

# Nationwide Public Safety Broadband Network Draft Programmatic Environmental Impact Statement for the Non-Contiguous United States



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**First Responder Network Authority**

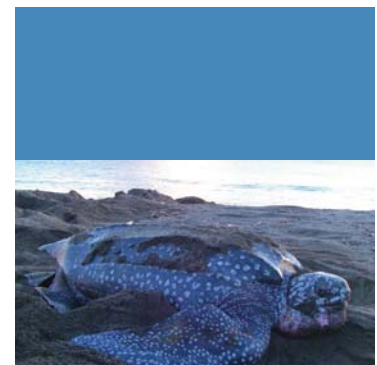
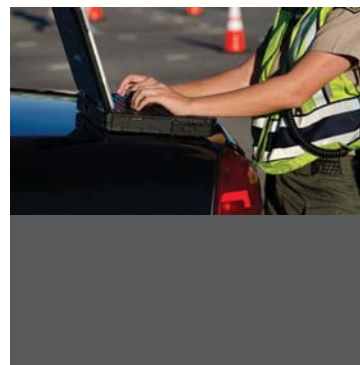
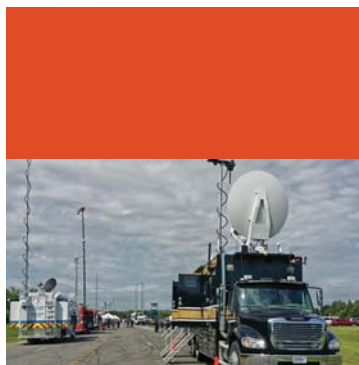
Executive Summary



- Alaska
- Hawaii
- American Samoa
- Guam
- Northern Mariana Islands
- Puerto Rico
- U.S. Virgin Islands



March 2016



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# First Responder Network Authority



## Nationwide Public Safety Broadband Network Draft Programmatic Environmental Impact Statement for the Non-Contiguous United States

### Executive Summary

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#### Cooperating Agencies

Federal Communications Commission  
General Services Administration  
U.S. Department of Agriculture—Rural Utilities Service  
U.S. Department of Agriculture—U.S. Forest Service  
U.S. Department of Agriculture—Natural Resource Conservation Service  
U.S. Department of Defense—Department of the Air Force  
U.S. Department of Energy  
U.S. Department of Homeland Security

March 2016

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## **ES1. INTRODUCTION**

Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (*Pub. L. No. 112-96, Title VI, 126 Stat. 156 (codified at 47 USC 1401 et seq.)*) (the Act) created and authorized the First Responder Network Authority (FirstNet) to ensure the establishment of a nationwide public safety broadband network (NPSBN) based on a single, national network architecture (*47 USC § 1422(b)*). FirstNet is an independent authority within the United States (U.S.) Department of Commerce’s National Telecommunications and Information Administration.

The NPSBN (i.e., the Proposed Action) is intended to cover all 50 states, 5 territories, and the District of Columbia. FirstNet has developed a series of five Draft Programmatic Environmental Impact Statement (PEIS) documents, one for each of five geographic regions across the U.S. This Draft PEIS fulfills the requirements of the National Environmental Policy Act (NEPA) for the NPSBN for the non-contiguous region, which includes the states of Alaska and Hawaii, as well as the Commonwealths of the Northern Mariana Islands and Puerto Rico and the territories of American Samoa, Guam, and the U.S. Virgin Islands.

### **ES1.1. FIRSTNET AND THE NEPA PROCESS**

The design, deployment (i.e., construction), and operation of the NPSBN is a broad action with nationwide implications. As a result, FirstNet has assessed potential impacts expected from the Proposed Action from the program as a whole. As part of a tiered approach to NEPA (see *NEPA §1502.20*), this Draft PEIS also supports any subsequent site-specific environmental analyses that may be required for individual actions for specific projects at specific locations, once they are identified.

### **ES1.2. PUBLIC ENGAGEMENT AND TRIBAL CONSULTATION**

Public comments on the Proposed Action have been and are being solicited as part of the NEPA process. In addition, in response to its obligations under the National Historic Preservation Act, FirstNet has initiated consultations with the Advisory Council on Historic Preservation, State Historic Preservation Offices, federally recognized American Indian tribes, and Native Hawaiian organizations. FirstNet anticipates consulting with Pacific Islanders on American Samoa, Guam, and the Northern Marina Islands as well as communities in Puerto Rico and the U.S. Virgin Islands.



In a letter dated January 30, 2015, FirstNet contacted tribal leaders and Tribal Historic Preservation Officers, where applicable, to initiate formal, government-to-government consultation with all 567 federally recognized American Indian tribes. In a subsequent letter dated May 15, 2015, FirstNet initiated consultation with 17 Native Hawaiian Organizations.

The process for soliciting public comments on this Draft PEIS has primarily been achieved through the NEPA-mandated scoping process (as described in Section 1.7.2, Scoping, of the Draft PEIS). Public engagement via the scoping process to date began with publication of a Notice of Intent (NOI) in the *Federal Register* to prepare five coordinated PEISs (79 *Federal Register* 67156 [November 12, 2014]). The NOI kicked off a 45-day public comment period, during which FirstNet received input from interested parties.

Following the publication of the NOI, FirstNet held a series of public meetings where participants had the opportunity to learn about the Proposed Action, talk directly with FirstNet environmental staff, and provide input regarding the scope and analysis of the Proposed Action. The public meetings were held in the following locations:

- Washington, D.C.—Tuesday, November 25, 2014 (4-8 p.m.)
- Honolulu, HI—Tuesday, December 2, 2014 (4-8 p.m.)
- San Francisco, CA—Thursday, December 4, 2014 (4-8 p.m.)
- Tucson, AZ—Thursday, December 4, 2014 (4-8 p.m.)
- Kansas City, MO - Tuesday, December 9, 2014 (4-8 p.m.)
- New Orleans, LA—Thursday, December 11, 2014 (5-9 p.m.)
- New York, NY—Monday, December 15, 2014 (4-8 p.m.)

The Scoping Summary Report can be found in Appendix B, *First Responder Network Authority Nationwide Public Safety Broadband Network Programmatic Environmental Impact Statement Scoping Summary Report*. The following major items were identified during the formal scoping comment period and in public meetings:

- Potential impacts of the NPSBN on sensitive natural resources;
- Concerns regarding the potential impacts of tower placement on culturally and ecologically sensitive areas; and
- The potential impact of the NPSBN on existing public safety communications infrastructure and operations.





Additional comments were received after the formal scoping period and, as appropriate, are addressed within the relevant resource area and state/territory where the comment applied. The additional comments related to radio frequency emissions, concerns over the location of a tower on culturally and historically sensitive land in Arizona, tribal concerns, and general requests for updates.

### **ES1.3. FEDERAL AGENCY PARTICIPATION**

FirstNet is the lead agency for the environmental review consistent with NEPA, and the consultation requirements of the National Historic Preservation Act Section 106 and the Endangered Species Act Section 7. As the lead agency, FirstNet coordinates with cooperating agencies to ensure compliance with the laws, regulations, and Executive Orders (EOs) discussed in Section 1.8, Overview of Relevant Laws and Executive Orders.

In letters dated January 16, 2015, FirstNet invited 37 federal agencies to participate in the development of the PEIS as cooperating agencies. Eight agencies accepted the invitation: the Federal Communications Commission; the General Services Administration; the U.S. Department of Agriculture's (USDA) Rural Utilities Service; the USDA's U.S. Forest Service; the USDA's Natural Resources Conservation Service; the U.S. Air Force; the U.S. Department of Energy; and the U.S. Department of Homeland Security, which includes the Federal Emergency Management Agency, the U.S. Coast Guard, and the U.S. Customs and Border Protection. Appendix A contains a complete list of those agencies invited to become cooperating agencies.

In a letter dated April 29, 2015, FirstNet invited all 56 state Single Points of Contact (SPOCs) to be consulting parties on the development of the PEISs in order to promote transparency and partnership. Thirteen SPOCs accepted the invitation, which afforded them the opportunity to review and comment on draft documents prior to public release.

## **ES2. PURPOSE OF AND NEED FOR THE FIRSTNET PROPOSED ACTION**

The Act meets a long-standing and critical national infrastructure need to create a nationwide broadband network that would, for the first time, allow police officers, firefighters, emergency medical service professionals, and other public safety officials to effectively communicate with each other across agencies and jurisdictions.



## **ES2.1. PURPOSE OF THE FIRSTNET PROPOSED ACTION**

The purpose of the Proposed Action is to design, deploy, and operate the NPSBN—a dedicated public safety communications network to provide first responders with the tools they need to do their jobs more effectively and to minimize the loss of life in the event of any future natural or manmade emergencies or disasters. The NPSBN will facilitate the use of rugged, easy-to-use devices and provide a set of applications and services on a single, interoperable platform built to open, non-proprietary, commercially available standards for emergency and daily public safety communications. These applications and services would enhance the ability of the public safety community to perform more reliably, effectively, and safely. The NPSBN would also provide a backbone to allow for improved communications by carrying high-speed data, location information, images, and, eventually, streaming video. This capability would increase situational awareness during an emergency, thereby improving the ability of the public safety community to effectively engage and respond.

The FirstNet network would be “hardened” in terms of physical structure, user access, and cyber security considerations. These efforts would be designed not only to ensure that the network has greater resistance to system failure than what is currently available, but also that it can recover more rapidly should failure occur at any point in the system. The goal would be to provide not only interoperability, but also improved operability in the event of a natural or manmade disaster. The network operating standards would also provide local control to public safety agencies, allowing for more control over the configuration, deployment, and management of multiple types of Information Technology resources, referred to as provisioning, as well as device features and reporting.

## **ES2.2. NEED FOR THE FIRSTNET PROPOSED ACTION**

The Proposed Action is needed to address existing deficiencies in public safety communications interoperability, durability, and resiliency that have been highlighted in recent years for the ways in which they have hindered response activities in high profile natural and manmade disasters. Today, first responders rely on numerous separate, often incompatible, and often proprietary land mobile radio networks. This makes it difficult, and at times impossible, for emergency responders from different jurisdictions to communicate, especially during major emergencies that require a multi-jurisdictional response (*National Task Force on Interoperability 2005*).



The lack of interoperability in public safety communications and the hazards associated with it have been known within the public safety community and the telecommunications industry for quite some time. A 1996 report on the state of public safety wireless communications (*Public Safety Wireless Advisory Committee 1996*) identified interoperability issues that hampered emergency response activities in the 1993 World Trade Center bombing in New York City and the 1995 bombing of the Alfred P. Murrah Federal Building in Oklahoma City.

Interoperability problems arose again during the terrorist attacks of September 11, 2001, the event that marks the true genesis of the NSPBN. As numerous onsite reports from public safety personnel at the World Trade Center, the Pentagon, and Somerset County, Pennsylvania, indicated, the lack of interoperable and resilient communications capability among the multiple police, fire, and emergency medical services personnel hampered rescue efforts and in many cases likely led to an increased loss of life, both among members of the public, as well as within the first responder community itself. Indeed, hundreds of police officers and firefighters, including off-duty personnel who reported to the scene to engage in rescue efforts upon learning of the events that were unfolding, lost their lives in the line of duty; this amounted to the largest loss of first responders in a single event anywhere in U.S. history (*National Commission on Terrorist Attacks upon the United States 2004*).

Subsequent disasters, such as Hurricane Katrina in 2005 and Hurricane Sandy in 2013, have shown that public safety response is still often compromised by an inability of public safety responders to communicate with each other due to radio systems operating on different, incompatible frequencies. This is largely the result of the fragmented initial design and upgrades of public safety communications that were often planned and executed at the local level. These disasters, along with the preceding terrorist events, demonstrated that the nation lacked an overarching plan to connect all first responders under one dedicated interoperable system.



### **ES3. THE PROPOSED ACTION AND ALTERNATIVES**

The Proposed Action would encompass the design, deployment, and operation of the NPSBN by FirstNet and/or a partner organization(s). By statute, the network must have several characteristics, including:

- Security, resiliency, backwards compatibility with existing commercial networks, and integration with public safety answering points<sup>1</sup> or their equivalents;
- Substantial rural coverage;
- Deployment that adheres to open, non-proprietary, commercially available standards; and
- Use of existing infrastructure to the maximum extent economically desirable.

The FirstNet network would have two components, the core network and the radio access network. The core network is a key component for ensuring that users have a single interoperable platform nationwide, and would consist of a wide range of telecommunications infrastructure including fiber optic cable, towers, data centers, microwave technology, and others. The radio access network would consist of all radio base station infrastructure that would connect user devices.

FirstNet must also continue to maintain and improve the NPSBN to account for new and evolving technologies. In particular, the FirstNet network would be based on the minimum technical requirements on the commercial standards for Long Term Evolution (LTE) service, a proven upgradeable technology now in its fourth generation (4G).

In accordance with the NEPA, FirstNet must examine a range of reasonable alternatives to design, construct, and operate the NPSBN. These alternatives must be reasonable ways in which FirstNet could meet the purpose and need for the Proposed Action. In addition to the range of reasonable alternatives, FirstNet is also required to “include the alternative of no action” as part of the alternatives analysis in the PEIS.

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<sup>1</sup> Public safety answering points are call centers responsible for answering calls to an emergency telephone number for police, fire, and emergency medical services.



The “No Action Alternative” describes what would happen if FirstNet did not construct the NPSBN, and is used as a baseline against which the potential impacts of the action alternatives can be compared (see *NEPA §1502.14*). In addition to the alternatives described below, other alternatives were considered but not carried forward. Those alternatives are discussed in Section 2.3, Alternatives Considered but not Carried Forward.

**ES3.1. PREFERRED ALTERNATIVE**

Under the Preferred Alternative, FirstNet and/or their partners would construct a nationwide broadband LTE network using a combination of the wired, wireless, deployable, and satellite technologies. There is currently a wide range of technologies that FirstNet may use to implement and deploy the NPSBN. Table ES3-1 provides a brief description of the types of wired, wireless, and deployable projects that FirstNet may consider. Full descriptions may be found in Section 2.1.2, Proposed Action Infrastructure.

**Table ES3-1: Proposed Action Infrastructure Types**

Project Type	Description
<b>Wired Projects</b>	
New Build – Buried Fiber Optic Plant	Plowing or trenching cable and/or cable conduit within public or (where necessary) private road, utility, or other rights-of-way (ROWs) or easements, along with new points of presence (POPs) <sup>a</sup> , huts, or other facilities.
Use of Existing Conduit – New Buried Fiber Optic Plant	Installation of new fiber optic cable in existing, buried conduit. Ground disturbance would usually be limited to existing conduit entry and exit points.
New Build – Aerial Fiber Optic Plant	Installation of new poles and new cables in previously disturbed or new ROWs or easements, or installing replacement poles in an existing ROW. Deployment may include new access roads, POPs, huts, or other facilities to house plant equipment.
Collocation on Existing Aerial Fiber Optic Plant	Installation of new fiber optic cable on existing poles. This may require structural hardening or reinforcement, and/or pole replacement.
Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable	Activation of existing unused (dark) fiber. Deployment may require the installation of new equipment, usually in existing equipment huts, as well as the installation of additional cable to reach the intended final destination.
New Build – Submarine Fiber Optic Plant	Installation of sealed cables in limited near-shore or inland bodies of water, along with new onshore landings and facilities to accept cable, which are typically buried close to shore.
Installation of Optical Transmission or Centralized Transmission Equipment	Installation of equipment as part of the core network deployment. This equipment is usually installed in small boxes or huts in the ROW of the utility corridor, and may involve construction of access roads.



Project Type	Description
<b>Wireless Projects</b>	
New Wireless Communication Towers	Installation of new towers, antennas, and/or microwave dishes to support wireless infrastructure, along with generators, equipment sheds, fencing, lighting, electrical feeds, concrete foundations and pads, and/or access roads.
Collocation on Existing Wireless Tower, Structure, or Building	Mounting or installation of equipment such as antennas or microwave dishes on existing towers, along with power units in some cases. Existing towers, structures, or buildings may require structural hardening or increased physical security measures.
<b>Deployable Technologies</b> (Technologies intended to provide service in areas where permanent, fixed infrastructure cannot or will not be deployed)	
Cell on Wheels (COW)	A cellular base station on a trailer with an expandable antenna mast, designed to be part of a cellular network and augment existing capacity. COWs typically include a small generator and microwave or satellite link.
Cell on Light Truck (COLT)	A cellular base station on a light truck platform with an expandable antenna mast, designed to be part of a cellular network and augment existing capacity. COLTs typically contain a small generator and microwave or satellite link.
System on Wheels (SOW)	A full base station and controller on a large towable trailer or truck, with a large antenna mast, suitable to address larger localized coverage or capacity shortages in the event of large incidents. A SOW can support an island system with no need for satellite/microwave link back, and typically includes a generator.
Deployable Aerial Communications Architecture (DACA)	Aerial vehicles such as drones, piloted aircraft, balloons, and blimps deployed at varying altitudes, capable of providing wide-area coverage, although with relatively low capacity/throughput. DACA would be generally used for addressing wide-scale loss of coverage after a major catastrophic event.
<b>Satellite Technologies</b>	
Satellite-Enabled Devices and Equipment	Installation of permanent equipment on existing structures or the use of portable devices that use satellite technology, such as satellite phones or video cameras.
Deployment of Satellites	FirstNet does not anticipate launching satellites as part of the deployment of the NPSBN; however, it could include equipment on satellites that are already being launched for other purposes.

<sup>a</sup> POPs are connections or access points between two different networks, or different components of one network.

### ES3.2. DEPLOYABLE TECHNOLOGIES ALTERNATIVE

Under the Deployable Technologies Alternative, FirstNet would procure, deploy, and maintain a nationwide fleet of mobile communications systems, including ground-based and aerial deployable technologies, to provide temporary coverage in areas not covered by existing, usable infrastructure. This alternative is evaluated as a stand-alone alternative and would not involve collocations of other equipment or construction of facilities, although some staging or landing areas (depending on the type of technology) could require minor construction and maintenance within public road right-of-ways and utility corridors, heavy equipment movement, and minor excavation and paving near public roads. Generally, these units would be deployed at times of an incident to the affected



area for either planned or unplanned incidents or events. Equipment would be stationed in every state and territory, often at multiple locations in each state or territory, to facilitate suitable response. These mobile communication units would be temporarily installed and may use existing satellite, microwave, or radio systems for backhaul.

### **ES3.3. No Action Alternative**

Under the No Action Alternative, the NPSBN would not be constructed; there would be no nationwide, coordinated system dedicated to public safety interoperable communications. The existing multiplicity of communications networks would remain in place, as would the current, known limitations and problems of existing communication networks during times of emergency or disaster. This alternative would require an act of Congress to revise the Act, which currently requires the NPSBN.

## **ES4. POTENTIAL IMPACTS OF THE PREFERRED ALTERNATIVE**

This Draft PEIS contains seven stand-alone chapters, each of which is devoted to one of the seven states or territories in the non-contiguous U.S. region. Each of these chapters discusses 15 separate resource areas, such as biological resources, land use, air quality, etc. For each state or territory, the Draft PEIS provides an overview of the affected environment (i.e., existing conditions), and then discusses the potential impacts of the Proposed Action in an environmental consequences section.

Through the programmatic approach, FirstNet has identified four categories of potential impacts on these resources:

- *Potentially significant*
- *Less than significant with best management practices (BMPs) and mitigation measures incorporated*
- *Less than significant*
- *No impact*

The methodology used to determine these impact levels is provided for each resource within each state or territory. The sections below summarize in tabular form the impact categories for each potential impact type, within each resource, and within each state or territory. For ease of reference, each impact category is assigned a color and a corresponding number, as shown below:



<b>1. Potentially significant</b>
<b>1-2. Range of potentially significant to less than significant with BMPs and mitigation measures incorporated</b>
<b>2. Less than significant with BMPs and mitigation measures incorporated</b>
<b>3. Less than significant</b>
<b>4. No impact</b>

The sections below discuss the potential impacts of the Preferred Alternative, focusing on potential impacts and only certain select proposed BMPs or mitigation measures which are offered as examples. The main body of the Draft PEIS describes all of these potential impacts and BMPs or mitigation measures in detail.

#### **ES4.1. INFRASTRUCTURE**

This section describes potential impacts to infrastructure including transportation, communications and other utilities, associated with deployment and operation of the Proposed Action, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts.

Deployment and operation of the Proposed Action could potentially impact transportation system safety and capacity through the creation of traffic congestion or delay, or result in the increase in transportation incidents (e.g., crashes, derailments) due to the transport of heavy equipment or deployment activities including plowing, directional boring, and trenching along roadways and within the public road right-of-ways. The presence of deployable technologies such as Cell on Wheels, Cell on Light Truck, System on Wheels, and Deployable Aerial Communications Architecture has the potential to impact air and land-based traffic congestion and safety. Submarine deployment activities in limited near-shore or inland bodies of water additionally have the potential to increase boat traffic and congestion on a short-term basis. These potential impacts to transportation capacity and safety would be *less than significant*, as they would likely be short term, would be regionally based around the ongoing phase of deployment, and would return to normal conditions after a few months or less.

