U.S. AIR FORCE

Environmental Assessment

Construction and Operation of an Instrumentation Tower at Wallops Island, Virginia

November 2017

In Cooperation with:
National Aeronautics and Space Administration
Naval Air Warfare Center – Aircraft Division
Naval Sea Systems Command

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Cover image: Photo-simulation of the preferred instrumentation tower site on Wallops Island.

FINAL ENVIRONMENTAL ASSESSMENT

PROPOSED
CONSTRUCTION AND OPERATION OF INSTRUMENTATION TOWER ON WALLOPS ISLAND
U.S. Air Force Materiel Center
Wright-Patterson Air Force Base, Ohio

Lead Agency:	U.S. Air Force
Cooperating Agencies:	National Aeronautics and Space Administration Naval Air Warfare Center – Aircraft Division Naval Sea Systems Command
Proposed Action:	Construction and Operation of Instrumentation Tower on Wallops Island
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ABSTRACT

Prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), this Environmental Assessment (EA) evaluates the proposed construction, operation, and maintenance of a 750-foot tall, guyed instrumentation tower by the United States Air Force (USAF) on Wallops Island at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility, Accomack County, Virginia (Proposed Action). The USAF is the lead agency for this EA and NASA, Naval Air Warfare Center – Aircraft Division (NAWCAD), and Naval Sea Systems Command (NAVSEA) are cooperating agencies.

This EA analyzes impacts on the environment of three alternatives in support of construction and operation of an instrumentation tower on Wallops Island. Under the Proposed Action Alternative, the USAF would build the proposed tower on a site near Building X-015. Under Alternative 1, the USAF would build the proposed tower on a site near Building X-079. The No Action Alternative, under which the proposed tower would not be built and existing conditions on Wallops Island would continue, is also analyzed in the EA to provide a baseline against which impacts potentially resulting from the action alternatives can be compared. The Proposed Action Alternative is the USAF's Preferred Alternative. Detailed discussions of impacts on physical, biological, and social resources potentially resulting from each of the alternatives are presented in the EA.

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Abbreviations and Acronyms

AGL	above ground level
AMSL	above mean sea level
APE	Area of Potential Effects
AST	aboveground storage tank
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DBH	diameter at breast height
DNH	Division of Natural Heritage
DoD	Department of Defense
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EIS	Environmental Impact Statement
EMR	electromagnetic radiation
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FONPA	Finding of No Practicable Alternative
fpm	flashes per minute
GHG	greenhouse gas(es)
GPR	Goddard Procedural Requirement
GPS	global positioning system
HERP	Hazards of Electromagnetic Radiation to Personnel
IBA	Important Bird Area
ICP	Integrated Contingency Plan
IFR	Instrument Flight Rules
IICEP	Interagency and Intergovernmental Coordination for Environmental Planning
MBTA	Migratory Bird Treaty Act of 1918
METAR	Meteorological Terminal Aviation Routine
MMP	Avifauna and Protected Avian Species Mitigation and Monitoring Plan
NA	not applicable
NASA	National Aeronautics and Space Administration
NAVSEA	Naval Sea Systems Command
NAWCAD	Naval Air Warfare Center – Aircraft Division
nb	non-breeding
NEPA	National Environmental Policy Act of 1969

NESDIS	National Environmental Satellite, Data, and Information Service
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl(s)
RDT&E	research, development, test, and evaluation
RF	radio frequency
ROAA	Record of Air Analysis
ROI	region of influence
SCSC	Surface Combat Systems Center
SEED	Stormwater, Erosion, and Environmental Development
SHPO	State Historic Preservation Office(r)
SVOC	semi-volatile organic compound(s)
SWPPP	stormwater pollution prevention plan
TNC	The Nature Conservancy
TPH	total petroleum hydrocarbons
UAS	Unmanned Aerial System(s)
UHF	ultra-high frequency
U.S.	United States
USACE	United States Army Corps of Engineers
USAF	United States Air Force
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
VAC	Virginia Administrative Code
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Island Fisheries
VDHR	Virginia Department of Historic Resources
VHF	very high frequency
VLR	Virginia Landmarks Registry
VOC	volatile organic compound(s)
WFF	Wallops Flight Facility
WHSRN	Western Hemisphere Shorebird Reserve Network

1 PURPOSE AND NEED

1.1 INTRODUCTION

The United States Air Force (USAF) has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969 (NEPA) to analyze impacts on the environment potentially resulting from the proposed construction, operation, and maintenance of a 750-foot tall, guyed instrumentation tower on Wallops Island at the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's Wallops Flight Facility (WFF) in Accomack County, Virginia (Proposed Action). The location of WFF is shown on **Figure 1-1**. The proposed tower would be used to conduct testing in collaboration with other Department of Defense (DoD) services and government agencies and would have a service life of at least 20 years. As the federal landowner, NASA would authorize the construction and operation of the proposed tower on its property. The USAF, NASA, the United States (U.S.) Navy's Naval Air Warfare Center – Aircraft Division (NAWCAD), and Naval Sea Systems Command (NAVSEA) would install, operate, and maintain equipment on the proposed tower. This EA has been prepared following the most stringent policies and procedures from each agency's regulations in order to legally satisfy USAF, NASA, and U.S. Navy NEPA obligations.

1.2 LOCATION AND SETTING

WFF is located in Accomack County, Virginia along the Atlantic coastline at the northern end of Virginia's Eastern Shore. Encompassing approximately 6,530 acres, WFF consists of three distinct land areas in close proximity to each other: Main Base, Mainland, and Wallops Island (**Figure 1-1**). WFF is owned and operated by NASA and hosts a number of mission partners including NAVSEA's Navy Surface Combat Systems Center (SCSC) (WFF's largest mission partner), the United States Coast Guard, and the National Oceanic and Atmospheric Administration (NOAA) (NASA 2016a).

Comprising approximately 2,200 acres, Wallops Island is approximately seven miles long and 0.5 mile wide. Most development on the island is concentrated in its central portion (hereafter referred to as "mid-Wallops Island"). Such development primarily consists of rocket launch pads and associated gantries and assembly buildings, and U.S. Navy facilities. Vehicular access to the island from Mainland is provided by Causeway Road, which connects to Wallops Island at its approximate midpoint.

The U.S. Navy's Virginia Capes Range Complex is adjacent to Wallops Island and consists of surface and subsurface areas as well as restricted airspace used for training activities by the Navy and other branches of the DoD. The shore boundary of the complex follows the Atlantic shoreline from Delaware to North Carolina, while the seaward boundary extends 155 nautical miles over the Atlantic Ocean. The Navy has authority to restrict access by non-military vessels and aircraft to all or portions of the Virginia Capes Range Complex when conducting training activities. In addition, restricted airspace managed by NASA overlies all of Wallops Island, Mainland, and the Main Base (NASA 2016b).

1.3 PURPOSE OF THE PROPOSED ACTION

The purpose of the Proposed Action is to enhance current operating DoD research, development, test, and evaluation (RDT&E) support capabilities for Unmanned Aerial Systems (UAS) and extended communication coverage in the mid-Atlantic operating area, allowing for refined communications infrastructure. The increased operations of UAS have led the DoD to identify requirements to effectively support off shore UAS testing. Current systems are limited in providing airspace management, flight test control and range safety functions, and spectrum management (collectively referred to as "integrated capabilities").

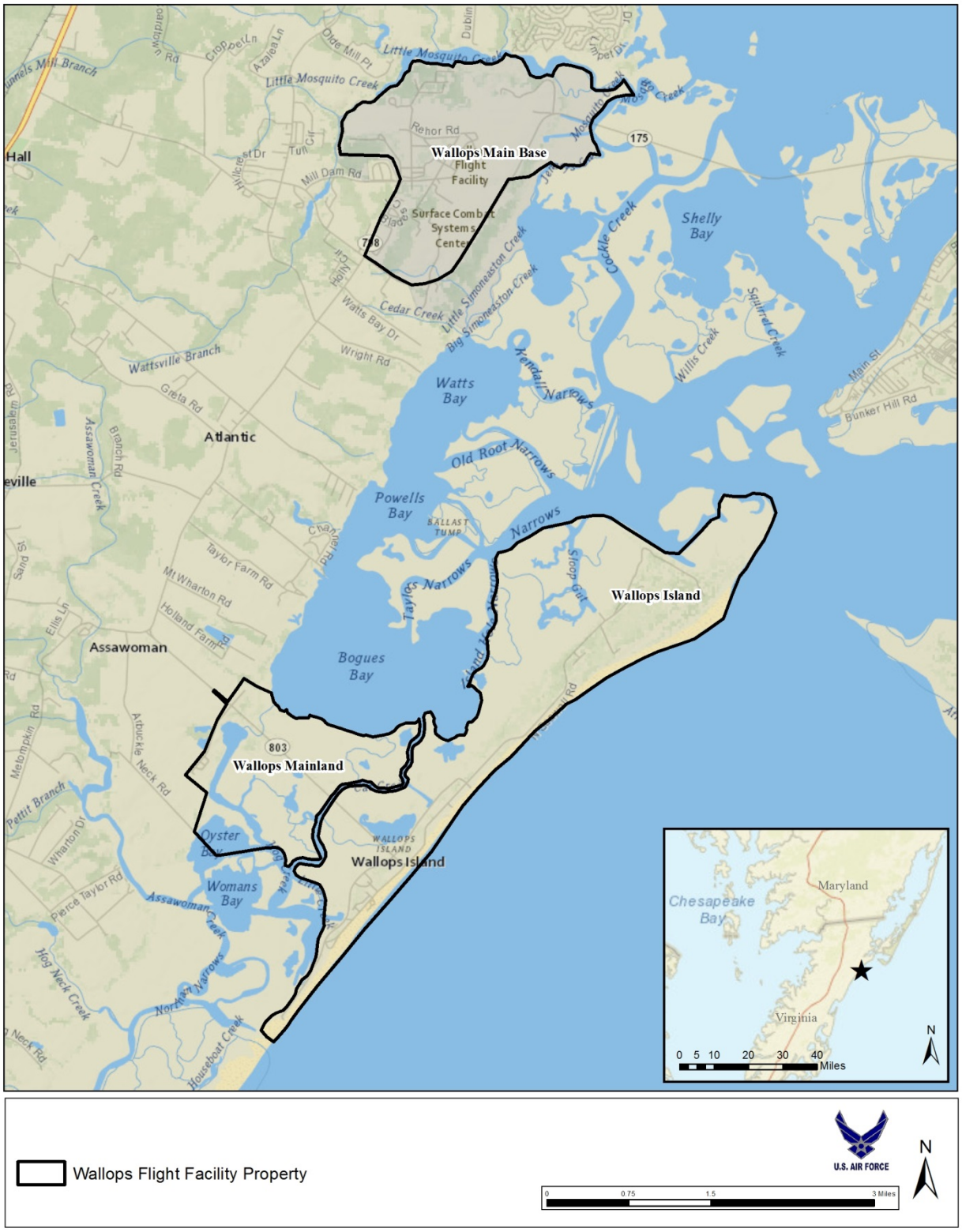

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Figure 1-1: Location of Wallops Flight Facility

1.4 NEED FOR THE PROPOSED ACTION

To support complex integrated capabilities, the USAF has identified the need to develop a larger RDT&E test footprint in the Virginia Capes Range Complex. These new integrated capabilities would minimize the usage of costly airborne and surface instrumentation systems currently in use and provide the communication coverage necessary to safely conduct testing and gather data on new and evolving systems being developed. Existing equipment is not sufficient to meet the new mission requirements. Through preliminary analysis of testing and technology requirements, the USAF has determined that stationary instrumentation with an elevation of 750 feet located in a coastal setting would provide the extended communication coverage necessary to fulfill RDT&E mission requirements.

Instrumentation mounted at a lower elevation and located at an inland area would not provide sufficient coverage and thus, would fail to meet the USAF's need. Mounting instrumentation at heights between 100 and 200 feet AGL would result in a coverage range between 17 and 23 miles, respectively, for an offshore surface target of about 6 feet in height. In contrast, mounting instrumentation as proposed on the new tower would result in coverage to approximately 41 miles offshore for a similarly-sized target. Thus, in comparison to a 100-foot tall structure, a tower of the height proposed by the USAF would enable an estimated 20 additional nautical miles of coverage when tracking aircraft at typical flight test altitudes (between 10,000 and 20,000 feet AGL).

Overall, the Proposed Action is needed for the DoD to meet current, emerging, and evolving requirements associated with the RDT&E of UAS, which necessitate more robust communications systems that cover areas that are larger and farther offshore than existing systems. In addition, extending the range of communication coverage would enable UAS to operate farther offshore, thereby minimizing the risk of crashes or other incidents over land and corresponding risks to human safety and personal property.

1.5 COOPERATING AGENCIES

As the federal landowner of WFF, NASA manages the facility in accordance with the National Aeronautics and Space Act (hereafter referred to as the Space Act) (51 United States Code [U.S.C.] §§20101 *et seq*.). Pursuant to Section 20113 of the Space Act, NASA is authorized to enter into agreements with other federal agencies for the use of its real property. Section 20114 of the Space Act directs NASA and the DoD to advise, coordinate, and consult with one another with regard to aerospace matters under each organization's respective jurisdiction. NASA's cooperation with the USAF with respect to the Proposed Action is consistent with this statutory authority and direction. Additionally, NASA would install, operate, and maintain meteorological instrumentation on the proposed tower. NASA, therefore, is serving as a cooperating agency during the preparation of this EA.

Under the Proposed Action, NAWCAD and NAVSEA would install, operate, and maintain equipment on the proposed tower to enhance and support their capabilities at both WFF and offshore areas within which they conduct their test operations; thus, NAWCAD and NAVSEA are also serving as cooperating agencies during the preparation of this EA.

A cooperating agency is any federal agency having legal jurisdiction by law and/or special expertise with respect to any environmental issues and/or effects potentially resulting from the action (40 Code of Federal Regulations [CFR] § 1501.6). As the federal landowner, NASA meets both of these criteria. NAWCAD and NAVSEA also have special expertise concerning local mission requirements, as well as the nature of equipment that would be placed on the tower. As federal agencies, NASA and the U.S. Navy each have their own NEPA policies and procedures with which they must comply (14 CFR Subpart 1216.3 and 32 CFR §775, respectively). As such, this EA has been prepared following the most stringent policies and procedures from each agency's regulations in order to legally satisfy USAF, NASA, and U.S. Navy NEPA obligations.

1.6 SCOPING

The USAF initially solicited scoping comments on the Proposed Action from local governments, federal and state agencies, and non-governmental organizations in February 2016. Following the continued refinement of alternatives, conceptual design, and other project details, a second scoping period was conducted in March 2017. During both scoping periods, predominant themes of the responses received consisted of the following:

- Prepare an environmental impact statement (EIS) for the Proposed Action, rather than an EA;
- Locate the tower in a less-ecologically sensitive area;
- Build and operate a non-guyed tower 500 feet or less in height; build and operate multiple non-guyed towers 200 feet or less in height; and/or place proposed equipment on existing towers;
- Minimize lighting on the proposed tower to the extent feasible; and
- Address interference potentially resulting from the proposed tower with other communication systems in the vicinity of Wallops Island.

In addition, regulatory agencies generally identified aspects of either the Proposed Action or potentially impacted resources within or outside a particular agency's jurisdiction and/or applicable procedures or requirements to which the construction and operation of the proposed tower must adhere.

As part of scoping, the USAF informed the public and appropriate agencies the Proposed Action would occur within floodplain and wetland areas as required by Executive Order (EO) 11988, *Floodplain Management* and EO 11990, *Protection of Wetlands*. Comments received during the 2016 and 2017 scoping periods have been considered by the USAF, and are addressed accordingly in the analysis presented in this Final EA.

1.7 DISTRIBUTION AND REVIEW OF THE DRAFT EA

The USAF directly notified 79 federal, state, and local agencies, organizations, and members of the general public of the availability of the Draft EA for review during the 30-day public review period. A list of the names and organizations of those who were notified is included in **Section 6**. A Notice of Availability (NOA) announcing the availability of the Draft EA for public review was published in the *Eastern Shore Post* on July 7, the *Eastern Shore News* on July 8, and the *Chincoteague Beacon* on July 13, 2017. Copies of the published NOA, including Affidavits of Publication, are included in **Appendix A**.

Copies of the Draft EA were made available for review at the Chincoteague Island Library, Chincoteague; Eastern Shore Public Library, Accomac; and the Wallops Flight Facility Visitors Center on Virginia Route 175 throughout the 30-day public review period.

In addition, the Draft EA was presented at NASA WFF's recurring monthly public meeting held on Wednesday, July 19, 2017 to discuss upcoming and ongoing projects occurring at WFF (copies of the meeting materials are included in **Appendix A**).

Printed copies of the Draft EA were available by request from the Air Force Materiel Center, and an electronic copy in Adobe® .pdf format was available for download on the NASA WFF website at https://sites.wff.nasa.gov/code250/Instrumentation_Tower_DEA.html. Physical and e-mail addresses of government points-of-contact were provided for the submission of written comments by the public.

The USAF received a combined total of seven letters and emails with written comments on the Draft EA during the public review period. The USAF received correspondence from the following agencies, organizations, and individuals:

- Virginia Department of Health, Office of Drinking Water
- Virginia Marine Resources Commission
- United States Environmental Protection Agency (EPA)
- The Nature Conservancy (TNC)

- NOAA, National Environmental Satellite, Data, and Information Service (NESDIS)
- Private Citizens (two separate emails with seven total signatories).

Comments on the Draft EA received during the 30-day public review period were reviewed by the USAF, U.S. Navy, and NASA and are addressed accordingly in the analysis presented in this Final EA. **Table A-1** in **Appendix A** summarizes the comments received during the 30-day public review period, provides the USAF's response to each comment, and indicates if the EA was revised in response to a particular comment. Copies of the correspondence received during the 30-day Draft EA public review period are included in **Appendix A**.

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2 PROPOSED ACTION AND ALTERNATIVES

This section provides a detailed description of the Proposed Action and alternatives that would meet the USAF's purpose and need as discussed in **Section 1.3** and **Section 1.4**, respectively. In accordance with 40 CFR §1502.14, this section also describes the No Action Alternative and discusses alternatives considered but not carried forward for detailed analysis in the EA.

2.1 SELECTION CRITERIA FOR ALTERNATIVE SITES

Based on the purpose and need, the USAF proposes the use of the Virginia Capes Range Complex to enhance its currently operating RDT&E support capabilities for UAS and extended communication coverage in the Mid-Atlantic operating area. The Proposed Action would increase capabilities and minimize the limitations of technology currently in use, thereby fulfilling mission requirements in terms of effectiveness, area of coverage, and technology.

The USAF developed criteria in the early stages of project planning to guide the identification and selection of alternative sites on which to build and operate the proposed tower. To be considered a reasonable alternative, the location for the proposed instrumentation tower must meet the following criteria:

1) Within 10 nautical miles of the Atlantic coast in the region of southern Maryland or northern Virginia, with sites closer to the coast preferred;
2) On a guarded military or other government-owned facility to meet security requirements;
3) On a site that provides vehicular access and is served by existing electrical and communications infrastructure, and does not require substantial site preparation and/or additional infrastructure investment;
4) In an open area that accommodates the approximately 590-foot radius of the required guy wire footprint (i.e., approximately 25 acres, at minimum);
5) Outside of an established or proposed aircraft flight corridor, thereby enabling the construction of a 750-foot tower; and
6) Result in no or manageable impacts on uses and activities adjacent to or near the tower site.

2.1.1 SITING

2.1.1.1. Macro-Scale (Regional) Siting

No naturally occurring elevation meeting the USAF's security and operational requirements occurs in the region where the enhanced communication coverage described in **Section 1.3** and **Section 1.4** is needed. Thus, options involving the operation of the necessary systems on topography providing the required elevation were rejected by the USAF from further consideration.

In addition to WFF, the USAF considered a range of potential sites including locations in Laurel, Delaware; Ocean City, Maryland; Salisbury, Maryland; Westover, Maryland; Chincoteague Island, Virginia; and Accomac, Virginia. An investigation of sites in each of these areas showed that locations in these areas would not provide the required open area with existing electrical and communications infrastructure or would have required significant site preparation to bring the site to a condition that would allow installation of the proposed equipment.

Ultimately, sites at WFF were the only sites that met the selection criteria in **Section 2.1**, and were carried forward by the USAF for further analysis.

2.1.1.2. Micro-Scale (Site-Specific) Siting

Based on the presence of existing development and operations, as well as the six selection criteria listed above, 16 sites were initially identified as possible alternative locations within WFF. Those sites are shown on **Figure 2-1**. One of the sites was located on Mainland and the remainder were located on Wallops Island. The USAF, in coordination with NASA and NAVSEA SCSC, reviewed each site for compatibility with mission operations, range safety, constructability, and natural resources. Based on this analysis, the Mainland site and 13 of the potential Wallops Island sites were rejected from further consideration for the following reasons:

- The Mainland site and three sites on north Wallops Island encroach upon approach surfaces associated with the airfield on Main Base.
- Implementation of the Proposed Action on two potential sites on mid-Wallops Island would encroach on existing launch pads near the sites and render them unusable for future NASA missions.
- Implementation of the Proposed Action at any of four other potential sites on mid-Wallops Island would generate interference with existing SCSC radar systems near the sites.
- Implementation of the Proposed Action on two mid-Wallops Island sites would create safety concerns with respect to icing of the proposed tower and/or its associated guy wires potentially occurring during winter months, and the presence of main access roads under one or more guy wire footprints. In addition, the presence of the proposed tower in either of these locations would adversely impact WFF's operations and mission by precluding the release of mission-critical NASA weather balloons from a neighboring facility.
- Implementation of the Proposed Action at either of two sites just southwest of those ultimately selected for analysis in this EA would adversely impact the operations of NASA radar systems.
- A potential site on south Wallops Island, while possibly compatible with WFF's missions, would be susceptible to storm damage and has limited upland area on which to site the proposed tower.

Figure 2-1 includes a summary of the rationale for why each site was considered unreasonable by the USAF and eliminated from further consideration in the EA.

2.1.1.3. Identification of the Alternative Sites

Based on the site selection and alternatives review process discussed above, the USAF identified two alternative sites located on mid-Wallops Island for further analysis in this EA. The USAF has determined that these two sites best meet the selection criteria and would fulfill the purpose and need for the Proposed Action. The Proposed Action Alternative site is located northwest of Building X-015[1] and the Alternative 1 site is located northwest of Building X-079. The locations of these sites are shown on **Figure 2-2**.

A detailed discussion of the USAF's Proposed Action is presented in **Section 2.2**. Alternatives analyzed in the EA, including the No Action Alternative, are further discussed in **Section 2.3**.

[1] Building X-015 is currently used as the Wallops Island Fire Station and is scheduled to be converted to a storage facility and temporary project/laboratory workspace within the approximate timeframe that the proposed tower would be built. Although it is anticipated that the proposed tower would not generate levels of electromagnetic radiation (EMR) hazardous to human health and safety, Hazards of Electromagnetic Radiation to Personnel (HERP) testing and review would be conducted during the tower's planning and design phase in accordance with established NASA policies to ensure that personnel working in Building X-015 would not be exposed to EMR levels exceeding thresholds for human exposure. The limited and irregular occupancy of Building X-015 following its conversion to storage and temporary project/ laboratory workspace, and its primary future use as a storage facility, would further minimize the exposure of personnel to any potential EMR hazards. The presence of the proposed tower would not impede the current or planned future uses of Building X-015.

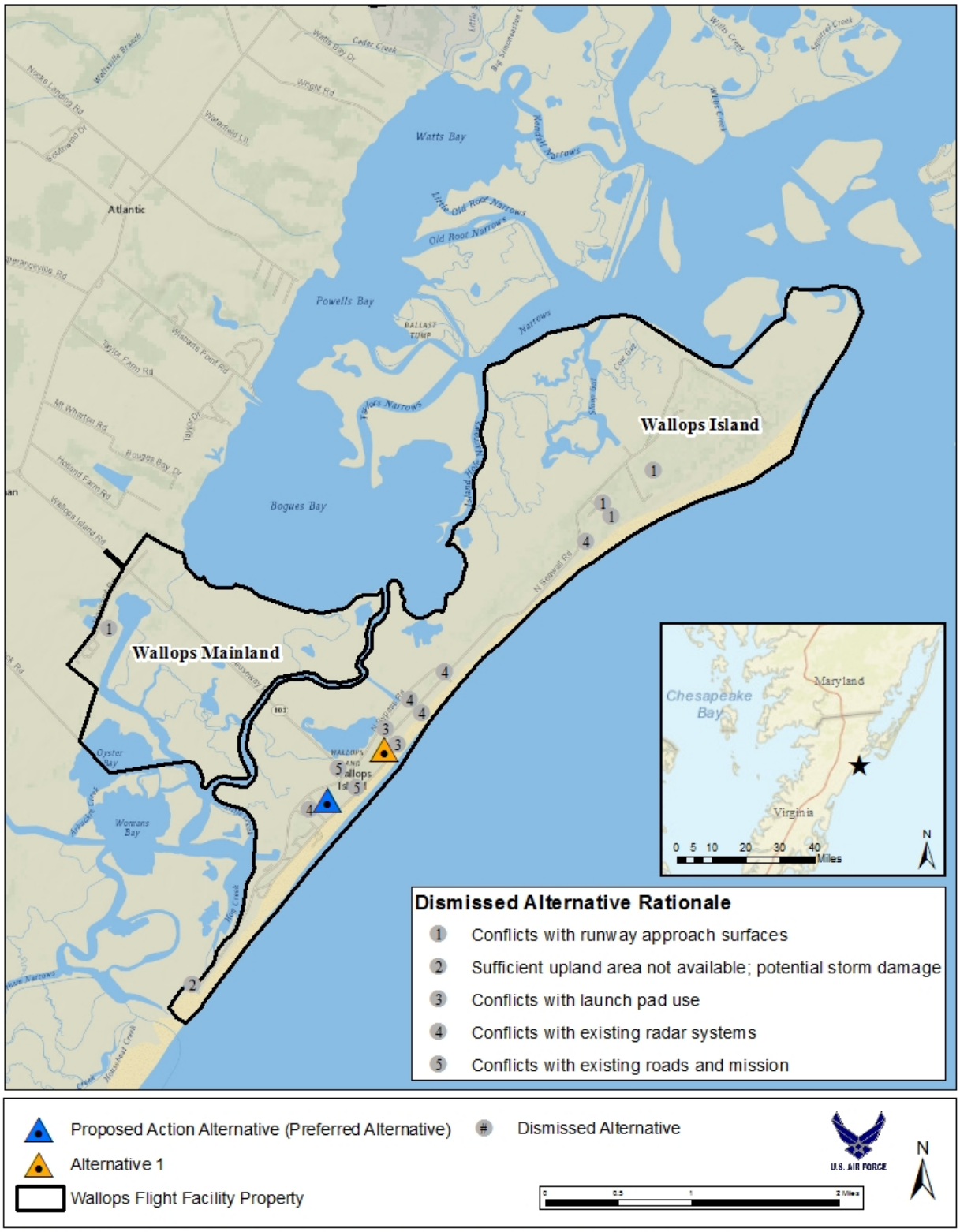

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Figure 2-1: Locations of Wallops Island Alternative Sites Evaluated by the USAF

Sources: Spatial Data courtesy of NASA (2016); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure 2-2: Locations of the Action Alternative Sites

2.1.2 ALTERNATIVES CONSIDERED BUT DISMISSED

In parallel with the site selection process, the USAF evaluated other alternatives for the design, construction, and location of the proposed tower that would potentially meet the purpose and need described in **Section 1.3** and **Section 1.4**, respectively. These alternatives were developed, in part, based on comments received during initial project scoping conducted in February 2016 (see **Section 1.6**) and consisted of the following:

1. **Locate required instrumentation on an existing tower.** As described in **Section 1.3** and **Section 1.4**, the USAF requires stationary instrumentation at an elevation of 750 feet to fulfill its purpose and need for the Proposed Action. The USAF considered placing equipment on an existing tower, which was given a higher priority in selection due to cost and time considerations. However, the USAF determined that there were no existing towers that provided the elevation required (i.e., 750 feet) and met the applicable selection criteria. Consequently, additional consideration of this option was abandoned.
2. **Construct a non-guyed, free-standing tower.** The USAF considered constructing a non-guyed, free-standing, self-supporting tower. However, through its preliminary analysis, the USAF determined that such an alternative would require substantially more robust and invasive construction methods, such as a wider base (approximately 200 feet by 200 feet, at minimum), the use of heavier and stronger structural components, and larger and deeper foundational elements (Bundick, pers. comm., April 12, 2017). Construction of such a tower would also result in a wider visual profile, making it more noticeable from the surrounding landscape, and would generally result in a structure more akin to a permanent facility on Wallops Island, making removal more difficult and less likely to occur in the event the use of the tower is discontinued in the future. For these reasons, this option was dismissed from further consideration.
3. **Locate the proposed tower further inland and/or in a less ecologically sensitive location.** As described in **Section 2.1.1**, the USAF and NASA conducted a site identification and screening process that resulted in the identification of the two mid-Wallops Island sites shown on **Figure 2-2** as the only reasonable alternative locations.
4. **Build a tower less than 500 feet in height.** As described above, the minimum tower height required is 750 feet. The USAF analyzed the elevation requirements to meet the purpose and need reviewing elevations from less the 500 feet to over 1000 feet and determined that a height of approximately 750 feet met the purpose and need described in **Section 1.3** and **Section 1.4**. In response to the initial scoping, as summarized in **Section 1.6**, the USAF completed an additional analysis to determine if a shorter tower could meet the purpose and need, and again concluded that the need was best met at 750 feet and that the environmental impact for structures taller than this was unacceptable. A shorter tower would not provide the appropriate geographic range of coverage under current mission requirements and directives.

