction activities would occur throughout the project to varying degrees from October 2022 through June 2024. A project duration of 21 months was used.

Contractor and Equipment Assumptions

- Construction workers would be on-site for all weekdays during the 21-month construction period to complete this work. Approximately 50 percent would commute to the site each day in a light duty gasoline vehicle and 50 percent would commute in a light duty gasoline truck, with an average round trip commute of 20 miles.

- Durations of operation for heavy equipment would vary depending on the project phase. A breakdown of project phase and equipment use is included below.

    - Estimated equipment to be used includes graders, rollers, rubber tired dozers, scrapers, tractors, loaders, backhoes, excavators, cranes, forklifts, generators sets, welders, cement and mortar mixers, other paving equipment, other industrial equipment, and other construction equipment.

Project Duration and Operation Assumptions

- Construction period of 21 months (October 2022 through June 2024).

- Operational emissions would be produced from the Proposed Action, specifically from heating units and emergency generators. Heating for new buildings and operation of emergency generators would begin following the completion of construction, approximately July 2024.

    - New buildings would be heated via natural gas.

    - One 1-megawatt generator would be installed at the distribution center.

    - One 240-kilowatt generator would be installed at the entry control facility.

Emissions

The emission calculations to quantify these values are presented in the table below, and were performed using the Department of the Air Force's Air Conformity Applicability Model, version 5.0.17b. The model was developed using the methodology and information provided in the *Air Emissions Guide for Air Force Mobile Sources, June 2020, Air Emissions Guide to Air Force Transitory Sources, June 2020, and Air Emissions Factor Guide to Air Force Stationary Sources, June 2020.*

Estimated Annual Air Emissions from Construction and Operation of a Distribution Center and Administrative Building[1]

Year	VOC	NO_x	CO[2]	SO_x[2]	PM_{10}[2]	$PM_{2.5}$[2]	CO_2e[2]
2022							
Construction of Distribution Center and Administrative Building	0.439	2.772	2.385	0.007	65.188	0.113	691.8
2023							
Construction of Distribution Center and Administrative Building	0.900	6.138	5.390	0.017	65.231	0.226	1,735.2
2024							
Construction of Distribution Center and Administrative Building Heating for Buildings Operation of Emergency Generators	6.875	3.265	2.890	0.016	0.191	0.189	2,507.3
2025 and later							
Heating for Buildings Operation of Emergency Generators	0.198	3.616	2.944	0.024	0.270	0.270	4,153.3

Notes:

[1] All values are in tons per year.

[2] The Record of Non-Applicability does not apply to emissions of CO, SO_X, PM_{10}, $PM_{2.5}$, and CO_2e.

Key: VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; CO2e = carbon dioxide equivalent.

General Conformity Applicability Thresholds for Actions Occurring in Fairfax County

VOC	50 tpy
NO_x	100 tpy

Construction Emissions for Distribution Center, Fort Belvoir North Area

Estimated Activity Emissions:

Pollutant	Total Emissions (tons)
VOC	8.115200
SO_X	0.027914
NO_X	10.366487
CO	9.193386
PM_{10}	130.475836
$PM_{2.5}$	0.392906
Pb	0.000000
NH_3	0.017819
CO_2e	2857.7

Key: VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; Pb = lead; NH_3 = ammonia; CO_2e = carbon dioxide equivalent.

Site Grading Phase

- Phase Start Date
  Start Month: 10
  Start Year: 2022

- Phase Duration
  Number of Months: 6

- General Site Grading Information
  Area of Site to be Graded (ft^2): 1,742,000
  Amount of Material to be Hauled On-Site (yd^3): 0
  Amount of Material to be Hauled Off-Site (yd^3): 0
  Average Days worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	2	8
Other Construction Equipment Composite	2	8
Rollers Composite	1	8
Rubber Tired Dozers Composite	2	8
Scrapers Composite	4	8
Tractors/Loaders/Backhoes Composite	2	8

- Vehicle Exhaust
  Average Hauling Truck Capacity (yd^3): 20
  Average Hauling Truck Round Trip Commute (mile): 20

- Vehicle Exhaust Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

Key: POV = privately-owned vehicle; LDGV = light duty gasoline vehicle (passenger cars); LDGT = light duty gasoline truck [0-8,500 pounds Gross Vehicle Weight Rating (GVWR)]; HDGV = heavy duty gasoline vehicle (>8,500pounds GVWR); LDDV = light duty diesel vehicle (passenger cars); LDDT = light duty diesel truck (0-8,500 pounds GVWR); HDDV = heavy duty diesel vehicle (>8,500 pounds GVWR); MC = motorcycle.

- Worker Trips
  Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Construction Exhaust Emission Factors

Equipment	Emissions Factors (pounds/hour)						GHG
	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	CO_2e
Graders Composite	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	132.92
Rollers Composite	0.0499	0.0007	0.3198	0.3798	0.0180	0.0180	67.149
Rubber Tires Dozers Composite	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	239.51
Scrapers Composite	0.1723	0.0026	1.1176	0.7579	0.0447	0.0447	262.87
Tractors/Loaders/Backhoes Composite	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	66.884
Other Construction Equipment Composite	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	122.61

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.282	000.002	000.220	003.283	000.007	000.006	0.0	000.023	00323.276
LDGT	000.358	000.003	000.388	004.597	000.009	000.008	0.0	000.024	00417.298
HDGV	000.706	000.005	001.021	015.119	000.022	000.019	0.0	000.045	00770.239
LDDV	000.112	000.003	000.133	002.524	000.004	000.004	0.0	000.008	00313.527
LDDT	000.253	000.004	000.380	004.330	000.007	000.006	0.0	000.008	00445.483
HDDV	000.493	000.013	004.921	001.743	000.169	000.155	0.0	000.028	01496.485
MC	002.436	000.003	000.747	012.951	000.027	000.024	0.0	000.054	00397.607

- Site Grading Phase Formulas

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (tons)
20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (tons)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Construction Equipment to Number of Workers
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

Trenching/Excavating Phase

- Phase Start Date
  Start Month: 11
  Start Year: 2022

- Phase Duration
  Number of Months: 2

- General Trenching/Excavating Information
  Area of Site to be Trenched/Excavated (ft^2): 3,800
  Amount of Material to be Hauled On-Site (yd^3): 0
  Amount of Material to be Hauled Off-Site (yd^3): 11,400
  Average Days worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8

Other General Industrial Equipment Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust

Average Hauling Truck Capacity (yd^3): 20

Average Hauling Truck Round Trip Commute (mile): 20

- Vehicle Exhaust Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Construction Exhaust Emission Factors

	Emissions Factors (pounds/hour)						GHG
Equipment	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	CO_2e
Graders Composite	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	132.92
Rollers Composite	0.0499	0.0007	0.3198	0.3798	0.0180	0.0180	67.149
Rubber Tires Dozers Composite	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	239.51
Scrapers Composite	0.1723	0.0026	1.1176	0.7579	0.0447	0.0447	262.87
Tractors/Loaders/Backhoes Composite	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	66.884
Other Construction Equipment Composite	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	122.61

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.282	000.002	000.220	003.283	000.007	000.006	0.0	000.023	00323.276
LDGT	000.358	000.003	000.388	004.597	000.009	000.008	0.0	000.024	00417.298
HDGV	000.706	000.005	001.021	015.119	000.022	000.019	0.0	000.045	00770.239
LDDV	000.112	000.003	000.133	002.524	000.004	000.004	0.0	000.008	00313.527
LDDT	000.253	000.004	000.380	004.330	000.007	000.006	0.0	000.008	00445.483
HDDV	000.493	000.013	004.921	001.743	000.169	000.155	0.0	000.028	01496.485
MC	002.436	000.003	000.747	012.951	000.027	000.024	0.0	000.054	00397.607

- Trenching / Excavating Phase Formulas

- Fugitive Dust Emissions per Phase

$PM10_{FD}$ = (20 * ACRE * WD) / 2000

$PM10_{FD}$: Fugitive Dust PM 10 Emissions (tons)

20: Conversion Factor Acre Day to pounds (20 lb / 1 Acre Day)

ACRE: Total acres (acres)

WD: Number of Total Work Days (days)

2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (tons)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (yd^3)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (yd^3)
HC: Average Hauling Truck Capacity (yd^3)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Construction Equipment to Number of Workers
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

Building Construction Phase

- Phase Start Date
  Start Month: 1
  Start Year: 2023

- Phase Duration
  Number of Months: 16

- General Building Construction Information
  Building Category: Office or Industrial
  Area of Building (ft^2): 565,500
  Height of Building (ft): 50
  Average Days worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	7
Forklifts Composite	3	8
Generator Sets Composite	1	8
Tractors/Loaders/Backhoes Composite	3	7
Welders Composite	1	8

- Vehicle Exhaust
  Average Hauling Truck Round Trip Commute (mile): 20

- Vehicle Exhaust Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
  Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
  Average Vendor Round Trip Commute (mile): 40

- Vendor Trips Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Construction Exhaust Emission Factors

Equipment	Emissions Factors (pounds/hour)						GHG
	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	CO_2e
Cranes Composite	0.0754	0.0013	0.5027	0.3786	0.0181	0.0181	128.79
Forklifts Composite	0.258	0.0006	0.1108	0.2145	0.0034	0.0034	54.454
Generator Sets Composite	0.320	0.0006	0.2612	0.2683	0.0103	0.0103	61.065
Tractors/Loaders/Backhoes Composite	0.0364	0.0007	0.2127	0.3593	0.0080	0.0080	66.879
Welders Composite	0.0242	0.0003	0.1487	0.1761	0.0067	0.0067	25.657

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e

LDGV	000.282	000.002	000.220	003.283	000.007	000.006	0.0	000.023	00323.276
LDGT	000.358	000.003	000.388	004.597	000.009	000.008	0.0	000.024	00417.298
HDGV	000.706	000.005	001.021	015.119	000.022	000.019	0.0	000.045	00770.239
LDDV	000.112	000.003	000.133	002.524	000.004	000.004	0.0	000.008	00313.527
LDDT	000.253	000.004	000.380	004.330	000.007	000.006	0.0	000.008	00445.483
HDDV	000.493	000.013	004.921	001.743	000.169	000.155	0.0	000.028	01496.485
MC	002.436	000.003	000.747	012.951	000.027	000.024	0.0	000.054	00397.607

- Building Construction Phase Formulas

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (tons)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.42 / 1000): Conversion Factor ft^3 to trips (0.42 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Construction Equipment to Number of Workers
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)

VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Vender Trips Emissions per Phase

$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
BA: Area of Building (ft^2)
BH: Height of Building (ft)
(0.38 / 1000): Conversion Factor ft^3 to trips (0.38 trip / 1000 ft^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{VT}: Vender Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

Architectural Coatings Phase

- Phase Start Date
  Start Month: 4
  Start Year: 2024

- Phase Duration
  Number of Months: 1

- General Architectural Coatings Information
  Building Category: Non-Residential
  Total Square Footage (ft^2): 565,500
  Average Days worked per week: 5

- Worker Trips
  Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Worker Trips Emission Factors (grams/mile)

	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.282	000.002	000.220	003.283	000.007	000.006	0.0	000.023	00323.276
LDGT	000.358	000.003	000.388	004.597	000.009	000.008	0.0	000.024	00417.298
HDGV	000.706	000.005	001.021	015.119	000.022	000.019	0.0	000.045	00770.239
LDDV	000.112	000.003	000.133	002.524	000.004	000.004	0.0	000.008	00313.527
LDDT	000.253	000.004	000.380	004.330	000.007	000.006	0.0	000.008	00445.483
HDDV	000.493	000.013	004.921	001.743	000.169	000.155	0.0	000.028	01496.485
MC	002.436	000.003	000.747	012.951	000.027	000.024	0.0	000.054	00397.607

- Architectural Coatings Phase Formulas

- Worker Trips Emissions per Phase

$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (mile)
PA: Paint Area (ft^2)
800: Conversion Factor square feet to man days (1 ft^2 / 1 man * day)

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (tons)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0$

VOC_{AC}: Architectural Coating VOC Emissions (tons)
BA: Area of Building (ft^2)
2.0: Conversion Factor total area to coated area (2.0 ft^2 coated area / total area)
0.0116: Emission Factor (lb/ft^2)
2000: Conversion Factor pounds to tons

Paving Phase

- Phase Start Date
  Start Month: 5
  Start Year: 2024

- Phase Duration
  Number of Months: 2

- General Paving Information
  Paving Area (ft^2): 135,000
  Average Days worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Paving Equipment Composite	2	6
Rollers Composite	1	7

- Vehicle Exhaust
  Average Hauling Truck Round Trip Commute (mile): 20

- Vehicle Exhaust Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC

POVs	0	0	0	0	0	100.00	0

- Worker Trips
  Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (percent)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Construction Exhaust Emission Factors

Equipment	Emissions Factors (pounds/hour)						GHG
	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	CO_2e
Graders Composite	0.0806	0.0014	0.4657	0.5731	0.0217	0.0217	132.92
Rollers Composite	0.0499	0.0007	0.3198	0.3798	0.0180	0.0180	67.149
Rubber Tired Dozers Composite	0.1919	0.0024	1.3611	0.7352	0.0536	0.0536	239.51
Scrapers Composite	0.1723	0.0026	1.1176	0.7579	0.0447	0.0447	262.87
Tractors/Loaders/Backhoes Composite	0.0383	0.0007	0.2301	0.3598	0.0095	0.0095	66.884
Other Construction Equipment Composite	0.0507	0.0012	0.2785	0.3488	0.0105	0.0105	122.61

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.282	000.002	000.220	003.283	000.007	000.006	0.0	000.023	00323.276
LDGT	000.358	000.003	000.388	004.597	000.009	000.008	0.0	000.024	00417.298
HDGV	000.706	000.005	001.021	015.119	000.022	000.019	0.0	000.045	00770.239
LDDV	000.112	000.003	000.133	002.524	000.004	000.004	0.0	000.008	00313.527
LDDT	000.253	000.004	000.380	004.330	000.007	000.006	0.0	000.008	00445.483
HDDV	000.493	000.013	004.921	001.743	000.169	000.155	0.0	000.028	01496.485
MC	002.436	000.003	000.747	012.951	000.027	000.024	0.0	000.054	00397.607

- Paving Phase Formulas

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (tons)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (ft^2)
0.25: Thickness of Paving Area (ft)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 yd^3 / 27 ft^3)
HC: Average Hauling Truck Capacity (yd^3)

(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC yd^3)
HT: Average Hauling Truck Round Trip Commute (mile/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$
V_{POL}: Vehicle Emissions (tons)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (mile)
1.25: Conversion Factor Construction Equipment to Number of Workers
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$
V_{POL}: Vehicle Emissions (tons)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (percent)
2000: Conversion Factor pounds to tons

- Off-Gassing Emissions per Phase

$VOC_P = (2.62 * PA) / 43560$
VOC_P: Paving VOC Emissions (tons)
2.62: Emission Factor (lb/acre)
PA: Paving Area (ft^2)
43560: Conversion Factor square feet to acre (43560 ft2 / $acre)^2$ / acre)

Heating Emissions for Distribution Center, Fort Belvoir North Area

Estimated Activity Emissions:

Pollutant	Total Emissions (tons)
VOC	0.189281
SO_X	0.020649
NO_X	3.441471
CO	2.890836
PM_{10}	0.261552
$PM_{2.5}$	0.261552
Pb	0.000000
NH_3	0.000000
CO_2e	4143.2

Key: VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; Pb = lead; NH_3 = ammonia; CO_2e = carbon dioxide equivalent.

- Activity Start Date
  Start Month: 7
  Start Year: 2024

- Activity End Date
  Indefinite: Yes

- General Heating Information
  Heating Calculation Type: Heat Energy Requirement Method
  Area of floorspace to be heated (ft^2): 565,500
  Type of fuel: Natural Gas
  Type of boiler/furnace: Industrial (10 - 250 MMBtu/hr)
  Heat Value ($MMBtu/ft^3$): 0.00105
  Energy Intensity ($MMBtu/ft^2$): 0.1278
  Operating Time Per Year (hours): 900

- Heating Emission Factors (pound/1000000 standard cubic foot)

VOC	SO_X	NO_X	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
5.5	0.6	100	84	7.6	7.6	0.0	0.0	120390

- Heating Formulas
- Heating Fuel Consumption ft^3 per Year

$FC_{HER} = HA * EI / HV / 1000000$

FC_{HER}: Fuel Consumption for Heat Energy Requirement Method
HA: Area of floorspace to be heated (ft^2)
EI: Energy Intensity Requirement ($MMBtu/ft^2$)
HV: Heat Value ($MMBTU/ft^3$)
1000000: Conversion Factor

- Heating Emissions per Year

$HE_{POL} = FC * EF_{POL} / 2000$

HE_{POL}: Heating Emission Emissions (tons)
FC: Fuel Consumption
EF_{POL}: Emission Factor for Pollutant
2000: Conversion Factor pounds to tons

Distribution Center Generator Emissions for Distribution Center, Fort Belvoir North Area

Estimated Activity Emissions:

Pollutant	Total Emissions (tons)
VOC	0.004350
SO_X	0.000076
NO_X	0.157343
CO	0.041796
PM_{10}	0.004915
$PM_{2.5}$	0.004915
Pb	0.000000
NH_3	0.000000
CO_2e	8.1

Key: VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; Pb = lead; NH_3 = ammonia; CO_2e = carbon dioxide equivalent.

- Activity Start Date
  Start Month: 7
  Start Year: 2024

- Activity End Date
  Indefinite: Yes

- General Emergency Generator Information
  Type of Fuel used in Emergency Generator: Diesel
  Number of Emergency Generators: 1
  Emergency Generator's Horsepower: 1350
  Average Operating Hours Per Year (hours): 9

- Emergency Generators Emission Factor (pounds/horsepower-hour)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
0.000716	0.0000125	0.0259	0.00688	0.000809	0.000809	0.0	0.0	1.33

- Emergency Generator Formula

- Emergency Generator Emissions per Year

$AE_{POL} = (NGEN * HP * OT * EF_{POL}) / 2000$

AE_{POL}: Activity Emissions (tons per year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)
2000: Conversion Factor pounds to tons

Entry Control Facility Generator Emissions for Distribution Center, Fort Belvoir North Area

Estimated Activity Emissions:

Pollutant	Total Emissions (tons)
VOC	0.004206
SO_X	0.003543
NO_X	0.017336
CO	0.011578
PM_{10}	0.003784
$PM_{2.5}$	0.003784
Pb	0.000000
NH_3	0.000000
CO_2e	2.0

Key: VOC = volatile organic compound; NO_X = nitrogen oxides; CO = carbon monoxide; SO_X = sulfur oxides; PM_{10} = particulate matter less than or equal to 10 micrometers in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 micrometers in diameter; Pb = lead; NH_3 = ammonia; CO_2e = carbon dioxide equivalent.

- Activity Start Date
  Start Month: 7
  Start Year: 2024

- Activity End Date
  Indefinite: Yes

- General Emergency Generator Information
  Type of Fuel used in Emergency Generator: Diesel
  Number of Emergency Generators: 1
  Emergency Generator's Horsepower: 335
  Average Operating Hours Per Year (hours): 9

- Emergency Generators Emission Factor (lb/hp-hr)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
0.000716	0.0000125	0.0259	0.00688	0.000809	0.000809	0.0	0.0	1.33

- Emergency Generator Formula

- Emergency Generator Emissions per Year

$AE_{POL} = (NGEN * HP * OT * EF_{POL}) / 2000$

AE_{POL}: Activity Emissions (tons per year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)
2000: Conversion Factor pounds to tons

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX H – TRAFFIC IMPACT STUDY

HDR
A JOINT VENTURE
TEHAMA

US Army Corps
of Engineers
Baltimore District

Traffic Impact Study to Support National Environmental Policy Act Documentation for Distribution Center at Fort Belvoir North Area (FBNA)

Fort Belvoir, Virginia

Contract No. W912DR-20-D-0010
Task Order W912DR22F0048

May 2022

Traffic Impact Study to Support National Environmental Policy Act Documentation for Distribution Center at Fort Belvoir North Area (FBNA)

Fort Belvoir, Virginia

Brad Loomis, PE, PTOE
Project Manager

Prepared for:
US Army Corps of Engineers
Baltimore District

Under contract with:
U.S. Army Corps of Engineers

Prepared by:
HDR-Tehama JV
1600 Genessee St
Ste 754
Kansas City, MO 64102-1064

Our Reference:
Contract W912DR-20-D-0010
Task Order W912DR22F0048
Tehama Project F0140.02

Date:
4 May 2022

.

CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

This Traffic Impact Study (TIS) presents the traffic operational analysis results in order to accommodate the proposed construction and operation of a new 525,000 square foot Distribution Center consolidated complex consisting of a high bay warehouse; two-story administrative building; truck maintenance/refueling building; covered/enclosed storage buildings; entry control facility, including gate house and vehicle inspection; enhanced security measures along the fenceline, including a new fence and an approximately 30-foot clear zone around the fence; a maintenance and patrol path; and parking areas for personnel. Approximately 600 additional personnel would be employed at the new site. This TIS focuses on roadways and intersections labeled A-R that provide access to the proposed Distribution Center location along Barta Road in the northwest area of the Fort Belvoir North Area (FBNA) complex (Figure ES-1).

A previous traffic study was completed in June 2021 to study alternate locations to construct an annex for the Defense Intelligence Agency (DIA) titled *Traffic Impact Study to Support National Environmental Policy Act Documentation for DIA HQ Annex* (HDR & Tehama, 2021). This annex construction project is hereinafter referred to as the "DIA Annex" or the "DIA Annex project." The data, modeling, and results from this previous study for the DIA Annex project are used within this report. Counts for this previous study were performed in March 2021 during a time that experienced decreased traffic because of the Coronavirus disease 2019 (COVID-19) pandemic. It was assumed that at this time a portion of FBNA staff worked from a home office. The June 2021 report information for the DIA Annex project (i.e., [HDR & Tehama, 2021]) has been supplemented, verified, and/or adjusted to determine the aggregate operational impact for the additional traffic of the proposed Distribution Center with other immediate anticipated site development/improvements.

For this Distribution Center TIS, traffic data was collected in March 2022 at four (4) intersections along Barta Road using JAMAR boards. This data was used to amend the aforementioned previously acquired counts collected in March 2021 for the DIA Annex project. The intersections counted are shown in Figure 2-1.

Level of Service Standards

Level of service is a qualitative measure describing operational traffic conditions, and the perception of these conditions by drivers or passengers. These conditions include factors such as speed, delay, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety. Levels of service are given letter designations from A to F, with Level of Service (LOS) A representing the best operating conditions (free flow, little delay) and LOS F, the worst (congestion, long delays). Generally, LOS A and B are considered high level of service, LOS C and D are considered moderate, and LOS E and F are considered low. In general, the standards are LOS D in urban areas and LOS C in rural areas.

The results of the operational analysis using Synchro are provided in Table ES-1.

Figure ES-1: Analyzed Intersections for Distribution Center preferred location

Table ES-1: Existing Intersection Operational Analysis – FBNA						
Intersection ID	Intersection	Signalized (Y/N)	AM	PM	AM	PM
			Delay (s/veh)		LOS	
B	Barta Road / Heller Road	Y	2.5	0.4	A	A
C	West Gate Entrance	N	-	-	A	A
D	Barta Road / Parking Garage Exit	Y	0.0	9.5	A	A
E	Barta Road / Main Guest Access	N	-	-	A	A
F	Barta Road / GEOINT Drive	Y	5.5	10.4	A	B
G	Barta Road / Heller Road	Y	9.8	0.4	A	A
H	Barta Road / Backlick Road	Y	7.9	18.9	A	B
I	Heller Road / HOV Entrance Ramp	N	-	-	A	A
J	I-95 Exit Ramp / Heller Road	N	-	-	A	A
K	South Gate Entrance	N	-	-	A	A
P	Barta Road / Rolling Road	Y	8.3	9.3	A	A
Q	Barta Road / SB VA 286 Ramps	Y	6.2	8.4	A	A
R	Barta Road / NB VA 286 Ramps	Y	9.0	11.9	A	B

As shown in the table above, all intersections are operating at LOS B or better.

No changes in existing roadway geometrics were assumed for this study. A new signalized intersection/entrance was modeled at the location shown on Figure ES-1 (Note: This new, proposed signalized intersection/entrance is represented by a star symbol on Figure ES-1 and as Intersection ID letter "A" in the tables herein).

The Distribution Center construction is estimated to generate 600 additional staff positions. The analysis assumes that each additional staff member generates 0.9 additional AM and PM peak hour trip for 600 additional staff (Distribution Center) and one (1) additional AM and PM peak hour trip for each 650 additional staff (DIA Annex). In addition, eighteen (18) truck trips have been modeled for both the AM and PM peak hours. New trip origin and destination points were determined utilizing the March 2021 count data.

Table ES-2: Build Condition (2023) Intersection Operational Analysis						
Intersection ID	Intersection	Signalized (Y/N)	***600 Added Personnel (Distribution Center) + 650 Added Personnel (DIA Annex)***			
			AM	PM	AM	PM
			Delay (s/veh)		LOS	
A	New Entrance / Barta Road	Y	4.9	22.7	A	C
B	Barta Road / Heller Road	Y	4.6	0.9	A	A
C	West Gate Entrance	N	-	-	A	A
D	Barta Road / Parking Garage Exit	Y	0.1	7.7	A	A
E	Barta Road / Main Guest Access	N	8.7	11.4	A	B
F	Barta Road / GEOINT Drive	Y	5.8	66.3	A	E
G	Barta Road / Heller Road	Y	9.8	4.7	A	A
H	Barta Road / Backlick Road	Y	8.5	22.2	A	C
I	Heller Road / HOV Entrance Ramp	N	-	-	A	A
J	I-95 Exit Ramp / Heller Road	N	-	-	A	A
K	South Gate Entrance	N	-	-	A	A
P	Barta Road / Rolling Road	Y	8.8	9.7	A	A
Q	Barta Road / SB VA 286 Ramps	Y	7.8	9.4	A	A
R	Barta Road / NB VA 286 Ramps	Y	27.7	11.3	C	B

Based on the traffic operational results found in Table ES-2, this study concludes that FBNA can accommodate the existing site traffic and the anticipated additional traffic generated by the Distribution Center and the DIA Annex.

Indirect Effects

Increased vehicle traffic may affect some intersections outside of the study area. The project traffic traveling through those intersections is expected to result in a small (less than 1 percent) increase in traffic at those intersections. The project trips associated with this project are not expected to affect the LOS of those intersections significantly based on the minor delay increase associated with the proposed additional trips at each outer intersection (H and P in tables ES-1 and ES-2).

Pedestrian and Bicycle Operations

Pedestrians are provided shared phasing with appropriate traffic phases. No impacts are expected along Barta Road. Additional connections to the new distribution facility may be appropriate with connection across Barta Road.

Proposed Design Features Intended to Reduce Impacts

From the analyses results, possible roadway and intersection improvements were identified to mitigate operational impacts that were degraded to LOS E. Potential mitigation is discussed below.

- PM - NB Geoint Drive to both EB & WB Barta Road
    - Mitigation – Signal optimization and additional turn lane for increased turn volumes.

Based on the modeling results, the existing roadway system build scenario operates at acceptable levels with the construction of the Distribution Center and added personnel. Low LOS at Geoint Drive in the PM will only be anticipated with the construction of the DIA Annex. LOS E is also expected only for exiting vehicles from existing Geoint Drive.

1 INTRODUCTION

1.1 Introduction

Tehama-HDR Joint Venture (JV) was retained by US Army Corps of Engineers (USACE) to evaluate the potential traffic impacts resulting from the proposed construction and operation of a new approximately 525,000 square foot Distribution Center consolidated complex consisting of a high bay warehouse; two-story administrative building; truck maintenance/refueling building; covered/enclosed storage buildings; entry control facility, including gate house and vehicle inspection; enhanced security measures along the fenceline, including a new fence, and an approximately 30-foot clear zone around the fence; a maintenance and patrol path; and parking areas for personnel. Approximately 600 additional personnel would be employed at the new site. This Traffic Impact Study (TIS) focused on roadways providing adequate site access to the proposed Distribution Center location along Barta Road in the northwest area of the Fort Belvoir North Area (FBNA) complex.

Various Measures of Effectiveness (MOEs), such as intersection delay and Level of Service (LOS) are presented in this study. The analysis results are determined using the definitions and methodology outlined in the Transportation Research Board (TRB)'s 6th edition of the Highway Capacity Manual (HCM) (TRB, 2016). The Synchro 11 software module is used to evaluate the signalized and unsignalized intersections.

1.2 Analyses Years

The traffic analyses were performed during morning (AM) and afternoon (PM) weekday peak hours for the following analysis years:

- Existing Year (2022)
    - 2022 turning movement counts (TMC) at 4 intersections at west end of Barta Road.
    - 2021 Adjusted volumes and TMCs based on total inbound base gate counts from January 2020 (pre Coronavirus disease 2019 or "COVID-19" pandemic) and January 2021. Volumes were increased by 40% to account for the 35-40% reduction in overall base traffic experienced.
- Build Condition (2023)
    - Additional 600 personnel reporting to new Distribution Center balanced with adjusted 2021 traffic.
    - Additional 650 personnel reporting to new DIA Annex with adjusted 2021 traffic. This development is planned for short-term implementation and has been included.

1.3 Study Area / Project

Formerly known as the Engineer Proving Ground, FBNA is located in Springfield, Virginia, approximately 3 miles northwest of Fort Belvoir's main installation (see Figure 1-1). FBNA currently hosts the National Geospatial-Intelligence Agency (NGA) headquarters and associated support facilities, which were constructed in 2011. The study area is located in the northwest corner of the FBNA.

Figure 1-1: Proposed Project Location at FBNA

2 DATA COLLECTION

2.1 Traffic Volume Collection

Traffic data for this study was gathered in March 2021 and March 2022. Additional 2018 traffic data was acquired from Fairfax County Department of Transportation (County of Fairfax, 2021).

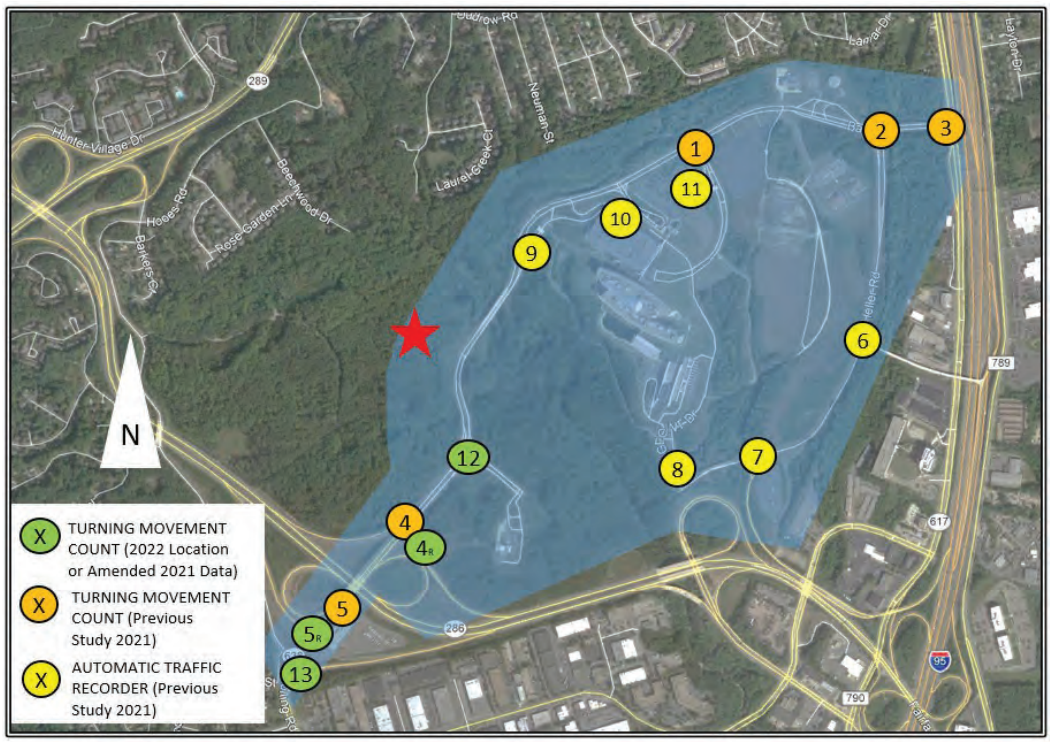


Figure 2-1: Count Locations for Existing Conditions

2.1.1 2021 Traffic Volume Collection

A previous traffic study was completed in June 2021 to study alternate locations to construct an annex for the Defense Intelligence Agency (DIA) titled *Traffic Impact Study to Support National Environmental Policy Act Documentation for DIA HQ Annex* (HDR & Tehama, 2021). This annex construction project is hereinafter referred to as the "DIA Annex" or the "DIA Annex project." The data, modeling, and results from this previous study for the DIA Annex project are used within this report. Counts for this previous study were performed in March 2021 during a time that experienced decreased traffic because of the Coronavirus disease 2019 (COVID-19) pandemic. It was assumed that at this time a portion of FBNA staff worked from a home office. The June 2021 report information for the DIA Annex project (i.e., [HDR & Tehama, 2021]) has been supplemented, verified, and/or adjusted to determine the aggregate operational impact for the

additional traffic of the proposed Distribution Center with other immediate anticipated site development/improvements.

