

Nationwide Public Safety Broadband Network

Final Programmatic Environmental Impact Statement

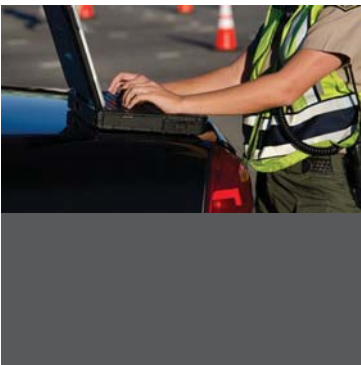
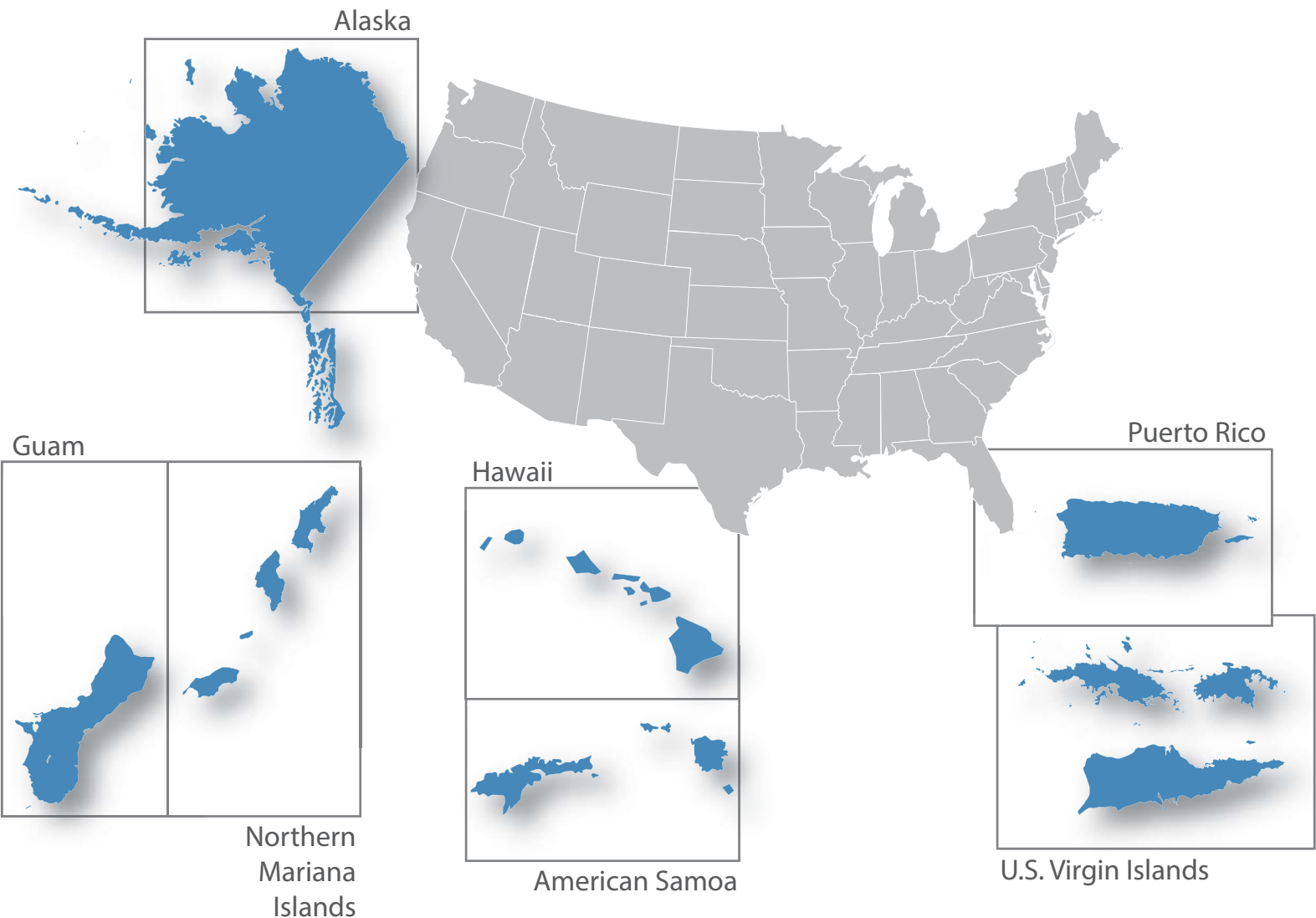
for the Non-Contiguous United States



First Responder Network Authority

Volume 8 - Chapters 10-18 & Appendices

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



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First Responder Network Authority



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

Volume 8

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Cooperating Agencies

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

May 2017

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ACRONYMS AND ABBREVIATIONS

°F	degree Fahrenheit	ASPA	American Samoa Power Authority
°N	degrees north	ATO	Air Traffic Organization
µg/m ³	microgram(s) per cubic meter	ATWC	Alaska Tsunami Warning Center
µPa	micro Pascal	AURORA	Alaska Uniform Response Online Reporting Access
%	percent	BACT	best available control technology
A	attained	BCE	before Common Era
AAC	Alaska Administrative Code	BCR	Bird Conservation Regions
AAFIS	Alaska Public Safety Identification System	BGEPA	Bald and Golden Eagle Protection Act
AAQS	Ambient Air Quality Standards	BLM	Bureau of Land Management
ACHP	Advisory Council on Historic Preservation	BLS	U.S. Bureau of Labor Statistics
ACS	American Community Survey (U.S. Census Bureau)	BMP	best management practice
ADEC	Alaska Department of Environmental Conservation	BRFSS	Behavioral Risk Factor Surveillance System
ADFG	Alaska Department of Fish and Game	BSAI	Bering Sea/Aleutian Island
AGL	above ground level	BWG	BioInitiative Working Group
AIRFA	American Indian Religious Freedom Act	CAA	Clean Air Act
AJRCCM	American Journal of Respiratory and Critical Care Medicine	CAB	Clean Air Branch
AKNHP	Alaska National Heritage Program	CARB	California Air Resources Board
AKOSH	Alaska Occupational Safety and Health	CBIA	Coastal Barrier Improvement Act of 1990
AKWAS	Alaska Warning System	CBRA	Coastal Barrier Resources Act of 1982
ALMR	Alaska Land Mobile Radio	CCP	Comprehensive Conservation Plan
ANCSA	Alaska Native Claims Settlement Act	CDC	Center for Disease Control
ANFIRS	Alaska Fire Incident Reporting System	CDLNR	Commonwealth Department of Lands and Natural Resources
ANSI	American National Standards Institute	CE	Common Era
APE	Area of Potential Effect	CELCP	Coastal and Estuarine Land Conservation Program
APLIC	Avian Power Line Interaction Committee	CEPD	Caribbean Environmental Protection Division
APSIN	Alaska Public Safety Information Network	CEQ	Council on Environmental Quality
AQCR	air quality control region	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ARFF	Aircraft Rescue and Firefighting	CFMC	Caribbean Fisheries Management Council
ARMS	Alaska Records Management System	CFR	Code of Federal Regulations
ARPA	Archaeological Resources Protection Act of 1979	cfs	cubic feet per second
AS	Alaska Statute	CH ₄	methane
ASAC	American Samoa Administrative Code	CHC	Commonwealth Health Center
ASCA	American Samoa Code Annotated	CIA	Central Intelligence Agency
ASCMP	American Samoa Coastal Management Program	CMIP3	Coupled Model Intercomparison Project phase 3
ASDHS	American Samoa Department of Homeland Security	CNMI	Commonwealth of Northern Mariana Islands
ASDMWR	American Samoa Department of Marine and Wildlife Resources	CNMIAC	Commonwealth of Northern Mariana Islands Administrative Code
ASEPA	American Samoa Environmental Protection Agency	CO	carbon monoxide
ASHPO	American Samoa Historic Preservation Office	CO ₂	carbon dioxide
		CO ₂ e	carbon dioxide equivalents
		COMAR	Committee on Man and Radiation