While potential impacts to health care and emergency health care systems are not certain, if they occurred, these potential impacts would be localized, short-term, and temporary and therefore *less than significant*. Any potential localized or temporary access restrictions to or strains on health care and emergency health services would likely improve during the operations phase of the Proposed Action.





Effects on commercial telecommunication systems, communications, or level of service would be *less than significant* due to deployment activities that could generate temporary and minor disruptions to the current commercial telecommunications system; minor decreased level of service could occur during deployment of the Proposed Action and during implementation of deployable technologies. Such deployment activities include plowing, directional boring, or trenching during the installation of fiber optic cable, as well as construction of wireless towers, structures and buildings. Potential impacts to underwater telecommunication infrastructure would also be *less than significant* due to submarine deployment activities in limited near-shore or inland bodies of water. During operations the new NPSBN is anticipated to improve commercial telecommunication systems, communications, and level of service by expanding the telecommunications service area to cover more areas.

Potential impacts to utilities during system deployment would be *less than significant* (see Table ES4-1). Such potential impacts, if they occurred, would likely be temporary and minor.

Overall, implementation of FirstNet public safety telecommunications infrastructure would likely significantly improve public safety communications capabilities and response times in both urban and rural areas during operations. Upgrades to the current infrastructure during the deployment phase could result in a temporary, likely minor, disruption in emergency communications, generally lasting only as long as it takes to connect and begin utilizing the new system. It is anticipated that public safety communications interoperability, durability, and resiliency would significantly improve during operation in comparison to existing conditions.



Table ES4-1: Summary of Potential Impacts, Infrastructure

Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Transportation system capacity and safety	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Follow all applicable federal, state/territory, and local requirements for construction on or near public roads;</li> <li>Follow all applicable federal, state/territory, and local laws concerning traffic speed and safety during the transport of equipment;</li> <li>Schedule deployment activities outside of peak traffic hours;</li> <li>Avoid roads with heavy traffic volumes and peak travel hours, to the extent possible, when scheduling the transport of heavy equipment or construction materials;</li> <li>Design staging areas to minimize unnecessary equipment and material mobilizations;</li> </ul>
Strain on capacity of local health, public safety, and emergency response services	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Repave and restore disturbed roads and public road rights-of-way (ROWs), applicable to federal, state/territory, and local laws, as quickly as possible to avoid any traffic impediments that may potentially hinder access to local health, public safety, and emergency facilities, and so traffic capacity and safety conditions could return to their pre-construction condition;</li> <li>Design new deployment activities within existing ROWs to the extent possible and outside of roadways and thoroughfares to minimize potential impacts on traffic flow or safety;</li> </ul>
Modification to existing public safety that directly affects public safety communication capabilities and response times <sup>b</sup>	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Coordinate closely with public safety officials, emergency and medical facilities, and existing telecommunications providers so that each is aware of the deployment activities and accompanying schedule, and can confirm whether access is being maintained;</li> <li>Schedule new construction outside of seasons known to cause more accidents (e.g., tsunami/ hurricane/tropical cyclone season or times of the year when wildfires are more likely to occur) to minimize the potential for impact associated with unforeseen service disruptions during deployment activities;</li> </ul>



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects on commercial telecommunication systems, communications, or level of service	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Confirm or otherwise install detection systems so that if and when a disruption to utility services or telecommunications systems occurs, it can be identified and repaired quickly;</li> <li>• Implement a backup telecommunications system, as needed, which allows first responders to communicate with each other and the public during deployment activities until the new nationwide public safety broadband network (NPSBN) has been successfully implemented;</li> </ul>
Effects on utilities, including electric power transmission facilities and water and sewer facilities	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Complete deployment activities as quickly and safely as possible to avoid any possible disruptions to utility services;</li> <li>• Complete those deployment activities that could interrupt power during non-peak times for power or water;</li> <li>• Follow all applicable state/territory and local one-call laws and procedures for buildouts; and</li> <li>• Follow all applicable federal, state/territory, or local requirements regarding utilities (water, sewer, power, and electricity) and construction within a utility ROW.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

<sup>b</sup> The discussion of impacts to public safety communication capabilities and response times focuses on potential adverse impacts during deployment. Overall, operation of the Proposed Action will result in—indeed, the purpose of the Proposed Action is to create—significant improvements in overall communications and response times.



**ES4.1.1. Alaska**

Infrastructure for public safety telecommunications within Alaska is minimal, particularly in rural areas. This, coupled with the broad distribution of communities across a very large geography, creates the potential for significant improvement in telecommunications conditions for both first responders and communities. The Proposed Action is intended to address existing deficiencies in public safety communications interoperability, durability, and resiliency, significantly improving public safety communications capabilities and response times in both urban and rural areas of Alaska during operations. As a result, the general effects on existing public safety in Alaska would be positive and any potential negative effects would be considered *less than significant* (see Table ES4-1).

**ES4.1.2. Hawaii**

The limited availability of fixed infrastructure and public safety telecommunications infrastructure on the islands of Hawaii, due to factors including unique topography, disconnected geographies, and the lack of commercial electricity in some areas, enhances the potential of the Proposed Action to improve current conditions for first responders and potentially impacted individuals in emergency situations. As a result, the general effects on existing public safety in Hawaii would be positive and any potential negative effects would be considered *less than significant* (see Table ES4-1).

**ES4.1.3. American Samoa**

Infrastructure potential impacts in American Samoa would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in American Samoa would be positive and any potential negative effects would generally be considered *less than significant* (see Table ES4-1).

**ES4.1.4. Guam**

Infrastructure potential impacts in Guam would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in Guam would be positive and any potential negative effects would generally be considered *less than significant* (see Table ES4-1).



**ES4.1.5. Northern Mariana Islands**

Infrastructure potential impacts in Northern Mariana Islands would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in the Northern Mariana Islands would be positive and any potential negative effects would generally be considered *less than significant* (see Table ES4-1).

**ES4.1.6. Puerto Rico**

Puerto Rico’s existing public safety communications interoperability, durability, and resiliency is inadequate due to many factors regarding notification and redundancy. The Proposed Action would significantly improve public safety communications capabilities and response times in both urban and rural areas of Puerto Rico during operations. As a result, the general effects on existing public safety in Puerto Rico would be positive and any potential negative effects would be considered *less than significant* (see Table ES4-1).

**ES4.1.7. U.S. Virgin Islands**

Infrastructure potential impacts in U.S. Virgin Islands would be similar in nature to the general potential impacts described above for Hawaii. The general effects on existing public safety in the U.S. Virgin Islands would be positive and any potential negative effects would generally be considered *less than significant* (see Table ES4-1).



## ES4.2. SOILS

This section describes potential impacts to soil resources associated with deployment and operation of the Proposed Action, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts. In general, operation of the Proposed Action would involve minimal potential impacts to soils. Potential impacts, although *less than significant*, would instead be more likely during deployment.

Construction activities associated with deployment could potentially impact sedimentation and soil erosion in areas where the slopes are steep and where the erosion potential is moderate to severe as indicated by soil characteristics. Increased sedimentation in waterways, for example, may alter natural sediment transport processes which can impair water and habitat quality and potentially affect aquatic plants and animals. Potential impacts associated with erosion and sedimentation would be *less than significant*, as they would likely be short term, would be localized to the deployment locations of individual facilities, and would return to normal conditions as soon as revegetation occurs, often by the next growing season (see Table ES4-2).

The potential for the loss of topsoil (i.e., organic and mineral topsoil layers) by mixing would be present during deployment of the proposed facilities/ infrastructure and during trenching, grading, and/or foundation excavation activities. It is anticipated that topsoil mixing would likely be minimal and isolated to specific locations; as a result, the potential impacts from topsoil mixing would be *less than significant*.

The movement of heavy equipment required to support any clearance, drilling, and construction activities, as well as installation of equipment or modification of structures needed to support network deployment could potentially impact soil resources by causing the compaction and rutting of susceptible soils. Potential impacts associated with erosion and sedimentation would be *less than significant*, as they would likely be short term, localized to the routes used to access off-road deployment locations, and would only be likely to occur in a limited range of soil types.



Table ES4-2: Summary of Potential Impacts, Soils

Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Soil erosion	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Follow all applicable federal, state/territory, and local requirements for soil erosion and sedimentation control and permitting to avoid or minimize erosion and sedimentation and restore disturbed soil;</li> <li>Avoid construction in areas with steep or unstable slopes, with soils known to be particularly susceptible to soil erosion, and construct facilities in alternate locations to avoid these areas, if practical;</li> <li>Develop a soil erosion and sedimentation control plan for disturbed areas, and implement BMPs and mitigation measures including the use of silt fences, erosion control blankets, and other controls as needed to reduce soil erosion, storm water runoff, and sedimentation;</li> <li>Schedule construction activities to avoid, to the extent possible, soil disturbance activities during periods or months with heavy rainfall and snowmelt;</li> </ul>
Topsoil mixing	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Avoid construction activities immediately following heavy precipitation events or cover exposed areas with tarps or similar materials to prevent exposure to the extent possible;</li> <li>Minimize the area of bare soil exposed at any one time as much as possible by constructing in stages;</li> <li>Revegetate disturbed areas as progressively and quickly as practicable to achieve stabilization;</li> <li>Minimize soil disturbance to the extent practicable, especially in wetland and designated natural resource areas;</li> <li>Identify and maintain topsoil and implement temporary topsoil storage areas;</li> </ul>



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Soil compaction and rutting	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Replace topsoil as soon as possible following construction;</li> <li>• Remove and store topsoil with a woven weed barrier or similar material for post-construction site restoration for areas requiring plowing;</li> <li>• Pay particular attention to areas identified as having soils that are vulnerable to compaction and select alternate locations to construct facilities if practical;</li> <li>• Implement deep tillage procedures where practical to loosen compacted soils;</li> <li>• Restore soil surface to original or improved contours;</li> <li>• Segregate topsoil to avoid topsoil compaction; and</li> <li>• Use timber mats or similar infrastructure as deemed necessary to distribute vehicle and heavy equipment weight.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact





**ES4.2.1. Alaska**

Given that steep slopes are present throughout much of Alaska, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures would help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Proposed Action would likely not be perceptible over a widespread area since poorly drained and hydric soils (with high potential for compaction) are present to varying degrees within only 12 of the 21 soils suborders present in Alaska. As a result, the general effects on soils in Alaska would be considered *less than significant* (see Table ES4-2).

**ES4.2.2. Hawaii**

Prime farmland comprises approximately 200,000 acres in Hawaii, or less than 5 percent of the state’s total land area. To the extent practicable, FirstNet will work to avoid areas with severe erosion potential due to sensitivity and constructability limitations associated with erosion-prone sensitive areas and/or steep slopes (up to 90 percent). Soil compaction and rutting in Hawaii would likely not be perceptible over a widespread area since soils with high potential for compaction and rutting are present to varying degrees within only 3 of the 18 soil suborders present in Hawaii. As a result, the general effects on soils in Hawaii would be considered *less than significant* (see Table ES4-2).

**ES4.2.3. American Samoa**

Minimal prime farmland is present in American Samoa. Given that steep slopes are present throughout much of American Samoa, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures would help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Proposed Action would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only one soil type in American Samoa. As a result, the general effects on soils in American Samoa would be considered *less than significant* (see Table ES4-2).



#### **ES4.2.4. Guam**

Prime farmland in Guam only exists in three of the eight soil types, and only when irrigated. However, given that steep slopes are present throughout much of Guam, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures would help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Proposed Action would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only four of the eight soil types present in Guam. As a result, the general effects on soils in Guam would be considered *less than significant* (see Table ES4-2).

#### **ES4.2.5. Northern Mariana Islands**

Prime farmland in the Northern Mariana Islands only exists in 3 of the 13 soil types, and only when irrigated. Given that steep slopes are present throughout much of the Northern Mariana Islands, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures would help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Proposed Action would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only 3 of the 13 soil types present in the Northern Mariana Islands. As a result, the general effects on soils in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-2).

#### **ES4.2.6. Puerto Rico**

Prime farmland comprises approximately 175,000 acres in Puerto Rico, or approximately 8 percent of the territory's total land area. Given that steep slopes are present throughout much of Puerto Rico, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures would help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Proposed Action would likely not be perceptible over a widespread area, although soils with high potential for compaction are present to varying degrees within 8 of 20 soil types present in Puerto Rico. As a result, the general effects on soils in Puerto Rico would be considered *less than significant* (see Table ES4-2).



#### **ES4.2.7. U.S. Virgin Islands**

Prime farmland is not present in the U.S. Virgin Islands. However, given that steep slopes are present throughout much of the U.S. Virgin Islands, some limited amount of infrastructure may be unavoidable in these areas that have severe erosion potential, in which case BMPs and mitigation measures would help avoid or minimize the potential impacts. Soil compaction and rutting as a result of deployment of the Proposed Action would likely not be perceptible over a widespread area since soils with high potential for compaction are present to varying degrees within only 2 of the 17 soil types in the U.S. Virgin Islands. As a result, the general effects on soils in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-2).

#### **ES4.3. GEOLOGY**

Deployment and operation of the Proposed Action could affect and/or be affected by geologic conditions and processes. The Draft PEIS considers the following aspects of geology:

- The potential for impacts to surface geology, bedrock, topography, physiography, and geomorphology, particularly as a result of trenching, grading, and/or foundation excavation activities;
- Potential impacts to mineral and fossil fuel resources, generally more likely in states or territories with a higher density of extraction areas (compared to the nation as a whole);
- The potential for impacts to paleontological resources, particularly during trenching, grading, and/or foundation excavation activities, and particularly in areas of a state or territory where known paleontological resources are highly prevalent;
- The effects of seismic hazards on the Proposed Action;
- The effects of volcanic activity on the Proposed Action; and
- Land subsidence due to the Proposed Action activities, particularly soil compaction and rutting from the movement of heavy equipment.

In general, operation of the Proposed Action would involve minimal potential impacts to geology. The potential impacts described in this section and in Table ES4-3 would instead be more likely during deployment. These potential impacts would generally be *less than significant*, as they would likely be short term and would be localized to the deployment locations of individual facilities.



Table ES4-3: Summary of Potential Impacts, Geology

Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
<i>Potential Impacts of the Proposed Action</i>								<ul style="list-style-type: none"> <li>• Avoid, to the extent practicable, deployment in areas that undergo significant geomorphological changes, such as within active glacial valleys (in Alaska) or streams and rivers;</li> <li>• Avoid construction in seismically active areas, locations with karst topography or that have shown recent subsidence, or steep or unstable slopes that are susceptible to erosion; construct facilities in alternate locations if practical;</li> <li>• Construct all infrastructure to standards that meet or exceed state/territory seismic requirements;</li> <li>• Avoid rock ripping to the extent practicable to preserve bedrock resources, topography, and physiography;</li> <li>• Minimize the area/volume of disturbed/removed terrain during deployment/construction;</li> <li>• Restore topographic features and grades to pre-construction/deployment conditions;</li> <li>• Limit construction to areas that are not actively mined or undergoing mineral or other material or petroleum extraction activities, or coordinate planning and deployment with mining and extraction plans and activities in active areas;</li> <li>• Follow all relevant federal, state/territory, and local laws and regulations as they apply to paleontological resources;</li> <li>• Develop a Paleontological Monitoring and Mitigation Plan outlining areas with high likelihood for encountering significant fossil resources and plans for avoidance and appropriate response if previously unknown resources are encountered;</li> <li>• Avoid areas with significant fossil resources, if practicable;</li> </ul>
Surface geology, bedrock, topography, physiography, and geomorphology	3	3	3	3	3	3	3	
Mineral and fossil fuel resource impacts	3	3	3	3	3	3	3	
Paleontological resources impacts	3	3	3	3	3	3	3	
<i>Potential Impacts to the Proposed Action</i>								
Seismic hazard	3	3	3	3	3	3	3	



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Volcanic activity	3	3	3	4	3	4	4	<ul style="list-style-type: none"> <li>• Suspend all work if paleontological resources are encountered on a project construction site until a certified paleontologist has been brought on-site to oversee project activities and ensure that fossil resources are handled properly;</li> <li>• Locate construction/deployment activities outside of high risk seismic hazard zones, active faults, and away from low coastal areas that could potentially be impacted from tsunamis;</li> <li>• Follow all applicable federal, state/territory, and local requirements for construction codes, seismic criteria, and geotechnical designs and construct/deploy all infrastructure to standards that meet or exceed state/territory seismic requirements;</li> <li>• Design and deploy resilient infrastructure to withstand earthquakes typical to the region;</li> <li>• Locate construction/deployment activities outside of high-risk volcanic hazard zones; and</li> <li>• Locate construction/deployment activities outside of areas identified as having karst topography, loosely compacted soils, and low density sediments prone to subsidence or compaction, to the extent practicable.</li> </ul>
Landslide	3	3	3	3	3	3	3	
Land subsidence	3	3	3	3	3	3	3	

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



### ES4.3.1. *Alaska*

It is anticipated that the Proposed Action's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Alaska would be minor and would not result in measureable changes, and could be further reduced with implementation of BMPs and mitigation measures. FirstNet and/or their partners will work to avoid areas that undergo significant geomorphological changes, such as active glacial valleys. Although Alaska ranked 5<sup>th</sup> among the 50 states in mineral production values in 2011, and 13<sup>th</sup> for total energy production in 2013, the state is about 21 percent of the size of the entire contiguous U.S. (*USGS 2015a; EIA 2014a*), which means the density of extraction areas is relatively low. Because of this, limited potential impacts to mineral and fossil fuel resources are anticipated as a result of the Proposed Action.

As discussed in detail in Section 3.1.3, Geology, some of the most scientifically significant fossils in the U.S. have been discovered in Alaska, and its geographic location along with the former land bridge that connected Asia and North America make the state rich in paleontological resources. However, it is anticipated that potential impacts to specific areas with significant paleontological resources would be avoided, or minimized and further reduced with the implementation of BMPs and mitigation measures.

One of the most active seismic boundaries in the world is located in Alaska and the state is susceptible to earthquakes, particularly in its southern portions. Volcanoes in Alaska exist primarily just north of the Aleutian Trench. The Proposed Action is unlikely to affect seismic activity, but rather seismic hazards could have the potential to impact the Proposed Action. Although some potential impacts to the Proposed Action infrastructure could occur during significant earthquake events, it is recommended that FirstNet and/or their partners, as practicable or feasible, work to design the network to reasonably withstand the seismic activity typical in the state of Alaska, thereby limiting potential impacts. Overall, effects on geology in Alaska would be considered *less than significant* (see Table ES4-3).



### **ES4.3.2. Hawaii**

It is anticipated that the Proposed Action’s potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Hawaii would be minor and would not result in measureable changes, and could be further reduced if BMPs and mitigation measures are implemented. It is anticipated that FirstNet and/or their partners will work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

Hawaii does not produce or have any proven recoverable reserves of petroleum, natural gas, or coal, and in 2011 the state ranked 47<sup>th</sup> among the 50 states for non-fuel mineral production (*USGS 2015c; EIA 2014b*). As a result, *no impacts* to fossil fuel resources and *less than significant* potential impacts to mineral resources could occur as a result of the Proposed Action.

Fossils known to exist in Hawaii include various reefs, corals and other sea animals, and birds. It is anticipated that potential impacts to specific areas with significant paleontological resources would be avoided or minimized, and could be further reduced with implementation of BMPs and mitigation measures.

Hawaii’s geology and its associated volcanic hotspot make the state susceptible to earthquakes, particularly within the island of Hawaii where seismic hazards are the highest and where the state’s active volcanoes are found. Landslides in Hawaii can be caused by combinations of geology, excessive rainfall, seismic activity, and/or volcanic activity. The Proposed Action is unlikely to affect seismic, volcanic, or landslide activity in Hawaii, but rather these hazards could have the potential to impact the Proposed Action. It is recommended that FirstNet and/or their partners work to avoid areas that are more prone to these hazards. Overall, effects on geology in Hawaii would be considered *less than significant* (see Table ES4-3).

### **ES4.3.3. American Samoa**

It is anticipated that the Proposed Action’s potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in American Samoa would be minor and would not result in measureable changes, and could be further reduced if BMPs and mitigation measures are implemented. It is anticipated that FirstNet and/or their partners will work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

American Samoa does not produce natural gas, petroleum, or coal, and has very limited mineral resources (*EIA 2015a*). In addition, very few fossil resources are preserved in American Samoa.



American Samoa resides near active plate boundaries and is susceptible to earthquakes, particularly in the northern islands of Ofu and Ta'ū, where seismic hazards are the highest. Three volcanoes exist in American Samoa, with one on each of the three islands of Ofu, Ta'ū, and Tutuila. The most recent eruptions occurred in 1866 and 1905 on the island of Ofu. Landslides in American Samoa can be caused by combinations of geology, excessive rainfall, seismic activity, and/or volcanic activity. The Proposed Action is unlikely to affect seismic, volcanic, or landslide activity in American Samoa, but rather these hazards could have the potential to impact the Proposed Action. It is recommended that FirstNet and/or their partners work to avoid areas that are more prone to these hazards. Overall, effects on geology in American Samoa would be considered *less than significant* (see Table ES4-3).