Traffic data was collected at eleven (11) locations to support the development of this TIS. Both turning movement counts (TMCs) at the major intersections (5 locations) and automated traffic recorders counts (ATRs) at select ramps/gates (6 locations) were collected. The turning movement counts were completed using JAMAR boards, which are industry-standard counting equipment versatile in acquiring data at signalized, unsignalized, and roundabout intersections. Pico tubes were used for the volume data at ATR identified locations. The tubes allowed the acquisition of 24-hour counts which helped identify peak hours.

TMCs and roadway volume counts were conducted at the locations shown in Figure 2-1. The locations for the roadways and intersection counts are listed below in Table 2-1. Figure 2-2 and Figure 2-3 present diagrams of the volumes counted at specific intersections within the study areas (refer to Appendix A for the original count data). The counts were collected during the AM and PM peak hours over a three-day period of a typical Tuesday, Wednesday, and Thursday. During project discussions, NGA noted that focus may be given to certain times based on employee work schedules. Based on this input, it was assumed the AM peak occurs between 6-9 AM and the PM peak occurs between 3-6 PM. The turning movement counts were collected in 15-minute periods and include classification of passenger vehicles, trucks (vehicles with 3 or more axles), and bicycles/pedestrians. This information was input into the existing conditions model.

Table 2-1: Traffic Volume Count Locations – March 2021

Count ID	Intersection	Count Date	Type
1	Barta Road with Geoint Drive	2021-03-23	TMC (JAMAR)
2	Barta Road with Heller Road	2021-03-23	TMC (JAMAR)
3	Barta Road with Backlick Road	2021-03-23	TMC (JAMAR)
4	Barta Road / Fairfax County Parkway (VA 286) NB Ramps	2021-03-24	TMC (JAMAR)
5	Barta Road / Fairfax County Parkway (VA 286) SB Ramps	2021-03-24	TMC (JAMAR)
6	Heller Road with I-95 NB/I-95 SB Express Lane	2021-03-23	ATR (Pico)
7	Heller Road with I-95 SB	2021-03-23	ATR (Pico)
8a	Heller Road with NGA South Gate (inbound)	2021-03-23	ATR (Pico)
8b	Heller Road with NGA South Gate (outbound)	2021-03-24	ATR (Pico)
9	Barta Road at NGA West Gate Entry	2021-03-24	ATR (Pico)
10	Barta Road at NGA West Gate Exit	2021-03-24	ATR (Pico)
11	GEOINT Drive Visitor Parking Lot Access Lane	2021-03-24	ATR (Pico)

24-Hour Counts were taken on either Tuesday, Wednesday, or Thursday at 6 primary locations (6 – 11) identified in Figure 2-1; The average daily traffic (ADT) measured in vehicles per day (vpd) is shown in Table 2-2.

Table 2-2 : 24-Hour Tube (ATR) Count ADT (2021)

Count ID	Roadway	Description	Direction	ADT (vpd)
6	HOV Entrance Lane	Traffic From Heller Road to I-95	EB	4697
7a	I-95 Exit Ramp	Exit Ramp to Heller Road (RT)	EB	2234
7b	I-95 Exit Ramp	Exit Ramp to Heller Road (LT)	WB	1792
8a	Heller Road	South Gate (Outbound)	SB	188
8b	Heller Road	South Gate (Inbound)	NB	2632
9	West Gate	West Gate Entrance Traffic	EB	5788
10	Exit Gate (Onto Barta Road)	Parking Garage Exit	NB	4180
11	GEOINT Drive	Visitor Parking Lot Access Lane	SB	1344

2.1.2 2022 Traffic Volume Collection

March 2022 traffic data was collected at four (4) intersections along Barta Road to support the development of the TIS using JAMAR boards. This data was used to amend previously acquired counts collected in March 2021 for the DIA Annex project. The intersections counted are shown in Figure 2-1.

TMCs were conducted at the locations shown in Figure 2-1. The locations for the intersection counts are listed below in Table 2-3. Figure 2-2 and Figure 2-3 present diagrams of the volumes counted and balanced at specific intersections within the study areas (refer to Appendix A for the original count data). The counts were collected during the AM and PM peak hours over a two-day period of a typical Tuesday and Wednesday. This information was input into the existing conditions model. Data was compared to previous data collected and adjusted for anticipated volumes.

Table 2-3: Traffic Volume Count Locations – March 2022			
Count ID	**Intersection**	**Count Date**	**Type**
4R	Barta Road / Fairfax County Parkway (VA 286) NB Ramps	2022-03-02	TMC (JAMAR)
5R	Barta Road / Fairfax County Parkway (VA 286) SB Ramps	2022-03-01	TMC (JAMAR)
12	Barta Road with Heller Road	2022-03-02	TMC (JAMAR)
13	Barta Road with Rolling Road	2022-03-01	TMC (JAMAR)

2.2 Existing Year (2022) Traffic Volumes

A review of the traffic count data indicates that the weekday morning and afternoon peak hours are not consistent among the study intersections. The respective peak hour for each intersection is shown in Table 2-4.

Table 2-4: Peak Hours for Existing Counts (2021)

Count ID	Location	Peak Hour	
		AM	PM
March 2021 Counts			
1	Barta Road with Geoint Drive	6:45–7:45	4:30–5:30
2	Barta Road with Heller Road	7:15-8:15	3:45-4:45
3	Barta Road with Backlick Road	7:00-8:00	4:00-5:00
4-5	Barta Road with Fairfax County Parkway (VA 286) NB Ramps (WB Barta Road)	6:45–7:45	3:45-4:45
6	Heller Road with I-95 NB/I-95 SB Express Lane	12:00-1:00	5:45-6:45
7	Heller Road with I-95 SB	7:45-8:45	3:00-4:00
8	Heller Road with NGA South Gate (inbound)	7:30-8:30	8:45-9:45
9	Barta Road at NGA West Gate Entry	9:30-10:30	-
10	Barta Road at NGA West Gate Exit	-	5:45-6:45
11	GEOINT Drive Visitor Parking Lot Access Lane	7:15-8:15	2:45-3:45
March 2022 Counts			
4R	Barta Road with Fairfax County Parkway (VA 286) NB Ramps	7:15-8:15	4:15-5:15
5R	Barta Road with Fairfax County Parkway (VA 286) SB Ramps	7:30-8:30	4:00-5:00
12	Barta Road with Heller Road	7:15-8:15	4:15-5:15
13	Barta Road with Rolling Road	7:45-8:45	4:30-5:30

Figures 2-2 through Figure 2-3 show the Existing morning (AM) and afternoon (PM) peak hour traffic volumes.

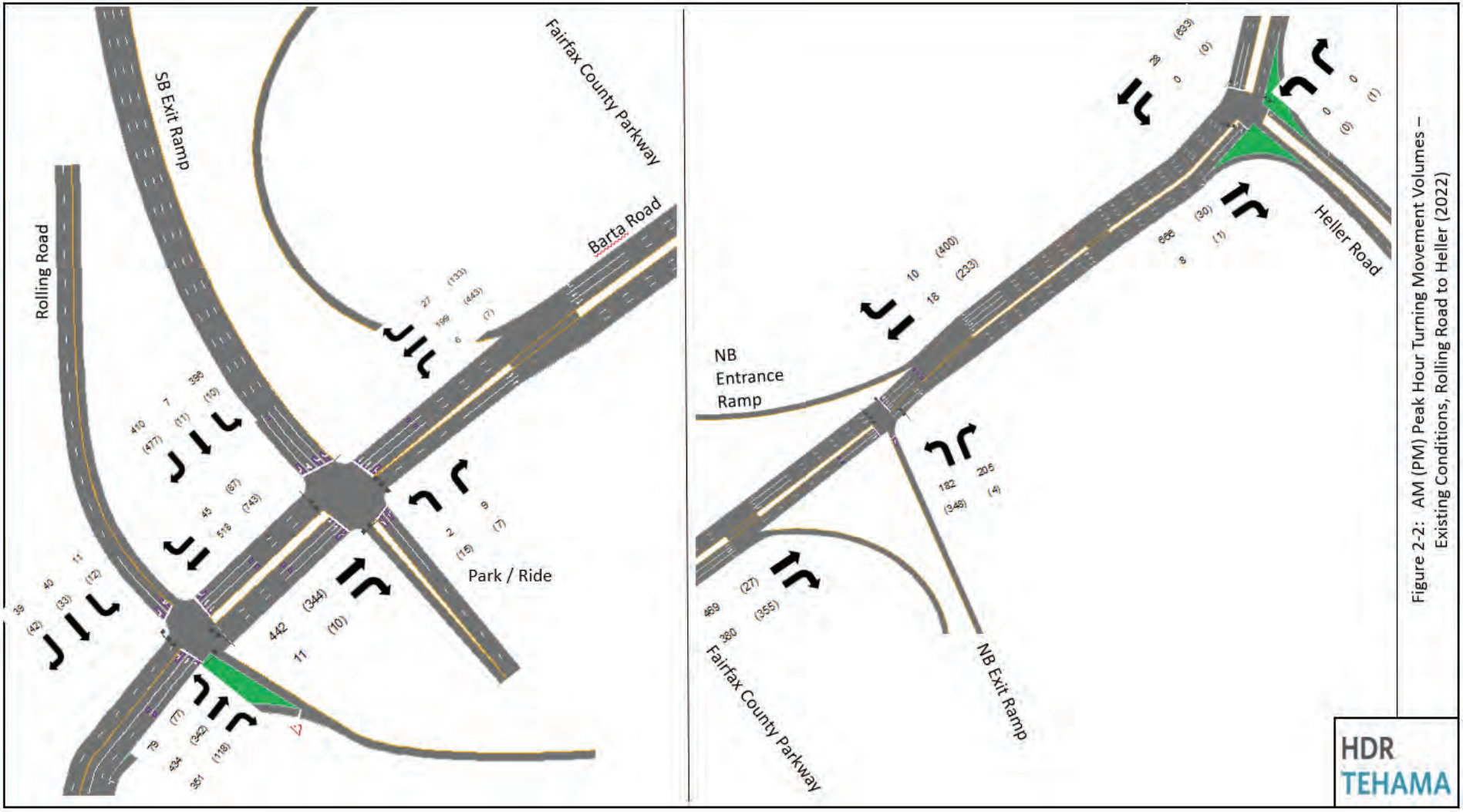


Figure 2-2: AM (PM) Peak Hour Turning Movement Volumes – Existing Conditions, Rolling Road to Heller (2022)

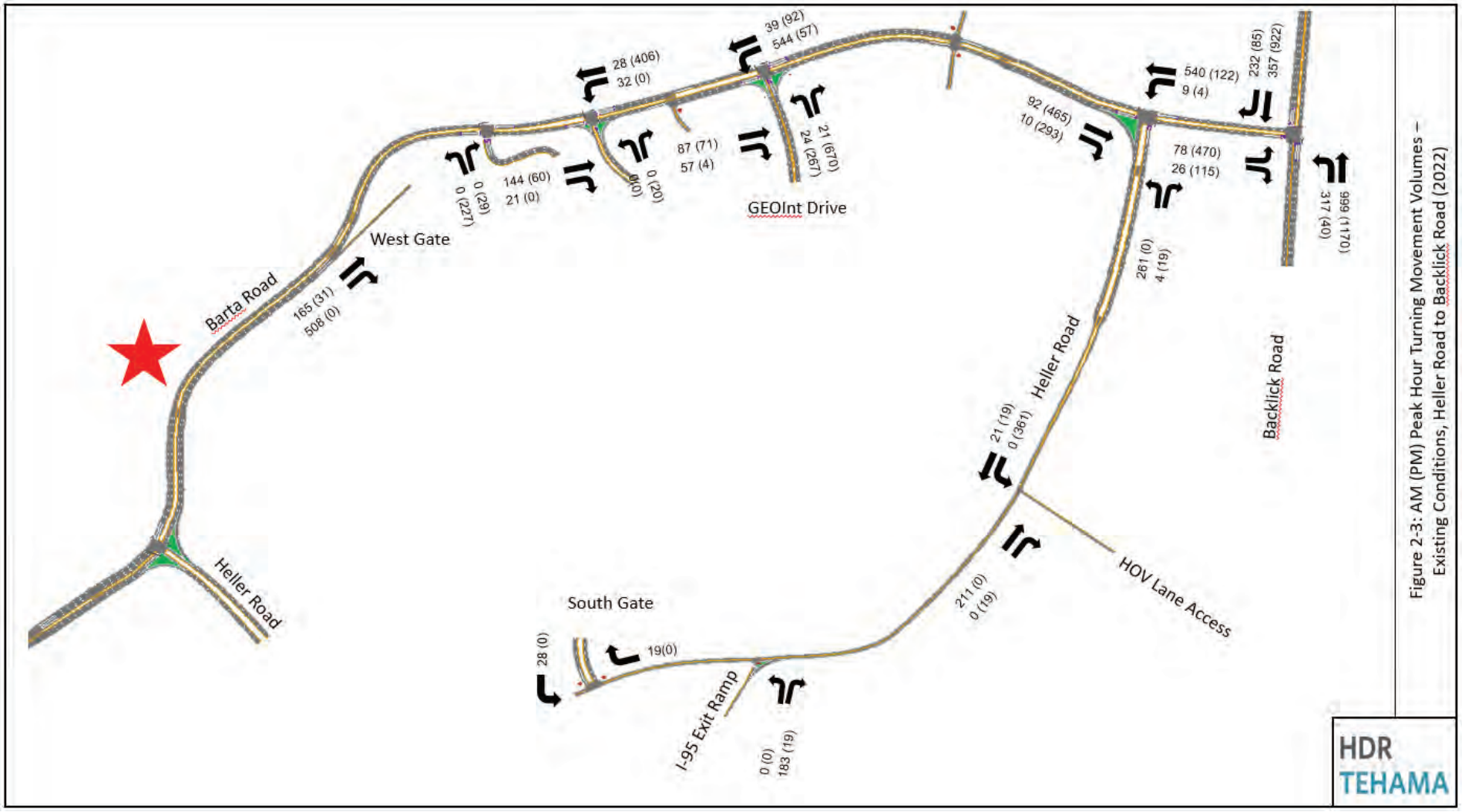


Figure 2-3: AM (PM) Peak Hour Turning Movement Volumes – Existing Conditions, Heller Road to Backlick Road (2022)

2.3 Traffic Signal Timing Data

Signal timing was not provided by the agencies. Timing was observed during traffic counts and noted. Total cycle length, protected / permissive movements, and phase lengths were collected and modelled within Synchro 11. Where timing and cycle length information was not recorded in the field, Synchro “optimized” conditions were used in the model. See Appendix A for field notes taken.

3 OPERATIONAL ANALYSES

3.1 Methodology

This study includes the operational analysis of the existing year 2022 conditions, future 2022 conditions with 600 new staff (proposed Distribution Center) and 650 new staff (proposed DIA Annex). The future year analyses were performed for only the 2023 Build condition. The operating condition of the study intersections were evaluated using the Synchro/SimTraffic micro-simulation software.

Different MOEs were evaluated while performing the operational condition. The intersection delay and LOS were evaluated and presented in this study for the existing, future year build traffic conditions.

The Synchro 11 traffic simulation software program was used to perform intersection and arterial operational analyses. This software provides industry standard analysis for signalized and roundabout intersections. The study area consists of both unsignalized and signalized intersections. The analysis methodologies are described in the following sections.

3.2 Description of Level of Service Grades (LOS)

Based on delay or density values, a "grade" or LOS ranging from LOS A, the best, to LOS F, the worst are assigned. The HCM (TRB, 2016) describes service as the following:

LOS A - free flow

Traffic flows at or above the posted speed limit and motorists have complete mobility between lanes. The average spacing between vehicles is about 550 ft (167 m) or 27 car lengths. Motorists have a high level of physical and psychological comfort. The effects of incidents or point breakdowns are easily absorbed. LOS A generally occurs late at night in urban areas and frequently in rural areas.

LOS B - reasonably free flow

LOS A speeds are maintained, maneuverability within the traffic stream is slightly restricted. The lowest average vehicle spacing is about 330 ft (100 m) or 16 car lengths. Motorists still have a high level of physical and psychological comfort.

LOS C - stable flow, at or near free flow

Ability to maneuver through lanes is noticeably restricted and lane changes require more driver awareness. Minimum vehicle spacing is about 220 ft (67 m) or 11 car lengths. Most experienced

drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained. Minor incidents may still have no effect but localized service will have noticeable effects and traffic delays will form behind the incident. This is the target LOS for some urban and most rural highways.

LOS D - approaching unstable flow

Speeds slightly decrease as traffic volume slightly increase. Freedom to maneuver within the traffic stream is much more limited and driver comfort levels decrease. Vehicles are spaced about 160 ft (50m) or 8 car lengths. Minor incidents are expected to create delays. Examples are a busy shopping corridor in the middle of a weekday, or a functional urban highway during commuting hours. It is a common goal for urban streets during peak hours, as attaining LOS C would require prohibitive cost and societal impact in bypass roads and lane additions.

LOS E - unstable flow, operating at capacity

Flow becomes irregular and speed varies rapidly because there are virtually no usable gaps to maneuver in the traffic stream and speeds rarely reach the posted limit. Vehicle spacing is about 6 car lengths, but speeds are still at or above 50 mi/h(80 km/h). Any disruption to traffic flow, such as merging ramp traffic or lane changes, will create a shock wave affecting traffic upstream. Any incident will create serious delays. Drivers' level of comfort become poor. This is a common standard in larger urban areas, where some roadway congestion is inevitable.

LOS F - forced or breakdown flow

Every vehicle moves in lockstep with the vehicle in front of it, with frequent slowing required. Travel time cannot be predicted, with generally more demand than capacity. A road in a constant traffic jam is at this LOS, because LOS is an average or typical service rather than a constant state. For example, a highway might be at LOS D for the AM peak hour, but have traffic consistent with LOS C some days, LOS E or F others, and come to a halt once every few weeks.

Figure 3-1 shows the roadway traffic condition corresponding to the LOS letter grades. The goal of this study is to ensure study intersections would operate at an acceptable LOS D or better in the future build year.

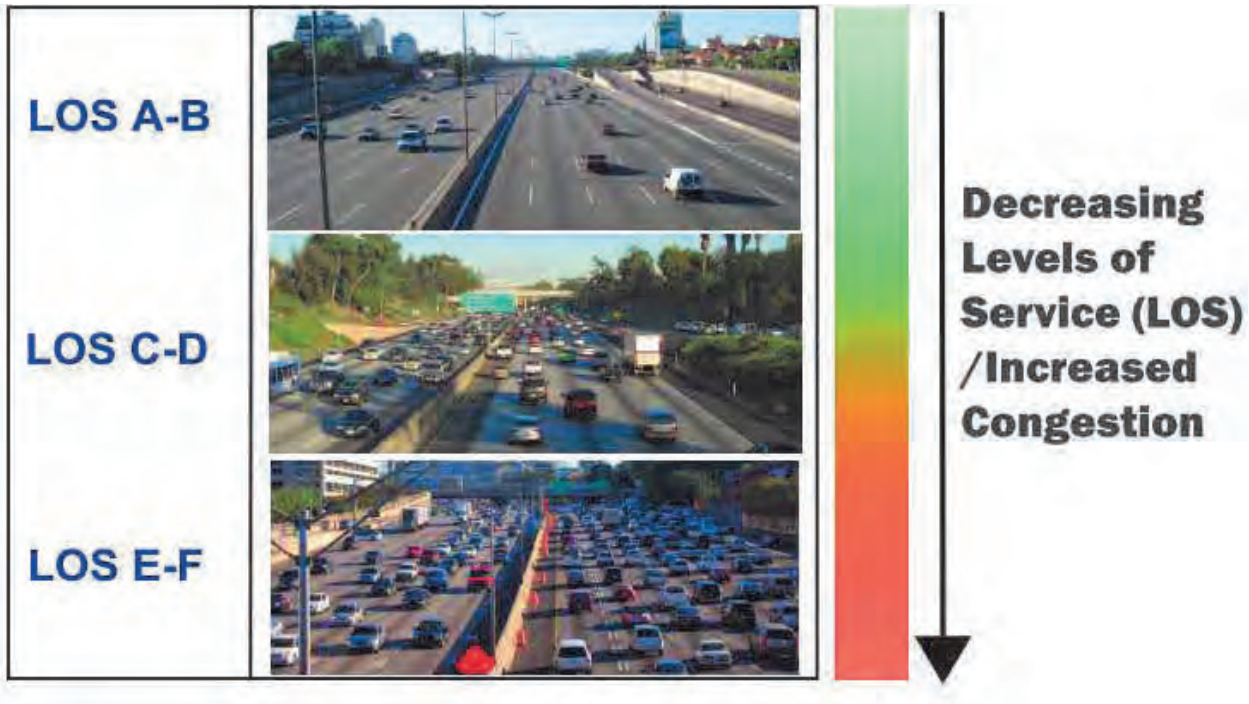


Figure 3-1: Level of Service (LOS) Conditions

3.3 Analysis Methodology for STOP Controlled Intersections

The capacity analysis procedures provide an 'approach delay' for the stop sign controlled approaches to the unsignalized intersections. The intersection LOS "grades" for two-way stop-controlled intersections are as follows in Table 3-1:

Table 3-1: STOP Controlled Intersection Level of Service (LOS) Criteria

Level of Service (LOS)	Average Control Delay (sec/veh)
A	< 10
B	10 to 15
C	15 to 25
D	25 to 35
E	35 to 50
F	> 50

Source: Highway Capacity Manual (TRB, 2016)

3.4 Analysis Methodology for SIGNAL Controlled Intersections

At a signalized intersection, the total delay is dependent upon a number of factors, including when a driver approaches the intersection, the driver's position in the queue and the traffic signal cycle length and green times. The control delay for a signalized intersection is determined for each lane group and aggregated for each approach and for the intersection as a whole.

Table 3-2 below presents the LOS criteria for signalized intersections (based on HCM), which is directly related to the overall intersection control delay value. The intersection LOS for signalized intersections are as follows:

Table 3-2: SIGNAL Controlled Intersection Level of Service (LOS) Criteria

Level of Service (LOS)	Average Control Delay (sec/veh)
A	< 10
B	10 to 20
C	20 to 35
D	35 to 55
E	55 to 80
F	> 80

Source: Highway Capacity Manual (TRB, 2016)

The operational analyses at each study area intersection, for each individual alternative, were evaluated based on these signalized intersection delay thresholds.

4 EXISTING CONDITIONS

4.1 Existing Geometric Configuration and Intersections

The study areas have been defined to include the development's area of influence shown below in Figure 4-1.

Figure 4-1: Analyzed Intersections for Distribution Center preferred location

Figure 4-2 presents the lane configurations for intersections within the study area under existing conditions for FBNA. Existing conditions in this report refer to the current conditions as of April 2022. Site visits were conducted in March 2021 and March 2022 to document the lane configurations in place at that time.

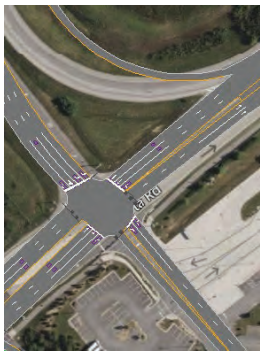
	B	C	D
			
E	F	G	H
			
I	J	K	P
			
Q	R		
			

Figure 4-2: Existing Lane Configurations, Fort Belvoir North Area

4.2 Existing Operational Analysis

As previously discussed above, a traffic study was completed in June 2021 for the DIA Annex. Counts for this previous study were performed in March 2021, during a time that experienced decreased traffic as a result of the Covid-19 pandemic. During this time, it was assumed that a portion of FBNA staff worked remotely.

The existing peak hour traffic volume (AM peak and PM peak hours) (Figures 2-2 and 2-3) and the existing lane-use configuration (Figures 4-2) were used in performing the existing (2022) operational analysis. The existing (2022) peak hour volumes were adjusted using a combination of 2021 DIA Annex TIS assumptions, March 2022 counts, and site observations.

4.2.1 Existing (2022) Intersection Operational Analysis

The AM and PM peak hour intersection operational analyses results were evaluated using the Synchro 11 model. They are presented in Table 4-1. The existing year Synchro output files are included in Appendix B.

Due to the nature of the anticipated additional trips, the weekday AM and PM peak periods were the focus of this study. Total volume counts system-wide were calculated from the 2021 intersection (TMC) and ATR data. The following peak hours were identified and compared to Table 2-3.

FBNA

- AM peak period: 7:30am-8:30am;
- PM peak period: 4:15pm-5:15pm.

Table 4-1: Existing Intersection Operational Analysis – FBNA						
Intersection ID	Intersection	Signalized (Y/N)	AM	PM	AM	PM
			Delay (s/veh)		LOS	
B	Barta Road / Heller Road	Y	2.5	0.4	A	A
C	West Gate Entrance	N	-	-	A	A
D	Barta Road / Parking Garage Exit	Y	0.0	9.5	A	A
E	Barta Road / Main Guest Access	N	-	-	A	A
F	Barta Road / GEOINT Drive	Y	5.5	10.4	A	B
G	Barta Road / Heller Road	Y	9.8	0.4	A	A
H	Barta Road / Backlick Road	Y	7.9	18.9	A	B
I	Heller Road / HOV Entrance Ramp	N	-	-	A	A
J	I-95 Exit Ramp / Heller Road	N	-	-	A	A
K	South Gate Entrance	N	-	-	A	A
P	Barta Road / Rolling Road	Y	8.3	9.3	A	A
Q	Barta Road / SB VA 286 Ramps	Y	6.2	8.4	A	A
R	Barta Road / NB VA 286 Ramps	Y	9.0	11.9	A	B

Existing

- All intersections (AM and PM) operate at LOS B or better.

5 BUILD CONDITIONS

5.1 Proposed Site Development

A location within FBNA has been selected to accommodate the proposed construction and operation of a new 525,000 square foot Distribution Center consolidated complex consisting of a high bay warehouse and a two-story administrative building with associated parking and covered storage for approximately 600 personnel. No changes to existing roadways have been identified. New infrastructure improvements are assumed to be limited to the building, parking structure, intersection along Barta Road, access lanes, and associated site improvements. In addition to the Distribution Center, trips associated with a DIA Annex at FBNA have also been included in modeling.

5.2 Geometric Configuration

No changes in existing roadway geometrics were assumed for this study. A new signalized intersection was modeled at the location, Proposed Distribution Center Entrance, shown on Figure 4-1.

5.3 Trip generation

The Distribution Center construction is estimated to generate 600 additional staff positions. The analysis assumes that each additional staff member generates 0.9 additional AM and PM peak hour trip for both 600 additional staff (Distribution Center) and one (1) additional AM and PM peak hour trip for each 650 additional staff (DIA Annex). In addition, eighteen (18) truck trips have been modeled for both the AM and PM peak hours. The distribution between site access points was determined utilizing the March 2021 count data.

Table 5-1: Trip Generation

Build Development	Scenario Description	Trips	
		AM	PM
Distribution Center	600 Additional Staff	540	540
DIA Annex	650 Additional Staff	650	650

5.4 Distribution of Access Volumes

Estimated percentages of entering and exiting traffic to the DIA Annex were calculated using the March 2021 field counts. Trip distribution for the Distribution Center was estimated based on site access, entrance location, and estimated distribution of new DIA Annex traffic. Table 4-1 and Table 4-2 summarize the distribution of entering and exiting vehicle percentages for each location during peak

hours. It was noted that the existing South Gate traffic occurred during off peak times in 2021. The West Gate off Barta Road, however, does not have direct access to the DIA Annex site location. Therefore, this study assumes that the South Gate would provide an alternative access point. The percentage shown below in Table 5-2 and Table 5-3 will be used to distribute expected new trips generated by the new facility for normal conditions.

Table 5-2: Modeled Gate Access Volumes (%) – Distribution Center			
	Description	**AM**	**PM**
Belvoir Gate (Enter) / Meade Gate (Exit)			
New	New Gate via Backlick Road	30%	30%
New	New Gate via VA 286 and Barta Road(EB)	70%	70%

Table 5-3: Modeled Gate Access Volume (%) – DIA Annex			
Access ID	**Description**	**AM**	**PM**
Existing	West Gate / Parking Garage Exit (Barta Road)	0%	0%
Existing	North Gate (GEOINT Drive)	70%	70%
Existing	South Gate (Heller Road)	30%	30%

Figure 5-1 through Figure 5-2 show the total intersection volumes used for the Build condition. No background growth was used for the two alternative sites.