CPA	Commonwealth Ports Authority	FirstNet	First Responder Network Authority
CRMP	Coastal Resources Management Program	FMP	Fishery Management Plan
CSP	Central South Pacific	FPPA	Farmland Protection Policy Act of 1981
CUC	Commonwealth Utilities Corporation	FR	Federal Register
CWA	Clean Water Act	ft	feet
CZMA	Coastal Zone Management Act	g/hp-hr	grams per horsepower-hour
CZMP	Coastal Zone Management Program	g/mi	grams per mile
DACA	Deployable Airborne Communications Architecture	GAP	Gap Analysis Program
DAR	Division of Aquatic Resources (Hawaii)	GCA	Guam Code Annotated
DAWR	Division of Aquatic and Wildlife Resources (Guam)	GDA	Guam Department of Agriculture
dB	decibel(s)	GEPA	Guam Environmental Protection Agency
dba	A-weighted decibel(s)	GHG	greenhouse gas
DBCP	1,2-dibromo-3-chloropropane	GIS	geographic information system
dBZ	Z-weighted decibel(s)	GMP	General Management Plan
DCP	1,2-dichloropropane	GOA	Gulf of Alaska
DEC	Department of Environmental Conservation	GRHP	Guam Register of Historic Places
DHHL	Department of Hawaiian Homelands	GWP	global warming potential
DLNR	Department of Land and Natural Resources (Hawaii)	H ₂ S	hydrogen sulfide
DMA	Disaster Mitigation Act of 2000	HDOH	Hawaii Department of Health
DNER	Department of Natural and Environmental Resources of Puerto Rico	HEI	Health Effects Institute
DOA	Department of Agriculture	HHCA	Hawaiian Homes Commission Act of 1920
DOD	Department of Defense	HI-EMA	Hawaii Emergency Management Agency
DOE	U.S. Department of Energy	HIANG	Hawaii Air National Guard
DOH	Department of Health	HIARNG	Hawaii Army National Guard
DOH-CAB	Hawaii Department of Health, Clean Air Branch	HIHWNMS	Hawaiian Islands Humpback Whale National Marine Sanctuary
DOT	U.S. Department of Transportation	HIOSH	Hawaii Occupational Safety and Health Division
DPNR	Department of Planning and Natural Resources (U.S. Virgin Islands)	hp	horsepower
DPS	Department of Public Safety	HRD	(Guam) Historic Resources Division
EA	Environmental Assessment	HRHP	Hawaii Register of Historic Places
EAS	Emergency Alert System	HRS	Hawaii Administrative Rules, Revised Statute
EBS	Emergency Broadcast System	HTA	Hawai'i Tourism Authority
EDB	ethylene dibromide	HUC	hydrologic unit code
EFH	essential fish habitat	I/M	Inspection/Maintenance
EMS	emergency medical services	IARC	International Agency for Research on Cancer
ENSO	El Niño/Southern Oscillation	IBA	Important Bird Area
EO	Executive Order	IEEE	Institute of Electrical and Electronics Engineers
EPCRA	Emergency Planning and Community Right-to-Know Act	IFC	International Finance Corporation
ERP	effective radiated power	in	inches
ESA	Endangered Species Act	IPCC	Intergovernmental Panel on Climate Change
ESI	Environmental Sensitivity Index	IR	ionizing radiation
FAA	Federal Aviation Administration	ITCZ	Intertropical Convergence Zone
FAD	Fish Aggregating Device	IUCN	International Union for Conservation of Nature
FCC	Federal Communications Commission	kg/gal	kilograms per gallon
FEMA	Federal Emergency Management Agency	KIRC	Kaho'olawe Island Reserve Commission

LAER	lowest achievable emission rate	NOAA	National Oceanic and Atmospheric Administration
lb/day	pounds per day	NOx	nitrogen oxides
lb/hp-hr	pounds per horsepower-hour	NP	National Park
LBJ	Lyndon B. Johnson	NPDES	National Pollutant Discharge Elimination System
Ldn	day-night average sound level	NPL	National Priorities List
Leq	equivalent noise levels	NPS	National Park Service
LNG	liquefied natural gas	NPSBN	nationwide public safety broadband network
LTE	Long Term Evolution	NRCS	Natural Resources Conservation Service
µg/m ³	microgram(s) per cubic meter	NRHP	National Register of Historic Places
µPa	micro Pascal	NSPS	New Source Performance Standards
m/s	meter per second	NTIA	National Telecommunications and Information Administration
MBTA	Migratory Bird Treaty Act	NVSR	National Vital Statistics Report
mg/m ³	Milligram(s) per cubic meter	NWI	National Wetland Inventory
mgd	million gallons per day	NWR	National Wildlife Refuge
MHz	megahertz	NWWS	National Weather Wire Satellite System
MLRA	Major Land Resource Area	OHA	Office of History and Archaeology
mm/s	millimeters per second	OIA	Office of Insular Affairs (USDI)
MMPA	Marine Mammal Protection Act	OSHA	Occupational Safety and Health Administration
MOA	Memorandum of Agreement	PA	Programmatic Agreement
MPA	Marine Protected Area	PAG	Port Authority of Guam
mph	miles per hour	PAHO	Pan American Health Organization
MSA	Magnuson-Stevens Fishery Conservation and Management Act	PCB	polychlorinated biphenyl
MTR	Military Training Route	PCP	pentachlorophenol
MUID	Map Unit Identification Data	PCS	Personal Communications Service
MW	megawatt	PDO	Pacific Decadal Oscillation
mW/cm ²	milliwatts per centimeter squared	PEIS	Programmatic Environmental Impact Statement
N	north; not attained	PL	Public Law
N ₂ O	nitrous oxide	PM	particulate matter
NA	not applicable; not assessed	PM ₁₀	particulate matter up to 10 micrometers in diameter
NAAQS	National Ambient Air Quality Standards	PM _{2.5}	particulate matter up to 2.5 micrometers in diameter
NAGPRA	Native American Graves Protection and Repatriation Act	POPs	points of presence
NANSR	Nonattainment New Source Review	ppm	parts per million
NAWAS	National Warning System	PRDNER	Puerto Rico Department of Natural and Environmental Resources
NCA	National Climate Assessment	PREQB	Puerto Rico Environmental Quality Board
NCD	non-communicable disease	PR OSHA	The Puerto Rico Occupational Safety and Health Administration
NCDC	National Climatic Data Center	PRASA	Puerto Rico Aqueduct and Sewer Authority
NCN	no common name	PREPA	Puerto Rico Electric Power Authority
NCRP	National Council on Radiation Protection and Measurements	PRSHPO	Puerto Rico State Historic Preservation Office
ND	no data	PSD	Prevention of Significant Deterioration
NE	northeast	PUAG	Public Utility Agency of Guam
NEPA	National Environmental Policy Act	Pub. L.	Public Law
NESHAP	National Emission Standards for Hazardous Air Pollutants		
NFIP	National Flood Insurance Program		
NFIRS	National Fire Incident Reporting System		
NHPA	National Historic Preservation Act		
NIR	non-ionizing radiation		
NMFS	National Marine Fisheries Service		
NMHC	non-methane hydrocarbon compounds		
NMOG	non-methane organic compounds		
NNE	north-northeast		

PV	photovoltaic	UVA	University of Virginia
RAN	radio access network	VdB	vibration decibel(s)
RCP	Representative Concentration Pathway	VIC	Virgin Islands Code
RCRA	Resource Conservation and Recovery Act	VIPA	Virgin Islands Port Authority
RF	radio frequency	VISHPO	Virgin Islands State Historic Preservation Office
RIN	Regulation Identification Number	VOC	volatile organic compound
rms	root mean square	vog	volcanic smog
ROW	right-of-way	VRM	Visual Resource Management
SAAQS	State Air Quality Standards	W	watt(s)
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users	W/m ²	watts per meters squared
SARA	Superfund Amendments and Reauthorization Act of 1986	WAPA	Water and Power Authority
SE	Standard of Error	WHO	World Health Organization
SHPO	State Historic Preservation Office	WIMARCS	West Indies Marine Animal Research and Conservation Science
SIP	State Implementation Plan	WNP	Western North Pacific
SLR	sea level rise	WNW	west-northwest
SMA	Special Management Area	WPC	watts per channel
SMS	Scenery Management System	WPRFMC	Western Pacific Regional Fishery Management Council
SO ₂	sulfur dioxide		
SO _x	sulfur oxides		
SPCC	Spill Prevention, Control, and Countermeasure		
SPCZ	South Pacific Convergence Zone		
SPOC	State Single Point of Contact		
SRES	Special Report on Emission Scenarios		
SSA	sole source aquifer		
STATSGO2	State Soil Geographic [Database]		
SW	southwest		
TAAQS	Territory Ambient Air Quality Standards		
TCP	traditional cultural property		
TEMCO	Territorial Emergency Management Coordinating Office		
TMDL	Total Maximum Daily Load		
TOC	total organic compound		
tpy	tons per year		
TRI	Toxic Release Inventory		
TSCA	Toxic Substances Control Act		
U.S.	United States		
UAMES	University of Alaska Museum Earth Sciences		
USACE	U.S. Army Corps of Engineers		
USC	United States Code		
USDA	U.S. Department of Agriculture		
USDI	U.S. Department of the Interior		
USEPA	U.S. Environmental Protection Agency		
USFWS	U.S. Fish and Wildlife Service		
USGCRP	U.S. Global Climate Change Research Program		
USGS	U.S. Geological Survey		
USVIDOH	U.S. Virgin Islands Department of Health		
USVIPD	U.S. Virgin Islands Police Department		

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11. BMPS AND MITIGATION MEASURES

This chapter provides examples of best management practices (BMPs) and mitigation measures that FirstNet and/or their partners would recommend or require to be implemented during deployment and operation of the Proposed Action to help avoid or minimize potential impacts to various resources, or potential impacts to deployed infrastructure from various hazards. Specifically, FirstNet and/or their partners would be required to implement mitigation measures, as defined through permitting and/or consultation with appropriate resource agencies. Unlike mitigation measures, however, BMPs would not necessarily be required in every project activity but would be applied as practicable or feasible during deployment and operation of the Proposed Action. The BMPs and mitigation measures outlined in this chapter have been developed based on initial consultation with other agencies as well as through independent research conducted by FirstNet and their environmental contractors. It is possible that other or additional site-specific BMPs and mitigation measures not included in this chapter may be recommended or required to be implemented as a result of consultation with resource agencies, permits, and/or additional environmental reviews.¹ The example BMPs and mitigation measures in this chapter are organized by resource area and, where applicable, each of the following project types:²

- Wired Projects
 - New Build – Buried Fiber Optic Plant
 - Use of Existing Conduit – New Buried Fiber Optic Plant
 - New Build – Aerial Fiber Optic Plant
 - Collocation on Existing Aerial Fiber Optic Plant
 - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable
 - New Build – Submarine Fiber Optic Plant
 - Installation of Optical Transmission or Centralized Transmission Equipment
- Wireless Projects
 - New Wireless Communication Towers
 - Collocation on Existing Wireless Tower, Structure, or Building
- Deployable Technologies
 - Cell on Wheels; Cell on Light Truck; System on Wheels
 - Deployable Aerial Communications Architecture

¹ Site-specific analysis or environmental reviews may be required depending on the site conditions, the type of deployment, or any other permits or permissions necessary to perform the work.

