BIOLOGICAL OPINION ON THE EFFECTS OF ROAD NETWORK OPERATION, MAINTENANCE, IMPROVEMENT, AND EXPANSION ON THE FEDERALLY LISTED (THREATENED) BOG TURTLE (*CLEMMYS [GLYPTEMYS] MUHLENBERGII*) IN NEW JERSEY

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ACRONYMS AND ABBREVIATIONS

ADA = Americans with Disabilities Act
APE = Area of Potential Effects
BLAES = NJDOT Bureau of Landscape Architecture and Environmental Solutions
BMPs = Best Management Practices
CM = Conservation Measure
Corps = U.S. Army Corps of Engineers
DER = Division of Environmental Resources
DLUR = New Jersey Division of Land Use Regulation
DMS = Dynamic Message Sign
ENSCA = New Jersey Endangered and Nongame Species Conservation Act
ENSP = New Jersey Endangered and Nongame Species Program
ESA = Endangered Species Act
FHWA = Federal Highway Administration (U.S. Department of Transportation)
GIS = Geographic Information System
H&H = Hydrology and Hydraulic
ILF = In Lieu Fee
IPaC = Information for Planning and Consultation (Service web-based resource)
ITS = Intelligent Transportation Systems
LAA = Likely to adversely affect (a listed species)
MTD = Manufactured Treatment Device
NA = Not applicable
NE = No effect (to listed species)
NJDEP = New Jersey Department of Environmental Protection
NJDFW = New Jersey Division of Fish and Wildlife
NJDOT = New Jersey Department of Transportation
NLAA = Not likely to adversely affect (a listed species)
NMFS = National Marine Fisheries Service
PAHs = Polycyclic Aromatic Hydrocarbons
PBO = Programmatic Biological Opinion
RND = Reproduction, Numbers, and Distribution (of a species)
RPMs = Reasonable and Prudent Measures
RQ = reportable quantities
Service = U.S. Fish and Wildlife Service
SESC = Soil Erosion and Sediment Control
SPPP = Stormwater Pollution Prevention Plans
STIP = Statewide Transportation Improvement Program
TAP = Transportation Alternatives Program
TCs = Terms and Conditions
TE = Transportation Enhancement
USEPA = U.S. Environmental Protection Agency
VMS = Variable Message Sign

INTRODUCTION

This document represents the U.S. Fish and Wildlife Service's (Service) Biological Opinion in accordance with Section 7 of the Endangered Species Act of 1973, as amended (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq*.) (ESA), on the effects of road network operation, maintenance, improvement, and expansion on the federally listed (threatened) bog turtle (*Clemmys [Glyptemys] muhlenbergii*) across the entire New Jersey portion of the species' range (the programmatic action area, see Figure 1) over the next 20 years. There is currently no critical habitat designated for the bog turtle. One of North America's smallest turtles, the semi-aquatic bog turtle usually occurs in small, discrete populations, generally occupying open-canopy, herbaceous sedge wet meadows and fens bordered by wooded areas. Threats to the bog turtle include habitat loss and degradation, as well as collection for the illegal wildlife trade.

Numerous roadway projects and related activities occur annually in New Jersey within the range of the bog turtle. These activities are needed to maintain a safe and operational roadway system and to improve its efficiency and effectiveness. These activities typically include roadside maintenance (*e.g.*, mowing); resurfacing; shoulder improvements; guiderail replacement/upgrade and new installation; culvert maintenance, repair, and extension/replacement; bridge maintenance and repair; bridge rehabilitation; bridge replacement; roadway drainage improvements and maintenance (including stormwater management); roadway widening; intersection improvements; construction of new roadways on new alignments; sidewalk and multipurpose path improvements; traffic signal improvements; lighting; and signage.

PURPOSES AND APPLICABILITY

The Federal Highway Administration (FHWA), the New Jersey Department of Transportation (NJDOT), the New Jersey Department of Environmental Protection (NJDEP), and the Service have worked cooperatively to jointly develop this Programmatic Biological Opinion (PBO) to evaluate the potential for roadway and related activities to affect the bog turtle in New Jersey. The purposes of this programmatic consultation are to:

- provide a more efficient and streamlined process for reviewing roadway projects[1] and addressing their potential effects on the bog turtle and its habitat;
- add predictability to the transportation planning and delivery process; and
- contribute to the conservation and recovery of the bog turtle.

This PBO covers all actions funded or approved by the FHWA, and carried out or overseen by the NJDOT, within the programmatic action area (Figure 1). The programmatic action area includes the entire range of the bog turtle in New Jersey.[2] Note that this definition for the

[1] As used throughout this document, "roadway project" refers to all activities covered by this PBO.

[2] ESA regulations at 50 CFR Section 402.02 define "action area" to include all areas to be affected directly or indirectly by a Federal action and not merely the immediate area (footprint) involved in the action. The programmatic action area should not be confused with the action area for each individual project that will be carried out under this PBO. At the project level, procedures in the User's Guide (Appendix A) focus only on the actual activity footprint. This is because potential effects extending beyond the activity footprint have been factored in to the application of Conservation Measures and effects determinations as shown in the Effects Matrix (Appendix B).

programmatic action area will not change over the life of this PBO, but the actual geographic extent may change if bog turtle sites become extirpated or if new ones are discovered. In other words, Figure 1 (and a corresponding Geographic Information System (GIS) layer, referenced in Appendix A – User's Guide) may be updated over the life of the PBO to reflect best available information regarding the known and likely range of the bog turtle in New Jersey.

This PBO also serves as technical assistance that can be applied to non-Federal (*e.g.*, State or locally funded) roadway and related projects that are comprised of activities described in this document. For State or local road projects without any Federal involvement, the review processes and Conservation Measures (CMs) described in this document can be used to help design and carry out activities to avoid incidental take of bog turtles. See Non-Federal Projects section of the User's Guide (Appendix A). The NJDOT coordinates both FHWA and certain non-Federal roadway projects across the State and will be primarily responsible for implementation of this PBO. The NJDOT has been designated by the FHWA as its non-Federal representative for the purposes of conducting interagency consultation under Section 7 of the ESA.

In the event that some FHWA-funded actions are carried out by one of New Jersey's toll road authorities (*e.g.*, activities along the New Jersey Turnpike, the Garden State Parkway, or the Atlantic City Expressway) rather than by NJDOT, the jurisdictional toll road authority may elect to utilize this PBO or to conduct stand-alone consultation. Likewise, for roadway projects that involve Federal land management agencies (*e.g.*, National Wildlife Refuges, National Park Service units, military lands), FHWA and other Federal action agencies may use this PBO, may consult on a case-by-case basis, or may use another applicable programmatic consultation developed by the Federal land managing agency.

In New Jersey, roadway projects within the range of the bog turtle seldom require authorization from U.S. Army Corps of Engineers (Corps) due to State assumption of the Clean Water Act (33 U.S.C. 1251 *et seq*.) Section 404 wetland permitting program. Service review of State-assumed wetland permits is governed by a 1993 (updated 2018) Memorandum of Agreement[3] among the Service, the NJDEP, and the U.S. Environmental Protection Agency (USEPA). Roadway projects covered by this PBO that also require authorization from the New Jersey Division of Land Use Regulation (DLUR) (under the New Jersey Freshwater Wetlands Protection Act (N.J.S.A. 13:9B) or other State laws) will follow the procedures and provisions of this PBO – separate review will be required by DLUR, and further conditions may be required under the regulations administered by DLUR. See Step 11 of the User's Guide (Appendix A). In the unlikely event that a non-FHWA roadway project requires Corps authorization, the Corps may elect to use this PBO or conduct stand-alone consultation.

In addition to satisfying the consultation requirements of the ESA, this PBO also provides an information framework for the New Jersey Endangered and Nongame Species Program (ENSP) and the DLUR, both within NJDEP, to consider the effects of proposed road activities on the bog turtle as a State-listed (endangered) species.

[3] https://www.fws.gov/northeast/njfieldoffice/pdf/MOAUSFWS.pdf

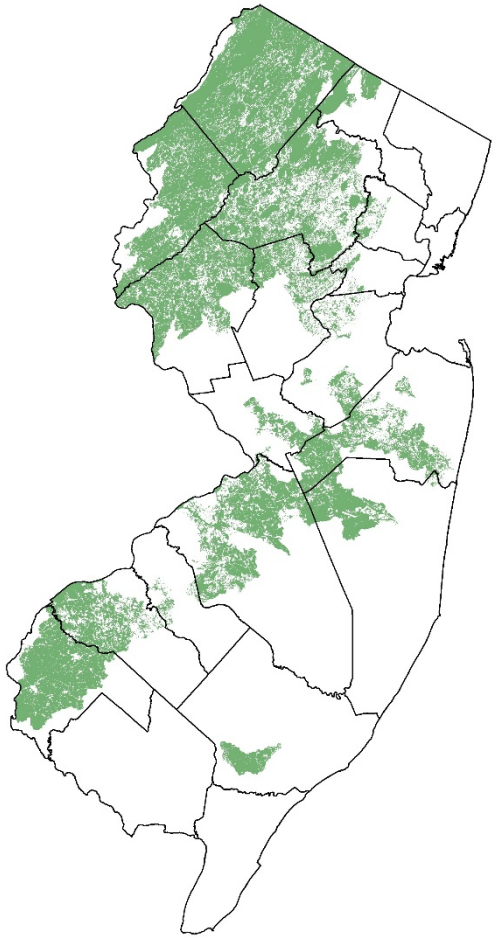

Figure 1. Programmatic Action Area

The programmatic action area is the entire range of the bog turtle in New Jersey. Mapping to depict the programmatic action area (as shown in Figure 1) is subject to revision as new information becomes available.