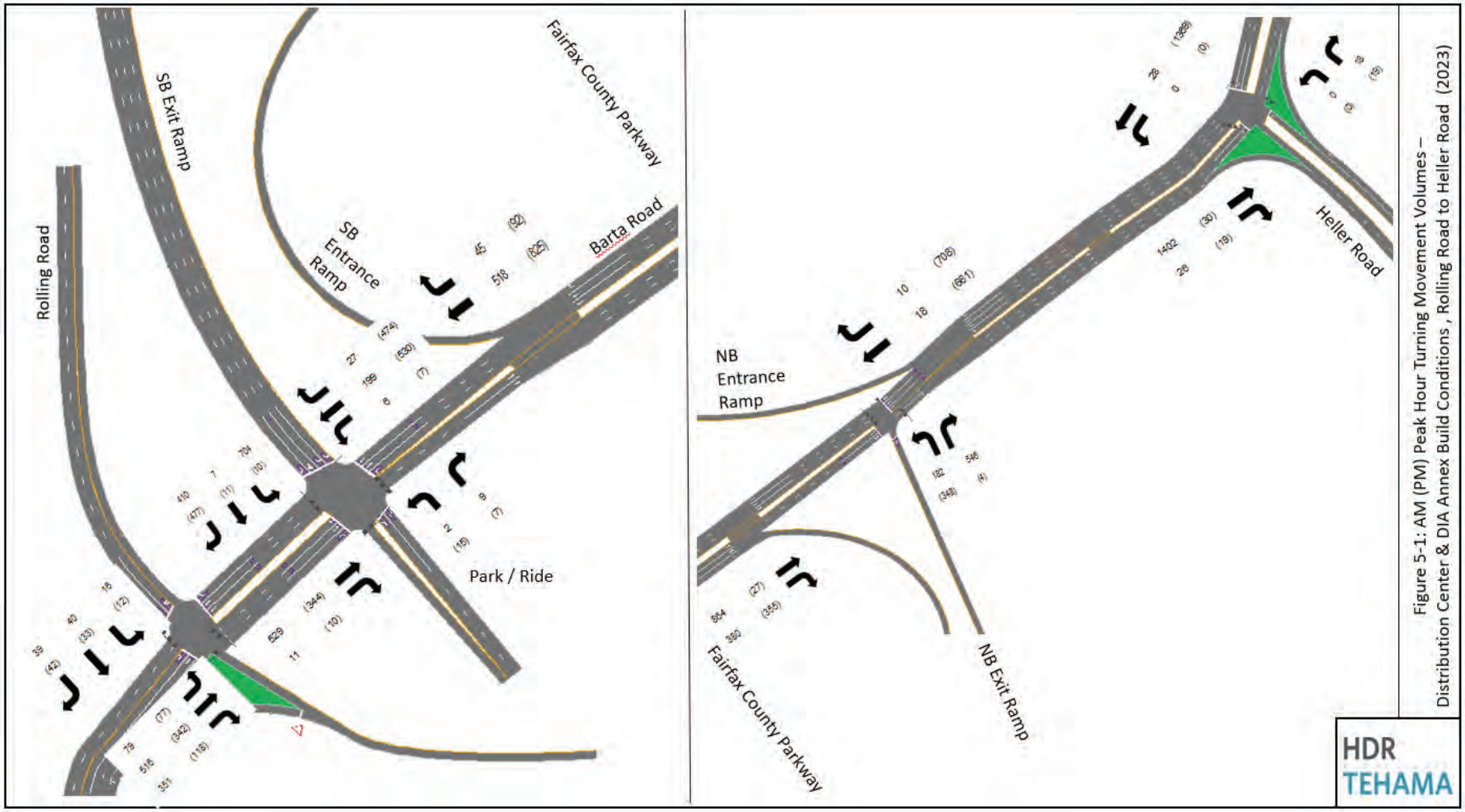


Figure 5-1: AM (PM) Peak Hour Turning Movement Volumes – Distribution Center & DIA Annex Build Conditions , Rolling Road to Heller Road (2023)

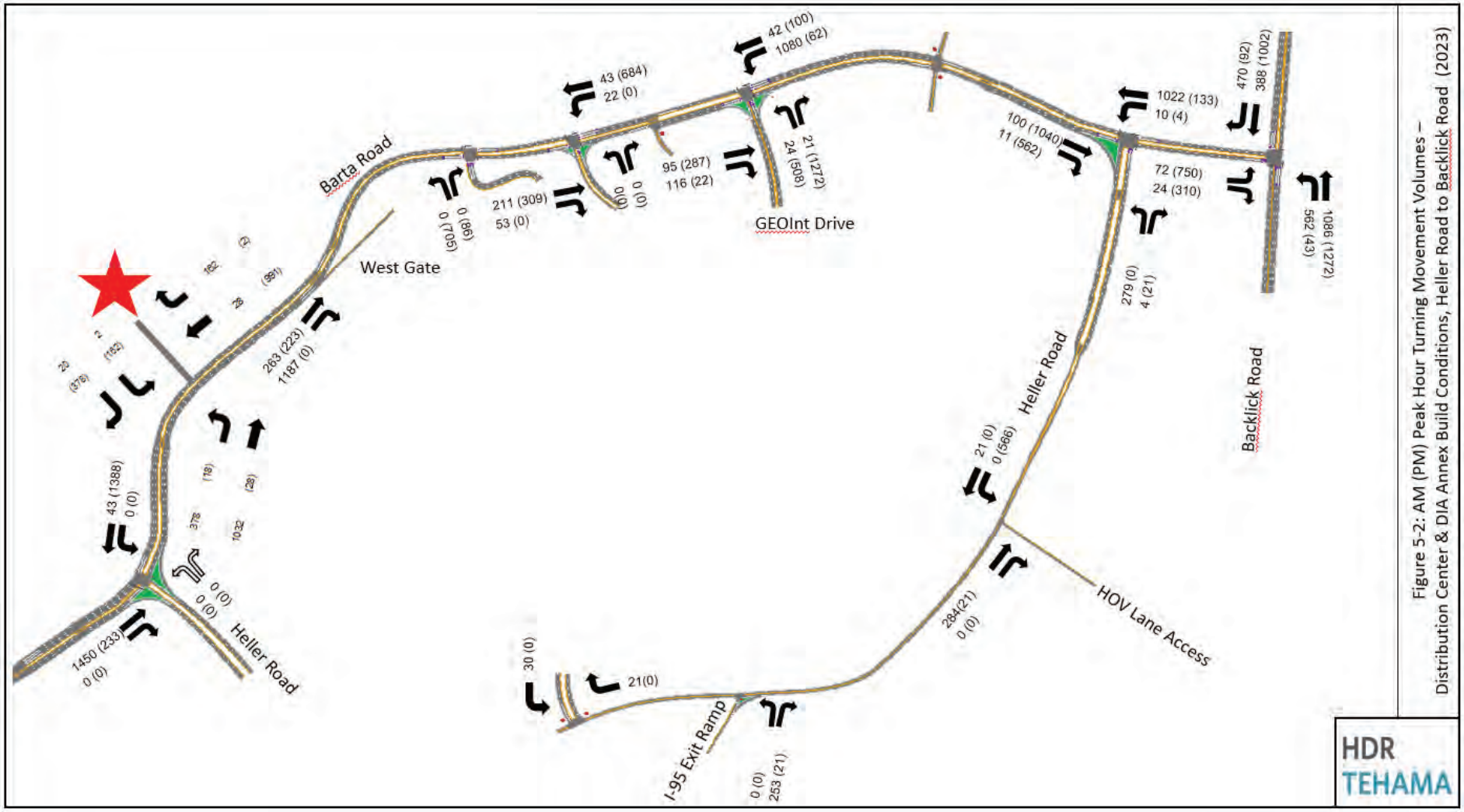


Figure 5-2: AM (PM) Peak Hour Turning Movement Volumes – Distribution Center & DIA Annex Build Conditions, Heller Road to Backlick Road (2023)

5.5 General Traffic Operations

Synchro traffic analysis models were created for each of the AM and PM peak periods to analyze traffic operations under existing and full-build conditions. The performance results of these models area presented in this section. Full Synchro reports are provided in Appendix B.

5.5.1 Intersections Analysis

Table 5-4 presents the general traffic operations summary for the Build scenario that includes the Distribution Center and planned DIA Annex.

Table 5-4: Build Condition (2023) Intersection Operational Analysis

Int. ID	Intersection	Signalized (Y/N)	***600 Added Personnel (Distribution Center) + 650 Added Personnel (DIA Annex)***			
			AM	PM	AM	PM
			Delay (s/veh)		LOS	
A	New Entrance / Barta Road	Y	4.9	22.7	A	C
B	Barta Road / Heller Road	Y	4.6	0.9	A	A
C	West Gate Entrance	N	-	-	A	A
D	Barta Road / Parking Garage Exit	Y	0.1	7.7	A	A
E	Barta Road / Main Guest Access	N	8.7	11.4	A	B
F	Barta Road / GEOINT Drive	Y	5.8	66.3	A	E
G	Barta Road / Heller Road	Y	9.8	4.7	A	A
H	Barta Road / Backlick Road	Y	8.5	22.2	A	C
I	Heller Road / HOV Entrance Ramp	N	-	-	A	A
J	I-95 Exit Ramp / Heller Road	N	-	-	A	A
K	South Gate Entrance	N	-	-	A	A
P	Barta Road / Rolling Road	Y	8.8	9.7	A	A
Q	Barta Road / SB VA 286 Ramps	Y	7.8	9.4	A	A
R	Barta Road / NB VA 286 Ramps	Y	27.7	11.3	C	B

Build Scenario

- All intersections (AM and PM) operate at LOS C or better with the exception of the intersections of:
    - Barta Road /Geoint Drive (LOS E during the PM peak hour) – Exiting traffic from Geoint Drive creates queues while waiting to turn on to Barta Road.

6 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis completed in the above sections, the following conclusions can be made:

Traffic Operations

- Existing Conditions
    - The analysis indicates that all signalized intersections are operating at acceptable levels overall (LOS B or better) at both alternate locations.
    - For the unsignalized intersections, the analysis indicates that the majority of the intersections are operating well.
- Build Scenario
    - FBNA – Build Scenario 1 (600 additional personnel – Distribution Center; 650 Additional Personnel – DIA Annex; Total 1250)
        - Intersection F (Barta Road/Geoint Drive) – The increased left/right turning volumes exiting Geoint Drive (PM) decrease the level of service due to added delay. Intersection PM peak LOS drops from LOS B to LOS E. The following are critical movement:
            - AM - WB Barta Road to SB Geoint Drive
            - PM - NB Geoint Drive to both EB & WB Barta Road
        - Intersection H (Barta Road/Backlick Drive) – The additional AM left turns from the south leg of Backlick Road exceed the capacity of the single turn lane and signal timing plan. Intersection PM peak LOS drops from LOS B to LOS C.
            - PM - EB Barta Road to NB Backlick Road
            - PM - SB Backlick Road
- Mitigation
    - Some intersection movements above are shown to have a less than desirable LOS. In these cases, geometric improvements in the form of an additional turn lane and signal optimization may be appropriate.
- Pedestrian and Bicycle Operations
    - Pedestrians are provided shared phasing with appropriate traffic phases. No impacts are expected along Barta Road. Additional connections to the new distribution facility may be appropriate with connection across Barta Road.

Based on the modeling results, the existing roadway system build scenario operates at acceptable levels with the construction of the Distribution Center and added personnel. Low level of service at Geoint Drive in the PM would only be anticipated with the construction of the DIA Annex. LOS E is also expected only for exiting vehicles from Geoint Drive.

7 ACRONYMS AND ABBREVIATIONS

ADT	Average Daily Traffic
ATR	Automated Traffic Recorder
DIA	Defense Intelligence Agency
EBL	Eastbound Left
EBR	Eastbound Right
EBT	Eastbound Thru
Ex	Existing
Ft	Foot
HCM	Highway Capacity Manual
HQ	Headquarters
JV	Joint Venture
LOS	Level of Service
MOE	Measure of Effectiveness
NBL	Northbound Left
NBR	Northbound Right
NBT	Northbound Thru
NGA	National Geospatial-Intelligence Agency
PE	Professional Engineer
s	Seconds
SBL	Southbound Left
SBR	Southbound Right
SBT	Southbound Thru
TIS	Traffic Impact Study
TMC	Turning Movement Count
TRB	Transportation Research Board
USACE	United States Army Corps of Engineers
veh	Vehicle
v/c	volume to capacity
vpd	vehicles per day
WBL	Westbound Left
WBR	Westbound Right
WBT	Westbound Thru

8 REFERENCES

County of Fairfax, 2021	County of Fairfax, Virginia. 2021. *Fairfax County & Franconia-Springfield Parkways: Alternatives Analysis & Long-Term Planning Study*.
HDR & Tehama, 2021	Appendix D: Traffic Impact Study to Support National Environmental Policy Act Documentation for DIA HQ Annex, REVISED DRAFT. In *Defense Intelligence Agency (DIA) Headquarters (HQ) Annex Environmental Assessment*, Fort Belvoir, Virginia, October 2021. Prepared for U.S. Army Corps of Engineers, Baltimore District and U.S. Army Garrison Fort Belvoir. June 2021.
TRB, 2016	Transportation Research Board (TRB) Highway Capacity Manual (HCM), 6th Edition: A Guide for Multimodal Mobility Analysis. Washington, DC: The National Academies Press.

APPENDIX A

Traffic Data

AM Counts

Barta Road at Rolling Road

1-Mar-22

	Rolling Road From North			Barta From East			Ramp From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
6:00:00 AM	5	7	2	4	36	0	0	0	0	50	29	2	135
6:15:00 AM	2	8	3	4	29	0	0	0	0	70	26	0	143
6:30:00 AM	6	11	1	2	53	0	0	0	0	67	40	6	186
6:45:00 AM	10	8	2	1	67	0	0	0	0	70	55	4	217
7:00:00 AM	7	14	2	5	54	0	0	0	0	69	82	9	242
7:15:00 AM	16	15	2	2	83	0	0	0	0	88	106	16	328
7:30:00 AM	7	14	1	3	92	0	0	0	0	102	107	24	350
7:45:00 AM	11	15	3	14	102	0	0	0	0	95	110	26	376
8:00:00 AM	11	7	4	4	152	0	0	0	0	87	98	22	385
8:15:00 AM	6	11	1	17	141	0	0	0	0	76	119	19	390
8:30:00 AM	11	7	3	10	123	0	0	0	0	93	107	12	366
8:45:00 AM	16	11	7	7	160	0	0	0	0	86	70	13	370

Barta Road at SB Ramp / Comm Parking

1-Mar-22

	SB Ramp / Comme Lot			Barta From East			Comm. Lot From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
5:45:00 AM	19	10	62	0	10	2	2	0	4	6	21	0	141
6:00:00 AM	24	3	65	0	10	3	4	0	0	3	27	0	139
6:15:00 AM	32	1	93	0	20	1	5	0	4	3	43	0	202
6:30:00 AM	39	0	71	4	22	1	3	0	3	4	49	0	196
6:45:00 AM	42	4	97	3	19	0	2	0	2	5	66	0	240
7:00:00 AM	36	1	112	7	30	3	4	0	1	1	109	0	304
7:15:00 AM	79	1	92	3	26	1	3	0	0	4	97	0	306
7:30:00 AM	92	2	104	5	35	2	0	0	0	1	121	0	362
7:45:00 AM	115	2	93	16	44	2	3	0	2	1	104	0	382
8:00:00 AM	112	1	101	4	65	0	3	0	0	5	103	1	395
8:15:00 AM	91	2	98	2	55	2	3	0	0	4	114	0	371
8:30:00 AM	99	1	67	5	72	1	3	0	1	6	87	0	342

Barta Road at NB Ramp

1-Mar-22

	NB Ramp From North			Barta From East			NB Ramp From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
5:45:00 AM	0	0	0	3	7	0	53	0	15	15	64	0	157
6:00:00 AM	0	0	0	1	4	0	40	0	19	23	93	0	180
6:15:00 AM	0	0	0	0	3	0	55	0	20	40	94	0	212
6:30:00 AM	0	0	0	1	2	0	48	0	19	39	134	0	243
6:45:00 AM	0	0	0	1	4	0	38	0	30	53	121	0	247
7:00:00 AM	0	0	0	3	2	0	57	0	26	82	121	0	291
7:15:00 AM	0	0	0	2	7	0	67	0	35	87	107	0	305
7:30:00 AM	0	0	0	3	3	0	39	0	39	95	151	0	330
7:45:00 AM	0	0	0	1	1	0	48	0	48	107	96	0	301
8:00:00 AM	0	0	0	0	7	0	51	0	60	91	115	0	324
8:15:00 AM	0	0	0	3	7	0	40	1	53	92	108	0	304
8:30:00 AM	0	0	0	1	5	0	36	0	65	69	96	0	272

Barta Road at Heller Road

1-Mar-22

	4 From North			B From East			4 From South			B From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
6:00:00 AM	0	0	0	0	0	0	0	0	0	3	0	0	3
6:15:00 AM	0	0	0	0	0	0	0	0	0	3	0	0	3
6:30:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1
6:45:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1
7:00:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1
7:15:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1
7:30:00 AM	0	0	0	0	0	0	0	0	1	1	0	0	2
7:45:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00 AM	0	0	0	0	0	0	0	0	1	2	0	0	3
8:15:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1
8:30:00 AM	0	0	0	0	0	0	0	0	1	1	0	0	2
8:45:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1

PM Counts

Barta Road at Rolling Road

2-Mar-22

	Rolling Road From North			Barta From East			SB Ramp From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
2:45:00 PM	10	9	4	11	144	0	0	0	0	84	80	12	354
3:00:00 PM	9	5	0	15	155	0	0	0	0	72	76	18	350
3:15:00 PM	11	9	3	19	135	0	0	0	0	56	87	16	336
3:30:00 PM	14	1	1	14	140	0	0	0	0	64	58	15	307
3:45:00 PM	9	5	2	16	156	0	0	0	0	60	55	24	327
4:00:00 PM	13	7	1	15	209	0	0	0	0	64	81	19	409
4:15:00 PM	13	11	2	32	176	1	0	0	0	69	91	25	420
4:30:00 PM	10	4	2	22	193	0	0	0	0	85	87	22	425
4:45:00 PM	9	11	2	12	145	0	0	0	0	70	69	15	333
5:00:00 PM	11	11	5	25	200	0	0	0	0	80	84	18	434
5:15:00 PM	12	7	3	28	205	0	0	0	0	63	102	22	442
5:30:00 PM	7	4	2	25	187	0	0	0	0	55	73	22	375

Barta Road at SB Ramp / Comm Parking

2-Mar-22

	SB Ramp From North			Barta From East			Comm. Lot From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
2:45:00 PM	100	1	2	33	73	2	1	0	0	1	82	0	295
3:00:00 PM	98	0	2	76	95	0	0	0	0	0	77	0	348
3:15:00 PM	102	1	4	25	82	0	2	0	2	1	100	0	319
3:30:00 PM	117	0	4	33	71	1	0	1	0	2	63	0	292
3:45:00 PM	93	2	4	36	92	4	1	0	5	3	60	0	300
4:00:00 PM	126	1	5	49	102	1	2	0	4	1	85	0	376
4:15:00 PM	117	5	4	40	105	3	0	0	4	2	93	0	373
4:30:00 PM	116	3	0	31	131	2	1	0	5	3	94	0	386
4:45:00 PM	118	2	1	13	105	1	4	0	2	3	72	0	321
5:00:00 PM	117	3	1	25	118	0	0	0	4	2	97	1	368
5:15:00 PM	121	2	2	23	119	1	1	0	5	2	102	0	378
5:30:00 PM	121	2	0	21	100	1	1	0	1	0	69	3	319

Barta Road at NB Ramp

2-Mar-22

	NB Ramp From North			Barta From East			NB Ramp From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
2:45:00 PM	0	0	0	70	49	0	3	0	44	66	8	0	240
3:00:00 PM	0	0	0	106	97	0	2	0	56	73	8	0	342
3:15:00 PM	0	0	0	73	62	0	2	0	68	83	10	0	298
3:30:00 PM	0	0	0	90	65	0	2	0	53	56	5	0	271
3:45:00 PM	0	0	0	95	52	0	1	0	49	72	10	0	279
4:00:00 PM	0	0	0	104	68	0	2	0	50	69	3	0	296
4:15:00 PM	0	0	0	88	55	0	2	0	87	83	6	0	321
4:30:00 PM	0	0	0	82	52	0	0	0	82	81	8	0	305
4:45:00 PM	0	0	0	77	44	0	1	0	79	90	6	0	297
5:00:00 PM	0	0	0	78	38	0	1	0	100	101	7	0	325
5:15:00 PM	0	0	0	71	47	0	1	0	63	91	4	0	277
5:30:00 PM	0	0	0	65	43	0	0	0	82	97	10	0	297

Barta Road at Heller Road

2-Mar-22

	Heller From North			Barta From East			Heller From South			Barta From West			Total Veh.
Start Time	Right	Thru	Left	Right *	Thru *	Left	Right *	Thru	Left	Right	Thru	Left	
2:45:00 PM	0	0	0	70	49	0	3	0	0	0	0	0	4
3:00:00 PM	0	0	0	106	97	0	2	0	0	0	0	0	2
3:15:00 PM	0	0	0	73	62	0	2	0	0	0	0	0	2
3:30:00 PM	0	0	0	90	65	0	2	0	0	0	0	0	2
3:45:00 PM	0	0	0	95	52	0	1	0	0	0	0	0	1
4:00:00 PM	0	0	0	104	68	0	2	0	0	0	0	0	2
4:15:00 PM	0	0	0	88	55	0	2	0	0	0	0	0	2
4:30:00 PM	0	0	0	82	52	0	0	0	0	0	0	0	0
4:45:00 PM	0	0	0	77	44	0	1	0	0	0	0	0	1
5:00:00 PM	0	0	0	78	38	0	1	0	0	0	0	0	1
5:15:00 PM	0	0	0	71	47	0	1	0	0	0	0	0	1
5:30:00 PM	0	0	0	65	43	0	0	0	0	0	0	0	0

movements at Intersection NB Ramp

APPENDIX B

Synchro Files

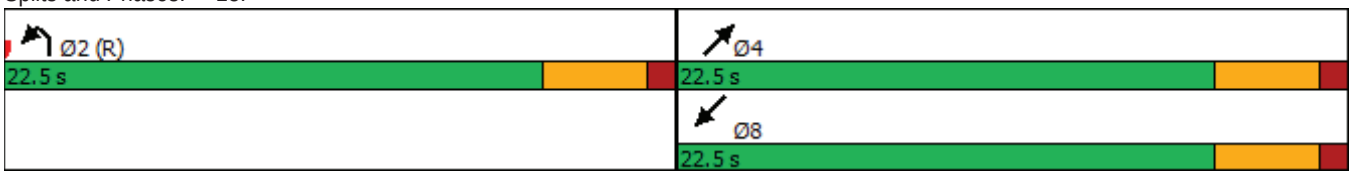
AM Existing LOS

Lane Group	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	214	205	469	0	0	18
Future Volume (vph)	214	205	469	0	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt	0.934					
Flt Protected	0.975					
Satd. Flow (prot)	1696	0	3539	0	0	5085
Flt Permitted	0.975					
Satd. Flow (perm)	1696	0	3539	0	0	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	128					
Link Speed (mph)	30		30			30
Link Distance (ft)	765		397			221
Travel Time (s)	17.4		9.0			5.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	233	223	510	0	0	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	456	0	510	0	0	20
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		6			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Turn Type	Prot		NA			NA
Protected Phases	2		4			8
Permitted Phases						
Minimum Split (s)	22.5		22.5			22.5
Total Split (s)	22.5		22.5			22.5
Total Split (%)	50.0%		50.0%			50.0%
Maximum Green (s)	18.0		18.0			18.0
Yellow Time (s)	3.5		3.5			3.5
All-Red Time (s)	1.0		1.0			1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	4.5		4.5			4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0			7.0
Flash Dont Walk (s)	11.0		11.0			11.0
Pedestrian Calls (#/hr)	5		5			5
Act Effct Green (s)	18.0		18.0			18.0
Actuated g/C Ratio	0.40		0.40			0.40
v/c Ratio	0.60		0.36			0.01
Control Delay	11.6		6.7			8.2
Queue Delay	0.0		0.0			0.0
Total Delay	11.6		6.7			8.2

Lane Group	NBL	NBR	NET	NER	SWL	SWT
LOS	B		A			A
Approach Delay	11.6		6.7			8.2
Approach LOS	B		A			A
Queue Length 50th (ft)	59		34			1
Queue Length 95th (ft)	131		51			4
Internal Link Dist (ft)	685		317			141
Turn Bay Length (ft)						
Base Capacity (vph)	755		1415			2034
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.60		0.36			0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 44.9%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 13:



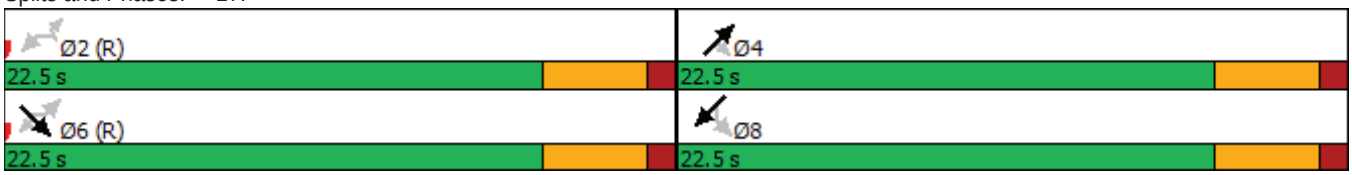
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	396	7	410	2	0	9	0	442	11	6	199	0
Future Volume (vph)	396	7	410	2	0	9	0	442	11	6	199	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.855	0.850			0.850			0.850			
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	3433	1513	1504	1770	0	1583	0	3539	1583	1770	3539	0
Flt Permitted	0.950			0.610						0.478		
Satd. Flow (perm)	3433	1513	1504	1136	0	1583	0	3539	1583	890	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		219	227			36			36			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		872			347			301			374	
Travel Time (s)		19.8			7.9			6.8			8.5	
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
Adj. Flow (vph)	430	8	446	2	0	10	0	480	12	7	216	0
Shared Lane Traffic (%)			49%									
Lane Group Flow (vph)	430	227	227	2	0	10	0	480	12	7	216	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60		60	60		60	60		60	60		60
Turn Type	Perm	NA	Perm	Perm		Perm		NA	Perm	Perm	NA	
Protected Phases		6						4			8	
Permitted Phases	6		6	2		2			4	8		
Minimum Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%		50.0%		50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5		3.5		3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5		4.5		4.5	4.5	4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0	7.0		7.0		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	5	5	5	5		5		5	5	5	5	
Act Effct Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Actuated g/C Ratio	0.40	0.40	0.40	0.40		0.40		0.40	0.40	0.40	0.40	
v/c Ratio	0.31	0.31	0.31	0.00		0.02		0.34	0.02	0.02	0.15	
Control Delay	10.1	3.2	3.0	8.0		1.0		4.6	0.2	9.8	8.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	10.1	3.2	3.0	8.0		1.0		4.6	0.2	9.8	8.9	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
LOS	B	A	A	A		A		A	A	A	A	
Approach Delay		6.5			2.2			4.5			9.0	
Approach LOS		A			A			A			A	
Queue Length 50th (ft)	37	1	0	0		0		13	0	1	12	
Queue Length 95th (ft)	61	32	30	3		2		20	m0	m2	m31	
Internal Link Dist (ft)		792			267			221			294	
Turn Bay Length (ft)												
Base Capacity (vph)	1373	736	737	454		654		1415	654	356	1415	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.31	0.31	0.31	0.00		0.02		0.34	0.02	0.02	0.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.34			
Intersection Signal Delay: 6.2		Intersection LOS: A	
Intersection Capacity Utilization 38.9%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17:



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	144	0	0	60	0	0
Future Volume (vph)	144	0	0	60	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1863
Link Speed (mph)	30			30	30	
Link Distance (ft)	404			491	211	
Travel Time (s)	9.2			11.2	4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	157	0	0	65	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	157	0	0	65	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	12			24	0	
Link Offset(ft)	0			6	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

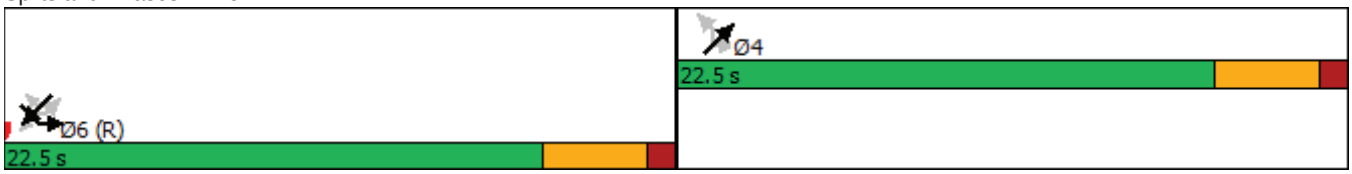
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 7.3%		ICU Level of Service A	
Analysis Period (min) 15			

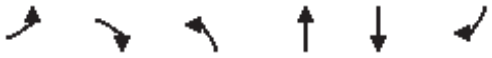
Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Traffic Volume (vph)	0	0	11	40	39	79	434	351	0	518	45
Future Volume (vph)	0	0	11	40	39	79	434	351	0	518	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	0	250		0	0		0
Storage Lanes	0	0		1	1	1		1	0		1
Taper Length (ft)	100			100		100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt					0.850			0.850			0.850
Flt Protected				0.950		0.950					
Satd. Flow (prot)	0	0	0	1770	1583	1770	3539	1583	0	3539	1583
Flt Permitted				0.950		0.441					
Satd. Flow (perm)	0	0	0	1770	1583	821	3539	1583	0	3539	1583
Right Turn on Red					Yes			Yes			Yes
Satd. Flow (RTOR)					42			382			49
Link Speed (mph)	30			30			30			30	
Link Distance (ft)	601			719			925			301	
Travel Time (s)	13.7			16.3			21.0			6.8	
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
Adj. Flow (vph)	0	0	12	43	42	86	472	382	0	563	49
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	0	0	55	42	86	472	382	0	563	49
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			12			12			12	
Link Offset(ft)	0			0			0			0	
Crosswalk Width(ft)	10			10			10			10	
Two way Left Turn Lane											
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60	60	60	60	60		60	60		60
Turn Type			D.Pm	Prot	Perm	Perm	NA	Perm		NA	Perm
Protected Phases				6!			4			6!	
Permitted Phases			6!		6	4		4			6
Minimum Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (%)			50.0%	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%
Maximum Green (s)			18.0	18.0	18.0	18.0	18.0	18.0		18.0	18.0
Yellow Time (s)			3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)			1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)				4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag											
Lead-Lag Optimize?											
Walk Time (s)			7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)			11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)			5	5	5	5	5	5		5	5
Act Effct Green (s)				18.0	18.0	18.0	18.0	18.0		18.0	18.0
Actuated g/C Ratio				0.40	0.40	0.40	0.40	0.40		0.40	0.40
v/c Ratio				0.08	0.06	0.26	0.33	0.44		0.40	0.07

Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Control Delay				8.8	3.8	11.7	10.2	3.2		10.4	3.3
Queue Delay				0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay				8.8	3.8	11.7	10.2	3.2		10.4	3.3
LOS				A	A	B	B	A		B	A
Approach Delay				6.6			7.5			9.8	
Approach LOS				A			A			A	
Queue Length 50th (ft)				8	0	14	42	0		58	0
Queue Length 95th (ft)				24	12	39	68	38		75	11
Internal Link Dist (ft)	521			639			845			221	
Turn Bay Length (ft)						250					
Base Capacity (vph)				708	658	328	1415	862		1415	662
Starvation Cap Reductn				0	0	0	0	0		0	0
Spillback Cap Reductn				0	0	0	0	0		0	0
Storage Cap Reductn				0	0	0	0	0		0	0
Reduced v/c Ratio				0.08	0.06	0.26	0.33	0.44		0.40	0.07

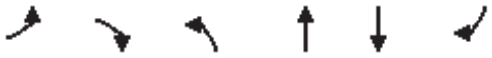
Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2: and 6:SESW, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.44			
Intersection Signal Delay: 8.3		Intersection LOS: A	
Intersection Capacity Utilization 34.1%		ICU Level of Service A	
Analysis Period (min) 15			
! Phase conflict between lane groups.			