2.2 ELEMENTS COMMON TO THE ALTERNATIVES

The Proposed Action analyzed in this EA consists of the associated activities and design, construction, and operational components described below. The USAF, in cooperation with NASA, NAWCAD, and NAVSEA, would implement the Proposed Action at one of the two alternative sites on mid-Wallops Island described in **Section 2.1.1.3** and shown on **Figure 2-2**. General mitigation measures that have been incorporated into the Proposed Action to minimize adverse impacts on wildlife (particularly birds) potentially resulting from the Proposed Action at either alternative site, are discussed in **Section 2.2.1**. **Section 2.2.2** summarizes key activities and requirements regarding the MMP. **Section 2.3** presents a detailed discussion of the alternatives, including the No Action Alternative, analyzed in this EA.

In response to the USAF's request to build and operate the instrumentation tower at WFF, NASA would authorize USAF to construct, operate, and maintain the proposed 750-foot tower on Wallops Island. NASA would specify the terms and conditions under which the tower must be built and operated at WFF. NAWCAD and NAVSEA would place equipment on the tower in coordination with, and as authorized by, the USAF and NASA.

authorized by, the USAF and NASA.

The proposed tower would be 750 feet tall and would be a three-sided lattice structure built of galvanized steel, 42 inches wide on each side. Guy wires would be required along the tower's vertical height to provide structural support and would tie into nine anchor points on the ground. The tower would require 12 steel guy wires on each of three sides, installed along radii extending horizontally out from the tower at angles of 120 degrees from each other and anchored in three groups. The three outermost anchor points would be located approximately 590 feet from the tower base, three intermediate anchor point will be located approximately 530 feet from the tower base, and the three innermost anchor points would be approximately 430 feet from the tower base (all measurements indicate horizontal distances). The tower base would consist of a square concrete slab measuring approximately 12 feet on each side, for a total surface area of approximately 144 square feet (0.003 acre). The proposed nine anchor points for the guy wires would consist either of concrete pier installations up to 7 feet in diameter and 65 feet deep (totaling approximately 346 square feet, or 0.008 acre) or helical piles, which consist of one to three bearing plates attached to a central shaft and installed by rotation, similar to a screw. A conceptual rendering of the proposed tower as it would appear on the Proposed Action Alternative site is shown on **Figure 2-3**.

The proposed tower would support, at appropriate elevations, a variety of equipment including ultra-high frequency (UHF)/very high frequency (VHF) radios, telemetry dishes, global positioning system (GPS) antennas, spectrum-monitoring antennas, a flight termination system, and meteorological instrumentation.

The design, construction, installation, and operation of the proposed tower and its associated instrumentation would be coordinated by the WFF Test Director and Spectrum Manager, who are responsible for the operational control of the radio frequency (RF) spectrum at WFF. Further, the proposed tower and its associated instrumentation would be operated and managed in accordance with the frequency utilization and management policies and procedures applicable to all range user activities at WFF as set forth in the *Wallops Flight Facility Frequency Utilization Management Handbook* (NASA 2004). Adherence to these requirements would ensure that the operation of the proposed tower would not generate interference with instrumentation operated by other agencies (e.g., U.S. Navy, NOAA).

Illumination of the proposed tower would be limited to the minimum amount required by Federal Aviation Administration (FAA) Aviation Circular (AC) 70/7460-1L for a type G3 tower (700- to 1,050-foot structure with appurtenance less than 40 feet). These requirements are illustrated on **Figure 2-4** and explained in additional detail in **Section 2.2.1**. Lighting on ground-level support structures and equipment would be down-shielded and motion-activated to minimize impacts on wildlife.

All structural components of the tower would be pile-supported, as necessitated by underlying geologic conditions (i.e., silty material beneath a thin layer of sand). Concrete piles would be driven or cast in place. Piles would be installed to a depth of at least 65 feet (USTS 2015). As necessary, one or more gravel-topped roads would be built from an existing nearby paved road or parking lot to the base of the tower to provide access for service personnel, vehicles, and equipment.

Two prefabricated structures measuring approximately 10 feet by 20 feet would be installed near the base of the tower to house equipment associated with the tower's operation and maintenance. Utility services required for the operation of the proposed tower, including electricity and broadband network communication, would be provided by existing infrastructure adjacent to each of the alternative sites. A 30-kilowatt propane-fueled generator and associated 500-gallon above-ground fuel tank would be installed near the prefabricated structures to provide electricity in the event of power outages.

Sources: Spatial Data courtesy of NASA (2016); Esri (2016); Google (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure 2-3: Conceptual Rendering of the Proposed Tower on the Proposed Action Alternative (Preferred Alternative) Site

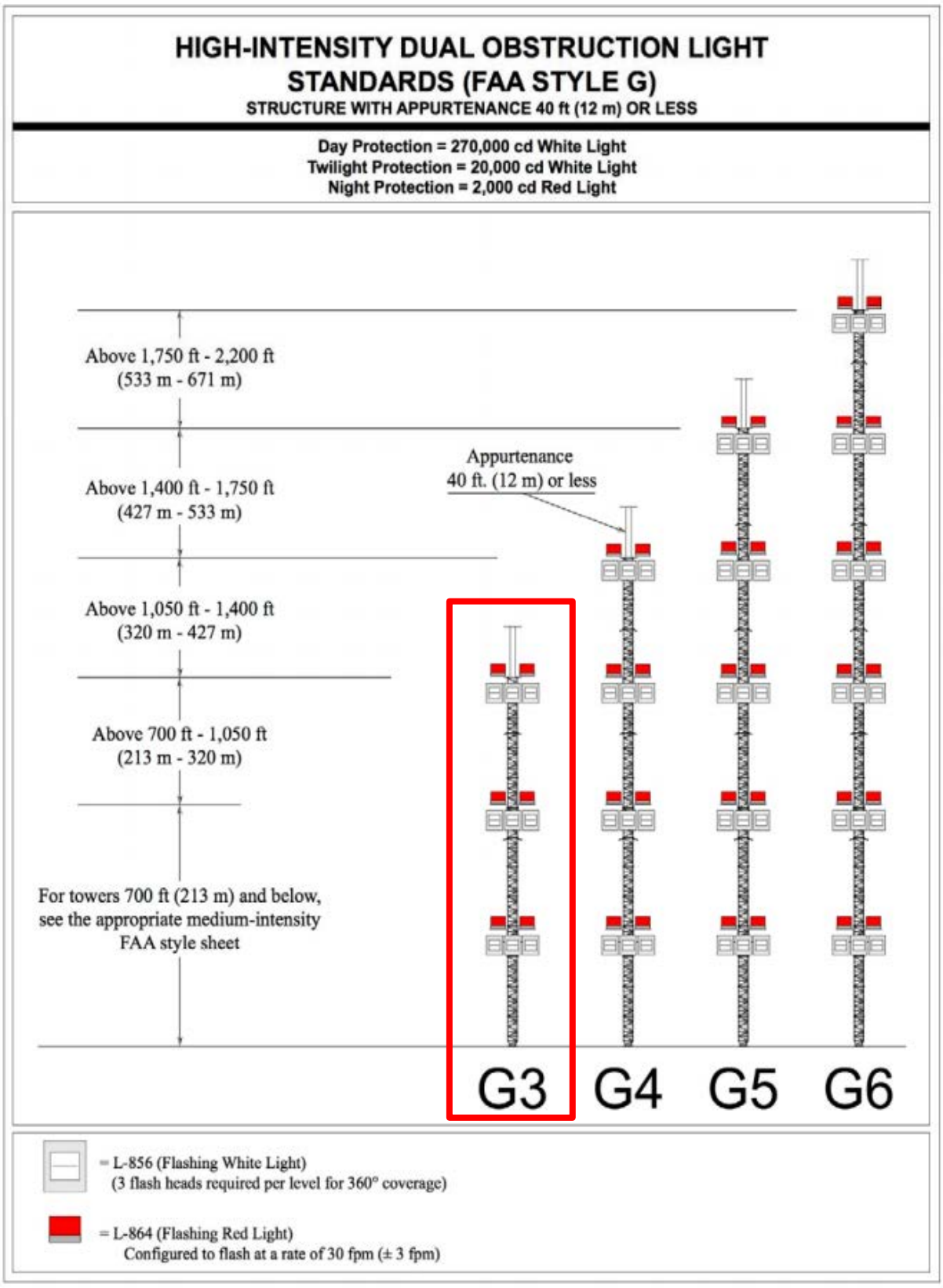


Figure 2-4: FAA Lighting Configurations

To mitigate potential flooding during storm events, the prefabricated structures and all equipment associated with the proposed tower would be installed on one or more elevated platforms at least 11 feet above mean sea level (AMSL) in accordance with established WFF management policies for facilities and critical infrastructure on Wallops Island[2]. In addition, these structures would be built in accordance with established design and engineering practices for facilities in a coastal setting that could potentially experience high winds and occasional storm-induced flooding (see additional discussion of the potential effects of climate change-induced sea level rise in **Table 3-1**, *Air Quality, Greenhouse Gases (GHG), and Climate Change*).

Construction of the proposed tower would occur over a period of approximately 18 months. Erection of the tower itself is anticipated to require approximately three months, while other activities (e.g., pile driving, installation and testing of electronics) would occupy the majority of the construction period. Routine maintenance of the tower would include tensioning the guy wires, replacing electronics, and trimming vegetation underneath the guy wires. Periodic top-dressing of the gravel access roads could also be necessary.

For the purposes of this EA, it is assumed that the tower would operate for an approximately 20-year period beginning in 2019. Prior to the end of this 20-year operational period, the USAF would reevaluate the need for the tower. When it is determined that the tower is no longer needed, the tower and associated equipment would be dismantled, recycled, and/or disposed of in accordance with applicable requirements at that time.

2.2.1 DESIGN FEATURES TO MITIGATE AVIAN IMPACTS

The USAF recognizes that the implementation of the Proposed Action has the potential to adversely impact species of migratory and resident birds occurring at and in the vicinity of Wallops Island. Substantial numbers of birds are present at and in the vicinity of Wallops Island throughout the year due to the island's coastal location, the presence of available habitat, and its proximity to the Atlantic Flyway (a major migratory bird corridor along the U.S. Atlantic coast). The presence of the proposed instrumentation tower and its associated guy wires would present a collision risk to birds flying in the vicinity of Wallops Island.

Therefore, the USAF has incorporated multiple measures into the Proposed Action to minimize impacts on common species of birds. These measures are primarily based on United States Fish and Wildlife Service (USFWS) guidance dated August 2016, titled *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning* (USFWS 2016a). The August 2016 USFWS guidance presents multiple measures to be considered and used, when feasible, in the siting, design, and construction of communication towers to minimize impacts on birds. A copy of this guidance is included in **Appendix C**.

Measures included in the USFWS guidance that were incorporated into the Proposed Action, and summaries of how the USAF would adhere to those measures, are presented below. Note that the numbering of items presented below corresponds to the numbering of the August 2016 USFWS guidance. Some of the guidelines were not incorporated into the Proposed Action because they would result in the project failing to meet the purpose and need as detailed in **Section 1.3** and **Section 1.4**; thus, those guidelines are omitted in the discussion below.

The USAF has prepared an Avifauna and Protected Species Mitigation and Monitoring Plan (MMP) to guide the implementation of the mitigation measures presented below and corresponding monitoring procedures. The MMP is summarized in **Section 2.2.2**.

[2] The requirement for the finished floor elevation and/or critical infrastructure on Wallops Island to be built at 11 feet AMSL was derived from measured water levels at Wallops Island during a January 1992 storm, which had an estimated storm surge in excess of 6 feet. In addition, the base flood level for the proposed project site (Zone AE) is 8 feet AMSL; accordingly, the finished floor level of facilities and critical infrastructure on Wallops Island are required to be built at least one foot above that level (Bundick, pers. comm., August 22, 2017).

Tower Siting and Construction

1. Collocation. Co-locate communications equipment on existing communication towers or other structures. This recommendation is intended to reduce the number of towers across the landscape.

USAF compliance: *While the Proposed Action would result in the construction of a new tower, it would enable the co-location of equipment by multiple users, thereby minimizing the number of new towers that would potentially need to be built otherwise.*

2. Coordination with USFWS Field Office. Communicate project plans to nearest USFWS Field Office.

USAF compliance: *NASA WFF and the USFWS Virginia Field Office initially discussed the proposed tower project in October 2014. At that time, USFWS requested the project complete two-years of post-construction avian mortality monitoring. The tower project reengaged with USFWS in January 2017 to confirm that project details had not changed substantially and that the previous determination was still valid. USFWS requested that the project submit a new species determination. Following receipt of the revised submittal, USFWS confirmed the need for two years of post-construction monitoring and provided its concurrence under Section 7 of the Endangered Species Act (ESA) on April 11, 2017* (see **Section 3.2.2.3** for additional discussion).

3. Placement. All new towers should be sited to minimize environmental impacts to the maximum extent practicable.

a. Place new towers within existing "antenna farms" (i.e., clusters of towers) when possible;

b. Select already degraded areas for tower placement;

e. Towers and associated facilities should be designed, sited, and constructed so as to avoid or minimize habitat loss within and adjacent to the tower footprint.

USAF compliance: *The proposed tower would be built in a previously developed area near similar types of vertical structures, including rocket launch gantries, water towers, and communication towers. The proposed tower would be designed and built in such a way to avoid or minimize disturbance of wetlands and loss of habitat within and adjacent to the tower footprint.*

4. Construction. During construction, the following considerations can reduce the risk of take of birds:

a. Schedule all vegetation removal and maintenance (e.g., general landscaping activities, trimming, grubbing) activities outside of the peak bird breeding season to reduce the risk of bird take.

b. When vegetation removal activities cannot avoid the bird breeding season, the following factors should be considered:

i. Surveys should be conducted no more than five days prior to the scheduled activity to ensure recently constructed nests are identified;

ii. Timing and dimensions of the area to be surveyed vary and will depend on the nature of the project, location, and expected level of vegetation disturbance; and

iii. If active nests are identified within or in the vicinity of the project site, avoid the site until nestlings have fledged or the nest fails. If the activity must occur, establish a buffer zone around the nest and no activities will occur within that zone until nestlings have fledged. The buffer should be a distance that does not elicit a flight response by the adult birds.

c. Prevent the introduction of invasive plants during construction to minimize vegetation community degradation by:

i. Use only native and local (when possible) seed stock for all temporary and permanent vegetation establishment; and

ii. Use vehicle wash stations prior to entering sensitive habitat areas to prevent accidental introduction of non-native plants.

USAF compliance: *The USAF would incorporate these factors into the construction of the tower to the greatest extent practicable. The USAF would also adhere to applicable guidelines established by WFF with respect to the disturbance of vegetation potentially providing habitat and wildlife potentially occurring on or in the vicinity of the project site, including protected species. Vegetation management would be prohibited between 15 March and 15 August. Procedures to prevent the introduction of non-native or invasive plants, particularly the common reed* (*Phragmites australis; hereafter referred to as Phragmites), would also be adhered to during construction of the proposed tower, in accordance with the Wallops Island Phragmites Control Plan* (NASA 2014a) (see **Section 3.1.1.3** for additional discussion).

5. Tower Design. Tower design should consider the following attributes:

b. If guy wires are required for tower design:

i. The minimum number of guy wires necessary should be used; and

ii. Guy wired towers that are proposed to be located in known raptor or waterbird concentrations areas, daily movement routes, major daytime migratory bird movement routes, staging areas, or stopover sites should have daytime visual markers or bird flight diverters installed on the guy wires to attempt to prevent daytime collisions.

c. Lights are a primary source of bird aggregation around towers; thus, minimizing all light is recommended.

iii. If taller (i.e., greater than 199 feet above ground level [AGL]) towers requiring lights for aviation safety must be constructed, the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA should be used.

iv. Security lighting for on-ground facilities, equipment, and infrastructure should be motion or heat-sensitive, down-shielded, and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination while still allowing safe nighttime access to the site.

USAF compliance: *The proposed tower would incorporate bird diverters placed every 30 feet along the inner and outer most guys. An example of the type of bird diverters planned for installation on the proposed tower's guy wires is shown in* **Figure 2-5**. *Tower lighting would be minimized to ensure it meets FAA requirements in FAA AC 70/7460-1L for type G3 towers (i.e., a 700- to 1,050-foot structure with a less than 40-foot appurtenance)* (**Figure 2-4**)*, but also remains as bird-friendly as possible. The proposed tower would include nine L-856/L-864 (white/red) LED-type strobes capable of high intensity/medium intensity lighting with variable flash rates in accordance with FAA AC 70/7460-1L (FAA 2015). Intensity and flash rate would auto-adjust based on time of day to meet FAA requirements. Lighting on support facilities associated with the proposed tower would be down-shielded and motion-activated to minimize impacts on wildlife in the vicinity of the proposed tower.*

Figure 2-5: Typical Bird Diverter

Tower Operation and Maintenance

Numbers 1 and 2 of the Tower Operation and Maintenance section of the USFWS guidance are not included below as they apply to existing towers and, therefore, are not relevant to this project. Numbers 3, 4, and 5 are discussed below.

3. Vegetation Management. When management of facility infrastructure is required:

a. Schedule all vegetation removal and maintenance (e.g., general landscaping activities, trimming, grubbing, etc.) activities outside of the peak bird breeding season to reduce the risk of bird take. Breeding seasons can be determined using online tools (e.g., Avian Knowledge Network, USFWS's Information for Planning and Conservation system, Birds of North America Online) or by contacting qualified experts (e.g., local Audubon or birding groups);

b. When vegetation removal activities cannot avoid the bird breeding season, conduct nest clearance surveys:

i. Surveys should be conducted no more than five days prior to the scheduled activity to ensure recently constructed nests are identified;

ii. Timing and dimensions of the area to be surveyed should depend on the nature of the project, location, and expected level of vegetation disturbance; and

iii. If active nests are identified within or in the vicinity of the project site, the site should be avoided until nestlings have fledged or the nest fails. If the activity must occur, a buffer zone should be established around the nest and no activities should occur within that zone until nestlings have fledged. The dimension of the buffer zone depends on the proposed activity, habitat type, and species present. The buffer should be a distance that does not elicit a flight response by the adult birds and can be 0.5 – 1 mile for hawks and eagles.

USAF compliance: *The USAF would incorporate these factors into the operation and maintenance of the tower to the greatest extent practicable. The USAF would also adhere to applicable guidelines established by WFF with respect to the disturbance of wildlife habitat, including that of protected species, occurring on or in the vicinity of the project site. Vegetation management would be prohibited between 15 March and 15 August. Procedures to prevent the introduction of non-native or invasive plants, particularly Phragmites, would also be adhered to during operation and maintenance of the proposed tower, in accordance with the Wallops Island Phragmites Control Plan (NASA 2014a)* (see additional discussion in **Section 3.1.1.3**).

4. Birds Nesting on Towers: If birds are nesting on communication towers that require maintenance activities, contact the state natural resource protection agency and/or the USFWS for permits, recommendations, and requirements. Schedule construction and maintenance activities around the nesting and activity schedule of protected birds. Minimize excess wires and securely attach wires to the tower structure to reduce the likelihood of birds becoming entangled on the tower.

USAF compliance: *The USAF would adhere to applicable federal, state, and NASA requirements in the event that ongoing maintenance activities would potentially disturb birds nesting on the proposed tower. To the greatest extent feasible, the tower would be built and maintained in such a way as to prevent the entanglement of birds in the tower structure or equipment installed on the tower.*

5. Tower Access: Representatives from the USFWS or researchers should be allowed access to the site to evaluate bird use, conduct dead-bird searches, and conduct other research, as necessary.

USAF compliance: *USFWS personnel, researchers, and/or other visitors with a pertinent interest in the interaction of birds or other wildlife with the proposed tower would be admitted to the tower site in accordance with applicable USAF and NASA security and safety requirements.*

Tower Decommissioning

1. Tower Removal. Towers no longer in use, not re-licensed by the Federal Communications Commission

(FCC) for use, or determined to be obsolete should be removed from the site within 12 months of cessation of use, preferably sooner.

USAF compliance: *As noted in **Section 2.2**, the proposed tower would be removed in accordance with applicable requirements following the determination that the tower is no longer needed.*

2.2.2 AVIFAUNA AND PROTECTED AVIAN SPECIES MITIGATION AND MONITORING PLAN

The USAF, in cooperation with NASA and through consultation with the USFWS and Virginia Department of Game and Inland Fisheries (VDGIF), has prepared an MMP to guide the implementation of the mitigation measures discussed in **Section 2.2.1** and monitor the proposed tower to ensure that implemented mitigations do in fact minimize the impact of the tower on avian species (see **Section 2.2.2**). The MMP incorporates the principles of adaptive management to continually evaluate the effectiveness of monitoring and mitigation methods and revise those mitigation methods as determined necessary and feasible based on the monitoring results. Organizations responsible for funding and implementing mitigation measures and a completion date for each measure are also identified in the MMP. Key activities and requirements regarding the MMP are briefly summarized as follows.

In addition to the mitigation measures discussed in **Section 2.2.1**, the MMP includes measures to actively manage *Phragmites* on the alternative site ultimately selected by the USAF for implementation of the Proposed Action (see **Section 2.2.2**). *Phragmites* is a highly opportunistic invasive species that grows in dense stands up to 15 feet tall, obscuring visibility and impeding access in areas where it occurs. As *Phragmites* covers up to 70 percent of the alternative sites, management of the plant would improve the efficiency and accuracy of searchers conducting monitoring activities in accordance with the MMP. Methods to manage *Phragmites* on the site would include a combination of methods consisting of controlled burning, application of herbicides, and mowing; all such methods would strictly adhere to requirements and conditions specified in the *Wallops Island Phragmites Control Plan* (NASA 2014a) as well as applicable federal, state, and local requirements. As noted in **Section 2.2.1**, no vegetation management activities would be conducted on the site between 15 March and 15 August.

Following the completion of construction activities, monitoring of avian fatalities would be conducted within a defined search area around the tower for a minimum period of two years. Searches would be conducted four days per week, year-round. The monitoring program would document the extent of avian mortality such that the effectiveness of the project's mitigations can be assessed.

An initial report of the search findings would be prepared by the search team six months after construction of the proposed tower and annually thereafter for a period of two years. The reports would be submitted to USFWS and VDGIF for review. Following the review of each report, the USAF and NASA, in consultation with USFWS and VDGIF, would determine if triggers for modifying mitigation and monitoring methods should be developed based on the monitoring results.

The Draft MMP was included in an appendix to the Draft EA that was made available for a 30-day public review period (see **Section 1.7**). Following the conclusion of the 30-day public review period, the USAF and NASA conducted additional consultation with the USFWS and VDGIF regarding the MMP and impacts on avifauna and protected avian species potentially resulting from the proposed tower. In emails dated September 14 and September 26, 2017, respectively, the USFWS and VDGIF provided their concurrence with the MMP following this additional consultation (copies of this correspondence are included in **Appendix A**).

Detailed information regarding the mitigation and monitoring measures that would be implemented by the USAF are presented in a copy of the MMP[3] included in **Appendix C** of this EA.

[3] The *Wallops Island Phragmites Control Plan* (NASA 2014a) is included as Attachment 1 to the MMP in **Appendix C**.

2.3 DESCRIPTION OF ALTERNATIVES ANALYZED IN THE EA

2.3.1 PROPOSED ACTION ALTERNATIVE (PREFERRED ALTERNATIVE): BUILDING X-015 SITE

Under the Proposed Action Alternative, the USAF would build, operate, and maintain a 750-foot tall, guyed tower on an approximately 40-acre site northwest of Building X-015 (**Figure 2-2**) following authorization by NASA. As previously noted, Building X-015 is currently used as the Wallops Island Fire Station, but is scheduled to be converted to a storage facility and temporary project/laboratory workspace within the approximate timeframe that the proposed tower would be built. The proposed tower would undergo HERP review prior to construction to ensure that any EM generated by the tower would not exceed human exposure thresholds. The presence of the proposed tower would not impede the current or future uses of Building X-015.

In addition to the construction, operation, and maintenance of the proposed 750-foot tower, the Proposed Action Alternative would include the relocation of an existing NASA telemetry dish to the Mainland or Wallops Island. Relocation of the dish would minimize impacts on the operation of the dish from the proposed tower that would otherwise occur if the dish were not relocated. The telemetry dish, which is approximately 2 feet in diameter, would be installed on existing infrastructure. The installation of the telemetry dish would not require the construction of additional new facilities, nor would it require the expansion of existing facilities.

The USAF has incorporated the locations of known jurisdictional wetlands on and adjacent to the Proposed Action Alternative site into the preliminary design of the proposed tower to minimize or eliminate impacts on wetlands to the extent possible. The presence of wetlands and impacts potentially resulting from the Proposed Action Alternative are discussed in **Section 3.1.1**.

There are no known hazardous materials or hazardous wastes on or underlying the Proposed Action Alternative site that would adversely impact the construction and operation of the proposed tower. Activities have been previously conducted on portions of the site to remediate soil and groundwater that was contaminated by pollutants released from operations that historically occurred on the site. All such remedial actions have been granted regulatory closure by the EPA and/or the Virginia Department of Environmental Quality (VDEQ). The current and historic use and presence of hazardous materials/wastes and impacts on or from them potentially resulting from the Proposed Action Alternative are discussed in **Section 3.1.3**.

The USAF has identified the Proposed Action Alternative as its Preferred Alternative for the following reasons: the site includes a previously cleared and regularly mowed area of sufficient size to accommodate the Proposed Action; implementation would avoid jurisdictional wetlands to the maximum extent possible; construction and operation of the proposed tower would avoid existing and future mission sites and uses; existing underground broadband communications and electrical connections are available nearby; and the site is located farther from the beach and areas where Federal-listed species or their habitat could be present than other alternatives considered on Wallops Island.

2.3.2 ALTERNATIVE 1: BUILDING X-079 SITE

Under Alternative 1, the USAF would build, operate, and maintain a 750-foot tall, guyed tower on an approximately 40-acre site north of Building X-079 following authorization by NASA. The Alternative 1 site is considered by the USAF to be less favorable than the Proposed Action Alternative site for the following reasons: the implementation of the Proposed Action on the Alternative 1 site would require disturbance, to potentially include draining and/or filling, of a jurisdictional wetland on the site; and the operation of the proposed tower on the Alternative 1 site would have minimal but manageable adverse impacts on U.S. Navy operations occurring to the north of the site. Alternative 1 would not require the relocation of the NASA telemetry dish as described for the Preferred Alternative.

If Alternative 1 is selected for implementation, the USAF would acquire all applicable federal, state, and local permits to impact wetlands on the site, and would adhere to the avoidance, compensation, and/or

mitigation requirements specified in such permits. In addition, the USAF would complete a historical review and visual inspection of the Alternative 1 site to characterize the current and/or historical presence and use of hazardous substances on the site.

2.3.3 NO ACTION ALTERNATIVE

Under the No Action Alternative, the USAF would not build, operate, or maintain the proposed 750-foot tall, guyed instrumentation tower on Wallops Island, and NASA would not authorize the USAF for such a tower. Existing conditions at Wallops Island would continue.