PROGRAMMATIC CONSULTATION

Programmatic consultations increase the efficiency of ESA Section 7 consultations by addressing multiple actions on a program, regional, or other basis. Programmatic consultation involves a two-tiered approach. Tier 1 consists of the programmatic consultation on the overall agency program[4] while Tier 2 involves streamlined consultations on individual actions carried out under a program. Certain individual activities covered by this PBO must continue to undergo individual (Tier 2) consultation to ensure consistency with the project description as given in this PBO (including all CMs), as well as consistency with the Reasonable and Prudent Measures (RPMs) and Terms and Conditions (TCs). Site-specific information for certain categories of individual

[4] Consistent with final regulations published May 11, 2015 (*Federal Register* Vol. 80, No. 90, p. 26845), this PBO evaluates a "framework programmatic action." As such, the Incidental Take Statement included with this PBO is only for those aspects of incidental take that are best addressed at a landscape level. Additional incidental take resulting from subsequent projects will be assessed during the Tier 2 consultation process for each project carried out under this PBO.

projects will also be evaluated by the Service to ensure continued consistency with the conclusions in this PBO regarding effects to listed species. Proposed projects adhering to all provisions of this PBO will receive expedited review by the Service. Individual projects that cannot be designed or carried out to conform to the provisions of this PBO may require separate, individual consultations.

Activities included in the programmatic scope of this consultation include those that result in no effect (NE), as well as activities that are "not likely to adversely affect" (NLAA) the bog turtle. This PBO provides advance Service concurrence with NLAA determinations that are consistent with certain criteria, subject to project-level verification. Primary responsibility for project-level verification lies with the NJDOT, but Service review (Tier 2 consultation) is required for some NLAA activities, as shown in the Effects Matrix (Appendix B).

Service review (Tier 2 consultation) is required for all activities that are, according to this PBO, "likely to adversely affect" (LAA) the bog turtle, or that could be LAA under certain circumstances. For LAA activities, this PBO provides the opinion of the Service that projects which are consistent with the program are not likely to jeopardize the continued existence of the bog turtle within the Delaware, Hudson/Housatonic, or Outer Coastal Plain Recovery Units. This PBO provides a limited Incidental Take Statement to account for certain impacts that are best addressed at the landscape scale, and to allow for minimal impacts to occur during the time period that a long-term mitigation program is being established. Additional take is considered in the jeopardy analysis, but will be apportioned to individual projects through Incidental Take Statements issued with future Tier 2 consultations as appropriate for LAA projects.[4]

Appendix A (User's Guide) outlines project-level (Tier 2) processes for using this PBO to comply with ESA Section 7. Appendix B (Effects Matrix) describes NE, NLAA, and LAA categories of road activities, based on proximity to bog turtle habitat, and indicates which CMs apply and when project-level Service review (Tier 2 consultation) is required. Appendix C provides a framework for developing a compensatory mitigation program over the next 2 years, Appendix D provides a summary of bog turtle resource needs, and Appendix E provides a glossary.

As discussed under Effects of the Action, many of the potential adverse effects to bog turtles from the operation, maintenance, improvement, and expansion of New Jersey's road network are entirely avoided, substantially reduced, or largely offset by the framework of CMs. Implementation of the CMs is central to the activity-level determinations shown in the Effects Matrix, and to the Service's landscape-level jeopardy analysis provided in this PBO.

CONSULTATION HISTORY

September 8, 2014	Memorandum of Agreement and Scope of Work signed by FHWA, NJDOT, NJDEP, and the Service to complete formal programmatic consultation. In addition to completing this PBO, the agreement also provides for the development of outreach materials and training for NJDOT maintenance and operations staff.
September 2014 to September 2015	The NJDOT developed a list of activities to be included in the consultation. The Service and ENSP refined the programmatic action area and the bog turtle's resource needs. All agencies began discussions regarding compensatory mitigation.
September 2015 to September 2016	The Service and ENSP refined information on species biology and environmental baseline conditions. The NJDOT started work on activity descriptions.
September 2016 to February 2018	The NJDOT, ENSP, DLUR, and the Service met roughly 25 to 30 times in person and via telephone to develop a set of CMs, and to apply those CMs to the list of NJDOT activities. The Effects Matrix (Appendix B) gives the complete set of this information, including ESA Section 7 determinations for each activity and indication of when Service review is required.
February 2018	The NJDOT, ENSP, and the Service initiated partner review of the draft Effects Matrix and supporting documents. Key partners included bog turtle and transportation experts.
March 2018 to November 2018	The NJDOT, ENSP, DLUR, and the Service met roughly 20 to 25 times in person and via telephone to address comments received during the partner review period as well as other outstanding issues on the draft documents, develop a strategy for addressing environmental contaminants, and develop a mitigation framework.
December 2018 to June 2019	The NJDOT, ENSP, and the Service completed final edits and internal review of the PBO.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Background

The FHWA provides stewardship over the construction, maintenance, and preservation of the nation's highways, bridges, and tunnels. The FHWA provides financial and technical assistance to State and local governments in an effort to improve safety, mobility, and livability, and to encourage innovation. The NJDOT receives funding from the FHWA in support of design,

construction, and some operations/maintenance activities within the State through the Federal Aid Highway Program.

The primary mission of the NJDOT is to provide a safe, reliable and efficient multi-modal transportation network which serves the mobility needs of residents, commerce and visitors in a manner that promotes economic development and ensures environmental responsibility.

The Statewide Transportation Improvement Program (STIP)[5] for the State of New Jersey is a 10-year plan that provides a comprehensive guide to major transportation improvements planned in New Jersey. The STIP lists the priority projects programmed for the first 4 years of the planning period. It also includes a priority list of projects to be funded over an additional 6 years.

The FHWA provides funding for several NJDOT programs that, upon project delivery, have the potential to adversely affect the bog turtle. These include NJDOT's Capital, Operations / Maintenance, and Local Aid Programs. The Transportation Capital Program represents an annual element of the STIP and outlines the planned capital investments for each State fiscal year (July 1 through June 30), including projects and programs that rebuild the State's bridges and roads, and reduce congestion along Interstate highways and State-owned roadways. The NJDOT Operations/Maintenance Program is responsible for the maintenance of Interstate highways and State-owned roadways, rest areas, roadsides, bridges, and regional maintenance facilities. The NJDOT oversees the Local Aid Program, which provides the opportunity for funding assistance to local governments (*e.g.*, counties, municipalities) for road, bridge and other transportation projects.

Description of Covered Activities

As defined in the ESA regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas." All activities funded or approved by the FHWA in New Jersey are covered by this PBO. The vast majority of activities that FHWA funds or carries out in New Jersey are covered by the descriptions provided below. The FHWA may occasionally fund or approve an activity not described in this PBO. In such cases, FHWA and/or NJDOT will initiate Tier 2 consultation to verify that likely effects to the bog turtle are similar to those already considered, and can, therefore, be covered by this PBO. In the unlikely event that FWHA funds or approves an activity with effects to the bog turtle beyond those considered in this PBO, FHWA will initiate stand-alone consultation for that activity. Within the programmatic action area, this PBO can also serve as technical assistance to Federal and non-Federal proponents of projects similar to those described below but have no funding or approvals from the FHWA.

Note that references to "categories" in the below activity descriptions may be to the narrative category heading or to information contained in that narrative. The references may also pertain to category or subcategory headings in the Effects Matrix (Appendix B) or to specific rows (activities) in the Effects Matrix.

[5] https://www.state.nj.us/transportation/capital/

1. Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence

Soil Erosion and Sediment Control (SESC) and water quality control measures limit sediment and other pollutants from entering the aquatic environment, and SESC measures also protect land and topsoil. Under the New Jersey Soil Erosion and Sediment Control Act, all projects that disturb greater than 5,000 square feet (SF) must be designed to include SESC measures. Water quality control and SESC measures must be constructed before starting construction operations. Activities in this category include the installation, maintenance, and removal of hay bales, caution fence, silt fence/heavy-duty silt fence, hay bale check dams, temporary stone check dams, floating and staked turbidity barriers, temporary slope drains, inlet protection, temporary stone outlet sediment traps, sedimentation/dewatering basins, sediment control bags/tanks, erosion control mats/blankets, concrete washout facilities, construction driveways, and pollution control items. While caution fence is not an SESC measure, it is used to demarcate a work area, to protect workers and the public from inappropriate entry, and to protect the surrounding environment from inadvertent expansion of the disturbance footprint.

Silt fencing and hay bales serve as sediment barriers, which intercept and detain small amounts of sediment from unprotected areas of limited extent. Caution fence is installed at locations shown on the plans to delineate wetlands and other environmentally sensitive areas. However, caution fence should not be used within 50 feet of the wetland portion of bog turtle habitat or within the wetland itself. Hay bales are to be embedded in the ground and placed end to end to form a continuous line without gaps. Silt fence/heavy-duty silt fence is installed with geotextile securely buried in the soil. Sections of the geotextile are joined so that they work effectively as a continuous fence. Silt fence posts are installed at a slight angle toward the anticipated runoff source. Heavy-duty silt fence posts may be constructed of heavier wood or metal as needed to withstand heavier sediment loading. This practice is appropriate where space for other practices is limited and heavy sediment loading is expected. Heavy-duty silt fence is not to be used in place of properly designed diversions which may be needed to control surface runoff rates and velocities, but may be required under CMs 12b, 15a, and 17 to provide bog turtle habitat with a high degree of protection from sedimentation (see Appendices A and B for detailed information on how to apply the CMs).