Splits and Phases: 25:





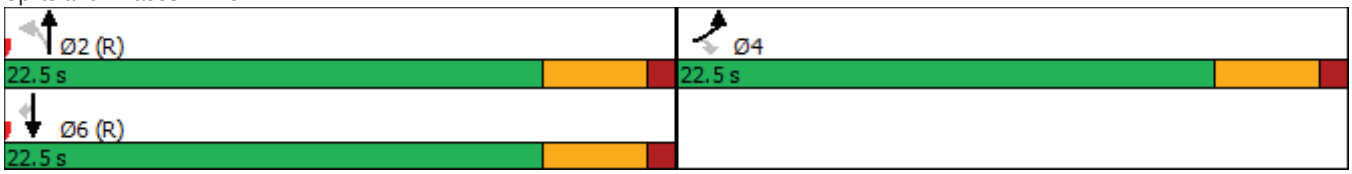
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	673	28	0
Future Volume (vph)	0	0	0	673	28	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	250			150
Storage Lanes	1	1	1			1
Taper Length (ft)	100		25			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	1863	1863	3539	3539	1863
Flt Permitted						
Satd. Flow (perm)	1863	1863	1863	3539	3539	1863
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	755			451	920	
Travel Time (s)	17.2			10.3	20.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	732	30	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	732	30	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			24	6	
Link Offset(ft)	0			-6	6	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60	60			60
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	5	5	5	5	5	5
Act Effct Green (s)				39.6	39.6	
Actuated g/C Ratio				0.88	0.88	
v/c Ratio				0.24	0.01	
Control Delay				3.4	3.0	
Queue Delay				0.0	0.0	
Total Delay				3.4	3.0	
LOS				A	A	
Approach Delay				3.4	3.0	
Approach LOS				A	A	
Queue Length 50th (ft)				0	0	
Queue Length 95th (ft)				109	11	
Internal Link Dist (ft)	675			371	840	
Turn Bay Length (ft)						
Base Capacity (vph)				3114	3114	
Starvation Cap Reductn				0	0	
Spillback Cap Reductn				0	0	
Storage Cap Reductn				0	0	
Reduced v/c Ratio				0.24	0.01	

Intersection Summary	
Area Type:	Other
Cycle Length: 45	
Actuated Cycle Length: 45	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.24	
Intersection Signal Delay: 3.4	Intersection LOS: A
Intersection Capacity Utilization 22.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 28:



Lane Group	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	28	165	508	0	0
Future Volume (vph)	0	28	165	508	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	0.95	0.95	1.00	1.00
Frt		0.850				
Flt Protected			0.950	0.998		
Satd. Flow (prot)	0	2787	1681	1766	0	0
Flt Permitted			0.950	0.998		
Satd. Flow (perm)	0	2787	1681	1766	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	227			920	549	
Travel Time (s)	5.2			20.9	12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	30	179	552	0	0
Shared Lane Traffic (%)			10%			
Lane Group Flow (vph)	0	30	161	570	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			36	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.9%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	847	205	27
Future Volume (vph)	0	0	0	847	205	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	3539	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	3539	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	818			374	654	
Travel Time (s)	18.6			8.5	14.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	921	223	29
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	921	223	29
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60	60			60
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.7%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	0	0	469	380	0	232
Future Volume (vph)	0	0	469	380	0	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt				0.850		
Flt Protected						
Satd. Flow (prot)	0	0	3539	1583	0	5085
Flt Permitted						
Satd. Flow (perm)	0	0	3539	1583	0	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	815		654			397
Travel Time (s)	18.5		14.9			9.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	510	413	0	252
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	510	413	0	252
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Sign Control	Free		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.9%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	674	18	10
Future Volume (vph)	0	0	0	674	18	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	5085	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	5085	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	1042			221	359	
Travel Time (s)	23.7			5.0	8.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	733	20	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	733	20	11
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	8			0	6	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 22.0%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	28	0	7	666	8
Future Volume (vph)	0	28	0	7	666	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	500	0	0
Storage Lanes	1	2	1	1	2	1
Taper Length (ft)	25		25		25	
Lane Util. Factor	1.00	0.88	1.00	1.00	0.97	1.00
Frt		0.850		0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	2787	1863	1583	3433	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	2787	1863	1583	3433	1583
Right Turn on Red		Yes		Yes		Yes
Satd. Flow (RTOR)		1920		492		9
Link Speed (mph)	30		30		30	
Link Distance (ft)	570		723		430	
Travel Time (s)	13.0		16.4		9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	30	0	8	724	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	30	0	8	724	9
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	30		32		32	
Link Offset(ft)	30		0		0	
Crosswalk Width(ft)	10		10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15	9
Number of Detectors	0	0	0	0	0	0
Detector Template	Thru	Thru	Thru	Thru	Thru	Thru
Leading Detector (ft)	0	0	0	0	0	0
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	Prot	pt+ov	Prot	Perm	Prot	Perm
Protected Phases	5	5 6	4		6	
Permitted Phases				4		6
Detector Phase	5	5 6	4	4	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	15.5		15.5	15.5	19.0	19.0
Total Split (%)	31.0%		31.0%	31.0%	38.0%	38.0%
Maximum Green (s)	11.0		11.0	11.0	14.5	14.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lead				Lag	Lag

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lead-Lag Optimize?	Yes				Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Max	C-Max
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)		47.1		5.5	45.1	45.1
Actuated g/C Ratio		0.94		0.11	0.90	0.90
v/c Ratio		0.01		0.01	0.23	0.01
Control Delay		0.0		0.0	2.6	2.8
Queue Delay		0.0		0.0	0.0	0.0
Total Delay		0.0		0.0	2.6	2.8
LOS		A		A	A	A
Approach Delay					2.6	
Approach LOS					A	
Queue Length 50th (ft)		0		0	0	0
Queue Length 95th (ft)		0		0	92	5
Internal Link Dist (ft)	490		643		350	
Turn Bay Length (ft)				500		
Base Capacity (vph)		2737		732	3096	1429
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		0.01		0.01	0.23	0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 6:NEL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.23			
Intersection Signal Delay: 2.4		Intersection LOS: A	
Intersection Capacity Utilization 22.7%		ICU Level of Service A	
Analysis Period (min) 15			

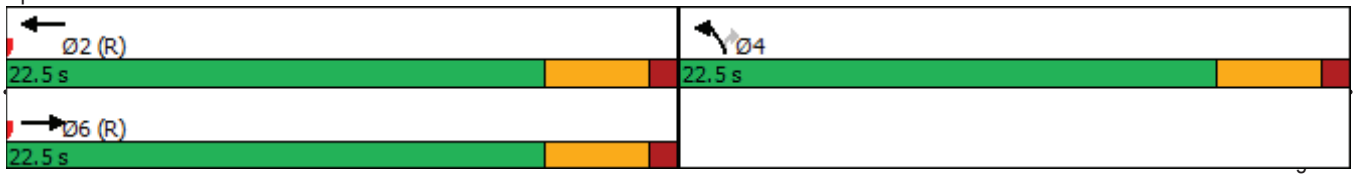
Splits and Phases: 102:

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	165	0	0	28	0	0
Future Volume (vph)	165	0	0	28	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	3614	1863
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	3614	1863
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	923			533	500	
Travel Time (s)	21.0			12.1	11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	179	0	0	30	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	179	0	0	30	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2			2	1	1
Detector Template	Thru			Thru	Left	Right
Leading Detector (ft)	100			100	20	20
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	6			6	20	20
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	5.0			5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5			22.5	22.5	22.5
Total Split (s)	22.5			22.5	22.5	22.5
Total Split (%)	50.0%			50.0%	50.0%	50.0%
Maximum Green (s)	18.0			18.0	18.0	18.0
Yellow Time (s)	3.5			3.5	3.5	3.5
All-Red Time (s)	1.0			1.0	1.0	1.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	C-Max			C-Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	45.0			45.0		
Actuated g/C Ratio	1.00			1.00		
v/c Ratio	0.05			0.01		
Control Delay	0.0			0.0		
Queue Delay	0.0			0.0		
Total Delay	0.0			0.0		
LOS	A			A		
Approach Delay						
Approach LOS						
Queue Length 50th (ft)	0			0		
Queue Length 95th (ft)	0			1		
Internal Link Dist (ft)	843			453	420	
Turn Bay Length (ft)						
Base Capacity (vph)	3539			3539		
Starvation Cap Reductn	0			0		
Spillback Cap Reductn	0			0		
Storage Cap Reductn	0			0		
Reduced v/c Ratio	0.05			0.01		

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.05			
Intersection Signal Delay: 0.0		Intersection LOS: A	
Intersection Capacity Utilization 8.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 103:

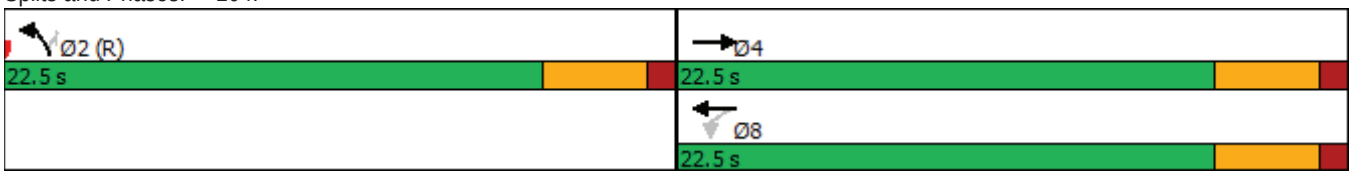


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	144	21	32	28	0	0
Future Volume (vph)	144	21	32	28	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.981					
Flt Protected			0.950			
Satd. Flow (prot)	3472	0	1770	3539	1863	1863
Flt Permitted			0.638			
Satd. Flow (perm)	3472	0	1188	3539	1863	1863
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	23					
Link Speed (mph)	30			30	30	
Link Distance (ft)	533			404	428	
Travel Time (s)	12.1			9.2	9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	157	23	35	30	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	180	0	35	30	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	20	
Link Offset(ft)	-12			8	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (%)	50.0%		50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0		18.0	18.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	18.0		18.0	18.0		
Actuated g/C Ratio	0.40		0.40	0.40		
v/c Ratio	0.13		0.07	0.02		
Control Delay	6.1		9.0	8.3		
Queue Delay	0.0		0.0	0.0		
Total Delay	6.1		9.0	8.3		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A		A	A		
Approach Delay	6.1			8.7		
Approach LOS	A			A		
Queue Length 50th (ft)	12		5	2		
Queue Length 95th (ft)	14		18	7		
Internal Link Dist (ft)	453			324	348	
Turn Bay Length (ft)						
Base Capacity (vph)	1402		475	1415		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.13		0.07	0.02		

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.13			
Intersection Signal Delay: 6.7		Intersection LOS: A	
Intersection Capacity Utilization 16.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 104:

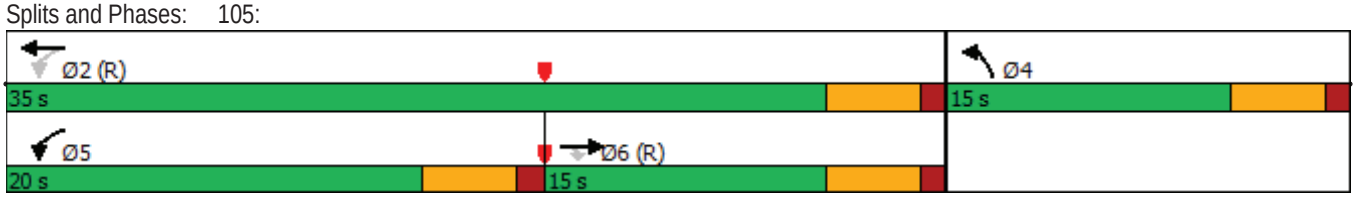


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	87	57	544	39	22	19
Future Volume (vph)	87	57	544	39	22	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.95
Frt		0.850			0.930	
Flt Protected			0.950		0.974	
Satd. Flow (prot)	3539	1583	1770	3539	3273	0
Flt Permitted			0.581		0.974	
Satd. Flow (perm)	3539	1583	1082	3539	3273	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		62			21	
Link Speed (mph)	30			30	30	
Link Distance (ft)	491			971	1149	
Travel Time (s)	11.2			22.1	26.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	62	591	42	24	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	62	591	42	45	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	
Detector Template	Thru	Right	Left	Thru	Left	
Leading Detector (ft)	100	20	20	100	20	
Trailing Detector (ft)	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	
Detector 1 Size(ft)	6	20	20	6	20	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	pm+pt	NA	Prot	
Protected Phases	6		5	2	4	
Permitted Phases		6	2			
Detector Phase	6	6	5	2	4	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	20.0	20.0	9.5	22.5	15.0	
Total Split (s)	15.0	15.0	20.0	35.0	15.0	
Total Split (%)	30.0%	30.0%	40.0%	70.0%	30.0%	
Maximum Green (s)	10.5	10.5	15.5	30.5	10.5	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max	None	C-Max	None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	11.0	11.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	26.1	26.1	41.1	43.8	6.0	
Actuated g/C Ratio	0.52	0.52	0.82	0.88	0.12	
v/c Ratio	0.05	0.07	0.57	0.01	0.11	
Control Delay	11.3	5.8	4.2	1.3	13.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.3	5.8	4.2	1.3	13.9	
LOS	B	A	A	A	B	
Approach Delay	9.1			4.0	13.9	
Approach LOS	A			A	B	
Queue Length 50th (ft)	3	0	1	0	3	
Queue Length 95th (ft)	26	23	75	m3	14	
Internal Link Dist (ft)	411			891	1069	
Turn Bay Length (ft)						
Base Capacity (vph)	1848	856	1112	3099	703	
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	0.05	0.07	0.53	0.01	0.06	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 5.5		Intersection LOS: A	
Intersection Capacity Utilization 48.5%		ICU Level of Service A	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 105:



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	99	7	150	582	15	0	0	4	0	0	0
Future Volume (vph)	0	99	7	150	582	15	0	0	4	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990			0.997			0.865				
Flt Protected					0.990							
Satd. Flow (prot)	0	3504	0	0	3493	0	0	1611	0	0	1863	0
Flt Permitted					0.990							
Satd. Flow (perm)	0	3504	0	0	3493	0	0	1611	0	0	1863	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		971			260			262			305	
Travel Time (s)		22.1			5.9			6.0			6.9	
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
Adj. Flow (vph)	0	108	8	163	633	16	0	0	4	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	116	0	0	812	0	0	4	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.2%		ICU Level of Service A	
Analysis Period (min) 15			

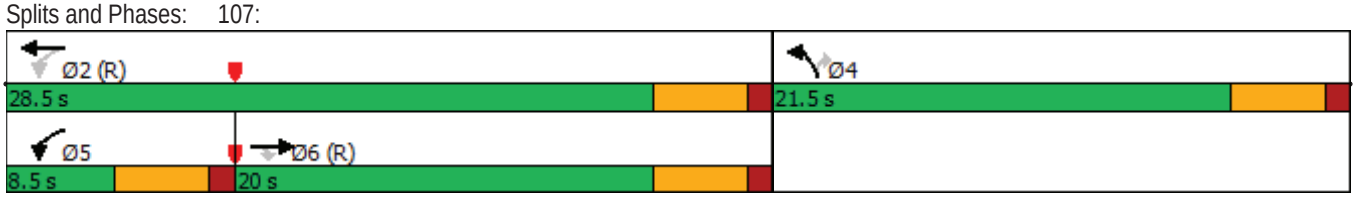
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	92	10	9	540	207	4
Future Volume (vph)	92	10	9	540	207	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12
Lane Util. Factor	0.95	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.999	0.950	
Satd. Flow (prot)	3539	1689	0	3536	1770	1583
Flt Permitted				0.952	0.950	
Satd. Flow (perm)	3539	1689	0	3369	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		11				4
Link Speed (mph)	30			30	30	
Link Distance (ft)	777			738	307	
Travel Time (s)	17.7			16.8	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	11	10	587	225	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	100	11	0	597	225	4
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	R NA	Left	Left	Left	Right
Median Width(ft)	16			16	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00
Turning Speed (mph)		15	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						

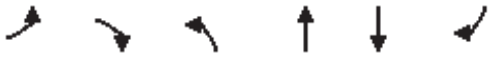
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5	22.5
Total Split (s)	20.0	20.0	8.5	28.5	21.5	21.5
Total Split (%)	40.0%	40.0%	17.0%	57.0%	43.0%	43.0%
Maximum Green (s)	15.5	15.5	4.0	24.0	17.0	17.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Walk Time (s)	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0
Act Effct Green (s)	29.5	29.5		29.5	11.5	11.5
Actuated g/C Ratio	0.59	0.59		0.59	0.23	0.23
v/c Ratio	0.05	0.01		0.30	0.55	0.01
Control Delay	2.2	0.5		6.8	21.5	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	2.2	0.5		6.8	21.5	9.0
LOS	A	A		A	C	A
Approach Delay	2.0			6.8	21.3	
Approach LOS	A			A	C	
Queue Length 50th (ft)	7	1		37	58	0
Queue Length 95th (ft)	1	0		75	98	5
Internal Link Dist (ft)	697			658	227	
Turn Bay Length (ft)						
Base Capacity (vph)	2085	999		1984	601	540
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	0.05	0.01		0.30	0.37	0.01

Intersection Summary

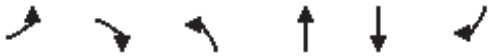
Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 9.8 Intersection LOS: A
Intersection Capacity Utilization 37.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 107:





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	72	24	317	999	357	232
Future Volume (vph)	72	24	317	999	357	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00
Frt	0.962					0.850
Flt Protected	0.964		0.950			
Satd. Flow (prot)	3351	0	1770	3539	3539	1583
Flt Permitted	0.964		0.405			
Satd. Flow (perm)	3351	0	754	3539	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	26					252
Link Speed (mph)	30			30	30	
Link Distance (ft)	738			727	965	
Travel Time (s)	16.8			16.5	21.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	26	345	1086	388	252
Shared Lane Traffic (%)						
Lane Group Flow (vph)	104	0	345	1086	388	252
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	36			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	15.0		15.0	35.0	20.0	20.0
Total Split (%)	30.0%		30.0%	70.0%	40.0%	40.0%
Maximum Green (s)	10.5		10.5	30.5	15.5	15.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	10.5		30.5	30.5	15.5	15.5
Actuated g/C Ratio	0.21		0.61	0.61	0.31	0.31
v/c Ratio	0.14		0.51	0.50	0.35	0.38
Control Delay	8.3		7.7	6.5	14.5	4.2
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	8.3		7.7	6.5	14.5	4.2



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	A		A	A	B	A
Approach Delay	8.3			6.8	10.5	
Approach LOS	A			A	B	
Queue Length 50th (ft)	12		40	77	45	0
Queue Length 95th (ft)	26		74	113	74	39
Internal Link Dist (ft)	658			647	885	
Turn Bay Length (ft)						
Base Capacity (vph)	724		673	2158	1097	664
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	0.14		0.51	0.50	0.35	0.38

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green, Master Intersection			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.51			
Intersection Signal Delay: 7.9		Intersection LOS: A	
Intersection Capacity Utilization 42.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 108:

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	211	0	0	19	0	0
Future Volume (vph)	211	0	0	19	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1082			1015	590	
Travel Time (s)	24.6			23.1	13.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	229	0	0	21	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	229	0	0	21	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 14.4%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	28	0	0	19	0	183
Future Volume (vph)	28	0	0	19	0	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1611	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1611	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	839			634	538	
Travel Time (s)	19.1			14.4	12.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	0	0	21	0	199
Shared Lane Traffic (%)						
Lane Group Flow (vph)	30	0	0	21	199	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 21.3%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	19	28	0
Future Volume (vph)	0	0	0	19	28	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.865			
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	1863
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	1863
Link Speed (mph)		30	30		30	
Link Distance (ft)		98	839		286	
Travel Time (s)		2.2	19.1		6.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	21	30	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	21	0	30	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		36	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

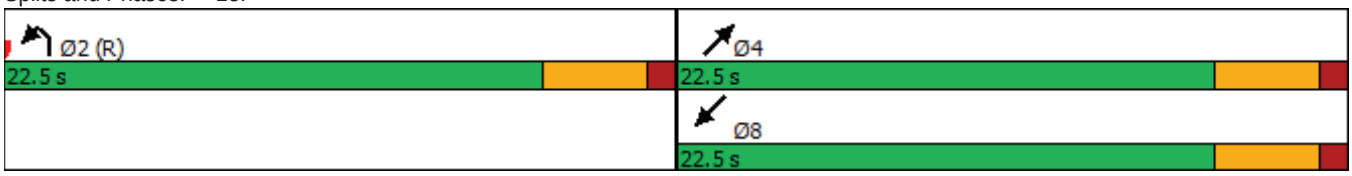
PM Existing LOS

Lane Group	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	348	4	27	0	0	233
Future Volume (vph)	348	4	27	0	0	233
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt	0.999					
Flt Protected	0.953					
Satd. Flow (prot)	1773	0	3539	0	0	5085
Flt Permitted	0.953					
Satd. Flow (perm)	1773	0	3539	0	0	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	1					
Link Speed (mph)	35		35			35
Link Distance (ft)	765		397			221
Travel Time (s)	14.9		7.7			4.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	378	4	29	0	0	253
Shared Lane Traffic (%)						
Lane Group Flow (vph)	382	0	29	0	0	253
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		6			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type	Prot		NA			NA
Protected Phases	2		4			8
Permitted Phases						
Minimum Split (s)	22.5		22.5			22.5
Total Split (s)	22.5		22.5			22.5
Total Split (%)	50.0%		50.0%			50.0%
Maximum Green (s)	18.0		18.0			18.0
Yellow Time (s)	3.5		3.5			3.5
All-Red Time (s)	1.0		1.0			1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	4.5		4.5			4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0			7.0
Flash Dont Walk (s)	11.0		11.0			11.0
Pedestrian Calls (#/hr)	5		5			5
Act Effct Green (s)	18.0		18.0			18.0
Actuated g/C Ratio	0.40		0.40			0.40
v/c Ratio	0.54		0.02			0.12
Control Delay	13.8		13.9			8.8
Queue Delay	0.0		0.0			0.0
Total Delay	13.8		13.9			8.8

Lane Group	NBL	NBR	NET	NER	SWL	SWT
LOS	B		B			A
Approach Delay	13.8		13.9			8.8
Approach LOS	B		B			A
Queue Length 50th (ft)	71		4			14
Queue Length 95th (ft)	133		14			25
Internal Link Dist (ft)	685		317			141
Turn Bay Length (ft)						
Base Capacity (vph)	709		1415			2034
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.54		0.02			0.12

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.54			
Intersection Signal Delay: 11.9		Intersection LOS: B	
Intersection Capacity Utilization 31.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 13:



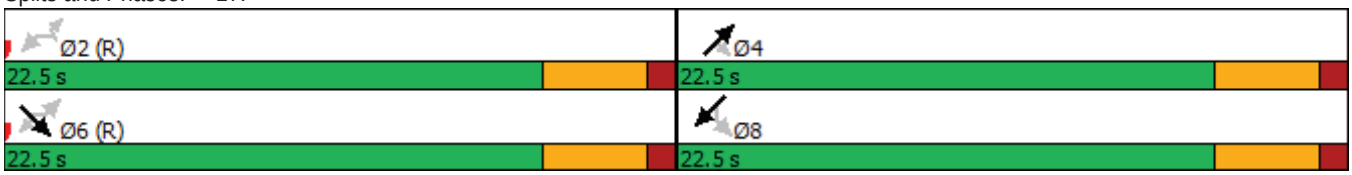
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	11	477	15	0	7	0	344	10	7	443	0
Future Volume (vph)	10	11	477	15	0	7	0	344	10	7	443	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.857	0.850			0.850			0.850			
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	3433	1517	1504	1770	0	1583	0	3539	1583	1770	3539	0
Flt Permitted	0.950			0.572						0.530		
Satd. Flow (perm)	3433	1517	1504	1065	0	1583	0	3539	1583	987	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		226	226			36			36			
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		872			347			301			374	
Travel Time (s)		17.0			6.8			5.9			7.3	
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
Adj. Flow (vph)	11	12	518	16	0	8	0	374	11	8	482	0
Shared Lane Traffic (%)			49%									
Lane Group Flow (vph)	11	266	264	16	0	8	0	374	11	8	482	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm		Perm		NA	Perm	Perm	NA	
Protected Phases		6						4			8	
Permitted Phases	6		6	2		2			4	8		
Minimum Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%		50.0%		50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5		3.5		3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5		4.5		4.5	4.5	4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0	7.0		7.0		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	5	5	5	5		5		5	5	5	5	
Act Effct Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Actuated g/C Ratio	0.40	0.40	0.40	0.40		0.40		0.40	0.40	0.40	0.40	
v/c Ratio	0.01	0.36	0.36	0.04		0.01		0.26	0.02	0.02	0.34	
Control Delay	8.2	4.1	4.0	8.7		0.4		14.7	7.9	7.9	8.6	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	8.2	4.1	4.0	8.7		0.4		14.7	7.9	7.9	8.6	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
LOS	A	A	A	A		A		B	A	A	A	
Approach Delay		4.1			5.9			14.5			8.6	
Approach LOS		A			A			B			A	
Queue Length 50th (ft)	1	6	6	2		0		55	0	1	34	
Queue Length 95th (ft)	4	41	41	11		1		94	m8	m4	57	
Internal Link Dist (ft)		792			267			221			294	
Turn Bay Length (ft)												
Base Capacity (vph)	1373	742	737	426		654		1415	654	394	1415	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.01	0.36	0.36	0.04		0.01		0.26	0.02	0.02	0.34	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.36			
Intersection Signal Delay: 8.4		Intersection LOS: A	
Intersection Capacity Utilization 46.1%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17:



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	40	20	0	359	47	35
Future Volume (vph)	40	20	0	359	47	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.949					0.865
Flt Protected					0.950	
Satd. Flow (prot)	3359	0	0	3539	0	1611
Flt Permitted					0.950	
Satd. Flow (perm)	3359	0	0	3539	0	1611
Link Speed (mph)	35			35	35	
Link Distance (ft)	404			491	211	
Travel Time (s)	7.9			9.6	4.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	22	0	390	51	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	65	0	0	390	51	38
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	12			24	0	
Link Offset(ft)	0			6	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

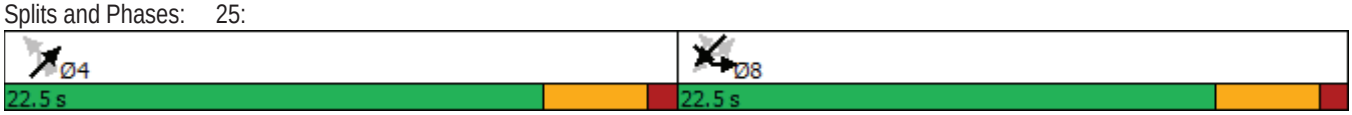
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization Err%		ICU Level of Service H	
Analysis Period (min) 15			

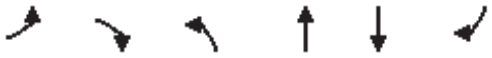
Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Traffic Volume (vph)	0	0	12	33	42	77	342	118	0	743	87
Future Volume (vph)	0	0	12	33	42	77	342	118	0	743	87
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	0	250		0	0		0
Storage Lanes	0	0		1	1	1		1	0		1
Taper Length (ft)	100			100		100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt					0.850			0.850			0.850
Flt Protected				0.950		0.950					
Satd. Flow (prot)	0	0	0	1770	1583	1770	3539	1583	0	3539	1583
Flt Permitted				0.950		0.222					
Satd. Flow (perm)	0	0	0	1770	1583	414	3539	1583	0	3539	1583
Right Turn on Red					Yes			Yes			Yes
Satd. Flow (RTOR)					46			128			95
Link Speed (mph)	35			35			35			35	
Link Distance (ft)	601			719			925			301	
Travel Time (s)	11.7			14.0			18.0			5.9	
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
Adj. Flow (vph)	0	0	13	36	46	84	372	128	0	808	95
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	0	0	49	46	84	372	128	0	808	95
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			12			12			12	
Link Offset(ft)	0			0			0			0	
Crosswalk Width(ft)	10			10			10			10	
Two way Left Turn Lane											
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	15	9	15		9	15		9
Turn Type			D.Pm	Prot	Perm	Perm	NA	Perm		NA	Perm
Protected Phases				8!			4			8!	
Permitted Phases			8!		8	4		4			8
Minimum Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (%)			50.0%	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%
Maximum Green (s)			18.0	18.0	18.0	18.0	18.0	18.0		18.0	18.0
Yellow Time (s)			3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)			1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)				4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag											
Lead-Lag Optimize?											
Walk Time (s)			7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)			11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)			5	5	5	5	5	5		5	5
Act Effct Green (s)				18.0	18.0	18.0	18.0	18.0		18.0	18.0
Actuated g/C Ratio				0.40	0.40	0.40	0.40	0.40		0.40	0.40
v/c Ratio				0.07	0.07	0.51	0.26	0.18		0.57	0.14

Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Control Delay				8.7	3.8	25.2	9.7	3.1		9.6	2.7
Queue Delay				0.0	0.0	0.0	0.0	0.0		0.1	0.0
Total Delay				8.7	3.8	25.2	9.7	3.1		9.6	2.7
LOS				A	A	C	A	A		A	A
Approach Delay				6.3			10.5			8.9	
Approach LOS				A			B			A	
Queue Length 50th (ft)				7	0	15	32	0		49	0
Queue Length 95th (ft)				22	13	#65	54	22		98	17
Internal Link Dist (ft)	521			639			845			221	
Turn Bay Length (ft)						250					
Base Capacity (vph)				708	660	165	1415	710		1415	690
Starvation Cap Reductn				0	0	0	0	0		54	0
Spillback Cap Reductn				0	0	0	0	0		0	0
Storage Cap Reductn				0	0	0	0	0		0	0
Reduced v/c Ratio				0.07	0.07	0.51	0.26	0.18		0.59	0.14

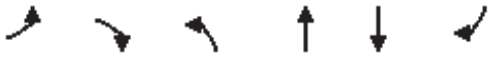
Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 9.3		Intersection LOS: A	
Intersection Capacity Utilization 40.2%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
! Phase conflict between lane groups.			