2.4 COMPARISON OF ALTERNATIVES

As required by 40 CFR §1501.14, this section compares the potential environmental impacts associated with the alternatives carried forward for detailed analysis in this EA. **Table 2-1** identifies the technical resource areas subject to environmental review[4] as determined by the USAF, and briefly describes the potential effects of the Proposed Action Alternative (Preferred Alternative), Alternative 1, and the No Action Alternative.

Table 2-1: Summary of Environmental Impacts by Alternative

Resource Area	No Action	Proposed Action Alternative (Preferred Alternative): X-015 Site	Alternative 1: X-079 Site
Water Resources	No impacts.	**Wetlands:** negligible short-term and negligible long-term impacts would not exceed more than 1,300 square feet, or approximately 0.03 acre. No or minimal impacts on surface or groundwater hydrology. **Floodplains:** negligible impacts.	Alternative 1 would disturb a larger area of wetlands relative to the Proposed Action Alternative (i.e., approximately 0.3 acre of temporary and 0.06 acre of permanent wetland impacts); however, short-term and long-term impacts on wetlands would remain negligible. No or minimal impacts on surface or groundwater hydrology. Impacts on floodplains would be similar to the Proposed Action Alternative.
Coastal Zone Management	No impacts.	The Proposed Action Alternative would be consistent to the maximum extent practicable with the enforceable policies of Virginia's Coastal Zone Management (CZM) Program. VDEQ provided its concurrence with the USAF's Federal Consistency Determination in a letter dated September 1, 2017.	Similar to the Proposed Action Alternative.
Hazardous Materials and Wastes	No impacts.	Negligible short-term and long-term impacts from the use of hazardous substances and generation of hazardous waste during the construction and operation of the proposed tower. No impacts from former remediation sites that have received regulatory closure underlying the Proposed Action Alternative site.	No hazardous substances are used on the site, and no hazardous wastes are generated or stored on the site. The presence of hazardous substances exceeding regulatory thresholds in soil or groundwater is not known. Impacts from the use of hazardous substances and generation of hazardous waste during the construction and operation of the proposed tower would be similar to those described for the Proposed Action Alternative.
Avifauna (common bird species)	No impacts.	Low to moderate adverse effects on avifauna based on implementation of the measures listed in **Section 2.2.1.**	Impacts would be similar to those described for the Proposed Action Alternative.

[4] Technical resource areas dismissed from further analysis in the Draft EA are summarized in **Table 3-1**.

Resource Area	No Action	Proposed Action Alternative (Preferred Alternative): X-015 Site	Alternative 1: X-079 Site
Special-Status Species	No impacts.	The USFWS concurred with the USAF's determination that the Proposed Action Alternative may affect, but is not likely to adversely affect, special-status species of birds and the federal-threatened northern long-eared bat at Wallops Island. The Proposed Action Alternative would have no potential to affect any other special-status terrestrial or marine species.	Impacts would be similar to those described for the Proposed Action Alternative.
Cultural Resources	No impacts.	No adverse effects on historic properties listed or eligible for listing in the National Register of Historic Places (NRHP). The Virginia Department of Historic Resources (VDHR) concurred with this determination in a letter dated September 8, 2017.	Impacts would be similar to those described for the Proposed Action Alternative.
Visual Quality and Aesthetics	No impacts.	Negligible short-term impacts and minor long-term impacts.	Impacts would be similar to those described for the Proposed Action Alternative.
Cumulative Effects	No impacts.	Would not result in cumulatively significant impacts when considered along with relevant past, present, and reasonably foreseeable future projects at WFF.	Would not result in cumulatively significant impacts when considered along with relevant past, present, and reasonably foreseeable future projects at WFF.

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes existing resources at WFF and effects on those resources that could potentially result from the implementation of the Proposed Action Alternative (Preferred Alternative) or Alternative 1 described in **Section 2.3**. Although it does not meet the USAF's purpose and need for the Proposed Action, impacts potentially resulting from the No Action Alternative are also presented in this section, in accordance with Council on Environmental Quality (CEQ) regulations (40 CFR §1502.14), to provide a baseline against which impacts potentially resulting from the Proposed Action can be compared. Throughout this EA, the terms "effects" and "impacts" are used synonymously to describe conditions that would potentially result from the implementation of the Proposed Action described in **Section 2.2**. Unless otherwise noted, short-term impacts refer to impacts that would result from activities associated with the construction of the proposed instrumentation tower, while long-term impacts are those that would potentially occur during the proposed tower's operational phase.

Table 3-1 summarizes the resources included for analysis in this EA, as well as those that were dismissed from detailed analysis because the Proposed Action would have no or only marginal effects on them.

Table 3-1: Resources Considered for Evaluation in this Environmental Assessment

Resource Area	Analyzed in Detail in this EA?	If *Yes*, EA Section Number If *No*, Rationale for Dismissal
Physical Environment: Section 3.1		
Water Resources	**Yes**	See **Section 3.1.1**.
Coastal Zone Management	**Yes**	See **Section 3.1.2**.
Air Quality, Greenhouse Gases (GHG), and Climate Change	No	Accomack County, where WFF is located, is attainment for all criteria pollutants regulated by the Clean Air Act. Therefore, a General Conformity Applicability Analysis is not required. Based on USAF requirements, a Record of Air Analysis (ROAA) was completed to determine the potential emissions from construction and operation of the proposed tower. A copy of the ROAA is included in **Appendix B** of this EA. This analysis shows that criteria pollutant and greenhouse gas emissions would be short-term and limited to construction, maintenance, and infrequent, intermittent generator use; negligible impact. EO 13783, *Promoting Energy Independence and Economic Growth* issued on March 28, 2017 indicates that the rules regarding analysis of impacts on or from climate change are likely to change in the near future. Therefore, although CEQ rescinded its *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* dated August 1, 2016, the USAF's analyses use that CEQ guidance as a baseline pending further guidance from Headquarters, Air Force. Thus, the following were considered: (1) The potential effects of the Proposed Action on climate change as indicated by assessing GHG emissions (e.g., to include, where applicable, carbon sequestration); and (2) the effects of climate change on the Proposed Action and its environmental impacts. The USAF concluded in the ROAA that the Proposed Action would generate limited amounts of GHG during construction and operation and would not contribute meaningfully to global climate change. Models developed by NASA's Goddard Institute for Space Studies project sea level at Wallops Island to rise by 2 to 5 inches through the 2020s, 7 to 11 inches through the 2050s, and 12 to 21 inches through the 2080s. Similarly, the U.S. Army Corps of Engineers (USACE) has projected sea level at Wallops Island to rise by 1.91 feet over the next 50 years. While little change is expected in average annual precipitation, heavy rainfall events may be more intense, leading to increased risks of flooding (NASA 2016a). As described in **Section 2.2**, ground-level support equipment associated with the proposed tower would be installed at an elevation of approximately 11 feet AMSL, thereby minimizing or eliminating its potential for inundation by floodwaters. It is unlikely that flooding would affect the tower itself.

Resource Area	Analyzed in Detail in this EA?	If *Yes*, EA Section Number If *No*, Rationale for Dismissal
Agriculture and Prime Farmland	No	Both alternative sites are located on federal property where access is restricted to authorized personnel, and neither of the sites is in active agriculture. None of the soils underlying the sites are designated as prime farmland. Thus, the Proposed Action would have no impact on agriculture or soils designated as prime farmland on or in the vicinity of Wallops Island.
Mineral and Energy Resources	No	No commercial mineral or energy resources are known to underlie the alternative sites and no activities to extract such resources are occurring on the sites. As such, the Proposed Action would have no impact on mineral and energy resources on or in the vicinity of Wallops Island.
Groundwater	No	The Proposed Action would not require new or addition withdrawals of groundwater, nor would it result in new or additional discharges to groundwater. Piles associated with the base of the proposed tower and guy wire anchor points would have the potential to minimally impede the flow of groundwater. However, any such effects would be highly localized, as they would occur in a small area relative to the proposed project site, the majority of which would remain in a permeable condition. Groundwater underlying the proposed project site would be expected to continue to flow in the same direction and at the same rate as under current conditions. Therefore, the Proposed Action would have minimal impacts on groundwater underlying Wallops Island.
Noise	No	Noise generated during the Proposed Action's construction phase would vary in volume, duration, and intensity but would be similar to that generated by other construction and development activities occurring on Wallops Island with relative frequency. Construction activities would primarily occur during normal daytime working hours and would not have the potential to disturb noise sensitive receptors, as no such receptors are located on Wallops Island. Ambient noise at the alternative site selected for implementation of the Proposed Action would return to pre-construction conditions following the completion of construction activities, and the operation of the proposed tower would not create a new, permanent source of noise. For these reasons, the Proposed Action would have negligible short-term impacts and no long-term impacts on noise at and in the vicinity of the alternative sites.
Geology and Soils	No	Because construction of the Proposed Action would disturb more than 10,000 square feet of land, the construction contractor would prepare an erosion and sediment control plan in accordance with the Virginia Erosion and Sediment Control Regulations (4 Virginia Administrative Code [VAC] 50-30). Adherence to measures specified in the erosion and sediment control plan would minimize the erosion of exposed soils and the sedimentation of receiving water bodies. The Proposed Action would have minor short-term impacts and no long-term impacts on soils
Hazardous Materials and Waste	**Yes**	See **Section 3.1.3**.
Biological Environment: Section 3.2		
Avifauna (common species of birds)	**Yes**	See **Section 3.2.1**.
Special-Status Species	**Yes**	See **Section 3.2.2**.
Marine Biological Resources	No	The construction and operation of the proposed tower would not involve activities or disturbance below, on, or above the surface of marine waters near the alternative sites. Although energy emitted by the proposed tower would have the potential to penetrate the surface of marine waters near the alternative sites, the operation of the tower would not introduce new emissions or stressors on marine fauna beyond those already occurring at WFF. Lights on the proposed tower and associated structures would have no effects on nesting sea turtles or their hatchlings due to the distance of the tower from the beach and the minimal use of lighting on the tower and the use of down-shielded and/or motion-activated lighting on associated structures. Thus, the Proposed Action would have no impacts on marine biological resources.
Terrestrial Vegetation	No	Vegetation disturbance and removal associated with the construction of the proposed tower as well as periodic maintenance activities during the proposed tower's operational phase would be limited to that necessary to conduct such activities and would affect a relatively small area in the context of the approximately 40-acre site. The alternative sites are previously disturbed, and no particularly pristine, unique, or valuable vegetation is present in the context of other areas in the vicinity of Wallops Island that experience minimal or no human-caused disturbance. Therefore, short-term and long-term impacts on terrestrial vegetation would be negligible.
Social Environment: Section 3.3		
Cultural Resources	**Yes**	See **Section 3.3.1**.

Resource Area	Analyzed in Detail in this EA?	If *Yes*, EA Section Number If *No*, Rationale for Dismissal
Visual Quality and Aesthetics	**Yes**	See **Section 3.3.2**.
Health and Safety	**Yes**	All construction will follow applicable Occupational Safety and Health Administration (OSHA) and NASA safety requirements and would have no or negligible short-term impacts on worker health and safety. The presence of the tower and guy wires could cause occasional increased concerns from ice buildup if placed over an active roadway (as in the Alternative 1 design). Road access would be controlled and guy wires monitored for ice buildup; thus, the presence of guy wires above an active roadway resulting from Alternative 1 would have a negligible long-term impact.
Land Use	No	The Proposed Action would occur entirely within the boundaries of WFF and would be consistent with NASA's land use plan for Wallops Island. The alternative sites are currently undeveloped; construction and operation of the proposed tower would not displace existing uses from either of the alternative sites. Further, the Proposed Action would not impede the continuation of uses occurring adjacent to or near the alternative sites, including Building X-015, currently used as the Wallops Island Fire Station and scheduled to be converted to a storage facility and temporary project/laboratory workspace within the approximate timeframe that the proposed tower would be built. During operation of the proposed tower, Building X-015 would not be occupied by personnel on a regular basis, and would be used primarily as a storage facility. As noted in **Sections 2.1.1.2** and **2.3.1**, the proposed tower would undergo HERP review prior to construction to ensure that any EM generated by the tower would not exceed human exposure thresholds. The presence of the proposed tower would not impede the current or planned future uses of Building X-015. Thus, the Proposed Action would have no short-term or long-term impacts on land use.
Transportation	No	Short-term increases in construction-related traffic traveling to and from either alternative site would vary during the Proposed Action's construction phase but would remain within the capacity of local public roads as well as roads within the boundaries of WFF, as such increases would be similar to those occurring during other construction and development projects of similar scale that occur with relative frequency at WFF. If required during construction, permits for oversize loads would be coordinated with the Virginia Department of Transportation and/or other applicable federal, state, and local regulatory agencies. The operation of the proposed tower would not increase employment at WFF and thus, would not generate additional traffic on local public or WFF roads. Siting of proposed tower has been coordinated with the WFF airfield and the FAA and would not inhibit the continued safe operation of aircraft in the vicinity of Wallops Island. For these reasons, the Proposed Action would have negligible short-term impacts and no long-term impacts on transportation.
Environmental Justice	No	There are no low-income or minority populations on WFF property and the Proposed Action would not affect populations outside the boundaries of WFF. Thus, the Proposed Action would have no short-term or long-term impacts on Environmental Justice populations.
Employment and Income	No	The Proposed Action would have beneficial impacts on employment and income, particularly for workers in or near Accomack County if local contractors are used to design and build the proposed tower; however, any such impacts would be of limited duration and would cease upon the completion of the proposed tower, and would likely be small in the context of economic activity in Accomack County. Long-term maintenance activities would have similarly beneficial impacts through the employment of contractors, but would be of limited duration (i.e., a few hours to a few days) and would occur relatively infrequently throughout the year. Thus, while the Proposed Action would have beneficial short-term and long-term impacts on employment and income, such impacts would remain negligible.
Public Services	No	The implementation of the Proposed Action would have no short-term or long-term impacts on public services, as the construction and operation of the proposed tower would not require the use of such services, and no such services are located on or near the alternative sites.
Utilities and Services	No	The proposed tower would connect to existing utilities located on or near the alternative sites; required utilities (particularly, electricity and communications) are maintained by NASA and have ample capacity to support the operation of the proposed tower. As such, the Proposed Action would have no short-term or long-term impacts on utilities at WFF.
Recreation	No	No recreational facilities are located on or near the alternative sites. Thus, the Proposed Action would have no short-term or long-term impacts on recreation.

In accordance with 40 CFR §1508.20, general mitigation measures would be implemented to avoid, minimize, or compensate for adverse impacts potentially resulting from the Proposed Action. These mitigation measures are presented with the discussion of each resource in this section, as applicable. A

summary of these mitigation measures is also included in **Section 4**.

3.1 PHYSICAL ENVIRONMENT

This section describes the physical resources that could be affected by the alternatives described in **Section 2.3.1** through **Section 2.3.3**. Physical resources discussed in this section include water resources (including wetlands and floodplains), coastal zone management, and hazardous materials and wastes.

3.1.1 WATER RESOURCES

3.1.1.1. Regulatory Context

Section 404 of the Clean Water Act established a permit program to regulate the discharge of fill material into waters of the United States. Managed jointly by the USACE and the EPA, the primary intent of the program is to minimize adverse effects on the aquatic environment. USACE is responsible for day-to-day administration and permit review, while the EPA provides program oversight. EO 11990, *Protection of Wetlands*, also requires analyses of potential impacts on wetlands related to proposed federal actions.

Floodplains are lowland areas located adjacent to bodies of water in which the ordinary high water level fluctuates on an annual basis. Floodplains are frequently discussed in terms of the 100-year flood and 500-year flood. The 100-year flood, or base flood, is a flood having a 1 percent chance of occurring in any given year. The 500-year floodplain designates the area having a 0.2 percent chance of being inundated in any given year.

EO 11988, *Floodplain Management*, requires federal agencies to avoid, to the extent possible, the short-term and long-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development, wherever there is a practicable alternative.

The USAF is required to analyze all practicable alternatives and determine if they would result in impacts on wetlands or floodplains. If there are no practicable alternatives to impacts on wetlands or floodplains a Finding of No Practicable Alternative (FONPA) in accordance with 32 CFR §989.14(g).

3.1.1.2. Affected Environment

More than 2,500 acres of estuarine emergent wetlands occur on Wallops Island. Non-tidal wetlands are located in depressional areas in the island's interior and extensive tidal marsh wetlands occur on its western side along Cat Creek. No tidal wetlands have been identified along the eastern (Atlantic Ocean) side of Wallops Island (NASA 2016a).

The invasive *Phragmites* covers approximately 687 acres throughout Wallops Island. WFF has implemented the *Wallops Island Phragmites Control Plan* (NASA 2014a) to prevent the introduction of the plant's seeds and rhizomes to areas of WFF where it is not currently present. The plan specifies practices and measures that are to be adhered to by WFF employees and contractors as applicable.

Delineations of wetlands conducted on the alternative sites in 2015 identified tidal and predominantly non-tidal wetlands within the boundaries of both sites (NASA 2015b). The USACE issued a preliminary Jurisdictional Determination for the delineated wetlands on July 24, 2015 (USACE 2015). Tidal and non-tidal wetlands on and in the vicinity of the alternative sites are shown on **Figure 3-1** and **Figure 3-2**.

Flood Insurance Rate Maps produced by the Federal Emergency Management Agency (FEMA) indicate that the majority of Wallops Island is located in the 100-year floodplain. The entirety of each alternative site is located in a portion of the 100-year floodplain designated Zone AE, Special Flood Hazard Areas Subject to Inundation by the 1% Annual Chance Flood, Base Flood Elevations Determined (FEMA 2017b).

Access to Wallops Island is controlled and only authorized personnel are allowed on the facility. Therefore, public education regarding flood hazards (e.g., marking flood heights on buildings) is not applicable. However, flood elevations are marked on some Wallops Island facilities to inform NASA personnel and visiting personnel of other agencies. Other flood control measures that are implemented at WFF include locating water-sensitive equipment, supplies, and other associated materials above elevations which have historically experienced flooding (i.e., at or above approximately 11 feet AMSL; see **Section 2.2** for

additional discussion), and securing or moving sensitive equipment outside the floodplain when substantial storms are imminent.

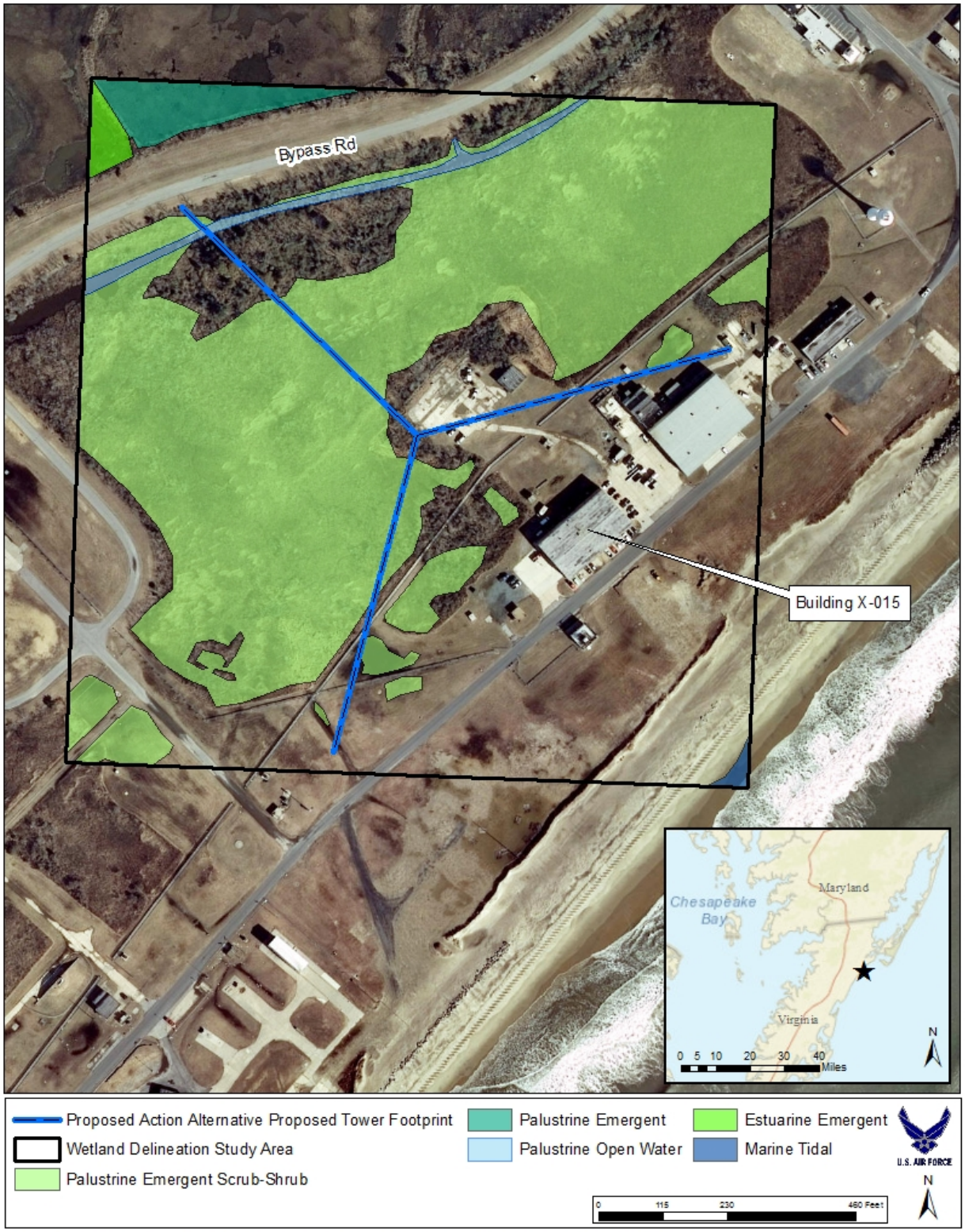
3.1.1.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed instrumentation tower would not be built and existing conditions at WFF would continue. As such, no impacts on water resources would occur.

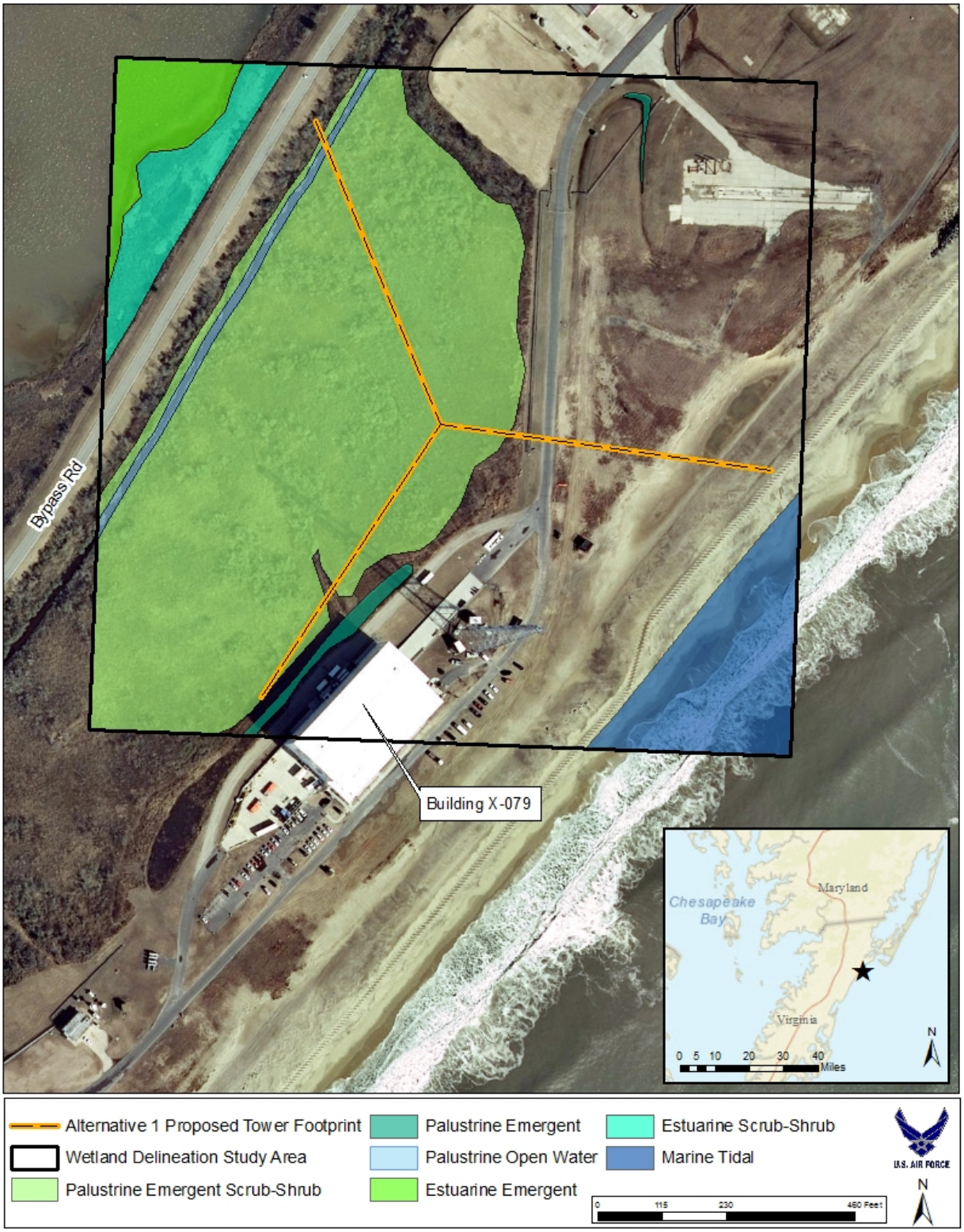
Proposed Action Alternative (Preferred Alternative): Building X-015 Site

The proposed tower has been designed and sited to avoid temporary and permanent impacts on wetlands to the greatest extent possible. As shown on **Figure 3-1**, the tower base and guy wire termini are sited in areas where wetlands are not present. Similarly, the prefabricated buildings, propane tank, and other support structures and equipment associated with the proposed tower would be sited on previously disturbed areas adjacent to the tower base where wetlands are not present.



Sources: Spatial Data courtesy of NASA (2016); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database. VHB (2015); USACE (2015).

Figure 3-1: Wetlands Occurring in the Vicinity of the Proposed Action Alternative (Preferred Alternative) Site



Sources: Spatial Data courtesy of NASA (2016); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database; VHB (2015); USACE (2015).

Figure 3-2: Wetlands Occurring in the Vicinity of the Alternative 1 Site

Two of the three intermediate guy wire anchor points have also been sited outside of wetland areas. However, the construction and permanent presence of the southernmost intermediate anchor point could potentially impact an adjacent area of wetlands. To the extent possible, disturbance of the wetland during the construction of this anchor point would be avoided. The contractor would use silt fences or similar measures to minimize runoff of sediment and pollutants to the wetland. It is estimated that if construction-related disturbance of the wetland were to occur, it would not exceed more than 1,300 square feet, or approximately 0.03 acre.

Construction-related impacts on wetlands, such as that noted above, could result from excavation, pile driving and drilling, and leveling and grading. Such impacts could include disturbance or removal of vegetation, soil compaction, and/or alteration of hydrologic flow patterns. In the event that disturbance of wetlands is required, the USAF would obtain permits from the USACE, VDEQ, and Accomack County Wetland Board to address impacts and mitigation requirements, as applicable. Adherence to avoidance, compensation, and/or mitigation measures specified in applicable federal and/or state permit(s) during and following the project's construction phase would ensure that impacts on wetlands and submerged aquatic resources remain minimal. As the majority of the proposed project site would remain in an undisturbed and permeable condition, the presence of the proposed tower would have no or minimal impacts on surface or groundwater hydrology. Impacts on wetlands on the Proposed Action Alternative site would be minimal in the context of wetlands on and in the vicinity of WFF.