Typical measures taken for activities within a waterbody include hay bale check dams (with temporary stone outlets), temporary stone check dams, floating turbidity barriers, and staked turbidity barriers (in a stream). Check dams and turbidity barriers are used to prevent the siltation of streams or waterways that pass through or about the construction site. Temporary stone check dams are constructed in ditches to reduce flow velocity. Floating turbidity barriers are typically used whenever construction operations are directly located in a stream or watercourse, or where a drainage pipe that may carry silt discharges into a stream or waterway. This practice limits the dispersion of runoff-borne sediment (and floatable material) to the immediate area of construction, thereby facilitating maintenance and cleanup. Sediment trapped behind the barrier drops out of suspension before being carried further downstream. Floating turbidity barriers must be cleaned out and kept free from debris; they must remain in place until all of the work in the area is completed, the cofferdam is removed (if applicable), and the adjacent ground area has established a firm stand of vegetation (if applicable). Floating turbidity barriers are to be removed in such a manner as to minimize the release of sediment and debris.

Slope protection structures, such as temporary slope drains, are used where concentrated water will cause excessive erosion on existing and/or recent cut and fill slopes. The primary benefit to water quality is through the prevention of steep slope erosion, by providing a means to safely convey stormwater runoff down to a stable area or condition. Total suspended solids discharged from the site, both during and after construction, are thereby reduced. Temporary structures are left in place until adequate vegetation and the permanent drainage system has been installed. Temporary slope drains may require the placement of riprap or other energy-dissipating measures. A temporary berm is constructed, and hay bales are placed at the top-of-slope in the vicinity of the slope drain to intercept runoff and channel the runoff to the slope drain. The drainpipe is staked to the slope or secured with temporary riprap to prevent movement or displacement. A flared end section is attached at each end of the pipe.

Inlet protection, such as inlet filters or temporary inlet sediment traps, serves to intercept and retain sediment. The primary benefit to water quality is the removal of sediment from stormwater runoff prior to entering the storm sewer system. As an added benefit, other floatable debris, such as vegetation and litter may also be filtered out of the runoff.

Temporary stone outlet sediment traps are temporary sediment control structures formed by excavation and/or an embankment with an approved outlet. The outlet of the trap is over a stone section placed on level ground. Sediment traps are often installed at points of discharge from a disturbed area. Sediment traps are utilized to protect drainage ways, properties, and rights-of-way downstream of the sediment trap from sedimentation. Sediment traps must outlet onto stabilized (preferably undisturbed) ground, into a watercourse, stabilized channel, or into an approved storm drain system. Temporary stone outlet sediment traps must be inspected periodically and repaired as needed. Once constructed, the top and outside face of the embankment are stabilized with seed and mulch.

A sedimentation/dewatering basin is a barrier, dam, excavated pit, or dugout constructed at a suitable location and serves to trap sediment originating from eroding areas and construction sites; limit pollution by providing basins for deposition and storage of silt, sand, gravel, and stone; and prevent undesirable deposition in storm sewers, waterways, streams, bottom-lands, and developed areas. The use of a properly designed sediment basin, in combination with other SESC measures, can significantly reduce both volumetric and pollution transport problems associated with soil erosion from construction sites. The turbid discharge from dewatering activities is contained and filtered in a dewatering basin so that clean water is released into the receiving waterbody. Floating turbidity barriers are installed where the basin outfall flows into a receiving waterbody (see *Dewatering*).

Sediment control tanks/bags and silt control tanks/bags are containers through which sediment-laden water is pumped to trap and retain the sediment. The sediment control bag may be surrounded by staked hay bales and filter fabric to enhance sediment capture. Sediment control tanks are often used during dewatering activities to capture sediment and floating debris (see *Dewatering*).

Erosion control mats and blankets may also be used as part of standard SESC measures, and under CM 15d.

Concrete washout facilities are essential for collecting and retaining the concrete washout water and solids from vehicles and equipment at construction sites. Concrete washout water is a slurry containing toxic metals, and must be handled properly to protect human health and the environment. Concrete washout facilities may include a pre-fabricated or roll-off container and/or a containment area temporarily constructed on site, usually at or above ground level. Typically, grading is not required but may be necessary in certain circumstances to level an area. Concrete washout facilities are placed in locations that provide convenient access to concrete trucks, preferably near the area where concrete is being poured, but should be placed at a minimum of 50 feet to 150 feet from a waterbody, wetland, or other environmentally sensitive area, and a minimum of 300 feet from the wetland portion of bog turtle habitat.

Construction driveways are provided at each location where vehicles exit a work site, serving to minimize the tracking of dirt and other materials onto existing roadways. When the driveway is no longer required, it is removed and the disturbed area is restored to its original condition.

Pollution control items such as absorbent booms, oil-only emergency spill kits, and oil-water separators may be installed, utilized, and removed during construction activities. If an oil spill occurs, absorbent booms are installed to ensure that oil products do not escape the work site. The absorbent booms are removed after absorption of oil and are disposed of as directed. Absorbent booms are replaced as necessary to continually protect the waterbody. An oil-only emergency spill kit is capable of cleaning up at least 95 gallons of spill. Before the start of construction operations, oil-only emergency spill kits are placed within the project limits, and replenished as needed. An oil-water separator can be utilized for the removal of free product generated in dewatering excavations in areas of petroleum contaminated groundwater.

The extent of the area to be affected by SESC and water quality control measures and caution fence depends on the size of the project area and the specific construction activity. The disturbance footprint can range from minor SESC measures (*e.g.*, inlet protection) to construction of a new sedimentation/dewatering basin or concrete washout facility. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary (see *Stream/Wetland Work* and *Dewatering*). The duration of work depends on the scope of the activity. For example, installation of fencing, floating turbidity barriers, inlet protection, temporary stone outlet sediment traps, or sediment bags/tanks could take hours to several days, while construction of a sedimentation/dewatering basin could take longer.

All SESC and water quality control measures are carried out to minimize erosion and sedimentation and to protect water quality. Temporary floating/staked turbidity barriers, hay bale check dams, stone check dams, and stone outlet sediment traps may temporarily alter hydrology of any nearby aquatic habitats. Other than maintenance and manual cleanouts of sediment bags/tanks, most SESC and water quality control work involves motorized vehicles and construction equipment. Small projects may be limited to hand tools such as wheelbarrows, shovels, and rakes. Larger projects could require a trencher, backhoe, loader, dump truck, or barge. A temporary floating platform/barge is sometimes used to transport materials/equipment to work areas. Raw concrete, grout, concrete wash water, and fuel may be present for certain kinds of construction activities or around concrete washout facilities. However, contaminants are

generally not a concern for other SESC and water quality control measures involving only natural stone, haybales, or prefabricated components.

2. Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance

Vegetation related practices are often required in order to maintain an existing railway, roadway, or structure or to clear an area for new construction. The activities implemented to manage vegetation include cutting and clearing vegetation, grubbing, hazardous tree removal, landscaping maintenance, and vegetation management for outdoor advertising. Vegetation management is often part of site preparation, clear zone maintenance, and shoulder maintenance. This category of activities includes vegetation removal and alteration, but not seeding or planting, which are covered under *Landscaping*.

Site preparation is the clearing of an area for new construction. This process begins with vegetation removal, which may be permanent or temporary. Permanent conversion of a vegetated area into a developed area includes clearing vegetation then grubbing out the roots. Grubbing goes a step further than vegetation clearing by removing the roots or stumps from the soil after vegetation clearing in order to prevent regrowth. Temporary vegetative clearing includes cutting vegetation but maintaining the root mass to allow for regrowth. Removed vegetation is disposed of appropriately.

A clear zone is an unobstructed, traversable roadside area that allows a driver to stop safely, or regain control of a vehicle that has left the roadway. A clear zone may include shoulders, bike lanes, acceleration lanes, and deceleration lanes. By creating clear zones, roadway agencies can increase the likelihood that a roadway departure results in a safe recovery rather than a crash, and mitigate the severity of crashes that do occur. Along with vegetation management techniques, clear zone and sight distance maintenance activities may also include preliminary earthwork (*e.g.*, stripping topsoil), safety hazard elimination, and obstruction, fixed object and/or debris removal.

A shoulder is the portion of the roadway contiguous with the traveled way, which is often used to accommodate stopped vehicles, including emergency use. Appropriate shoulder maintenance practices ensure that the roadway shoulders continue to serve their purpose in providing emergency pull-offs and escape zones, improved highway capacity and sight distance, and space for pedestrians and bicycle usage where there is no sidewalk. Road shoulder maintenance typically involves the removal of sediment or debris build-up along the edge of the road (vegetated or under guiderail). Precautions are taken to prevent sedimentation of nearby roadside habitats (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category).