Splits and Phases: 25:





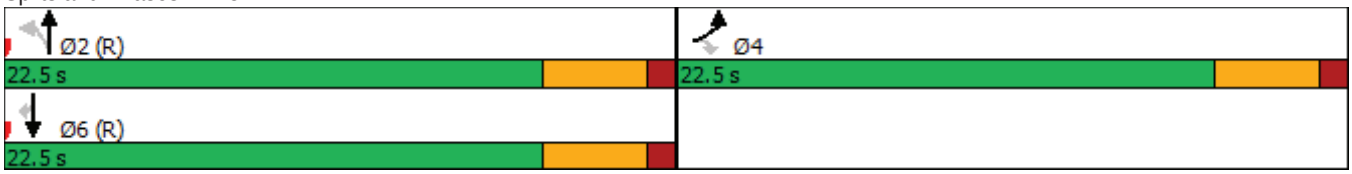
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	31	633	0
Future Volume (vph)	0	0	0	31	633	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	250			150
Storage Lanes	1	1	1			1
Taper Length (ft)	100		25			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	1863	1863	3539	3539	1863
Flt Permitted						
Satd. Flow (perm)	1863	1863	1863	3539	3539	1863
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (mph)	35			35	35	
Link Distance (ft)	755			451	920	
Travel Time (s)	14.7			8.8	17.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	34	688	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	34	688	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			24	6	
Link Offset(ft)	0			-6	6	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	5	5	5	5	5	5
Act Effct Green (s)				39.6	39.6	
Actuated g/C Ratio				0.88	0.88	
v/c Ratio				0.01	0.22	
Control Delay				4.1	3.4	
Queue Delay				0.0	0.0	
Total Delay				4.1	3.4	
LOS				A	A	
Approach Delay				4.1	3.4	
Approach LOS				A	A	
Queue Length 50th (ft)				0	0	
Queue Length 95th (ft)				8	102	
Internal Link Dist (ft)	675			371	840	
Turn Bay Length (ft)						
Base Capacity (vph)				3114	3114	
Starvation Cap Reductn				0	0	
Spillback Cap Reductn				0	0	
Storage Cap Reductn				0	0	
Reduced v/c Ratio				0.01	0.22	

Intersection Summary	
Area Type:	Other
Cycle Length: 45	
Actuated Cycle Length: 45	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.22	
Intersection Signal Delay: 3.4	Intersection LOS: A
Intersection Capacity Utilization 21.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 28:



Lane Group	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	633	31	0	0	0
Future Volume (vph)	0	633	31	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	0.95	0.95	1.00	1.00
Frt		0.850				
Flt Protected			0.950	0.950		
Satd. Flow (prot)	0	2787	1681	1681	0	0
Flt Permitted			0.950	0.950		
Satd. Flow (perm)	0	2787	1681	1681	0	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	227			920	549	
Travel Time (s)	4.4			17.9	10.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	688	34	0	0	0
Shared Lane Traffic (%)			50%			
Lane Group Flow (vph)	0	688	17	17	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			36	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.5%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	361	450	133
Future Volume (vph)	0	0	0	361	450	133
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	3539	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	3539	1583
Link Speed (mph)	35			35	35	
Link Distance (ft)	818			374	654	
Travel Time (s)	15.9			7.3	12.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	392	489	145
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	392	489	145
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 15.8%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	0	0	27	355	0	581
Future Volume (vph)	0	0	27	355	0	581
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt				0.850		
Flt Protected						
Satd. Flow (prot)	0	0	3539	1583	0	5085
Flt Permitted						
Satd. Flow (perm)	0	0	3539	1583	0	5085
Link Speed (mph)	35		35			35
Link Distance (ft)	815		654			397
Travel Time (s)	15.9		12.7			7.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	29	386	0	632
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	29	386	0	632
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.5%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	31	233	400
Future Volume (vph)	0	0	0	31	233	400
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	5085	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	5085	1583
Link Speed (mph)	35			35	35	
Link Distance (ft)	1042			221	359	
Travel Time (s)	20.3			4.3	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	34	253	435
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	34	253	435
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	8			0	6	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 28.1%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	633	0	1	30	1
Future Volume (vph)	0	633	0	1	30	1
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	500	0	0
Storage Lanes	1	2	1	1	2	1
Taper Length (ft)	25		25		25	
Lane Util. Factor	1.00	0.88	1.00	1.00	0.97	1.00
Frt		0.850		0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	2787	1863	1583	3433	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	2787	1863	1583	3433	1583
Right Turn on Red		Yes		Yes		Yes
Satd. Flow (RTOR)		1920		1007		1
Link Speed (mph)	35		35		35	
Link Distance (ft)	570		723		430	
Travel Time (s)	11.1		14.1		8.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	688	0	1	33	1
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	688	0	1	33	1
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	30		32		32	
Link Offset(ft)	30		0		0	
Crosswalk Width(ft)	10		10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15	9
Number of Detectors	0	0	0	0	0	0
Detector Template	Thru	Thru	Thru	Thru	Thru	Thru
Leading Detector (ft)	0	0	0	0	0	0
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	Prot	pt+ov	Prot	Perm	Prot	Perm
Protected Phases	5	5 6	4		6	
Permitted Phases				4		6
Detector Phase	5	5 6	4	4	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	15.5		15.5	15.5	19.0	19.0
Total Split (%)	31.0%		31.0%	31.0%	38.0%	38.0%
Maximum Green (s)	11.0		11.0	11.0	14.5	14.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lead				Lag	Lag

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lead-Lag Optimize?	Yes				Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Max	C-Max
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)		47.1		5.5	33.3	33.3
Actuated g/C Ratio		0.94		0.11	0.67	0.67
v/c Ratio		0.25		0.00	0.01	0.00
Control Delay		0.2		0.0	4.4	4.0
Queue Delay		0.0		0.0	0.0	0.0
Total Delay		0.2		0.0	4.4	4.0
LOS		A		A	A	A
Approach Delay	0.2				4.4	
Approach LOS	A				A	
Queue Length 50th (ft)		0		0	1	0
Queue Length 95th (ft)		0		0	7	2
Internal Link Dist (ft)	490		643		350	
Turn Bay Length (ft)				500		
Base Capacity (vph)		2737		1133	2286	1054
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		0.25		0.00	0.01	0.00

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 6:NEL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.25			
Intersection Signal Delay: 0.4		Intersection LOS: A	
Intersection Capacity Utilization 25.9%		ICU Level of Service A	
Analysis Period (min) 15			

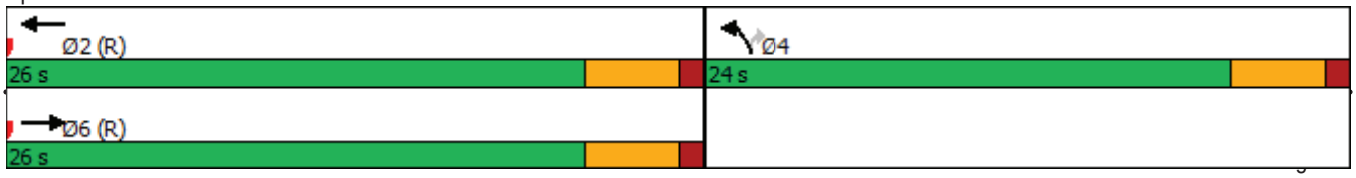
Splits and Phases: 102:

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	31	0	0	406	227	29
Future Volume (vph)	31	0	0	406	227	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	3539	0	0	3539	3433	1583
Flt Permitted					0.950	
Satd. Flow (perm)	3539	0	0	3539	3433	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						32
Link Speed (mph)	35			35	35	
Link Distance (ft)	923			533	500	
Travel Time (s)	18.0			10.4	9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	0	0	441	247	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	34	0	0	441	247	32
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2			2	1	1
Detector Template	Thru			Thru	Left	Right
Leading Detector (ft)	100			100	20	20
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	6			6	20	20
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	5.0			5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5			22.5	22.5	22.5
Total Split (s)	26.0			26.0	24.0	24.0
Total Split (%)	52.0%			52.0%	48.0%	48.0%
Maximum Green (s)	21.5			21.5	19.5	19.5
Yellow Time (s)	3.5			3.5	3.5	3.5
All-Red Time (s)	1.0			1.0	1.0	1.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	C-Max			C-Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	32.1			32.1	8.9	8.9
Actuated g/C Ratio	0.64			0.64	0.18	0.18
v/c Ratio	0.01			0.19	0.40	0.10
Control Delay	3.8			4.2	19.8	7.9
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	3.8			4.2	19.8	7.9
LOS	A			A	B	A
Approach Delay	3.8			4.2	18.4	
Approach LOS	A			A	B	
Queue Length 50th (ft)	1			22	33	0
Queue Length 95th (ft)	5			42	55	16
Internal Link Dist (ft)	843			453	420	
Turn Bay Length (ft)						
Base Capacity (vph)	2272			2272	1338	636
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	0.01			0.19	0.18	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 9.5		Intersection LOS: A	
Intersection Capacity Utilization 25.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 103:

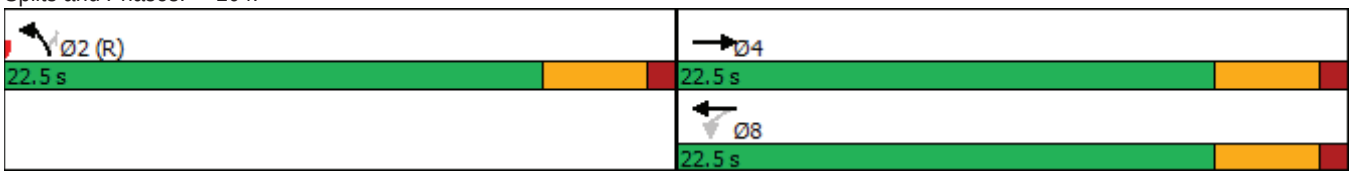


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	60	0	0	406	0	20
Future Volume (vph)	60	0	0	406	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	3539	0	1863	3539	1863	1583
Flt Permitted						
Satd. Flow (perm)	3539	0	1863	3539	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						887
Link Speed (mph)	35			35	35	
Link Distance (ft)	533			404	428	
Travel Time (s)	10.4			7.9	8.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	0	0	441	0	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	65	0	0	441	0	22
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	20	
Link Offset(ft)	-12			8	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (%)	50.0%		50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0		18.0	18.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	18.0			18.0		18.0
Actuated g/C Ratio	0.40			0.40		0.40
v/c Ratio	0.05			0.31		0.02
Control Delay	8.4			10.0		0.1
Queue Delay	0.0			0.0		0.0
Total Delay	8.4			10.0		0.1

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A			B		A
Approach Delay	8.4			10.0	0.1	
Approach LOS	A			B	A	
Queue Length 50th (ft)	5			38		0
Queue Length 95th (ft)	13			64		0
Internal Link Dist (ft)	453			324	348	
Turn Bay Length (ft)						
Base Capacity (vph)	1415			1415		1165
Starvation Cap Reductn	0			0		0
Spillback Cap Reductn	0			0		0
Storage Cap Reductn	0			0		0
Reduced v/c Ratio	0.05			0.31		0.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.31			
Intersection Signal Delay: 9.4		Intersection LOS: A	
Intersection Capacity Utilization 15.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 104:

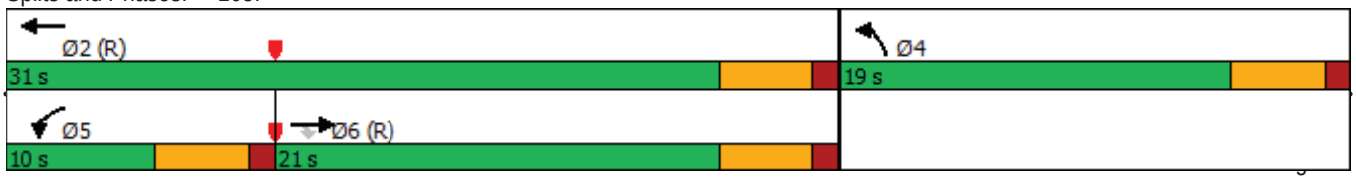


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	71	4	57	92	267	670
Future Volume (vph)	71	4	57	92	267	670
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.95
Frt		0.850			0.893	
Flt Protected			0.950		0.986	
Satd. Flow (prot)	3539	1583	1770	3539	3182	0
Flt Permitted			0.950		0.986	
Satd. Flow (perm)	3539	1583	1770	3539	3182	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		4			728	
Link Speed (mph)	35			35	35	
Link Distance (ft)	491			971	1149	
Travel Time (s)	9.6			18.9	22.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	77	4	62	100	290	728
Shared Lane Traffic (%)						
Lane Group Flow (vph)	77	4	62	100	1018	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	
Detector Template	Thru	Right	Left	Thru	Left	
Leading Detector (ft)	100	20	20	100	20	
Trailing Detector (ft)	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	
Detector 1 Size(ft)	6	20	20	6	20	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Prot	NA	Prot	
Protected Phases	6		5	2	4	
Permitted Phases		6				
Detector Phase	6	6	5	2	4	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	20.0	20.0	9.5	22.5	15.0	
Total Split (s)	21.0	21.0	10.0	31.0	19.0	
Total Split (%)	42.0%	42.0%	20.0%	62.0%	38.0%	
Maximum Green (s)	16.5	16.5	5.5	26.5	14.5	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max	None	C-Max	None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	11.0	11.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	23.4	23.4	6.0	29.7	11.3	
Actuated g/C Ratio	0.47	0.47	0.12	0.59	0.23	
v/c Ratio	0.05	0.01	0.30	0.05	0.79	
Control Delay	10.9	8.2	28.4	3.8	10.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	10.9	8.2	28.4	3.8	10.0	
LOS	B	A	C	A	A	
Approach Delay	10.8			13.2	10.0	
Approach LOS	B			B	A	
Queue Length 50th (ft)	7	0	16	4	35	
Queue Length 95th (ft)	18	5	48	11	79	
Internal Link Dist (ft)	411			891	1069	
Turn Bay Length (ft)						
Base Capacity (vph)	1654	742	210	2101	1439	
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	0.05	0.01	0.30	0.05	0.71	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 10.4		Intersection LOS: B	
Intersection Capacity Utilization 46.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 105:



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑			↑			↑	
Traffic Volume (vph)	0	741	0	2	119	2	27	0	17	0	0	4
Future Volume (vph)	0	741	0	2	119	2	27	0	17	0	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.998			0.948			0.865	
Flt Protected					0.999			0.970				
Satd. Flow (prot)	0	3539	0	0	3529	0	0	1713	0	0	1611	0
Flt Permitted					0.999			0.970				
Satd. Flow (perm)	0	3539	0	0	3529	0	0	1713	0	0	1611	0
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		971			260			262			305	
Travel Time (s)		18.9			5.1			5.1			5.9	
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
Adj. Flow (vph)	0	805	0	2	129	2	29	0	18	0	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	805	0	0	133	0	0	47	0	0	4	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.4%		ICU Level of Service A	
Analysis Period (min) 15			

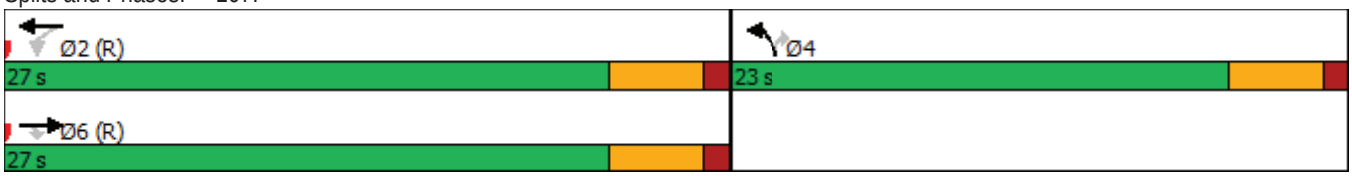
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	465	293	4	122	0	19
Future Volume (vph)	465	293	4	122	0	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12
Lane Util. Factor	0.95	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.999		
Satd. Flow (prot)	3539	1689	0	3536	1863	1583
Flt Permitted				0.947		
Satd. Flow (perm)	3539	1689	0	3352	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		318				253
Link Speed (mph)	35			35	35	
Link Distance (ft)	777			738	307	
Travel Time (s)	15.1			14.4	6.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	505	318	4	133	0	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	505	318	0	137	0	21
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	R NA	Left	Left	Left	Right
Median Width(ft)	16			16	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00
Turning Speed (mph)		15	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	2	2	4	4
Switch Phase						

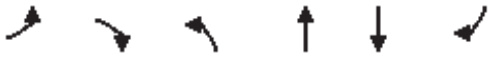
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.0	27.0	27.0	27.0	23.0	23.0
Total Split (%)	54.0%	54.0%	54.0%	54.0%	46.0%	46.0%
Maximum Green (s)	22.5	22.5	22.5	22.5	18.5	18.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	47.1	47.1		47.1		5.5
Actuated g/C Ratio	0.94	0.94		0.94		0.11
v/c Ratio	0.15	0.20		0.04		0.05
Control Delay	0.5	0.2		0.7		0.3
Queue Delay	0.0	0.0		0.0		0.0
Total Delay	0.5	0.2		0.7		0.3
LOS	A	A		A		A
Approach Delay	0.4			0.7	0.3	
Approach LOS	A			A	A	
Queue Length 50th (ft)	0	0		0		0
Queue Length 95th (ft)	m14	m0		7		0
Internal Link Dist (ft)	697			658	227	
Turn Bay Length (ft)						
Base Capacity (vph)	3334	1609		3157		745
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	0.15	0.20		0.04		0.03

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.20			
Intersection Signal Delay: 0.4		Intersection LOS: A	
Intersection Capacity Utilization 29.8%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 107:





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	470	115	40	1170	922	85
Future Volume (vph)	470	115	40	1170	922	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00
Frt	0.971					0.850
Flt Protected	0.961		0.950			
Satd. Flow (prot)	3372	0	1770	3539	3539	1583
Flt Permitted	0.961		0.200			
Satd. Flow (perm)	3372	0	373	3539	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	67					92
Link Speed (mph)	35			35	35	
Link Distance (ft)	738			727	965	
Travel Time (s)	14.4			14.2	18.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	511	125	43	1272	1002	92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	636	0	43	1272	1002	92
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	36			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	21.5		8.5	28.5	20.0	20.0
Total Split (%)	43.0%		17.0%	57.0%	40.0%	40.0%
Maximum Green (s)	17.0		4.0	24.0	15.5	15.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	17.0		24.0	24.0	15.5	15.5
Actuated g/C Ratio	0.34		0.48	0.48	0.31	0.31
v/c Ratio	0.53		0.15	0.75	0.91	0.17
Control Delay	10.6		8.2	14.0	32.0	4.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	10.6		8.2	14.0	32.0	4.6

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	B		A	B	C	A
Approach Delay	10.6			13.8	29.7	
Approach LOS	B			B	C	
Queue Length 50th (ft)	52		6	145	145	0
Queue Length 95th (ft)	68		18	212	#253	24
Internal Link Dist (ft)	658			647	885	
Turn Bay Length (ft)						
Base Capacity (vph)	1190		290	1698	1097	554
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	0.53		0.15	0.75	0.91	0.17

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green, Master Intersection			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 18.9		Intersection LOS: B	
Intersection Capacity Utilization 57.8%		ICU Level of Service B	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 108:

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	19	0	361	0	0	0
Future Volume (vph)	19	0	361	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	0	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	0	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	1082			1015	590	
Travel Time (s)	21.1			19.8	11.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	0	392	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	0	0	392	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.0%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	19
Future Volume (vph)	0	0	0	0	0	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1611	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1611	0
Link Speed (mph)	35			35	35	
Link Distance (ft)	839			634	538	
Travel Time (s)	16.3			12.4	10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	21	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	0	1863	1863	0	1863	1863
Flt Permitted						
Satd. Flow (perm)	0	1863	1863	0	1863	1863
Link Speed (mph)		35	35		35	
Link Distance (ft)		98	839		286	
Travel Time (s)		1.9	16.3		5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		36	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

AM Build LOS

Lane Group	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	214	205	469	0	0	18
Future Volume (vph)	214	523	855	0	0	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt	0.904					
Flt Protected	0.986					
Satd. Flow (prot)	1660	0	3539	0	0	5085
Flt Permitted	0.986					
Satd. Flow (perm)	1660	0	3539	0	0	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	18					
Link Speed (mph)	30		30			30
Link Distance (ft)	765		397			221
Travel Time (s)	17.4		9.0			5.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	233	568	929	0	0	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	801	0	929	0	0	20
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		6			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Turn Type	Prot		NA			NA
Protected Phases	2		4			8
Permitted Phases						
Minimum Split (s)	22.5		22.5			22.5
Total Split (s)	37.0		23.0			23.0
Total Split (%)	61.7%		38.3%			38.3%
Maximum Green (s)	32.5		18.5			18.5
Yellow Time (s)	3.5		3.5			3.5
All-Red Time (s)	1.0		1.0			1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	4.5		4.5			4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0			7.0
Flash Dont Walk (s)	11.0		11.0			11.0
Pedestrian Calls (#/hr)	5		5			5
Act Effct Green (s)	32.5		18.5			18.5
Actuated g/C Ratio	0.54		0.31			0.31
v/c Ratio	0.88		0.85			0.01
Control Delay	26.3		29.2			14.5
Queue Delay	0.0		0.0			0.0
Total Delay	26.3		29.2			14.5

Lane Group	NBL	NBR	NET	NER	SWL	SWT
LOS	C		C			B
Approach Delay	26.3		29.2			14.5
Approach LOS	C		C			B
Queue Length 50th (ft)	225		163			1
Queue Length 95th (ft)	#461		#262			6
Internal Link Dist (ft)	685		317			141
Turn Bay Length (ft)						
Base Capacity (vph)	907		1091			1567
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.88		0.85			0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.88			
Intersection Signal Delay: 27.7		Intersection LOS: C	
Intersection Capacity Utilization 44.9%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 13:

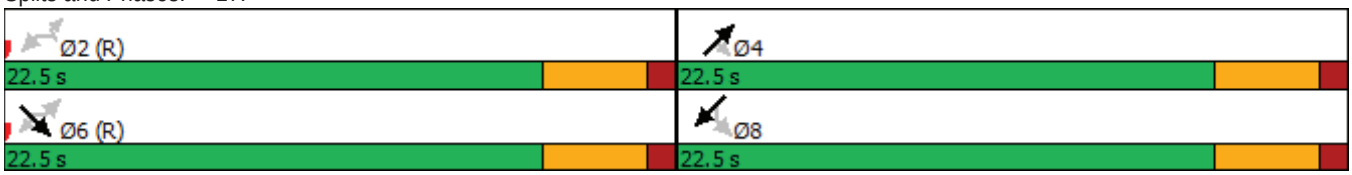
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	396	7	410	2	0	9	0	442	11	6	199	0
Future Volume (vph)	721	7	410	2	0	9	0	503	11	6	199	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.855	0.850			0.850			0.850			
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	3433	1513	1504	1770	0	1583	0	3539	1583	1770	3539	0
Flt Permitted	0.950			0.610						0.432		
Satd. Flow (perm)	3433	1513	1504	1136	0	1583	0	3539	1583	805	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		219	227			36			36			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		872			347			301			374	
Travel Time (s)		19.8			7.9			6.8			8.5	
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
Adj. Flow (vph)	784	8	446	2	0	10	0	547	12	7	216	0
Shared Lane Traffic (%)			49%									
Lane Group Flow (vph)	784	227	227	2	0	10	0	547	12	7	216	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60		60	60		60	60		60	60		60
Turn Type	Perm	NA	Perm	Perm		Perm		NA	Perm	Perm	NA	
Protected Phases		6						4			8	
Permitted Phases	6		6	2		2			4	8		
Minimum Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%		50.0%		50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5		3.5		3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5		4.5		4.5	4.5	4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0	7.0		7.0		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	5	5	5	5		5		5	5	5	5	
Act Effct Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Actuated g/C Ratio	0.40	0.40	0.40	0.40		0.40		0.40	0.40	0.40	0.40	
v/c Ratio	0.57	0.31	0.31	0.00		0.02		0.39	0.02	0.02	0.15	
Control Delay	12.5	3.2	3.0	8.0		1.0		4.8	0.2	8.5	9.0	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	12.5	3.2	3.0	8.0		1.0		4.8	0.2	8.5	9.0	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
LOS	B	A	A	A		A		A	A	A	A	
Approach Delay		9.1			2.2			4.7			9.0	
Approach LOS		A			A			A			A	
Queue Length 50th (ft)	76	1	0	0		0		16	0	1	17	
Queue Length 95th (ft)	118	32	30	3		2		23	m0	6	33	
Internal Link Dist (ft)		792			267			221			294	
Turn Bay Length (ft)												
Base Capacity (vph)	1373	736	737	454		654		1415	654	322	1415	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.57	0.31	0.31	0.00		0.02		0.39	0.02	0.02	0.15	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 7.8		Intersection LOS: A	
Intersection Capacity Utilization 38.9%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17:



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	144	0	0	60	0	0
Future Volume (vph)	470	0	0	222	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	0	1863
Link Speed (mph)	30			30	30	
Link Distance (ft)	404			491	211	
Travel Time (s)	9.2			11.2	4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	511	0	0	241	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	511	0	0	241	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	12			24	0	
Link Offset(ft)	0			6	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

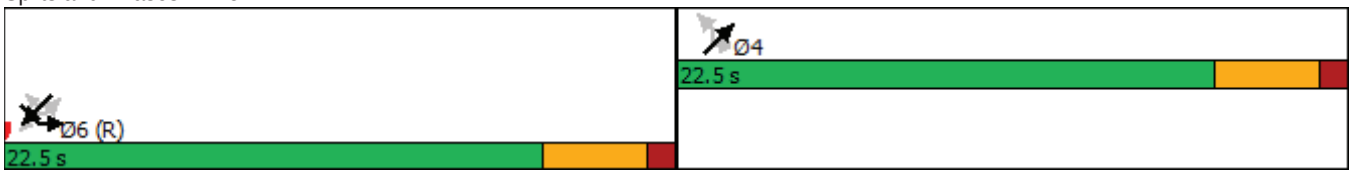
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 7.3%		ICU Level of Service A	
Analysis Period (min) 15			

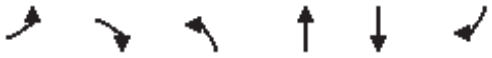
Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Traffic Volume (vph)	0	0	11	40	39	79	434	351	0	518	45
Future Volume (vph)	0	0	16	40	39	79	490	351	0	518	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	0	250		0	0		0
Storage Lanes	0	0		1	1	1		1	0		1
Taper Length (ft)	100			100		100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt					0.850			0.850			0.850
Flt Protected				0.950		0.950					
Satd. Flow (prot)	0	0	0	1770	1583	1770	3539	1583	0	3539	1583
Flt Permitted				0.950		0.441					
Satd. Flow (perm)	0	0	0	1770	1583	821	3539	1583	0	3539	1583
Right Turn on Red					Yes			Yes			Yes
Satd. Flow (RTOR)					42			382			49
Link Speed (mph)	30			30			30			30	
Link Distance (ft)	601			719			925			301	
Travel Time (s)	13.7			16.3			21.0			6.8	
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
Adj. Flow (vph)	0	0	17	43	42	86	533	382	0	563	49
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	0	0	60	42	86	533	382	0	563	49
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			12			12			12	
Link Offset(ft)	0			0			0			0	
Crosswalk Width(ft)	10			10			10			10	
Two way Left Turn Lane											
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60	60	60	60	60		60	60		60
Turn Type			D.Pm	Prot	Perm	Perm	NA	Perm		NA	Perm
Protected Phases				6!			4			6!	
Permitted Phases			6!		6	4		4			6
Minimum Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (%)			50.0%	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%
Maximum Green (s)			18.0	18.0	18.0	18.0	18.0	18.0		18.0	18.0
Yellow Time (s)			3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)			1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)				4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag											
Lead-Lag Optimize?											
Walk Time (s)			7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)			11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)			5	5	5	5	5	5		5	5
Act Effct Green (s)				18.0	18.0	18.0	18.0	18.0		18.0	18.0
Actuated g/C Ratio				0.40	0.40	0.40	0.40	0.40		0.40	0.40
v/c Ratio				0.08	0.06	0.26	0.38	0.44		0.40	0.07

Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Control Delay				8.9	3.8	11.7	10.5	3.2		11.3	4.2
Queue Delay				0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay				8.9	3.8	11.7	10.5	3.2		11.3	4.2
LOS				A	A	B	B	A		B	A
Approach Delay				6.8			7.8			10.8	
Approach LOS				A			A			B	
Queue Length 50th (ft)				9	0	14	48	0		63	3
Queue Length 95th (ft)				25	12	39	77	38		78	14
Internal Link Dist (ft)	521			639			845			221	
Turn Bay Length (ft)						250					
Base Capacity (vph)				708	658	328	1415	862		1415	662
Starvation Cap Reductn				0	0	0	0	0		0	0
Spillback Cap Reductn				0	0	0	0	0		0	0
Storage Cap Reductn				0	0	0	0	0		0	0
Reduced v/c Ratio				0.08	0.06	0.26	0.38	0.44		0.40	0.07

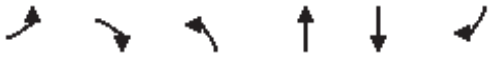
Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2: and 6:SESW, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.44			
Intersection Signal Delay: 8.8		Intersection LOS: A	
Intersection Capacity Utilization 34.1%		ICU Level of Service A	
Analysis Period (min) 15			
! Phase conflict between lane groups.			