² The resource areas are ordered in this chapter consistent with how they appear in each of the state/territory-specific chapters (Chapters 3 through 9). Additional information and details regarding the Proposed Action infrastructure and project types can be found in Section 2.1.2, Proposed Action Infrastructure, and each respective section within the state/territory chapters.

- Satellites and Other Technologies
 - Satellite-Enabled Devices and Equipment
 - Deployment of Satellites

11.1. INFRASTRUCTURE

11.1.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to infrastructure. The following BMPs and mitigation measures would apply to all project types:

- Follow all applicable federal, state/territory, and local requirements for construction on or near public roads.
- Follow all applicable federal, state/territory, and local laws concerning traffic speed and safety during the transport of equipment.
- Schedule deployment activities outside of peak traffic hours.
- Avoid roads with heavy traffic volumes and peak travel hours, to the extent possible, when scheduling the transport of heavy equipment or construction materials.
- Design staging areas to minimize unnecessary equipment and material mobilizations.
- 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.
- 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.
- Coordinate with federal, state/territory, and local government agencies as appropriate, as well as with public safety officials, emergency and medical facilities, and existing telecommunications providers to the extent practicable to facilitate awareness of deployment activities and accompanying schedule.
- 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) so that potential service disruptions are less likely to coincide with times of increased demand.
- 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.
- 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.

- Complete deployment activities as quickly and safely as possible to avoid any possible disruptions to utility services.
- Complete those deployment activities that could interrupt power during non-peak times for power or water.
- Follow all applicable state/territory and local one-call laws and procedures for buildouts.
- Follow all applicable federal, state/territory, or local requirements regarding utilities (water, sewer, power, and electricity) and construction within a utility ROW.

11.1.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

11.2. SOILS

11.2.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to soil resources. The following BMPs and mitigation measures would apply to all project types:

- 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.
- Avoid construction in areas with steep or unstable slopes or with soils known to be particularly susceptible to soil erosion, (see Affected Environment Soils sections) and construct facilities in alternate locations to avoid these areas, if practical.
- Develop a soil erosion and sedimentation control plan for disturbed areas, and use silt fences,³ erosion control blankets,⁴ retention ponds, straw and sandbag barriers, and/or other controls as needed to reduce soil erosion, storm water runoff, and sedimentation.
- Schedule construction activities to avoid, to the extent possible, soil disturbance activities during periods or months with heavy rainfall and snowmelt.⁵
- Cover exposed areas with tarps or similar materials to prevent rainfall exposure to the extent possible.
- Minimize the area of bare soil exposed at any one time as much as possible by constructing in stages.

³ Silt fences are designed to trap sediment in the area where construction or soil disturbance is taking place to minimize or avoid soil erosion and sedimentation. The fence is typically 2- to 3-feet tall, buried 8 to 12 inches into the soil, and secured with stakes.

⁴ Erosion control blankets are biodegradable or synthetic sheet-like materials that are rolled out onto disturbed areas to protect soil from wind and water erosion.

⁵ See Affected Environment Climate Change sections for an explanation of seasonal climate and weather patterns.

- Revegetate disturbed areas with native plants, to the extent practicable, as progressively and quickly as practicable to achieve stabilization.⁶
- Minimize soil disturbance to the extent practicable, especially in wetland and designated natural resource areas.
- Maintain topsoil by segregating topsoil or surface soil from subsurface layers and implementing temporary topsoil storage areas during construction.⁷
- Replace topsoil as soon as possible following construction.
- Remove and store topsoil with a woven weed barrier or similar material for post-construction site restoration for areas.
- Pay particular attention to areas identified as having soils that are vulnerable to compaction (see Affected Environment Soils sections) and select alternate locations to construct facilities if practical.
- Implement deep tillage procedures where practical to loosen compacted soils.
- Restore soil surface to original or improved contours.
- Use timber mats or similar infrastructure as deemed necessary to distribute vehicle and heavy equipment weight.
- Use existing roads or previously disturbed areas to the maximum extent practicable.

11.2.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures for soils beyond those listed above for all project types.

11.3. GEOLOGY

11.3.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to geologic resources or potential impacts to the Proposed Action as a result of geologic hazards. The following BMPs and mitigation measures would apply to all project types:

- 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.

⁶ Plant roots play a significant role in stabilizing soils. Seeding disturbed areas quickly after construction activities would allow for faster plant and root development and would therefore provide better erosion protection.

⁷ Topsoil is segregated from subsoil layers by stripping the uppermost soil from the area being excavated and storing it separately from the subsurface soil. Once construction is completed, the topsoil is replaced as the uppermost soil unit.

- 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.
- Construct all infrastructure to standards that meet or exceed state/territory seismic requirements.
- Avoid rock ripping to the extent practicable to preserve bedrock resources, topography, and physiography.
- Minimize the area/volume of disturbed/removed terrain during deployment/construction.
- Restore topographic features and grades to pre-construction/deployment conditions.
- 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.
- Follow all relevant federal, state/territory, and local laws and regulations as they apply to paleontological, mineral, and fossil fuel resources.
- 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.
- Avoid areas with significant fossil resources, if practicable.
- 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.
- 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.
- 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.
- Design and deploy resilient infrastructure to withstand earthquakes typical to the region.
- Locate construction/deployment activities outside of high-risk volcanic hazard zones.
- Locate construction/deployment activities away from steep slopes with unconsolidated material and other areas prone to landslides, to the extent practicable.
- 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.
- Consider alternate methods to trenching for placement of fiber optic cable and transmission lines in sensitive areas.

11.3.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures for geology beyond those listed above for all project types.

11.4. WATER RESOURCES

11.4.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to water resources. The following BMPs and mitigation measures would apply to all project types:

- Minimize ground disturbance in or near waterbodies during construction, as practicable, particularly in areas prone to erosion.
- 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.
- Develop a storm water pollution prevention plan.
- Include engineered or site-designed methods to control storm water.
- Include any forested riparian areas along the stream in the length of the bore to minimize impacts to forested habitat when using directional bores to cross a stream.
- Ensure the cleared width through any forested area is the minimum needed to install the line; the width should be no more than 20 feet wide through the forested area to allow the canopy to close over the line.
- Restore disturbed stream banks using bioengineering bank stabilization methods and revegetate disturbed banks with native trees, shrubs, and herbaceous plants.
- Restore stream bank slopes after project completion to stable-slope steepness (not steeper than 2:1).
- Use graded stone or riprap to protect the section of trench below the normal water level from scour or erosion if using directional boring under a stream. Any stone or riprap fill in the streambed must not be placed above the existing streambed elevation to avoid creating a fish passage obstruction. As an alternative to using stone or riprap, allow sufficient separation distance between the directional boring and the stream bottom to minimize the potential for scour or erosion to affect the installed line.

- 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,⁸ and infiltration [or recharge] basins).⁹
- Direct water to storm water drains for large-scale construction activities or to constructed bioretention areas,¹⁰ rain gardens, or other storage and retention areas designed to slow water and allow sediments to settle out.
- Stabilize and revegetate disturbed areas as progressively and quickly as practicable to achieve stabilization and minimize the potential for erosion.
- 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.
- Station all deployables and aboveground structures outside of floodplains, to the extent practicable; if deployables or aboveground structures must be placed in 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.
- Restore native vegetation/wetlands to stabilize stream banks and stop erosion.
- Minimize the use of riprap and the use of alternative erosion protection materials whenever possible.
- Place only enough riprap to provide stream bank toe protection, such as from the toe of the bank, where riprap must be used. Consider using bioengineered bank stabilization methods instead of riprap.
- Meet state/territory or local regulations for development proposed in a floodway or floodplain.
- 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.
- 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.

⁸ Storm water filtration structures use a filtering media (sand, soil, gravel, peat, or compost) in storm water filtration structures to remove pollutants from storm water runoff.

⁹ Infiltration basins (also known as recharge basins) are considered a treatment BMP because they can remove pollutants from surface discharges by capturing the storm water runoff volume (typically, larger volumes than an infiltration trench) and infiltrating it directly to the soil rather than discharging it to an aboveground drainage system.

¹⁰ Bioretention is a structural storm water control measure that captures and temporarily stores storm water runoff using soils and vegetation in shallow basins or landscaped areas to provide enhanced removal of dissolved storm water pollutants, including nutrients, pesticides, organics, metals, and biological constituents.