The extent of the area to be affected by vegetation-related, clear zone and shoulder maintenance activities depends on the size of the project area and the specific actions required. The disturbance footprint can range from minor maintenance (*e.g.*, cutting and trimming vegetation) to more involved maintenance work (*e.g.*, clearing vegetation and grubbing). The duration of vegetation related work depends on the scope of the activity and the size of the disturbance footprint.

Vegetation management, clear zone/sight distance maintenance, and shoulder maintenance may involve soil disturbance. Temporary construction Best Management Practices (BMPs) call for various SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Vegetation related activities, clear zone/sight distance maintenance and shoulder maintenance are not likely to affect the hydrology of any nearby aquatic habitats. Most of the activities involved with this work involve motorized vehicles and construction equipment such as loaders, backhoes, dump trucks, or other heavy equipment. Small projects may be limited to a wheelbarrow and shovel or rake. Herbicides (see *Landscaping)* may be used to manage vegetation growing along roadway shoulders or beneath guiderail. Other sources of contamination are generally not a concern for these vegetation related practices.

3. Drainage Facilities

Drainage facilities are used to convey water from highway systems. Such facilities include roadside ditches and channels, drainage pipes, catch basins and inlets, outfall structures, and pump stations. Drainage features function to keep the highway free from excess water that could create an unsafe condition.

Drainage facilities are normally designed and constructed as part of a new feature such as a roadway, shoulder, lane, or intersection. Existing drainage facilities may be repaired, replaced, upgraded, or expanded as needed, as a stand-alone project or as a part of a larger roadway enhancement project. In addition, drainage facilities require regular maintenance and cleaning to continue operating properly. Regular cleaning helps to maintain water quality and minimize sediments that enter the natural stream systems.

Drainage facilities can become blocked by debris, sediment, vegetation, beaver-deposited materials, or eroded materials. Occasionally, scour within the system can result in the blocking of a pipe with rock or gravel. Blocked pipes can result in flooding over the roadway, or in severe cases, the pipe and the roadway can wash out. To look for blockages, video inspections are conducted.

Inlets (catch basin), drainage pipes, and outfalls require periodic cleaning to permit free flow and to avoid erosion and damage to roads and other infrastructure. Regular removal of debris, sediment, and vegetation can avoid and correct problems. Obstructions must be removed regularly. Cleanout may include sediment/debris removal by hand (*e.g.*, shovels, hoses, hydraulic pumps) or by machinery (*e.g.*, vacuum truck), both within and beyond the drainage facility (*e.g.*, ditch, stream, wetlands, or adjacent upland areas). Material removed from within or nearby the drainage facility is disposed of following appropriate sediment/debris disposal practices. Sometimes exclusionary devices, such as sandbag berms, are installed to allow for cleaning in a dewatered environment (see *Dewatering*).

Other maintenance and repair activities may include repair of drainage pipes, headwalls, wingwalls, flared end sections, outfall structures, and installation of outfall protection. Repairing drainage pipes often involves lining/relining the pipes with materials such as high-density plastic sleeve or sprayed on shotcrete coating. Outfall protection activities include excavating soil to the proposed bottom where the selected type of outfall protection material will be installed. Common

outfall protection materials include loose riprap stone, stone within a wire basket (gabion), grouted stone, poured concrete with embedded stone, articulated concrete block, and specialty stone.

Reconstruction and replacement of drainage facilities may include in-kind replacement or upgrading of existing inlets; new inlet installation connecting to an existing drainage facility; and reconstruction or replacement of headwalls, wingwalls, flared end sections, outfall structures, riprap or other types of outfall protection. Replacement can occur via two methods: in-kind replacement (located in the same location/alignment, having the same dimensions and constructed of the same materials as existing) OR out-of-kind replacement that may involve a different type, material, footprint, location, and/or alignment relative to the existing structure. Replacement of drainage pipes can occur under existing pavement, within stormwater basins, or under maintained vegetated portions of existing roadways (*e.g.*, medians, roadway berms, and slopes), and may or may not be the same size and material as the existing pipes. Drainage pipes may directly connect to an outfall, or may connect elsewhere within a drainage system.

The construction of a drainage facility with a new outfall may include the installation of new pipe and construction of headwalls, wingwalls, flared end sections, outfall structures, riprap or other type of outfall protection. Trenching or more extensive excavation/grading may be necessary for the installation of a new pipe.

The extent of the area to be affected by drainage system construction, repair, and maintenance activities depends on the size of the drainage facility and the specific actions required. The disturbance can range from in-kind replacement of existing riprap to a new, enlarged, or reconfigured footprint. Most repair and maintenance activities are completed within hours to days.

Drainage facility maintenance, some types of repairs, reconstruction/replacement, and new construction involve soil disturbance. Downstream sedimentation is minimized through the use of standard sediment control practices (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Maintenance beyond the structure itself (*e.g.*, stream/ditch cleaning or excavation) may alter hydrology of any nearby aquatic habitats. Drainage pipe extension, relocation, and out-of-kind replacement (*e.g.,* a different size or material) may also alter hydrology. Surface water could be temporarily affected by diversions, cofferdams, or floating turbidity barriers, but surface water flow is normally maintained. Proper dewatering (if required) and SESC measures can be used to avoid adverse impacts on water quality (see *Dewatering* and *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Although dewatering may be required, groundwater alteration would not typically occur.

Equipment use varies depending on the type of drainage facility project. Small projects may be limited to wheelbarrow and manual raking of stone. Larger projects could require cranes, grubbers, loaders, backhoes, dump trucks, concrete trucks, or other heavy equipment. Potential contaminants involved with drainage facility projects may include uncured concrete, lubricant on concrete forms, and fuel leaks.

4. Stormwater Management Facilities

Stormwater management is an important consideration in the design of roadway drainage systems. Stormwater management practices, when properly selected, designed, and implemented, can be utilized to mitigate the adverse hydrologic and hydraulic impacts caused by NJDOT facilities and mitigate losses in groundwater recharge. Stormwater management facilities can thereby protect the health of streams and wetlands, the yield of water supply wells, downstream areas from increased flooding/erosion, and water quality. If the proposed roadway project disturbs 1 or more acres of land or creates at least 0.25 acre of new or additional impervious surface, stormwater management is generally triggered under the current NJDEP Stormwater Management Rules.

Stormwater management facilities include retention (wet pond) basins, detention basins, extended detention basins, infiltration basins, bio-infiltration basins, bioretention basins, ditches, swales, bioretention swales, vegetative filter strips, bio-infiltration strips, sand filters, standard constructed wetlands, subsurface gravel wetlands, underground detention basins, rain gardens, manufactured treatment devices (MTDs), and pervious paving systems.

Regular and thorough maintenance is necessary for stormwater management measures to operate effectively and reliably. The potential for problems to develop is accentuated by many of the very features and characteristics that allow stormwater management facilities to do their job, including standing or slowing moving water, dense vegetation, forebays, trash racks, dams, and the need to continually function in all types of weather. Therefore, stormwater management facility maintenance is necessary in order to prevent diminished performance, deterioration, and failure, in addition to a range of health and safety problems including mosquito breeding, nuisance wildlife, and the potential for drowning. Stormwater management facilities are also expected to become the repositories for sediment, nutrients, trash, debris, and other pollutants targeted by the NJDEP Stormwater Management Rules.

Typical maintenance activities of some stormwater management facilities include vegetation maintenance and sediment/debris removal and disposal. All stormwater management facilities must be accessible for inspection and maintenance. Therefore, trees, shrubs, and underbrush must be pruned or trimmed as necessary to maintain access to the stormwater management measure via roadways, paths, and ramps (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category). Stormwater management facility maintenance also includes regular management of vegetation that is part of the facility (*e.g.*, mowing). Maintenance or cleanout activities for MTDs and underground detention basins may include the use of a vacuum truck. Pervious paving systems may require vacuum sweeping, power washing, and sediment and debris removal, along with proper sediment disposal.

New structural stormwater management measures (*e.g.*, basins) are designed and constructed to take into account existing site conditions, such as environmentally sensitive areas, including wetlands and flood-prone areas; steep slopes; seasonally high water tables; soil conditions; drainage considerations; and the underlying geology (*e.g.*, limestone). Stormwater management facility construction may also include the installation of MTDs or pervious paving systems.

The extent of the area to be affected by stormwater management facility construction or maintenance activities depends on the size of the facility and the specific actions required. The disturbance footprint can range from vegetation maintenance to a newly constructed basin. Most maintenance activities are completed within a few hours in any given location. However, some projects may take a few days to complete.

Stormwater management facility maintenance and construction typically involve soil/sediment disturbance. Sedimentation can be minimized through standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Maintenance beyond the structure itself (*e.g.*, stream/ditch cleaning or excavation) is likely to alter hydrology of any nearby aquatic habitats. Proper dewatering (if required) and SESC measures can avoid adverse impacts on water quality (see *Dewatering* and *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* categories). Even if dewatering is required, groundwater alteration would not typically occur. Equipment use varies depending on the type of stormwater management facility project. Small projects may be limited to wheelbarrow and manual raking of stone. Larger projects could require cranes, grubbers, loaders, backhoes, dump trucks, concrete trucks, or other heavy equipment. Potential contaminants involved with stormwater facility projects may include uncured concrete, lubricant on concrete forms, and fuel and fluid leaks.

5. Stream Culverts

Culverts include metal or concrete pipes or concrete box or three-sided concrete frame structures that convey streams under roadways. Culverts function to keep the roadway free from excess water that could create an unsafe condition, or that could damage roads and other infrastructure. Some culverts include structural elements to allow passage of terrestrial wildlife above the level of the stream (see *Terrestrial Wildlife Passage* category).