Splits and Phases: 25:





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	673	28	0
Future Volume (vph)	0	0	378	999	28	162
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	250			150
Storage Lanes	1	1	1			1
Taper Length (ft)	100		25			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						0.850
Flt Protected			0.950			
Satd. Flow (prot)	1863	1863	1770	3539	3539	1583
Flt Permitted			0.737			
Satd. Flow (perm)	1863	1863	1373	3539	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						176
Link Speed (mph)	30			30	30	
Link Distance (ft)	755			451	920	
Travel Time (s)	17.2			10.3	20.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	411	1086	30	176
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	411	1086	30	176
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			24	6	
Link Offset(ft)	0			-6	6	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60	60			60
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6



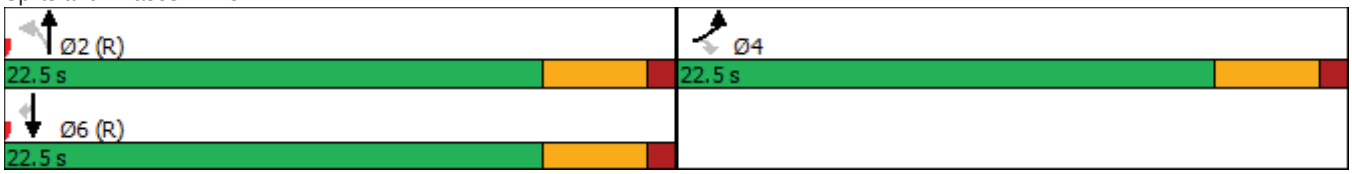
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	5	5	5	5	5	5
Act Effct Green (s)			39.6	39.6	39.6	39.6
Actuated g/C Ratio			0.88	0.88	0.88	0.88
v/c Ratio			0.34	0.35	0.01	0.12
Control Delay			7.1	4.4	2.6	3.2
Queue Delay			0.0	0.0	0.0	0.0
Total Delay			7.1	4.4	2.6	3.2
LOS			A	A	A	A
Approach Delay				5.1	3.1	
Approach LOS				A	A	
Queue Length 50th (ft)			0	0	0	0
Queue Length 95th (ft)			#207	181	11	73
Internal Link Dist (ft)	675			371	840	
Turn Bay Length (ft)			250			150
Base Capacity (vph)			1208	3114	3114	1414
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			0.34	0.35	0.01	0.12

Intersection Summary	
Area Type:	Other
Cycle Length: 45	
Actuated Cycle Length: 45	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.35	
Intersection Signal Delay: 4.9	Intersection LOS: A
Intersection Capacity Utilization 22.4%	ICU Level of Service A
Analysis Period (min) 15	

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 28:



Lane Group	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	28	165	508	0	0
Future Volume (vph)	0	190	491	508	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	0.95	0.95	1.00	1.00
Frt		0.850				
Flt Protected			0.950	0.996		
Satd. Flow (prot)	0	2787	1681	1763	0	0
Flt Permitted			0.950	0.996		
Satd. Flow (perm)	0	2787	1681	1763	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	227			920	549	
Travel Time (s)	5.2			20.9	12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	207	534	552	0	0
Shared Lane Traffic (%)			10%			
Lane Group Flow (vph)	0	207	481	605	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			36	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.9%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	847	205	27
Future Volume (vph)	0	0	0	1233	205	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	3539	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	3539	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	818			374	654	
Travel Time (s)	18.6			8.5	14.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1340	223	29
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	1340	223	29
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60	60			60
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 26.7%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	0	0	469	380	0	232
Future Volume (vph)	0	0	855	380	0	232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt				0.850		
Flt Protected						
Satd. Flow (prot)	0	0	3539	1583	0	5085
Flt Permitted						
Satd. Flow (perm)	0	0	3539	1583	0	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	815		654			397
Travel Time (s)	18.5		14.9			9.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	929	413	0	252
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	929	413	0	252
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	60	60		60	60	
Sign Control	Free		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 44.9%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	674	18	10
Future Volume (vph)	0	0	0	1378	18	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	5085	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	5085	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	1042			221	359	
Travel Time (s)	23.7			5.0	8.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	1498	20	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	1498	20	11
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	8			0	6	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 22.0%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	28	0	7	666	8
Future Volume (vph)	0	28	0	7	1370	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	500	0	0
Storage Lanes	1	2	1	1	2	1
Taper Length (ft)	25		25		25	
Lane Util. Factor	1.00	0.88	1.00	1.00	0.97	1.00
Frt		0.850		0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	2787	1863	1583	3433	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	2787	1863	1583	3433	1583
Right Turn on Red		Yes		Yes		Yes
Satd. Flow (RTOR)		1920		471		9
Link Speed (mph)	30		30		30	
Link Distance (ft)	570		723		430	
Travel Time (s)	13.0		16.4		9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	30	0	8	1489	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	30	0	8	1489	9
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	30		32		32	
Link Offset(ft)	30		0		0	
Crosswalk Width(ft)	10		10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15	9
Number of Detectors	0	0	0	0	0	0
Detector Template	Thru	Thru	Thru	Thru	Thru	Thru
Leading Detector (ft)	0	0	0	0	0	0
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	Prot	pt+ov	Prot	Perm	Prot	Perm
Protected Phases	5	5 6	4		6	
Permitted Phases				4		6
Detector Phase	5	5 6	4	4	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	15.5		15.5	15.5	19.0	19.0
Total Split (%)	31.0%		31.0%	31.0%	38.0%	38.0%
Maximum Green (s)	11.0		11.0	11.0	14.5	14.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lead				Lag	Lag

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lead-Lag Optimize?	Yes				Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Max	C-Max
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)		47.1		5.5	45.1	45.1
Actuated g/C Ratio		0.94		0.11	0.90	0.90
v/c Ratio		0.01		0.01	0.48	0.01
Control Delay		0.0		0.0	4.7	2.8
Queue Delay		0.0		0.0	0.0	0.0
Total Delay		0.0		0.0	4.7	2.8
LOS		A		A	A	A
Approach Delay					4.7	
Approach LOS					A	
Queue Length 50th (ft)		0		0	0	0
Queue Length 95th (ft)		0		0	#281	5
Internal Link Dist (ft)	490		643		350	
Turn Bay Length (ft)				500		
Base Capacity (vph)		2737		715	3096	1429
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		0.01		0.01	0.48	0.01

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 6:NEL, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.48			
Intersection Signal Delay: 4.6		Intersection LOS: A	
Intersection Capacity Utilization 22.7%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

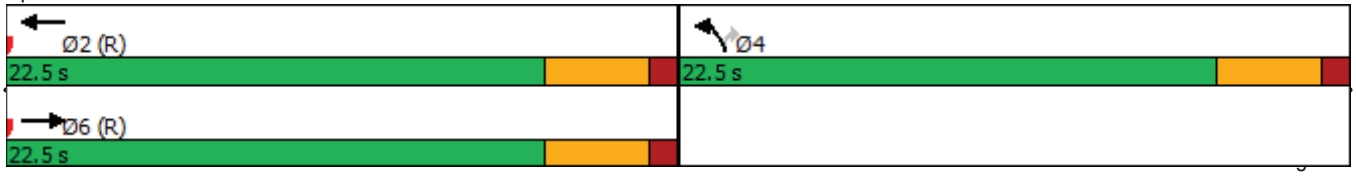
Splits and Phases: 102:

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	165	0	0	28	0	0
Future Volume (vph)	491	0	0	190	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	3539	0	0	3539	3614	1863
Flt Permitted						
Satd. Flow (perm)	3539	0	0	3539	3614	1863
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						
Link Speed (mph)	30			30	30	
Link Distance (ft)	923			533	500	
Travel Time (s)	21.0			12.1	11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	534	0	0	207	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	534	0	0	207	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2			2	1	1
Detector Template	Thru			Thru	Left	Right
Leading Detector (ft)	100			100	20	20
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	6			6	20	20
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	5.0			5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5			22.5	22.5	22.5
Total Split (s)	22.5			22.5	22.5	22.5
Total Split (%)	50.0%			50.0%	50.0%	50.0%
Maximum Green (s)	18.0			18.0	18.0	18.0
Yellow Time (s)	3.5			3.5	3.5	3.5
All-Red Time (s)	1.0			1.0	1.0	1.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	C-Max			C-Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	45.0			45.0		
Actuated g/C Ratio	1.00			1.00		
v/c Ratio	0.15			0.06		
Control Delay	0.1			0.0		
Queue Delay	0.0			0.0		
Total Delay	0.1			0.0		
LOS	A			A		
Approach Delay	0.1					
Approach LOS	A					
Queue Length 50th (ft)	0			0		
Queue Length 95th (ft)	0			0		
Internal Link Dist (ft)	843			453	420	
Turn Bay Length (ft)						
Base Capacity (vph)	3539			3539		
Starvation Cap Reductn	0			0		
Spillback Cap Reductn	0			0		
Storage Cap Reductn	0			0		
Reduced v/c Ratio	0.15			0.06		

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.15			
Intersection Signal Delay: 0.1		Intersection LOS: A	
Intersection Capacity Utilization 8.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 103:

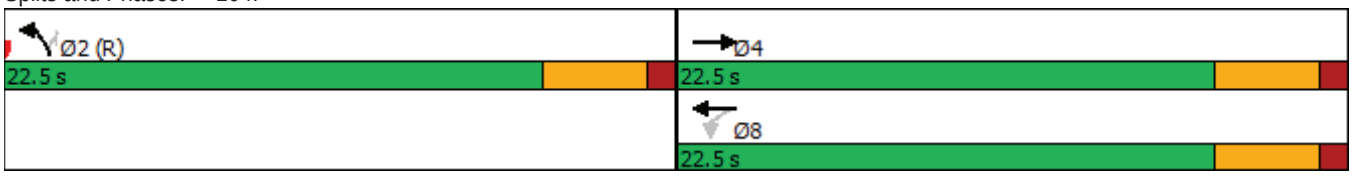


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	144	21	32	28	0	0
Future Volume (vph)	470	21	32	190	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.994					
Flt Protected			0.950			
Satd. Flow (prot)	3518	0	1770	3539	1863	1863
Flt Permitted			0.441			
Satd. Flow (perm)	3518	0	821	3539	1863	1863
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	12					
Link Speed (mph)	30			30	30	
Link Distance (ft)	533			404	428	
Travel Time (s)	12.1			9.2	9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	511	23	35	207	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	534	0	35	207	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	20	
Link Offset(ft)	-12			8	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (%)	50.0%		50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0		18.0	18.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	18.0		18.0	18.0		
Actuated g/C Ratio	0.40		0.40	0.40		
v/c Ratio	0.38		0.11	0.15		
Control Delay	8.5		9.6	9.0		
Queue Delay	0.0		0.0	0.0		
Total Delay	8.5		9.6	9.0		

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A		A	A		
Approach Delay	8.5			9.1		
Approach LOS	A			A		
Queue Length 50th (ft)	47		5	16		
Queue Length 95th (ft)	37		19	32		
Internal Link Dist (ft)	453			324	348	
Turn Bay Length (ft)						
Base Capacity (vph)	1414		328	1415		
Starvation Cap Reductn	0		0	0		
Spillback Cap Reductn	0		0	0		
Storage Cap Reductn	0		0	0		
Reduced v/c Ratio	0.38		0.11	0.15		

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.38			
Intersection Signal Delay: 8.7		Intersection LOS: A	
Intersection Capacity Utilization 16.3%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 104:

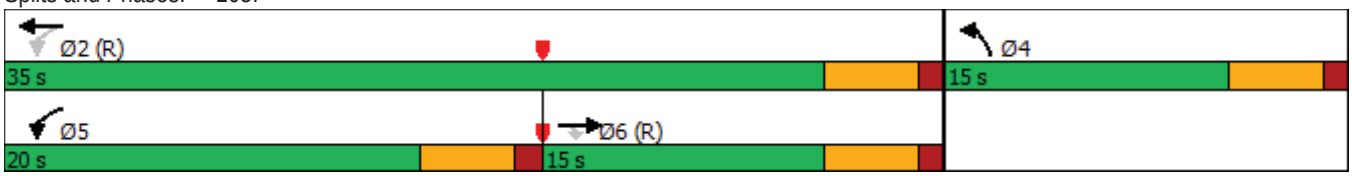


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	87	57	544	39	22	19
Future Volume (vph)	87	383	674	201	22	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.95
Frt		0.850			0.930	
Flt Protected			0.950		0.974	
Satd. Flow (prot)	3539	1583	1770	3539	3273	0
Flt Permitted			0.568		0.974	
Satd. Flow (perm)	3539	1583	1058	3539	3273	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		416			21	
Link Speed (mph)	30			30	30	
Link Distance (ft)	491			971	1149	
Travel Time (s)	11.2			22.1	26.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	95	416	733	218	24	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	416	733	218	45	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	
Detector Template	Thru	Right	Left	Thru	Left	
Leading Detector (ft)	100	20	20	100	20	
Trailing Detector (ft)	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	
Detector 1 Size(ft)	6	20	20	6	20	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	pm+pt	NA	Prot	
Protected Phases	6		5	2	4	
Permitted Phases		6	2			
Detector Phase	6	6	5	2	4	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	20.0	20.0	9.5	22.5	15.0	
Total Split (s)	15.0	15.0	20.0	35.0	15.0	
Total Split (%)	30.0%	30.0%	40.0%	70.0%	30.0%	
Maximum Green (s)	10.5	10.5	15.5	30.5	10.5	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max	None	C-Max	None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	11.0	11.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	23.2	23.2	41.1	43.8	6.0	
Actuated g/C Ratio	0.46	0.46	0.82	0.88	0.12	
v/c Ratio	0.06	0.43	0.69	0.07	0.11	
Control Delay	12.6	4.2	6.8	0.8	13.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	12.6	4.2	6.8	0.8	13.9	
LOS	B	A	A	A	B	
Approach Delay	5.8			5.4	13.9	
Approach LOS	A			A	B	
Queue Length 50th (ft)	4	0	12	0	3	
Queue Length 95th (ft)	26	58	#124	7	14	
Internal Link Dist (ft)	411			891	1069	
Turn Bay Length (ft)						
Base Capacity (vph)	1643	958	1112	3099	703	
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	0.06	0.43	0.66	0.07	0.06	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 5.8		Intersection LOS: A	
Intersection Capacity Utilization 48.5%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 105:



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	99	7	150	582	15	0	0	4	0	0	0
Future Volume (vph)	0	99	7	150	874	15	0	0	4	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990			0.998			0.865				
Flt Protected					0.993							
Satd. Flow (prot)	0	3504	0	0	3507	0	0	1611	0	0	1863	0
Flt Permitted					0.993							
Satd. Flow (perm)	0	3504	0	0	3507	0	0	1611	0	0	1863	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		971			260			262			305	
Travel Time (s)		22.1			5.9			6.0			6.9	
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
Adj. Flow (vph)	0	108	8	163	950	16	0	0	4	0	0	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	116	0	0	1129	0	0	4	0	0	0	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 34.2%		ICU Level of Service A	
Analysis Period (min) 15			

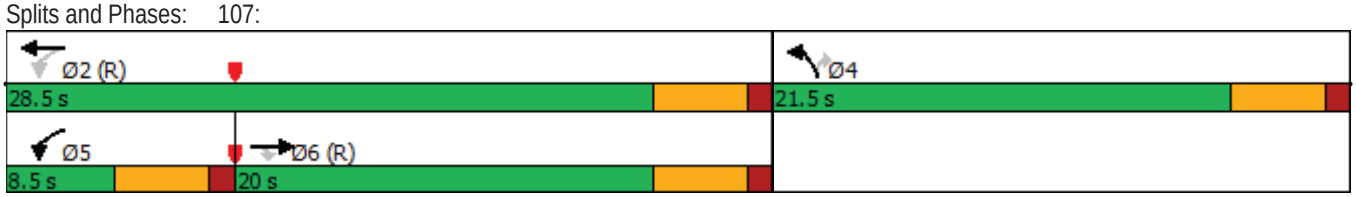
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	92	10	9	540	207	4
Future Volume (vph)	92	10	107	832	207	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12
Lane Util. Factor	0.95	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.994	0.950	
Satd. Flow (prot)	3539	1689	0	3518	1770	1583
Flt Permitted				0.904	0.950	
Satd. Flow (perm)	3539	1689	0	3199	1770	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		11				4
Link Speed (mph)	30			30	30	
Link Distance (ft)	777			738	307	
Travel Time (s)	17.7			16.8	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	11	116	904	225	4
Shared Lane Traffic (%)						
Lane Group Flow (vph)	100	11	0	1020	225	4
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	R NA	Left	Left	Left	Right
Median Width(ft)	16			16	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00
Turning Speed (mph)		15	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	pm+pt	NA	Prot	Perm
Protected Phases	6		5	2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	5	2	4	4
Switch Phase						

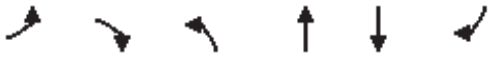
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	9.5	22.5	22.5	22.5
Total Split (s)	20.0	20.0	8.5	28.5	21.5	21.5
Total Split (%)	40.0%	40.0%	17.0%	57.0%	43.0%	43.0%
Maximum Green (s)	15.5	15.5	4.0	24.0	17.0	17.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?	Yes	Yes	Yes			
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	None	C-Max	None	None
Walk Time (s)	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0		0	0	0
Act Effct Green (s)	29.5	29.5		29.5	11.5	11.5
Actuated g/C Ratio	0.59	0.59		0.59	0.23	0.23
v/c Ratio	0.05	0.01		0.54	0.55	0.01
Control Delay	1.8	0.4		8.1	21.5	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0
Total Delay	1.8	0.4		8.1	21.5	9.0
LOS	A	A		A	C	A
Approach Delay	1.6			8.1	21.3	
Approach LOS	A			A	C	
Queue Length 50th (ft)	7	1		70	58	0
Queue Length 95th (ft)	1	0		137	98	5
Internal Link Dist (ft)	697			658	227	
Turn Bay Length (ft)						
Base Capacity (vph)	2085	999		1884	601	540
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	0.05	0.01		0.54	0.37	0.01

Intersection Summary

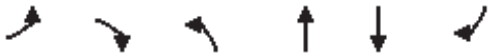
Area Type: Other
Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 9.8 Intersection LOS: A
Intersection Capacity Utilization 37.5% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 107:





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	72	24	317	999	357	232
Future Volume (vph)	72	24	431	999	357	508
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00
Frt	0.962					0.850
Flt Protected	0.964		0.950			
Satd. Flow (prot)	3351	0	1770	3539	3539	1583
Flt Permitted	0.964		0.405			
Satd. Flow (perm)	3351	0	754	3539	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	26					552
Link Speed (mph)	30			30	30	
Link Distance (ft)	738			727	965	
Travel Time (s)	16.8			16.5	21.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	78	26	468	1086	388	552
Shared Lane Traffic (%)						
Lane Group Flow (vph)	104	0	468	1086	388	552
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	36			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	15.0		15.0	35.0	20.0	20.0
Total Split (%)	30.0%		30.0%	70.0%	40.0%	40.0%
Maximum Green (s)	10.5		10.5	30.5	15.5	15.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	10.5		30.5	30.5	15.5	15.5
Actuated g/C Ratio	0.21		0.61	0.61	0.31	0.31
v/c Ratio	0.14		0.70	0.50	0.35	0.63
Control Delay	7.5		12.1	6.5	14.5	5.5
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	7.5		12.1	6.5	14.5	5.5



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	A		B	A	B	A
Approach Delay	7.5			8.2	9.2	
Approach LOS	A			A	A	
Queue Length 50th (ft)	12		60	77	45	0
Queue Length 95th (ft)	26		#115	113	74	56
Internal Link Dist (ft)	658			647	885	
Turn Bay Length (ft)						
Base Capacity (vph)	724		673	2158	1097	871
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	0.14		0.70	0.50	0.35	0.63

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green, Master Intersection			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 8.5		Intersection LOS: A	
Intersection Capacity Utilization 42.8%		ICU Level of Service A	
Analysis Period (min) 15			

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 108:

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	211	0	0	19	0	0
Future Volume (vph)	211	0	0	117	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	0	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1082			1015	590	
Travel Time (s)	24.6			23.1	13.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	229	0	0	127	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	229	0	0	127	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 14.4%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	28	0	0	19	0	183
Future Volume (vph)	28	0	0	117	98	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.912	
Flt Protected					0.983	
Satd. Flow (prot)	1863	0	0	1863	1670	0
Flt Permitted					0.983	
Satd. Flow (perm)	1863	0	0	1863	1670	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	839			634	538	
Travel Time (s)	19.1			14.4	12.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	0	0	127	107	199
Shared Lane Traffic (%)						
Lane Group Flow (vph)	30	0	0	127	306	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 21.3%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	19	28	0
Future Volume (vph)	0	0	0	215	28	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.865			
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	1863
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	1863
Link Speed (mph)		30	30		30	
Link Distance (ft)		98	839		286	
Travel Time (s)		2.2	19.1		6.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	234	30	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	234	0	30	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		36	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

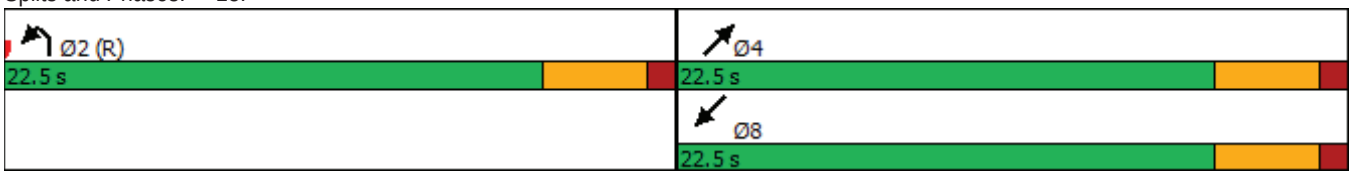
PM Build LOS

Lane Group	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	348	4	27	0	0	233
Future Volume (vph)	348	4	27	0	0	612
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt	0.999					
Flt Protected	0.953					
Satd. Flow (prot)	1773	0	3539	0	0	5085
Flt Permitted	0.953					
Satd. Flow (perm)	1773	0	3539	0	0	5085
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	1					
Link Speed (mph)	30		30			30
Link Distance (ft)	765		397			221
Travel Time (s)	17.4		9.0			5.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	378	4	29	0	0	665
Shared Lane Traffic (%)						
Lane Group Flow (vph)	382	0	29	0	0	665
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		6			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Turn Type	Prot		NA			NA
Protected Phases	2		4			8
Permitted Phases						
Minimum Split (s)	22.5		22.5			22.5
Total Split (s)	22.5		22.5			22.5
Total Split (%)	50.0%		50.0%			50.0%
Maximum Green (s)	18.0		18.0			18.0
Yellow Time (s)	3.5		3.5			3.5
All-Red Time (s)	1.0		1.0			1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	4.5		4.5			4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0			7.0
Flash Dont Walk (s)	11.0		11.0			11.0
Pedestrian Calls (#/hr)	5		5			5
Act Effct Green (s)	18.0		18.0			18.0
Actuated g/C Ratio	0.40		0.40			0.40
v/c Ratio	0.54		0.02			0.33
Control Delay	13.8		9.6			9.9
Queue Delay	0.0		0.0			0.0
Total Delay	13.8		9.6			9.9

Lane Group	NBL	NBR	NET	NER	SWL	SWT
LOS	B		A			A
Approach Delay	13.8		9.6			9.9
Approach LOS	B		A			A
Queue Length 50th (ft)	71		4			41
Queue Length 95th (ft)	133		14			61
Internal Link Dist (ft)	685		317			141
Turn Bay Length (ft)						
Base Capacity (vph)	709		1415			2034
Starvation Cap Reductn	0		0			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.54		0.02			0.33

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.54			
Intersection Signal Delay: 11.3		Intersection LOS: B	
Intersection Capacity Utilization 31.5%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 13:



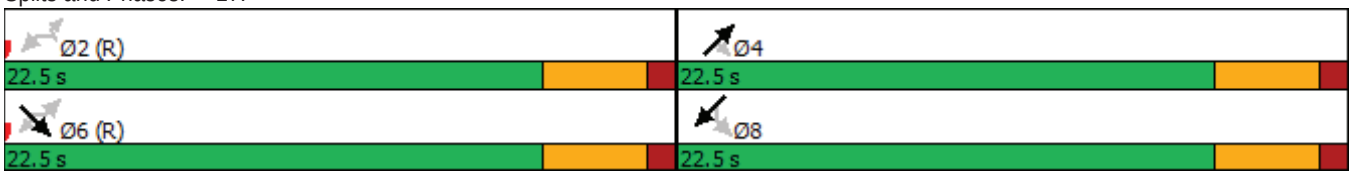
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	10	11	477	15	0	7	0	344	10	7	443	0
Future Volume (vph)	10	11	477	15	0	7	0	344	10	7	504	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	0.95	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.857	0.850			0.850			0.850			
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	3433	1517	1504	1770	0	1583	0	3539	1583	1770	3539	0
Flt Permitted	0.950			0.572						0.530		
Satd. Flow (perm)	3433	1517	1504	1065	0	1583	0	3539	1583	987	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		181	181			36			36			
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		872			347			301			374	
Travel Time (s)		19.8			7.9			6.8			8.5	
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
Adj. Flow (vph)	11	12	518	16	0	8	0	374	11	8	548	0
Shared Lane Traffic (%)			49%									
Lane Group Flow (vph)	11	266	264	16	0	8	0	374	11	8	548	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm		Perm		NA	Perm	Perm	NA	
Protected Phases		6						4			8	
Permitted Phases	6		6	2		2			4	8		
Minimum Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (s)	22.5	22.5	22.5	22.5		22.5		22.5	22.5	22.5	22.5	
Total Split (%)	50.0%	50.0%	50.0%	50.0%		50.0%		50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Yellow Time (s)	3.5	3.5	3.5	3.5		3.5		3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0		1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5		4.5		4.5	4.5	4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0	7.0		7.0		7.0	7.0	7.0	7.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0		11.0		11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)	5	5	5	5		5		5	5	5	5	
Act Effct Green (s)	18.0	18.0	18.0	18.0		18.0		18.0	18.0	18.0	18.0	
Actuated g/C Ratio	0.40	0.40	0.40	0.40		0.40		0.40	0.40	0.40	0.40	
v/c Ratio	0.01	0.37	0.37	0.04		0.01		0.26	0.02	0.02	0.39	
Control Delay	8.2	5.3	5.3	8.7		0.4		13.8	7.5	8.9	10.5	
Queue Delay	0.0	0.0	0.0	0.0		0.0		0.0	0.0	0.0	0.0	
Total Delay	8.2	5.3	5.3	8.7		0.4		13.8	7.5	8.9	10.5	

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
LOS	A	A	A	A		A		B	A	A	B	
Approach Delay		5.3			5.9			13.6			10.5	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	1	13	13	2		0		54	0	1	55	
Queue Length 95th (ft)	4	51	50	11		1		92	m8	m4	100	
Internal Link Dist (ft)		792			267			221			294	
Turn Bay Length (ft)												
Base Capacity (vph)	1373	715	710	426		654		1415	654	394	1415	
Starvation Cap Reductn	0	0	0	0		0		0	0	0	0	
Spillback Cap Reductn	0	0	0	0		0		0	0	0	0	
Storage Cap Reductn	0	0	0	0		0		0	0	0	0	
Reduced v/c Ratio	0.01	0.37	0.37	0.04		0.01		0.26	0.02	0.02	0.39	

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NWL and 6:SETL, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.39			
Intersection Signal Delay: 9.4		Intersection LOS: A	
Intersection Capacity Utilization 46.1%		ICU Level of Service A	
Analysis Period (min) 15			

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 17:



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	40	20	0	359	47	35
Future Volume (vph)	202	20	0	685	47	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.986					0.865
Flt Protected					0.950	
Satd. Flow (prot)	3490	0	0	3539	0	1611
Flt Permitted					0.950	
Satd. Flow (perm)	3490	0	0	3539	0	1611
Link Speed (mph)	30			30	30	
Link Distance (ft)	404			491	211	
Travel Time (s)	9.2			11.2	4.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	22	0	745	51	38
Shared Lane Traffic (%)						
Lane Group Flow (vph)	242	0	0	745	51	38
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	12			24	0	
Link Offset(ft)	0			6	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

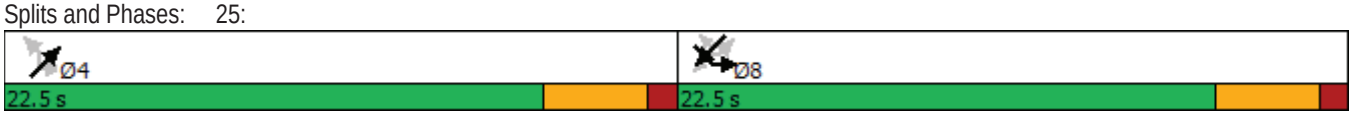
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization Err%		ICU Level of Service H	
Analysis Period (min) 15			

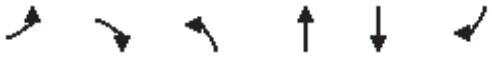
Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Traffic Volume (vph)	0	0	12	33	42	77	342	118	0	743	87
Future Volume (vph)	0	0	12	33	42	77	342	118	0	799	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		0	0	250		0	0		0
Storage Lanes	0	0		1	1	1		1	0		1
Taper Length (ft)	100			100		100			100		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt					0.850			0.850			0.850
Flt Protected				0.950		0.950					
Satd. Flow (prot)	0	0	0	1770	1583	1770	3539	1583	0	3539	1583
Flt Permitted				0.950		0.222					
Satd. Flow (perm)	0	0	0	1770	1583	414	3539	1583	0	3539	1583
Right Turn on Red					Yes			Yes			Yes
Satd. Flow (RTOR)					46			128			100
Link Speed (mph)	30			30			30			30	
Link Distance (ft)	601			719			925			301	
Travel Time (s)	13.7			16.3			21.0			6.8	
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
Adj. Flow (vph)	0	0	13	36	46	84	372	128	0	868	100
Shared Lane Traffic (%)											
Lane Group Flow (vph)	0	0	0	49	46	84	372	128	0	868	100
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			12			12			12	
Link Offset(ft)	0			0			0			0	
Crosswalk Width(ft)	10			10			10			10	
Two way Left Turn Lane											
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	15	9	15		9	15		9
Turn Type			D.Pm	Prot	Perm	Perm	NA	Perm		NA	Perm
Protected Phases				8!			4			8!	
Permitted Phases			8!		8	4		4			8
Minimum Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (s)			22.5	22.5	22.5	22.5	22.5	22.5		22.5	22.5
Total Split (%)			50.0%	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%
Maximum Green (s)			18.0	18.0	18.0	18.0	18.0	18.0		18.0	18.0
Yellow Time (s)			3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)			1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0
Lost Time Adjust (s)				0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)				4.5	4.5	4.5	4.5	4.5		4.5	4.5
Lead/Lag											
Lead-Lag Optimize?											
Walk Time (s)			7.0	7.0	7.0	7.0	7.0	7.0		7.0	7.0
Flash Dont Walk (s)			11.0	11.0	11.0	11.0	11.0	11.0		11.0	11.0
Pedestrian Calls (#/hr)			5	5	5	5	5	5		5	5
Act Effct Green (s)				18.0	18.0	18.0	18.0	18.0		18.0	18.0
Actuated g/C Ratio				0.40	0.40	0.40	0.40	0.40		0.40	0.40
v/c Ratio				0.07	0.07	0.51	0.26	0.18		0.61	0.14

Lane Group	WBL	WBR	SEL2	SEL	SER	NEL	NET	NER	SWL	SWT	SWR
Control Delay				8.7	3.8	25.2	9.7	3.1		10.3	2.2
Queue Delay				0.0	0.0	0.0	0.0	0.0		0.1	0.0
Total Delay				8.7	3.8	25.2	9.7	3.1		10.3	2.2
LOS				A	A	C	A	A		B	A
Approach Delay				6.3			10.5			9.5	
Approach LOS				A			B			A	
Queue Length 50th (ft)				7	0	15	32	0		66	1
Queue Length 95th (ft)				22	13	#65	54	22		96	14
Internal Link Dist (ft)	521			639			845			221	
Turn Bay Length (ft)						250					
Base Capacity (vph)				708	660	165	1415	710		1415	693
Starvation Cap Reductn				0	0	0	0	0		44	0
Spillback Cap Reductn				0	0	0	0	0		0	0
Storage Cap Reductn				0	0	0	0	0		0	0
Reduced v/c Ratio				0.07	0.07	0.51	0.26	0.18		0.63	0.14

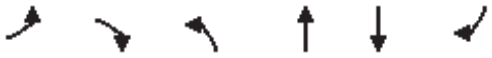
Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2: and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.61			
Intersection Signal Delay: 9.7		Intersection LOS: A	
Intersection Capacity Utilization 40.2%		ICU Level of Service A	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			
! Phase conflict between lane groups.			