- Seed and protect disturbed stream banks that are 3:1 or steeper with heavy-duty, net-free biodegradable erosion control blankets to minimize the entrapment and snaring of small wildlife such as snakes and turtles (follow manufacturer's recommendation for installation); seed and apply mulch on all other disturbed areas.
- Use weed-free erosion control mechanisms (such as straw wattles or straw or hay bales).
- Avoid construction activities (especially activities resulting in soil disturbance), to the extent possible, during rainy or snowmelt seasons when streamflow, rainfall, and runoff are highest.
- Minimize the total area of bare soil exposed at any one time as much as possible by constructing in stages.
- Minimize clearing of riparian and streamside vegetation, including trees, as practicable.
- Establish and clearly mark all waterbody buffers in the field with signs or highly visible flagging until construction-related ground disturbing activities are complete.
- Stabilize and revegetate disturbed areas as progressively and quickly as practicable to achieve stabilization.
- 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.
- Retain vegetative buffers, wherever possible, to prevent runoff into waterbodies.
- Revegetate all bare and disturbed areas along stream banks or shorelines with a mixture of grasses (excluding all varieties of tall fescue), legumes, and native shrub and hardwood tree species as soon as possible upon completion.
- Minimize in-stream work to the extent practicable, and when working in streams, restore streambeds and banks to original contours.
- Construct all stream crossings (roads and trenching) as close as perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.
- Use standard upland construction techniques when crossing 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.
- Route the stream crossing to minimize the number of waterbody crossings where waterbodies meander or have multiple channels, as practicable.
- Prepare a Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent, contain, and report accidental spills.
- 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.
- Maintain and repair all equipment and vehicles on impervious surfaces, as practicable, away from all sources of surface water.

- Park vehicles at least 50 feet from any stream or wetland unless authorized by a permit or on an existing roadway, as practicable.
- Deposit and stabilize all excavated material not reused in an upland area outside of floodplains and streams.
- 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.
- Space and size culverts properly.
- Stabilize approaches to streams and stream crossings with clean rock or steel plates during construction to minimize erosion and sedimentation, as practicable.
- Place materials storage and staging areas outside of waterways and floodplain.
- Maintain adequate waterbody flow rates to protect aquatic life and prevent the interruption of existing downstream users, as practicable, if conducting in-stream construction (trenching or roads if necessary) during times that streams have flow.

11.4.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply to Wired Projects in addition to those listed above for all project types:

- Wireless Projects
 - New Wireless Communication Towers
 - Do not permit underwater blasting and pile driving activities in any waterbody.

11.5. WETLANDS

11.5.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to wetlands. The following BMPs and mitigation measures would apply to all project types:

- Follow all BMPs and mitigation measures related to minimizing soil erosion, sedimentation, and soil compaction presented in Section 11.2, Soils.
- 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.
- Follow any BMPs and mitigation measures for work in or near wetlands developed by state/territory and local agencies, such as state/territory departments of transportation.
- 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.

- Develop a storm water pollution prevention plan.
- Time construction to outside the breeding and migratory seasons of wetland wildlife when construction is unavoidable.
- Preserve existing tree canopies and natural areas in and around wetlands as much as possible.
- Cut wetland vegetation by hand (chain or hand saw) instead of using large equipment when cutting is unavoidable.
- Use timber mats when working in or near wetlands.
- Use weed-free erosion control mechanisms (such as straw wattles or straw or hay bales).
- Prepare an SPCC Plan to prevent, contain, and report accidental spills.
- Avoid both above and belowground wetland crossings unless necessary.
- Take advantage of already disturbed areas such as easements, roads, roadway shoulders, bridges, or old railroad beds when crossing a wetland is unavoidable.
- Span a wetland by locating telecommunication poles on either side of the wetland instead of disturbing the interior, where practicable or feasible.
- Avoid diversion of surface water and groundwater sources, which could affect nearby wetlands.
- Include engineered or site-designed methods to control storm water.
- Create and maintain buffer zones around wetlands to protect their functions and values.
- 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.
- Position deployment activities to avoid wetlands to the greatest extent practicable and to minimize the project footprint while safely and practically implementing the Proposed Action.
- 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.
- Segregate and salvage all topsoil up to a maximum of 12 inches of topsoil from the area disturbed in dry wetlands, where practicable, and restore topsoil to its approximate original stratum after backfilling is complete.
- Avoid temporarily storing or stockpiling materials in wetland areas or in areas that could alter wetland hydrology (causing damming and flooding) or impede or divert water (causing drying). When unavoidable, place temporary fill on geotextile fabric.
- 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.

- 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.
- Time construction using heavy equipment to avoid periods of heavy moisture, as appropriate, when construction within wetlands is unavoidable.
- 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, and 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.
- Consult local wetland restoration guidance, including communicating with the appropriate local agency, if one exists. Use suggested up-to-date published restoration manuals to ensure that appropriate wetland restoration measures are followed and to increase restoration success.
- 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.
- Stockpile wetland topsoil and sod mats used during facility installation after initial use when working in areas where wetlands would be restored. Use standard reclamation protocol. Re-use the topsoil and sod mats in the post-construction wetland restoration.
- Revegetate, as applicable, bare areas as progressively and quickly as possible (preferably within the same growing season) to stabilize soils, reduce sedimentation, and avoid the spread of invasive species. Install erosion protection and leave in place until the area is revegetated and the soil is stabilized.
- Prohibit use of herbicides or pesticides within 100 feet of any wetland (unless allowed or required by the appropriate land management, tribal, or state/territory agency).
- Conduct post-construction monitoring inspections after the first growing season to determine success of revegetation, as applicable, unless otherwise required by a permit.
- Determine restoration to be successful if the surface condition is similar to adjacent undisturbed communities or found acceptable by the applicable regulatory body.

11.5.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply to Wired Projects in addition to those listed above for all project types:

- New Build –Buried Fiber Optic Plant
 - 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.
 - 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.
 - Replace topsoil and restore original contours to the greatest extent practicable.
 - Install buried cable along existing road ROWs wherever possible to minimize vegetation clearing and other potential impacts to wetlands.
 - Use structures or devices to prevent subdraining or groundwater movement along new trenched-in buried conduit such as anti-seepage collars, intermittent clay barriers, trench plugs, or clay saddles.
- New Build – Aerial Fiber Optic Plant
 - Coordinate with U.S. Fish and Wildlife Service (USFWS) during site-specific reviews as required to assess whether it may be preferable and less impactful to implement line burial instead of installing lines overhead. However, depending on site conditions, installation of overhead transmission lines along existing road ROWs may minimize vegetation clearing and other potential impacts to some (but not all) wetlands.
- New Build – Submarine Fiber Optic Plant
 - 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.
 - 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.
 - Replace topsoil and restore original contours to the greatest extent practicable.

11.6. BIOLOGICAL RESOURCES

11.6.1. Terrestrial Vegetation

11.6.1.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to terrestrial vegetation. The following BMPs and mitigation measures would apply to all project types:

- Engage in early consultation with appropriate agencies and stakeholders, including but not limited to the USFWS and state/territory agencies.
- Consolidate facilities as much as possible (collocation and use of existing ROWs) to reduce vegetation loss.
- Avoid high-quality habitat.¹¹
- Minimize construction of all roads, fences, and other ancillary facilities to reduce overall vegetation loss and habitat fragmentation. Control fugitive dust generated by the use of unpaved roads and construction.
- Limit construction equipment and vehicles to approved roads or ROWs.
- Avoid construction/deployment in areas with sensitive vegetation (i.e., woodlots and wetlands), unique habitat (i.e., shorelines and stream banks), or designated natural resources, if practical.
- Close and revegetate any temporary and unnecessary roads after project completion.
- Segregate topsoil or surface soil from subsurface layers during construction for reuse during post-construction seeding.
- Restore disturbed areas as progressively and quickly as possible to pre-construction use; grade and apply vegetation cover using appropriate and certified seed mixes and seed dispersal, management, and maintenance processes, as applicable.
- Revegetate with native species that approximate pre-disturbance plant community composition.
- Use existing roads and regularly maintained areas when conducting routine maintenance and inspections to the extent feasible.
- Follow all applicable federal, state/territory, and local requirements for vegetation removal, disturbance, and restoration.

¹¹ High-quality habitats contain high plant diversity and low numbers of non-native or invasive plants; are left in a natural state; and have high-quality plants or ones that are very valuable to wildlife. Disturbed habitats generally contain non-native, invasive species and extremely low plant diversity; are under regular maintenance; and consist of low quality or unsuitable habitat. Professional biologists can typically provide a basic assessment of the quality of the site based on one or more site visits. Private consultants can also evaluate habitat quality through a standardized assessment tool, the Floristic Quality Assessment. This assessment provides a quantitative assessment score, rating sites on a scale from 0 to 10 (10 being the highest quality).

- Obtain all appropriate permits and comply with conditions to minimize or avoid impacts to vegetation.
- Minimize or avoid forest removal whenever possible.
- 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.
- Store soil containing noxious or invasive plants in a location away from clean topsoil and subsoil.
- 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.
- Locate staging areas and construction sites in previously disturbed areas.

11.6.1.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

11.6.2. Wildlife

11.6.2.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to wildlife. The following BMPs and mitigation measures would apply to all project types:

- 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 wildlife and natural resource agencies.
- Give preference to development options that involve use of existing physical infrastructure, and/or that do not involve new aboveground structures (e.g., collocation on existing structures, etc.).
- Minimize vehicular harm of animals migrating between seasonal habitats by locating activities, roads, and infrastructure away from these areas or installing barriers along roadsides.
- Locate project activities, facilities, and roads away from key habitats (e.g., wetlands, cays,¹² and stream sites) for amphibians and reptiles.