#### **ES4.3.4. Guam**

It is anticipated that the Proposed Action's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in American Samoa would be minor and would not result in measureable changes, and further reduced with implementation of BMPs and mitigation measures. It is anticipated that FirstNet and/or their partners will work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels in southern Guam.

Guam does not produce natural gas, coal, or petroleum, and has limited mineral resources (*USGS 2015b; EIA 2015b*). Few paleontological studies of Guam have been widely circulated, but fossils do exist in various limestone formations including fossilized algae, corals, and mollusks.

Guam is located near the Pacific Plate - Philippine Sea Plate boundary. According to the U.S. Geological Survey, the entire island of Guam has a high seismic hazard risk (*Mueller et al. 2012*). There are no active volcanoes on Guam. Landslides in Guam can be caused by combinations of geology, excessive rainfall, and/or seismic activity. The Proposed Action is unlikely to affect seismic or landslide activity in Guam, but rather these hazards could have the potential to impact the Proposed Action. It is recommended that FirstNet and/or their partners, as practicable or feasible, work to avoid areas that are more prone to these hazards. Overall, effects on geology in Guam would be considered *less than significant*, except for volcanic activity, where there would be *no impact* (see Table ES4-3).





#### **ES4.3.5. Northern Mariana Islands**

It is anticipated that the Proposed Action's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in the Northern Mariana Islands would be minor and would not result in measureable changes, and further reduced if BMPs and mitigation measures are implemented.

The Northern Mariana Islands does not produce fossil fuel resources and mineral resources are limited (*USGS 2014; EIA 2015c*). Fossil resources exist primarily in the southern islands of the Northern Mariana Islands, and various reptiles, birds, rodents, as well as algae deposits have been discovered in the limestone formations of those islands. It is anticipated that potential impacts to specific areas with significant paleontological resources would be avoided or minimized, and could be further reduced with implementation of BMPs and mitigation measures.

The Northern Mariana Islands is located near the Pacific Plate - Philippine Sea Plate boundary, and seismic hazard risks are high throughout the entire territory, but particularly on the islands of Rota, Aguijan, and the northern most (largely uninhabited) islands. Volcanoes in the Northern Mariana Islands primarily occur in the northern, largely uninhabited islands. Landslides can be caused by combinations of geology, excessive rainfall, seismic activity, and/or volcanic activity. The Proposed Action is unlikely to affect seismic or landslide activity in the Northern Mariana Islands, but rather these hazards could have the potential to impact the Proposed Action. It is recommended that FirstNet and/or their partners, as practicable or feasible, work to avoid areas that are more prone to these hazards. Overall, effects on geology in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-3).

#### **ES4.3.6. Puerto Rico**

It is anticipated that the Proposed Action's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in Puerto Rico would be minor and would not result in measureable changes, and could be further reduced if BMPs and mitigation measures are implemented. It is anticipated that FirstNet and/or their partners will work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.



Puerto Rico does not produce petroleum, natural gas, or coal and ranked equivalent to 49<sup>th</sup> out of the 50 states in non-fuel mineral production (*USGS 2015b; EIA 2015d*). However, numerous geologic formations in Puerto Rico, particularly those in the northern portion of the territory, contain plant and animal fossils, particularly preserved mollusks. It is anticipated that potential impacts to specific areas with significant paleontological resources would be avoided or minimized, and further reduced if BMPs and mitigation measures are implemented.

Puerto Rico is located near the North American and Caribbean Plate boundary. The great majority of the territory has a moderate seismic hazard risk. There are no active volcanoes in Puerto Rico. Landslides in Puerto Rico can be caused by combinations of geology, excessive rainfall, and/or seismic activity. The Proposed Action is unlikely to affect seismic or landslide activity in Puerto Rico, but rather these hazards could have the potential to impact the Proposed Action. It is recommended that FirstNet and/or their partners, as practicable or feasible, work to avoid areas that are more prone to these hazards. Overall, effects on geology in Puerto Rico would be considered *less than significant*, except for volcanic activity, where there would be *no impact* (see Table ES4-3).

#### **ES4.3.7. U.S. Virgin Islands**

It is anticipated that the Proposed Action's potential impacts to surface geology, bedrock, topography, physiography, and geomorphology in the U.S. Virgin Islands would be minor and would not result in measureable changes, and could be further reduced if BMPs and mitigation measures were implemented. It is anticipated that FirstNet and/or their partners will work to avoid or bore under areas that undergo significant geomorphological changes, such as active stream or river channels.

The U.S. Virgin Islands does not produce petroleum, natural gas, or coal, although it does produce crushed stone (*USGS 2015b; EIA 2015e*). Few paleontological studies of the U.S. Virgin Islands have been widely circulated. However, fossil resources do exist, and numerous fossils can be found, among other places, on Coki Point Cliffs in St. Thomas, and Vagthus Point in St. Croix. It is anticipated that potential impacts to specific areas with significant paleontological resources would be avoided or minimized, and further reduced with implementation of the BMPs and mitigation measures.

The U.S. Virgin Islands is located near the North American and Caribbean Plate boundary. St. Croix has a low to moderate seismic hazard risk, and the islands of St. John and St. Thomas have a moderate seismic hazard risk. There are no active volcanoes in the U.S. Virgin Islands. Landslides in the U.S. Virgin Islands can be



caused by combinations of geology, excessive rainfall, and/or seismic activity. The Proposed Action is unlikely to affect seismic or landslide activity in the U.S. Virgin Islands, but rather these hazards could have the potential to impact the Proposed Action. It is recommended that FirstNet and/or their partners, as practicable or feasible, work to avoid areas that are more prone to these hazards. Overall, effects on geology in the U.S. Virgin Islands would be considered *less than significant*, except for volcanic activity, where there would be *no impact* (see Table ES4-3).

#### **ES4.4. WATER RESOURCES**

This section describes potential impacts to water resources associated with deployment and operation of the Proposed Action and alternatives, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts. In general, operation of the Proposed Action would likely involve minimal potential impacts to water resources. Potential impacts would instead be more likely during deployment (see Table ES4-4).

Construction activities associated with deployment of the Proposed Action could affect water quality primarily as a result of ground-disturbing activities (both within and outside of floodplains), and alteration of drainage patterns. These potential impacts to water resources would generally be *less than significant* since they would be isolated and short-term, and would likely return to baseline conditions once revegetation of disturbed areas is complete. These potential impacts could be further reduced by implementation of BMPs and mitigation measures.

Groundwater or aquifer characteristics could potentially be impacted if Proposed Action activities involved contamination of groundwater with petroleum, lubricants, or other fluids from heavy equipment. Spills from vehicles or machinery used during deployment tend to be associated with refueling activities, and as such, would likely be a few gallons or less in volume, an amount that would likely be easily contained and/or cleaned up on site. As a result, potential impacts to groundwater are not anticipated, while potential impacts to surface water quality due to spills would be minor, sporadic, and isolated, and therefore would be *less than significant*.



Table ES4-4: Summary of Potential Impacts, Water Resources

Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Water quality: sedimentation, pollutants, water temperature	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Minimize ground disturbance in or near waterbodies during construction, as practicable, particularly in areas prone to erosion;</li> <li>Follow all applicable federal, state/territory, and local requirements for soil erosion and sedimentation control and permitting to avoid or minimize inputs of eroded materials into waterbodies;</li> <li>Develop a storm water pollution prevention plan;</li> <li>Include engineered or site-designed methods to control storm water;</li> <li>Implement storm water reduction methods for large-scale construction activities, including minimizing impervious surfaces, using porous materials, or collecting and reusing storm water (e.g., extended detention ponds, storm water wetlands, filtration structures, and infiltration (or recharge) basins);</li> <li>Direct water to storm water drains for large-scale construction activities or to constructed bioretention, rain garden, or other storage and retention areas designed to slow water and allow sediments to settle out;</li> </ul>
Floodplain degradation	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Stabilize and revegetate disturbed areas as progressively and quickly as practicable to achieve stabilization and minimize the potential for erosion;</li> <li>Place materials storage and staging areas outside of waterways and floodplains, as practicable;</li> <li>Avoid construction of roads and other impervious surfaces in floodplain areas to the extent practicable; where necessary in floodplains, construct roads and other impervious surfaces level with existing grades, as practicable, to not change or restrict water flow;</li> <li>Station all deployables and above ground structures outside of the 100-year floodplain, to the extent practicable; if deployables or above ground structures must be placed in 100-year floodplains, station them such that they are not vulnerable to be damaged by flood flows and do not themselves impede or restrict flood flows, as practicable;</li> <li>Meet state/territory or local regulations for development proposed in a floodway or floodplain;</li> </ul>



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Drainage pattern alteration	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Avoid construction, where feasible, in areas with steep or unstable slopes with soils known to be particularly susceptible to soil erosion and construct facilities in alternate locations if practical;</li> <li>• Develop a soil erosion and sedimentation control plan for disturbed areas, and implement BMPs, as appropriate, including the use of silt fences, erosion control blankets, progressive revegetation, and other controls as needed to reduce soil erosion, storm water runoff, and sedimentation;</li> <li>• Minimize the total area of bare soil exposed at any one time as much as possible by constructing in stages;</li> <li>• Monitor site restoration following ground disturbance activities, as required by law or permit; implement contingency measures if site restoration should fail and soil erosion occurs;</li> <li>• Retain vegetative buffers, wherever possible, to prevent runoff into waterbodies;</li> <li>• Minimize in-stream work to the extent practicable;</li> <li>• Construct all stream crossings (roads and trenching) as close as perpendicular to the axis of the waterbody channel as engineering and routing conditions permit;</li> </ul>
Flow alteration	4	4	4	4	4	4	4	<ul style="list-style-type: none"> <li>• Use standard upland construction techniques when crossing of waterbodies when they are dry or frozen and not flowing or as required by permit or law, provided that it is not likely for flow to resume during construction and prior to post-construction stabilization;</li> <li>• Route the stream crossing to minimize the number of waterbody crossings where waterbodies meander or have multiple channels, as practicable;</li> <li>• Prepare a spill prevention and response plan to prevent, contain, and report accidental spills;</li> <li>• Park vehicles at least 50 feet from any stream or wetland unless authorized by a permit or on an existing roadway, as practicable;</li> <li>• Place materials storage and staging areas outside of waterways and floodplains, as practicable and deposit and stabilize all excavated material not reused in an upland area outside of floodplains and streams;</li> <li>• Design any structures located in floodplains, as feasible, with structural hardening to withstand flooding and to not increase the risk of flooding for other areas of the floodplain;</li> </ul>



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Changes in groundwater or aquifer characteristics	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Inspect and maintain tanks and equipment containing oil, fuel, or chemicals for drips or leaks to prevent spills to the ground or directly into waterbodies;</li> <li>• Maintain and repair all equipment and vehicles on impervious surfaces, as practicable, away from all sources of surface water;</li> <li>• Avoid construction of roads and other impervious surfaces in floodplain areas to the extent practicable, and where necessary in floodplains, construct roads and other impervious surfaces level with existing grades, as practicable, to not change or restrict water flow;</li> <li>• Stabilize approaches to streams and stream crossings with clean rock or steel plates during construction to minimize erosion and sedimentation, as practicable;</li> <li>• Conduct in-stream construction (trenching or roads if necessary) during times that streams have flow, maintain adequate waterbody flow rates to protect aquatic life and prevent the interruption of existing downstream users, as practicable; and</li> <li>• Do not permit underwater blasting and pile driving activities in any waterbody.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



#### **ES4.4.1. Alaska**

Of Alaska’s 700,000 miles of rivers and streams, 99.9 percent are currently considered unimpaired (*ADEC 2013*). The pristine nature of these resources highlights the significance of any potential impacts to water quality within Alaska, including inputs of sedimentation or pollutants due to ground disturbance, disruption of streamside soils or vegetation, or spills of fluids from motorized equipment. A return to baseline sedimentation levels may take longer in Alaska, particularly in northern Alaska due to the area’s shorter growing seasons. It is recommended, to the extent practicable or feasible, FirstNet and/or their partners work to avoid stream crossings, limit crossings to times of the year that they are dry or frozen, or reduce potential impacts to flowing streams by scheduling crossings for the times of the year when stream flow is lowest. Further, to the extent practicable or feasible, limiting deployment in areas with severe erosion potential due to sensitivity and constructability limitations associated with steep slopes (up to 90 percent) could also reduce potential water quality impacts. However, because steep slopes are present throughout much of Alaska, some limited amount of infrastructure is likely to be built in these areas, in which case BMPs and mitigation measures could help avoid or minimize the potential impacts. As a result, effects on water resources in Alaska would be considered *less than significant* (see Table ES4-4).

#### **ES4.4.2. Hawaii**

Hawaii has 3,326 miles of rivers and streams, 37 square mile of bays and harbors, and 5 square miles of lakes and reservoirs. Turbidity due to sedimentation is a particular water quality concern in Hawaii (*HDOH 2014*). This would be particularly true during the state’s wet season. Although spills in Hawaii could affect groundwater due to the state’s porous underlying geology, they are likely to be small and rare (a few gallons or less in volume). In general, effects on water resources in Hawaii would be considered *less than significant* (see Table ES4-4).

#### **ES4.4.3. American Samoa**

The sensitive Malaeimi Valley is a major recharge area for the Tafuna-Leone aquifer. As such, special groundwater protections may apply to ensure that the quality of its water is not impacted by the Proposed Action. Although spills (e.g., of petroleum products used in vehicle fueling) in the Malaeimi Valley (and, to a lesser degree, in other parts of American Samoa) could affect groundwater, such spills are likely to be small and rare (a few gallons or less in volume). As practicable or feasible, it is recommended that stream crossings occur when



streams are dry or at minimal flow. In general, effects on water resources in American Samoa would be considered *less than significant* (see Table ES4-4).

**ES4.4.4. Guam**

Streams occur only in southern Guam, constraining potential impacts to water quality in Northern Guam to marine and groundwater bodies. In northern Guam, however, porous, limestone geology enhances the vulnerability of groundwater to spilled contaminants including chemicals or petroleum products. Activities with the potential to generate spills would be minor and localized, and would not involve large numbers of vehicles (a potential source of spills).

In southern Guam, intense flooding occurs due to climate and geology, enhancing potential impacts to floodplains, particularly if a large amount of the buildout/deployment locations would be located in the 500-year floodplain, involve floodplain fill, have substantial increases in impervious surfaces that reduce filtration or would impede or redirect flood flows or potentially impact floodplain hydrology. As it is anticipated there would be minimal aboveground facilities built, effects on water resources in Guam would be considered *less than significant* (see Table ES4-4).

**ES4.4.5. Northern Mariana Islands**

Potential impacts to water resources in Tinian, Saipan and Rota are constrained to marine and groundwater bodies, because streams do not occur on Tinian, and no perennial streams occur on Saipan or Rota.

The risk of potential impacts to floodplains is minimal in Northern Mariana Islands, as the high-permeability geology inhibits flow during flood events, and floodplains from streams are rare. In general, effects on water resources in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-4).

**ES4.4.6. Puerto Rico**

Although likely to be small and rare (as described for other geographic areas) spills could infiltrate the groundwater aquifer in areas with porous geology if they are not contained. Areas in Puerto Rico where groundwater is most likely vulnerable to these pollutants are in its alluvial valley aquifers; however, activities with the potential to generate spills would be minor and localized, and would not involve large numbers of vehicles (a potential source of spills). Additionally, turbidity arising from erosion or insufficient sediment control could potentially impact surface waters. However, FirstNet and/or its partners would comply with all local regulations or requirements associated with erosion and sediment control





thereby minimizing this potential impact. As a result, effects on water resources in Puerto Rico would be considered *less than significant* (see Table ES4-4).

#### **ES4.4.7. U.S. Virgin Islands**

Potential sources of water quality impacts include vehicle travel on dirt or gravel roads, or off-road construction activity outside of the dry season. It is anticipated that these activities would be infrequent and would cause only minimal potential impact to water resources. BMPs and mitigation measures could be implemented during deployment to further minimize soil erosion and storm water runoff. In general, effects on water resources in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-4).

#### **ES4.5. WETLANDS**

This section describes potential impacts to wetland resources associated with deployment and operation of the Proposed Action, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts. In general, operation of the Proposed Action would involve minimal potential impacts to wetlands. Potential impacts would instead be more likely during deployment.

Direct and indirect wetland loss or alteration can be caused by a variety of activities often associated with deployment activities, such as the placement of fill into wetlands, changes in hydrology, vegetation clearing, ground disturbance, changes to soils or hydrologic alteration such as flooding or draining.

In general, the loss or alteration of wetlands associated with deployment of the Proposed Action would be considered *less than significant* (see Table ES4-5). Loss of high- and low-quality wetlands would be *less than significant* given the small amount of land disturbance associated with the project locations (generally less than an acre) and the short timeframe of deployment activities. Additionally, all site-specific locations will be subject to an environmental review to help ensure environmental concerns are addressed. Potential wetlands impacts can be further reduced by implementing BMPs and mitigation measures.



Table ES4-5: Summary of Potential Impacts, Wetlands

Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Follow all applicable federal, state/territory, and local requirements related to potential wetland impacts and permitting to avoid or minimize potential wetland impacts, compensate for unavoidable impacts to wetlands, and restore impacted wetlands.</li> <li>• Follow all BMPs and mitigation measures related to minimizing soil erosion, sedimentation, and soil compaction presented in Table ES4-2.</li> <li>• Develop management plans such as, but not limited to, wetland and vegetation management and restoration, water quality protection, and erosion and sediment control plans for the management of wetland habitat, vegetation, water quality, and soils/erosion control.</li> <li>• Conduct a detailed baseline study of the wetland to be impacted to aid in restoration of pre-impact condition, including, as appropriate or required by law, a survey of wetland contours; soil texture and profile; plant species, structure, and cover; and hydrology.</li> <li>• Develop a storm water pollution prevention plan.</li> <li>• Time construction to outside the breeding and migratory seasons of wetland wildlife when construction is unavoidable.</li> <li>• Preserve existing tree canopies and natural areas in and around wetlands as much as possible.</li> <li>• Cut wetland vegetation by hand (chain or hand saw) instead of using large equipment when cutting is unavoidable.</li> <li>• Use timber mats when working in or near wetlands.</li> <li>• Avoid both above and belowground wetland crossings unless necessary.</li> <li>• Utilize already disturbed areas such as easements, roads, roadway shoulders, bridges, or old railroad beds when crossing a wetland is unavoidable.</li> <li>• Consider spanning a wetland by locating telecommunication poles on either side of the wetland instead of disturbing the interior.</li> <li>• Avoid diversion of surface water and groundwater sources, which could affect nearby wetlands.</li> </ul>



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects (continued)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Include engineered or site-designed methods to control storm water.</li> <li>• Create and maintain buffer zones around wetlands to protect their functions and values.</li> <li>• Clearly mark the boundaries of wetland areas to be avoided during construction using flagging, and maintain markers until reclamation is complete (as applicable). Train equipment operators on the activities to avoid within or near wetlands.</li> <li>• Minimize vegetation clearing in or near wetlands. If vegetation clearing is required, minimize ground disturbance and maintain low groundcover vegetation, as well as the roots of taller vegetation. Revegetate, as applicable, bare areas as progressively and quickly as possible.</li> <li>• Install and maintain sediment barriers, as appropriate, at saturated wetlands or wetlands with standing water across the entire construction ROW upslope of the wetland boundary and where saturated wetlands or wetlands with standing water are adjacent to the construction ROW as necessary to prevent sediment flow into the wetland.</li> <li>• Time construction using heavy equipment to avoid periods of heavy moisture, as appropriate, when construction within wetlands is unavoidable.</li> <li>• Do not maintain, store, wash, or repair equipment in or near (within 100 feet of) wetland areas to avoid spills or contamination, where practicable. Do not use heavy equipment within wetlands, even temporarily, and do not travel through wetlands, where practicable. Use wide-tracked, or low-ground pressure construction equipment and/or conventional equipment operating from the ROW, timber mats, or prefabricated equipment mats. Prohibit storage of hazardous materials, chemicals, fuels, lubricating oils in wetlands. Use existing access roads whenever possible. Where construction is required, maintain natural drainage patterns to the extent practicable by installing culverts in sufficient number and size to prevent ponding, diversion, or concentrated runoff. Use gravel for road surfaces where possible to avoid an increase in permeable surfaces and use proper drainage structures to minimize sedimentation and erosion to adjacent wetlands.</li> </ul>



Potential Impact (Deployment Only)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects (continued)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Conduct post-construction monitoring inspections after the first growing season to determine success of revegetation, as applicable, unless otherwise required by a permit.</li> <li>• Avoid, as appropriate, stockpiling material from directional drilling in a wetland, or where the stockpile could cause sedimentation into a wetland or dam water, causing flooding of a wetland area; avoid, as appropriate, setting up drilling equipment in a wetland.</li> <li>• Conduct dewatering in a manner to prevent erosion and to prevent heavily silt-laden water from flowing directly into any wetland or waterbody if dewatering an excavation.</li> <li>• Install buried cable along existing road ROWs wherever possible to minimize vegetation clearing and other potential impacts to wetlands.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:  
 1. (Red) Potentially significant  
 2. (Orange) Less than significant with BMPs and mitigations measures incorporated  
 3. (Yellow) Less than significant  
 4. (Green) No impact



#### **ES4.5.1. Alaska**

In general, effects on wetlands in Alaska would be considered *less than significant* (see Table ES4-5). Wetlands are extensive in Alaska, particularly in the interior and within the Arctic region. Direct and indirect potential wetland impacts may therefore be unavoidable; however, it is anticipated that deployment in wetland areas, as practicable or feasible, would be avoided or minimized, and further reduced with implementation of the BMPs and mitigation measures.