Splits and Phases: 25:





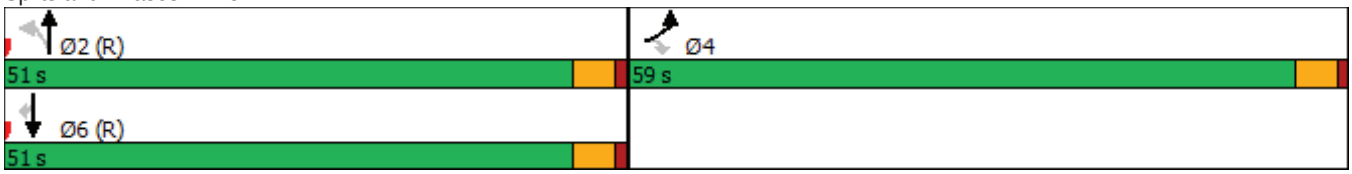
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	18	31	633	2
Future Volume (vph)	162	378	18	31	959	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	250			150
Storage Lanes	1	1	1			1
Taper Length (ft)	100		25			
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.850				0.850
Flt Protected	0.950		0.950			
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.950		0.217			
Satd. Flow (perm)	1770	1583	404	3539	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		39				1
Link Speed (mph)	30			30	30	
Link Distance (ft)	755			451	920	
Travel Time (s)	17.2			10.3	20.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	176	411	20	34	1042	2
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	411	20	34	1042	2
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			24	6	
Link Offset(ft)	0			-6	6	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Number of Detectors	1	1	1	2	2	1
Detector Template	Left	Right	Left	Thru	Thru	Right
Leading Detector (ft)	20	20	20	100	100	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	20	6	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)				94	94	
Detector 2 Size(ft)				6	6	
Detector 2 Type				Cl+Ex	Cl+Ex	
Detector 2 Channel						
Detector 2 Extend (s)				0.0	0.0	
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	59.0	59.0	51.0	51.0	51.0	51.0
Total Split (%)	53.6%	53.6%	46.4%	46.4%	46.4%	46.4%
Maximum Green (s)	54.5	54.5	46.5	46.5	46.5	46.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	5	5	5	5	5	5
Act Effct Green (s)	33.6	33.6	67.4	67.4	67.4	67.4
Actuated g/C Ratio	0.31	0.31	0.61	0.61	0.61	0.61
v/c Ratio	0.33	0.81	0.08	0.02	0.48	0.00
Control Delay	29.3	43.3	13.1	11.1	14.0	10.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.3	43.3	13.1	11.1	14.0	10.5
LOS	C	D	B	B	B	B
Approach Delay	39.1			11.8	14.0	
Approach LOS	D			B	B	
Queue Length 50th (ft)	96	244	5	4	197	0
Queue Length 95th (ft)	130	309	22	14	325	4
Internal Link Dist (ft)	675			371	840	
Turn Bay Length (ft)			250			150
Base Capacity (vph)	876	803	247	2168	2168	970
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.51	0.08	0.02	0.48	0.00

Intersection Summary	
Area Type:	Other
Cycle Length: 110	
Actuated Cycle Length: 110	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 22.7	Intersection LOS: C
Intersection Capacity Utilization 21.2%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 28:



Lane Group	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	633	31	0	0	0
Future Volume (vph)	0	959	193	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	0.95	0.95	1.00	1.00
Frt		0.850				
Flt Protected			0.950	0.950		
Satd. Flow (prot)	0	2787	1681	1681	0	0
Flt Permitted			0.950	0.950		
Satd. Flow (perm)	0	2787	1681	1681	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	227			920	549	
Travel Time (s)	5.2			20.9	12.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1042	210	0	0	0
Shared Lane Traffic (%)			50%			
Lane Group Flow (vph)	0	1042	105	105	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			36	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 25.5%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	361	450	133
Future Volume (vph)	0	0	0	361	511	451
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	3539	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	3539	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	818			374	654	
Travel Time (s)	18.6			8.5	14.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	392	555	490
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	392	555	490
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 15.8%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	WBL	WBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	0	0	27	355	0	581
Future Volume (vph)	0	0	27	355	0	960
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.91
Frt				0.850		
Flt Protected						
Satd. Flow (prot)	0	0	3539	1583	0	5085
Flt Permitted						
Satd. Flow (perm)	0	0	3539	1583	0	5085
Link Speed (mph)	30		30			30
Link Distance (ft)	815		654			397
Travel Time (s)	18.5		14.9			9.0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	29	386	0	1043
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	29	386	0	1043
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	0		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	10		10			10
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 31.5%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	0	0	0	31	233	400
Future Volume (vph)	0	0	0	31	612	725
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	0	0	0	3539	5085	1583
Flt Permitted						
Satd. Flow (perm)	0	0	0	3539	5085	1583
Link Speed (mph)	30			30	30	
Link Distance (ft)	1042			221	359	
Travel Time (s)	23.7			5.0	8.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	34	665	788
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	34	665	788
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	8			0	6	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Free			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 28.1%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lane Configurations						
Traffic Volume (vph)	0	633	0	19	30	19
Future Volume (vph)	0	1337	0	19	30	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	0	500	0	0
Storage Lanes	1	2	1	1	2	1
Taper Length (ft)	25		25		25	
Lane Util. Factor	1.00	0.88	1.00	1.00	0.97	1.00
Frt		0.850		0.850		0.850
Flt Protected					0.950	
Satd. Flow (prot)	1863	2787	1863	1583	3433	1583
Flt Permitted					0.950	
Satd. Flow (perm)	1863	2787	1863	1583	3433	1583
Right Turn on Red		Yes		Yes		Yes
Satd. Flow (RTOR)		1920		1007		21
Link Speed (mph)	30		30		30	
Link Distance (ft)	570		723		430	
Travel Time (s)	13.0		16.4		9.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1453	0	21	33	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	1453	0	21	33	21
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Right
Median Width(ft)	30		32		32	
Link Offset(ft)	30		0		0	
Crosswalk Width(ft)	10		10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15	9	15	9
Number of Detectors	0	0	0	0	0	0
Detector Template	Thru	Thru	Thru	Thru	Thru	Thru
Leading Detector (ft)	0	0	0	0	0	0
Trailing Detector (ft)	0	0	0	0	0	0
Turn Type	Prot	pt+ov	Prot	Perm	Prot	Perm
Protected Phases	5	5 6	4		6	
Permitted Phases				4		6
Detector Phase	5	5 6	4	4	6	6
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	15.5		15.5	15.5	19.0	19.0
Total Split (%)	31.0%		31.0%	31.0%	38.0%	38.0%
Maximum Green (s)	11.0		11.0	11.0	14.5	14.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag	Lead				Lag	Lag

Lane Group	SBL	SBR	NWL	NWR	NEL	NER
Lead-Lag Optimize?	Yes				Yes	Yes
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	C-Max	C-Max
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)		47.1		5.5	30.9	30.9
Actuated g/C Ratio		0.94		0.11	0.62	0.62
v/c Ratio		0.53		0.02	0.02	0.02
Control Delay		0.7		0.1	5.7	3.6
Queue Delay		0.0		0.0	0.0	0.0
Total Delay		0.7		0.1	5.7	3.6
LOS		A		A	A	A
Approach Delay	0.7		0.1		4.9	
Approach LOS	A		A		A	
Queue Length 50th (ft)		0		0	1	0
Queue Length 95th (ft)		0		0	8	9
Internal Link Dist (ft)	490		643		350	
Turn Bay Length (ft)				500		
Base Capacity (vph)		2709		1133	2121	986
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		0.54		0.02	0.02	0.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 6:NEL, Start of Green			
Natural Cycle: 70			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.53			
Intersection Signal Delay: 0.9		Intersection LOS: A	
Intersection Capacity Utilization 25.9%		ICU Level of Service A	
Analysis Period (min) 15			

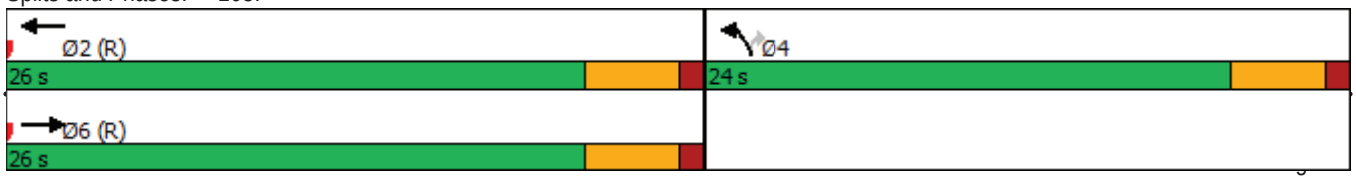
Splits and Phases: 102:

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	31	0	0	406	227	29
Future Volume (vph)	193	0	0	732	227	29
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frt						0.850
Flt Protected					0.950	
Satd. Flow (prot)	3539	0	0	3539	3433	1583
Flt Permitted					0.950	
Satd. Flow (perm)	3539	0	0	3539	3433	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						32
Link Speed (mph)	30			30	30	
Link Distance (ft)	923			533	500	
Travel Time (s)	21.0			12.1	11.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	210	0	0	796	247	32
Shared Lane Traffic (%)						
Lane Group Flow (vph)	210	0	0	796	247	32
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2			2	1	1
Detector Template	Thru			Thru	Left	Right
Leading Detector (ft)	100			100	20	20
Trailing Detector (ft)	0			0	0	0
Detector 1 Position(ft)	0			0	0	0
Detector 1 Size(ft)	6			6	20	20
Detector 1 Type	Cl+Ex			Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0			0.0	0.0	0.0
Detector 1 Queue (s)	0.0			0.0	0.0	0.0
Detector 1 Delay (s)	0.0			0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA			NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases						4
Detector Phase	6			2	4	4
Switch Phase						
Minimum Initial (s)	5.0			5.0	5.0	5.0

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	22.5			22.5	22.5	22.5
Total Split (s)	26.0			26.0	24.0	24.0
Total Split (%)	52.0%			52.0%	48.0%	48.0%
Maximum Green (s)	21.5			21.5	19.5	19.5
Yellow Time (s)	3.5			3.5	3.5	3.5
All-Red Time (s)	1.0			1.0	1.0	1.0
Lost Time Adjust (s)	0.0			0.0	0.0	0.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Recall Mode	C-Max			C-Max	None	None
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	32.1			32.1	8.9	8.9
Actuated g/C Ratio	0.64			0.64	0.18	0.18
v/c Ratio	0.09			0.35	0.40	0.10
Control Delay	3.9			5.0	19.8	7.9
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	3.9			5.0	19.8	7.9
LOS	A			A	B	A
Approach Delay	3.9			5.0	18.4	
Approach LOS	A			A	B	
Queue Length 50th (ft)	9			44	33	0
Queue Length 95th (ft)	21			80	55	16
Internal Link Dist (ft)	843			453	420	
Turn Bay Length (ft)						
Base Capacity (vph)	2272			2272	1338	636
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	0.09			0.35	0.18	0.05

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.40			
Intersection Signal Delay: 7.7		Intersection LOS: A	
Intersection Capacity Utilization 25.2%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 103:

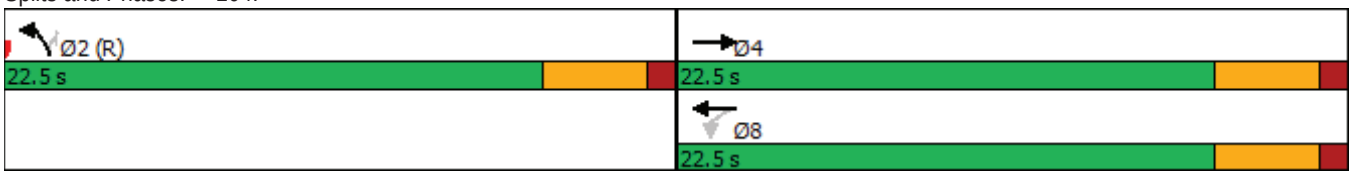


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	60	0	0	406	0	20
Future Volume (vph)	222	0	0	732	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt						0.850
Flt Protected						
Satd. Flow (prot)	3539	0	1863	3539	1863	1583
Flt Permitted						
Satd. Flow (perm)	3539	0	1863	3539	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)						503
Link Speed (mph)	30			30	30	
Link Distance (ft)	533			404	428	
Travel Time (s)	12.1			9.2	9.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	241	0	0	796	0	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	241	0	0	796	0	22
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	20	
Link Offset(ft)	-12			8	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Minimum Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (s)	22.5		22.5	22.5	22.5	22.5
Total Split (%)	50.0%		50.0%	50.0%	50.0%	50.0%
Maximum Green (s)	18.0		18.0	18.0	18.0	18.0
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Walk Time (s)	7.0		7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0		11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0		0	0	0	0
Act Effct Green (s)	18.0			18.0		18.0
Actuated g/C Ratio	0.40			0.40		0.40
v/c Ratio	0.17			0.56		0.02
Control Delay	9.1			12.4		0.1
Queue Delay	0.0			0.0		0.0
Total Delay	9.1			12.4		0.1

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
LOS	A			B		A
Approach Delay	9.1			12.4	0.1	
Approach LOS	A			B	A	
Queue Length 50th (ft)	20			78		0
Queue Length 95th (ft)	36			121		0
Internal Link Dist (ft)	453			324	348	
Turn Bay Length (ft)						
Base Capacity (vph)	1415			1415		935
Starvation Cap Reductn	0			0		0
Spillback Cap Reductn	0			0		0
Storage Cap Reductn	0			0		0
Reduced v/c Ratio	0.17			0.56		0.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 45			
Actuated Cycle Length: 45			
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green			
Natural Cycle: 45			
Control Type: Pretimed			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 11.4		Intersection LOS: B	
Intersection Capacity Utilization 15.8%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 104:



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	71	4	57	92	267	670
Future Volume (vph)	233	4	57	92	593	800
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	0.95
Frt		0.850			0.914	
Flt Protected			0.950		0.979	
Satd. Flow (prot)	3539	1583	1770	3539	3234	0
Flt Permitted			0.950		0.979	
Satd. Flow (perm)	3539	1583	1770	3539	3234	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		4			577	
Link Speed (mph)	30			30	30	
Link Distance (ft)	491			971	1149	
Travel Time (s)	11.2			22.1	26.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	253	4	62	100	645	870
Shared Lane Traffic (%)						
Lane Group Flow (vph)	253	4	62	100	1515	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			24	24	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Number of Detectors	2	1	1	2	1	
Detector Template	Thru	Right	Left	Thru	Left	
Leading Detector (ft)	100	20	20	100	20	
Trailing Detector (ft)	0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0	
Detector 1 Size(ft)	6	20	20	6	20	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Prot	NA	Prot	
Protected Phases	6		5	2	4	
Permitted Phases		6				
Detector Phase	6	6	5	2	4	
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	

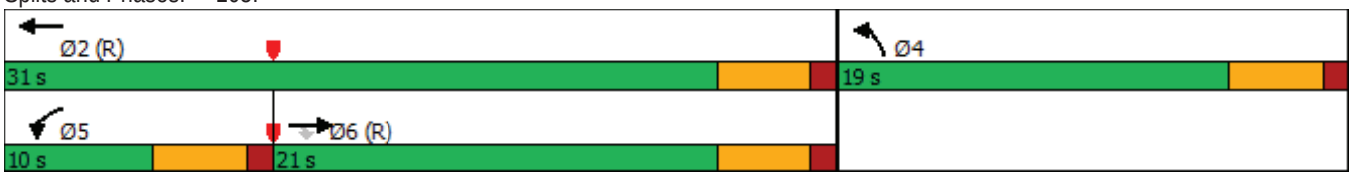
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Split (s)	20.0	20.0	9.5	22.5	15.0	
Total Split (s)	21.0	21.0	10.0	31.0	19.0	
Total Split (%)	42.0%	42.0%	20.0%	62.0%	38.0%	
Maximum Green (s)	16.5	16.5	5.5	26.5	14.5	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lag	Lag	Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Recall Mode	C-Max	C-Max	None	C-Max	None	
Walk Time (s)	7.0	7.0				
Flash Dont Walk (s)	11.0	11.0				
Pedestrian Calls (#/hr)	0	0				
Act Effct Green (s)	20.5	20.5	5.5	26.5	14.5	
Actuated g/C Ratio	0.41	0.41	0.11	0.53	0.29	
v/c Ratio	0.17	0.01	0.32	0.05	1.12	
Control Delay	11.3	8.2	26.9	2.8	81.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	11.3	8.2	26.9	2.8	81.4	
LOS	B	A	C	A	F	
Approach Delay	11.3			12.1	81.4	
Approach LOS	B			B	F	
Queue Length 50th (ft)	27	0	18	5	~206	
Queue Length 95th (ft)	48	5	39	4	#322	
Internal Link Dist (ft)	411			891	1069	
Turn Bay Length (ft)						
Base Capacity (vph)	1450	651	194	1875	1347	
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	0.17	0.01	0.32	0.05	1.12	

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.12			
Intersection Signal Delay: 66.3		Intersection LOS: E	
Intersection Capacity Utilization 46.2%		ICU Level of Service A	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 105:



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑			↑↑			↑			↑	
Traffic Volume (vph)	0	741	0	2	119	2	27	0	17	0	0	4
Future Volume (vph)	0	1033	0	2	119	2	27	0	17	0	0	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.998			0.948			0.865	
Flt Protected					0.999			0.970				
Satd. Flow (prot)	0	3539	0	0	3529	0	0	1713	0	0	1611	0
Flt Permitted					0.999			0.970				
Satd. Flow (perm)	0	3539	0	0	3529	0	0	1713	0	0	1611	0
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		971			260			262			305	
Travel Time (s)		22.1			5.9			6.0			6.9	
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
Adj. Flow (vph)	0	1123	0	2	129	2	29	0	18	0	0	4
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1123	0	0	133	0	0	47	0	0	4	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		16			16			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 36.4%		ICU Level of Service A	
Analysis Period (min) 15			

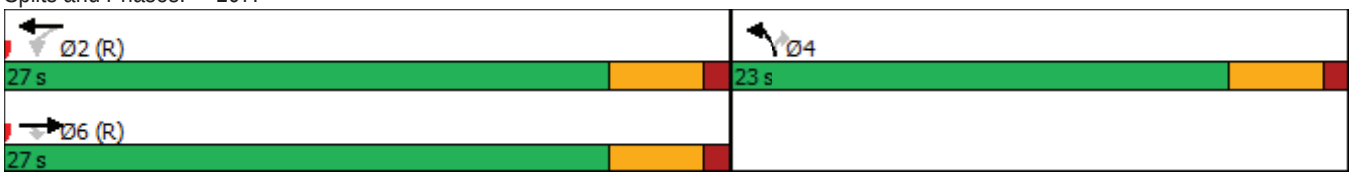
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	465	293	4	122	0	19
Future Volume (vph)	757	293	4	122	0	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	14	12	12	12	12
Lane Util. Factor	0.95	1.00	0.95	0.95	1.00	1.00
Frt		0.850				0.850
Flt Protected				0.999		
Satd. Flow (prot)	3539	1689	0	3536	1863	1583
Flt Permitted				0.941		
Satd. Flow (perm)	3539	1689	0	3330	1863	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		318				96
Link Speed (mph)	30			30	30	
Link Distance (ft)	777			738	307	
Travel Time (s)	17.7			16.8	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	823	318	4	133	0	127
Shared Lane Traffic (%)						
Lane Group Flow (vph)	823	318	0	137	0	127
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	R NA	Left	Left	Left	Right
Median Width(ft)	16			16	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	0.92	1.00	1.00	1.00	1.00
Turning Speed (mph)		15	15		15	9
Number of Detectors	2	1	1	2	1	1
Detector Template	Thru	Right	Left	Thru	Left	Right
Leading Detector (ft)	100	20	20	100	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	6	20	20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)	94			94		
Detector 2 Size(ft)	6			6		
Detector 2 Type	Cl+Ex			Cl+Ex		
Detector 2 Channel						
Detector 2 Extend (s)	0.0			0.0		
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	6			2	4	
Permitted Phases		6	2			4
Detector Phase	6	6	2	2	4	4
Switch Phase						

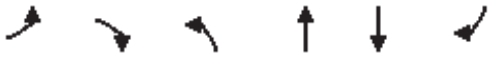
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	27.0	27.0	27.0	27.0	23.0	23.0
Total Split (%)	54.0%	54.0%	54.0%	54.0%	46.0%	46.0%
Maximum Green (s)	22.5	22.5	22.5	22.5	18.5	18.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0	0
Act Effct Green (s)	36.7	36.7		36.7		7.2
Actuated g/C Ratio	0.73	0.73		0.73		0.14
v/c Ratio	0.32	0.24		0.06		0.41
Control Delay	5.0	2.1		2.8		11.6
Queue Delay	0.0	0.0		0.0		0.0
Total Delay	5.0	2.1		2.8		11.6
LOS	A	A		A		B
Approach Delay	4.2			2.8	11.6	
Approach LOS	A			A	B	
Queue Length 50th (ft)	53	6		5		8
Queue Length 95th (ft)	m57	m7		11		42
Internal Link Dist (ft)	697			658	227	
Turn Bay Length (ft)						
Base Capacity (vph)	2600	1325		2446		646
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	0.32	0.24		0.06		0.20

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:WBTL and 6:EBT, Start of Green			
Natural Cycle: 45			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.41			
Intersection Signal Delay: 4.7		Intersection LOS: A	
Intersection Capacity Utilization 29.8%		ICU Level of Service A	
Analysis Period (min) 15			

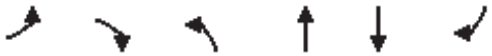
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 107:





Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	470	115	40	1170	922	85
Future Volume (vph)	746	229	40	1170	922	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.97	0.95	1.00	0.95	0.95	1.00
Frt	0.965					0.850
Flt Protected	0.963		0.950			
Satd. Flow (prot)	3358	0	1770	3539	3539	1583
Flt Permitted	0.963		0.200			
Satd. Flow (perm)	3358	0	373	3539	3539	1583
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	91					92
Link Speed (mph)	30			30	30	
Link Distance (ft)	738			727	965	
Travel Time (s)	16.8			16.5	21.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	811	249	43	1272	1002	92
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1060	0	43	1272	1002	92
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	36			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot		pm+pt	NA	NA	Perm
Protected Phases	4		5	2	6	
Permitted Phases			2			6
Minimum Split (s)	22.5		9.5	22.5	22.5	22.5
Total Split (s)	21.5		8.5	28.5	20.0	20.0
Total Split (%)	43.0%		17.0%	57.0%	40.0%	40.0%
Maximum Green (s)	17.0		4.0	24.0	15.5	15.5
Yellow Time (s)	3.5		3.5	3.5	3.5	3.5
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5		4.5	4.5	4.5	4.5
Lead/Lag			Lead		Lag	Lag
Lead-Lag Optimize?			Yes		Yes	Yes
Walk Time (s)	7.0			7.0	7.0	7.0
Flash Dont Walk (s)	11.0			11.0	11.0	11.0
Pedestrian Calls (#/hr)	0			0	0	0
Act Effct Green (s)	17.0		24.0	24.0	15.5	15.5
Actuated g/C Ratio	0.34		0.48	0.48	0.31	0.31
v/c Ratio	0.88		0.15	0.75	0.91	0.17
Control Delay	24.9		8.2	14.0	32.0	4.6
Queue Delay	0.0		0.0	0.0	0.0	0.0
Total Delay	24.9		8.2	14.0	32.0	4.6



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
LOS	C		A	B	C	A
Approach Delay	24.9			13.8	29.7	
Approach LOS	C			B	C	
Queue Length 50th (ft)	141		6	145	145	0
Queue Length 95th (ft)	#234		18	212	#253	24
Internal Link Dist (ft)	658			647	885	
Turn Bay Length (ft)						
Base Capacity (vph)	1201		290	1698	1097	554
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		0.15	0.75	0.91	0.17

Intersection Summary			
Area Type:	Other		
Cycle Length: 50			
Actuated Cycle Length: 50			
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green, Master Intersection			
Natural Cycle: 60			
Control Type: Pretimed			
Maximum v/c Ratio: 0.91			
Intersection Signal Delay: 22.2		Intersection LOS: C	
Intersection Capacity Utilization 57.8%		ICU Level of Service B	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 108:

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	19	0	361	0	0	0
Future Volume (vph)	117	98	361	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.938					
Flt Protected				0.950		
Satd. Flow (prot)	1747	0	0	1770	0	0
Flt Permitted				0.950		
Satd. Flow (perm)	1747	0	0	1770	0	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1082			1015	590	
Travel Time (s)	24.6			23.1	13.4	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	127	107	392	0	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	234	0	0	392	0	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.0%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	19
Future Volume (vph)	196	0	0	0	0	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1611	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1611	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	839			634	538	
Travel Time (s)	19.1			14.4	12.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	213	0	0	0	0	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	213	0	0	0	21	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Sign Control	Free			Free	Stop	

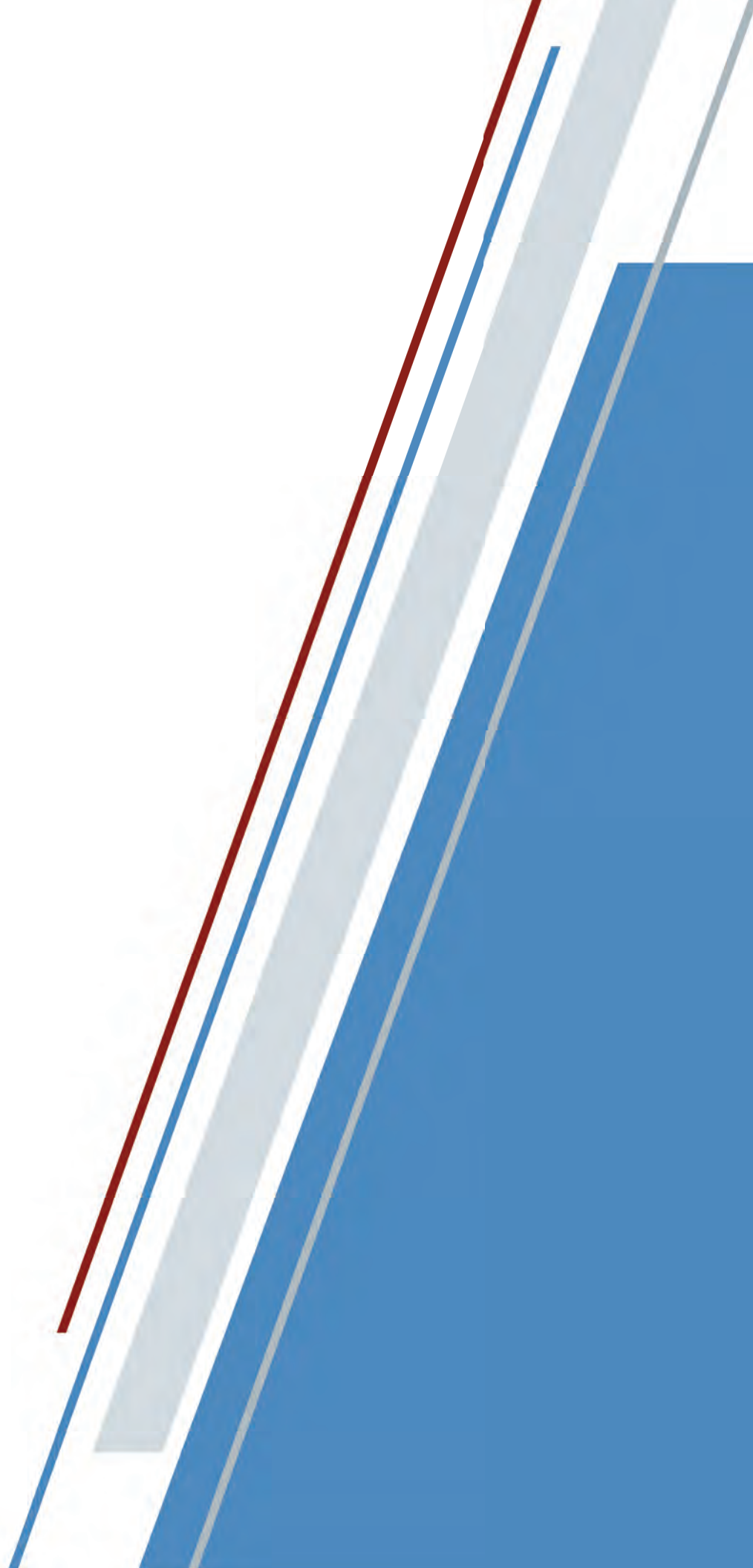
Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	0	0	0
Future Volume (vph)	0	0	0	0	196	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1863	0	1770	1863
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1863	0	1770	1863
Link Speed (mph)		30	30		30	
Link Distance (ft)		98	839		286	
Travel Time (s)		2.2	19.1		6.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	213	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	0	213	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		36	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Stop		Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

HDR
TEHAMA
HDR Tehama JV
1600 Genessee St
Ste 754

Kansas City, MO 64102-1064



THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX I – NOISE STUDY

HDR
A JOINT VENTURE
TEHAMA

Final

Noise Technical Report

Fort Belvoir North Area (FBNA) Distribution Center

Springfield, Virginia

Contract No. W912DR-20-D-0010
Task Order W912DR22F0048

September 1, 2022

US Army Corps
of Engineers
Baltimore District

This page intentionally left blank.

Contents

Tables

Figures

This page intentionally left blank.

1 Introduction

Fort Belvoir proposes to construct and operate a new Distribution Center at the Fort Belvoir North Area (FBNA) in Springfield, Virginia. FBNA currently hosts the National Geospatial-Intelligence Agency (NGA) headquarters and associated support facilities. The Proposed Action would construct a high bay warehouse, a two-story administrative building, a truck maintenance/refueling building, covered/enclosed storage buildings, an entry control facility, and enhanced site security measures.

HDR performed a noise analysis for the Proposed Action and the No Action Alternative. This report details the affected noise environment and the evaluation of environmental consequences related to noise.

1.1 Noise Concepts

Noise is generally defined as unwanted sound. Noise may be continuous, intermittent, or impulsive. An impulsive sound (or impulse sound) generally lasts for no more than one second, such as sound from firearms, pile drivers, or blasting. Human response to noise varies depending on the type of the noise, distance from the noise source, sensitivity, and time of day.

The decibel (dB) is a unit of measurement for noise levels and uses a logarithmic scale. To better match the sensitivity of the human ear, noise levels are typically A-weighted (dBA) to deemphasize low-frequency and very high-frequency sound. For low-frequency sounds such as artillery fire, noise levels are often C-weighted (dBC) to evaluate the presence of low-frequency sound. Table 1-1 contains average sound levels for some common noise sources.

Table 1-1. Common Sources of Noise

Sound Source	Average Sound Level (dB)
Soft whisper	30
Refrigerator hum	40
Normal conversation, air conditioner	60
Washing machine, dishwasher	70
City traffic (inside the car), gas-powered lawnmowers, and leaf blowers	80 – 85
Motorcycle	95

Source: Centers for Disease Control and Prevention (CDC), 2019

Because of the logarithmic scale, noise levels cannot be simply added or subtracted. If sound energy is doubled, the noise level only increases by 3 dB. However, a doubling of sound energy is not perceived by humans as a doubling of loudness. A 3-dB change is generally perceived as a just noticeable difference, a 5-dB change is generally perceived as a clearly noticeable difference, and a 10-dB change is generally perceived as twice as loud or half as loud.

Environmental noise levels are often expressed over a specified period. The equivalent-average sound level (LEQ) represents an average sound level in decibels of a given event or period of time (typically one hour). The day-night average sound level (DNL) represents a 24-hour LEQ with a 10-dBA penalty applied to nighttime hours. Daytime is defined as 7:00 a.m. to 10:00 p.m., and nighttime as 10:00 p.m. to 7:00 a.m.

2 Affected Environment

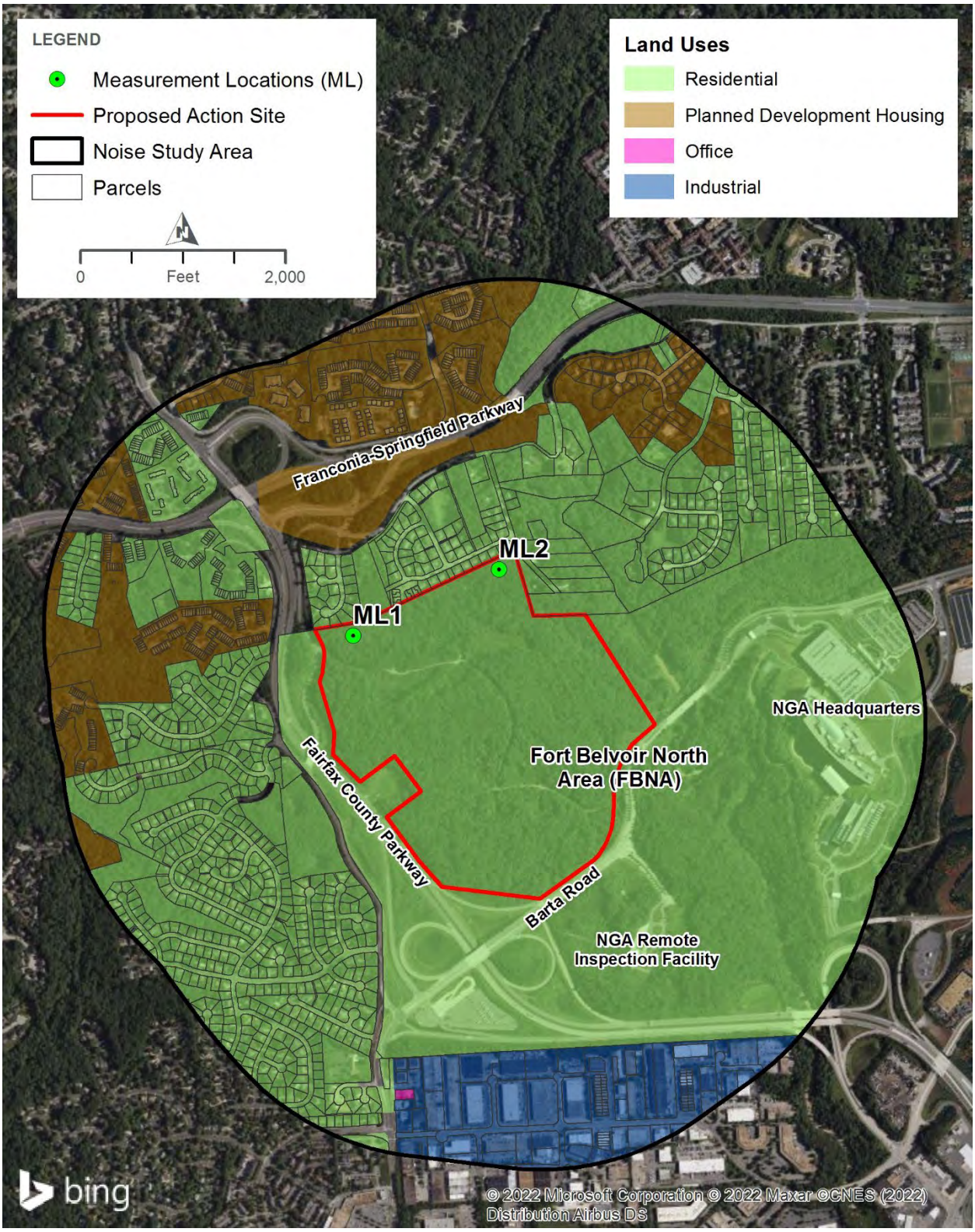
HDR evaluated the affected environment by defining a noise study area, reviewing applicable noise regulations, and documenting existing noise levels for the Proposed Action Site.