¹² Cays are small, low-elevation, sandy islands on the surface of a coral reef.

- 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.
- Consolidate facilities as much as possible (e.g., collocation and use of existing ROWs).
- 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).
- 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).
- Minimize construction of all roads, fences, and other ancillary facilities to reduce overall habitat fragmentation.
- 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.
- Do not permit pets on site in order to avoid harassment and disturbance of wildlife.
- Report observations of potential wildlife interactions, including wildlife mortality, to the appropriate agency immediately.
- Avoid known marine mammal haulouts or concentration areas as locations for deployment and associated activities.
- Provide for passage of fish and wildlife in new crossings and avoid reducing the efficiency of a structure to allow passage.
- Avoid roads and ROWs that provide access to critical wildlife habitat and near known migration routes (especially terrestrial and semi-aquatic wildlife routes), stopover sites, and large blocks of habitat.
- Assess critical life stages of marine mammals hauled out near locations (1 mile) selected for deployment and associated activities.
- Avoid development in areas that contain high densities of breeding or wintering birds, in high wildlife use areas, migratory staging areas, woodlots, riparian corridors, Audubon Important Bird Areas, nature preserves, state and national parks, state forests, fish and wildlife areas, and other publicly owned properties.
- Reduce habitat fragmentation, minimize the number of new roads constructed, and maximize use of existing corridors, roads, disturbed or developed areas.
- Assess potential noise impacts to migrating whales and local pinnipeds if deployment and activities would occur over sea ice. 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.

- Develop “good housekeeping” procedures to ensure that sites are kept clean of debris, garbage, and/or waste.
- Follow food and waste management protocols to minimize attractants to proposed network deployment sites.
- Restore habitat in construction zones, staging areas, etc. once construction is complete.
- Follow recommendations outlined by the Avian Power Line Interaction Committee and USFWS (*APLIC 2006*; *APLIC and USFWS 2005*; *APLIC 2012*) for any aboveground lines or cables (e.g., use of diverters and anti-nesting devices).
- Install bat exclusions and/or deterrents on existing and new structures.
- Turn off all unnecessary lighting at night.
- 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.
- Determine during site-specific reviews the feasibility and effectiveness of implementing construction timing windows to avoid or minimize adverse effects to bird nests, eggs, and young birds and implement if practicable or feasible.
- Monopole structures should be considered in place of lattice structures, to the extent practicable or feasible. If lattice structures are to be used, FirstNet and/or their partners would work with the USFWS to incorporate anti-nesting devices into project design, as practicable or feasible.
- Work with USFWS to choose appropriate markers when towers requiring guy wires are necessary. Markers should be regularly maintained for the life of the project.
- Use outdoor security or safety lights, as practicable or feasible, that are motion-triggered, downcast and/or down-shielded, and directed inward whenever possible to prevent “star” effects when viewed offsite during construction/deployment and operation, particularly in coastal areas.
- Use structures containing the fewest perching options in areas where raptors and raven predation of sensitive resources is a concern.
- Use structures and components compatible with the guidance in *APLIC 2006* where raptor electrocution is a concern.
- Follow, as practicable or feasible, the suggested practices by the APLIC to minimize impacts to migratory birds through collision and electrocution.

The following BMPs and mitigation measures are recommended by USFWS, including guidelines on communications tower siting (2012a, 2013b):

“1. Collocation of the communications equipment on an existing communication tower or other structure (e.g., billboard, water and transmission tower, distribution pole, or building mount) is strongly recommended. Depending on tower load factors and communication needs, from 6 to 10 providers should collocate on an existing tower or structure provided that frequencies do not overlap/‘bleed’ or where frequency length or broadcast distance requires higher towers. New towers should be designed structurally and electronically to accommodate the applicant’s antenna, and antennas of at least 2 additional users—ideally 6 to 10 additional users, if possible—unless the design would require the addition of lights and/or guy wires to an otherwise unlit and/or unguyed tower. This recommendation is intended to reduce the number of towers needed in the future.

2. If collocation is not feasible and a new tower or towers are to be constructed, it is strongly recommended that the new tower(s) should be not more than 199 feet above ground level (AGL), and that construction techniques should not require guy wires. Such towers should be unlighted if Federal Aviation Administration (FAA) regulations and lighting standards (*FAA 2007, Patterson 2012, FAA 2013 lighting circular anticipated update* [¹³]) permit. Additionally, the Federal Communications Commission (FCC) through recent rulemaking now requires that new towers > 450 ft AGL contain no red-steady lights. FCC also recommends that new towers 350-450 ft AGL also contain no red-steady lights, and they will eventually recommend that new towers < 350 ft AGL convert non-flashing lights to flash with existing flashing lights. LED lights are being suggested as replacements for all new construction and for retrofits, with the intent of future synchronizing the flashes. Given these dynamics, the Service recommends using lattice tower or monopole structures for all towers < 200 ft AGL and for taller towers where feasible. The Service considers the less than 200 ft AGL option the ‘gold standard’ and suggests that this is the environmentally preferred industry standard for tower placement, construction and operation—i.e., towers that are unlit, unguyed, monopole or lattice, and less than 200 ft AGL.

3. If constructing multiple towers, the cumulative impacts of all the towers to migratory birds—especially to Birds of Conservation Concern (*[US]FWS 2008*) and threatened and endangered species, as well as the impacts of each individual tower, should be considered during the development of a project.

¹³ Current FAA guidance (*FAA 2016a*) requires lighting for towers greater than 200 feet.

4. The topography of the proposed tower site and surrounding habitat should be clearly noted, especially in regard to surrounding hills, mountains, mountain passes, ridge lines, rivers, lakes, wetlands, and other habitat types used by raptors, Birds of Conservation Concern, and state and federally listed species, and other birds of concern. Active raptor nests, especially those of Bald and Golden Eagles, should be noted, including known or suspected distances from proposed tower sites to nest locations. Nest site locations for Golden Eagles may vary between years, and unoccupied, inactive nests and nest sites may be re-occupied over multiple years. The Service's 2013 Eagle Conservation Plan Guidance, Module 1, Land-based Wind Energy, Version 2, available on our website, is a useful document (*USFWS 2013[a]*).

5. If at all possible, new towers should be sited within existing 'antenna farms' (i.e., clusters of towers), in degraded areas (e.g., strip mines or other heavily industrialized areas), in commercial agricultural lands, in Superfund sites, or other areas where bird habitat is poor or marginal. Towers should not be sited in or near wetlands, other known bird concentration areas (e.g., state of federal refuges, staging areas, rookeries, and Important Bird Areas), in known migratory, daily movement flyways, areas of breeding concentration, in habitat of threatened or endangered species, or key habitats for Birds of Conservation Concern (*[US]FWS 2008*). Disturbance can result in effects to bird populations which may cumulatively affect their survival. The Service has recommended some disturbance-free buffers, e.g., 0.5 mi around raptor nests during the nesting season, and 1-mi disturbance free buffers for Ferruginous Hawks and Bald Eagles during nesting season in Wyoming (*[US]FWS WY Ecological Services Field Office, referenced in Manville 2007:23*). The effects of towers on 'prairie grouse,' 'sage grouse,' and grassland and shrub-steppe bird species should also be considered since tall structures have been shown to result in abandonment of nest site areas and leks, especially for 'prairie grouse' (*Manville 2004*). The issue of buffers is currently under review, especially for Bald and Golden Eagles. Additionally, towers should not be sited in areas with a high incidence of fog, mist, and low cloud ceilings.

6. If taller (> 199 ft AGL) towers requiring lights for aviation safety must be constructed, the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA should be used.^[14] Unless otherwise required by the FAA, only white strobe or red strobe lights (red preferable since it is generally less displeasing to the human eye at night), or red flashing incandescent lights should be used at night, and these should be the minimum number, minimum intensity (< 2,000 candela), and minimum number of flashes per minute (i.e., longest duration between flashes/'dark phase') allowable by the FAA. The use of solid (non-

¹⁴ This guidance (*USFWS 2013b*) was based on earlier FAA guidance that has since been updated. Current FAA guidance (*FAA 2016a*) now requires lighting for towers greater than 200 feet.

flashing) warning lights at night should be avoided (*Patterson 2012, Gehring et al. 2009*)—see recommendation #2 above. Current research indicates that solid red lights attract night-migrating birds at a much higher rate than flashing lights (*Gehring et al. 2009, Manville 2007, 2009*). Recent research indicates that use of white strobe, red strobe, or red flashing lights alone provides significant reductions in bird fatalities (*Patterson 2012, Gehring et al. 2009*).

7. Tower designs using guy wires for support, which are proposed to be located in known raptor or waterbird concentrations areas, daily movement routes, major diurnal migratory bird movement routes, staging areas, or stopover sites, should have daytime visual markers or bird deterrent devices installed on the wires to prevent collisions by these diurnally moving species. The efficacy of bird deterrents on guy wires to alert night migrating species has yet to be scientifically validated. For guidance on markers, see *Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines - State of the Art in 2006*. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC, and Sacramento, CA. 207 pp, and APLIC. 2012. *Reducing Avian Collisions with Power Lines – the State of the Art in 2012*. Edison Electric Institute and APLIC. Washington, DC. 159 pp. Also see www.aplic.org, www.energy.ca.gov, or call 202-508-5000.