Culverts can become blocked by debris, sediment, vegetation, or beaver-deposited materials. Occasionally, scour within the system can result in blocking of the culvert with rock or gravel. Blocked culverts can result in flooding over the roadway, or in severe cases, the culvert and the roadway can wash out. To look for blockages, culvert inspections are conducted, typically by video inspections, walk-throughs, or remote control vehicles. Culverts are cleaned periodically to permit free flow of the stream. Culvert cleanout may include sediment/debris removal by hand (*e.g.*, shovels, hoses, hydraulic pumps) or by machinery (*e.g.*, small earthwork equipment), both within and beyond the culvert (*e.g.*, ditch, stream, wetlands, or adjacent upland areas). Material removed from within or near the culvert is disposed of following appropriate sediment/debris disposal practices. Sometimes temporary diversions, such as sandbag berms, are installed to allow for culvert cleaning in a dewatered environment (see *Stream/Wetland Work - Temporary Stream Diversion* and *Dewatering*).

Scour holes are localized erosional areas that sometimes form in the stream within a culvert or near the end of a culvert. Scour repair/protection can help to restore the streambed to its original elevation. Scour hole repair may be localized or may span the streambed, and typically involves placement of hard structures (*e.g.*, riprap, grout bags, gabion baskets, concrete structures) to resist or deflect stream velocities and slow or stop erosion of the stream. Stream diversion is

sometimes required for scour repair (see *Temporary Stream Diversion* under the *Stream/Wetland Work* category, and the *Dewatering* category).

Culvert repair (*e.g.*, to address cracks or other structural deficiencies) includes repairs to the culvert itself as well as the headwall, wing walls, footings, and terrestrial wildlife passage structural elements. One repair method involves lining the inside of the culvert with a high-density plastic sleeve or sprayed-on shotcrete coating. In addition to regular cleaning and periodic repairs, culverts may sometimes require reconstruction, extension, or replacement (in-kind or out-of-kind). New culverts are typically designed and constructed as part of a larger project such as a new roadway, lane, or intersection.

The extent of the area to be affected by culvert maintenance, repair, or reconstruction, or scour repair depends on the size of the drainage channel or ditch and the specific actions required. The disturbance can range from minor repair (*e.g.*, filling in a scour hole or repairing minimal undermining) to a new/enlarged/reconfigured culvert footprint. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary (see *Stream/Wetland Work*). The duration of culvert work depends on the scope of the activity. For example, minor scour repairs could take up to a week, while major repairs or significant armoring could take several weeks.

Culvert maintenance, some types of culvert repairs, culvert reconstruction/extension/ replacement, and scour repair typically involve sediment disturbance. Downstream sedimentation is minimized through the use of standard SESC measures (See *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Culvert maintenance beyond the structure itself (*e.g.*, stream/ditch cleaning or excavation) may alter hydrology of any nearby aquatic habitats. Culvert extension, relocation, and out-of-kind replacement may also alter hydrology. Other than inspection and manual cleanouts, most culvert work involves motorized vehicles and construction equipment. Small projects may be limited to a wheelbarrow and manual raking of stone. Larger projects could require a crane, loader, backhoe, dump truck, concrete truck, other heavy equipment, or barge. Raw concrete, grout, and fuel may be present for certain kinds of culvert repair or replacement activities. However, contaminants are generally not a concern for culvert cleanout or for scour repair involving only natural stone or prefabricated components.

6. Bridges

A bridge is an elevated structures that conveys a roadway over a stream, river, wetland, or man-made feature such as a railway or another road. There are many types of bridges including but not limited to concrete slab, concrete arch, concrete box girder, concrete T-beam, steel beam, pre-tensioned concrete beam, steel truss and timber trestle. Some bridges span the stream systems they are crossing, while others have piers in the channel. Most new bridges are designed to span as much of the river as possible, and to minimize constriction in the aquatic system. Some bridges include a natural pathway or structural elements to allow passage of terrestrial wildlife adjacent to the stream (see *Terrestrial Wildlife Passage* category). Bridge construction may be a component of a larger roadway or rail construction project or a stand-alone project.

Bridge inspection, repair, and maintenance activities are implemented to prolong the use and function of bridges, ensure motorist safety, and protect the environment. Bridge inspections can

be conducted via snooper truck or suspended scaffolding for access from the bridge deck, or via boat or barge for access from a waterbody. Bridge maintenance and repair activities may include washing, painting, debris removal from piers, cleaning out or repairing/replacing drains/scuppers, repairing expansion joints, cleaning/repairing structural steel, sealing concrete surfaces, patching concrete, repairing guiderails/lighting/signage, and rehabilitating other structural elements. Bridge painting involves washing the bridge with high-pressurized water and abrasive sand blasting to remove all corrosion prior to painting. A containment system is used to capture dust/debris. Debris removal can be accomplished in a variety of ways depending on the type and quantity of debris, and the size and configuration of the bridge. Hand removal of debris is possible in some instances although the use of heavy equipment, is often necessary. Some bridge maintenance/repair projects can be long-term, lasting more than one construction season.

Bridge reconstruction and rehabilitation can involve superstructure and/or substructure work. Whether a bridge is repaired, rehabilitated, or replaced depends on the age and condition of the bridge. Bridge reconstruction/rehabilitation projects can be long-term, lasting more than one construction season. Structural rehabilitation may include replacement or repair of degraded steel superstructure, repair to bridge approaches, or repair or replacement of bridge railing.

Bridge deck repair is one element of superstructure work. Activities may include crack sealing, spalling repair, pothole repair, pavement repair patchwork, high friction surface treatment (skid resistant treatment), and pavement overlay or milling and resurfacing. Deck repair or replacement may involve traditional mechanical methods such as jackhammers, concrete saws, and cold-milling (grinding), or hydro-demolition, which uses a high-pressure water jet to remove unsound concrete. Concrete debris is contained and then removed with vacuum equipment. Superstructure work can also include repair to parapets, railing, beams, stringers, girders, curbs, and sidewalks.

Bridge substructure repair may include spalling repair and crack sealing; repair of abutments, wingwalls, piers, footings, and terrestrial wildlife passage structural elements; scour and undermining repair; bridge timber pile repairs; steel collar installation; fender system waler replacement; and in-kind dolphin repair. Substructure replacements may also include bridge pile replacement (*e.g.*, timber or concrete piles) and may occur on land or in water. Installation techniques used include pile driving using an impact or vibratory hammer, and drilled shaft construction for foundations. Replacement of existing fender systems or installation of new fender systems, and in-kind dolphin replacement or installation of new or additional dolphins may also occur. There is a high variability of the disturbance footprint, depending on the size, location, and composition of the existing substructure and streambed properties. Disturbance footprints can range from staying within the existing footprint (*e.g.*, for most maintenance/repairs and in-kind replacement) to a new/enlarged/reconfigured infrastructure footprint. The duration of the activity can be relatively short if the scope is limited, for example to repair spalled concrete. A longer duration may be required, for example to replace bridge wingwalls.

Commonly used equipment for bridge repair, maintenance, reconstruction, and rehabilitation may include backhoes, excavators, barges, dump trucks, front-end loaders, snooper trucks, scaffolding, drapes, generators, cranes, concrete saws, traffic control devices, compressors, and other heavy equipment. The equipment may operate from the bridge deck, a work barge in

navigable waters, or a temporary work platform beneath the bridge deck. In some situations, equipment may be required to operate from a stream bank to remove debris or repair bridge abutments and supports.

Widening or replacement of existing bridges tend to be long-term projects, which may require 1 or more years to complete. Installation of new bridges may require construction of a detour bridge. Occasionally, half of the new bridge is constructed adjacent to the old bridge and acts as the detour bridge while the original is removed and replaced. Most bridge replacements use the same alignment or are constructed near the old alignment. Temporary bridges may be built as construction platforms. Often, in-water work is generally timed to minimize impacts to sensitive aquatic species. Bridge construction and removal can result in sediment and construction debris entering the water. This may be minimized by the use of SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category*)* and a containment system under the bridge. New bridge construction may include the construction of a permanent or temporary bridge. Construction equipment used for bridge replacement or construction of a new bridge is similar to that listed above for reconstruction and rehabilitation.

Isolation of the work area and stream is often required on new or replacement bridge projects that involve in-stream work, and may require the use of cofferdams, sandbag berms, temporary culverts or flumes, or a temporary stream diversion, depending on site conditions (see *Dewatering* and *Stream/Wetland Work*). This technique helps minimize construction impacts by isolating the work from the stream.

Potential alterations to surface water and/or groundwater could result as cofferdams and floating turbidity barriers could temporarily affect surface water, but surface water flow is normally maintained. Adverse impacts to water quality can be avoided through proper dewatering (if required) and standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Although dewatering may be required, groundwater alteration would not typically occur. There is a minimal risk of contaminants from prefabricated fender materials and non-polluting piles/timbers. Potential contaminants involved with bridge projects may include uncured concrete, and fuel and fluid leaks.