#### **ES4.5.2. Hawaii**

In general, effects on wetlands in Hawaii would be considered *less than significant* (see Table ES4-5). Wetlands comprise less than 3 percent of the area on the Hawaiian islands (*USFWS 2015b*) and are considered a rare, highly valued habitat type to be preserved (*HCZMP 2014*), both due to their rarity and due to their important natural functions. FirstNet and/or its partners would likely attempt to avoid, as practicable or feasible, the relatively small area of wetlands present in the state.

#### **ES4.5.3. American Samoa**

In general, effects on wetlands in American Samoa would be considered *less than significant* (see Table ES4-5). Wetlands comprise less than 1 percent of the area on American Samoa (*BioSystems 1992; ASCMP 2008*) and are therefore a rare habitat type. In addition, most wetlands on American Samoa are considered high-quality habitats due to the amount of natural functions they provide (*BioSystems 1992; USGS 1996*). It is anticipated that deployment in wetland areas would be avoided or minimized, as practicable or feasible, and further reduced with implementation of the BMPs and mitigation measures.

#### **ES4.5.4. Guam**

In general, effects on wetlands in Guam would be considered *less than significant* (see Table ES4-5). Wetlands comprise less than 3 percent of the area on Guam (*USFWS 2015b*), and are therefore considered a rare, highly valued habitat type to be preserved (*GCMP 2008; Government of Guam 1978*). The Guam Coastal and Estuarine Land Conservation Program Plan includes wetland areas as one class of areas to be protected. It is anticipated that deployment in wetland areas would be avoided or minimized, as practicable or feasible, and further reduced with implementation of the BMPs and mitigation measures.



**ES4.5.5. Northern Mariana Islands**

In general, effects on wetlands in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-5). Wetlands comprise less than 5 percent of the area on the Northern Mariana Islands (*USFWS 2015c*), and are therefore considered a rare highly valued habitat type to be preserved (*CNMI CRMO 2008*). The Coastal and Estuarine Land Conservation Program Plan for the Northern Mariana Islands expresses concern about the protection of drinking water, and specifically discusses the role of wetland preservation in addressing this concern (*CNMI CRMO 2008*). It is anticipated that deployment in wetland areas would be avoided or minimized, as practicable or feasible, and further reduced with implementation of the BMPs and mitigation measures.

**ES4.5.6. Puerto Rico**

In general, effects on wetlands in Puerto Rico would be considered *less than significant* (see Table ES4-5). Wetlands comprise just over 5 percent of the area in Puerto Rico, and are therefore considered a rare, highly valued habitat type to be preserved. The Draft Puerto Rico Coastal and Estuarine Land Conservation Plan developed by the Puerto Rico Department of Natural and Environmental Resources identifies wetland habitats as one of the “principal habitats of concern” for their “contribution to the ecological integrity of the overall coastal environment” (*PRDNER 2010*). It is anticipated that deployment in wetland areas would be avoided or minimized, as practicable or feasible, and further reduced with implementation of the BMPs and mitigation measures.

**ES4.5.7. U.S. Virgin Islands**

In general, effects on wetlands in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-5). Wetlands comprise less than 2 percent of the area of the U.S. Virgin Islands, and are considered a rare, highly valued habitat type to be preserved (*Conservation Data Center 2010; Platenberg 2006; UVI 2009*). In addition to habitat and shoreline stabilization functions, mangroves in the U.S. Virgin Islands are also particularly important for processing and export of naturally-derived organic matter (e.g., leaf litter) to other habitats such as seagrass beds and coral reefs, which contribute to the high productivity of these environments, in turn creating important fish and wildlife habitat. It is anticipated that deployment in wetland areas, including mangrove habitats, would be avoided or minimized, as practicable or feasible, and further reduced with implementation of the BMPs and mitigation measures.



## ES4.6. BIOLOGICAL RESOURCES

This section describes potential impacts to biological resources including terrestrial vegetation; wildlife; fisheries; and federal, state/territory, or agency listed plant and animal species associated with deployment and operation of the Proposed Action, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts (see Table ES4-6). Proposed Action activities that involve collocation or shared use of existing facilities or do not require new ground disturbance or substantial construction activity would have *no effect* on biological resources. The development scenarios or deployment activities that could result in potential effects on biological resources include: New Build Scenarios (Buried Fiber Optic Plant, Aerial Fiber Optic Plant, or Submarine Fiber Optic Plant); New Wireless Communication Towers; Deployable Technologies; and Deployable Aerial Communications Architecture. The primary actions related to these components that could cause potential impacts to biological resources include land/vegetation clearing; excavation and trenching; construction of access roads; installation or restructuring of towers and poles; installation of underwater cables in limited near-shore or inland bodies of water; installation of security/safety lighting and fencing; and deployment of aerial platforms. Potential impacts of deployment and operation of the Proposed Action to biological resources (including wildlife, fisheries, and threatened and endangered species and species of conservation concern) are assessed separately in this Draft PEIS, but include the same categories of potential impacts:

- Direct injury or mortality—includes injury or death of an individual or localized population due to physical injuries, extreme stress, or injury or death of an individual from interactions associated with the Proposed Action;
- Indirect effects from disturbance or displacement—includes changes in an individual or population’s habitat use or life history pattern due to disturbance from increased noise and vibration, human activity, visual disturbance, and transportation activity; increased competition for resources or habitat due to displacement of individuals from the affected area into the territory of other animals; or other indirect effects that ultimately cause mortality, decreased fitness, or reduced breeding and recruitment in the future population; and
- Direct or indirect effects on habitats that affect population size and long-term viability of species—direct habitat effects are primarily physical disturbances that result in alterations in the amount or quality of a habitat. Indirect habitat loss can occur through preventing an animal from accessing a regular (e.g., migratory route) or optimal habitat (e.g., breeding, forage, or refuge), either by physically preventing use of a habitat or by causing an animal to avoid a habitat, either temporarily or long-term.



Table ES4-6: Summary of Potential Impacts, Biological Resources

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>								Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands		
<b>Vegetation</b>									
Vegetation and habitat loss, alteration, or fragmentation	3	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Engage in early consultation with appropriate agencies and stakeholders, including federal, state/territory, and local agencies and follow applicable requirements for vegetation removal, disturbance, and restoration;</li> <li>Consolidate facilities as much as possible (collocation and use of existing ROWs) to reduce vegetation loss;</li> <li>Minimize construction of all roads, fences, and other ancillary facilities to reduce overall vegetation loss and habitat fragmentation;</li> <li>Avoid construction/deployment in areas with sensitive vegetation, unique habitat, or designated natural resources, if practical;</li> <li>Segregate topsoil or surface soil from subsurface layers during construction for reuse during post-construction seeding;</li> <li>Restore disturbed areas as progressively and quickly as possible to pre-construction use and vegetation cover using appropriate and certified seed mixes and seed dispersal, management, and maintenance processes, as applicable;</li> <li>Use existing roads and regularly maintained areas when conducting routine maintenance and inspections to the extent feasible;</li> </ul>
Invasive species effects	3	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Obtain all appropriate permits and comply with conditions to minimize or avoid impacts to vegetation;</li> <li>Minimize or avoid forest removal whenever possible;</li> <li>Identify all areas within the proposed construction footprint that contain noxious or invasive plants and use pre-construction treatments such as mowing or herbicide applications (in consultation with appropriate agencies and stakeholders) prior to ground disturbance activities;</li> <li>Store soil containing noxious or invasive plants in a location away from clean topsoil and subsoil; and</li> <li>Inspect and clean all construction equipment and deployable vehicles with high-pressure washing equipment to remove soil and plant matter prior to moving to the next job site or staging location.</li> </ul>





Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
<b>Wildlife</b>								
Amphibians and Reptiles	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Engage in early consultation with appropriate agencies and stakeholders as necessary, including but not limited to USFWS, the National Marine Fisheries Service (NMFS), and relevant state/territory agencies;</li> <li>Minimize vehicular harm of animals migrating between seasonal habitats by locating activities, roads, and infrastructure away from these areas or installing barriers along roadsides;</li> <li>Locate project activities, facilities, and roads away from key habitats (e.g., wetlands, cays, and stream sites) for amphibians and reptiles;</li> <li>Control the spread of invasive animals and plants by coordinating mowing schedules and assisting agencies and groups with ROW permits, washing mowers and equipment between sites, and educating staff;</li> <li>Consolidate facilities as much as possible (e.g., collocation and use of existing ROWs);</li> <li>Avoid known calving/lambing areas in Alaska during critical life stages when undertaking deployment and associated activities (these times vary greatly depending on region, species, and habitat);</li> </ul>
Terrestrial Mammals	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Assess locations of roost sites for bats and timing of critical life stages (e.g., maternity and weaning periods), hibernation for deployment and associated activities (these times vary greatly depending on region, species, and habitat);</li> <li>Minimize construction of all roads, fences, and other ancillary facilities to reduce overall habitat fragmentation;</li> <li>Instruct all construction employees to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship, lambing/calving, pupping and molting [haulout period], spring/fall migrations) seasons;</li> <li>Do not permit pets on site in order to avoid harassment and disturbance of wildlife;</li> <li>Report observations of potential wildlife interactions, including wildlife mortality, to the appropriate agency immediately;</li> <li>Avoid known marine mammal haulouts or concentration areas as locations for deployment and associated activities;</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Marine Mammals	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Assess critical life stages of marine mammals hauled out near locations (1 mile) selected for deployment and associated activities;</li> <li>Assess potential noise impacts to migrating whales and local pinnipeds if deployment and activities would occur over sea ice;</li> <li>Control the spread of invasive animals and plants by coordinating mowing schedules, assisting agencies and groups with ROW permits, washing mowers and equipment between sites, and educating staff;</li> <li>Develop “good housekeeping” procedures to ensure that sites are kept clean of debris, garbage, and or waste;</li> <li>Follow food and waste management protocols to minimize attractants to proposed network deployment sites;</li> </ul>
Birds <sup>2</sup>	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Turn off all unnecessary lighting at night;</li> <li>Minimize or avoid the need for or use of specific types of illumination (e.g., sodium vapor lights) at site facilities to reduce attraction of migratory birds;</li> <li>Follow all BMPs and mitigation measures required by <i>USFWS 2013</i>;</li> <li>Avoid activities within migratory bird flyways and in the immediate vicinity of bat roosts to the extent practicable;</li> <li>Do not operate aircraft at an altitude that could disturb known natural roosting sites of bats, with the exception only for severe weather conditions;</li> <li>Do not operate aircraft at an altitude lower than 1,500 feet within 0.5 mile of known calving/lambing areas during critical life stages, with the exception only for severe weather conditions;</li> </ul>

<sup>2</sup> Additional BMPs and mitigation measures may be required to further reduce potential impacts to migratory birds.



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Terrestrial Invertebrates	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Do not operate aircraft at an altitude lower than 1,500 feet within 0.5 mile of known walrus observed on land or ice, with the exception only for severe weather conditions;</li> <li>Follow standards and guidelines outlined by the Avian Power Line Interaction Committee and USFWS (<i>APLIC and USFWS 2005; APLIC 2012</i>) for any above-ground lines or cables (e.g., use of diverters and anti-perching and anti-nesting devices);</li> <li>Install bat exclusions on existing and new structures;</li> <li>Follow USFWS Guidelines For Recommendations On Communications Tower Siting, Construction, Operation, and Decommissioning (<i>USFWS 2012</i>); and</li> <li>Insert anti-perching or anti-nesting devices on existing or new structures.</li> </ul>
<b>Fisheries</b>								
Direct injury/mortality	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Avoid construction, as practicable, during sensitive seasons for fish such as migration, spawning, egg development (including intra-gravel development) and larval fish (benthic or pelagic) development (sensitive seasons/time periods vary by species and location);</li> <li>Consolidate facilities as much as possible;</li> <li>Use site-appropriate native plants and invasive-free materials (e.g., seed mixes, rock, mulch, soil) for revegetation and restoration efforts;</li> </ul>
Vegetation and habitat loss, alteration, or Fragmentation	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Revegetate and restore riparian areas and other vegetated areas around aquatic resources to the extent possible once construction activities are complete;</li> <li>Report spills or other observed pollutants to the appropriate agency immediately;</li> <li>Instruct all construction employees to avoid harassment and disturbance of fish and other aquatic species, and report any signs of mortality to the appropriate agency immediately;</li> </ul>
Indirect injury/mortality	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Avoid productive habitats to the extent practicable, such as coastal wetlands, inland waterways, essential fish habitats, spawning areas, and reefs;</li> <li>Minimize sedimentation and turbidity in fish habitats by implementing sediment and erosion control measures, as practicable; the use of such measures (e.g., silt fences, silt curtains, and erosion control blankets) could reduce erosion and sedimentation;</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects on migration or migratory patterns	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Use set-backs when clearing vegetation for construction, where appropriate, from riparian zones to avoid removal of important fish cover such as vegetation boulders, and large woody debris;</li> <li>• Perform regular maintenance checks of equipment near protected areas to minimize detachment of components reaching critical habitat by tidal flow;</li> <li>• Avoid construction/deployment, as practicable, in productive riparian zones, marine preserves, and wetlands since construction could potentially result in less refuge for fish, fundamental changes in channel structure (e.g., loss of pool habitats), instability of stream banks, and alteration of nutrient and prey sources within the shoreline aquatic community (<i>Hanson et al. 2003</i>);</li> </ul>
Reproductive effects	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Implement an emergency response plan for fuel spills and environmental emergencies;</li> <li>• Include secondary containment for hazardous materials such as fuels and use uplands, as feasible, away from streams and waterbodies for refueling of construction or operations equipment;</li> <li>• Implement invasive species plans to minimize introduced aquatic plant and animal species into the Proposed Action areas (e.g., wash and inspect equipment and vehicles before moving from one drainage basin or watershed to the next);</li> </ul>
Invasive species effects	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Minimize construction noise in and near fish habitats, as practicable;</li> <li>• Avoid physical barriers in waterbodies, to the extent practicable, during installation and operation to allow for the migration of invertebrates and other aquatic fauna;</li> <li>• Follow all applicable federal and state/territory requirements for construction activities near/in fish and fish habitat;</li> <li>• Use horizontal directional drilling where possible and appropriate, for stream crossings to avoid potential impacts to the streambed, banks, and associated fish habitat; and</li> <li>• Keep poles or lines clear of excess vegetation growth during equipment operation and non-operation periods.</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
<b>Threatened and Endangered Species and Species of Conservation Concern<sup>b</sup></b>								
Marine mammals	2	2	2	2	2	2	2	<ul style="list-style-type: none"> <li>Engage in early consultation with appropriate agencies and stakeholders including, but not limited to, USFWS, NMFS, and state/territory wildlife and natural resources agencies.</li> <li>Avoid conducting deployment activities in areas with known locations or habitats for threatened and endangered plants.</li> <li>Instruct all construction employees to identify and report any sightings of listed species, to avoid harassment and disturbance of wildlife, and to not disturb or enter any nearby caves or mines.</li> <li>Follow food and waste management protocols to minimize attractants to the deployment site.</li> <li>Minimize construction of all roads, fences, and other ancillary facilities to reduce overall habitat fragmentation.</li> </ul>
Terrestrial mammals	4	2	2	2	2	NA	NA	<ul style="list-style-type: none"> <li>Use site-appropriate native plants and invasive-free materials (e.g., seed mixes, rock, mulch, soil) for revegetation and restoration efforts.</li> <li>Prohibit any pets on site during construction or deployment.</li> <li>Report observations of sensitive species that are injured, dead, or entangled to the appropriate agency immediately.</li> <li>Consolidate Proposed Action facilities as much as possible (e.g., collocation and use of existing ROWs).</li> <li>Implement seasonal and spatial buffer zones for construction and other potentially disturbing activities during sensitive periods for listed species such as breeding, nesting, calving/pupping, haulout, migration, spawning, and egg development as identified by USFWS, the NMFS, and/or relevant state/territory agency.</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>								Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands		
Birds	2	2	2	2	2	2	2	<ul style="list-style-type: none"> <li>• Avoid removal or disturbance of forest to the maximum extent practicable and ensure that any unavoidable forest impacts do not result in the loss of listed snails, butterflies, bird breeding habitat, or bat roost sites or hibernacula.</li> <li>• Avoid activities within seagrass beds and control turbidity to minimize potential indirect impacts on seagrass.</li> <li>• Avoid potential impacts to known grouper spawning sites.</li> <li>• Avoid potential impacts within coastal estuarine habitats.</li> <li>• Train construction and deployment staff in the Proposed Action BMPs and mitigation measures and incentivize reporting of any lapses in BMP and mitigation measure implementation.</li> </ul>	
Reptiles	4	2	2	2	2	2	2	<ul style="list-style-type: none"> <li>• Implement a strict policy prohibiting pets on site and prohibiting hunting or fishing or any other action that would result in any avoidable disturbance of listed species.</li> <li>• Use setbacks from riparian zones when clearing vegetation for construction to avoid removal of important fish cover such as vegetation boulders and large woody debris.</li> <li>• Follow all applicable federal and state/territory requirements for construction activities near/in fish and fish habitat.</li> <li>• Use appropriate sediment and erosion control measures to minimize sedimentation and turbidity in fish habitats.</li> <li>• Minimize the use of coastal lighting, particularly in the vicinity of known turtle nesting areas. If the use of coastal lighting in sea turtle use areas is unavoidable, use turtle safe lighting instead of normal lights (low-pressure sodium-vapor lighting or red lights that emit a very narrow portion of the visible light spectrum) and consult with local sea turtle experts on the design of the coastal lighting plan.</li> </ul>	



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Invertebrates	NA	2	2	2	2	2	2	<ul style="list-style-type: none"> <li>• Implement an emergency response plan for fuel spills and environmental emergencies.</li> <li>• Include secondary containment for hazardous materials and use non-wetland sites away from streams and waterbodies for refueling of construction or operations equipment.</li> <li>• Implement invasive species plans to minimize introduced aquatic plant and animal species into the areas affected by the Proposed Action (e.g., wash and inspect equipment and vehicles before moving from one drainage basin or watershed to the next).</li> <li>• Implement the same construction and deployment BMPs and mitigation measures for any operational activities that involve any major infrastructure replacement as part of ongoing system maintenance.</li> <li>• Implement seasonal and spatial buffer zones for operational activities that involve potentially disturbing activities in listed species use areas.</li> </ul>
Fish	2	NA	2	2	2	2	2	<ul style="list-style-type: none"> <li>• Implement “good housekeeping” procedures to ensure that during operation the sites would be kept clean of debris, garbage, and fugitive trash or waste.</li> <li>• Turn off all unnecessary lighting at night.</li> <li>• Avoid or minimize the use of sodium vapor lights at site facilities to reduce attraction of migratory birds.</li> <li>• Develop and implement operational monitoring and adaptive management procedures</li> <li>• Follow standards and guidelines outlined by the Avian Power Line Interaction Committee and USFWS (<i>APLIC 2012</i>) for any above-ground lines or cables (e.g., use of diverters) or other structures (e.g., perch and nest diverters).</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Plants	4	2	2	2	2	2	2	<ul style="list-style-type: none"> <li>Minimize underwater construction noise in all aquatic habitats by minimizing vessel speed, using quieter equipment or technologies, or deploying bubble curtains or other noise screens during underwater work.</li> <li>Implement a marine observer program during construction and operation to avoid and minimize boat strikes to whales, sea turtles, seals, and dugongs.</li> <li>Restrict aircraft operation at altitudes lower than 1,500 feet within 0.5 mile of known pupping or haulout areas during critical life stages, with the exception only for severe weather conditions.</li> <li>Keep aircraft above altitudes higher than 1,500 feet within 0.5 mile of walrus and seals hauled out on land or ice, with the exception only for severe weather conditions.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

<sup>b</sup> Note that the impact ratings used for Threatened and Endangered Species and Species of Conservation Concern are a distinct set of impact categories, based on those in the *Endangered Species Consultation Handbook (USFWS and NMFS 1998)*, in order to facilitate impact evaluation under Section 7 of the Endangered Species Act. These impact categories used in Table ES4-6 are as follows:

1. (Red) May affect, likely to adversely affect
2. (Orange) May affect, not likely to adversely affect
4. (Green) No effect

NA: Taxa not present (Note that no amphibians with threatened/endangered/conservation concern status were present in any of the locations evaluated in this Draft PEIS).