8. Towers and appendant facilities should be designed, sited, and constructed so as to avoid or minimize habitat loss within and adjacent to the tower ‘footprint.’ However, a larger tower footprint is preferable to the use of guy wires in construction. Several shorter, un-guyed towers are preferable to one, tall guyed, lighted tower. Road access and fencing should be minimized to reduce or prevent habitat fragmentation, disturbance, and the creation of barriers, and to reduce above ground obstacles to birds in flight.

9. If, prior to tower design, siting and construction, if it has been determined that a significant number of breeding, feeding and roosting birds, especially of Birds of Conservation Concern (*[US]FWS 2008*), state or federally-listed bird species, and eagles are known to habitually use the proposed tower construction area, relocation to an alternate site is highly recommended. If this is not an option, seasonal restrictions on construction are advised in order to avoid disturbance, site and nest abandonment, especially during breeding, rearing and other periods of high bird activity.

10. Security lighting for on-ground facilities, equipment and infrastructure should be motion- or heat-sensitive, down-shielded, and of a minimum intensity to reduce nighttime bird attraction and eliminate constant nighttime illumination, but still allow safe nighttime access to the site (*USFWS 2012[b], Manville 2011*).

11. Representatives from the USFWS or researchers from the Research Subcommittee of the Communication Tower Working Group should be allowed access to the site to evaluate bird use; conduct dead-bird searches; place above ground net catchments below the towers (*Manville 2002*); and to perform studies using radar, Global Position System, infrared, thermal imagery, and acoustical monitoring, as necessary. This will allow for assessment and verification of bird movements, site use, avoidance, and mortality. The goal is to acquire information on the impacts of various tower types, sizes, configurations and lighting protocols.

12. Towers no longer in use, not re-licensed by the FCC for use, or determined to be obsolete should be removed from the site within 12 months of cessation of use, preferably sooner.

13. In order to obtain information on the usefulness of these guidelines in preventing bird strikes and better understanding impacts from habitat fragmentation, please advise USFWS personnel of the final location and specifications of the proposed tower, and which measures recommended in these guidelines were implemented. If any of these recommended measures cannot be implemented, please explain why they are not feasible. This will further advise USFWS in identifying any recurring problems with the implementation of the guidelines, which may necessitate future modifications.”

Additional tower lighting BMPs are described in Section 11.6.2.2, Project-Type Specific BMPs and Mitigation Measures.

11.6.2.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply in addition to those listed above for all project types:

- Deployable Technologies
 - Avoid activities within migratory bird flyways and in the immediate vicinity of bat roosts to the extent practicable.
 - Site towers away from known communal bat use areas and high bird use areas to the extent practicable or feasible.
 - Do not operate aircraft at an altitude that could disturb known natural roosting sites of bats, with the exception only for severe weather conditions.
 - 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.

- Wired Projects
 - New Build – Aerial Fiber Optic Plant
 - Follow recommendations outlined by the Avian Power Line Interaction Committee and USFWS (*APLIC 2006; APLIC and USFWS 2005; APLIC 2012*) for any aboveground lines or cables (e.g., use of diverters and anti-nesting devices).
 - Install bat exclusions and/or deterrents on existing and new structures.
 - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable
 - Follow recommendations outlined by the Avian Power Line Interaction Committee and USFWS (*APLIC 2006; APLIC and USFWS 2005; APLIC 2012*) for any aboveground lines or cables (e.g., use of diverters and anti-nesting devices).
- Wireless Projects
 - New Wireless Communication Towers
 - Follow USFWS Guidelines For Recommendations On Communications Tower Siting, Construction, Operation, and Decommissioning (*USFWS 2012a*).
 - Insert anti-nesting devices on existing or new structures.
 - Site towers away from known communal bat use areas and high bird use areas to the extent practicable or feasible.
 - Construct new towers more than 3 miles from any ocean (or Great Lake shoreline), as practicable or feasible. If towers must be closer than 3 miles from the shoreline:
 - Conduct site-specific studies;
 - Ensure towers are self-standing (un-guyed); and
 - Ensure towers are short enough to not require lighting, as practicable or feasible. If towers do require lighting, install lighting that does not include steady-burning lights, as practicable or feasible.
 - Follow the FAA requirements to eliminate steady-burning flashing obstruction lights and use only flashing obstruction lights in accordance with FAA Advisory Circulars AC 70/7460-1L and AC 150/5345-43H (*FAA 2016a; FAA 2016b; FCC 2017*).
 - Collocation on Existing Wireless Tower, Structure, or Building
 - Follow the FAA requirements to eliminate steady-burning flashing obstruction lights and use only flashing obstruction lights in accordance with FAA Advisory Circulars AC 70/7460-1L and AC 150/5345-43H (*FAA 2016a; FAA 2016b; FCC 2017*).

11.6.3. Fisheries and Aquatic Habitats

11.6.3.1. *BMPs and Mitigation Measures for All Project Types*

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to fisheries and aquatic habitats. The following BMPs and mitigation measures would apply to all project types:

- Avoid construction, as practicable, during sensitive seasons for fish such as migration, spawning, egg development (including intra-gravel development) and larval fish (benthic¹⁵ or pelagic¹⁶) development (sensitive seasons/time periods vary by species and location).
- Consolidate facilities as much as possible.
- Use site-appropriate native plants and invasive-free materials (e.g., seed mixes, rock, mulch, soil) for revegetation and restoration efforts.
- Revegetate and restore riparian areas and other vegetated areas around aquatic resources to the extent possible once construction activities are complete.
- Report spills or other observed pollutants to the appropriate agency immediately.
- Prepare an SPCC Plan to prevent, contain, and report accidental spills.
- 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.
- Avoid productive habitats to the extent practicable, such as coastal wetlands, inland waterways, essential fish habitats, spawning areas, and reefs.
- 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,¹⁷ and erosion control blankets) could reduce erosion and sedimentation.
- Minimize the amount of fill placed in wetlands and streams when constructing access roads by installing bridges and or culverts; work with the appropriate agency to use culverts and bridges that are appropriately designed and sized for fish passage.
- 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.
- Perform regular maintenance checks of equipment near coastal areas, waterways, and other protected areas to minimize detachment of components reaching critical habitat.
- Consider tidal regimes when deploying near coastal areas to help prevent loss of equipment and marine debris in nearby coastal fish habitat.

¹⁵ Benthic means anything associated with or occurring on the bottom of a body of water.

¹⁶ Pelagic means anything that inhabits the water column as opposed to being associated with the sea floor, generally occurring anywhere from the surface to 1,000 meters (*NOAA 2006*).

¹⁷ Silt curtains are floating barriers used in marine construction and remediation to control silt and sediment in a body of water.

- Utilize buffer zones, temporary or permanent native seeding on disturbed ground, ground cover, plastic sheeting, and/or matting to minimize sedimentation.
- Develop a storm water pollution prevention plan.
- 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 (*Hanson et al. 2003*).
- Implement an emergency response plan for fuel spills and environmental emergencies.
- 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.
- 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).
- Minimize construction noise in and near fish habitats, as practicable.
- Avoid physical barriers in waterbodies, to the extent practicable, during installation and operation to allow for the migration of invertebrates and other aquatic fauna.
- Follow all applicable federal and state/territory requirements for construction activities near fish and fish habitat.

11.6.3.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply to Wired Projects in addition to those listed above for all project types:

- New Build – Buried Fiber Optic Plant
 - Use horizontal directional drilling where possible and appropriate, for stream crossings to avoid potential impacts to the streambed, banks, and associated fish habitat.

11.6.4. Threatened and Endangered Species and Species of Conservation Concern

11.6.4.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to threatened and endangered species and species of conservation concern. The following BMPs and mitigation measures would apply to all project types:

- Fully adhere to the compliance requirements of the Endangered Species Act.
- Engage in early consultation with appropriate agencies and stakeholders including, but not limited to, USFWS, NMFS, and state/territory wildlife and natural resources agencies.
- Avoid conducting deployment activities in areas with known locations or habitats for threatened and endangered plants.
- 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.
- Follow food and waste management protocols to minimize attractants to the deployment site.
- Minimize construction of all roads, fences, and other ancillary facilities to reduce overall habitat fragmentation.
- Use site-appropriate native plants and invasive-free materials (e.g., seed mixes, rock, mulch, soil) for revegetation and restoration efforts.
- Prohibit any pets on site during construction or deployment.
- Report observations of sensitive species that are injured, dead, or entangled to the appropriate agency immediately.
- Consolidate Proposed Action facilities as much as possible (e.g., collocation and use of existing ROWs).
- 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.
- 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.¹⁸
- Avoid activities within seagrass beds and control turbidity to minimize potential indirect impacts on seagrass.
- Avoid potential impacts to known grouper spawning sites.
- Avoid potential impacts within coastal estuarine habitats.
- 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.
- 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.

¹⁸ Hibernacula are the habitats within which animals hibernate or otherwise seek refuge for extended periods.