7. Terrestrial Wildlife Passage

The impact of roads on wildlife populations is a significant and growing problem worldwide. In rural and suburban areas of North America, accidents with wildlife are becoming a major safety concern for motorists, and road mortality can further impact populations of endangered or vulnerable species. Wildlife crossing structures are intended to increase permeability and habitat connectivity across roads and reduce wildlife–vehicle collisions. The siting of wildlife crossing structures is important. Identifying the proper location of crossing structures is critical for designing effective mitigation of the barrier effect caused by roads. Design is also important, involving variations on above-grade (wildlife overpass) or below-grade (wildlife underpass) structures designed to facilitate movement of animals and connections among animal populations. Terrestrial wildlife passage may be provided through a stream culvert, under a

bridge or as a dry passage culvert. Guide fence is sometimes installed to help direct wildlife towards the terrestrial passage or to prevent wildlife from entering the roadway.

Terrestrial wildlife culvert passage, designed for use by small- and medium-sized wildlife associated with riparian habitats, may include articulated concrete block, other structural elements, or a suspended shelf. Dry platforms or walkways can vary in design but are typically constructed along the interior walls of the culvert, with the top of the passage typically above the high-water mark. Bridge terrestrial passage is a walkway, whether natural or constructed, under a bridge over a waterway, which allows larger terrestrial mammals to safely pass beneath the structure without entering the waterway. A dry passage is a culvert constructed in dry (non-stream) conditions, specifically for the purpose of providing a passage under the roadway for terrestrial wildlife.

Terrestrial wildlife passage may also consist of the planting, restoration, or maintenance of suitable vegetation. Many species of wildlife, including bog turtles, may be limited in their ability or success to move through a landscape based on habitat conditions within a wetland, riparian corridor, or upland. For example, most terrestrial wildlife species prefer movement through natural cover vegetation over a corn or soy agricultural field.

The extent of the area to be affected by the repair, reconstruction, or replacement, or installation of a terrestrial wildlife passage depends on the size of the culvert or bridge and the specific actions required. The disturbance can range from minor repair to a new, enlarged, or reconfigured culvert/bridge footprint. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary (see *Stream/Wetland Work* and *Dewatering*). The duration of work depends on the scope of the activity. For example, minor repairs could take several hours to several days; whereas, installation of a new passage could take several weeks to several months. For other associated activities, also see the *Stream Culverts* and *Bridges* categories, and *Fence* under the *Appurtenant Features* category.

Construction of a new terrestrial wildlife passage or the repair, reconstruction, or replacement of an existing passage may involve soil/sediment disturbance. Downstream sedimentation is minimized through standard SESC measures (See *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Installation of terrestrial wildlife passage in a culvert or bridge associated with riparian habitats or waterways may alter the hydrology of any nearby aquatic habitats. Most terrestrial wildlife passage work involves motorized vehicles and construction equipment. Small projects (*e.g.*, repair of terrestrial wildlife passage) may be limited to hand tools. Larger projects could require a loader, backhoe, dump truck, concrete truck, other heavy equipment, or barge. A temporary floating platform/barge is sometimes used to transport materials/equipment to work areas. Raw concrete, grout, and fuel may be present for certain types of culvert or bridge terrestrial wildlife passage repair, replacement, or installation projects. However, contaminants are generally not a concern for construction of a dry passage involving only natural stone or prefabricated components.

8. Demolition

Demolition is sometimes required to remove old bridges or buildings that have become unnecessary and/or unsafe. Demolition activities require a high degree of control to ensure the safety and protection of the public and the environment. Demolition of bridges and buildings requires the use of heavy equipment, along with the proper removal and disposal of debris.

The type of bridge demolition method is determined by site and project-specific conditions including the structure type of the bridge, the size of the bridge, the presence of a waterway, the topography, the amount of access to the bridge and the banks, and requirements for construction staging and traffic maintenance. Bridge demolition can be carried out by different methods, including: (1) dismantling from an adjacent bridge deck or approach; (2) dismantling and removing sections of the bridge using a crane; and (3) building false-work (temporary structures) under and around the bridge. If a bridge is over a waterway, in addition to the above methods, dismantling may be accomplished by lowering the bridge onto a barge in sections or by barging the bridge out to a dismantling site.

Many bridges have piers in the aquatic environment; these also need to be removed. Concrete piers can be removed by demolition using a hoe ram (as long as pieces do not enter the water), or be removed by using a vibratory hammer. The piers can be cut off below the ground level.

Building demolition typically requires a pre-demolition inspection of the building itself and surrounding structures. The structural integrity of the building must be assessed prior to the commencement of demolition activities to determine the ideal sequence or approach in an effort to prevent inadvertent collapse.

The extent of the area to be affected by demolition depends on the size of the bridge or building and the specific actions required. The disturbance footprint may extend beyond the footprint of the building or bridge itself, to include banks along a stream or open water impacts. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary (see *Stream/Wetland Work* and *Dewatering*). The duration of demolition work depends on the scope of the activity and the size of the structure to be demolished.

Bridge or building demolition activities typically involve soil/sediment disturbance. For bridges spanning waterways, downstream sedimentation is minimized through standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category*)*. In general, demolition of a building or bridge is not likely to alter hydrology of any nearby aquatic habitats. However, demolition of a bridge spanning a waterway may require the removal of piers or abutments, which could alter the hydrology of any nearby aquatic habitats. Most demolition work involves motorized vehicles and the use of heavy construction equipment. Larger projects could require a crane, loader, backhoe, dump truck, or barge. A temporary floating platform/barge is sometimes used to transport materials/equipment to work areas. Fuel may be present for demolition work. In some cases, demolition may expose contaminants depending on the types of materials being demolished.

9. Rockfall Safety Measures

Rockfall is the fall of newly detached segments of bedrock of any size from a cliff or steep slope, posing a hazard to any roadways or other infrastructure below and a safety hazard for humans. Rock movements can be rapid, and may not be preceded by minor movements. The natural occurrence of rockfall and other erosive slope processes is generally dependent on the geologic conditions, vegetation growth, antecedent groundwater conditions, and significant climatic or geologic events in a specific area. Previous construction methods or other human factors may also influence rockfall occurrence. Rockfall hazard mitigation involves stabilization, containment, avoidance, or some combination of these approaches. Rockfall safety measure activities may include netting and pinning, construction of catchment fence, and controlled blasting.

Stabilization measures include removing unstable material, reinforcing material with rock anchors and possibly shotcrete, and/or improving subsurface drainage by installing drains. Protective netting can be placed and pinned against the at-risk rockfall slope in order to stabilize loose stones and boulders.

A variety of retaining walls and fences are used as containment measures to provide rockfall or landslide support. Catchment fences are typically used as lower capacity rockfall barriers that can be used in both permanent and temporary situations to contain falling debris. Walls may consist of large reinforced masses, referred to as gravity walls, or they may consist of reinforcing anchors secured to a rigid wall face (*e.g.*, soil nail wall, soldier pile, tie-back wall). Ground improvement seeks to improve the shear resistance of the failing material by replacing or injecting high-strength materials into the ground (*e.g.*, stone columns, pressure grouting).

Controlled blasting with the use of a protective blanket serves as an avoidance measure to reduce erosion, prevent rockfall, or reduce raveling. Protective blankets made from natural or manufactured materials (*e.g.*, excelsior, burlap, cotton) are used for erosion control and to prevent or reduce raveling on cut slopes. Pinning the blanket to the slope (combined with seed and fertilizer) holds it in place until the vegetation takes root.

Rockfall hazard mitigation measures may include, but may not be limited to, clearing of vegetation, slope scaling, large block removal, installation of wire mesh netting and rockfall catch fences, and grading of catchment areas. The extent of the area to be affected by rockfall safety measures varies depending on the scale of the material that is present on the slope and the specific actions required. The disturbance footprint can range from the managed roadway/right-of-way to surface waters and wetlands. The duration of rockfall mitigation work depends on the scope of the activity. For example, stabilization efforts could take days to weeks, while major construction of retaining walls or catchment fences could take several weeks to several months. Construction of temporary access fills and roads may be required to provide a working platform or access for machinery (see *Temporary Access Road/Temporary Driveway Construction and Removal* category). Working platforms are usually constructed of light, loose riprap matched to the material necessary for the repair. The platform material is then repositioned as the machinery backs from the work site.

Rockfall safety measures and rockfall hazard mitigation may involve soil disturbance. If a waterway is located near the project area, downstream sedimentation is minimized through standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). However, rockfall stabilization and avoidance measures often help to prevent further soil disturbance, once they are installed. Rockfall safety measures are not likely to alter hydrology of any nearby aquatic habitats. Most rockfall work involves motorized vehicles and construction equipment. Projects could require a crane, loader, dump truck, concrete truck, or other heavy equipment. Raw concrete, grout, and fuel may be present for certain kinds of rockfall work. However, contaminants are generally not a concern for rockfall safety measures involving only natural stone or prefabricated components.

10. Slope Stabilization

Slope stabilization may involve streambanks or roadway embankments. Streambank stabilization may be necessary where an eroding bank threatens the integrity or safe operation of a roadway, or where road activities have compromised the integrity or health of the stream. Streambank stabilization can help to prevent the loss of land or damage to facilities adjacent to the banks, maintain the capacity of the channel, reduce sediment loads causing downstream damage or pollution, and protect/enhance water quality. Roadway slope stabilization is necessary where overly steep or eroding slopes threaten the integrity or safe operation of the roadway. Roadway slopes may occasionally be one and the same with a streambank, where a roadway has been constructed close to a section of stream or river. Typical roadway and bank stabilization activities include vegetation clearing or planting; bioengineering; placement of erosion control mats; placement of riprap, gabion baskets/mattress, and articulated concrete block mattress; and the repair, reconstruction, replacement or new construction of a retaining wall or bulkhead.