Any species with individuals, populations, or habitat in the vicinity of activities related to the Proposed Action could be subject to one or more of the above potential impacts from the Proposed Action; however, implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, could avoid potential impacts on some species and reduce potential impacts on others. The nature and extent of potential impacts to biological resources would vary depending on many factors, including but not limited to, the species; the nature, location, and extent of the Proposed Action activity; the time of year in relation to species life history; and the duration of deployment.

#### **ES4.6.1. Alaska**

As discussed in Section 3.1.6.3, Terrestrial Vegetation, some invasive plants in Alaska, such as the Canada thistle (*Cirsium arvense*), giant hogweed (*Heracleum mantegazzianum*), leafy spurge (*Euphorbia esula*), and others, thrive in disturbed soil environments and could be aggravated by the Proposed Action, although soil disturbance will be temporary and disturbed soils would likely be revegetated shortly after deployment (*ADEC 2010*). In addition, habitat loss or fragmentation and other wildlife effects could be a source of mortality or injury to terrestrial mammals in Alaska, particularly larger migratory mammals such as moose and caribou. Loss of habitat can also affect birds, given the relatively sparse feeding opportunities in Alaska.

Activities in the water in near-shore environments could disturb or displace marine mammals in Alaska, including whales and pinnipeds, although FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in Alaska (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).

There are 39 federally listed species and 2 candidate species for federal listing in Alaska. Of the 39 federally listed species, 1 is a plant, 4 are birds, 15 are mammals (of which all but one are marine or live on the sea ice), 4 are marine reptiles (sea turtles), and 15 are fish. With effective implementation of BMPs and mitigation measures as defined through consultation with the appropriate resource agency, the Proposed Action would have *no effect* on listed plants, terrestrial mammals, and reptiles. With full and effective implementation of BMPs and mitigation measures, the Proposed Action *may affect, but is not likely to adversely affect* listed birds, mammals, and fish. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.



### ES4.6.2. *Hawaii*

Removal or loss of forest also decreases foraging habitat and would potentially impact insect-eating bats like the Hawaiian hoary bat that are dependent on the forest for the diversity and numbers of flying insects. Displacement of migratory birds is of particular concern in Hawaii because the islands are important stopovers for resting and replenishing energy stores as well as wintering habitats. Hawaii bird communities are vulnerable to introduced predators such as rats and feral cats.

The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Hawaii provides highly productive coral habitats, as well as other aquatic habitats that provide breeding, spawning, feeding, and cover for fish and invertebrate species. FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in Hawaii (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).

There are 474 federally and/or state-listed species in Hawaii (*USFWS 2015c*; *DLNR 2014*). These include 351 plants, 41 birds, 9 mammals (all but 1 are marine), 5 reptiles (all marine), and 68 invertebrates. There are no Federal Candidate Species or Federal Species of Concern. With full and effective implementation of BMPs and mitigation measures as defined through consultation with the appropriate resource agency, the Proposed Action *may affect, but is not likely to adversely affect* listed species. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.

### ES4.6.3. *American Samoa*

The loss of suitable habitat is a concern for bat populations in American Samoa, with almost all the lowland rainforest of the Tafuna Plains (Tutuilia) replaced by urban development and plantations (*NRCS 2009*; *Lindsay et al. 2008*). The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Displacement of migratory birds is of particular concern in American Samoa because the islands are important stopovers for resting and replenishing energy stores as well as wintering habitats.

American Samoa provides one of the healthiest coral reef habitats in the southernmost U.S. Pacific Territory (*NOAA 2008*). Several sanctuaries, preserves, and wildlife conservation areas in American Samoa focus on the conservation of coral reefs, mangroves, wetlands, fish spawning areas, commercial finfish, shellfish, and areas with high species abundance



(*Territory of American Samoa 2010*). FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in American Samoa (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).

There are 16 federally listed animal species in American Samoa, including 1 bird, 5 mammals (all marine), 3 reptiles (all marine turtles), 1 fish, and 6 invertebrates (all corals). Additionally, four species are listed in the territory's Comprehensive Wildlife Conservation Strategy (*DMWR 2006*) and Samoa's 4<sup>th</sup> National Report to the Convention on Biological Diversity (*Government of Samoa 2009*) as critically endangered, endangered, or vulnerable. The potential impacts associated with the Proposed Action *may affect, but are not likely to adversely affect*, listed species. The full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, would likely further reduce potential impacts. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.

#### **ES4.6.4. Guam**

The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Guam is located along the Central Pacific Flyway between North American breeding sites and South Pacific wintering grounds, and is an important stopover for resting and replenishing energy stores as well as wintering habitats

Guam provides highly productive coral reef habitats, submerged vegetation (i.e., algae), rivers, and complex benthic substrates that harbor many diverse freshwater and marine fishes, invertebrates, mollusks, and other aquatic fauna (*Burdick et al. 2008*). The major cause of fish habitat decline in Guam is due to coastal development. Guam has established five marine protected areas, national wildlife refuges, and ecological research areas that should be avoided because these areas provide critical habitat, essential fish habitat, and niche specific ranges occupied by freshwater and marine fishes. FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in Guam (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).

There are 32 federally and/or territory-listed plant and animal species in Guam, including 3 plants, 5 birds, 7 mammals, 10 reptiles, 1 fish, and 6 invertebrates. There are 15 federal candidate species including 13 plants and 2 invertebrates. With full and effective implementation of BMPs and mitigation measures as



defined through consultation with the appropriate resource agency, the Proposed Action *may affect, but is not likely to adversely affect* listed species. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.

#### **ES4.6.5. Northern Mariana Islands**

The waters of the South Pacific serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. Displacement of migratory birds is of particular concern. The Northern Mariana Islands is located along the Central Pacific Flyway between North American breeding sites and South Pacific wintering grounds, and is an important stopover for resting and replenishing energy stores as well as wintering habitats.

The Northern Mariana Islands provides one of the most productive habitats of the Indo-West Pacific. Habitat within this volcanic chain of islands includes complex coral reefs, submerged vegetation (i.e., algae, seagrasses), and benthic substrates that harbor many diverse freshwater and marine fishes, invertebrates, mollusks, and other aquatic fauna (*Williams 1996*). Several sanctuaries, preserves, and wildlife conservation areas in the Mariana Islands focus on the conservation of coral reefs, mangroves, seagrasses, algal beds, wetlands, bays and estuaries, fish spawning areas, commercial finfish, shellfish, and areas with high species abundance (*NOAA 2007*). FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in the Northern Mariana Islands (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).

There are 37 federally and/or territory-listed plant and animal species in the Northern Mariana Islands, including 3 plants, 11 birds, 8 mammals, 10 reptiles, 1 fish, and 4 invertebrates. There are 12 federal candidate species including 8 plants and 4 invertebrates. With full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, the Proposed Action *may affect, but is not likely to adversely affect* listed or candidate species. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.

#### **ES4.6.6. Puerto Rico**

The loss of foraging and roosting habitats is common problems for bat populations in the Caribbean (*Gannon et al. 2005*). The waters of the Caribbean serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. The



Caribbean’s location between North American breeding sites and South American wintering grounds makes Puerto Rico an important stopovers for resting and replenishing energy stores.

Puerto Rico provides highly productive coral habitats, submerged vegetation (i.e., seagrasses), wetlands, rivers, and complex hardbottom substrates harboring many marine fishes, invertebrates, mollusks, colonization and other aquatic organisms and related activities (*CFMC 2015*). The National Oceanic and Atmospheric Administration and the regional fishery management councils have identified more than 100 habitat areas of particular concern in Puerto Rico. FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in Puerto Rico (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).

There are 94 federally and territory-listed species in Puerto Rico. Of the 94 federally listed and candidate species, 50 are plants, 7 are birds, 6 are marine mammals, 4 are marine reptiles (sea turtles), 7 are terrestrial reptiles, 6 are amphibians, 4 are fish, and 10 are marine invertebrates (*USFWS 2015a; NMFS 2015; PRDNER 2005*). With full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, the Proposed Action *may affect, but is not likely to adversely affect* listed species. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.

#### **ES4.6.7. U.S. Virgin Islands**

The waters of the Caribbean serve as primary habitat for a range of critical activities for marine mammals (such as humpback whales), including feeding, mating, and calving. The Caribbean’s location between North American breeding sites and South American wintering grounds makes The U.S. Virgin Islands is an important stopover for resting and replenishing energy stores.

There are approximately 500 different species of fish associated with the Virgin Islands, each with its own ecological niche (*NPS 2015*). Coral reefs, seagrass meadows, and mangrove prop roots are all important habitats that support fish, providing food, shelter, and nursery areas for fish at various stages of their lives (*CFMC 2014*). FirstNet anticipates deployment activities will be limited to near-shore and inland waters and not on the open ocean. In general, effects on biological resources in the U.S Virgin Islands (except for listed species—see below) would be considered *less than significant* (see Table ES4-6).



There are 117 federally and/or territory-listed plant and animal species in the U.S. Virgin Islands, including 62 plants, 33 birds, 6 mammals, 8 herptiles (amphibians and reptiles), 1 fish, and 7 invertebrates. With full and effective implementation of BMPs and mitigation measures, as defined through consultation with the appropriate resource agency, the Proposed Action *may affect, but is not likely to adversely affect* listed species. Site-specific analysis would be required to determine the potential impacts on listed species at specific proposed locations.

#### **ES4.7. LAND USE, AIRSPACE, AND RECREATION**

This section describes potential impacts to land use, airspace, and recreation, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts (see Table ES4-7).

Deployment and operation of new aboveground facilities associated with the Proposed Action, such as new towers, antennae, or other structures, could result in direct changes to land use where such deployment occurs on land not already used for telecommunications, industrial, or public utility activity. As discussed in Section 4.2.9, Socioeconomics, the presence of permanent aboveground facilities could lead to reduced property values due to negative aesthetic characteristics or concerns about potential health impacts. Purchases of land for the Proposed Action buildout could also affect localized real estate market values. These potential impacts would generally be *less than significant* since they would likely be localized to the deployment locations of individual facilities, and individual structures or facilities can often be screened to further minimize any potential impacts.

Deployment and operation of new aboveground facilities associated with the Proposed Action, particularly taller structures such as new towers and antennae, could add new obstructions to existing airspace. These potential impacts would generally be *less than significant*, due to the sporadic location of such aboveground facilities, and the avoidance of military airspace and the heavily used airspace around airfields.

Deployment of the Proposed Action could temporarily block or hinder access to recreation lands, or could reduce the enjoyment that residents and visitors experience while using those recreation lands—particularly in areas where high-quality visual conditions (see Section ES4.8, Visual Resources) are expected. Potential impacts from the loss of access would generally be *less than significant*, while potential impacts from diminished enjoyment of recreation areas would generally be *less than significant*, reflecting the ability to screen or block most individual structures from view.



Table ES4-7: Summary of Potential Impacts, Land Use, Airspace, and Recreation

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Direct land use change (site of FirstNet facility installation or deployable base)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Give preference to development options that involve use of existing physical infrastructure, and/or that do not involve new aboveground structures (i.e., collocation on existing structures, new buried or undersea infrastructure, etc.), especially near recreation lands;</li> <li>• Give preference to development options that are compatible with existing zoning and applicable comprehensive plans;</li> <li>• Select infrastructure locations that are screened from view by topography and/or vegetation, that do not require noticeable permanent changes in landforms (i.e., cut and fill) or vegetation, and that are as far from surrounding residences as possible;</li> <li>• Retain existing vegetation wherever possible to provide visual screening of new infrastructure;</li> <li>• Select infrastructure designs that minimize contrast with the surrounding landscape and land uses and select infrastructure locations that are as far from recreation lands as possible, giving preference to infrastructure locations that are compatible with existing park or recreation planning documents;</li> <li>• Select the shortest possible structures necessary to meet the FirstNet system's needs, and only deploy towers less than 200 feet in height;</li> <li>• Place new infrastructure near existing similar infrastructure where possible, to minimize the total number of new aerial navigation hazards;</li> <li>• Avoid placing new infrastructure near airports or the areas regulated under the FAA's Part 77 regulations (<i>FAA 2015</i>);</li> <li>• Avoid placing new infrastructure within Military Operations Areas or under Military Training Routes; and</li> <li>• Limit the use of Deployable Airborne Communications Architecture to areas less likely to be used by commercial, military, or private aviation (to the degree feasible, and in consultation with the FAA and Department of Defense).</li> </ul>
Indirect land use change (site of FirstNet facility installation or deployable base)	3	3	3	3	3	3	3	
Use of airspace (at and near site of FirstNet facility installation or deployable base)	3	3	3	3	3	3	3	
Loss of access to public or private recreation land	3	3	3	3	3	3	3	
Loss of enjoyment of public or private recreation land	3	3	3	3	3	3	3	

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



**ES4.7.1. Alaska**

Aviation, and particularly general aviation (i.e., smaller aircraft that typically fly at lower altitudes than commercial aircraft) plays an important role in day-to-day transportation in Alaska (*Alaska DOT 2013*). The addition of new aerial hazards could therefore have a greater effect than in other territories. The presence of new aboveground facilities or deployment activity could be perceived as a potential negative recreational impact, particularly in Alaska where land is valued for its pristine, relatively undeveloped characteristic. Such potential impacts would generally occur in a limited number of areas, generally within sight of Project-related aboveground facilities. In general, effects on land use, airspace, and recreation in Alaska would be considered *less than significant* (see Table ES4-7).

**ES4.7.2. Hawaii**

Hawaii is renowned for its scenic and recreational lands. Hawaii residents often choose to live near such lands—and, along with visitors, to visit those lands—because of their scenic beauty and environmental quality. Placement of new aboveground facilities within sight of such lands, including beaches, could create a perceived diminution of those aesthetic and environmental values in the eyes of Hawaii residents and visitors, thus reducing the enjoyment they derive from living near or visiting recreation lands and facilities. Given the relative proximity of existing development to many recreational lands and facilities in Hawaii, such potential impacts are unlikely to be widespread. In general, effects on land use, airspace, and recreation in Hawaii would be considered *less than significant* (see Table ES4-7).

**ES4.7.3. American Samoa**

Land Use, Airspace, and Recreation potential impacts in American Samoa would be similar in nature to the general potential impacts described in Hawaii and would be considered *less than significant* (see Table ES4-6).

**ES4.7.4. Guam**

Land Use, Airspace, and Recreation potential impacts in Guam would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* (see Table ES4-7).

**ES4.7.5. Northern Mariana Islands**

Land Use, Airspace, and Recreation potential impacts in the Northern Mariana Islands would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* (see Table ES4-7).





**ES4.7.6. Puerto Rico**

Land Use, Airspace, and Recreation potential impacts in Puerto Rico would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* (see Table ES4-7).

**ES4.7.7. U.S. Virgin Islands**

Scenic and recreational lands are an intrinsic aspect of the U.S. Virgin Islands identity. Placement of new aboveground facilities within sight of such lands, including beaches, could create a perceived diminution of those aesthetic and environmental values in the eyes of U.S. Virgin Islanders and visitors, thus reducing the enjoyment they derive from living near or visiting recreation lands and facilities. Given the importance of offshore recreation in the U.S. Virgin Islands (as evidenced, in part, by the presence of two protected coral reef areas), the visibility of the Proposed Action’s onshore aboveground facilities from the water could have a similar effect. Given the relative proximity of existing development to many recreational lands and facilities in the U.S. Virgin Islands, such potential impacts are unlikely to be widespread. In general, effects on land use, airspace, and recreation in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-7).

**ES4.8. VISUAL RESOURCES**

This section describes potential impacts to visual resources associated with deployment and operation of the Proposed Action, and discusses BMPs and mitigation measures that would avoid or minimize potential negative impacts, and/or that would preserve or enhance potential positive impacts (see Table ES4-8).

Deployment and operation of new aboveground facilities, such as new towers, antennae, or other structures, could add new permanent elements to the visual landscape (what observers can readily see from a given vantage point), while deployment of options other than aboveground facilities could create only temporary changes to the landscape—such as construction scars or the presence of construction equipment. Observers are more likely to perceive Proposed Action facilities adversely in or near public or recreational areas, such as local parks, historic neighborhoods and landmarks. Other areas where higher scenic values or the absence of new structures may be preferred include relatively undeveloped areas.



Table ES4-8: Summary of Potential Impacts, Visual Resources

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Adverse change in aesthetic character <sup>b</sup>	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Take the scenic character of the surrounding area into account in the proposed design to reasonably minimize or avoid visual impacts to the surrounding area when viewed from existing roadways or shorelines;</li> <li>• Utilize non-reflecting coatings on towers, antennas, buildings, and associated structures where possible;</li> <li>• Implement sensitive grading techniques that blend grading with the natural terrain;</li> <li>• Treat all disturbed slopes for erosion control and minimize the area of bare soil at any one time as much as possible by constructing in stages;</li> <li>• Revegetate disturbed areas as progressively and quickly as practicable to restore vegetative cover;</li> <li>• Reduce or eliminate the need for lighting on poles or structures, or to restrict the duration and directionality of needed lighting;</li> <li>• Give preference to development options that involve use of existing physical infrastructure and specifically avoid the construction of new aerial fiber optic plant and/or new wireless communication towers within or in locations within sight of federal or other lands where visual resources are regulated (e.g., units of the National Park System, or areas where local zoning regulations emphasize protection of views or aesthetic conditions);</li> <li>• Select infrastructure locations that are screened from view by topography and/or vegetation, that do not require noticeable permanent changes in landforms (i.e., cut and fill) or vegetation, and that are as far from surrounding residences as possible;</li> </ul>
Nighttime lighting (overall)	3	3	3	3	3	3	3	



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Nighttime lighting (isolated rural areas) <sup>c</sup>	2	2	2	2	2	2	2	<ul style="list-style-type: none"> <li>• Retain existing vegetation wherever possible to provide visual screening of new infrastructure;</li> <li>• Select infrastructure designs that minimize contrast with the surrounding landscape;</li> <li>• Comply with all relevant and applicable federal regulations and guidance regarding visual and aesthetic conditions and impacts;</li> <li>• Select parking locations for deployable technologies that are screened from view by topography or vegetation, that are as far away from as many observers as possible, and that are not in or near areas considered scenic, such as shorelines, ridgelines, or scenic roads; and</li> <li>• Select deployable designs that minimize the use of nighttime lighting, that include shielded or directional nighttime lighting, and/or that use the minimum nighttime lighting required for safe operations.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

<sup>b</sup> Additional BMPs and mitigation measures may be required for towers.

<sup>c</sup> Potential nighttime lighting impacts during deployment would be *less than significant* due to the temporary nature of the potential impacts but would be *less than significant with BMPs and mitigation measures incorporated* during operations in isolated rural areas or if sited near a national park.



Potential real estate purchasers (individuals who wish to purchase a home or property, investors, developers, etc.) and renters could see the presence of aboveground facilities as a negative aesthetic element—a perception that could affect property values. These visual potential impacts would generally be *less than significant*, since they would likely be localized to the deployment locations of individual facilities, and individual structures or facilities can often be screened or otherwise blocked from view.

Taller aboveground facilities, such as towers, would likely require nighttime and possibly daytime lighting. The visual potential impacts of that lighting would generally be *less than significant* in more developed areas, where new light sources would not be noticeable, but could be *less than significant with BMPs and mitigation measures incorporated* in rural areas or near national parks where the new light sources might interfere with enjoyment of the night sky.

#### **ES4.8.1. Alaska**

Large portions of Alaska are managed for visual resources—including units of the National Park System and national forests—and/or for recreational or cultural activities—local and state parks; state or national forest areas; waterways that are used for subsistence fishing or for recreational purposes including sports fishing or wildlife viewing; Alaska Native villages or communities of historic character; and coastlines and a variety of state lands. Outside of these areas, Alaskans and Alaska visitors have generally come to expect high scenic quality and pristine, undeveloped terrestrial and marine spaces. As a result, the Proposed Action facilities that extend above the horizon are likely to be perceived more negatively than in other parts of the U.S. In addition to high-quality daytime views and dark nighttime skies, Alaskans and Alaska visitors are likely to be concerned about the Proposed Action’s effects on the visibility of the *aurora borealis*.

In general, effects on visual resources in Alaska would be considered *less than significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

#### **ES4.8.2. Hawaii**

Hawaii is renowned for its high quality scenery and overall visual attractiveness, particularly (but not exclusively) in areas managed for visual resources (such as units of the National Park System) and/or recreation. Because Hawaii residents and visitors have come to expect high scenic quality, new aboveground facilities are likely to be perceived more negatively than in other parts of the U.S. In general, effects on visual resources in Hawaii would be considered *less than*



*significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

**ES4.8.3. American Samoa**

Visual Resource potential impacts in American Samoa would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

**ES4.8.4. Guam**

Visual Resource potential impacts in Guam would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

**ES4.8.5. Northern Mariana Islands**

Visual Resource potential impacts in Northern Mariana Islands would be similar in nature to the general potential impacts described in Hawaii, and would be considered *less than significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

**ES4.8.6. Puerto Rico**

Puerto Rico is known for its scenic quality and attracts tourism in part due to that character (*Puerto Rico Tourism Company 2015*); adverse effects on visual resources, including topography and vistas, may be perceived more acutely as a result. In general, effects on visual resources in Puerto Rico would be considered *less than significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).