- 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.
- Follow all applicable federal and state/territory requirements for construction activities near fish and fish habitat.
- Use appropriate sediment and erosion control measures to minimize sedimentation and turbidity in fish habitats.
- 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.
- Implement an emergency response plan for fuel spills and environmental emergencies.
- Include secondary containment for hazardous materials and use non-wetland sites away from streams and waterbodies for refueling of construction or operations equipment.
- 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).
- 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.
- Implement seasonal and spatial buffer zones for operational activities that involve potentially disturbing activities in listed species use areas.
- Implement “good housekeeping” procedures to ensure that during operation the sites would be kept clean of debris, garbage, and fugitive trash or waste.
- Turn off all unnecessary lighting at night.
- Avoid or minimize the use of sodium vapor lights at site facilities to reduce attraction of migratory birds.
- Develop and implement operational monitoring and adaptive management procedures.
- Prepare an SPCC Plan to prevent, contain, and report accidental spills.
- Post and enforce speed limits on access roads, particularly within areas where a listed animal may be struck by construction and/or maintenance vehicles.

11.6.4.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply in addition to those listed above for all project types:

- **Wired Projects**
 - New Build – Aerial Fiber Optic Plant
 - Follow recommendations outlined by the Avian Power Line Interaction Committee and USFWS (*APLIC 2006; APLIC and USFWS 2005; APLIC 2012*) for any aboveground lines or cables (e.g., use of diverters and anti-nesting devices).
 - Collocation on Existing Aerial Fiber Optic Plant
 - Follow recommendations outlined by the Avian Power Line Interaction Committee and USFWS (*APLIC 2006; APLIC and USFWS 2005; APLIC 2012*) for any aboveground lines or cables (e.g., use of diverters and anti-nesting devices).
- **Wired Projects**
 - Use of Existing Buried or Aerial Fiber Optic Plant or Existing Submarine Cable
 - 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.
 - Implement a marine observer program during construction and operation to avoid and minimize boat strikes to whales, sea turtles, seals, and dugongs.
- **Deployable Technologies**
 - 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.
 - Keep aircraft above altitudes higher than 1,500 feet within 0.5 mile of walruses and seals hauled out on land or ice, with the exception only for severe weather conditions.

11.7. LAND USE, AIRSPACE, AND RECREATION

11.7.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to land use, airspace, and recreation. The following BMPs and mitigation measures would apply to all project types:

- Give preference to development options that involve use of existing physical infrastructure, and/or that do not involve new aboveground structures (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.), especially near recreation lands.

- Give preference to development options that are compatible with existing zoning and applicable comprehensive plans.
- 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.
- Retain existing vegetation wherever possible to provide visual screening of new infrastructure.
- Select infrastructure designs that minimize contrast with the surrounding landscape and land uses.
- Avoid infrastructure locations on easements established for wildlife habitat and other conservation purposes, to the extent practicable and feasible, and ensure compliance with applicable conditions and restrictions for locations on conservation lands.
- Select infrastructure locations that are as far from recreation lands as practicable and feasible.
- Select infrastructure designs that minimize construction footprints.
- Give preference to infrastructure locations that are compatible with existing park or recreation planning documents.
- Avoid or minimize, as practicable and feasible, construction activities in areas covered by existing incompatible easements.

11.7.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply in addition to those listed above for all project types:

- Wireless Projects
 - New Wireless Communication Towers
 - Select the shortest possible structures necessary to meet the FirstNet system's needs, and only deploy towers less than 200 feet in height.
 - Place new infrastructure near existing similar infrastructure where possible, to minimize the total number of new aerial navigation hazards.
 - Avoid placing new infrastructure near airports or the areas regulated under the FAA's Part 77 regulations (*FAA 2016a*).
 - Avoid placing new infrastructure within Military Operations Areas or under Military Training Routes.
 - Work closely with the National Park Service (NPS) to address any concerns they might have if a tower needs to be placed in an area that might affect the nighttime sky at an NPS unit.

- Deployable Technologies
 - 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).

11.8. VISUAL RESOURCES

11.8.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to visual resources. The following BMPs and mitigation measures would apply to all project types:

- 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 (design structures to complement the natural landscape; for example, use paint that blends with the surrounding landscape).
- Utilize non-reflecting coatings on towers, antennas, buildings, and associated structures where possible.
- Implement sensitive grading techniques that blend grading with the natural terrain.
- Treat all disturbed slopes for erosion control.
- Minimize the area of bare soil at any one time as much as possible by constructing in stages.
- Revegetate disturbed areas as progressively and quickly as practicable to restore vegetative cover.
- Reduce or eliminate the need for lighting on poles or structures, or to restrict the duration and directionality of needed lighting.
- Give preference to development options that involve use of existing physical infrastructure (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.), 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), or where residents and visitors have come to expect high visual quality and the absence of human-built structures.
- 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.
- Select infrastructure designs that minimize construction footprints.
- Retain existing vegetation wherever possible to provide visual screening of new infrastructure.

- Select infrastructure designs that minimize contrast with the surrounding landscape.
- Comply with all relevant and applicable federal regulations and guidance regarding visual and aesthetic conditions and impacts.

11.8.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply in addition to those listed above for all project types:

- Wireless Projects
 - New Wireless Communication Towers
 - Work closely with the NPS to address any concerns they might have if a tower needs to be placed in an area that might affect the nighttime sky at an NPS unit.
- Deployable Technologies
 - 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.
 - 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.

11.9. SOCIOECONOMICS

11.9.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to socioeconomics. The following BMPs and mitigation measures would apply to all project types:

- 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. Acceptable distances could vary, depending on the nature of the aesthetic impacts, the nature of other objectionable effects that influence property values, and other factors such as residential density, local concern over aesthetics, desire for improved wireless communications, local media response, and more. According to a recent literature review, measurable adverse impacts of wireless communication towers on property values are generally not observable beyond 300 meters (984 feet), and often are not observable beyond 100 meters (328 feet) (*Bond et al. 2013*).

- 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. Acceptable distances could vary depending on the size of the facility, types of activities occurring there, the nature of the aesthetic impacts or other aspects that influence property values, and other factors such as residential density, local concern over aesthetics, desire for improved wireless communications, local media response, and more.
- Give preference to development options that involve use of existing physical infrastructure (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.).
- 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.
- Retain existing vegetation wherever possible to provide visual screening of new infrastructure.
- Select infrastructure designs that minimize contrast with the surrounding landscape.
- Give preference to hiring workers who are local residents, where practicable. In addition to reducing influx and associated social cohesion effects; this BMP would have the following effects on socioeconomic resources:
 - Reducing demand for public services, since employees would already be residents (i.e., existing public service users).
 - Increasing local employment and economic activity through wages and spending.
- Share deployment plans with public service providers, especially first responders, as early in the process as possible, and throughout the deployment process. This will provide advance notice to public service providers, and would particularly allow first responders to be better prepared for emergencies that could arise during deployment.
- Consult with subsistence users (including Indigenous Peoples and other individuals or groups for whom subsistence is a way of life) to understand the species and habitats used for subsistence activities, as well as the seasonal cycle of subsistence activity.
- Select infrastructure locations that minimize or avoid disturbance of subsistence species habitat.

11.9.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

11.10. ENVIRONMENTAL JUSTICE

11.10.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential environmental justice impacts. The following BMPs and mitigation measures would apply to all project types:

- 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 (this is important in Alaska given the size of block groups, particularly in rural areas). 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.
- Consult with subsistence users (including Indigenous Peoples and other individuals or groups for whom subsistence is a way of life) to understand the species and habitats used for subsistence activities, as well as the seasonal cycle of subsistence activity.
- Give preference to development options that involve use of existing physical infrastructure (e.g., collocation on existing structures, new buried or undersea infrastructure, etc.).
- Select infrastructure locations, where possible, that are not within or near environmental justice communities, particularly new build options.
- Follow all BMPs identified throughout this chapter that reduce adverse impacts of construction activities, such as generation of noise, dust, and traffic.
- 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. In general, proximity means within a distance at which noise and dust would be considered objectionable or where effects on traffic volume or patterns would be considered detrimental to local residents or businesses.
- 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. According to a recent literature review, measurable adverse impacts on property values are generally not observable beyond 300 meters (984 feet), and often are not observable beyond 100 meters (328 feet) (*Bond et al. 2013*).

11.10.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

11.11. CULTURAL RESOURCES

11.11.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to cultural resources. The following BMPs and mitigation measures would apply to all project types:

- Comply with the requirements of Section 106 of the National Historic Preservation Act.
- Follow all applicable federal and state requirements if inadvertent discoveries of human remains are made during deployment or operations.
- Ensure usage of an appropriate indirect effects Area of Potential Effects as part of pre-siting or pre-deployment surveys to sufficiently account for potential indirect effects to cultural resources.
- Establish procedures for pre-deployment monitoring if a project has the potential to adversely indirectly affect historic properties to collect baseline data, monitor potential indirect effects during deployment, and determine if effects have occurred post-deployment. 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.
- 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. Other techniques such as bored piling could be used to minimize the vibration generated, where possible.
- 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).
- 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.
- Consult with site users through a community liaison team to understand site usage and how the project could affect user access.
- 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.

- Follow all applicable federal requirements for agency and tribal consultation on the identification of and assessment of effects to cultural resources.
- Avoid deployment in areas with known historic properties and deploy equipment and facilities in alternate locations if practical.

11.11.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures for cultural resources beyond those listed above for all project types.