Vegetated treatment may include seeding and plantings of woody and/or herbaceous species. Erosion control mats can also act as temporary or permanent measures for erosion control and may or may not be biodegradable. The use of living plants as a streambank or roadway slope stabilization technique serves to protect soil from erosion. Through strong root systems, vegetation binds and restrains soil particles, which protects against the mass movement of soil. Bioengineering has benefits that may make it preferable to structural engineering methods of erosion control and slope stabilization. For example, plants can be both aesthetically pleasing and offer wildlife cover and habitat. Plants help to trap sediment and other pollutants, which can further protect streams. As vegetation is established, the streambank can become more resistant to the forces of fast moving water. If bioengineering alone does not provide sufficient stability, a combination of bioengineering practices and structural engineering (*e.g.*, riprap) may be used for slope stabilization.

Structural engineering techniques for streambank and roadway slope stabilization may include the placement of loose riprap, stone within a wire basket (gabion), grouted stone, poured concrete with embedded stone, articulated concrete block, or specialty stone. Structural retaining walls and retaining wall systems may serve as a solution to handle water or drainage issues and impede erosion. Bulkheads are man-made vertical structures, typically along the shorelines of tidal waterbodies. Repair, reconstruction, replacement, or new construction of a retaining wall or bulkhead may include a mechanically stabilized earth wall, stone wall, concrete wall, soil nail

wall, geosynthetic reinforced soil, sheet piling or H-piles, or a wood or plastic bulkhead. An underdrain system may be installed.

The extent of the area to be affected by streambank or roadway slope stabilization depends on the size of the watercourse or roadway and the specific actions required. The disturbance can range from minor maintenance (*e.g.*, vegetation clearing or planting) to a new, enlarged, or reconfigured bulkhead or retaining wall footprint. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary (see *Stream/Wetland Work*) and *Dewatering)*. The duration of slope stabilization work depends on the scope of the activity. For example, minor vegetation clearing or planting could take days to weeks, while major repairs or construction of bulkheads or retaining walls could take several weeks to several months.

Slope stabilization activities may involve soil disturbance during construction. Downstream sedimentation is minimized through standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category*)*. However, overall slope stabilization activities help to prevent further erosion of slopes and sedimentation into waterways and roadways. Retaining walls and bulkheads may alter hydrology. Most slope stabilization work involves motorized vehicles and construction equipment. Small projects may be limited to a wheelbarrow, planting by hand, and manual raking of stone. Larger projects could require a crane, loader, dump truck, concrete truck, other heavy equipment, or barge. A temporary floating platform/barge is sometimes used to transport materials/equipment to work areas. Raw concrete, grout, and fuel may be present for certain types of structural slope stabilization projects. However, contaminants are generally not a concern for slope stabilization activities involving only natural stone or prefabricated components.

11. Appurtenant Features

Appurtenant features of roadways contribute to the safety and efficiency of the roadway network. Examples include longitudinal barriers and their end treatments; signs and foundations; traffic signals, including poles, foundations, and associated equipment; utility poles; sidewalks; above-ground and underground utilities; lighting; fence; and curbing. Some of these features are discussed under this category while others have been grouped under their own major category (see *Bicycle and Pedestrian Facilities* and *Cameras, Intelligent Transportation System (ITS), and Utilities* categories).

Longitudinal barriers include guiderails and median barriers. The primary function of guiderail is to safely redirect an errant vehicle away from a roadside or median obstruction. Repair of guiderail may include replacement or upgrade of a beam. Other guiderail activities include the replacement, reset or upgrade of existing guiderail; or installation of new guiderail that may be vegetated or non-vegetated underneath. Non-vegetated treatment may include broken stone, pavement/porous pavement and/or a polyester mat. A median barrier is used to prevent an errant vehicle from crossing into oncoming traffic. Median barrier activities include repair or replacement of existing or the installation of new barriers (*e.g.*, median crossover projects).

A variety of sign structures may be used along roadways and bridges, including typical traffic signs (*e.g.*, speed limit signs), and variable message signs (VMS)/dynamic message signs

(DMS), which may be used for incident management. Signage may include signs with posts (no footing(s) or foundation) and sign structures with footings or a foundation or concrete pad. Some signs may have associated electrical equipment. Activities may include repair and maintenance of existing signs, replacement of existing signs (on or off-site from the existing location), installation of new signs, and removal of existing signs.

Traffic signal systems may require replacement or upgrading, as well as installation of new signals or other equipment. These activities may include poles, signal heads, upgraded or new pedestrian signals (including pedestrian signal heads and push buttons) at existing or new signals, and electrical equipment cabinets. Signal system improvements may include repair or installation of loops and sensors within existing pavement. Trenching for the purpose of wiring installation is addressed in the *Utility Line Relocation/Installation* under *Cameras, Intelligent Transportation Systems, and Utilities* category. If applicable, see *Milling and Resurfacing of Pavement* under the *Roadways* category.

Lighting activities include the replacement of existing lighting or the installation of new bridge or roadway lighting. Two types of roadway lighting systems are utilized: High Mast Lighting Systems and Conventional Lighting Systems. For bridges, underdeck lighting may be needed. This work does not include trenching for the purpose of wiring installation (see *Utility Line Relocation/Installation* under *Cameras, Intelligent Transportation Systems, and Utilities*).

Fence activities may include repair or replacement of existing fence or installation of a new fence that may include footings, and the fence may be permanent or temporary. Fence can also be associated with terrestrial wildlife passages (*i.e.*, guide fence) and/or to prevent wildlife from entering the roadway (see *Terrestrial Wildlife Passage*). For silt fence and caution fence, see the *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category.

Curb work may involve the repair, reconstruction or replacement of existing curb or the installation of new curb.

Streetscaping activities may include the placement of street furniture such as benches, bicycle racks, clocks, planters; landscaping (see *Landscaping* category); trash receptacles; and decorative/historic replica lighting.

The extent of the area to be affected by roadway appurtenant features depends on the type and size of the feature and the specific actions required. The disturbance can range from minor repair of existing structures to a new, enlarged, or reconfigured guiderail, median barrier, sign structure, or traffic signal footprint. The duration of roadway appurtenant feature work depends on the scope of the activity. For example, minor repairs could take days to weeks; whereas, major repairs/construction or streetscaping projects could take longer.

Construction, repair, and replacement of roadway appurtenant features are not likely to involve soil disturbance as these activities typically occur along the curb/edge of roadway and non-vegetated areas. However, if necessary depending on project specifics, impacts can be minimized through standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality*

Control Measures, and Caution Fence Installation, Maintenance, and Removal category). Activities associated with roadway appurtenant features are not typically expected to alter hydrology of any nearby aquatic habitats. Most of the construction and repair work involves motorized vehicles and construction equipment. Small projects may be limited to hand tools. Larger projects could require a crane, loader, dump truck, other heavy equipment, or concrete truck. Raw concrete, grout, and fuel may be present for certain kinds of repair or replacement activities. However, contaminants are generally not a concern for construction of appurtenant features involving only natural stone or prefabricated components.

12. Bicycle/Pedestrian Facilities (Sidewalks, Trails, ADA)

Bicycle and pedestrian facilities include sidewalk or multi-use trails near a roadway, trails not along a roadway, and Americans with Disabilities Act (ADA)-compliant facilities (*e.g.*, depressed curbing, curb ramp replacements/upgrades or installation, median openings, and detectable warning surfaces). Some projects may only involve replacing/updating bicycle and pedestrian facilities, while larger roadway projects may incorporate new bicycle and pedestrian facilities into their overall design scope.

Typical activities for sidewalk or multi-use trails near a roadway include repair, reconstruction, and replacement of existing sidewalk and bicycle and pedestrian facilities as well as installation of new sections and installation/completion of missing sections of bicycle and pedestrian facilities. Excavation may be required, and the depth of the excavation depends on the thickness of the proposed trail or sidewalk, including surface and base courses. For a stone or aggregate surface, stone is placed by hand or with a small dozer/spreader. For a paved surface, the material is applied with a paver and smoothed with a roller. For a concrete surface, forms are built, and concrete is poured and cured. Soil backfill is often used around the sides of the completed trail to match the finished grade relative to the existing ground. Upon completion of the work, both the backfill and disturbed areas require seeding and stabilization.

Trails not located along a roadway may include recreational trails, including rail/canal alignments converted to trails. The trail may be paved or unpaved. Activities include maintenance and restoration of existing trails, development and rehabilitation of trailside and trailhead facilities and trail linkages (*e.g.*, parking, signage, shelters), and construction of new trails. Street furniture is not discussed under this activity; see *Streetscape* under *Appurtenant Features* category.

The ADA ensures that persons with disabilities have equal opportunity to use the transportation system in an accessible and safe manner. Basic ADA requirements call for stable, firm and slip-resistant surfaces, detectable warning surfaces and even pavement.

The extent of the area to be affected by bicycle and pedestrian facility repair, replacement, reconstruction or new construction depends on the length of the facility and the specific actions required. The footprint of disturbance is generally small, but there is high variability with respect to length. Sidewalk is generally five feet wide, but wider where ADA-compliant curb ramps are proposed. Multi-use trails are typically 10 feet wide. There is high variability in the size and duration of the activity, depending on the scope, location, and character of the sidewalk or trail

design. Construction could take 1 week to several months. Longer durations may be required for some types of projects.