#### **ES4.8.7. U.S. Virgin Islands**

The U.S. Virgin Islands has a reputation for scenic quality and attracts and relies on tourism in part due to this character. Visitors and residents alike tend to prefer or even demand higher levels of scenic quality in such areas. Because of this, new aboveground facilities in U.S. Virgin Islands are likely to be perceived more negatively than in other parts of the U.S. In general, effects on visual resources in the U.S. Virgin Islands would be considered *less than significant* during the daytime, and *less than significant with BMPs and mitigation measures incorporated* at night, particularly in rural areas where the new light sources might interfere with enjoyment of the night sky (see Table ES4-8).

#### **ES4.9. SOCIOECONOMICS**

Deployment and operation of the Proposed Action may have a variety of potential socioeconomic impacts (both positive and negative), including potential direct and indirect, impacts. In general, operation of the Proposed Action would involve minimal impacts to socioeconomics. Potential impacts would instead be more likely during deployment (see Table ES4-9).

Deployment and operation of new aboveground facilities, such as new towers, antennae, or other structures, could adversely affect local real estate values, due to the diminishment of surrounding aesthetic character. These potential impacts would generally be *less than significant* as recent studies have shown a minimal impact on property prices due to the presence of a nearby tower and decreased to no effect beyond 100 meters (328 feet).

Potential impacts to economic activity would generally be *less than significant*, due to the relatively small amount of economic activity associated with the Proposed Action. Deployment and operation could additionally affect the state or territory's economy through changes in tax revenue, wages, and spending. The Proposed Action could additionally create direct, indirect, and induced employment, through new jobs associated with the Proposed Action (direct), its contractors and subcontractors (indirect), and other businesses that serve the Proposed Action employees, contractors, or subcontractors (induced). Economic effects are typically positive, although potential negative economic impacts are possible.



Table ES4-9: Summary of Potential Impacts, Socioeconomics

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Potential impacts to real estate (deployment)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Avoid development of new wireless communication towers in or near residential areas to reduce the potential that such activities could have adverse impacts on residential property values;</li> <li>• Avoid development or enlargement of storage, staging, and launch/landing areas for deployable technologies in or near residential areas to reduce the potential that such activities could have adverse impacts on residential property values;</li> <li>• Give preference to development options that involve use of existing physical infrastructure;</li> <li>• Select infrastructure locations that are screened from view by topography and/or vegetation, that do not require noticeable permanent changes in landforms (i.e., cut and fill) or vegetation and that are as far from surrounding residences as possible;</li> <li>• Retain existing vegetation wherever possible to provide visual screening of new infrastructure;</li> <li>• Give preference to hiring workers who are local residents, where practicable;</li> <li>• Select infrastructure designs that minimize construction footprints; and</li> <li>• Select infrastructure locations that minimize or avoid disturbance of subsistence species habitat.</li> </ul>
Potential impacts to real estate (operations)	3	3	3	3	3	3	3	
Economic benefits or adverse impacts related to changes in tax revenues, wages, or direct spending (could be positive or negative)	3	3	3	3	3	3	3	
Employment	3	3	3	3	3	3	3	
Increased pressure on existing public services	3	3	3	3	3	3	3	
Diminished social cohesion/disruption related to influx	3	3	3	3	3	3	3	
Reduced opportunities for subsistence practices	3	3	3	3	3	3	3	

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



Increases in employment associated with deployment and operation of the NPSBN would be temporary, and would likely consist at least in part of local labor. The potential impacts of land acquisition for Proposed Action activities would generally have no potential impacts to land or natural resources available for subsistence activities; however, site-specific evaluation would be required to confirm the absence of impacts. Potential impacts would generally be *less than significant*, due to the relatively small amount of economic activity in any given area associated with the Proposed Action.

#### **ES4.9.1. Alaska**

Because Alaska is such a highly scenic state and has such a comparably small real estate market, the negative aesthetic perception of large aboveground facilities such as towers could influence potential real estate activity to a greater degree than in other states or territories. Similarly, direct purchases of land by the Proposed Action could affect Alaska real estate markets more directly than in other locations. The same potential visual impacts that could affect real estate (see above) in Alaska could also negatively affect tourist activity, which is based at least in part on the state's visual characteristics. In general, these effects would be limited to areas near new-build projects. As discussed in Section 3.1.9, Socioeconomics, subsistence is an important way of life in Alaska; thus, Proposed Action potential impacts on subsistence practices could be stronger here than in other locations. In general, effects on socioeconomics in Alaska would be considered *less than significant* (see Table ES4-9).

#### **ES4.9.2. Hawaii**

While Hawaii is a highly scenic state, it also has a constrained real estate market (i.e., little space for new development). As a result, the adverse real estate effects of the negative aesthetic perception of large aboveground facilities such as towers would likely be offset by a relative inability to choose housing away from such structures. These same potential visual impacts could also negatively affect tourist activity in Hawaii, which is based at least in part on the state's visual characteristics. In general, these effects in Hawaii would be limited to areas near new-build projects. In general, effects on socioeconomics in Hawaii would be considered *less than significant* (see Table ES4-9).





**ES4.9.3. American Samoa**

Potential adverse visual impacts associated with the Proposed Action could negatively affect tourist activity in American Samoa (which the territory is working to increase), which is based at least in part on the territory’s visual characteristics. Residents of American Samoa could also experience potential adverse visual impacts due to changes in views considered locally or personally important. In general, these effects in American Samoa would be limited to areas near new-build projects, and would be considered *less than significant* (see Table ES4-9).

**ES4.9.4. Guam**

Potential adverse visual impacts associated with the Proposed Action could negatively affect tourist activity in Guam, a principal activity in the territory’s economy. Residents of Guam could also experience potential adverse visual impacts due to changes in views considered locally or personally important. In general, these effects in Guam would be limited to areas near new-build projects, and would be considered *less than significant* (see Table ES4-9).

**ES4.9.5. Northern Mariana Islands**

Potential adverse visual impacts associated with the Proposed Action could negatively affect tourist activity in the Northern Mariana Islands, which is based at least in part on the territory’s visual characteristics and which comprises nearly one quarter of all employment. Residents of the Northern Mariana Islands could also experience potential adverse visual impacts due to changes in views considered locally or personally important. In general, these effects in the Northern Mariana Islands would be limited to areas near new-build projects, and would be considered *less than significant* (see Table ES4-9).

**ES4.9.6. Puerto Rico**

Potential adverse visual impacts associated with the Proposed Action could negatively affect tourist activity in Puerto Rico, which is based at least in part on the territory’s visual characteristics. Residents of Puerto Rico could also experience potential adverse visual impacts due to changes in views considered locally or personally important. In general, these effects in Puerto Rico would be limited to areas near new-build projects, and would be considered *less than significant* (see Table ES4-9).



**ES4.9.7. U.S. Virgin Islands**

Potential adverse visual impacts associated with the Proposed Action could negatively affect tourist activity in the U.S. Virgin Islands, which is a principal economic activity. Residents of the U.S. Virgin Islands could also experience potential adverse visual impacts due to changes in views considered locally or personally important. In general, these effects in the U.S. Virgin Islands would be limited to areas near new-build projects, and would be considered *less than significant* (see Table ES4-9).

**ES4.10. ENVIRONMENTAL JUSTICE**

Potential environmental justice impacts could occur if minority (race or ethnicity) or low-income groups are disproportionately affected by adverse social, health, or environmental consequences of the Proposed Action. Given that these potential impacts could only occur if these particular groups are present and the specific locations within states and territories of deployment and operations activities of the Proposed Action have not been identified, this Draft PEIS mapped the potential of environmental justice impacts' occurrence as low, moderate, or high within each of the states and territories considered.

In general, the impacts from deployment activities would be *less than significant* as the potential impacts would be short-term and could potentially involve objectionable dust, noise, traffic, or other localized impacts due to construction activities (see Table ES4-10). Potential environmental justice impacts associated with routine maintenance and inspection of the facilities are anticipated to have *less than significant* impacts if the same roads are used to perform inspections and maintenance activities. Any major infrastructure replacement as part of ongoing system maintenance would result in potential impacts similar to the deployment impacts described above.



Table ES4-10: Summary of Potential Impacts, Environmental Justice<sup>a</sup>

Potential Impact (Deployment and Operations)	Impact Rating <sup>b</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects associated with other resource areas (e.g., cultural resources) that have environmental justice implications due to the affected parties (as defined by EO 12898)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Identify specific communities (i.e., neighborhoods or populations that may be contained within individual block groups), where possible, that are at risk of experiencing environmental justice impacts. Conduct targeted outreach to these communities-tailored to the specific racial, ethnic, financial, and/or cultural background-as early in the development process as possible to explain the nature and extent of specific potential impacts, and to gain feedback on those impacts.</li> <li>• Consult with subsistence users to understand the species and habitats used for subsistence activities, as well as the seasonal cycle of subsistence activity.</li> <li>• Give preference to development options that involve use of existing physical infrastructure.</li> <li>• Select infrastructure locations, where possible, that are not within or near environmental justice communities, particularly new build options.</li> <li>• Follow BMPs that reduce adverse impacts of construction activities, such as generation of noise, dust, and traffic.</li> <li>• Avoid siting deployment activities and facilities requiring construction in proximity to environmental justice communities to reduce the potential that such activities would be seen as disproportionately affecting environmental justice communities.</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>b</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Effects associated with other resource areas (e.g., cultural resources) that have environmental justice implications due to the affected parties (as defined by EO 12898) (continued)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Avoid development of new wireless communication towers in proximity to environmental justice communities because of their potential impacts on property values and to reduce the potential that such activities would be seen as disproportionately affecting environmental justice communities. Proximity could be defined variably depending on the nature of the aesthetic impacts, nature of other objectionable effects that influence property values and other factors such as local concern over aesthetics, desire for improved wireless communications, local media response, and more.</li> </ul>

<sup>a</sup> Since potential environmental justice impacts occur at the site-specific level, analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities. BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

<sup>b</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



### **ES4.10.1. Alaska**

Approximately 33 percent of Alaska’s population identifies itself as a racial minority (i.e., a race other than white or Caucasian). A substantial portion of Alaska’s block groups has a high potential for environmental justice communities, and therefore a high potential for impacts to those communities. These high potential areas are found on all of Alaska’s populated islands and cover a substantial portion of the mainland. Moderate-potential block groups are found near Fairbanks, Anchorage, Sitka, and Juneau. Moderate- and low-potential block groups appear to be clustered near major population centers such as Anchorage, Fairbanks, Juneau, and Sitka. In general, effects on environmental justice in Alaska would be considered *less than significant* (see Table ES4-10), although analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

### **ES4.10.2. Hawaii**

Approximately 75 percent of Hawaii’s population identifies itself as a racial minority (i.e., a race other than white or Caucasian). A substantial portion of Hawaii’s block groups has a high potential for environmental justice communities, and therefore a high potential for impacts to those communities. These high potential areas are found on all of Hawaii’s populated islands and cover all or nearly all of Kauai, Lanai, and Molokai. Moderate-potential block groups are found on the largest islands—Hawaii, Maui, Molokai, Oahu, and Kauai. There is no apparent correlation between major population centers and any specific level of potential environmental justice concerns. In general, effects on environmental justice in Hawaii would be considered *less than significant* (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

### **ES4.10.3. American Samoa**

Approximately 93 percent of American Samoa’s population identifies itself as Native Hawaiian or Other Pacific Islander. Block groups within the populated Eastern, Manu’a and Western Districts have a high potential for environmental justice impacts; Rose Island and Swain’s Island have a low potential for these impacts, based on population density. In general, effects on environmental justice in American Samoa would be considered *less than significant* (see Table ES4-10).



Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

#### **ES4.10.4. Guam**

Approximately 93 percent of Guam's population identifies itself as a racial minority (i.e., a race other than white or Caucasian), including 49 percent of the population that identifies itself themselves as Native Hawaiian or Other Pacific Islander). A substantial portion of Guam's block groups has a high potential for environmental justice communities, and therefore a high potential for impacts to those communities. These high potential areas include Guam's outlying islands, most of the central portion of the main island (including the urban area in and around Tamuning), and portions of the southwestern and northwestern coastlines. Moderate-potential block groups are found in the northeastern and southeastern area of the main island, as well as the area near Naval Base Guam, southwest of Tamuning). Low-potential block groups are found along the northern coast and south-central portion of the main island. In general, effects on environmental justice in Guam would be considered *less than significant* (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

#### **ES4.10.5. Northern Mariana Islands**

Approximately 63 percent of the Northern Mariana Islands' population identifies itself as a racial minority (i.e., a race other than white or Caucasian), including 35 percent of the population who identify themselves as Native Hawaiian or Other Pacific Islander. All of the Northern Mariana Islands' block groups have a high potential for environmental justice communities, due primarily to poverty statistics, and therefore a high potential for impacts to those communities. In general, effects on environmental justice in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.



#### **ES4.10.6. Puerto Rico**

Approximately 30 percent of Puerto Rico’s population identifies itself as a racial minority (i.e., a race other than white or Caucasian, not including Hispanic), while 99 percent of the population identify themselves as Hispanic. Areas of high potential for environmental justice impacts are found on all of Puerto Rico’s populated islands and cover all or nearly all of the islands. Moderate- and low-potential block groups are only found on the largest island—Puerto Rico. Moderate- and low-potential block groups appear to generally be clustered near major population centers, such as San Juan, Carolina, Caguas, and Bayamon. In general, effects on environmental justice in the Puerto Rico would be considered *less than significant* (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.

#### **ES4.10.7. U.S. Virgin Islands**

Approximately 84 percent of the U.S. Virgin Islands’ population identifies itself as a racial minority (i.e., a race other than white or Caucasian). High-, moderate-, and low-potential environmental justice areas are found on all three of the major populated islands in the U.S. Virgin Islands (St. Croix, St. Thomas, and St. John). High-potential block groups cover approximately 50 percent of the land area of St. Croix and St. Thomas, while moderate-potential block groups cover over 50 percent of the land area of St. John. Major population centers such as Christiansted, Frederiksted, Charlotte Amalie, and Cruz Bay appear to correlate to high-potential block groups. In general, effects on environmental justice in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-10). Analyses of individual proposed projects would be required to determine potential impacts to specific environmental justice communities, and BMPs and mitigation measures may be required to address potential impacts to environmental justice communities at the site-specific level.



## ES4.11. CULTURAL RESOURCES

As discussed in the Cultural Resources sections of the Draft PEIS, the evaluation of potential impacts to cultural resources uses a distinct set of impact categories, comparable to those defined in *36 Code of Federal Regulations (CFR) 800, Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation*, and the U.S. National Park Service's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation (NPS 1995)*. These impact categories (and the equivalent impact categories and numeric ratings used throughout the rest of this Executive Summary) are:

- Adverse effect (1, *potentially significant*);
- Mitigated adverse effect (2, *less than significant with BMPs and mitigation measures incorporated*);
- Effect, but not adverse (3, *less than significant*); and
- No effect (4, *no impact*).

The primary cultural resource concern during deployment and operation activities is physical damage to and/or destruction of historic properties (see Table ES4-11). Indirect effects on historic properties could include changes to the views to and from a resource (potential viewshed impacts); increased noise levels at a resource; vibration; and/or visual or atmospheric effects caused by dust, emissions, or pollutants. The goal of historic preservation is not only to preserve and protect historic properties, but also to provide access to cultural resources, especially to those who value them.

To the extent practicable, FirstNet does not expect to raze, adversely affect, or permanently restrict access to any historic structures, historic properties, traditional cultural properties, or other cultural resources. If the proposed deployment activities would have the potential to adversely affect historic properties, FirstNet would apply BMPs and mitigation measures, as practicable or feasible, and/or consult with appropriate federal, state/territory, and interested parties to apply appropriate mitigation measures to resolve adverse effects. Potential residual impacts (those occurring after implementation of BMPs and mitigation measures) would generally be temporary and limited to the area near individual Proposed Action deployment sites. Based on the analysis of deployment activities to cultural resources, impacts as a result of direct and indirect effects are anticipated to *effect, but not adverse*.





Table ES4-11: Summary of Potential Impacts, Cultural Resources

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Physical damage to and/or destruction of historic properties	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Ensure usage of an appropriate indirect effects APEs as part of pre-siting or pre-deployment surveys to sufficiently account for potential indirect effects to cultural resources.</li> <li>• Establish procedures for monitoring if a project has the potential to adversely indirectly affect historic properties. Develop BMPs and mitigation measures as part of a Memorandum of Agreement or Programmatic Agreement to address any potential effects, if they were to occur.</li> <li>• Use low-impact construction alternatives, when feasible. For instance, ripping could be used as an alternative to blasting near structures or archaeological sites identified as at risk of effects from vibration.</li> </ul>
Indirect effects on historic properties (i.e., visual, noise, vibration, atmospheric)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Restrict the timing of deployment activities so as not to disturb the use of historic properties, as applicable. Stop work at certain times when traditional and/or religious properties are in use, such as during significant events (e.g., religious festivals or ceremonies).</li> <li>• Design projects to mitigate potentially negative visual and auditory impacts of facilities. The following visual and noise abatement techniques should be considered: noise-reducing barriers, low-profile constructions, proper siting to maximize the use of topography and vegetation, screening, blending with topographic forms and existing vegetation patterns, and use of environmental coloration or advanced camouflage techniques to limit visual effects.</li> <li>• Consult with site users through a community liaison team to understand site usage and how the project could affect user access.</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Loss of access to historic properties	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Arrange alternative access using stakeholder input if access to an important cultural heritage site is restricted or blocked. Notify the public of the blockage and alternate means of access.</li> <li>• Follow all applicable federal requirements for consultation on the identification of and assessment of effects to cultural resources.</li> <li>• Avoid deployment in areas with known historic properties and deploy equipment and facilities in alternate locations if practical.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Adverse effect
2. (Orange) Mitigated adverse effect
3. (Yellow) Effect, but not adverse
4. (Green) No effect

Categories of impacts defined as an *adverse effect*; *mitigated adverse effect*; *effect, but not adverse*; and *no effect* are comparable to those defined in 36 CFR 800, Secretary of Interior’s Standards and Guidelines for Archaeology and Historic Preservation, and the U.S. National Park Service’s *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (NPS 1995).



### **ES4.11.1. Alaska**

In Alaska, cultural resources can be found in coastal or inland environments, in relatively flat areas or more remote locations, such as those that could be used for ceremonial purposes. There are currently 475 cultural resources listed on the National Register of Historic Places (NRHP) in Alaska. FirstNet and/or their partners would consult with the appropriate state agencies and interested Alaska Native tribes and organizations to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project Area of Potential Effect (APE) to determine the potential effect of the Proposed Action on any identified historic properties. Apart from such potential site-specific considerations, the overall effects on cultural resources in Alaska would be considered an *effect, but not adverse* (see Table ES4-11).

### **ES4.11.2. Hawaii**

In Hawaii, cultural resources can be found in coastal or inland environments, in relatively flat areas or more remote locations, such as those that could be used for ceremonial purposes. There are currently 384 cultural resources listed on the NRHP in Hawaii, and the Hawaiian Register of Historic Places currently contains 1,345 listed cultural resources. FirstNet and/or their partners would consult with the appropriate state agencies and interested Native Hawaiian groups to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project APE to determine the potential effect of the Proposed Action on any identified historic properties. Apart from such potential site-specific considerations, the overall effects on cultural resources in Hawaii would be considered *effect, but not adverse* (see Table ES4-11).

### **ES4.11.3. American Samoa**

Known and unidentified cultural resources can occur throughout American Samoa, which currently has 31 cultural resources listed on the NRHP. Portions of American Samoa with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, historic properties, near-shore shipwrecks, and military facilities and pillboxes. FirstNet and/or their partners would consult with the appropriate territory agencies and interested Chamorro groups to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project APE to determine the potential effect of the Proposed Action on any identified historic properties. Apart from such potential site-specific considerations, the overall effects on cultural resources in American Samoa would be considered *effect, but not adverse* (see Table ES4-11).



#### **ES4.11.4. Guam**

As with other territories, known and unidentified cultural resources can occur throughout Guam. There are currently 161 cultural resources listed on the Guam Register of Historic Places and 127 cultural resources listed on the NRHP in Guam; of these, 120 cultural resources are listed on both. Portions of Guam with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, historic properties, near-shore shipwrecks, as well as flat, inland areas. FirstNet and/or their partners would consult with the appropriate territory agencies and interested Chamorro groups to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project APE to determine the potential effect of the Proposed Action on any identified historic properties. Apart from such potential site-specific considerations, the overall effects on cultural resources in Guam would be considered *effect, but not adverse* (see Table ES4-11).