11.12. AIR QUALITY

11.12.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to air quality. The following BMPs and mitigation measures would apply to all project types:

- Follow all applicable federal, state/territory, and local requirements for obtaining air pollution control permits for applicable emission sources.
- 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.
- Use vehicles with hybrid or electric technology, when possible, to reduce or eliminate criteria pollutant emissions from fuel combustion.
- Use renewable energy, as practicable or feasible, for backup power at buildout locations (cell tower sites, for example).
- 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.
- Post and enforce speed limits on dirt/gravel roads to reduce airborne fugitive dust.
- Limit idling time of construction vehicle and equipment and conduct proper vehicle maintenance.
- Minimize the time of operation of drones or aircraft below the mixing height (i.e., typically estimated at 3,000 feet aboveground level).
- Use electric or alternate fueled ground support equipment for drones or other aircraft.

- Avoid placement of air emission sources within Class I Areas to the extent possible.¹⁹
- Ensure all activities are in compliance with general conformity requirements in nonattainment and maintenance areas.
- Ensure all activities conform to the State or Territory Implementation Plan.
- Follow all applicable federal, state/territory, and local air quality requirements, including standards for nuisance (where possible) and fossil fuel-powered generators.
- Ensure all diesel engines are compliant with USEPA emission standards for the corresponding engine class.
- Ensure all equipment is appropriately sized for the Proposed Action.
- Consider using hydrogen-fueled generators where practicable to reduce nitrous oxides emissions.
- Obtain permits, where required, to install and operate fossil fuel-powered generators.²⁰
- Implement a dust control plan for construction activities and any travel over unpaved roads.
- Use only ultra-low sulfur fuel (where commercially available) for both on-road and off-road diesel engines.
- Ensure all fuel-burning equipment including, but not limited to, heavy construction equipment and power generator, is maintained in accordance with manufacturer's specifications.

11.12.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

11.13. NOISE AND VIBRATIONS

11.13.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential noise and vibration impacts. The following BMPs and mitigation measures would apply to all project types:

- Use noise mufflers on heavy equipment to limit noise and vibration exposure on noise and vibration-sensitive receptors during construction and grading activities near populated areas and other noise sensitive receptors, including parks or other protected areas; limit the use of such equipment to operation during daytime hours only.

¹⁹ Class I areas are national parks and wilderness areas in attainment or unclassifiable areas that exceed 5,000 acres in size and were in existence on August 7, 1977.

²⁰ Permits for stationary sources (diesel generators) should be obtained in advance of future deployment.

- Avoid, as practicable, deployment in areas with highly sensitive receptors and construct facilities in alternate locations for those projects involving heavy equipment for deployment. Such sensitive areas include foraging or breeding areas for disturbance-sensitive congregatory species such as some species of bats, colonial waterbirds, and seabirds, particularly those species that are listed as threatened or endangered, as well as wilderness areas (where recreational activities such as hiking, bird watching, etc. occur).
- Follow all applicable federal, state/territory, county/borough, and local requirements for construction and operation noise and vibration control to avoid or minimize increased noise and vibration.
- Follow all state/territory and federal guidelines for limiting aircraft noise and vibration on populated areas and over national parks.
- Include mitigation measures during the design and implementation phases of the project for equipment that is expected to generate significant noise or vibration (e.g., use of noise barriers such as walls, shrubbery).
- Ensure, as practicable, all heavy equipment, power generators, and boats are maintained in accordance with manufacturer's specifications.
- Limit construction activities to daytime hours (7 a.m. to 7 p.m.) to the extent possible when increased noise levels are more tolerable and avoid construction on Sundays and legal holidays.
- 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.

11.13.2. Project-Type Specific BMPs and Mitigation Measures

The following project-specific BMPs and mitigation measures apply in addition to those listed above for all project types:

- Wired Projects
 - New Build – Aerial Fiber Optic Plant
 - Do not permit underwater blasting and pile driving activities in any waterbody.
 - New Build – Submarine Fiber Optic Plant
 - Do not permit underwater blasting and pile driving activities in any waterbody.

11.14. CLIMATE CHANGE

11.14.1. BMPs and Mitigation Measures for All Project Types

To minimize the GHG emissions of the Proposed Action, FirstNet and/or their partners would require, as practicable or feasible, implementation of the following BMPs and mitigation measures:

- Ensure that equipment used is the most energy efficient, or use state-of-the-art equipment to increase energy efficiency.
- Use more fuel-efficient diesel-power generation units or low-emission units such as gasoline- or hydrogen-fueled power generators.
- Ensure that construction vehicles are running only when required for construction and reduce or limit unnecessary idling.
- Ensure all operators and drivers have received adequate training to efficiently use equipment.
- Conduct regular maintenance and inspection on equipment to ensure that it is running at the maximum energy efficiency.
- Use renewable energy, as practicable or feasible, for backup power at buildout locations (cell tower sites, for example).
- Minimize disturbed land area and soil disturbance by co-locating where it is feasible.
- Revegetate disturbed land areas after construction where it is feasible.
- Use access roads previously used during deployment activities for maintenance and operational activities.

To minimize climate change effects on the Proposed Action, FirstNet and/or their partners would require, as practicable or feasible, implementation of the following BMPs and mitigation measures to provide for adaptation to climate change effects:

- Ensure design of aboveground structures and equipment has included allowances for maximum temperature and precipitation changes.
- Continuously monitor and reinforce structures build on permafrost.
- Assess sea-level rise prior to installation of infrastructure near coastal areas.
- To allow for extreme weather events and flooding, monitor risk-prone areas and reinforce structures or relocate structures such as deployables outside of high-risk areas as needed.
- Work jointly with public authorities in the implementation of monitoring plans and action plans related to potential impacts that could affect the Proposed Action.

11.14.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

11.15. HUMAN HEALTH AND SAFETY

11.15.1. BMPs and Mitigation Measures for All Project Types

FirstNet and/or their partners would require, as practicable or feasible, the BMPs and mitigation measures listed below to help avoid or minimize potential impacts to human health and safety. The following BMPs and mitigation measures would apply to all project types:

- Follow all applicable federal, state/territory, and local requirements for hazardous materials and hazardous waste management.
- Utilize trained and licensed heavy equipment operators, when available or required.
- Develop a site-specific Health and Safety Plan that identifies all potential physical and chemical hazards present at the site, including historic contamination.
- Develop and utilize Standard Operating Procedures for site preparation activities and include descriptions of work practice controls and administrative controls.
- Ensure workers wear proper safety equipment as appropriate to the potential hazards present, such as high visibility safety vests, hard hats, steel-toe boots, gloves, eye protection, and hearing protection.
- Provide daily safety meetings to review activities, potential hazards, and safety objectives.
- Avoid site preparation work in areas with high vehicle traffic volume, such as road ROWs.
- Avoid site preparation work in areas known to contain environmental contamination.
- Incorporate all BMPs and mitigation measures listed in Section 11.1, Infrastructure, on potential impacts to transportation system capacity and safety.
- Incorporate all BMPs and mitigation measures listed in Section 11.2, Soils, for potential impacts from soil erosion.
- Incorporate all BMPs and mitigation measures listed in Section 11.4, Water Resources, for potential impacts to water quality – sedimentation, pollutants, nutrients or water temperature, and changes to groundwater or aquifer characteristics.
- Incorporate all BMPs and mitigation measures listed in Section 11.12, Air Quality.
- Incorporate all BMPs and mitigation measures listed in Section 11.13, Noise and Vibrations.
- Prepare an SPCC Plan to prevent, contain, and report accidental spills.
- 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 the Occupational Safety and Health Administration (OSHA).
- Search for the location of known contaminated sites prior to site selection in the area where the Proposed Action site is being considered, for new or existing infrastructure projects.

- Ensure that appropriate measures are taken in compliance with applicable regulations (including Resource Conservation and Recovery Act and Comprehensive Environmental Response, Compensation, and Liability Act)²¹ if construction occurs in an area where there is the potential for legacy contamination, to protect workers and the public from unacceptable levels of exposure to contaminants as a result of deployment activities.
- 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.
- 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.²²
- 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.
- 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.
- Use signage to clearly mark construction sites, and establish boundaries and barricades to keep people out of dangerous areas.
- 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.
- Ensure all workers are appropriately trained in wildlife identification and hazard management to minimize the likelihood of wildlife attacks.
- Ensure all workers are appropriately trained in weather hazard management and equipped with all necessary personal protective equipment.
- 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.
- 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.

²¹ The main objective of the Resource Conservation and Recovery Act of 1976 is to “protect human health and the environment from the potential hazards of waste disposal, to conserve energy and natural resources, to reduce the amount of waste generated, and to ensure that wastes are managed in an environmentally sound manner” (*USEPA 2015a*). The Comprehensive Environmental Response, Compensation, and Liability Act or Superfund law was designed to help clean up hazardous waste sites and releases of pollutants or contaminants that may negatively affect public health (*USEPA 2011*).

²² The Emergency Planning and Community Right-to-Know Act of 1986 was designed to assist communities in planning for emergencies related to hazardous waste. The law also requires industry to inform federal, state, and local governments on the storage, use, and releases of hazardous chemicals: 75,000 gallons for gasoline; 100,000 gallons for diesel; and 10,000 pounds for all other hazardous chemicals (*USEPA 2015b*).

- Given that no filariasis-, chikungunya-, or dengue-specific OSHA recommendations are available, 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.
- 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.

11.15.2. Project-Type Specific BMPs and Mitigation Measures

There are no project-specific BMPs and mitigation measures beyond those listed above for all project types.

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