During construction activities, the contractor would implement and adhere to WFF's *Wallops Island Phragmites Control Plan* (NASA 2014a) to both remove *Phragmites* in accordance with the MMP (see **Section 2.2.2** and **Appendix C**) and prevent the introduction of seeds and rhizomes of *Phragmites* to areas of WFF where the plant is not present. Removal methods, which would include a combination of herbicide application, controlled burning, and mowing, would strictly adhere to requirements and conditions set forth in the *Wallops Island Phragmites Control Plan* (NASA 2014a) as well as applicable federal, state, and local requirements. Prevention measures would include the inspection and cleaning of tracked vehicles and equipment to remove any rhizomes and seeds prior to arrival on the project site, conducting earth-disturbing activities where the plant is present on the site near the end of the project, and/or cleaning the equipment prior to use on any other portion of the site where *Phragmites* is not present. Construction vehicles and equipment would be cleaned using hand tools such as brushes, brooms, rakes, or shovels on all track and bucket or blade components to adequately remove all visible dirt and plant debris. If water should be used during the cleaning of vehicles and equipment, the runoff water or slurry would be contained so as to restrict introduction of *Phragmites* rhizomes and seeds into the project site as well as to prevent off-site introduction during debris disposal. Construction vehicle and equipment rinse-out areas would be located in upland areas, and runoff would be contained to minimize or eliminate impacts. Adherence to these measures would minimize short-term and long-term impacts from the introduction of an invasive species on wetlands on and adjacent to the project site as well as elsewhere on or in the vicinity of WFF.

The proposed relocation of the telemetry dish would have no potential to impact wetlands, as it would be installed on existing infrastructure on the Mainland or Wallops Island. Thus, this component of the Proposed Action Alternative would have no short-term or long-term impacts on wetlands.

The proposed tower and its associated guy wires and anchor points would be built entirely within the 100-year floodplain on Wallops Island. As currently designed, the 12-foot square concrete tower base would have an area of 144 square feet and each of the nine concrete guy wire anchor points (assuming concrete pier installations up to 7 feet in diameter) would have an area of 38 square feet, for a total cumulative area of 486 square feet (0.01 acre). While these slabs would prevent the percolation of flood waters into underlying soils, this additional quantity of impermeable surface on the proposed project site would be minimal in the context of permeable area that would remain on and adjacent to the site.

As discussed in **Section 2.1.1**, the only practicable alternative is to build and operate the proposed tower at a site on Wallops Island located in the 100-year floodplain. The USAF and NASA would ensure that the Proposed Action Alternative complies with EO 11988, *Floodplain Management*, and NASA Regulations on Floodplain and Wetland Management at 14 CFR §1216.2 to the maximum extent possible. The Proposed Action Alternative considers the best-available, actionable data and methods that integrate current and future flooding predictions based on science**.** Neither of the alternative sites are likely to experience permanent inundation from rising sea level during the 20-year service life of the proposed tower. Because the Proposed Action Alternative would involve federally funded and authorized construction in the 100-year floodplain, this EA also serves as the USAF's and NASA's means for facilitating public review as required by EO 11988 and 32 CFR §989.24.

The approximate footprint of the prefabricated structures and propane tank associated with the proposed tower would total approximately 229 square feet. However, as described in **Section 2.2**, supporting equipment associated with the proposed tower would be elevated to at least 11 feet AMSL to mitigate the potential for flooding during storm events. The functionality of the floodplain on Wallops Island, provided both by the wetlands on the island and the area of the island itself, would not be substantially reduced because the footprint of the proposed tower and its anchor points would be relatively small and thus, would displace small quantities of water. The installation of the telemetry dish would have no impact on floodplains, as it would be installed on existing infrastructure. Therefore, impacts on floodplains resulting from the implementation of the Proposed Action Alternative would be negligible.

The USAF has prepared a FONPA in accordance with 32 CFR §989.14(g) to address impacts on wetlands and floodplains potentially resulting from the implementation of the Proposed Action Alternative.

Alternative 1: Building X-079 Site

Alternative 1 would disturb a larger area of wetlands than the Proposed Action Alternative. The installation of the tower base, prefabricated structures and propane tank, a gravel access road to the tower base, and at least three guy wire anchor points under Alternative 1 would occur within jurisdictional wetlands, as shown on **Figure 3-2**. The types of disturbance to wetlands would be similar to that described for the Proposed Action Alternative. It is estimated that the construction of these components, as well as temporary gravel-surfaced roads to provide access for construction vehicles, equipment, and personnel, would collectively disturb a minimum of approximately 0.3 acre of wetlands. Of this disturbance, permanent impacts on wetlands resulting from the presence of three anchor points, the prefabricated structures, the propane tank, and a permanent access road to the tower base would total an estimated of 0.06 acre, at minimum.

Disturbance of wetlands resulting from Alternative 1 would occur in accordance with applicable federal and/or state permits that the USAF would obtain for the project. Adherence to the requirements of applicable permit(s) would minimize temporary and permanent impacts on wetlands. In the context of wetlands on and in the vicinity of Wallops Island, wetlands impacts would remain minimal. The presence of the proposed tower would have no or minimal impacts on surface or groundwater hydrology, as the majority of the proposed project site would remain in an undisturbed and permeable condition. As described for the Proposed Action Alternative, the contractor would implement and adhere to practices specified in WFF's *Wallops Island Phragmites Control Plan* (NASA 2014a) to prevent the introduction of seeds and rhizomes of *Phragmites* to areas of WFF where the plant is not present.

For these reasons, impacts on wetlands resulting from Alternative 1 would remain negligible and not significant. Impacts on floodplains at Wallops Island resulting from Alternative 1 would be similar to those described for the Proposed Action Alternative.

3.1.2 COASTAL ZONE MANAGEMENT

3.1.2.1. Regulatory Context

Section 307 of the Coastal Zone Management Act (CZMA) (16 U.S.C. §1456) requires that federal activities affecting a state's coastal uses or resources be conducted in a manner consistent with the enforceable policies of that state's approved coastal management program. VDEQ administers Virginia's Coastal Zone Management (CZM) Program. Federal lands, the use of which is by law subject solely to the discretion of or which is held in trust by the federal government, its officers or agents, are excluded from Virginia's coastal management area. However, activities on federal lands with any reasonably foreseeable coastal effects must be consistent with the Virginia CZM Program.

3.1.2.2. Affected Environment

As a federal property, WFF is statutorily excluded from the CZMA's definition of the Commonwealth of Virginia's "coastal zone" (16 U.S.C §1453 [1]). However, the USAF has determined that the Proposed Action has the potential to have reasonably foreseeable effects on Virginia's coastal zone resources.

3.1.2.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed instrumentation tower would not be built and existing conditions at Wallops Island would continue. This alternative would have no effect on Virginia's coastal zone resources.

Proposed Action Alternative (Preferred Alternative): Building X-015 Site

The USAF has determined that that the Proposed Action Alternative would be consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program. The USAF submitted to VDEQ a Federal Consistency Determination analyzing the applicability of the enforceable policies to the Proposed Action Alternative and the Proposed Action Alternative's consistency with those policies. In a letter dated September 1, 2017 VDEQ concurred with the USAF's determination that the Proposed Action is consistent to the maximum extent practicable with the Virginia CZM Program provided all applicable permits and approvals are obtained. As described in this EA, the USAF would obtain all such applicable permits and approvals prior to building and operating the proposed tower. Based on recommendations in VDEQ's concurrence letter, the USAF has also conducted additional consultation with, and received concurrence from, the USFWS and VDGIF with respect to the Proposed Action and the MMP. Concurrence was provided by the USFWS and VDGIF in emails dated September 14 and September 26, 2017, respectively.

Copies of the Federal Consistency Determination, VDEQ's response, and correspondence from the USFWS and VDGIF are included in **Appendix A**.

Alternative 1: Building X-079 Site

Based on the similarity and proximity of the Alternative 1 site to that of the Proposed Action Alternative, it is anticipated that implementation of Alternative 1 would be consistent to the maximum extent practicable with the enforceable policies of Virginia's CZM Program.

3.1.3 HAZARDOUS SUBSTANCES

Hazardous substances are defined as any solid, liquid, contained gaseous, or semi-solid waste, or any combination of wastes that pose a potential hazard to human health and the environment. Improper management and disposal of hazardous substances can contribute to the pollution of groundwater or other drinking water supplies, and the contamination of surface water and soil.

3.1.3.1. Regulatory Context

The management and disposal of hazardous substances and wastes is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (2 U.S.C. §§9601 *et seq*.) (CERCLA; also known as Superfund), which establishes management requirements for the cleanup of hazardous waste sites; the Resource Conservation and Recovery Act (40 CFR §§239-282) (RCRA), which addresses the accumulation, handling, storage, and shipment of hazardous and non-hazardous wastes; and the Toxic Substance Control Act (15 USC §§2601 *et seq*.) (TSCA), which sets forth requirements for reporting, record-keeping, and testing, as well as restrictions relating to chemical substances and/or mixtures.

3.1.3.2. Affected Environment

Hazardous materials used in operations and activities conducted at WFF include liquid and solid rocket propellants, cutting fluids, solvents, flammables, laboratory reagents, and paint thinners. The use of such materials generates corresponding quantities of hazardous waste. WFF is classified as a large quantity generator of hazardous waste and maintains separate generator identification numbers issued by the EPA for Main Base and Mainland/Wallops Island. In addition, WFF maintains a hazardous waste transporter license and a RCRA Permit for Open Burning Treatment of Hazardous Waste for the treatment of waste solid rocket propellant. Hazardous materials and hazardous wastes are used, handled, stored, and disposed of at WFF in accordance with GPR 8500.3, *Waste Management* and all other applicable NASA, federal, and state regulations (NASA 2016a).

Pesticides are periodically applied on the alternative sites to manage insect populations, particularly mosquitoes. These substances are applied by authorized NASA personnel or licensed private contractors in accordance with all applicable label directions and regulatory requirements, are mixed off-site prior to application, and are stored off-site when not in use. No other hazardous substances are used, stored, handled, or disposed of on the alternative sites.

At WFF, NASA employs a multi-faceted approach to ensure that no ground disturbance occurs at environmental restoration sites without proper controls. By way of a geographic information system-based mapping portal and a dig permit/excavation request process involving multiple organizations (e.g., facilities, environmental, safety offices), all new projects are reviewed on a case-by-case basis prior to their approval to avoid potential impacts to restoration sites or other areas of concern. This process would be employed for either alternative site prior to breaking ground.

A number of former environmental restoration sites or other areas of concern have been identified adjacent to the Proposed Action Alternative site. These areas are shown on **Figure 2** in **Appendix D** and described as follows:

- Site 5 is located approximately 185 feet east of the planned excavation footprint for the proposed tower and encompasses approximately two acres where operations associated with a former plant operations and maintenance building (Building X-115, now demolished) resulted in soils impacted by total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), pesticides, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), and metal. Remediation of the site was completed and Site 5 was granted regulatory closure was granted by the EPA and VDEQ in 2014.
- Site 6 is located approximately 400 feet southeast of the planned excavation footprint of the tower base. The site underwent remediation for petroleum-impacted soils associated with former Building X-010 (now demolished) and was granted regulatory closure by VDEQ in 2000. Additional remediation was subsequently conducted on the site and regulatory closure for this area was granted by the VDEQ Storage Tank Program (which is not regulated by EPA) in 2008.
- Site 12 encompasses approximately 3.4 acres and underlies Building X-015 and the area where the base of the proposed tower would be located. Groundwater underlying Site 12 was found to be impacted with TPH-Diesel Range Organics associated with a power generating plant (Building X-

020) formerly located on the property. Remediation of the site was completed and Site 12 was granted closure under the VDEQ Storage Tank Program in 2008.

Two additional areas of concern are also located within Site 12:

- Backfill containing munitions and explosives constituents (MEC) was used in an approximately 0.15-acre area of the former power generating plant approximately 165 feet southeast of where the base of the proposed tower would be located. A surface sweep of the area was completed in 2008 and anomalies were subsequently excavated to two feet below ground surface (bgs). No soil contaminant testing specific to munitions has reportedly been conducted, and a dig permit/excavation request process has been instituted for any activities that would disturb the soil of the backfill area and immediately surrounding areas.
- An approximately 0.15-acre area underlain by soils contaminated with PAH associated with four creosote-coated wooden pilings that were abandoned in place is located approximately 200 feet northeast of where the base of the proposed tower would be located. These soils were addressed during the aforementioned remedial actions for Site 5 and Site 12. It was determined that the PAH contamination did not constitute a CERCLA release and EPA and VDEQ closure for this area was incorporated into the closure of Sites 5 and 12.

No additional investigations or remedial actions are required by applicable regulatory agencies on the Proposed Action Alternative site as there would be no spatial overlap between construction activities and the MEC backfill or creosote-coated piling areas of concern. However, additional investigation may be warranted for the areas within Site 12 if it is determined during continued planning and design of the proposed tower that construction of the tower would disturb either of those areas.

No current or historical conditions involving the use, storage, disposal, or release of hazardous materials or hazardous waste are known to occur at the Alternative 1 site.

3.1.3.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no change in conditions pertaining to hazardous materials or wastes at Wallops Island and existing conditions would continue. There would be no impacts on or from hazardous materials and wastes as a result of the No Action Alternative.

Proposed Action Alternative (Preferred Alternative): Building X-015 Site

As currently designed, the construction of the proposed tower would avoid the abandoned creosote-coated piles and former MEC-contaminated soils within Site 12. Construction workers would comply with NASA Goddard Technical Standard 8715.1, *Goddard Space Flight Center Explosive Safety Program*. In the event that construction workers encounter stained or malodorous soil or other evidence of potential environmental contamination (e.g., suspected MEC, debris, fuel drums, etc.) during land disturbance, the USAF's contractor would be required to halt work and immediately contact the WFF Safety and Environmental Offices. Assignment of responsibility for restoration of such areas would be handled on a case-by-case basis, considering such factors as the type and source(s) of contamination. Construction would not resume until the area was deemed safe for workers by the WFF Safety Office.

The presence of former remediation Sites 5 and 12 underlying the Proposed Action Alternative site would have no impacts on the construction and operation of the proposed tower, as all remedial activities have been completed and closure has been granted by applicable regulatory agencies. Additionally, personnel working in MEC areas must take MEC awareness training prior to entering the area.

Construction activities associated with the Proposed Action Alternative would likely involve the use of hazardous materials (e.g., lubricants, solvents, and cleaners) and would generate corresponding quantities of hazardous waste (e.g., empty cartons or containers, oily rags). In addition, the construction of the proposed tower and the installation of the telemetry dish would involve the use of vehicles and equipment

using petroleum-based fuels and lubricants.

During construction activities, hazardous substances would be used in accordance with their label directions and requirements set forth in applicable safety data sheets (SDS). Such materials would only be available to personnel authorized to use them and would be secured at the project site in a hazardous materials locker or similar storage cabinet when not in use. The USAF's construction contractor would be required to implement site-specific measures for vehicle and equipment fueling and maintenance, as well as spill prevention and control measures as specified in WFF's *Integrated Contingency Plan* (ICP) (NASA 2017b). In addition, all fuel and oil storage during the operations would comply with applicable VDEQ regulations. If 55 or more gallons of fuel would be stored on the project site in portable or temporary aboveground storage tanks (AST), the following conditions would apply:

- WFF Facilities Management Division would be notified of the AST
- A spill prevention plan would be prepared by the construction contractor

Inspections of all fuel storage containers would be conducted in accordance with applicable regulations. All fuel storage containers and fuel handling activities would also comply with the requirements of the WFF ICP. Any spills would be reported immediately to the WFF Fire Department.

The use of hazardous materials during ongoing operation and maintenance of the proposed tower would include 500 gallons of propane stored in a tank near the tower base to operate the emergency backup generator during power outages, as well as small quantities of hazardous substances (e.g., cleaners, lubricants, and solvents) needed to perform maintenance activities. The USAF would develop task-specific work instructions to ensure that the elevated tank is filled and maintained in accordance with industry standards. Small quantities of hazardous substances used for ongoing maintenance activities would be present on the site only when such activities are being conducted and would either be stored in appropriate locations at WFF or taken off-site by maintenance personnel when not in use. All such materials would be used and disposed of in accordance with GPR 8500.3, *Waste Management*, applicable label instructions, and SDS requirements.

Pesticides would continue to be applied on the site to manage insect populations, and herbicides would likely be applied to manage vegetation around the tower base, ground-level support equipment, and under the guy wires. All such substances would be applied by authorized NASA personnel or licensed contractors in accordance with applicable label directions and regulatory requirements, would be mixed off-site prior to application, and would be stored off-site when not in use.

Hazardous wastes generated during the project's construction and operational phases would be managed and disposed of in accordance with GPR 8500.3, *Waste Management* and all other applicable NASA, federal, and state regulations.

For these reasons, short-term and long-term impacts from hazardous materials and wastes would be negligible and less than significant.

Alternative 1: Building X-079 Site

No current or historical conditions involving the use, storage, disposal, or release of hazardous materials or hazardous waste are known to occur at the Alternative 1 site. If this site were to be identified as a preferred site for construction and operation of the proposed tower, the USAF would formally characterize the historic and current presence of hazardous materials and/or hazardous waste. Construction- and operationally-related impacts on and from hazardous materials and wastes would be similar to those described for the Proposed Action Alternative.

3.2 BIOLOGICAL ENVIRONMENT

This section describes biological resources occurring on or in the vicinity of the alternative sites and Wallops Island. Biological resources of concern, as identified in **Table 3-1**, include avifauna (common species of birds) as well as special-status species. Scientific names of all birds discussed in the following analysis are presented in **Tables C-1** and **C-2** included in **Appendix C**.

Avifauna are discussed in **Section 3.2.1**. Special-status species, including those protected under the ESA as well as other federal and state laws, and Birds of Conservation Concern (BCC), are addressed in **Section 3.2.2**.

3.2.1 AVIFAUNA (COMMON BIRD SPECIES)

3.2.1.1. Regulatory Context

The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. §§70-712) makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird, including feathers or other parts, nests, eggs, or products, without an appropriate permit. As of November 2013, the MBTA protects 1,026 species of birds in the United States (50 CFR §10.13). The majority of the birds occurring at WFF are protected under the MBTA.

A Final Rule authorizing take of birds protected by the MBTA by DoD agencies during military readiness activities was published in the *Federal Register* on February 28, 2007. The Final Rule directs the Armed Forces to assess the effects of military readiness activities on migratory birds, in accordance with NEPA, and requires the Armed Forces to develop and implement appropriate conservation measures if a proposed action may have a significant adverse effect on a migratory bird population. In addition, the rule requires DoD agencies to retain data for five years when conservation measures associated with a proposed action require monitoring of migratory bird populations.

3.2.1.2. Affected Environment

Wallops Island and its vicinity are home to a wide variety of bird species, high numbers of migratory birds, and important bird habitats (Paxton and Wilson 2015). Barrier islands, including Wallops, Assateague, Chincoteague, and Assawoman Islands, are particularly important for migratory birds. Some species use these islands as a stopover point, while others use the islands and surrounding habitats as an overwintering area. The bay (west) side of the islands tends to contain the highest concentrations of BCC and other migratory birds. Shorebirds would be expected to frequently cross Wallops Island when foraging between the beach and bayside mudflats. The island is along the coastal route of the Atlantic Flyway, a corridor for migrating land and water birds that winter on the waters and marshes south of Delaware Bay. For these reasons, the National Audubon Society has designated Wallops Island part of the Barrier Island Lagoon System Important Bird Area (IBA), an approximately 260,000-acre area of Global Significance for a variety of species of water birds (National Audubon Society 2013).

Adjacent to the WFF Main Base is the Wallops Island National Wildlife Refuge (NWR), which consists of 373 acres of upland and marsh (USFWS 2014). Chincoteague NWR is located directly north (Assateague Island) and south (Assawoman Island) of Wallops Island and was established in 1943 to provide habitat for migratory birds (USFWS 2007). In addition to its IBA status, Wallops Island is included in the Maryland-Virginia Barrier Islands Western Hemisphere Shorebird Reserve Network (WHSRN), an internationally important shorebird area visited by more than 100,000 shorebirds annually (WHSRN 2017). Within the WHSRN, Wallops Island is located approximately six miles north of The Nature Conservancy's Metompkin Island Reserve (TNC 2017).

Birds are categorized in the following discussion as either land birds or water birds, corresponding to the habitats on which they rely. Land birds are species relying primarily on terrestrial habitats dominated by forest, scrub, or fields, or the aerial space over these habitats. Water birds spend most of their time in tidal or non-tidal aquatic habitats. Scientific names of avifauna species discussed in the following analysis, including those that have been documented or could potentially occur at WFF, are presented in **Tables C-1** and **C-2** in **Appendix C**.

Land Birds

Neotropical migratory birds breed in North America and spend the rest of the year in the tropical and subtropical Americas. Neotropical migrants arrive in the spring, breed and raise their young throughout the summer, and then migrate south to overwinter. Southbound migration begins between July and September for most species. With the inclusion of young birds born in the summer, the number of birds migrating is larger during fall migration than during northerly spring migration because many birds do not survive their first year, die during migration, or die on their wintering grounds (Mabey *et al.* 1993; Klaassen *et al.* 2014).

The Neotropical Migratory Bird Conservation Act of 2000 (Public Law 106-247) lists 386 bird species as neotropical migrants, while other sources list 330 species of birds as neotropical migrants (Elphick 2007). The majority of birds breeding in North American forests, including warblers, hummingbirds, swallows, orioles, tanagers, vireos, thrushes, flycatchers, sparrows, cuckoos, and nighthawks, are neotropical migrants. Raptors, shorebirds, and a few species of waterfowl (e.g., blue-winged teal) are also considered neotropical migrants because they migrate from their breeding grounds in North America to the tropics.

The geographic distribution of migrating neotropicals changes predictably between fall and spring. During fall, the majority of neotropical migrants follow the Atlantic Flyway close to the coast, while on their return in the spring they cover a broader front across the continent. Neotropical migrants make up 60 to 80 percent of breeding birds in forests of eastern North America. The most significant stopover area for land birds in this flyway is coastal habitat from Cape May, New Jersey to Cape Charles, Virginia, which includes Wallops Island. On the Delmarva Peninsula, neotropical migrants are more abundant within one mile of the coast than further inland. In addition, bay coastal zones have higher densities of neotropical migrants than the coast or further inland, and migratory songbirds are more common on barrier islands than the mainland (Mabey *et al.* 1993).

Approximately 65 species of breeding land birds and 70 species of wintering land birds use the Delmarva Peninsula and Virginia Barrier Island region (Paxton and Wilson 2015). The 10 most common species of native songbirds found in Accomack County, and therefore likely to occur at WFF, are red-winged blackbird, northern cardinal, American robin, boat-tailed grackle, American crow, common grackle, Carolina wren, yellow-rumped warbler, Carolina chickadee, and northern mockingbird (NASA 2010; eBird 2017). Other songbirds that commonly occur in open and developed areas of Mainland and Main Base include song sparrow, tree and barn swallows, fish crow, brown-headed cowbird, and blue jay[5].

Diurnal (i.e., active during the day) raptor species commonly found in Accomack County, and therefore likely to occur at WFF, include osprey, bald eagle, northern harrier, red-tailed hawk, Cooper's hawk, sharp-shinned hawk, red-shouldered hawk, merlin, American kestrel, peregrine falcon, turkey vulture, and black vulture[6]. Other raptor species that could occur infrequently at WFF include broad-winged hawk, rough-legged hawk, swallow-tailed kite, and Swainson's hawk (eBird 2017).

Owls commonly found in Accomack County include great horned owl, eastern screech-owl, short-eared owl, barred owl, and barn owl[7]. Other owl species that could occur infrequently at WFF include northern saw-whet owl, long-eared owl, and snowy owl (eBird 2017; Allen 2000; Dunn and Alderfer 2011).

For soaring birds such as hawks, migration begins as the thermals and updrafts upon which they rely develop during the morning hours. As the temperatures increase, soaring activity increases and so does the elevation of activity. Over the course of a day, soaring birds such as raptors are typically migrating at 600 feet to 1,500 feet and higher, with a maximum height of approximately 3,500 feet to 4,000 feet (Kerlinger 1995).

Most nocturnally migrating songbirds fly at approximately 2,000 feet AGL or lower (Kerlinger 1995). A

[5] Non-native bird species, such as house sparrow, rock pigeon, and European starling that occur at WFF are not protected under the MBTA.

[6] Bald eagles and peregrine falcons are discussed further in **Section 3.2.2**.

[7] Great horned owls have been observed in the coastal forest (Fleming 1996).

dozen of the more common neotropical migrant songbirds in Accomack County show similar migration patterns, with peaks in spring migration occurring in early May and in fall migration occurring in September though early October. These patterns are illustrated in **Figure 3-3**.

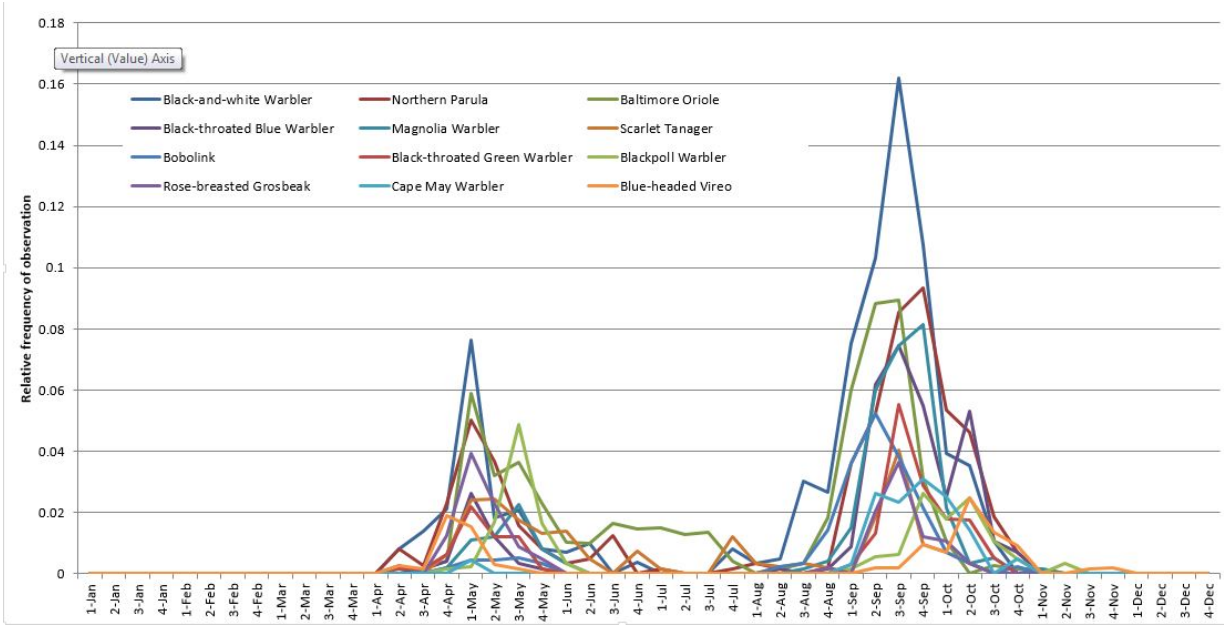


Figure 3-3: Relative Frequency of Observation of 12 Most Common Neotropical Migrants* in Accomack County, by Quarter Month

*In order of frequency of occurrence: black-and-white warbler, northern parula, Baltimore oriole, black-throated blue warbler, magnolia warbler, scarlet tanager, bobolink, black-throated green warbler, blackpoll warbler, rose-breasted grosbeak, Cape May warbler, and blue-headed vireo.

Source: eBird 2017[8].

Water Birds

A number of water birds occur at Wallops Island due to the abundance of adjacent wetlands and surface waters. The 12 most common species of native waterfowl commonly reported to eBird in Accomack County are Canada goose, mallard, American black duck, bufflehead, northern shoveler, gadwall, red-breasted merganser, snow goose, tundra swan, green-winged teal, American wigeon, and northern pintail, in that order (eBird 2017). Other common species of native waterfowl occurring in the area include blue-winged teal, ruddy duck, black and surf scoter, brant, and wood duck (NASA 2010; eBird 2017). The majority of these waterfowl commonly overwinter in areas around WFF, although species such as Canada goose, wood duck, and American black duck also are commonly found in the area during the summer. The relative frequency of observation for these species around WFF is shown in **Figure 3-4**.

[8] The online resource eBird is used to determine species' occurrence in areas with good coverage by birdwatchers. Records submitted to eBird are checked for errors by regional reviewers to reduce the possibility that a species is mistakenly reported.