#### **ES4.11.5. Northern Mariana Islands**

Known and unidentified cultural resources can occur throughout the Northern Mariana Islands; currently 40 cultural resources are listed on the NRHP. Portions of the territory with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, historic properties, and near-shore shipwrecks. FirstNet and/or their partners would consult with the appropriate territory agencies and interested native Mariana Islander groups to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project APE to determine the potential effect of the Proposed Action on any identified historic properties. Apart from such potential site-specific considerations, the overall effects on cultural resources in the Northern Mariana Islands would be considered *effect, but not adverse* (see Table ES4-11).

#### **ES4.11.6. Puerto Rico**

Puerto Rico has known and unidentified cultural resources throughout the territory. There are currently 351 cultural resources listed on the NRHP in Puerto Rico. Portions of Puerto Rico with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, as well as flat, inland areas. FirstNet and/or their partners would consult with the appropriate territory agencies and interested groups to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project APE to determine the potential effect of the Proposed Action on any identified historic properties.



Apart from such potential site-specific considerations, the overall effects on cultural resources in Puerto Rico would be considered *effect, but not adverse* (see Table ES4-11).

#### **ES4.11.7. U.S. Virgin Islands**

As with other territories, the U.S. Virgin Islands has known and unidentified cultural resources throughout the territory, with 92 cultural resources currently listed on the NRHP and various cultural resources are listed on the U.S. Virgin Islands Register of Historic Places. Portions of the islands with higher potential for the presence of cultural resources (including unidentified resources) include, but are not limited to, coastal areas where populated areas and infrastructure are prevalent, as well as flat, inland areas. FirstNet and/or their partners would consult with the appropriate territory agencies and interested groups to identify, evaluate, and apply the criteria of adverse effects on historic properties within the project APE to determine the potential effect of the Proposed Action on any identified historic properties. Apart from such potential site-specific considerations, the overall effects on cultural resources in the U.S. Virgin Islands would be considered *effect, but not adverse* (see Table ES4-11).

#### **ES4.12. AIR QUALITY**

This section describes potential impacts to air quality associated with deployment and operation of the Proposed Action and alternatives, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts (see Table ES4-12). In general, operation of the Proposed Action would involve minimal potential impacts to air quality, generally limited to vehicle emissions associated with periodic inspection of structures, or operation of deployables during times of emergency. These cases notwithstanding, air quality potential impacts from the Proposed Action would be more likely during deployment.

Increased air emissions could result in negative potential impacts to human health, wildlife, vegetation, and visibility. Emissions could result from stationary or mobile equipment that is powered by fossil fuels such as excavators, backhoes, front end loaders, graders, pavers, dump trucks, and other equipment required to support any clearance, drilling, and construction activities associated with network deployment. In addition, the use of power generators, first responder on-road vehicles and aerial platforms associated with the use of deployable technologies could also increase air emissions, both from fossil fuel combustion and, in some cases, from stirring up dust on unpaved roads and construction areas.



Table ES4-12: Summary of Potential Impacts, Air Quality

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Increased air emissions (deployment and operations)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Follow all applicable federal, state/territory, and local requirements for air quality control and obtain air pollution control permits for applicable emission sources;</li> <li>Avoid constructing and operating sources in extreme or severe nonattainment areas to the extent practicable;</li> <li>Use engines certified to the lowest emission standards and engines that burn alternative fuels (e.g., natural gas, biofuels), and/or install emission control devices (when practicable) for equipment with internal combustion engines;</li> <li>Control dust from construction or other land-disturbing activities by spraying water on roads/construction areas, limiting the area of uncovered soil to the minimum needed for each activity, siting staging areas to minimize fugitive dust, using a soil stabilizer (chemical dust suppressor), mulching areas or using a temporary gravel cover, limiting the number and speed of vehicles on the site, and covering trucks hauling dirt;</li> <li>Ensure all activities conform to the State or Territory Implementation Plan;</li> <li>Ensure all diesel engines are compliant with USEPA emission standards for the corresponding engine class;</li> <li>Obtain permits, where required, to install and operate fossil fuel-powered generators;</li> <li>Use only ultra-low sulfur fuel (where commercially available) for both on-road and off-road diesel engines; and</li> <li>Ensure all fuel-burning equipment including, but not limited to, heavy construction equipment and power generators, are maintained in accordance with manufacturer’s specifications.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



Potential impacts from increased air emissions could occur in any location; however, they would be most significant in nonattainment areas (where air quality does not currently meet local standards), maintenance areas (where air quality has improved but historically did not meet local standards), and designated Class I Areas (areas of special national or cultural significance including certain national parks, wilderness areas, and national monuments).

These potential impacts would generally be *less than significant*, because Proposed Action deployment would avoid, to the degree possible, areas sensitive to decreased air quality, such as designated Class I Areas. It is anticipated that any air pollution increase due to deployment would likely be short-term with pre-existing air quality levels generally achieved after some months (typically less than a year).

#### **ES4.12.1. Alaska**

There are four Class I Areas in Alaska (Bering Sea Wilderness Area, Denali National Park, Simeonof Wilderness Area, and Tuxedni Wilderness Area). Fairbanks North Star Borough is designated as a moderate nonattainment area for particulate matter with a diameter of 2.5 micrometers or less (PM<sub>2.5</sub>). Anchorage and Fairbanks are designated as maintenance areas for carbon monoxide, while Anchorage–Eagle River; and Juneau–Mendenhall Valley are designated as maintenance areas for particulate matter with a diameter of 10 micrometers or less (PM<sub>10</sub>). In general, effects on air quality in Alaska would be considered *less than significant* (see Table ES4-12).

#### **ES4.12.2. Hawaii**

There are no designated nonattainment or maintenance areas for any pollutants in Hawaii. There are two Class I Areas in the state: Haleakala National Park and Hawaii Volcanoes National Park. In general, effects on air quality in Hawaii would be considered *less than significant* (see Table ES4-12).

#### **ES4.12.3. American Samoa**

There are no designated nonattainment or maintenance areas or Class I Areas in American Samoa. In general, effects on air quality in American Samoa would be considered *less than significant* (see Table ES4-12).



**ES4.12.4. Guam**

There are no Class I Areas in Guam, although the areas near the Piti Power Plant and Tanguisson Power Plant are nonattainment areas for sulfur dioxide. In general, effects on air quality in Guam would be considered *less than significant* (see Table ES4-12).

**ES4.12.5. Northern Mariana Islands**

There are no designated nonattainment or maintenance areas or Class I Areas in the Northern Mariana Islands. In general, effects on air quality in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-12).

**ES4.12.6. Puerto Rico**

There are no Class I Areas in Puerto Rico. Arecibo is designated as a nonattainment area for lead and Guaynabo County is designated as a maintenance area for PM<sub>10</sub>. In general, effects on air quality in Puerto Rico would be considered *less than significant* (see Table ES4-12).

**ES4.12.7. U.S. Virgin Islands**

There are no designated nonattainment or maintenance areas in the U.S. Virgin Islands. Virgin Islands National Park is a Class I Area. In general, effects on air quality in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-12).

**ES4.13. NOISE**

This section describes potential impacts to noise associated with deployment and operation of the Proposed Action and alternatives, and discusses BMPs and mitigation measures that would avoid or minimize those potential impacts (see Table ES4-13). In general, operation of the Proposed Action would involve minimal potential noise impacts, with the notable exception being potential localized noise impacts from generators associated with operation of deployables. That case notwithstanding, potential noise impacts would be more likely during deployment.





Table ES4-13: Summary of Potential Impacts, Noise

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Increased noise levels (deployment and operations)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Use noise mufflers on heavy equipment to limit noise exposure on noise-sensitive receptors for construction and grading activities near populated areas; limit the use of such equipment to operation during daytime hours only;</li> <li>• Include mitigation measures during the design and implementation phases of the project for equipment that is expected to generate significant noise (e.g., use of noise barriers such as walls, shrubbery);</li> <li>• Avoid, as practicable, deployment in areas with highly sensitive receptors and construct facilities in alternate locations for those projects involving heavy equipment for deployment;</li> <li>• Follow all applicable federal, state/territory, county/borough, and local requirements for construction and operation noise control to avoid or minimize increased noise levels;</li> <li>• Ensure, as practicable, all heavy equipment, power generators, and boats are maintained in accordance with manufacturer’s specifications;</li> <li>• Limit construction activities to daytime hours to the extent possible;</li> <li>• Implement BMPs and mitigation measures as directed by the local jurisdiction such as avoiding unnecessary revving of engines, switching off equipment when not in use, changing location of stationary construction equipment, minimizing drop height of materials, replacing conventional audible reversing alarms with more quiet alternative reversing warning systems, siting equipment away from noise sensitive areas (if practicable), notifying adjacent residents in advance of construction work, installing temporary acoustic barriers around stationary construction noise sources, and other controls as needed to reduce increased noise levels; and</li> <li>• Do not permit underwater blasting and pile driving activities in any waterbody.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



Potential impacts to the community from increased noise levels could occur in wilderness areas or pristine environments (including wildlife refuges, historic sites, ecological preserve areas, etc.) where natural quiet is expected, rural and outer suburban areas with negligible traffic, general suburban areas with infrequent traffic, general suburban areas with medium density traffic, or suburban areas with some commerce or industry. These areas are most sensitive to increased noise levels because of their low to medium baseline average noise levels. Urban areas are less susceptible to increased noise levels because of their higher average ambient noise levels.

Increased noise levels could result in community annoyance by interfering with speech and other human-related activities. Noise emissions associated with movement of heavy equipment such as excavators, backhoes, trenchers, graders, pavers, rollers, dump trucks, cranes, etc., required to support any deployment activities needed for network deployment could potentially temporarily impact sensitive receptors, such as residences, hotels/motels/inns, hospitals, and recreational areas.

These potential impacts would generally be *less than significant*, because Proposed Action deployment would avoid or minimize, to the degree practicable, areas sensitive to increased noise, such as designated wilderness areas and lands managed for recreation (such as national parks or national wildlife refuges) where noise is less common. In addition, it is anticipated that any noise increase due to deployment would likely be isolated within those locations and would be short-term with pre-existing noise levels generally achieved after some months (typically less than a year; could also be a few hours for linear activities such as pole construction).

#### **ES4.13.1. Alaska**

Over 50 percent of the wilderness areas in the U.S. are in Alaska, including several individual wilderness areas that each covers more than one million acres. In addition, Alaska has millions of acres of other lands managed for recreation, wildlife, or other uses where an absence of artificial noise is likely to be expected. Because some Proposed Action infrastructure would be expected to be built near these areas, attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.



**ES4.13.2. Hawaii**

Noise-sensitive areas subject to Proposed Action potential impacts in Hawaii include wilderness and pristine natural environments such as Haleakala and Hawaii Volcanoes National Park, as well as rural and suburban areas. Because some Proposed Action infrastructure would be expected to be deployed near these areas, attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.

**ES4.13.3. American Samoa**

Although there are no wilderness areas in American Samoa, other noise-sensitive areas subject to Proposed Action potential impacts are present, including the National Park of American Samoa, which preserves and protects coral reefs, tropical rainforests, and Samoan culture. Because some Proposed Action infrastructure would be expected to be deployed near these areas, attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.

**ES4.13.4. Guam**

Although there are no wilderness areas in Guam, other noise-sensitive areas subject to Proposed Action potential impacts are present, including the Guam National Wildlife Refuge, along with rural and suburban areas. Because some Proposed Action infrastructure would be expected to be deployed near these areas, the attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.

**ES4.13.5. Northern Mariana Islands**

Noise-sensitive areas subject to Proposed Action potential impacts in the Northern Mariana Islands include national wildlife refuges and offshore marine sanctuaries. Because some Proposed Action infrastructure would be expected to be deployed near these areas, the attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.



#### **ES4.13.6. Puerto Rico**

Puerto Rico contains substantial areas subject to Proposed Action potential impacts that may be more sensitive to noise, such as El Yunque National Forest (including the El Toro Wilderness Area) and several national wildlife refuges, as well as rural and suburban areas. Because some Proposed Action infrastructure would be expected to be deployed near these areas, the attendant potential noise impacts could occur within these areas, although such potential impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.

#### **ES4.13.7. U.S. Virgin Islands**

Noise-sensitive areas subject to Proposed Action potential impacts in the U.S. Virgin Islands include national wildlife refuges and offshore marine sanctuaries, as well as units of the National Park System and pristine natural areas. Because these sensitive areas are unavoidable in the U.S. Virgin Islands, some Proposed Action infrastructure would likely be deployed in or near these areas, although the attendant potential noise impacts would generally be temporary and limited to areas immediately near deployment locations. As described above, such potential impacts would generally be *less than significant*.

#### **ES4.14. CLIMATE CHANGE**

The analysis of climate change focuses on two primary factors: greenhouse gas (GHG) emissions from Proposed Action activities and the effects of climate change on Proposed Action facilities (see Table ES4-14). GHG emissions, which would generally occur during deployment of the Proposed Action (as well as during operation of deployables during emergency situations), would arise from combustion of fossil fuel in stationary or mobile equipment (such as construction equipment and deployables), clearing of vegetation, use of generators, and changes in land use during deployment and operation. GHG emissions would be emitted locally but likely have a minimal effect globally.

The magnitude of GHG potential impacts would generally be *less than significant*. Revised Draft Council on Environmental Quality Guidance requires that projects provide a quantitative analysis for emissions greater than 25,000 metric tons of carbon dioxide equivalents annually. Exceeding this threshold is unlikely for any project type in this region.



Table ES4-14: Summary of Potential Impacts, Climate Change

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
GHG emissions: less than quantification threshold of 25,000 metric tons per project (deployment)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Ensure that equipment used is the most energy efficient, or use state-of-the-art equipment to increase energy efficiency;</li> <li>• Ensure that construction vehicles are running only when required for construction and reduce or limit unnecessary idling;</li> <li>• Conduct regular maintenance and inspection on equipment to ensure that it is running at the maximum energy efficiency;</li> <li>• Minimize disturbed land area and soil disturbance by co-locating where it is feasible;</li> <li>• Revegetate disturbed land areas after construction where it is feasible;</li> <li>• Use more fuel-efficient diesel-power generation units or low-emission units such as gasoline- or hydrogen-fueled power generators; and</li> <li>• Use access roads previously used during deployment activities for maintenance and operational activities.</li> </ul>
GHG emissions: at or above quantification threshold of 25,000 metric tons per project (deployment)	3	3	3	3	3	3	3	
GHG emissions: single backup power unit (operations)	3	3	3	3	3	3	3	
GHG emissions: multiple backup power units (operations)	3	3	3	3	3	3	3	
Effect of climate change on Proposed Action (operations) <sup>b</sup>	1-2	1-2	1-2	1-2	1-2	1-2	1-2	<ul style="list-style-type: none"> <li>• Ensure design of above ground structures and equipment has included allowances for maximum temperature and precipitation changes;</li> <li>• Continuously monitor and reinforce structures build on permafrost;</li> <li>• Assess sea-level rise prior to installation of infrastructure near coastal areas;</li> <li>• Reinforce structures to include allowances for extreme weather events and flooding; and</li> <li>• Work jointly with public authorities in the implementation of monitoring plans and action plans related to potential impacts that could affect the Proposed Action.</li> </ul>

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
- 1-2. (White) Range of Potentially significant to Less than significant with BMPs and mitigation measures incorporated.
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

<sup>b</sup> Climate change effects on the various deployment activities would likely be minimal and are expected to have *no impacts*.



Climate changes due to increasing global GHG emissions from all sources, which would generally affect operation of the Proposed Action, are projected to produce a range of effects, including changes in temperature, precipitation, and sea level as well as changes in frequency and intensity of weather events when compared to historical trends. These climate effects can exacerbate, lessen, or have a positive effect on environmental resources during operation of the Proposed Action:

- Projections indicate increasing average annual temperatures through the end of the century. These increases could lead to potential impacts associated with heat stress and wildfire risk particularly for aboveground infrastructure.
- Climate change can lead to increased or decreased precipitation in different parts of the world. Increased precipitation could lead to flooding, erosion, and similar effects, while decreased precipitation could lead to soil compaction. All of these effects can potentially impact the stability of aboveground infrastructure, such as towers, antennas, POPs, huts, poles, and microwave dishes.
- Projections indicate that global mean sea level would rise through the end of the century. Sea-level rise increases the likelihood for coastal flooding and erosion, which could pose significant potential impacts to infrastructure near or on the coast.

Based on the analysis of the operational activities described above, climate change effects on the Preferred Alternative could be *potentially significant to less than significant with BMPs and mitigation measures incorporated* because climate change effects such as changes in temperature, precipitation, and sea-level rise during operations could potentially impact the infrastructure of the Preferred Alternative. Mitigation measures could minimize or reduce the severity or magnitude of a potential impact resulting from the Proposed Action, while adaptation refers to anticipating adverse effects of climate change and taking appropriate action to prevent and minimize the damage climate change effects could cause.

#### **ES4.14.1. Alaska**

The GHG emissions associated with the Proposed Action in Alaska would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in Alaska is expected to increase by 8.3 degrees Fahrenheit (°F) by the end of the century, while precipitation in Alaska is projected to increase 25 percent. These climate changes could lead to thawing of permafrost, which would likely lead to potential impacts on infrastructure, particularly foundations and structures including buildings and roads (*Markon et al. 2012*). Climate



change could produce other concerns for Proposed Action facilities in Alaska, particularly for facilities in coastal areas, such as increased frequency of flood events, sea level rise, and increased potential for fires (Markon *et al.* 2012). Accordingly, the magnitude of potential climate change impacts on the Proposed Action in Alaska would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.

#### **ES4.14.2. Hawaii**

The GHG emissions associated with the Proposed Action in Hawaii would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in Hawaii is expected to increase by 5°F by the end of the century. Precipitation will vary greatly in northern and southern Hawaii; increases in precipitation are projected in southern Hawaii while decreases in precipitation are projected in northern Hawaii. Sea-level rise would increase the vulnerability of coastal Proposed Action structures, although potential impacts would vary with location. Increasing mean sea levels would likely increase the frequency of extreme events such as hurricanes (Keener *et al.* 2012). Accordingly, the magnitude of potential climate change impacts on the Proposed Action in Hawaii would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.

#### **ES4.14.3. American Samoa**

The GHG emissions associated with the Proposed Action in American Samoa would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in the Central South Pacific region, which includes American Samoa, is expected to increase by 4.8°F, and the intensity and frequency of extreme heat will also increase through the end of the century. Precipitation is also projected to increase along the equator through the end of the century (Keener *et al.* 2012). El Niño like events could be expected more frequently in the tropical Pacific (Keener *et al.* 2013). Increasing mean sea levels would likely increase the frequency of extreme events such as hurricanes (Keener *et al.* 2012). Drier conditions, related to increased heat, could increase soil contraction, potentially impacting foundations of infrastructure. These changes, along with sea-level rise, could increase the risk to Proposed Action structures and facilities, particularly those in coastal areas. Accordingly, the magnitude of potential climate change impacts on the Proposed Action in American Samoa would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.



#### **ES4.14.4. Guam**

The GHG emissions associated with the Proposed Action in Guam would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in the Western North Pacific region, which includes Guam, is expected to increase by 5.1°F, and the intensity and frequency of extreme heat will also increase through the end of the century. Precipitation is also projected to increase along the equator through the end of the century (*Keener et al. 2012*). El Niño-like events could be expected more frequently in the tropical Pacific (*Keener et al. 2013*). Increasing mean sea levels would likely increase the frequency of extreme events such as hurricanes (*Keener et al. 2012*). Drier conditions, related to increased heat, could increase soil contraction, potentially impacting foundations of infrastructure. These changes, along with sea-level rise, could increase the risk to Proposed Action structures and facilities, particularly those in coastal areas. Accordingly, the magnitude of potential climate change impacts on the Proposed Action in Guam would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.

#### **ES4.14.5. Northern Mariana Islands**

The GHG emissions associated with the Proposed Action in the Northern Mariana Islands would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in the Western North Pacific region, which includes the Northern Mariana Islands, is expected to increase by 5.1°F, and the intensity and frequency of extreme heat will also increase through the end of the century. Precipitation is also projected to increase along the equator through the end of the century (*Keener et al. 2012*). El Niño like events could be expected more frequently in the tropical Pacific (*Keener et al. 2013*). Increasing mean sea levels would likely increase the frequency of extreme events such as hurricanes (*Keener et al. 2012*). Drier conditions, related to increased heat, could increase soil contraction, potentially impacting foundations of infrastructure. These changes, along with sea-level rise, could increase the risk to Proposed Action structures and facilities, particularly those in coastal areas. Accordingly, the magnitude of potential climate change impacts on the Proposed Action in the Northern Mariana Islands would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.