2.1 Noise Study Area

Figure 2-1, below, shows the Proposed Action Site, the noise study area, and the land uses within that area. The noise study area is defined as the area within one half mile of the Proposed Action Site. The nearest noise-sensitive receptors (NSR) to the Proposed Action Site include residences to the north and to the west, outside the FBNA property boundary. NSRs within the FBNA boundary include the existing NGA headquarters, located east of the Proposed Action Site, and the existing NGA remote inspection facility, located to the south.

The Proposed Action Site is separated from areas to the west by Fairfax County Parkway and areas to the south by Barta Road. The major thoroughfare of Interstate-95 (I-95) is located approximately 1.25 miles to the east of the Proposed Action Site. Currently, the major noise source in the project vicinity is vehicular traffic on Fairfax County Parkway, Barta Road, Franconia-Springfield Parkway, and I-95. Davison Army Airfield is located approximately 2.5 miles to the south of the Proposed Action Site.

Figure 2-1. Noise Study Area



Note: Figure uses computer-aided design (CAD) and geographic information system (GIS) data from the U.S. Army Corps of Engineers (USACE) and Fairfax County

2.2 Applicable Noise Regulations

Department of Defense (DoD) Instruction 4715.13 instructs facilities to minimize effects on the environment from military noise (DoD, 2020). The Noise Control Act of 1972 (42 United States Code [USC] §4901, et seq.) directs federal agencies to comply with applicable federal, state, interstate, and local noise control regulations. The applicable local noise control regulation is the Fairfax County noise ordinance (Chapter 108.1), which includes quantitative noise limits that apply at the property boundary of the sound source or at any point within any other property affected by the sound (County of Fairfax, 2021). Table 2-1 summarizes the Fairfax County maximum sound levels, which include limits for continuous sound sources (e.g., an air handling unit) and impulse sound sources (e.g., a firearm).

Table 2-1. Fairfax County Maximum Sound Levels

Use and Zoning District Classification	Time of Day	Maximum Continuous Sound Level (dBA)	Maximum Impulse Sound Level (dBA)
Residential Areas in Residential Districts	7 a.m. to 10 p.m.	60	100
Residential Areas in Residential Districts	10 p.m. to 7 a.m.	55	80
Non-Residential Areas in Residential Districts	All	60	100
Mixed Use Area	7 a.m. to 10 p.m.	65	100
Mixed Use Area	10 p.m. to 7 a.m.	60	80
Commercial Districts	All	65	100
Industrial Districts	7 a.m. to 10 p.m.	72	120
Industrial Districts	10 p.m. to 7 a.m.	65	100

Source: County of Fairfax, 2021 (Chapter 108.1)

Section 108.1-4-1 of the Fairfax County noise ordinance contains some specific prohibitions relevant to the Proposed Action:

- Construction, repair, maintenance, remodeling, demolition, grading, or other improvement of real property is prohibited outdoors between the hours of 9:00 p.m. and 7:00 a.m. from Sunday through Thursday and between the hours of 9:00 p.m. and 9:00 a.m. on Fridays, Saturdays, and the day before a federal holiday.
- Loading or unloading trucks outdoors within 100 yards of a residential dwelling is prohibited between the hours of 9:00 p.m. and 6:00 a.m.

Section 108.1-5-1 of the Fairfax County noise ordinance contains some specific exceptions relevant to the Proposed Action:

- Emergency work is exempt from the provisions of Chapter 108.1.
- Motor vehicles on road right-of-way are exempt from the provisions of Chapter 108.1.
- Construction, repair, maintenance, remodeling, demolition, grading, or other improvement of real property is exempt from the provisions of Chapter 108.1 except that such activity shall not generate noise levels exceeding 90 dBA in residential

areas and shall not begin before 9:00 a.m. on Saturdays, Sundays, and federal holidays.

- Back-up generators are exempt from the provisions of Chapter 108.1 during power outages from storms or other emergencies. Routine testing and maintenance of back-up generators are exempt from the provisions of Chapter 108.1 between the hours of 7:00 a.m. and 9:00 p.m., and are prohibited from occurring at other hours. Additionally, the duration of routine testing and maintenance events shall not exceed two consecutive or non-consecutive hours in any one day.

Section 14-4 of Army Regulation 200-1 defines noise zones for the determination of compatible land use (U.S. Army, 2007). The DNL is the primary metric for military zones, and is typically assessed and averaged over a period of 250 days for Active Army Installations and 104 days for Army Reserve and National Guard Installations. Single event noise metrics are used for small arms and large caliber weapons noise. The metric PK 15(met) is the peak noise level expected to be exceeded by 15 percent of all events that might occur, and does not include a frequency weighting. Table 2-2 defines the noise zones and their associated noise levels.

Table 2-2. Noise Limits for Noise Zones

Noise Zone	DNL Limit for Aviation Sources (dBA)	DNL Limit for Impulsive Sources (dBC)	PK 15(met) Limit for Small Arms (dB)
LUPZ (Land Use Planning Zone)	60 – 65	57 – 62	N/A
I	< 65	< 62	< 87
II	65 – 75	62 – 70	87 – 104
III	> 75	> 70	> 104

Source: U.S. Army, 2007

2.3 Existing Noise Levels

The nearest airfields are Davison Army Airfield, located approximately 2.5 miles to the south of the Proposed Action Site; Ronald Reagan Washington National Airport, located approximately 10.5 miles to the northeast; and Dulles International Airport, located approximately 16.5 miles to the northwest. The noise associated with airfields is generally reported to the public with maps showing the areas anticipated to experience aircraft overflight noise levels of 65 dBA DNL or more. The Proposed Action Site falls outside of these 65 dBA DNL areas for the nearest airfields; therefore, aircraft-related noise is anticipated to be less than 65 dBA DNL and existing noise levels are anticipated to be driven by other sources.

HDR measured outdoor noise levels from March 8 to 11, 2022, at two locations on the north end of the Proposed Action Site to document existing noise conditions. Measurement Location (ML) 1 is in the northwest corner of the Proposed Action Site and is representative of residential NSRs north of the site that are closer to Fairfax County Parkway (see Figure 2-1). ML2 is in the northeast corner of the Proposed Action Site and is representative of residential NSRs north of the site that are further from Fairfax County Parkway. HDR followed measurement guidelines from the American National

Standards Institute (ANSI) and the Acoustical Society of America (ASA) standard S1.13, "Measurement of Sound Pressure Levels in Air" (ANSI/ASA, 2010). HDR used Type 1 digital sound level meters and a Type 1 handheld calibrator to perform the measurements. The microphones were protected using wind screens and were positioned away from reflecting surfaces.

Table 2-3 summarizes the existing noise levels at ML1 and ML2.

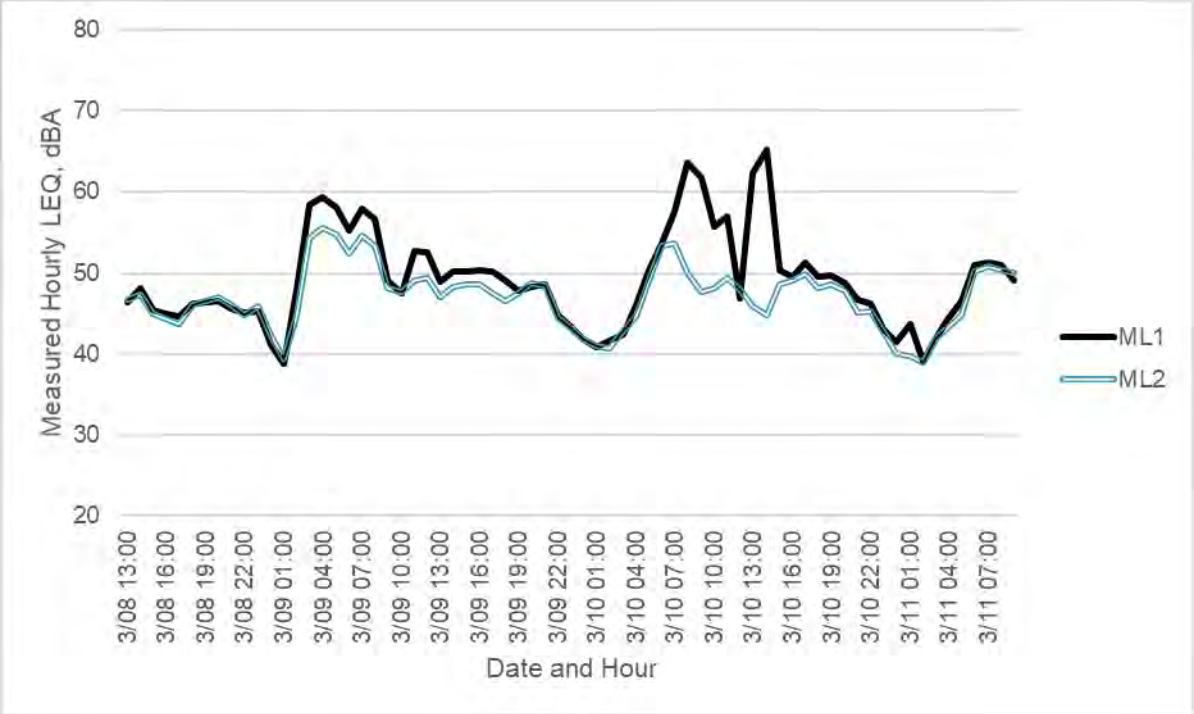
Table 2-3. Noise Measurement Results

Measurement Location	Measured Overall Equivalent-Average Sound Level (LEQ) (dBA)	Range of Measured Hourly LEQ at Daytime (dBA)	Range of Measured hourly LEQ at Night (dBA)	Measured Overall DNL (dBA)
ML1	54	45 - 65	39 - 59	58
ML2	49	44 - 55	39 - 56	55

ML1 was generally louder than ML2, which is to be expected for the location closer to Fairfax County Parkway. The measured noise levels during quieter periods were similar between the two locations. With reference to Table 2-2, the site would be classified as Noise Zone I because the measured DNL was below the aviation noise DNL threshold of 65 dBA at both locations.

Figure 2-2 illustrates the measured hourly LEQ at ML1 and ML2.

Figure 2-2. Measured Hourly Noise Levels



The measured hourly LEQ at ML1 and ML2 were similar for about half of the measurement duration, but there were two periods when noise levels were higher at ML1. Noise levels in residential areas often display a pattern of elevated noise levels during the day when there is more noise from transportation sources, and lower noise

levels at night. This pattern was disrupted between the hours of 3:00 a.m. and 8:00 a.m. on March 9, when noise levels were elevated at both ML1 and ML2. On March 10, noise levels were again elevated at ML1 between the hours of 7:00 a.m. and 2:00 p.m., but the event appears to have been more localized to ML1. The sources of these elevated noise levels on March 9 and March 10 are unclear.

3 Environmental Consequences

HDR evaluated the potential for noise impacts resulting from the Proposed Action and the No Action Alternative.

3.1 Noise Analysis Approach

Impacts on the noise environment from the Proposed Action or No Action Alternative would be considered significant if any of the following were to occur:

- Construction activities during prohibited hours or generating noise levels exceeding the Fairfax County noise limit of 90 dBA in residential areas (see Section 2.2).
- Back-up generator testing in a manner prohibited by Fairfax County (see Section 2.2).
- Typical operations generating noise levels exceeding the Fairfax County limits (see Table 2-1).
- Typical operations exceeding Noise Zone I aviation noise limits of 65 dBA DNL at on-site or off-site NSRs (see Table 2-2).

3.1.1 Noise Analysis Approach for Proposed Action Construction

HDR estimated construction noise levels using source levels and usage factors from the Federal Highway Administration's (FHWA) Highway Construction Noise Handbook (FHWA, 2006). Exact equipment types, quantities, and locations are unknown at this time; therefore, calculated construction noise levels are representative of various activities at set distances. The calculations assumed all equipment associated with an activity would operate at the same location. HDR anticipates construction equipment would be spread throughout the site, so the calculation approach may result in higher noise levels than during peak construction periods. The FHWA Highway Construction Noise Handbook quantifies construction equipment noise emissions using the maximum sound level (LMAX). HDR used the LMAX and usage factors to calculate hourly LEQs for representative activities.

3.1.2 Noise Analysis Approach for Proposed Action Operations

HDR calculated operations noise levels using the 3-D environmental noise software Computer Aided Noise Abatement (CadnaA), with calculation methods from the International Organization for Standardization (ISO) 9613-2, "Acoustics – Attenuation of Sound during Propagation Outdoors" (ISO, 1996). The model accounts for mobile and stationary Proposed Action noise sources, terrain (including grading), and existing and proposed buildings. The noise model does not include noise from existing sources.

The Fairfax County noise ordinance exempts motor vehicles on right-of-way; therefore, modeled noise levels represent on-site mobile noise sources. The automobile and truck noise emissions were based on FHWA Traffic Noise Model (TNM) calculation methods in CadnaA. HDR used projected peak hour traffic volumes to estimate noise from automobile and truck movements around the site. Table 3-1 summarizes the projected inbound and outbound traffic volumes for the Proposed Action.

Table 3-1. Projected Traffic Volumes for Proposed Action

Period	Inbound Traffic Volume	Outbound Traffic Volume
Peak AM Hour	540 [a]	22 [b]
Peak PM Hour	20 [c]	540 [a]

Source: HDR-Tehama JV, 2022

[a] Assumed 18 of these vehicles would be heavy trucks.

[b] Assumed 4 of these vehicles would be heavy trucks.

[c] Assumed 2 of these vehicles would be heavy trucks.

HDR modeled on-site automobile and truck noise based on the following assumptions.

- Peak PM hour volumes were modeled throughout the daytime hours (7:00 a.m. to 10:00 p.m.).
- Peak AM hour volumes divided by nine were modeled throughout the nighttime hours (10:00 p.m. to 7:00 a.m.). Assumed peak AM hour commuters may arrive before 7:00 a.m., but other overnight vehicle movements would be minimal.
- Half of the heavy trucks would travel to and from the north side of the Distribution Center and half of the heavy trucks would travel to and from the south side of the Distribution Center.
- Automobile movements were distributed throughout the site largely based on the number of parking stalls at each parking area.
- Automobiles and trucks would move around the site at a speed of 15 miles per hour.

HDR modeled on-site stationary noise from electric forklifts, rooftop units, transformers, and a diesel fire pump. Electric forklifts are a mobile source, but HDR assumed they would operate within defined areas on the north and south sides of the Distribution Center. HDR assumed the location, quantity, and noise emissions for all stationary noise sources. Table 3-2 summarizes the modeled sound power levels.

Table 3-2. Modeled Stationary Source Sound Power Levels

Stationary Source	Lw at 63 Hz (dBL)	Lw at 125 Hz (dBL)	Lw at 250 Hz (dBL)	Lw at 500 Hz (dBL)	Lw at 1000 Hz (dBL)	Lw at 2000 Hz (dBL)	Lw at 4000 Hz (dBL)	Lw at 8000 Hz (dBL)
Electric Forklift (Qty 3) [a]	122	117	114	112	112	108	102	97
Rooftop Unit (Qty 3) [b]	97	96	97	96	94	90	86	81
Transformer (Qty 2) [c]	99	101	96	96	90	85	80	73
Diesel Fire Pump (Qty 1) [c]	103	101	100	99	98	97	96	92

[a] Octave band sound power levels derived from British Standard (BS) 5228-1:2009 (British Standards Institution [BSI], 2009)

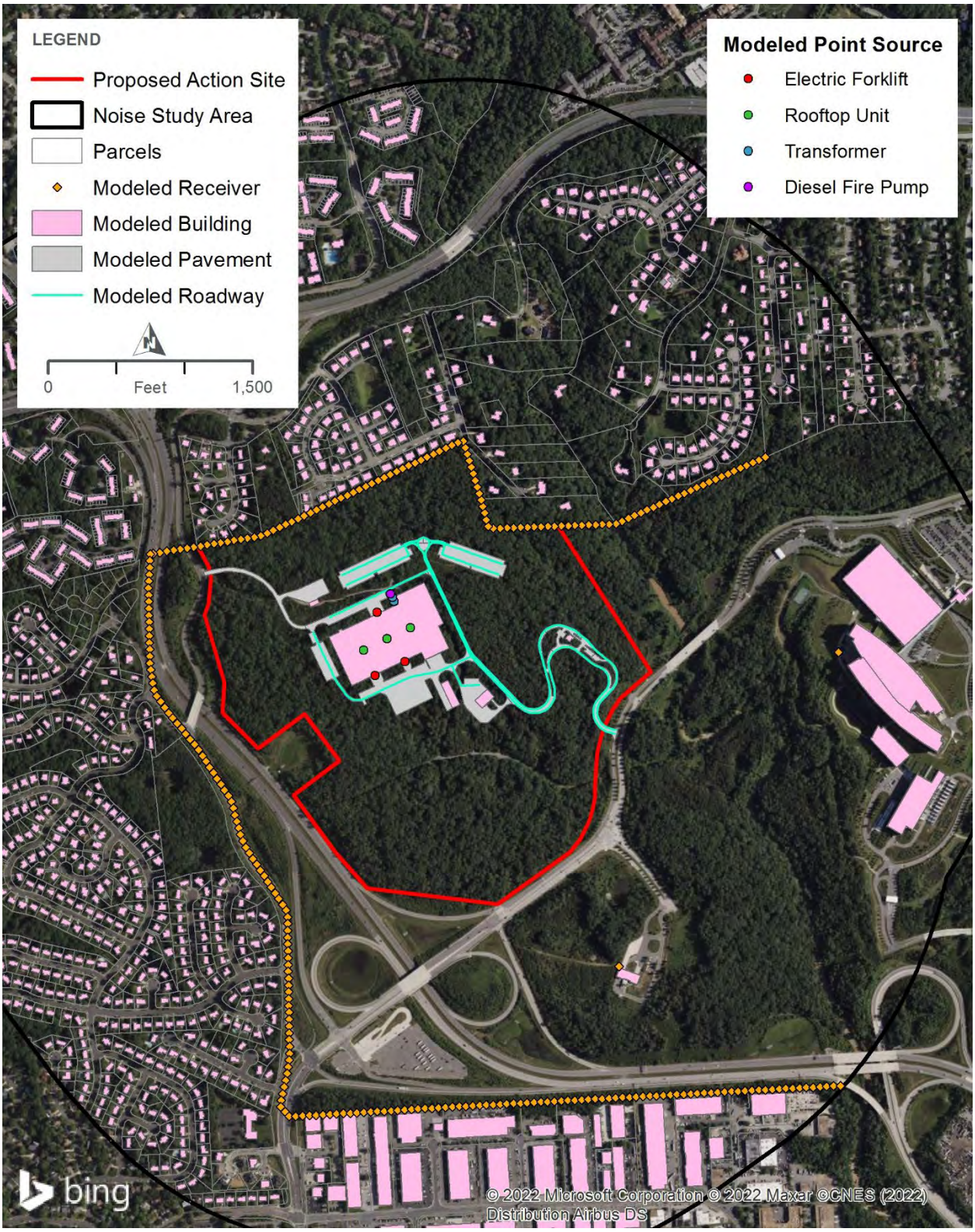
[b] Octave band sound power levels derived from typical submittals

[c] Octave band sound power levels derived from "Electric Power Plant Environmental Noise Guide" (Edison Electric Institute, 1984)

HDR assumed the electric forklifts would operate at all daytime hours, and the rooftop units, transformers, and diesel fire pump would operate at all hours of the day. HDR assumed the stated quantities of each source would operate simultaneously. The Proposed Action would also include two generators. The Fairfax County noise ordinance includes exemptions for back-up generators, so HDR excluded them from the noise model.

Figure 3-1 shows the noise model features.

Figure 3-1. Noise Model Features



Note: Figure uses CAD and GIS data from USACE and Fairfax County

Table 3-3 summarizes the modeled heights for the stationary noise sources and existing and proposed buildings.

Table 3-3. Modeled Heights

Stationary Source / Building	Modeled Height (feet)
Electric Forklift	3.3
Rooftop Unit (height relative to Distribution Center / Administrative Building roof)	9.9
Transformer	6.6
Diesel Fire Pump	3.3
Distribution Center / Administrative Building	48
Support Buildings	15
Gate House	10
Existing FBNA NGA Headquarters	91
Existing FBNA NGA Support Building & Parking Structure	39
Existing FBNA NGA Central Plant & Visitor Center & Remote Inspection Facility	15
Existing Off-site Buildings	15

Table 3-4 summarizes the noise model parameters.

Table 3-4. Model Parameters

Parameter	Model Approach
Terrain	Proposed Action grading was merged with publicly available terrain data. Model included 5-foot interval contour lines.
Buildings	Model included proposed buildings and existing off-site buildings based on publicly available GIS data.
Ground Factor	The ground was generally modeled as 45% absorptive to account for mostly soft ground. Proposed pavement was modeled as 0% absorptive.
Foliage	No foliage was modeled. While the Proposed Action Site is wooded, the foliage appears to be mostly deciduous. The model represents the condition when the trees have shed their leaves, because this condition would result in higher modeled noise levels than the condition when the trees have their leaves.
Meteorology	Downwind conditions were assumed in all directions – at each modeled receiver. Downwind conditions result in higher modeled noise levels.
Temperature and Relative Humidity	The modeled temperature of 10 degrees Celsius and relative humidity of 70% generally aligned with publicly available annual averages for the Washington, D.C. area.

HDR modeled operations noise levels at specific receiver points, which were placed every 50 feet along the FBNA property boundary. Additional receiver points were placed to represent the NGA headquarters and remote inspection facility.

3.2 Proposed Action Analysis

The Proposed Action would introduce short-term noise sources during construction and long-term noise sources during operations.

3.2.1 Analysis of Proposed Action Construction

Construction under the Proposed Action would result in elevated noise levels due to heavy equipment operation on-site for about 21 months. The noise levels generated at any given time would vary depending on the phase of construction, the specific activities occurring, and the equipment used. The highest construction noise levels would more likely occur during earlier phases of construction due to grading and earthwork activities. Construction activity would generally occur between the hours of 7:00 a.m. and 3:30 p.m., Monday through Friday, which would comply with the construction schedule requirements of the Fairfax County noise ordinance.

Table 3-5 summarizes calculated construction noise levels for representative activities and equipment that may operate on the Proposed Action Site.

Table 3-5. Calculated Construction Noise Levels

Equipment Type	Quantity	Usage Factor [a]	LMAX at 50 feet (dBA) [a]	Hourly LEQ at 50 feet (dBA)	Hourly LEQ at 100 feet (dBA)	Hourly LEQ at 250 feet (dBA)	Hourly LEQ at 500 feet (dBA)
Peak Hour Traffic (6:30 a.m. to 7:30 a.m.)							
Automobile	56	0.25 [b]	55	66	60	52	46
Truck	18	0.25 [b]	84	91	85	77	71
Total for Activity	-	-	-	91	85	77	71
Mobilization							
Excavator	1	0.40	85	81	75	67	61
Dozer	3	0.40	85	86	80	72	66
Skid Steer Loader	2	0.40	80	79	73	65	59
Truck	6	0.25 [b]	84	86	80	72	66
Total for Activity	-	-	-	90	84	76	70
Tree Removal / Grubbing							
Dozer	3	0.40	85	86	80	72	66
Scraper	2	0.40	85	84	78	70	64
Excavator	1	0.40	85	81	75	67	61
Crane	1	0.16	85	77	71	63	57
Truck	6	0.25 [b]	84	86	80	72	66
Total for Activity	-	-	-	91	85	77	71
Earthwork & Site Development							
Dozer	3	0.40	85	86	80	72	66
Grader	2	0.40	85	84	78	70	64
Excavator	1	0.40	85	81	75	67	61
Truck	6	0.25 [b]	84	86	80	72	66
Total for Activity	-	-	-	91	85	77	71
Base Building Construction							
Crane	1	0.16	85	77	71	63	57
Concrete Saw	2	0.20	90	86	80	72	66
Truck	3	0.25 [b]	84	83	77	69	63
Total for Activity	-	-	-	88	82	74	68

[a] LMAX and Usage Factor generally derived from FHWA Highway Construction Noise Handbook (FHWA, 2006)
[b] Assumed max vehicle idling time of 15 minutes per hour (one quarter of the hour)

While the Fairfax County noise ordinance includes an exemption for daytime construction activities, such activities cannot generate noise levels exceeding 90 dBA in residential areas. The calculated construction noise levels in Table 3-5 exceed 90 dBA within 50 feet of some activities. At 100 feet, all calculated construction activity noise levels would be below 90 dBA. The primary site features associated with the Proposed Action are more than 100 feet from the FBNA property boundary. HDR assumes some equipment may operate within 100 feet of the FBNA property boundary, but not a concentration of construction equipment. Therefore, based on the representative construction activities and equipment outlined in Table 3-5, construction noise levels are not anticipated to exceed 90 dBA in residential areas.

Construction of the Proposed Action would result in elevated noise levels throughout the construction phase. The construction schedule would comply with the Fairfax County noise ordinance. The representative calculations of Table 3-5 indicate the resulting noise levels in residential areas would be below 90 dBA. Therefore, construction noise is projected to have a ***less than significant adverse impact***.

3.2.2 Analysis of Proposed Action Operations

Operation of the Proposed Action would introduce new or additional noise sources to the noise study area, including automobiles, trucks, electric forklifts, rooftop units, transformers, a diesel fire pump, and generators. While HDR's modeling approach assumed more consistent traffic volumes, the automobile noise would be highest during the morning and afternoon/evening commuting hours. HDR assumes truck and electric forklift noise would be variable depending on the timing of material deliveries and retrievals. The Distribution Center / administration building is more than 100 yards from the FBNA property boundary, so HDR assumes loading and unloading of trucks would not occur within 100 yards of a residential dwelling per the Fairfax County noise ordinance.

Table 3-6 summarizes the noise model results for typical operations, which excludes the generators.

Table 3-6. Noise Model Results for Typical Operations

Modeled Receiver Group	Highest Modeled Hourly LEQ at Daytime (dBA)	Highest Modeled Hourly LEQ at Night (dBA)	Highest Modeled DNL (dBA)
North FBNA Boundary (residential parcels)	52	43	52
West FBNA Boundary (residential parcels)	55	38	53
South FBNA Boundary (industrial parcels)	47	28	45
FBNA NGA Remote Inspection Facility	50	34	49
FBNA NGA Headquarters	48	35	47

The FBNA boundary results represent the highest modeled noise levels across those receiver points. They are considered representative of the adjacent NSRs. The typical operations noise sources were assumed to operate continuously in calculating hourly

LEQs, so HDR compared the modeled results to the Fairfax County noise limits for continuous sources. All modeled daytime hourly LEQ are below the most stringent Fairfax County daytime limit of 60 dBA, and all modeled nighttime hourly LEQs are below the most stringent nighttime limit of 55 dBA. The modeled daytime and nighttime hourly LEQs are within the range of existing hourly LEQs measured at ML1 and ML2 (see Table 2-3). The modeled DNLs are below the measured DNLs from ML1 and ML2. Therefore, HDR anticipates the site would remain classified as Noise Zone I during operations (see Table 2-2).

HDR assumes the generators would only operate during emergency conditions or for maintenance events. HDR assumes the maintenance events would only occur between the hours of 7:00 a.m. and 9:00 p.m. with a total duration in any one day not to exceed two hours. Under these conditions, the generators would comply with the Fairfax County exemption for generator noise.

Based on the modeled typical operations noise levels and assumed generator maintenance schedule, the operational noise from the Proposed Action is projected to have a ***less than significant adverse impact***.

3.3 No Action Alternative Analysis

Under the No Action Alternative, the Proposed Action would not occur. The Proposed Action Site would remain in its existing condition. The existing noise environment would not change; therefore, the No Action Alternative would have ***no impact*** on the noise environment.

4 Mitigation Measures

While no significant adverse noise impacts are anticipated, HDR recommends best practice mitigation measures for construction and operation under the Proposed Action.

4.1 Mitigation Measures for Construction

Best practices for managing noise during construction include the following:

- Select quietest available construction methods and equipment.
- Include the original equipment manufacturer's muffler or a higher performing muffler on all equipment.
- Maintain and inspect all equipment to allow for quieter operation.
- Use augmented back-up alarms, such as chirps.
- Use neoprene padding on dump truck tailgates.
- Prohibit jake braking or engine compression braking at the Proposed Action Site.
- Utilize noise barriers and enclosures where feasible.

4.2 Mitigation Measures for Operations

Select the quietest available electric forklifts, rooftop units, transformers, diesel fire pump, and generators. Place the generators in enclosures with exhaust mufflers.

5 Acronyms and Abbreviations

ANSI	American National Standards Institute
ASA	Acoustical Society of America
BS	British Standard
BSI	British Standards Institution
CAD	computer-aided design
CadnaA	Computer Aided Noise Abatement
CDC	Centers for Disease Control and Prevention
dB	decibel
dBA	decibel, A-weighted
dBC	decibel, C-weighted
DNL	day-night average sound level
DoD	Department of Defense
FBNA	Fort Belvoir North Area
FHWA	Federal Highway Administration
GIS	geographic information system
I-95	Interstate-95
ISO	International Organization for Standardization
LEQ	equivalent-average sound level
LMAX	maximum sound level
LUPZ	Land Use Planning Zone
ML	measurement location
NGA	National Geospatial-Intelligence Agency
NSR	noise-sensitive receptor
PK 15(met)	peak noise level exceeded by 15 percent of events
TNM	Traffic Noise Model
USC	United States Code
USACE	U.S. Army Corps of Engineers

6 References

American National Standards Institute (ANSI) / Acoustical Society of America (ASA)

2010 S1.13, Measurement of Sound Pressure Levels in Air.

British Standards Institution (BSI)

2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise. BS 5228-1:2009.

Centers for Disease Control and Prevention (CDC)

2019 What Noises Cause Hearing Loss, last reviewed October 7, 2019. https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html

County of Fairfax (Virginia)

2021 Code of Ordinances, Noise Ordinance, Chapter 108.1, effective December 7, 2021.

Department of Defense (DoD)

2020 DoD Instruction 4715.13, DoD Operational Noise Program. Prepared by the Office of the Under Secretary of Defense for Acquisition and Sustainment, January 28, 2020.

Edison Electric Institute

1984 Electric Power Plant Environmental Noise Guide.

Federal Highway Administration (FHWA)

2006 FHWA Highway Construction Noise Handbook. Final Report, August 2006.

HDR-Tehama JV

2022 DRAFT Traffic Impact Study to Support National Environmental Policy Act Documentation for Distribution Center at Fort Belvoir North Area (FBNA).

International Organization for Standardization (ISO)

1996 9613-2, Acoustics — Attenuation of Sound during Propagation Outdoors — Part 2: General Method of Calculation.

U.S. Army

2007 Army Regulation 200-1, Environmental Quality, Environmental Protection and Enhancement. Prepared by the U.S. Department of the Army, effective December 27, 2007.

THIS PAGE INTENTIONALLY LEFT BLANK