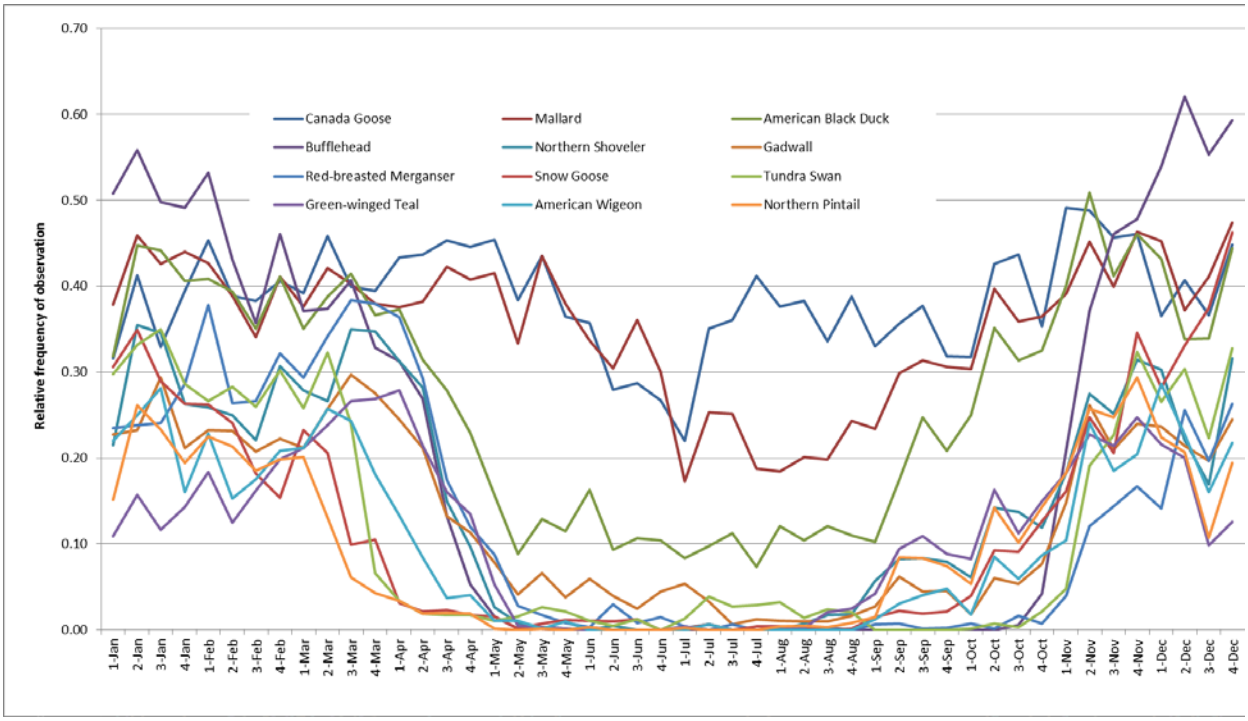


Figure 3-4: Relative Frequency of Observation of 12 Most Common Species of Waterfowl in Accomack County, by Quarter Month

Source: eBird 2017.

Less common native waterfowl species occurring in the area include long-tailed duck, common goldeneye, canvasback, ring-necked duck, greater and lesser scaup, white-winged scoter, and hooded and common mergansers. The non-native mute swan is commonly found on the nearby Chincoteague NWR and could also occur at WFF. Other water birds regularly occurring in waters around WFF include common loon, red-throated loon, horned grebe, and pied-billed grebe (Allen 2000; Dunn and Alderfer 2011; eBird 2017).

Marshes and shorelines on Wallops Island provide high-quality habitat for a variety of other water birds, including several species of wading birds and shorebirds. The most frequently recorded species of native wading birds commonly found in Accomack County are great egret, great blue heron, snowy egret, tricolored heron, little blue heron, green heron, and black-crowned night-heron. The most frequently recorded species of shorebirds commonly found in Accomack County, and which occur or are likely to occur at WFF, are willet, greater yellowlegs, American oystercatcher, black-bellied plover, dunlin, sanderling, semi-palmated plover, lesser yellowlegs, killdeer, semipalmated sandpiper, marbled godwit, and ruddy turnstone (NASA 2010; eBird 2017). Of those, the willet, American oystercatcher, and killdeer breed in the area, while all other species are migratory. The relative frequency of observation for these species around WFF is shown in **Figure 3-5**.

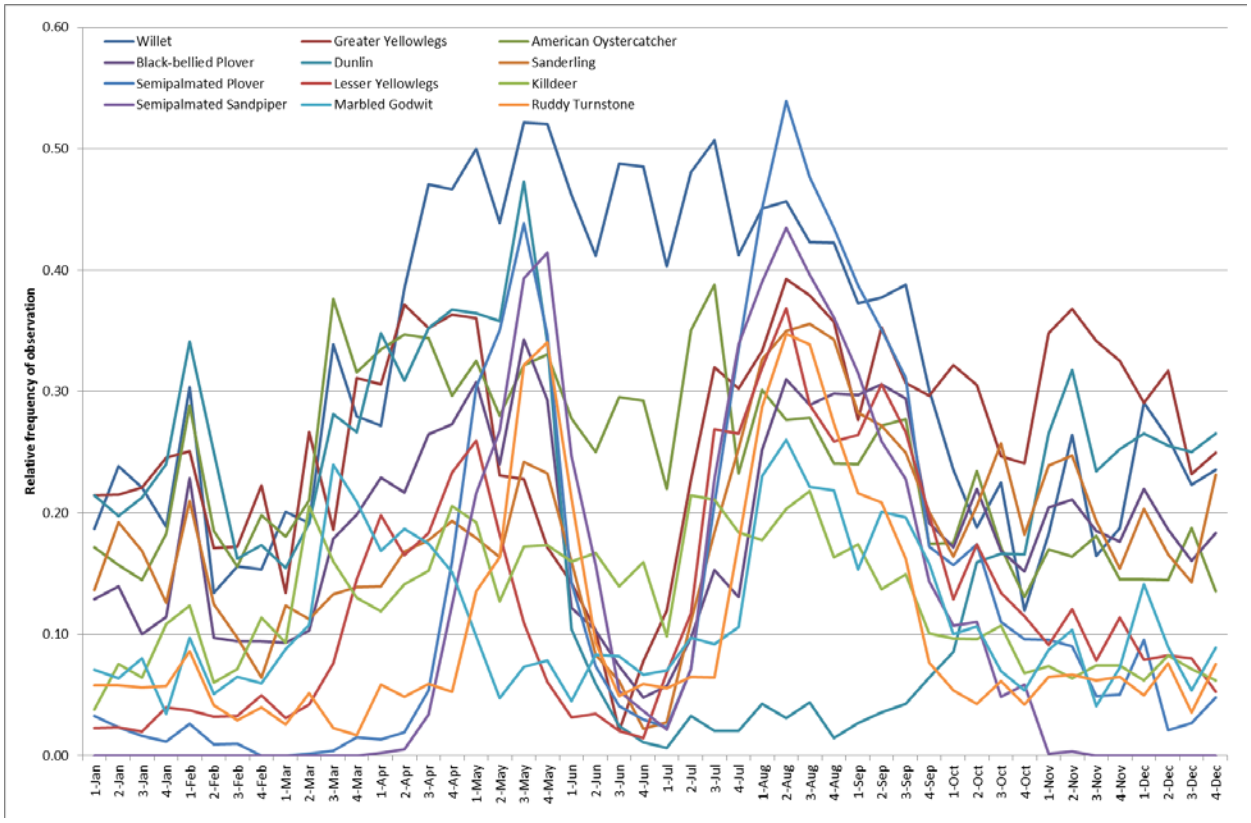


Figure 3-5: Relative Frequency of Observation of 12 Most Common Species of Shorebirds in Accomack County, by Quarter Month

Source: eBird 2017

No non-native species of shorebird have been recorded in Accomack County (eBird 2017). More than 24 other species of shorebirds could be expected to occur at WFF, although about half of these would be relatively rare. While not among the 10 most frequently reported shorebird species in the Delaware Bay/Virginia Barrier Island region, whimbrel use the area in large numbers, with an estimated 40,000 individuals passing through the area in the spring (Paxton and Wilson 2015). Other water birds common in the area include various species of gulls (e.g., herring gull, ring-billed gull, and laughing gull), Forster's tern, and double-crested cormorant (Allen 2000; NASA 2010; Dunn and Alderfer 2011; eBird 2017).

The Delaware Bay/Virginia Barrier Island region provides valuable habitat for breeding water birds. More than 20,000 colonial water bird nests of 16 different species are located within 10 miles of Wallops Island. The region supports more than half of all breeding colonial water birds in Virginia, including the entire Virginia breeding population of white ibis (two colonies; 369 pairs in 2013) and Caspian terns (two colonies; 9 pairs in 2013), and more than 75 percent of the Virginia breeding population of glossy ibis, snowy egret, tricolored heron, little blue heron, cattle egret, black-crowned night heron, herring gull, laughing gull, gull-billed tern, and black skimmer (Watts and Paxton 2014).

Shorebirds often fly as high as 3,000 feet, while ducks and other water birds near shore usually fly within 100 to 200 feet AGL, although they sometimes fly much higher. Many waterfowl often fly just above the water (Kerlinger 1995).

Bird Collisions with Communication Towers

It is estimated that between 6.8 million and 50 million birds are killed each year in the United States and Canada by collisions with communication towers (Manville 2005; Longcore *et al.* 2012). Weather conditions and lighting on structures are the two main factors affecting the likelihood that birds will collide with a structure (Kerlinger *et al.* 2010). The probability of collision is largely a function of behavior (APLIC 2012), with specific behaviors such as migration, flushing, and aerial hunting potentially rendering species more susceptible to collision.

Collisions also occur when birds flying in poor visibility conditions do not see a structure in time to avoid it. This can occur during the day when the tower is obscured by fog, or at night. Artificial lighting is also known to disorient or divert migrating or foraging birds and cause collisions with structures (Taylor and Anderson 1973; Avery *et al.* 1976; Longcore *et al.* 2008; Gehring *et al.* 2009; Kerlinger *et al.* 2010). In otherwise dark environments or when cloud base obscures moonlight, the impacts of bright lights appear to be most severe. For example, 13,037 birds were recorded by thermal imaging camera over a 13 month period on a single, brightly lit unmanned offshore research platform in the North Sea. Of these, 442 (3 percent) were documented collision fatalities. Most (99 percent) of fatalities were passerines, mainly thrushes, common starling, and skylark (Hüppop *et al*. 2006).

A study conducted at communication towers in Michigan comparing red strobe, red flashing, white strobe, red strobe combined with red non-flashing and steady red burning lights found that there were fewer neotropical migrating songbird fatalities with red flashing lighting. This study did not include flashing white lights (Gehring *et al*. 2009). A study comparing 30 wind turbines with differing lighting regimes in the United States found that turbines with flashing red FAA lighting do not attract nocturnally migrating birds. This study also found that there were no impacts on birds from unlit turbines (Kerlinger et al. 2010).

Weather and Seasonality

Most mass mortality events of migrant bird collisions with communication towers are weather-related (Taylor and Anderson 1974; Newton 2007). Prevailing weather conditions on nights of large kills are characterized by overcast skies, often with precipitation; winds favorable for migration; and, in the fall, with the passage of cold fronts (Kale *et al.* 1969; Carter III and Parnell 1976, 1978; Avery *et al.* 1977; Erickson *et al.* 2005). Data also shows that many bird collisions occur throughout the migration seasons under clear skies, particularly in the spring, although affecting different ages and different species of birds (rails and fringilids) (Kale *et al.* 1969; Carter III and Parnell 1976; Avery *et al.* 1977).

Reasons for these differences between seasons and species are largely unexplained, although discussion surrounding this topic infers migratory strategy in the spring is more direct and completed more rapidly. More birds are attracted to lighted towers on overcast nights, and most appear to avoid towers of any lighting type on clear nights (Avery *et al.* 1976). Other consistent patterns related to collision events with towers include: mortality occurring during south and north winds (as opposed to east or west winds), but with north winds resulting in higher mortality; high mortality usually during the passage of cold fronts; and, in general, the highest mortality in the fall during overcast skies (Crawford 1981). Younger birds possibly collide more frequently than older birds, which could render fall migrants more susceptible to collision (Kelly 1999).

Instrument Flight Rules (IFR) are a set of FAA regulations for civil aviation aircraft. IFR conditions are met when cloud ceilings are below 1,000 feet and/or visibilities are less than 3 statute miles. For WFF, an IFR event is recorded when there are at least 3 hourly observations of IFR conditions within a five-hour period as recorded in Meteorological Terminal Aviation Routine (METAR) reports (i.e., routine weather reports provided at fixed intervals) (Thomas, pers. comm., August 27, 2014). **Figure 3-6** illustrates the monthly frequency of 252 IFR events that occurred at WFF between 1997 and 2012 Approximately 9 and 3 percent of all the annual IFR conditions at WFF occur during May and September, respectively, which correlate to the peak spring and fall bird migration months. Thus, when considered with the other factors of weather and seasonality described above, IFR conditions occurring in May would have the potential to

contribute to a correspondingly higher number of bird collisions at Wallops Island than IFR conditions occurring in September.

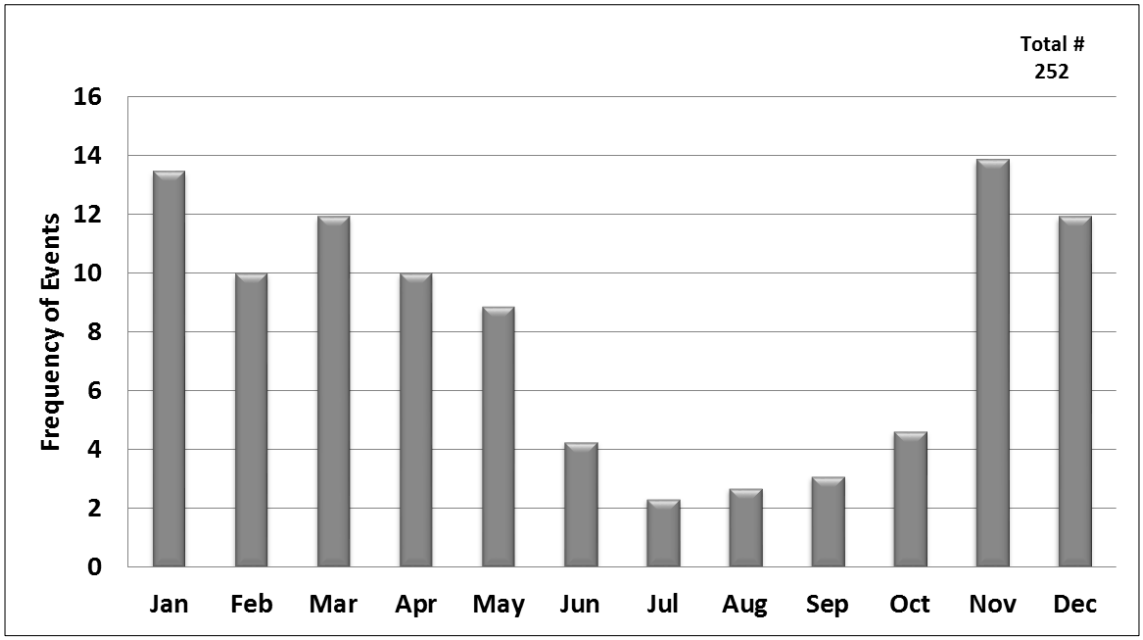


Figure 3-6: Monthly Frequency of IFR Events at WFF from 1997 to 2012

Source: Thomas, pers. comm., August 27, 2014

Tower Height, Tower Lighting, and Guy Wires

The height of a tower, the presence of associated guy wires, and a tower's lighting regime can affect the severity of the hazard posed to birds (Taylor and Anderson 1973; Kemper 1996; Crawford and Engstrom 2001; Longcore *et al.* 2008). A significant decrease in mortality is associated with reduced tower height (Crawford and Engstrom 2001). Towers taller than 450 feet are generally recommended to be sited away from coastal zones, bird staging areas, colonial nesting sites, and WHSRN sites (FCC 2012). Guyed towers cause higher mortality than non-guyed towers (Gehring *et al.* 2011; Dickey *et al.* 2012; Gehring and Walter 2012). One study showed 70 times as many collisions at tall, guyed towers (i.e., towers 1,000 feet or more in height) than on non-guyed, medium-height towers (i.e., towers between 380 feet and 479 feet in height) (Gehring *et al.* 2011). Tall, guyed towers lit with steady-burning lights have the highest fatality rates (Carter III and Parnell 1976, 1978; Erickson *et al.* 2005). Fewer bird fatalities have been documented at towers equipped with only red or white flashing lights as compared to towers with non-flashing, steady-burning lights (Carter III and Parnell 1976, 1978; Gehring *et al.* 2009, 2011). Extinguishing steady-burning, red tower lights have been determined to reduce avian collisions with towers by 70 percent (Kemper 1996; Gehring and Walter 2012).

Species Most Susceptible to Collisions

Nearly all species of migratory land birds have been documented to collide with communication towers along their migratory path (Shire *et al.* 2000; Longcore *et al.*, 2012 in Paxton and Wilson 2015), with collision numbers usually correlated with species abundance (Kemper 1996). Night migrating songbirds, such as warblers, thrushes, vireos, tanagers, cuckoos, and sparrows, appear to be most affected, with percent species composition in fatality data for these groups ranging from 69 percent to 97.4 percent (Taylor and Anderson 1974; Carter III and Parnell 1976, 1978; Crawford and Engstrom 2001; Gehring *et al.* 2011; Longcore *et al.* 2013). Smaller numbers of waterfowl, shorebirds, and other species have been documented to collide with towers (Brewer and Ellis 1958; Carter III and Parnell 1976, 1978; Avery *et al.* 1977; Crawford and Engstrom 2001; Erickson *et al.* 2005; Gehring *et al.* 2009, 2011; Buchanan 2011; Longcore *et al.* 2013).

Between 1949 and 1999, 121 reports were written documenting 545,250 bird mortalities at communication towers (Shire 2000). Forty-seven of the reported studies, the longest of which was conducted intermittently over a period of 39 years, presented species-specific information from constantly lit towers (steady burning lights are no longer recommended under FAA and USFWS guidelines). Species composition and collision susceptibility presented in this study lend some insight into relative vulnerability of birds to collision mortality. These studies documented 184,797 birds of 230 different species, including 10 on the Partners in Flight Extremely High Priority list (Shire 2000). The majority of bird mortalities documented in these studies were neotropical migratory songbirds. However, 1,452 deaths occurred among 54 species of water birds and raptors. Among those mortalities, the most commonly documented species (other than passerines) were sora (657), Virginia rail (144), pied-billed grebe (123), yellow rail (67), and ring-necked duck (61) (Shire 2000).

Rails and fringillids are frequently documented to collide with towers, and appear to collide with towers in all weather conditions. Neotropical nocturnal migrants and diurnal migrant warblers experience increased mortality in periods of overcast skies and also have the highest documented collision rates (Avery *et al.* 1977; Crawford and Engstrom 2001; Gehring *et al.* 2011). Of these species, red-eyed vireo, grey catbird, Nashville warbler, blackpoll warbler, mourning dove, and ovenbird have the highest mortality rates from collisions with towers (Crawford and Engstrom 2001; Gehring *et al.* 2009, 2011). Other species identified as “super colliders” (i.e., species that collide most frequently with buildings and towers) are bay-breasted warbler and black-throated blue warbler (Arnold and Zink 2011). The same study identified horned lark, cliff swallow, American robin, and common grackle as “super avoiders” (i.e., species that collide least frequently with buildings and towers). Overall, neotropical nocturnal migrants represented 97.4 percent of tower fatalities, consisting of Parulidae (58.4 percent), Vireonidae (13.4 percent), Turdidae (7.7 percent), and Emberizidae (5.8 percent) (Longcore *et al.* 2013). Most of these fatalities resulted from collisions involving attraction to lighting.

Breeding birds that nest in elevated areas, such as trees or poles, have increased daily exposure to collision as compared to ground-nesting birds. Such birds include osprey, bald eagle, a variety of other raptors, and many woodpeckers, doves, and songbirds. In addition, birds traveling between breeding, feeding, and roosting sites, especially over water and particularly in flocks, have increased risk of collision (APLIC 2012). Such species include ducks, geese, swans, herons, egrets, rails, shorebirds, gulls, and terns. Flocking birds are generally susceptible to collisions, with some shorebird species even colliding with each other (Buchanan 2011).

Electromagnetic Impacts

Studies of the effects of electromagnetic fields produced by communications towers on breeding and foraging birds have been determined to be inconclusive (Bhattacharya and Roy 2013). Therefore, such effects are not discussed further in this analysis.

3.2.1.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed instrumentation tower would not be built and existing conditions at Wallops Island would continue. This would have no effect on avifauna (common bird species) at or in the vicinity of Wallops Island.

Proposed Action Alternative (Preferred Alternative): Building X-015 Site

The proposed relocation of the telemetry dish would have no short-term or long-term impacts on avifauna, as the telemetry dish would be installed on existing infrastructure in a previously developed portion of the Mainland or Wallops Island.

Construction and operation of the proposed instrumentation tower could result in the further loss or fragmentation of habitat available at and in the vicinity of the Proposed Action Alternative site. However,

the Proposed Action Alternative site and the quantity of habitat potentially available in that location is small in the context of habitat provided in areas on and near Wallops Island. Furthermore, the alternative site is previously disturbed, periodically maintained (e.g., via trimming, herbicide application, and mowing of vegetation), and located adjacent to existing development on Wallops Island. Thus, available habitat on the site is of low quality, and any fragmentation or loss of such habitat resulting from the construction and operation of the proposed tower under the Proposed Action Alternative would be negligible.

Based on information detailed above, the construction and operation of the proposed instrumentation tower under the Proposed Action Alternative would pose a moderate risk of collision to some species, and low risk of collision to other species occurring at or in the vicinity of Wallops Island. The Risk Level Category for potential collision with the proposed tower, generalized by families of birds occurring at and in the vicinity of Wallops Island, is presented in **Table 3-2** and combines quantitative and qualitative assessment. Species documented or potentially occurring at WFF that could have a higher-than-average collision rate with the proposed tower would include those belonging to the following species groups: Troglodytidae (wrens), Tyrannidae (tyrant flycatchers), Emberizidae (New World sparrows), Cardinalidae (buntings, cardinals and allies), Vireonidae (vireos) and Parulidae (New World warblers). Individuals belonging to the Hirundinidae (swallows and martins), Strigidae (owls), Picidae (woodpeckers), Fringillidae (finches, siskins and allies), Icteridae (blackbirds and allies), Accipitridae (hawks, eagles, and kites) and Turdidae (thrushes, bluebirds and allies) species groups would have a lower risk of collision with the proposed tower, although individuals of those groups have also been documented to collide with towers (Arnold and Zink 2011) (see **Table C-3** in **Appendix C**). Waterfowl, shorebirds, and other bird species would also have the potential to collide with the proposed tower and its associated guy wires, particularly in consideration of the proposed tower's proximity to areas within and adjacent to Wallops Island that provide habitat for such birds.

To varying degrees, the risk of collision potentially posed by the proposed tower would be reduced with appropriate mitigation. As described in **Section 2.2.1**, the USAF would incorporate proactive measures to minimize effects to avian species. This would include meeting FAA standards for lighting and marking, during both construction and operation (FAA 2016), among other measures as identified in **Section 2.2.1**.

While such measures would minimize the risk of collision to birds, such risk would not be eliminated altogether. Continued research and monitoring of bird collisions and mortality at the site of the proposed tower is recommended, and, as described in **Section 2.2.1**, would include allowing access to the proposed tower site by USFWS personnel, researchers, and/or other visitors with a pertinent interest in the interaction of birds or other wildlife with the proposed tower.

As discussed in **Section 2.2.2**, the USAF has prepared an MMP in consultation with USFWS and VDGIF. A copy of the MMP is included in **Appendix C** of this EA. With implementation of these monitoring and mitigation measures, impacts on avifauna would be less than significant.

The Proposed Action Alternative would be implemented in accordance with the Final Rule authorizing take of birds protected by the Migratory Bird Treaty Act by DoD agencies during military readiness activities dated February 28, 2007. In accordance with the Final Rule, the USAF has assessed the effects of the Proposed Action Alternative on migratory birds in accordance with NEPA, has coordinated with USFWS and VDGIF, and would implement the MMP as discussed above. USFWS and VDGIF concurred with the measures outlined in this Plan in emails dated September 14 and September 26, 2017, respectively.

Alternative 1: Building X-079 Site

Impacts on avifauna resulting from Alternative 1 would be similar to those described for the Proposed Action Alternative, as both sites are ecologically similar and located in proximity to one another. The implementation of Alternative 1 would be in accordance with the Final Rule authorizing take of birds protected by the Migratory Bird Treaty Act by DoD agencies during military readiness activities dated February 28, 2007, for the same reasons described for the Proposed Action Alternative.

Table 3-2: Risk Level Category for Potential Collision with the Proposed Tower, Generalized by Bird Family

Bird Family	Risk Level Category
Charadriidae (Plovers)	Moderate
Rallidae (Rails, Gallinules, and Coots)	Moderate
Anatidae (Ducks, Geese, and Waterfowl)	Low-Moderate
Ardeidae (Herons, Egrets, and Bitterns)	Low-Moderate
Mimidae (Mockingbirds and Thrashers)	Low-Moderate
Pandionidae (Osprey) & Accipitridae (Hawks, Eagles, and Kites)	Low-Moderate
Parulidae (New World Warblers)	Low-Moderate
Pelecanidae (Pelicans)	Low-Moderate
Scolopacidae (Sandpipers and Allies)	Low-Moderate
Tyrannidae (Tyrant Flycatchers)	Low-Moderate
Vireonidae (Vireos)	Low-Moderate
Alaudidae (Larks)	Low
Alcedinidae (Kingfishers)	Low
American Pipit	Low
Apodidae (Swifts)	Low
Bombycillidae (Waxwings)	Low
Calcariidae (Longspurs and Snow Buntings)	Low
Caprimulgidae (Nightjars and Allies)	Low
Cardinalidae (Cardinals and Allies)	Low
Cathartidae (New World Vultures)	Low
Certhiidae (Treecreepers)	Low
Columbidae (Pigeons and Doves)	Low
Corvidae (Crows and Jays)	Low
Cuculidae (Cuckoos)	Low
Emberizidae (New World Sparrows)	Low
Falconidae (Falcons and Caracaras)	Low
Fringillidae (Finches and Allies)	Low
Gaviidae (Loons)	Low
Gruidae (Cranes)	Low
Hirundinidae (Swallows)	Low
Icteridae (Troupials and Allies)	Low
Laridae (Gulls, Terns, and Skimmers)	Low
Motacillidae (Pipits)	Low
Odontophoridae (New World Quail)	Low
Paridae (Chickadees, and Titmice)	Low
Passeridae (Old World Sparrows)	Low
Phalacrocoracidae (Cormorants)	Low
Phasianidae (Pheasants, Grouse, and Allies)	Low
Picidae (Woodpeckers)	Low

Bird Family	Risk Level Category
Podicipedidae (Grebes)	Low
Polioptilidae (Gnatcatchers)	Low
Recurvirostridae (Stilts and Avocets)	Low
Regulidae (Kinglets)	Low
Sittidae (Nuthatches)	Low
Stercorariidae (Skuas and Jaegers)	Low
Strigidae (Owls)	Low
Sturnidae (Starlings)	Low
Sulidae (Boobies and Gannets)	Low
Threskiornithidae (Ibises and Spoonbills)	Low
Troglodytidae (Wrens)	Low
Turdidae (Thrushes and Allies)	Low
Tytonidae (Barn Owls)	Low

Note: Collision risk based on local species population size and species range overlap with site.
Sources: Brewer and Ellis 1958; Taylor and Anderson 1974; Carter III and Parnell 1976, 1978; Avery *et al.* 1977; Shire *et al.* 2000; Crawford and Engstrom 2001; Erickson *et al.* 2005; Gehring *et al.* 2009, 2011; Buchanan 2011; Longcore *et al.* 2013; Arnold and Zink 2011.

3.2.2 SPECIAL-STATUS SPECIES

3.2.2.1. Regulatory Context

Special-status species include any species that is listed or proposed for listing as threatened or endangered by the USFWS under the provisions of the ESA; special-status bird species protected by the Bald and Golden Eagle Protection Act (BGEPA); and species listed as threatened or endangered by VDGIF. Avifauna (common bird species) are discussed in **Section 3.2.1**. Scientific names of special-status species discussed in the following analysis, including those that have been documented or could potentially occur at WFF, are presented in **Tables C-1** and **C-2** in **Appendix C**.

Section 7 of the ESA requires federal agencies to evaluate the effects of their proposed actions on federal-listed species and consult with either the USFWS or National Marine Fisheries Service if the agency determines that its action "may affect" an individual or critical habitat of a federal-listed species. In addition, the 1988 amendment to the Fish and Wildlife Conservation Act (Public Law 100-653, Title VIII), which is administered by the USFWS, mandates identification of BCC. The Act requires the USFWS to "…identify species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973."