**ES4.14.6. Puerto Rico**

The GHG emissions associated with the Proposed Action in Puerto Rico would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in the Caribbean (including Puerto Rico) is expected to increase by 6.1°F (Centella et al. 2008), while precipitation is projected to decrease by the end of the century (Ingram et al. 2013). Furthermore, drought frequency is expected to increase (Ingram et al. 2013). As a result of these changes, damage to Proposed Action infrastructure, particularly in coastal areas, could occur from storm surges or sea-level rise. Drought conditions could increase soil contraction, affecting Proposed Action facility foundations. Accordingly, the magnitude of potential climate change impacts on the Proposed Action in Puerto Rico would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.

**ES4.14.7. U.S. Virgin Islands**

The GHG emissions associated with the Proposed Action in the U.S. Virgin Islands would be considered *less than significant* (see Table ES4-14). In a high-emission scenario, temperature in the Caribbean (including Puerto Rico) is expected to increase by 6.1°F (Centella et al. 2008), while precipitation is projected to decrease by the end of the century (Ingram et al. 2013). Furthermore, drought frequency is expected to increase (Ingram et al. 2013). As a result of these changes, damage to Proposed Action infrastructure, particularly in coastal areas, could occur from storm surges or sea-level rise. Drought conditions could increase soil contraction, affecting Proposed Action facility foundations. Accordingly, the magnitude of potential climate change impacts on the Proposed Action in U.S. Virgin Islands would generally range between *potentially significant* and *less than significant with BMPs and mitigation measures incorporated*.



#### ES4.15. HUMAN HEALTH AND SAFETY

Health effects from human exposure to environmental contaminants can range from experiences of physical irritation/nuisance to acute illness, to chronic disease outcomes, depending on the type of contaminant and level of exposure. Potential human health impacts of the Proposed Action generally include (see Table ES4-15):

- Existing environmental contaminants in soil or water. Proposed Action deployment activities could pose a health risk to workers and communities if deployment causes or facilitates direct contact with contaminated soil (i.e., soil that is already contaminated, or that becomes contaminated as a result of Proposed Action activities) or surface water runoff containing soil chemicals from the construction site.
- Potential pollutants in surface water from spills (i.e., spills associated with Proposed Action activities).
- Air emissions from stationary and mobile sources that are powered by fossil fuels. Particularly sensitive populations include those with chronic respiratory diseases, acute respiratory infections, chronic heart disease, and/or diabetes.
- Workplace and construction site accidents and injuries, including injuries to FirstNet workers as well as community members.
- Road traffic accidents and injuries, including accidents involving FirstNet workers as well as members of the community.
- Potential noise-related health impacts, including at Proposed Action deployment sites, as well as at nearby residences and businesses.
- Communicable diseases. Of particular concern are insect-borne diseases such as dengue and chikungunya, which could affect FirstNet workers exposed to the elements.

These potential impacts would generally be *less than significant*, due to the relatively small amount of hazardous materials (such as vehicle fuels), air emissions, and noise associated with Proposed Action deployment and operation, safety procedures required by federal and state/territory law, and limited potential for increased risk of communicable disease. In general, operation of the Proposed Action would involve minimal potential impacts to human health, except for new air emissions and potential road traffic accidents associated with operation of deployables during emergencies. Although still minimal, potential impacts would instead be more likely during deployment.



Table ES4-15: Summary of Potential Impacts, Human Health and Safety

Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Potential exposure to hazardous materials (deployment)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Follow all applicable federal, state/territory, and local requirements for health and safety;</li> <li>Utilize trained and licensed heavy equipment operators, when available or required;</li> <li>Develop a site-specific Health and Safety Plan that identifies all potential physical and chemical hazards present at the site, including historic contamination;</li> <li>Develop and utilize Standard Operating Procedures for site preparation activities and include description of work practice controls and administrative control;</li> </ul>
Potential exposure to hazardous materials (operation)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Ensure workers wear proper safety equipment, such as high visibility safety vests, hard hats, steel-toe boots, gloves, eye protection, and hearing protection;</li> <li>Provide daily safety meetings to review activities, potential hazards, and safety objectives;</li> <li>Avoid site preparation work in areas with high vehicle traffic volume, such as road ROWs;</li> <li>Avoid site preparation work in areas known to contain environmental contamination or mine lands;</li> </ul>
Accidents and injuries (deployment)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>Incorporate all BMPs and mitigation measures listed in Infrastructure, Soils, Water Resources, and Air Quality and Noise;</li> <li>Conduct air and noise monitoring to ensure levels stay within health-protective levels for communities and workers and, as required, that workers are trained and comply with personal protective equipment requirements as established by OSHA;</li> <li>Search for the location of federal and state/territory Superfund sites prior to site section in the area where the Proposed Action site is being considered, for new or existing infrastructure projects and take appropriate protective actions;</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Accidents and injuries (operations)	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Ensure that appropriate measures are taken in compliance with applicable regulations if construction occurs in an area where there is the potential for legacy soil contamination, to protect workers and the public from unacceptable levels of exposure to contaminants as a result of deployment activities;</li> <li>• Establish an emergency response plan (including emergency preparedness and response activities, resources, and responsibilities) to attend to specific emergencies (e.g., accidental spills) that could arise during deployment;</li> </ul>
Exposure to noise (deployment).	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Ensure that reporting requirements are followed in the event that Emergency Planning and Community Right-to-Know Act reporting thresholds are reached for the shipping, handling or storage of gasoline or diesel used for equipment and generators;</li> <li>• Establish a grievance mechanism or other stakeholder engagement tool that is accessible and culturally appropriate for use by the community to express concerns regarding the Proposed Action;</li> </ul>
Exposure to noise (operations).	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Implement community education and public awareness, as needed, about the Proposed Action’s traffic, routes used, road signage, and safety which are particularly critical in high-risk areas;</li> <li>• Use signage to clearly mark construction sites, and establish boundaries and barricades to keep people out of dangerous areas;</li> <li>• Make sure an incident investigation procedure is in place that can be specifically used for any near misses or incidents involving workers and community members;</li> <li>• Ensure all workers are appropriately trained in hazard management;</li> </ul>



Potential Impact (Deployment and Operations)	Impact Rating <sup>a</sup>							Typical BMPs and Mitigation Measures
	Alaska	Hawaii	American Samoa	Guam	N. Mariana Islands	Puerto Rico	U.S. Virgin Islands	
Communicable disease (deployment).	3	3	3	3	3	3	3	<ul style="list-style-type: none"> <li>• Inform community members of dates and times of construction activities that are likely to generate noise at levels above 55 A-weighted decibels at the residences or workplaces of those individuals;</li> <li>• Monitor land clearing and construction sites for areas of standing water, including ditches and holes in the ground, as well open receptacles (e.g., empty barrels) and fill or eliminate these hazards to prevent mosquito breeding;</li> <li>• Follow OSHA-recommended Workplace Precautions against West Nile Virus, another mosquito-borne illness for which, like chikungunya and dengue, the only preventative measure is avoidance of bites by infected mosquitoes; and</li> <li>• Ensure that the appropriate medication is available for treatment of any filariasis infections that may arise in the workforce for projects located in areas where filariasis is known to occur.</li> </ul>
Communicable disease (operations).	3	3	3	3	3	3	3	

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact



**ES4.15.1. Alaska**

Alaska has six active Superfund sites that have ongoing cleanup action to address soil and groundwater contamination. The state has identified four specific highway segments that have a higher than average incidence of fatal and major injury crashes (Seward, Parks, Knik/Goose Bay and Sterling Highways). Some Proposed Action infrastructure could be deployed in or near some of these areas with the human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to Occupational Safety and Health Administration (OSHA) workplace health and safety standards.

**ES4.15.2. Hawaii**

Hawaii has three active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In Hawaii, human cases of the mosquito-borne diseases chikungunya and dengue have been reported in recent years. While all reported chikungunya cases and most reported dengue cases have been imported (*USGS 2015d*), the mosquito vectors that transmit the virus are present in the state and therefore local transmission is possible (*Remanda 2015*). Some Proposed Action infrastructure would be expected to be deployed in or near these areas with these human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to OSHA workplace health and safety standards.

**ES4.15.3. American Samoa**

American Samoa has no active Superfund sites. The rate of diabetes prevalence in American Samoa is almost six times higher than the national average (*CDC 2013; WHO 2011*). Diabetics may be more sensitive to air pollution than other individuals. In American Samoa, the mosquito- and tick-borne disease filariasis and the mosquito-borne diseases chikungunya and dengue are endemic, and are a major public health concern. Some Proposed Action infrastructure would be expected to be deployed in these areas with these human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to OSHA workplace health and safety standards.



**ES4.15.4. Guam**

Guam has 12 active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In Guam, the mosquito-borne dengue is an ongoing public health concern. Some Proposed Action infrastructure would be expected to be deployed in or near some of these areas with these human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to OSHA workplace health and safety standards.

**ES4.15.5. Northern Mariana Islands**

The Northern Mariana Islands has no active Superfund sites and is ranked 55 out of 56 states or territories for toxic release volume (*USEPA 2015; 2014*). In the Northern Mariana Islands, the mosquito-borne disease dengue is endemic, although there have been no reported cases in recent years. Some Proposed Action infrastructure would be expected to be deployed in these areas with these human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to OSHA workplace health and safety standards.

**ES4.15.6. Puerto Rico**

Puerto Rico is a heavily industrialized area and has 33 active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In Puerto Rico, human cases of the mosquito-borne diseases chikungunya and dengue have been reported in recent years, including a notable dengue outbreak in 2010. Some Proposed Action infrastructure would be expected to be deployed in or near some of these areas with these human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to OSHA workplace health and safety standards.

**ES4.15.7. U.S. Virgin Islands**

The U.S. Virgin Islands has four active Superfund sites that have ongoing cleanup action around soil and groundwater contamination. In the U.S. Virgin Islands, the mosquito-borne diseases chikungunya and dengue have been identified by public health officials as infectious diseases of concern. Some Proposed Action infrastructure would be expected to be built in or near some of these areas with these human health risks. As described above, such potential impacts would generally be *less than significant*, assuming the adherence to OSHA workplace health and safety standards.



## **ES4.16. CUMULATIVE EFFECTS**

NEPA regulations (*40 CFR § 1500-1508*) require the assessment of the Proposed Action to address potential cumulative impacts: the potential incremental impact of the Proposed Action in combination with other past, present, and reasonably foreseeable future actions. The scope of the cumulative effects analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur, as well as a description of what resources could potentially be cumulatively affected.

The design, deployment, and operation of the Proposed Action would occur throughout the non-contiguous region of the U.S., and specific project sites have not yet been identified. Furthermore, there is currently a wide range of technologies that FirstNet may use to implement and deploy the Proposed Action. Therefore, this Draft PEIS addresses potential cumulative impacts qualitatively.

The geographic extent of the Proposed Action as considered for the cumulative impact analysis includes the area under the jurisdiction of the Proposed Action, specifically the non-contiguous region that is the subject of this Draft PEIS. The timeframe considered for this analysis is 50 years. There are few other past, present, and reasonably foreseeable future telecommunication projects planned for the non-contiguous region. As described in Chapters 3 through 9 of the Draft PEIS, the effects of the Proposed Action would not result in *significant* potential impacts, either alone or when combined with other ongoing telecommunications infrastructure development or operations.

## **ES5. POTENTIAL IMPACTS OF OTHER ALTERNATIVES**

### **ES5.1. DEPLOYABLE TECHNOLOGIES ALTERNATIVE**

Under the Deployable Technologies Alternative option, a nationwide fleet of mobile communications systems would provide temporary coverage in areas not covered by the existing, usable infrastructure. There would be no collocation of equipment and no new construction associated with wired or wireless projects discussed above under the Preferred Alternative. The specific infrastructure associated with the Deployable Technologies Alternative would be the same as the deployable technologies implemented as part of the Preferred Alternative but would likely be implemented in greater numbers, over a larger geographic extent, and used with greater frequency and duration.

Table ES5-1 summarizes the impact ratings for the Deployable Technologies Alternative. The ratings for each type of potential impact reflect the overall rating for that potential impact across all seven states and territories evaluated in this





Draft PEIS. In cases where the states and territories had different values, the value selected for Table ES5-1 reflects the more potentially impactful category. Please see the discussion of the Deployable Technologies Alternative in Chapter 12, Comparison of Alternatives, and in each Environmental Consequences section in the Draft PEIS for a more detailed discussion. BMPs and mitigation measures for the Deployable Technologies Alternative would generally be the same as those described for the Deployable Technologies option within the Proposed Action.

**ES5.1.1. Potential Deployment Impacts**

Deployment of deployable technologies would generally involve the purchase, initial testing, staffing, and mobilization of deployables. These activities would generally result in potential impacts similar to those described throughout Section ES4 (such as additional air emissions and noise from testing). In general, these potential impacts would range from *no impact* to *less than significant with BMPs and mitigation measures incorporated*, although most deployment potential impacts would be *less than significant* (including potential socioeconomic impacts, which would be positive due to equipment purchase and staffing).

**ES5.1.2. Potential Operation Impacts**

Operation of deployable technologies would involve the mobilization and stationing of deployables at various pre-determined locations in (or above, in the case of deployable aerial communications architecture) each state or territory, for periods of time lasting up to approximately two years.

As shown in Table ES5-1, these potential impacts would range from *no impact* to *less than significant with BMPs and mitigation measures incorporated*. The exact value of operational potential impacts would depend on the type and length of time of deployable technology used.



**Table ES5-1: Summary of Potential Impacts, Deployment and Operation of Deployable Technologies Alternative**

Resource Area/Type of Effect	Potential Impact <sup>a</sup>	
	Deployment	Operations
<b>Infrastructure</b>		
Transportation system capacity and safety	3	3
Strain on capacity of local health, public safety, and emergency response services	3	3
Modifies existing public safety response telecommunication practices, physical infrastructure, or level of service in a manner that directly affects public safety communication capabilities and response times.	3	3
Effects on commercial telecommunication systems, communications, or level of service	3	3
Effects on utilities, including electric power transmission facilities and water and sewer facilities	3	3
<b>Soils</b>		
Soil erosion	3	3
Topsoil mixing	3	3
Soil compaction and rutting	3	3
<b>Geology</b>		
<i>Potential Impacts of the Project</i>		
Surface geology, bedrock, topography, physiography, and geomorphology	3	3
Mineral and fossil fuel resource potential impacts	3	3
Paleontological resources potential impacts	3	3
<i>Potential Impacts to the Project</i>		
Seismic hazard	3	3
Volcanic activity	3	3
Landslide	3	3
Land subsidence	3	3
<b>Water Resources</b>		
Water Quality (groundwater and surface water): sedimentation, pollutants, water temperature	3	3
Floodplain degradation	3	4
Drainage pattern alteration	3	4
Flow alteration	4	4
Changes in groundwater or aquifer characteristics	3	4
<b>Wetlands</b>		
Direct wetland loss (fill or conversion to non-wetland), other direct and indirect effects	3	3
<b>Biological Resources</b>		
<i>Vegetation</i>		
Vegetation and habitat loss, alteration, or fragmentation	3	3
Invasive species effects	3	3
<i>Wildlife</i>		
Amphibians and Reptiles	3	3
Terrestrial Mammals	3	3
Marine Mammals	3	3
Birds	3	3
Terrestrial Invertebrates	3	3



Resource Area/Type of Effect	Potential Impact <sup>a</sup>	
	Deployment	Operations
<i>Fisheries</i>		
Direct Injury/Mortality	3	3
Vegetation and Habitat/Loss	3	3
Indirect Injury/Mortality	3	3
Migration Effects	3	3
Reproductive Effects	3	3
Effects of Invasive Species	3	3
<i>Threatened and Endangered Species and Species of Conservation Concern<sup>b</sup></i>		
Marine Mammals	2	2
Terrestrial Mammals	2	2
Birds	2	2
Reptiles	2	2
Fish	2	2
Invertebrates	2	2
Plants	2	2
<b>Land Use, Airspace, and Recreation</b>		
Direct land use change (site of FirstNet facility installation or deployable base)	4	3
Indirect land use change (site of FirstNet facility installation or deployable base)	4	3
Use of airspace (at and near site of FirstNet facility installation or deployable base)	3	3
Loss of access to public or private recreation land	4	3
Loss of enjoyment of public or private recreation land (due to visual, noise, or other potential impacts that make recreational activity less desirable)	4	3
<b>Visual Resources</b>		
Adverse change in aesthetic character	3	3
Nighttime lighting (overall)	3	3
Nighttime lighting (isolated rural areas)	3	3
<b>Socioeconomics</b>		
Potential impacts to real estate	4	4
Potential economic benefits or adverse impacts related to changes in tax revenues, wages, or direct spending (could be positive or negative)	3	3
Employment	3	3
Increased pressure on existing public services	4	4
Diminished social cohesion/disruption related to influx	4	4
Reduced opportunities for subsistence practices	4	3
<b>Environmental Justice</b>		
Effects associated with other resource areas (e.g., cultural resources) that have environmental justice implications due to the affected parties (as defined by <i>EO 12898</i> )	3	3
<b>Cultural Resources<sup>c</sup></b>		
Physical damage to and/or destruction of historic properties <sup>d</sup>	3	3
Indirect effects on historic properties (i.e., visual, noise, vibration, atmospheric)	3	3
Loss of access to historic properties	3	3
<b>Air Quality</b>		
Increased air emissions	3	3
<b>Noise</b>		
Increased noise levels	3	3



Resource Area/Type of Effect	Potential Impact <sup>a</sup>	
	Deployment	Operations
<b>Climate Change</b>		
Contribution to climate change through GHG emissions	3	1-2
Effect of climate change on potential Proposed Action-related impacts	4	4
<b>Human Health and Safety</b>		
Potential exposure to hazardous materials	3	4
Accidents and Injuries	3	3
Exposure to Noise	3	3
Communicable Disease	3	3

<sup>a</sup> Impact ratings and colors are as follows:

1. (Red) Potentially significant
- 1-2. (White) Range of Potentially significant to less than significant with BMPs and mitigations measures incorporated
2. (Orange) Less than significant with BMPs and mitigations measures incorporated
3. (Yellow) Less than significant
4. (Green) No impact

<sup>b</sup> Note that the impact ratings used in the Threatened and Endangered Species and Species of Conservation Concern are a distinct set of impact categories, based on those in the *Endangered Species Consultation Handbook (USFWS and NMFS 1998)*, in order to facilitate impact evaluation under Section 7 of the Endangered Species Act. These impact categories used in Table ES4-6 are as follows:

1. (Red) May affect, likely to adversely affect
2. (Orange) May affect, not likely to adversely affect
4. (Green) No effect

<sup>c</sup> Impact ratings for the evaluation of cultural resources are as follows:

1. (Red) Adverse effect
2. (Orange) Mitigated adverse effect
3. (Yellow) Effect, but not adverse
4. (Green) No effect

<sup>d</sup> Categories of impacts defined as an *adverse effect*; *mitigated adverse effect*; *effect, but not adverse*; and *no effect* are comparable to those defined in *36 CFR 800, Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation*, and the U.S. National Park Service's *National Register Bulletin: How to Apply the National Register Criteria for Evaluation (NPS 1995)*.

## ES5.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the NPSBN would not be deployed; therefore there would be no associated deployment or installation of wired, wireless, deployable infrastructure or satellites and other technologies. As a result, there would be *no impacts* as a result of deployment and operation of the Proposed Action. Conditions would therefore be the same as those described in the Affected Environment sections of the Draft PEIS.

## ES5.3. COMPARISON OF ALTERNATIVES

Potential impacts associated with the two Proposed Action alternatives are generally similar. Both alternatives have potential impacts whose significance ranges from *no impacts* to *potentially significant*. For many resources, impact ratings are identical, although some differences exist for some resource areas. For example, the Preferred Alternative would have somewhat greater potential impacts than the Deployable Technologies Alternative to water resources,



wetlands, and visual resources. Conversely, the Deployable Technologies Alternative would have somewhat greater potential impacts than the Preferred Alternative to air resources. The purpose and need of the NPSBN would not be met under the No Action Alternative.

## **ES6. DRAFT PEIS CONTENTS**

This Draft PEIS includes descriptions of the affected environment, potential impacts, and BMPs and mitigation measures for the Proposed Action and its alternatives in each of the seven states and territories that make up the Non-contiguous region. The structure and contents of this document have been developed in accordance with NEPA requirements. The main organization of this document is as follows:

- Chapter 1: Introduction;
- Chapter 2: Description of the Proposed Action and Alternatives;
- Chapters 3 through 9: Each chapter focuses on one of the non-contiguous region states or territories and contains an analysis of that state's or territory's affected environment (including descriptions of the portions of the environment that could be affected by the Proposed Action), environmental consequences (including descriptions of the potential environmental, social, historic, and cultural impacts of the Proposed Action), and references;
- Chapter 10: Cumulative Effects;
- Chapter 11: BMPs and Mitigation Measures;
- Chapter 12: Comparison of Alternatives;
- Chapter 13: Other Required Analyses;
- Chapter 14: List of Preparers and Contributors;
- Chapter 15: Distribution List;
- Chapter 16: Index;
- Chapter 17: Glossary; and
- Appendices



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