3.2.2.2. Affected Environment

Birds

Six species of federal- and state-listed threatened and endangered birds have the potential to occur on Wallops Island **(**VDGIF 2016; USFWS 2017a). These species are listed in **Table 3-3**. Two federal-listed threatened bird species, the piping plover and the rufa subspecies of the red knot, occur on beaches near the alternative sites. The federal-listed endangered roseate tern has been recorded at the nearby Chincoteague NWR (eBird 2017) but has not been documented at WFF and is not included in **Table 3-3** (NASA 2010; eBird 2017, NASA 2016a).

Table 3-3: Federal- and State-listed Threatened and Endangered Birds Documented at Wallops Island

Common Name	Status[1]
Bald Eagle	BGEPA
Gull-billed Tern	ST
Peregrine Falcon	ST
Piping Plover	FT and ST
Red Knot	FT and ST
Wilson's Plover	SE

Note: BGEPA= Bald and Golden Eagle Protection Act; FE=Federal-listed Endangered; FT=Federal-listed Threatened; SE=State Endangered; ST=State Threatened

Sources: VDGIF 2016; USFWS 2017a; NASA 2016a.

State-listed birds occurring in Accomack County (eBird 2017) and documented at WFF include Wilson's plover, gull-billed tern, and peregrine falcon. Although Wilson's plover occurs in the area in low densities, its entire Virginia breeding population occurs in the area (Watts 2006). Gull-billed terns would be expected to use the beach and mudflat near WFF from the spring through the fall; individuals were observed on August 3, 2009 flying south of the project site in an easterly direction (NASA 2010). Peregrine falcons occur in the WFF area year-round, although there is a peak in their numbers during fall migration, in particular during late September and early October (NASA 2010; eBird 2017).

Nine BCC breeding land birds and 10 BCC wintering land birds are believed to use the Delmarva Peninsula and Virginia Barrier Island region (Paxton and Wilson 2015). BCC that may occur on or within the vicinity of WFF include the following (species are listed in taxonomic order) (USFWS 2008a; NASA 2016a):

- American Bittern
- American Oystercatcher
- Bald Eagle
- Black Rail*
- Black Skimmer
- Blue-winged Warbler
- Brown-headed Nuthatch
- Buff-breasted Sandpiper (nb)**
- Cerulean Warbler*
- Golden-winged Warbler*
- Gull-billed Tern
- Horned Grebe (nb)
- Hudsonian Godwit (nb)
- Kentucky Warbler
- Least Bittern
- Least Tern
- Lesser Yellowlegs (nb)
- Marbled Godwit (nb)
- Nelson's Sparrow
- Peregrine Falcon
- Pied-billed Grebe
- Prairie Warbler
- Purple Sandpiper* (nb)
- Red Knot (nb)
- Red-headed Woodpecker
- Red-throated Loon (nb)
- Rusty Blackbird (nb)
- Saltmarsh Sparrow
- Seaside Sparrow
- Sedge Wren
- Semipalmated Sandpiper (nb)
- Short-billed Dowitcher (nb)
- Short-eared Owl (nb)
- Snowy Egret
- Solitary Sandpiper (nb)
- Upland Sandpiper (nb)
- Whimbrel (nb)
- Eastern Whip-poor-will
- Wilson's Plover
- Wood Thrush
- Worm-eating Warbler

* Indicates that the species has not been documented at WFF, although WFF is located within the species' normal range.
** nb = non-breeding; (i.e., birds with breeding ranges that do not include WFF); birds not indicated as nb may or may not breed in the area.

Blue-winged warblers are of high conservation concern across multiple bird conservation regions, including the area around Wallops Island. These birds are sparsely distributed across the northeastern United States, but follow coastal migration routes in the spring and fall (Gil *et al.* 2001). Therefore, blue-winged warblers may represent populations of high vulnerability to a coastal hazard.

Suitable habitat for the federally threatened piping plover and red knot (rufa subspecies) occurs adjacent to the alternative sites. These species are described in additional detail below.

Piping Plover

Atlantic Coast populations of piping plover are listed as threatened under the ESA (USFWS 2017a). These small shorebirds arrive in Accomack County in the spring in early to mid-March, breed in the area, and depart by mid-August (eBird 2017). To understand the presence and numbers of piping plovers near WFF, it is useful to look at both frequency (i.e., the percentage of eBird checklists that report the species) and high count (i.e., the highest count of a species submitted on a single checklist) in Accomack County. The frequency and high count of piping plovers in Accomack County are shown in **Figure 3-7** and **Figure 3-8**, respectively. From these figures, it is possible to estimate that piping plovers are relatively frequently encountered in the county (**Figure 3-7**) in numbers sometimes as high as 40 to 80 birds (**Figure 3-8**) in a single observation (eBird 2017).

Between 1986 and 2005, Virginia supported between 84 and 127 pairs of the Atlantic Coast population of piping plovers, representing 6 to 13 percent of that population. In that 20-year period, the number of breeding piping plover pairs on Wallops Island has fluctuated between 0 and 5, with a mean of approximately 2 pairs per year (Boettcher *et al.* 2007). More recent numbers for piping plover nesting observations are discussed below.

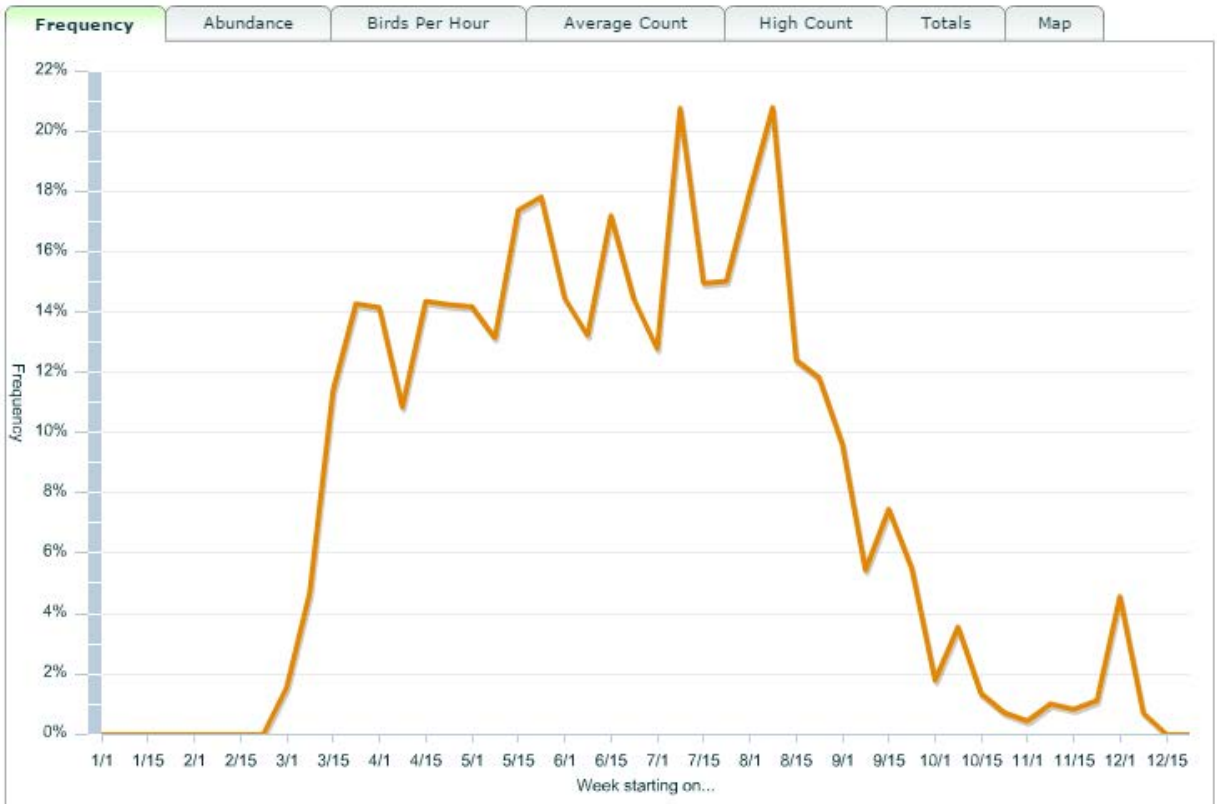


Figure 3-7: Percentage of eBird Checklists Reporting Piping Plovers in Accomack County

Source: eBird 2017.

Figure 3-8: High Counts of Piping Plovers in Accomack County on eBird Checklists

Source: eBird 2017.

As required by the USFWS Biological Opinion regarding ongoing operations on Wallops Island (USFWS 2016b), NASA has prepared a Protected Species Monitoring Plan and annually reports monitoring results to USFWS and VDGIF. In accordance with the Plan, NASA annually conducts piping plover surveys three to four times weekly from March to September, or when the last chick fledges. From March 2016 to September 2016, nine nests were found on the piping plover nesting area shown on **Figure 3-9** (NASA 2016c). The success of individual nests during 2016 ranged from 75 percent (with three of four chicks fledging from one nest) to 0 percent (with none of four chicks fledging due to predation). Five of the nests failed to produce fledgling chicks, while the other four nests had at least a 50 percent success rate. The overall success rate of the nine nests documented in 2016 was 26 percent. Nest failure and success during the 2016 season is summarized in **Table 3-4**.

Figure 3-9: Locations of Piping Plover Nests on Wallops Island in 2016

Source: NASA 2016b, unpublished data.

Table 3-4: 2016 Piping Plover Nesting Results at Wallops Island

Nest	Number of Eggs	Number of Eggs Hatched	Number of Chicks Fledged	Success Rate (percent)[1]
1	4	3	0	0
2	4	4	2	50
3	4	4	3	75
4	4	4	0	0
5	4	4	2	50
6	4	4	0	0
7	3	3	2	67
8	4	0	0	0
9	3	0	0	0
Totals	**34**	**26**	**9**	**26**

Note: Number of chicks fledged relative to number of eggs laid.
Source: NASA 2016b.

Although comparatively fewer shorebird species' mortalities have been reported at communication towers (which could be interpreted as these species being at lower collision risk), flocking shorebirds have been identified as being more prone to collision (Buchanan 2011). Little is known about piping plover migration behavior, flight altitude, or habitat use, all of which are factors in weighing collision risk (USFWS 1996). The majority of Atlantic Coast piping plover migratory movements is thought to take place along a narrow flight corridor including the outer beaches of the coastline, with rare offshore and inland observations (USFWS 1996). Piping plover visual acuity and maneuverability are known to be good, including night vision, suggesting that plovers may be able to identify and avoid structures in their flight paths (Burger *et al*. 2011; Staine and Burger 1994). Piping plover collisions with fixed structures in the coastal zone, including lighthouses, are rare, if not nonexistent in the literature (USFWS 2008b). However, the ability to avoid structures (such as the proposed tower), even if normally good, could be reduced in poor visibility conditions (Burger *et al*. 2011).

Red Knot

The rufa subspecies of red knot is listed as threatened under the ESA. These medium-size arctic-breeding shorebirds may be present year-round in Accomack County, although peak numbers occur during spring migration in May and again during fall migration between August and September (eBird 2017). Beaches of the Virginia Barrier Islands support a large portion of the overall population of red knots that stage on the Atlantic Coast, although this proportion has declined from 32 percent between 2007 and 2010 to 17 percent between 2011 and 2014. A larger proportion of red knots would likely pass WFF while migrating north in the spring (Paxton and Wilson 2015). This species has been documented at WFF during fall migration (NASA 2010).

To understand the presence and numbers of red knots near WFF, it is useful to look at both frequency (i.e., the percentage of eBird checklists that report the species) and average count (i.e., the average count of a species submitted on all checklists) in Accomack County. The frequency and high count of red knots in Accomack County are shown in **Figure 3-10** and **Figure 3-11**, respectively. High count data for red knots is more difficult to visualize than average count data due to some extremely large counts from Chincoteague NWR in the early 1980s (eBird 2017). From these data, it is possible to estimate that red knots are encountered at variable frequencies in the county (**Figure 3-10**, **Figure 3-11**), but with more frequent sightings in spring and fall. Data from eBird indicates that numbers of red knots drop in the winter, with average counts fewer than 20 birds from December through April, but between 40 and greater than 300 individuals during the rest of the year, and peak numbers in the spring (**Figure 3-11**) (eBird 2017).

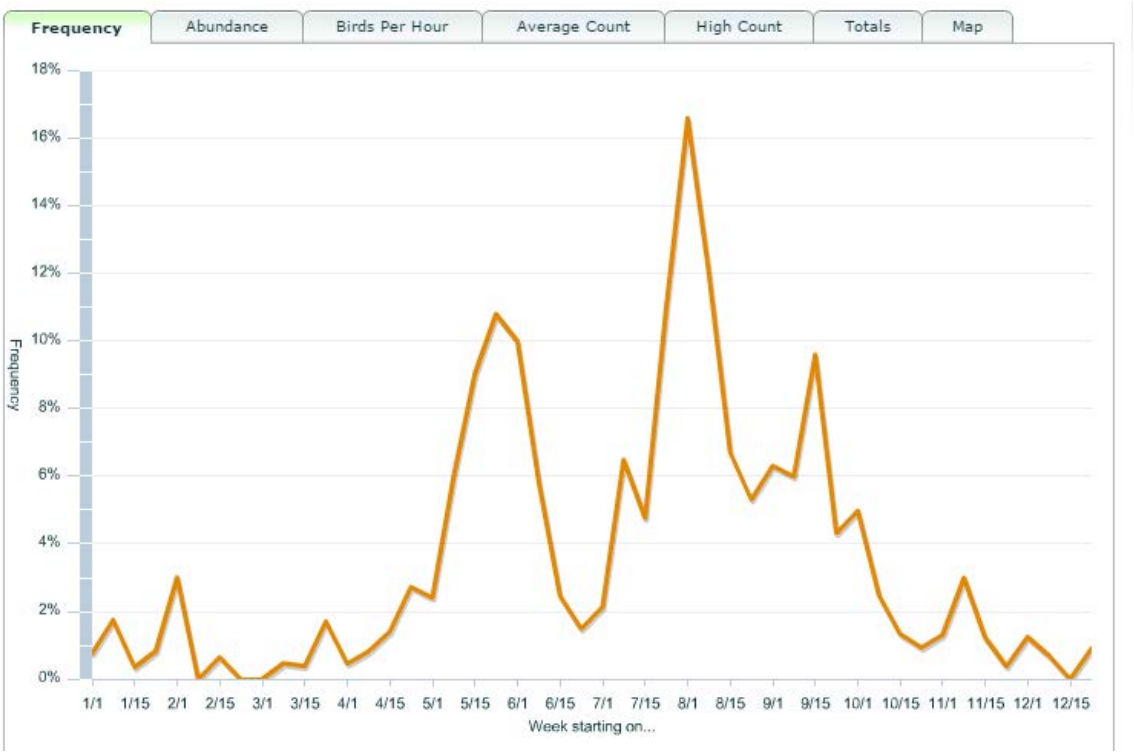


Figure 3-10: Percentage of eBird Checklists Reporting Red Knots in Accomack County

Source: eBird 2017.

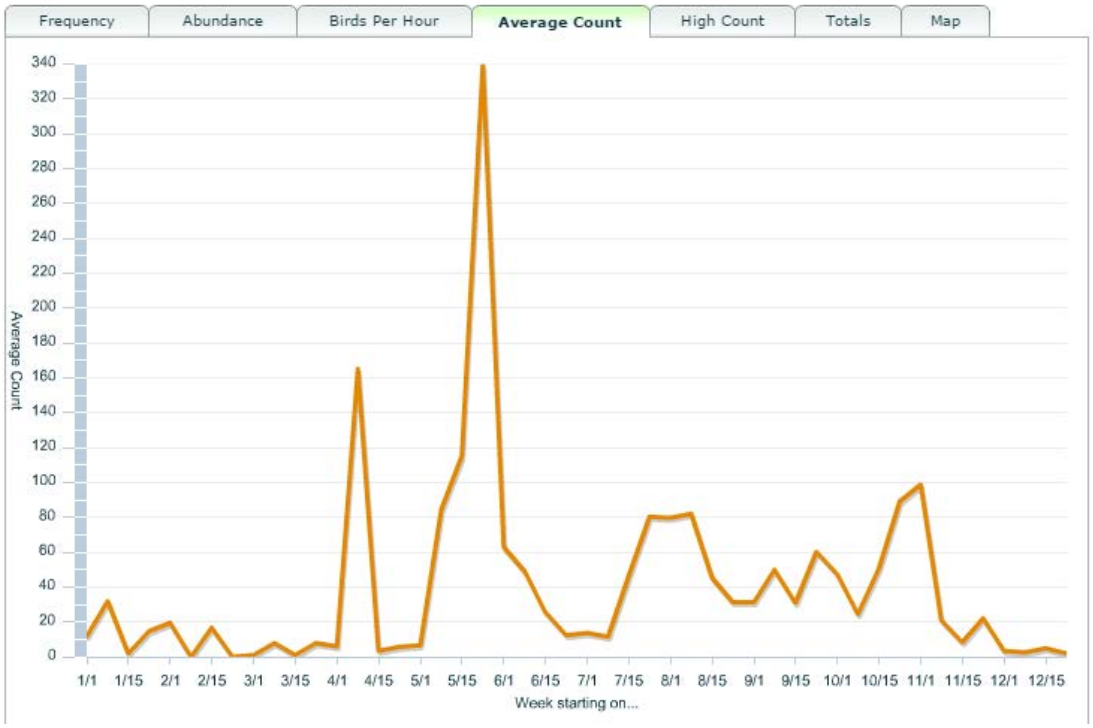


Figure 3-11: Average Counts of Red Knots in Accomack County on eBird Checklists

Source: eBird 2017.

In accordance with the WFF Protected Species Monitoring Plan and in conjunction with piping plover surveys, NASA conducts annual surveys for red knots. Results of red knot surveys on the north end of Wallops Island from 2010 through 2016 are shown in **Figure 3-12**.

The highest counts recorded at WFF occurred during the month of May 2012 when NASA observed almost 3,500 red knots on Wallops Island. Monitoring conducted in 2012 yielded the second highest counts with slightly more than 2,500 individuals (NASA 2016c).

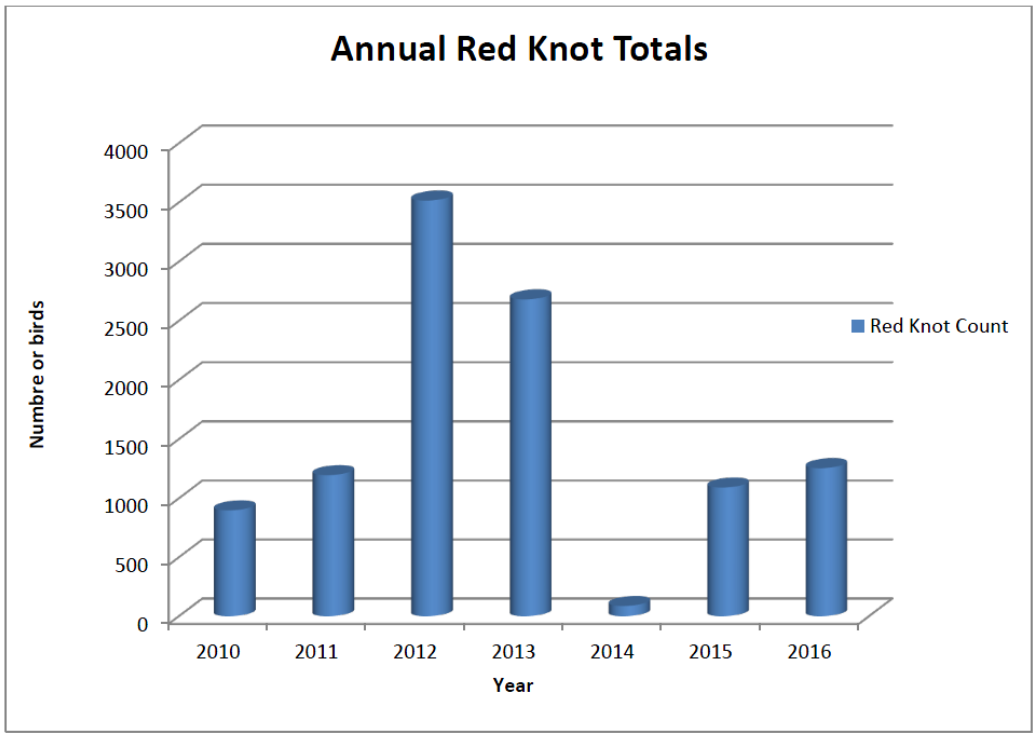


Figure 3-12: Annual Red Knot Totals

Source: NASA 2016b.

Bird Species of Concern Associated with Nearby Conservation Sites

The Virginia Department of Conservation and Recreation's (VDCR) Division of Natural Heritage (DNH) program has identified five Conservation Sites at WFF: two on Wallops Island, North Wallops Island and North Assawoman/South Wallops Island; two on the Main Base, Little Mosquito Creek and Wallops Main Base Airfield Swale; and one on Mainland and the west side of central Wallops Island, Wallops Island Causeway Marshes (Fleming 1996).

Bird species of concern associated with two of the Conservation Sites, the 1,600-acre Wallops Island Causeway Marshes and the approximately 100-acre North Assawoman/South Wallops Island sites, could potentially be affected by the proposed tower. VDCR-DNH has assigned the Causeway Marshes site a biodiversity significance ranking of B4, representing a site of moderate significance. The natural heritage resources of concern at this site are the saltmarsh sparrow (*Ammodramus caudacutus*) and northern harrier (*Circus cyaneus*), which have not been observed on Wallops Island but for which suitable habitat is present. A biodiversity significance ranking of B3 has been assigned to the North Assawoman/South Wallops Island site, representing a site of high significance. Its species of concern are the piping plover, Wilson's plover, and least tern (Fleming 1996).

Terrestrial Mammals

The northern long-eared bat is a federal-listed threatened species throughout its range (80 *Federal Register* 17974), which includes Virginia and more than 30 other states in the eastern and north-central United States. This species roosts singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees during the summer months (i.e., approximately April through August) and hibernates in caves or mines during the winter. Breeding occurs prior to winter hibernation, and females give birth to a single pup the following summer. Individual bats forage three to ten feet above the ground between the understory and canopy of forested hillsides and ridges, with peak foraging activity occurring within five hours after sunset (U.S. Nuclear Regulatory Commission 2015).

White-nose syndrome, a fungal disease known to affect bats, is currently the predominant threat to the northern long-eared bat, especially throughout the northeastern United States where the species has declined by up to 99 percent from pre-white-nose syndrome levels at many hibernation sites. Impacts on winter hibernacula and loss or degradation of summer habitat are additional factors affecting the mortality of the species.

The USFWS published the final ESA 4(d) rule for the northern long-eared bat in the *Federal Register* on January 14, 2016 (81 *Federal Register* 1900-1922). Under Section 4(d) of the ESA, the USFWS may issue regulations deemed "necessary and advisable to provide for the conservation of threatened species." It enables the USFWS to promulgate special rules for species listed as threatened that provide flexibility in implementing the ESA (USFWS 2017b).

The final 4(d) rule for the northern long-eared bat identifies prohibitions that focus on protecting the bat's sensitive life stages in areas affected by white-nose syndrome, which includes Accomack County. As such, the northern long-eared bat final 4(d) rule prohibits all "purposeful take" of the species, defined as the intentional destruction, harm, or disturbance of the species, except in specific situations generally related to the protection of human health and safety. Activities potentially resulting in the "incidental take" of northern long-eared bats (i.e., activities that do not intentionally target the species, such as the removal of trees potentially providing habitat to facilitate a construction project) are allowed without a permit under the final 4(d) rule except when either of the following circumstances apply (USFWS 2017c):

- When the activity occurs within 0.25 mile of a known northern long-eared bat hibernaculum, or
- When the activity involves the disturbance or destruction of a known occupied maternity roost tree, or any other tree within a 150-foot radius of a maternity roost tree, during the species' pup season from June 1 through July 31 of any year.

The northern long-eared bat final 4(d) rule established a streamlined Section 7 consultation process with regard to the species. Under the streamlined Section 7 consultation process, a federal agency may determine that a proposed activity occurring within areas affected by white-nose syndrome "may affect, but is not likely to adversely affect" the northern long-eared bat if the activity does not result in the purposeful take of the species, does not occur within 0.25 mile of a known hibernaculum, or does not affect known maternity roost trees or trees within a 150-foot radius of maternity roost trees. The agency is required to submit documentation of the proposed activity to the USFWS office with jurisdiction over the project site, but USFWS concurrence with the agency's determination may be assumed if the USFWS does not respond within 30 days of the submission (USFWS 2017c).

The range of the northern long-eared bat includes Accomack County. During acoustic bat surveys conducted in the marshes on Wallops Island and between the island and Mainland in 2008, 0.3 percent of the calls identified were attributed to myotids (Stantec Consulting 2008 in NASA 2016a). While northern long-eared bats were not separated from the rest of the guild, it is reasonable to assume that this species could occur in the vicinity of WFF, as suitable summer habitat is present (NASA 2016a).

Trees providing maternity roost habitat for the northern long-eared bat have not been documented on either of the alternative sites at Wallops Island. Winter hibernacula suitable for the species have not been documented at or near Wallops Island (VDGIF 2017).

Species Most Sensitive to Collisions with Towers

Collision mortality is an added burden for populations already in decline for other reasons. The Connecticut warbler (*Oporornis agilis*) falls under this category. On the "watch list" due to significant declines in population, this species has been identified as a "super collider" (Arnold and Zink 2011).

Species that rely on tidal salt marsh and brackish marsh habitats have a spatially restricted movement corridor. This increases the risk of collision with tall structures and could particularly impact species such as the saltmarsh sparrow, Nelson's sparrow (*Ammodramus nelsoni*), and seaside sparrow (*Ammodramus maritimus*), all of which have potential to occur at WFF. These species are of high conservation concern over their breeding grounds and throughout their breeding range in the New England/Mid-Atlantic Coasts and Atlantic Northern Forest Bird Conservation Regions (Wilson and Watts 2013). Sparrows are one of the species groups frequently found in tower collision mortality data (APLIC 2012).

3.2.2.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed instrumentation tower would not be built and existing conditions at Wallops Island would continue. This would have no effect on special-status species at Wallops Island.

Proposed Action Alternative (Preferred Alternative): Building X-015 Site

Birds

As discussed for avifauna in **Section 3.2.1.3**, implementation of the Proposed Action Alternative would have negligible effects on habitat loss and fragmentation for special-status species, as the Proposed Action Alternative site is relatively small in the context of available habitat on and in the vicinity of Wallops Island; previously disturbed and periodically maintained; adjacent to existing development; removed from the shoreline habitat of the majority of Wallops Island special-status species; and of generally low habitat quality.

Implementation of the Proposed Action Alternative would not result in any construction in areas within known piping plover nesting or foraging habitat. Although documented piping plover collisions with fixed structures in the coastal zone are rare if not non-existent, the ability to avoid structures such as the proposed tower could be reduced in poor visibility conditions (Burger *et al.* 2011) and interaction with guy wires is possible in all weather conditions (USFWS 2008b). Months with high rates of IFR events (indicating higher chance of poor visibility) (**Figure 3-6**) and high occurrence of piping plovers include mid-February through May (**Figure 3-7**, **Figure 3-8**) when there are nine to twelve IFR events per month.

The proposed tower would be located outside known foraging habitat of the red knot, but collision risk during migration cannot be discounted. Although red knot cruising altitude is between 3,300 and 9,800 feet AGL (Burger *et al.* 2011), well above the height of the proposed tower or guy wires, the most serious risk would occur when northbound long-distance spring migrants make landfall. Additionally, inclement weather conditions could increase collision risk, as could flocking behavior. Collision risk would be the highest during the month of May, as it is the month with elevated average occurrences of IFR events (nine) at WFF (**Figure 3-8**) and high occurrences of red knots in Accomack County (**Figure 3-10** and **Figure 3-11**).

Based on this analysis, the Proposed Action Alternative would have no impact on habitat of the piping plover or red knot, as no such habitat is present on the alternative site. However, the Proposed Action Alternative would have the unlikely potential to adversely affect individual piping plovers and red knots while in flight as a result of possible collision with the proposed tower and associated guy wires.

Generally, the Proposed Action Alternative would pose risks of collision to special-status species of birds similar to those described for common bird species in **Section 3.2.1.3**. Risks would vary from low to high

depending on the species. Additional risks would include additional exposure (i.e., the relative level a population is expected to overlap with the alternative site) to land birds, and population vulnerability. Exposure/collision risk and population risk for special-status birds are summarized in **Table 3-5**.

Table 3-5: Risks from the Proposed Action Alternative to Special-Status Birds Documented on Wallops Island

Common Name	Population Exposure[1]	Population Vulnerability[2]	Collision Risk[3]	Population Risk[4]
American Bittern			Medium	Low
American Oystercatcher			High	Medium
Bald Eagle			Low	Low
Black Skimmer			High	Medium
Blue-winged Warbler	High	High		
Brown-headed Nuthatch	Low	Low		
Buff-breasted Sandpiper (nb)[5]			Low	Low
Cerulean Warbler	High	Low		
Eastern Whip-poor-will	High	Low		
Gull-billed Tern			Medium	Low
Horned Grebe (nb)			Medium	Low
Hudsonian Godwit (nb)			Low	Low
Kentucky Warbler	High	Moderate-High		
Least Bittern			High	Medium
Least Tern			Medium	Medium
Lesser Yellowlegs (nb)			Medium	Low
Marbled Godwit (nb)			Medium	High
Nelson's Sparrow	High	Low		
Peregrine Falcon			Low	Medium
Pied-billed Grebe			High	Low
Piping Plover			Medium	High
Prairie Warbler	High	Low		
Red Knot (nb)			High	High
Red-headed Woodpecker	High	Low		
Red-throated Loon (nb)			Low	Medium
Rusty Blackbird (nb)	High	Low		
Saltmarsh Sparrow	High	Low		
Seaside Sparrow	High	Low		
Sedge Wren	High	Low		
Semipalmated Sandpiper (nb)			High	Low
Short-billed Dowitcher (nb)			High	High
Short-eared Owl (nb)			Low	Low
Snowy Egret			High	Low
Solitary Sandpiper (nb)			Low	Low
Upland Sandpiper (nb)			Low	Low
Whimbrel (nb)			High	High
Wilson’s Plover			Low	Low
Wood Thrush	High	High		
Worm-eating Warbler	High	Moderate-High		

Notes:
1. Population exposure refers to the relative level a population is expected to overlap with the proposed sites.
2. Population vulnerability refers to the level in which a population may respond negatively to a demographic disturbance.
3. Collision risk based on assessment of wing/body morphology, flight characteristics, flocking habits, nocturnal movements, habitat use, and population exposed to hazard.
4. Population risk based on assessment proportion of population exposed to hazard.
5. nb = non-breeding

Source: Paxton and Wilson 2015.

To varying degrees, the risk of collision potentially posed by the proposed tower would be reduced with appropriate mitigation. As described in **Section 2.2.1,** the USAF would incorporate proactive measures to minimize effects on avian species, including special-status bird species. This would include meeting FAA standards for lighting and marking during both construction and operation of the proposed tower (FAA 2016), among other measures.

While such measures would minimize the risk of collision to special-status bird species, such risk would not be eliminated altogether. Continued research and monitoring of bird collisions and mortality at the site of the proposed tower is recommended. As described in **Section 2.2.1**, such research and monitoring could include allowing access to the proposed tower site by USFWS personnel, researchers, and/or other visitors with a pertinent interest in the interaction of birds or other wildlife with the proposed tower. In addition, the USAF has prepared an MMP in consultation with the USFWS and VDGIF. A copy of the MMP is included in **Appendix C**. USFWS and VDGIF concurred with the measures outlined in the MMP in emails dated September 14 and September 26, 2017, respectively.

With implementation of these monitoring and mitigation measures, impacts on special-status species of birds would be less than significant.

The USAF has consulted with the USFWS in accordance with Section 7 of the ESA to determine effects on federal-listed species of birds potentially resulting from the Proposed Action Alternative. In an email dated April 11, 2017 the USFWS concurred with the USAF's determination that the Proposed Action Alternative may affect, but is not likely to adversely affect rufa red knots and piping plovers occurring at Wallops Island. Copies of correspondence relevant to this consultation are included in **Appendix A.**

Terrestrial Mammals

None of the activities included in the Proposed Action Alternative involve the purposeful take of individual northern long-eared bats. However, construction activities and the presence of associated cranes or other equipment have the potential to disorient individual northern long-eared bats during the project's construction phase, adversely affecting their navigation, flight, and/or feeding patterns. Similarly, individual northern long-eared bats could be affected by the presence of the tower structure and associated guy wires during the operational phase of the Proposed Action Alternative.

The construction and operation of the proposed tower would not involve the disturbance or removal of known maternity roost trees or trees within 150 feet of known maternity roost trees, nor would it disturb or destroy winter hibernacula or trees within 0.25 mile of winter hibernacula. To minimize adverse impacts on the northern long-eared bat during the construction or periodic maintenance of the proposed tower, the USAF would adhere to the following avoidance and minimization measures:

- To the greatest extent possible, trees on the Proposed Action Alternative site potentially providing habitat for the northern long-eared bat would not be removed between June 1 and July 31 of any year.
- Should the USAF determine that the removal of trees three inches diameter at breast height (DBH) or greater is required between June 1 and July 31, it would either:

    1. Conduct a bat emergence survey (one surveyor per 10 trees) one to two days prior to the scheduled tree removal; or

    2. Conduct a presence/absence survey of the affected area, employing a qualified bat surveyor.

All survey results would be provided to the USFWS. If the removal of maternal roost trees occupied by northern long-eared bats is planned between June 1 and July 31, additional consultation with the USFWS would be required.

While components of the Proposed Action Alternative could result in incidental take of individual northern long-eared bats, particularly from individuals colliding with the tower during its operational phase, such effects are anticipated to remain minimal and would not threaten the continued propagation of the species.

Energy emitted by equipment mounted on the tower is not anticipated to adversely affect individual northern long-eared bats flying near the tower. Based on the information presented in **Section 3.2.2.2, *Terrestrial Mammals***, the presence and operation of communication towers is not a primary influence on the mortality of northern long-eared bats. The relocation of the telemetry dish would have no impacts on the northern long-eared bat, as the dish would be installed on existing infrastructure on the Mainland or Wallops Island. For these reasons, short- and long-term impacts on the northern long-eared bat resulting from the Proposed Action Alternative would be negligible.

The USAF has consulted with the USFWS in accordance with Section 7 of the ESA to determine effects on the northern long-eared bat potentially resulting from the Proposed Action Alternative. In an email dated April 11, 2017 the USFWS concurred with the USAF's determination that the Proposed Action Alternative may affect, but is not likely to adversely affect, northern long-eared bats occurring at Wallops Island. Copies of correspondence relevant to this consultation are included in **Appendix A.**

Alternative 1: Building X-079 Site

Impacts on special-status bird species and the northern long-eared bat resulting from Alternative 1 would be similar to those described for the Proposed Action Alternative, as the alternative sites are ecologically similar and located in proximity to one another.

3.3 SOCIAL ENVIRONMENT

This section describes resources of the social environment that could be affected by the alternatives considered. Social resources discussed in this section include cultural resources and visual quality and aesthetics.

3.3.1 CULTURAL RESOURCES

Cultural resources are defined as prehistoric or historic sites, buildings, structures, objects, or other physical evidence of human activity that are considered important to a culture or community for scientific, traditional, or religious reasons.

3.3.1.1. Regulatory Context

The National Historic Preservation Act of 1966 (NHPA), as amended, outlines federal policy to protect historic properties and promote historic preservation in cooperation with other nations, tribal governments, states, and local governments. Section 106 of the NHPA and its implementing regulations require federal agencies to consider the effects of their proposed actions on historic properties before undertaking a project. Under Section 106, federal agencies are responsible for delineating the Area of Potential Effects (APE) in which impacts from a proposed action may occur; identifying historic properties present within the APE; assessing the potential effects of the undertaking on those historic properties; and considering ways to avoid, minimize, and mitigate any adverse effects. Federal agencies are further required to initiate consultation with the State Historic Preservation Officer (SHPO) for actions that may impact historic properties; VDHR serves as the SHPO for the Commonwealth of Virginia.

3.3.1.2. Affected Environment

Archaeological and Architectural Resources

In December 2014, NASA, VDHR, and the Advisory Council on Historic Preservation, in consultation with Native American tribes, executed a Programmatic Agreement (PA) for the management of facilities, infrastructure, and sites at WFF (NASA 2014b). The PA sets forth a streamlined process for NASA's compliance with Section 106 of the NHPA when agreed-upon criteria are met and procedures in the PA are followed. Appendix G of the PA defines activities occurring at WFF with limited potential to affect historic resources including launch/flight operations, new construction that does not directly impact or alter identified archaeological sites, and ground disturbance in areas having low archaeological sensitivity as identified in a cultural resources assessment prepared for WFF in 2003 (NASA 2003).

In consultation with VDHR, the direct APE for the analysis of physical impacts on historic properties potentially resulting from the Proposed Action was defined as the tower footprint and any associated cable runs and equipment shelters. A three-mile radius around the proposed tower, extended to include the Assateague Beach Coast Guard Station (also known as the Assateague Beach Life Saving Station), was defined as the indirect APE for assessing visual impacts on nearby historic properties potentially resulting from the Proposed Action. The indirect APE is shown on **Figure 3-13**.

No architectural resources or archaeological sites have been documented within the direct APE of the alternative sites (NASA 2016d). Both alternative sites are located in areas identified in the 2003 Cultural Resources Assessment as having low archaeological sensitivity (NASA 2003).

Twenty-seven architectural resources, 50 years and older, within the indirect APE[9] were surveyed in a cultural resources assessment prepared by NASA in 2016 (NASA 2016d) to assess effects potentially resulting from the Proposed Action Alternative. Sixteen properties included in the 2016 assessment had not been previously evaluated. Properties evaluated in the 2016 assessment are summarized in **Table 3-6**. Map symbols included in the first column of **Table 3-6** correspond to the locations of the resources shown on **Figure 3-13**.

Within the indirect APE, two properties were previously listed in the National Register of Historic Places (NRHP) and Virginia Landmarks Registry (VLR), and two had been previously identified as eligible for listing in the NRHP. Two properties that had not been previously surveyed, consisting of one individual historic property and one historic district comprising eight architectural resources, were recommended as eligible for listing in the NRHP and VLR by the 2016 assessment (NASA 2016d).

With the exception of the Wallops Beach Life Saving Station and Observation Tower, none of the NRHP-listed, eligible, and recommended eligible properties evaluated in the assessment are located on Wallops Island. All of the NRHP-listed, eligible, and recommended eligible properties are located more than two miles from the alternative sites. The remaining 14 resources evaluated in the 2016 assessment, all of which had not been previously evaluated, were determined not eligible for listing in the NRHP. No further cultural resource investigations with respect to the Proposed Action were recommended by the 2016 assessment.

[9] The NRHP-listed Assateague Lighthouse was also analyzed in the 2016 cultural resources assessment but is located outside the indirect APE, approximately 8.4 miles northeast of the alternative sites, and is not shown on **Figure 3-13**.

Sources: Spatial Data courtesy of NASA (2016); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure 3-13: Indirect APE of the Proposed Action Alternative Site and Associated Architectural Resources

Table 3-6: Summary of Properties Evaluated in the 2016 Cultural Resources Assessment

Map Symbol	VDHR No.	Name	Property Type	NRHP Status
A	001-0052	Mount Wharton	Residential, 1772 Dwelling	**NRHP Eligible, SHPO Opinion 2008**
B	001-0050	Wharton Place	Residential, 1797 Dwelling	**NRHP-Listed 1972, VLR Listed 1972**
C	001-0172	Assateague Beach Coast Guard Station[1]	Military/Defense, 1922 Dwelling	**NRHP-Listed 2015, VLR Listed 1973**
(not shown on **Figure 3-13**)	001-0078	Assateague Lighthouse	Government, 1867 Lighthouse	**NRHP-Listed 1973, VLR Listed 1973**
D	001-0027-0100/ 001-0027-0101	Wallops Beach Life Saving Station and Observation Tower	Military/Defense, 1936 Dwelling/Tower	**NRHP Eligible, SHPO Opinion 2005**
E	Not Applicable (NA)	House on Point Breeze Lane	Residential, Circa 1890 Dwelling	**Recommended NRHP and VLR Eligible**
F1	NA	Wisharts Point Historic District	Residential, 1900 Dwelling	**Recommended NRHP and VLR Eligible**
F2			Residential, 1920 Dwelling	
F3			Residential, 1920 Dwelling	
F4			Residential, 1920 Dwelling	
F5			Residential, 1920 Dwelling	
F6			Residential, 1900 Dwelling	
F7			Residential, 1920 Dwelling	
F8			Residential, 1900 Dwelling	
G	NA	NA	Residential, 1900 Dwelling	Not Eligible
H	NA	NA	Residential, 1920 Dwelling	Not Eligible
I	NA	NA	Residential, 1920 Dwelling	Not Eligible
J	NA	NA	Residential, 1920 Dwelling	Not Eligible
K	NA	NA	Residential, 1920 Dwelling	Not Eligible
L	NA	NA	Residential, 1900 Dwelling	Not Eligible
M	NA	NA	Residential, 1920 Dwelling	Not Eligible
N	NA	NA	Residential, 1900 Dwelling	Not Eligible
O	NA	NA	Residential, 1900 Dwelling	Not Eligible
P	NA	NA	Residential, 1910 Dwelling	Not Eligible
Q	NA	NA	Residential, 1918 Dwelling	Not Eligible
R	NA	NA	Residential, 1930 Dwelling	Not Eligible
S	NA	NA	Residential, 1768 Dwelling	Not Eligible
T	NA	NA	Residential, 1930 Dwelling	Not Eligible

Note:
1. Also referred to as the Assateague Beach Life Saving Station.
Source: NASA 2016c.

In response to a request from VDHR dated April 4, 2017, the USAF conducted a Phase II reconnaissance-level architectural survey of the recommended-eligible Wisharts Point Historic District. The purpose of the survey was to provide additional information on the district and individual properties comprising the district. The Phase II survey also provided scaled, georeferenced visual simulations of the proposed tower as viewed from the recommended-eligible Wisharts Point Historic District, a house on Point Breeze Lane, and the listed Assateague Beach Coast Guard Station, Wharton Place, and Mount Wharton, to determine if the proposed tower would have adverse effects on the integrity of those properties (i.e., viewshed effects). The survey was conducted in accordance with VDHR's *Guidelines for Conducting Historic Resources Survey in Virginia* dated October 2011 (URS 2017). A copy of the Phase II survey is included in **Appendix A**.

Traditional Cultural Resources

No traditional cultural resources have been documented or are otherwise known to exist on Wallops Island. As part of the public scoping process for this EA, the USAF sent letters to the Pocomoke Indian Nation, Catawba Indian Nation, and Pamunkey Indian Tribe requesting information on any potential tribal interest that might be affected by the Proposed Action.

In its response dated March 8, 2016, the Catawba Nation stated that it has no immediate concerns with regard to traditional cultural properties, sacred sites or Native American archaeological sites within the boundaries of the proposed project areas. In addition, the Catawba Nation requested that it be notified if Native American artifacts and/or human remains are located during ground-disturbing activities associated with the Proposed Action. A copy of the Catawba Nation's response is included in **Appendix A**.

To date, no response from the Pocomoke Indian Nation or the Pamunkey Indian Tribe has been received.

3.3.1.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed instrumentation tower would not be built and existing conditions at Wallops Island would continue. This would have no effect on cultural resources.

Proposed Action Alternative (Preferred Alternative): Building X-015 Site

All ground disturbance associated with the Proposed Action Alternative would occur within areas modeled as having low sensitivity for prehistoric and historic archaeological sites. As such, it is anticipated that no archeological resources would be encountered. Ground disturbance associated with the Proposed Action Alternative would be conducted in accordance with the terms of the 2014 PA described in **Section 3.3.1.2**.

In the event that previously unknown archaeological artifacts or human remains are encountered during ground disturbing activities associated with the Proposed Action Alternative, the USAF's contractor would be required to halt work and immediately contact WFF's Cultural Resources Manager. The WFF Cultural Resources Manager would, in accordance with the 2014 PA, consult with VDHR to: 1) determine the significance of the resource, 2) evaluate the effects of the undertaking on the resource, and 3) identify the appropriate avoidance or mitigation measures.

The 2016 cultural resources assessment noted that the proposed tower would have the potential to be visible from the six listed or eligible properties and the one eligible historic district evaluated in the assessment. However, the 2017 Phase II survey determined that the Proposed Action Alternative would have no effect on the integrity of the recommended-eligible and listed properties, as vegetation blocks the view of the alternative sites from the recommended-eligible Wisharts Point Historic District, the southwest (i.e., rear) property lines of the individual properties comprising the district (the primary views of these individual properties face to the northeast, away from the alternative sites), and the other listed or recommended-eligible properties evaluated in the Phase II survey (URS 2017). Visual simulations of the proposed tower on the Proposed Action Alternative site as potentially viewed from these listed or recommended-eligible properties are included in the Phase II survey (**Appendix A**).

The relocation of the telemetry dish included in the Proposed Action Alternative would have no indirect effects on the viewsheds of surrounding eligible and/or recommended eligible NRHP properties, as the dish would be installed on existing infrastructure on the Mainland or Wallops Island. Its appearance would be consistent with other facilities and equipment that support the missions of WFF and its tenants. Considering the relatively small size of the telemetry dish (i.e., approximately 2 feet in diameter), its appearance would be virtually indistinguishable from the surrounding landscape when viewed from nearby eligible and/or recommended eligible NRHP properties.

No traditional cultural resources have been documented or are otherwise known to exist on Wallops Island. Thus, it is anticipated that the Proposed Action Alternative would have no effects on traditional cultural resources.

The USAF has consulted with VDHR in accordance with Section 106 of the NHPA with respect to the Proposed Action. The USAF determined that the Proposed Action Alternative would not adversely affect NRHP-listed or eligible properties within the indirect APE. In a letter dated September 8, 2017, VDHR concurred with the USAF's determination. Copies of correspondence relevant to Section 106 consultation for the Proposed Action Alternative are included in **Appendix A**.

Alternative 1: Building X-079 Site

Similar to the Proposed Action Alternative, all ground disturbances resulting from Alternative 1 would occur within areas modeled in the 2003 WFF cultural resources assessment as having low sensitivity for prehistoric and historic archaeological sites. As such, it is anticipated that no archeological resources would be encountered. Ground disturbance associated with Alternative 1 would be conducted in accordance with the terms of the 2014 PA described in **Section 3.3.1.2**. In the event that previously unknown archaeological artifacts or human remains are identified during the construction of Alternative 1, the USAF's contractor would be required to halt work and immediately contact WFF's Cultural Resources Manager.

The 2016 assessment only evaluated effects on historic properties within the indirect APE for the Proposed Action Alternative. However, based on the analysis presented in the 2017 Phase II survey, the proposed tower built on the Alternative 1 site would not be visible from the listed or recommended-eligible historic district or properties evaluated in the survey and thus, would have no adverse effects on those properties or district. VDHR concurred with this determination in a letter dated September 8, 2017. Copies of correspondence relevant to Section 106 consultation for the Proposed Action are included in **Appendix A**.

No effects on traditional cultural resources resulting from the implementation of Alternative 1 are anticipated.

3.3.2 VISUAL QUALITY AND AESTHETICS

3.3.2.1. Regulatory Context

NEPA requires the consideration of visual resources when analyzing the potential effects of a federal proposed action. The affected environment for visual resources and aesthetics includes areas on and outside Wallops Island and WFF from which the proposed tower would potentially be visible.

3.3.2.2. Affected Environment

The visual environment of Virginia's and Maryland's Eastern Shore in the vicinity of WFF is characterized by predominantly rural, low density development that includes agricultural lands, wooded areas, small towns, scattered commercial and light industrial uses, and single family residences. Buildings and structures are generally low in height, with the exception of some light industrial facilities and agricultural-related structures, such as grain storage silos. Concentrations of development are infrequent and are generally located along U.S. Highway 13, which is the primary north-to-south highway along the Eastern Shore in Maryland and Virginia.

Fifteen free-standing or guyed towers registered with the FCC ranging in height from approximately 193 to 500 feet are located in Accomack County, Virginia (FCC 2016). Five of these towers exceed 330 feet, with three located within a 10-mile radius of Wallops Island. These include a guyed tower 500 feet in height located approximately 7.5 miles northeast on Chincoteague Island, a 330-foot guyed tower located approximately 7.6 miles to the southwest near Metompkin, and a 476-foot guyed tower located approximately five miles to the west in Mappsville (FCC 2016). In addition, 12 communication towers exceeding 100 feet in height are located at WFF; of these, one is 200 feet tall, and two exceed 300 feet in height (NASA 2017a).

Visual characteristics at Wallops Island consist of relatively low-rise administrative, maintenance, and warehouse-type facilities ranging in height from approximately one to three stories, as well as a number of elevated structures substantially greater in height. Such taller structures include water tanks, communications towers, and rocket launch pad gantries. Two of the taller structures on the island, an

existing 335-foot tall, free-standing communications tower and a 300-foot tall water tower, are located near the alternative sites.

Generally, existing elevated structures are distributed across the island, thereby avoiding concentrations of visual "clutter" in any particular area. As shown in **Figure 3-14** through **Figure 3-18**, a number of the taller structures on Wallops Island are visible at varying distances as an observer approaches the island from the northwest (the perspectives of these figures are keyed to the locations indicated in the callouts on **Figure 3-13**).

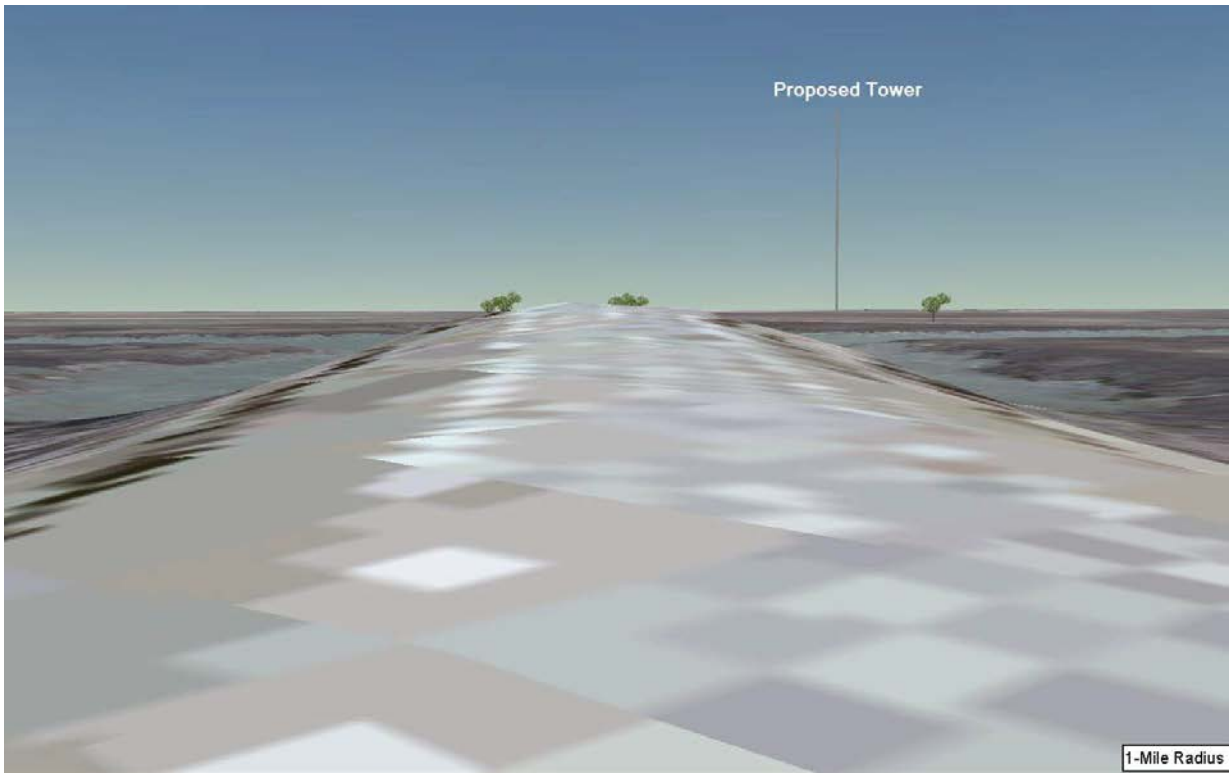


Figure 3-14: Photo-simulation of Proposed Action Alternative from 1 Mile

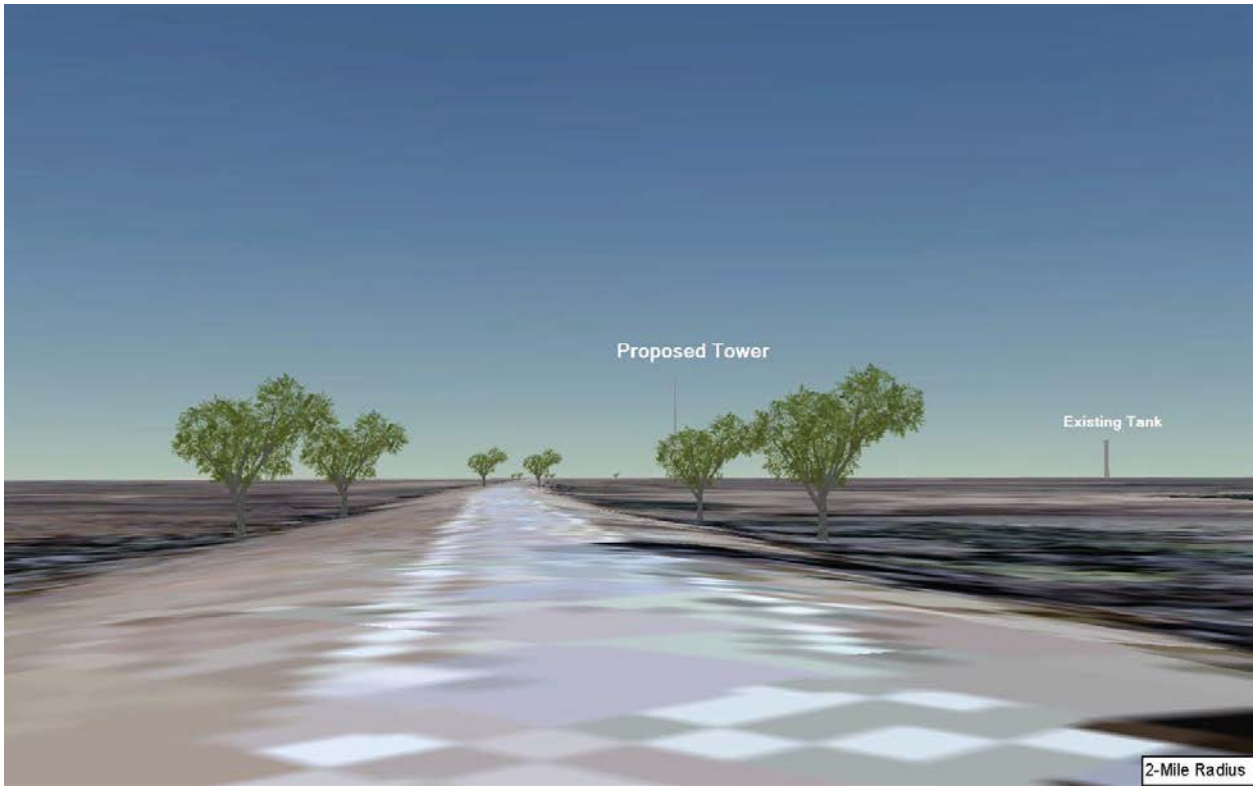


Figure 3-15: Photo-simulation of the Proposed Action Alternative from 2 Miles

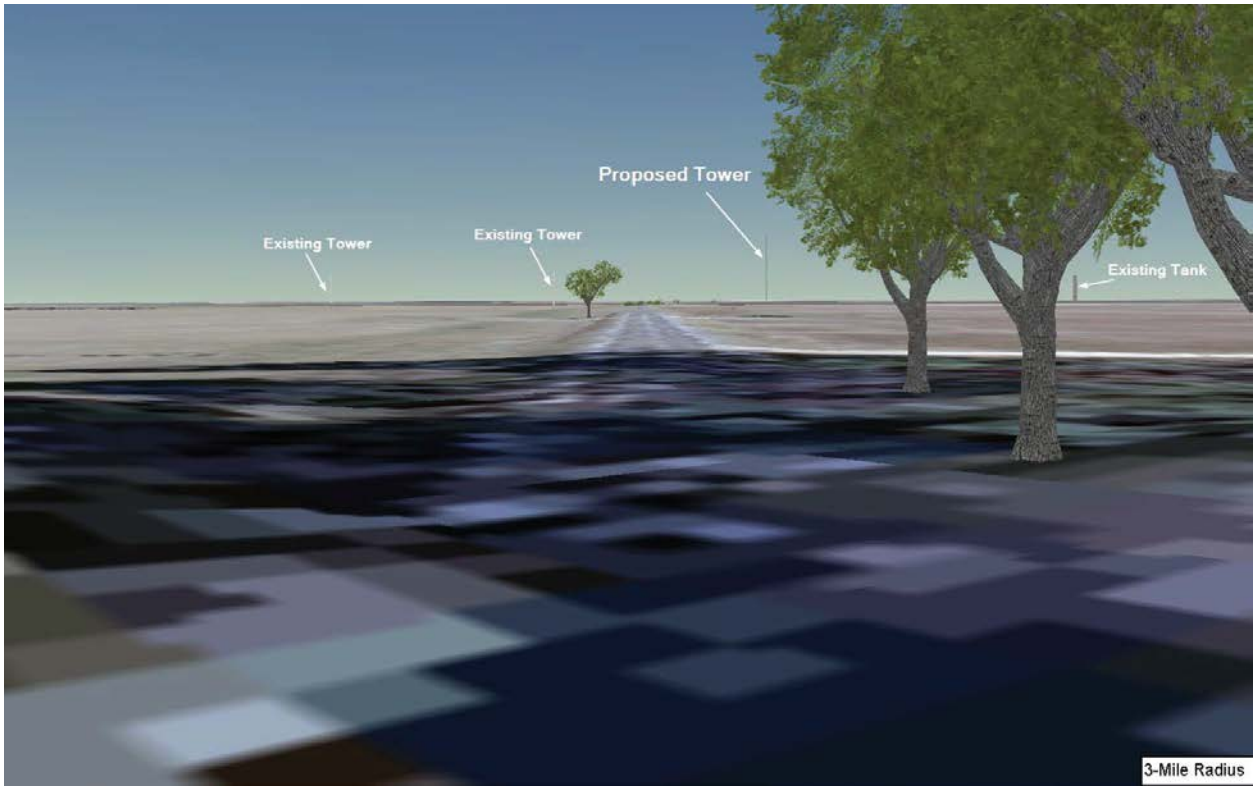


Figure 3-16: Photo-simulation of the Proposed Action Alternative from 3 Miles

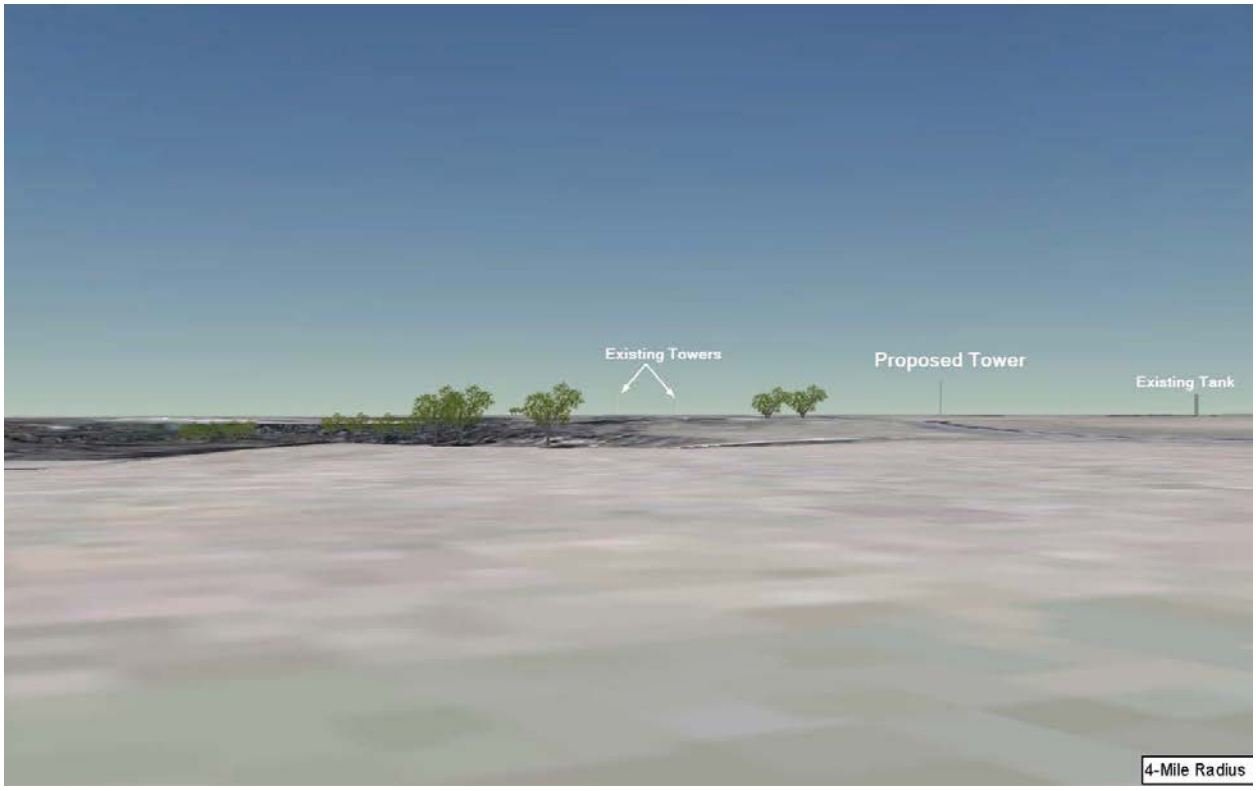


Figure 3-17: Photo-simulation of the Proposed Action Alternative from 4 Miles

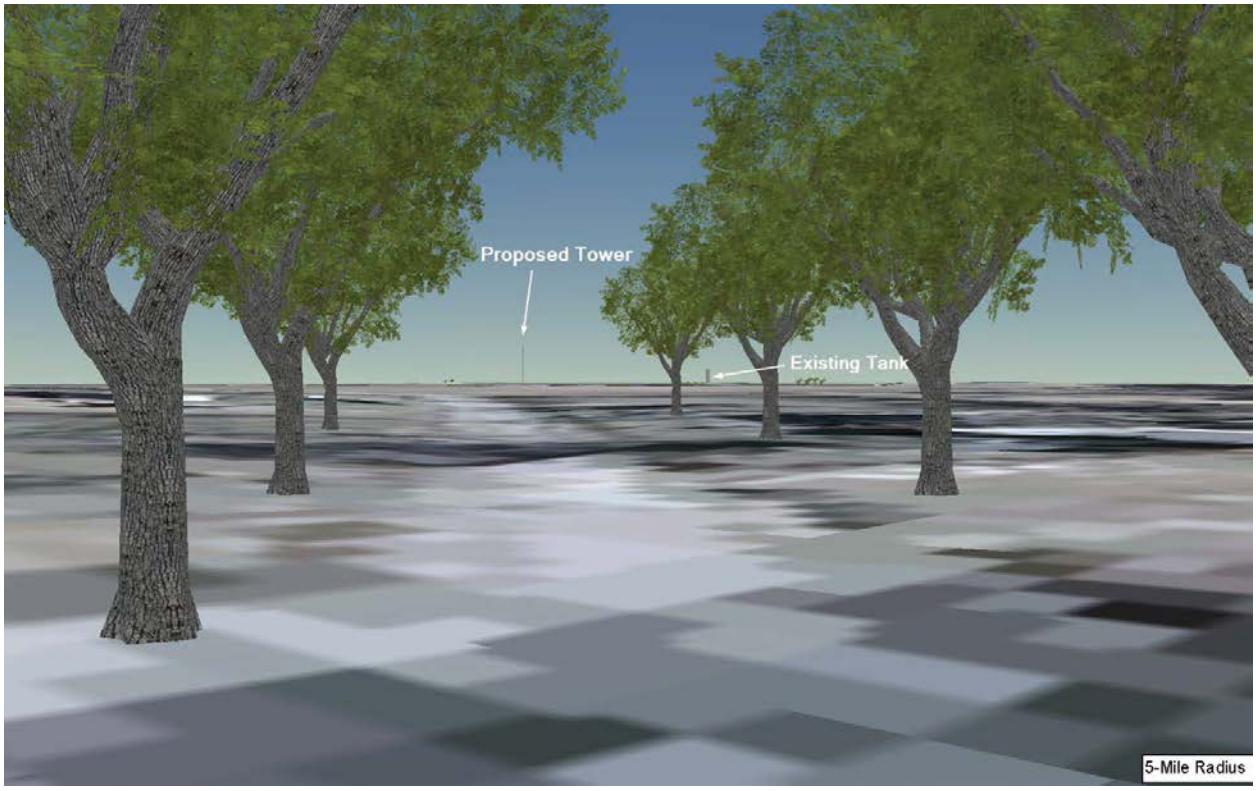


Figure 3-18: Photo-simulation of the Proposed Action Alternative from 5 Miles

Figure 3-19 illustrates variations in height among structures on Wallops Island and the island's overall visual character, as viewed from the south. The visual environment of Wallops Island is generally characterized by administrative and light-industrial buildings and structures that support the operations of NASA and its tenants and whose appearance corresponds to their functionality and use. No pristine or particularly unique vistas or viewsheds have been documented at Wallops Island.

Figure 3-19: Variations in Structure Heights and Overall Visual Character of Wallops Island

3.3.2.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative, the proposed instrumentation tower would not be built and existing conditions at Wallops Island would continue. This would have no impact on visual quality and aesthetics at or in the vicinity of Wallops Island.

Proposed Action Alternative (Preferred Alternative): Building X-015 Site

During construction, the appearance of the Proposed Action Alternative site would be characterized by construction vehicles and equipment, areas of cleared vegetation and disturbed soils, and temporary fencing to restrict access to the site by unauthorized personnel. The number, type, and size of vehicles and equipment on the site would vary throughout the project's construction phase, as would the size and number of areas where vegetation and soils would be disturbed. Due to the relatively flat topography on Wallops Island, the appearance of conditions on the site would be limited to observers adjacent to or in the immediate vicinity of the site. Generally, the appearance of the site during the construction phase would be similar to that of other construction projects and similar activities occurring with relative frequency on Wallops Island. Such conditions would not be particularly unusual to personnel and other observers who work at or frequently visit the island. Following the completion of construction, construction-related

vehicles and equipment would be removed and areas disturbed during construction would be restored to pre-construction conditions. Thus, the Proposed Action Alternative would have negligible short-term impacts on visual quality and aesthetics on Wallops Island.

Once complete, the proposed tower would be the tallest structure visible in comparison to other nearby towers and elevated structures on Wallops Island. A conceptual rendering of the proposed tower on the Proposed Action Alternative site, as viewed from the south, is shown on **Figure 3-20**. In addition, it is likely that the proposed tower would be visible from several miles away (see **Figure 3-14** through **Figure 3-18**). However, the tower would be located in an area of Wallops Island that has been previously developed with other, similar vertical tower structures. The appearance of the proposed tower would be consistent with these other vertical structures on Wallops Island that support the missions of NASA and its partner organizations, and would not contribute to the degradation of an otherwise undisturbed visual landscape. It is likely that the structure of the proposed tower would be virtually indistinguishable at night (although pilot illumination and/or obstruction lighting would be visible). Illumination would be limited to the minimum amount required by the FAA (**Section 2.2.1**).

The proposed relocation of the telemetry dish would have no impacts on the visual quality and aesthetics of WFF, as the dish is of relatively small size (i.e., less than 2 feet in diameter) and would be installed on existing infrastructure in a previously developed area of the Mainland or Wallops Island. Its appearance would be consistent with other facilities and equipment that support the missions of WFF and its tenants, and its small size would make it virtually indistinguishable when observed from a distance.

For these reasons, short- and long-term impacts on visual quality and aesthetics on and in the vicinity of Wallops Island resulting from the Proposed Action Alternative would be minor.

Figure 3-20: Conceptual Rendering of Proposed Tower on the Proposed Action Alternative (Preferred Alternative) Site

Alternative 1: Building X-079 Site

A conceptual rendering of the proposed tower on the Alternative 1 site, as viewed from the south, is shown on **Figure 3-21**. Due to the proximity of the Alternative 1 site to that of the Proposed Action Alternative, impacts on visual quality and aesthetics resulting from Alternative 1 would be similar to those described for the Proposed Action Alternative.

Figure 3-21: Conceptual Rendering of Proposed Tower on the Alternative 1 Site

3.4 CUMULATIVE EFFECTS

3.4.1 DEFINITION OF CUMULATIVE EFFECTS

CEQ defines cumulative effects as the "impact on the environment which results from the incremental impact of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR §1508.7). The key function of a cumulative effects analysis (CEA) is to determine whether other actions are inducing additive stressors on the same resources that may be affected by the proposed action under consideration.

The first step in assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the proposed action. The scope must consider both geographic and temporal overlaps among the proposed action and other actions, as well as the nature of interactions among them.

3.4.2 SCOPE OF THE CUMULATIVE EFFECTS ANALYSIS

The scope of this CEA is defined by four key factors: 1) the relevant cumulative issues (i.e., technical resource areas of potential effect) related to the Proposed Action under consideration in this EA; 2) the geographical boundary (i.e., Region of Influence [ROI]) within which additive effects would be reasonably

expected; 3) the temporal boundary during which such effects would be expected to occur; and 4) other actions that could interact with the same resources affected by the Proposed Action.

For the CEA prepared for this EA, the geographic ROI is defined as a 10-mile radius around the sites of the Proposed Action Alternative and Alternative 1 on Wallops Island. The ROI encompasses an area of approximately 314 square miles and is the maximum area within which impacts resulting from the Proposed Action would be reasonably anticipated to potentially contribute to cumulative impacts, particularly on avian species, resulting from other similar federal or non-federal actions. The temporal ROI for this CEA is defined as the 20-year lifespan of the proposed tower.

Consistent with CEQ's guidance entitled *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997), the scope of the CEA should be related to the magnitude of the environmental effects of the Proposed Action. Proposed actions of limited scope and impact typically do not require as comprehensive a CEA as proposed actions that have environmental impacts over a large area. Therefore, similar to the methodology employed for deciding those resources to be considered in detail in the **Section 3.1** through **Section 3.3** of this EA, only those resource areas upon which the USAF's Proposed Action would cause measurable effects are considered in detail in this analysis. In consideration of the preceding analyses of potential effects on physical, biological, and social resources presented in this EA, the USAF has determined that the relevant issues to be assessed in this cumulative effects analysis are related to avifauna.

3.4.3 PAST, PRESENT, AND FUTURE ACTIONS

Past and present actions have been incorporated into the discussion of the affected environment for each resource addressed in **Sections 3.1** through 3.3 and, therefore, have been previously considered in the analysis of impacts presented in this EA.

As discussed in **Section 3.1** through **Section 3.3**, the construction and operation of the proposed tower would generally have no, negligible, or minor adverse short-term and long-term impacts on resources analyzed in this EA. Adherence to applicable mitigation and monitoring measures would further minimize such impacts. Therefore, with the exception of biological resources (discussed below), the proposed tower would not have the potential to contribute to significant cumulative impacts on resources analyzed in this EA.

The proposed tower would, individually, result in moderate, less-than-significant effects on birds, including both common (i.e., non-protected) and special-status bird species. As described in **Section 3.2**, the operation of the proposed tower could have moderately adverse impacts on some birds, although the severity of such impacts would likely vary and would be influenced by a number of factors and characteristics particular to each bird species. Ultimately, it is anticipated that the presence of the proposed instrumentation tower would contribute to increased mortality of birds occurring in the vicinity of Wallops Island as a result of collisions with the tower or its associated guy wires.

However, with the implementation of specified mitigation measures, including the use of adaptive management techniques, as incorporated into the Proposed Action and included in the MMP prepared by the USAF in consultation with the USFWS and VDGIF (see **Appendix C**), impacts on birds resulting from the presence of the proposed tower would be minimized and maintained at acceptable levels. As noted in **Section 3.2.2.3,** the USFWS concurred with the USAF's determination that the proposed tower may affect, but is not likely to adversely affect, protected species occurring in the vicinity of Wallops Island.

Therefore, it is unlikely that the proposed tower would inhibit the continued propagation of special-status avian species. Equally, it is not anticipated that the continued propagation of common bird species would be adversely impacted by the proposed tower. For these reasons, impacts on birds resulting from the operation of the proposed instrumentation tower would be, individually, less than significant.

There are 155 FAA-registered towers within the 314-square mile ROI, of which 27 are between 200 feet and 500 feet in height; the remaining 128 towers are less than 200 feet in height. No FAA-registered towers

in the ROI exceed 500 feet in height (FAA 2017). Based on this information, the average densities at which these towers are distributed within the ROI are presented in **Table 3-7**.

Table 3-7: Average Densities at Which FAA-Registered Towers Are Distributed in the ROI

Tower Type	Number of Towers	Average Density Within ROI (towers per square mile)
All FAA-registered towers in ROI	155	0.5
Towers 200 to 500 feet in height in ROI	27	0.09
Towers less than 200 feet in height in ROI	128	0.4

Based on this analysis, the average density at which FAA-registered towers are distributed throughout the ROI can be characterized as low, with less than one tower per square mile, and less than one tower between 200 and 500 feet in height per 10 square miles.

While the presence of guy wires and lighting regimes of these towers is not known, it is likely that these towers generally pose a collision risk to avian species. However, as previously noted, non-guyed medium-height towers less than 500 feet in height pose a notably lower collision risk than guyed towers exceeding 500 feet in height (Gehring *et al.* 2011) (see **Section 3.2.1.2**). Therefore, while these towers individually pose an additional collision risk to avifauna, it is likely that any such additional risk is low.

The overall scale and density of development on the Eastern Shore (i.e., within the vicinity of the proposed tower) can be characterized as low in general, and in the ROI in particular. Thus, considering the overall risk of collision posed by the Eastern Shore's low density and scale of development, coupled with the wide distribution of FAA-registered towers throughout the ROI, the relatively low collision risk posed by towers less than 500 feet in height, and the relatively low number of towers exceeding 200 feet in height in the ROI, it is unlikely that existing FAA-registered towers in the ROI individually or cumulatively result in a significant adverse impact to birds.

Currently, the proposed tower is the tallest structure planned for construction and operation within the ROI. Based on the data review performed as part of this EA, no other towers or vertical structures (i.e., above 199 feet) are currently planned in the ROI. Further, the proposed tower would be built and operated in an area where no other structures of comparable height are currently located or planned; thus, the proposed tower would not notably increase the density of tall structures in its immediate vicinity or within the ROI.

As described above, while the proposed tower would pose an increased risk of collision to avifauna and result in adverse impacts from corresponding bird mortality, such impacts would not be significant, notably in light of proposed mitigation. Therefore, when considered with other existing towers in the ROI, the proposed tower would be unlikely to contribute to cumulatively significant adverse impacts on avifauna.

Activities occurring at WFF, such as launches of aerial vehicles (i.e., including rockets and unmanned aerial vehicles) and construction activities associated with ongoing development projects, pose risks of collision, startle response, disorientation, loss of habitat, and injury or mortality to birds. However, impacts on birds resulting from these activities have been determined to be less than significant (NASA 2005, 2009, 2012, 2015a).

Generally, numerous anthropogenic factors directly result in bird mortality each year in the United States. Such factors include cat predation, building and automobile collisions, collisions with power lines, power line electrocutions and communication tower collisions, and wind turbine collisions (Loss *et al*. 2015). Each of these factors is estimated to result in hundreds of thousands to billions of bird deaths annually. The degree to which these factors affect bird mortality in the ROI is unknown; however, based on the generally rural character and low intensity of development on the Eastern Shore and within the ROI, it is likely that effects on birds from these factors varies from negligible to minor.

As noted above, the conclusions reached for the Proposed Action concerning potential for significant effects, including the concurrence of no adverse effect by the USFWS, include consideration of existing towers and other vertical obstructions already extant in the ROI.

Should other structures, currently unplanned, be built in the ROI in the future, additional cumulative effects on avian species could occur. Thus, such currently unforeseen federal and/or non-federal actions could similarly contribute to the increased mortality of birds occurring near such structures. As with the proposed tower, the severity of such increases in mortality potentially resulting from future structures would vary and would be contingent on factors such as the height, bulk, density, and operational characteristics of any such structures, as well as the behavior and characteristics of birds interacting with them. The specific effects of each such future tower would need to be carefully evaluated during its planning and review process, as coordinated by the FCC, FAA, or other applicable federal agencies.

For these reasons, it is unlikely that the proposed tower would have the potential to result in significant cumulative impacts to common or protected avian species when considered with other past, present, and reasonably foreseeable future actions and conditions affecting avian mortality in the ROI.

4 MITIGATION AND MINIMIZATION MEASURES

This section summarizes applicable mitigation and minimization measures that have been incorporated into the Proposed Action and would be adhered to during the construction and/or operation of the proposed instrumentation tower under either action alternative.

- The design, construction, installation, and operation of the proposed tower and its associated instrumentation would be coordinated by the WFF Test Director and Spectrum Manager, who are responsible for the operational control of the RF spectrum at WFF. Further, the proposed tower and its associated instrumentation would be operated and managed in accordance with the frequency utilization and management policies and procedures applicable to all range user activities at WFF as set forth in the *Wallops Flight Facility Frequency Utilization Management Handbook* (NASA 2004). Adherence to these requirements would ensure that the operation of the proposed tower would not generate interference with instrumentation operated by other agencies (e.g., U.S. Navy, NOAA).
- To mitigate potential flooding during storm events, the prefabricated structures and all equipment associated with the proposed tower would be installed on one or more elevated platforms at least 11 feet AMSL in accordance with established WFF management policies for facilities and critical infrastructure on Wallops Island. In addition, these structures would be built in accordance with established design and engineering practices for facilities in a coastal setting that could potentially experience high winds and occasional storm-induced flooding
- Project-specific mitigation and minimization measures applicable to common and special-status avian species that are incorporated in the Proposed Action are summarized in **Section 2.2.1** and detailed in the MMP summarized in **Section 2.2.2** and included in **Appendix C** of this EA. To improve searchability of the project area for monitoring purposes, *Phragmites* would be removed during the construction phase in accordance with the *Wallops Island Phragmites Control Plan* (NASA 2014a) (a copy of this plan is included is included as Attachment 1 to the MMP in **Appendix C**).
- Because construction of the Proposed Action would disturb more than 10,000 square feet of land, the construction contractor would be required to prepare an erosion and sediment control plan in accordance with the Virginia Erosion and Sediment Control Regulations (4 VAC 50-30). Acquisition of the permit would require the preparation of an SWPPP. The WFF SEED Team would review and approve applicable construction and development plans involving land disturbance and would conduct periodic inspections and any necessary enforcement in accordance with the terms of the erosion and sediment control and/or stormwater management plans. Compliance with the requirements set forth in the erosion and sediment control plan, the General Permit, the SWPPP, and oversight from the WFF SEED Team would minimize impacts resulting from construction-related soil erosion and stormwater runoff.
- To minimize emissions of criteria pollutants and GHG during construction activities, the USAF would implement measures such as prohibiting the idling of construction vehicles and equipment for extended periods, and requiring contractors to maintain exhaust systems on construction vehicles and equipment in optimal condition.
- All fuel and oil storage during the operations would comply with VDEQ regulations. If at least 55 gallons or more of fuel would be stored on the project site in portable or temporary AST, the following conditions would apply:
    - WFF Facilities Management Division would be notified of the AST;
    - A spill prevention plan would be prepared by the construction contractor; and

  Inspections of all fuel storage containers would be conducted in accordance with applicable

regulations. All fuel storage containers and fuel handling activities would also comply with the requirements of the WFF ICP (NASA 2017b). Any spills would be reported immediately to the WFF Fire Department.

- Construction workers would comply with NASA Goddard Technical Standard 8715.1, *Goddard Space Flight Center Explosive Safety Program*. In the event that construction workers encounter stained or malodorous soil or other evidence of potential environmental contamination (e.g., suspected MEC, debris, fuel drums, etc.) during land disturbance, the USAF's contractor would be required to halt work and immediately contact the WFF Safety and Environmental Offices. Assignment of responsibility for restoration of such areas would be handled on a case-by-case basis, considering such factors as the type and source(s) of contamination. Construction would not resume until the area was deemed safe for workers by the WFF Safety Office.
- The USAF would develop task-specific work instructions to ensure that the elevated 500-gallon propane tank associated with the proposed tower's emergency backup generator is filled and maintained in accordance with industry standards.
- Following the completion of construction activities, any disturbed areas of the project site not built on or otherwise developed would be returned to a pre-construction condition. As necessary, clean fill soils would be imported to the site if existing soils are determined to be inadequate to support the construction of the proposed tower.
- The USAF's construction contractor would implement and adhere to site-specific measures for vehicle and equipment fueling and maintenance as well as spill prevention and control measures in accordance with established NASA requirements. Adherence to such measures would ensure that the potential for inadvertent spills of petroleum products during construction activities would be eliminated or remain minimal.
- The extent of impacts on wetlands would be determined during the formal engineering design of the proposed tower. In the event that disturbance of wetlands is required, the USAF would obtain applicable permits from the USACE and other federal and state regulatory agencies; the extent of impacts on wetlands would be reflected in the permit application(s). Adherence to avoidance, compensation, and/or mitigation measures specified in applicable federal and/or state permit(s) during and following the project's construction phase would ensure that impacts on wetlands remain minimal.
- In the event that previously unknown archaeological artifacts or human remains are identified during the construction of the Proposed Action, the USAF's contractor would be required to halt work and immediately contact WFF's Cultural Resources Manager, who would consult with the VDHR to: 1) determine the significance of the resource; 2) evaluate the effects of the undertaking on the resource; and 3) identify the appropriate avoidance or mitigation measures.
- To prevent the accidental introduction of *Phragmites* to the project site during construction of the tower, all tracked equipment involved in earth work would be inspected and cleaned to remove any rhizomes and seeds prior to arrival on the project site. If possible, earth disturbing activities in areas where *Phragmites* is present would be conducted last, or the equipment would be cleaned prior to use on any portion of the site that is known to be free of *Phragmites*. Construction equipment would be cleaned by using physical means and hand tools, such as brushes, brooms, rakes, or shovels, on all track and bucket/blade components to adequately remove all visible dirt and plant debris. If water should be used, the water/slurry would be contained so as to restrict introduction of *Phragmites* rhizomes and seeds into the project site as well as to prevent off-site introduction during debris disposal. Construction vehicle and equipment rinse-out areas would be located in upland areas, and runoff would be contained to minimize or eliminate impacts (NASA 2014a).

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6 DISTRIBUTION AND REVIEW OF THE DRAFT EA

The following agencies, organizations, and individuals were notified of the availability of the Draft EA for public and agency review.

Name	Organization
Federal Agencies	
Mr. Lou Chiarella	National Marine Fisheries Service, Habitat Conservation Division
Ms. Kim Damon-Randall	National Marine Fisheries Service, Protected Resources Division
Ms. Deborah Darden	National Park Service, Assateague Island National Seashore
Mr. John Gironda	National Oceanic and Atmospheric Administration, NESDIS Management Operations & Analysis Division
Mr. Christoper Jarboe	NAVAIR Ranges Sustainability Office, Atlantic Test Range
Ms. Jill Jester	Surface Combat Systems Command
CAPT Jeffrey Lock	U.S. Navy, Surface Combat Systems Center
Mr. Albert McMath	National Oceanic and Atmospheric Administration, Wallops Command and Data Acquistion Station
Ms. Barbara Rudnick	U.S. Environmental Protection Agency, Office of Environmental Programs
Brady Scheib	U.S. Coast Guard, USCG SFO Eastern Shore
Ms. Cindy Schulz	U.S. Fish and Wildlife Service, Ecological Services, Virginia Field Office
Mr. Kevin Sloan	U.S. Fish and Wildlife Service, Chincoteague National Wildlife Refuge
Mr. Wes Vinyard	Federal Aviation Administration, Operations Support Group
LT Joshua Zirbes	U.S. Coast Guard, USCG SFO Eastern Shore
State Agencies	
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Copies of correspondence received during the 30-day Draft EA public review period are included in **Appendix A**. **Table A-1** summarizes comments received on the Draft EA during the public review period, provides USAF responses to the comments, and indicates if (and where) the Final EA was revised in response to a particular comment.

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