Work associated with bicycle/pedestrian facilities may involve soil disturbance; however, impacts are minimized through the use of SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Depending on the project specifics, bicycle/pedestrian facilities may alter surface water or groundwater. Standard SESC measures are required near waterbodies and wetlands. Typical equipment for these activities includes loaders, dump trucks, concrete trucks, graders, pavers, and rollers. There is a high variability in construction methods. Raw concrete, grout, and fuel may be present for certain types of bicycle/pedestrian facility projects. In addition, for rail lines converted to trails, other contaminants may be present as a result of previous rail operations (*e.g.*, creosote-treated railroad ties, railroad ballast, and fluid and fuel leaks from trains). However, contaminants are generally not a concern for bicycle/pedestrian facility construction involving only natural stone or prefabricated components.

13. Transportation Alternatives/Enhancements

Transportation alternatives/enhancements cover a wide range of projects and activities. Programs and projects defined as transportation alternatives by the FHWA's Transportation Alternatives Program (TAP) include on- and off-road pedestrian and bicycle facilities; infrastructure projects for improving non-driver access to public transportation and enhanced mobility; community improvement activities such as historic preservation and vegetation management; environmental mitigation related to stormwater and habitat connectivity; recreational trail projects; safe routes to school projects; and projects for constructing boulevards and other roadways largely in the right-of-way of formerly divided highways. The TAP program has superseded the Transportation Enhancement (TE) program; consequently, the names of some of the categories or subcategories have changed. However, many of the activities, including some TE projects that had funding previously apportioned, are still covered. TE projects may include bicycle/pedestrian paths/trails; historic bridge or railroad depot rehabilitation; construction of overlooks, viewpoints, historical markers, and wildlife passage facilities; and other activities described below.

A Transportation Alternatives Program/Transportation Enhancement (TAP/TE) activity regarding pedestrian and bicycle facilities may involve the preservation of abandoned railway corridors and their conversion and use for pedestrian and bicycle trails (see *Bicycle and Pedestrian Facilities* category).

Other TAP/TE activities may involve scenic or historic highways, including scenic turnouts, overlooks, and viewing areas; and the acquisition, preservation, restoration, rehabilitation, upgrading, or reuse of certain transportation-related historic buildings, structures, and facilities (*e.g.*, railroad depots, lighthouses, canals). For streetscaping activities, see *Streetscape* under the *Appurtenant Features* category.

Certain types of environmental mitigation may also be included in TAP/TE activities. For environmental mitigation enacted to address water pollution due to highway stormwater runoff, see *Stormwater Management Facilities* Category. For stream channel stabilization, see

Streambank Stabilization under the *Slope Stabilization* category. For vegetation management, including invasive species prevention, see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category. Environmental mitigation enacted to reduce vehicle-caused wildlife mortality or to restore and maintain habitat connectivity is covered under *Terrestrial Wildlife Passage, Stream Culverts, Bridges,* and *Fence* (under *Appurtenant Features)* categories.

The purpose of safe routes to schools projects is to make it safer for students to walk and bike to school. Activities may include providing safer street crossings and construction of missing sections of sidewalk (see *Bicycle and Pedestrian Facilities* category).

The extent of the area to be affected by a TAP/TE activity depends on the type of enhancement and the specific actions required. The disturbance footprint may be small for activities such as streetscaping. More substantial disturbance may be involved for construction of a boulevard. In some instances, the disturbance footprint may be limited to a previously disturbed area, or an existing structure or facility. The duration of TAP/TE work depends on the scope of the activity, ranging from several days to several weeks for simpler projects to several months or possibly longer for more complex projects.

Some TAP/TE activities may involve soil/sediment disturbance, especially if the action requires new construction; however, impacts are minimized through the use of standard SESC measures (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Some of these activities may alter the hydrology of nearby aquatic habitats. Many TAP/TE activities involve motorized vehicles and construction equipment. Small projects may be limited to hand tools. Larger projects could require a crane, loader, dump truck, or concrete truck. Raw concrete, grout, and fuel may be present for certain kinds of repair or rehabilitation activities. However, contaminants are generally not a concern for TAP/TE projects.

14. Landscaping

Landscaping serves transportation projects by creating and maintaining safe, functional, and visually pleasing transportation corridors, structures, and facilities. Landscaping activities can contribute to a range of projects from improving both the function and appearance of stormwater management facilities to streetscaping and SESC measures. Landscape designs are included in many projects to address aesthetics and to mitigate other impacts. Over periods of time, the landscape features mature, outlive a functional service life, decline from drought, insects or diseases, get overrun with invasive plants or are damaged from weather events. These changes can negatively impact mowing efficiency, aesthetics, safety, and litter removal.

Landscaping activities include placement of topsoil, seeding, plantings, fertilizing, mulching, erosion control mats, and use of herbicides. Most of these activities require a level of site preparation before commencement. In order to prepare the existing soil for a landscaping treatment, the surface of the existing soil should be cleared of all stumps, brush, weeds, and debris (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category). The soil should be cultivated to a depth of 3 to 4 inches to prepare a seedbed and be brought to a smooth grade. For grading, see *Restoration of Temporary Impacts* category.

Two methods can be used for seeding and fertilizing: the hydraulic method or the dry method. For the hydraulic method, seed and fertilizer should be mixed in water and then applied under pressure at the specified rate.

When immediate protection of newly graded slopes is necessary at times other than during optimum seeding seasons, mulch or erosion control mats should be applied with a temporary seed mixture. Mulch can be left in place and allowed to disintegrate. If necessary, the area should be re-fertilized, re-seeded, and re-mulched.

Mulching for individual trees or shrubs may include a layer of wood chips, stone, gravel, or shredded hardwood bark. Plants should be mulched soon after installation.

Erosion control mats and blankets may also be used for landscaping purposes (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, or Removal* category).

Herbicides may be used for guiderail maintenance, clear zone and sight distance maintenance, and invasive species control. General application of herbicides includes glyphosate herbicides, imazapic herbicides and a combination of the two together.

The extent of the area to be affected by landscaping activities depends on the size of the area requiring landscaping and the specific actions required. The disturbance can range from minor plantings or mulching to the application of fertilizer or herbicides across a wider area. The duration of landscaping work depends on the scope of the activity. While most activities will take a few hours to a few days to complete, if landscaping is required along a lengthy road construction project, the duration may be several weeks.

Landscaping activities may involve initial disturbance of soil during preparation of the site to be landscaped. Any disturbance during landscaping activities will be repaired by grading, fertilizing, seeding, and mulching as appropriate. Some landscaping activities are employed as an SESC measure to prevent/limit sedimentation. Landscaping is not likely to alter hydrology of any nearby aquatic habitats. Most landscaping work involves motorized vehicles and construction equipment. Small projects may be limited to a wheelbarrow, manual raking of soil or stone, and mechanical or hand-operated spreaders. Larger projects could require a loader, backhoe, or dump truck. Herbicides and some fertilizers pose a possible contaminant source and should be used with caution; chemicals should be stored away from any nearby water sources. Overall, contaminants are generally not a concern for landscaping activities involving only natural plantings and stone or prefabricated components.

15. Graffiti Removal

Transportation infrastructure may be susceptible to vandalism. Concrete walls and abutments are used as canvasses for a variety of unwanted artwork and unauthorized markings. Due to the rough surface of concrete faces, cleaning them is often challenging and costly. Graffiti removal techniques include chemical and pressure washing, hot water treatments, and the use of abrasives and water under pressure.

Alternative methods of construction and maintenance include the installation of graffiti-resistant coatings, which require less maintenance. Certain concrete coatings used for transportation structures are resistant to paint and pollution and can reduce cleaning time. Existing graffiti-resistant coatings available in the market can be divided into two broad categories, namely: sacrificial and permanent coatings. Sacrificial, usually a wax-like polymer coating, is sprayed or mixed with water and applied to surfaces that are vulnerable to graffiti. Permanent coating formulations are organic and generally use the same chemicals that are used for non-stick cookware.

If graffiti is applied to a bridge or noise wall that has been treated with a permanent coating, soil and graffiti can often be removed using high pressure water or some form of chemical. In some cases, common citrus-based cleaners can be used along with hot water and a scrubbing tool or pressure washer. Most companies that manufacture and/or distribute permanent coatings recommend a method for graffiti removal. This recommendation sometimes includes the use of chemicals patented by the company that are designed to work well with their coating system. After chemicals have been applied, they are usually washed off with water. The various chemicals used in graffiti removal for permanent coatings are claimed to be benign and not have any harmful effects to the environment.

If graffiti is applied to a bridge or noise wall that has been treated with a sacrificial coating, the general process for removal includes melting off the coating and graffiti with hot water under pressure. Sacrificial coating manufacturers and/or distributors often recommend that their own cleaners be used along with a hot water blaster. After the surface has dried, the sacrificial coating can be re-applied.

The extent of the area to be affected by graffiti removal depends on the size of the graffitied area on the structure face and the specific actions required for its removal. The disturbance footprint is generally contained to the area on the structure where graffiti is applied and may also include the surrounding area near the graffiti. The duration of graffiti removal depends on the scope of the activity and the extent of graffiti to be removed. Most graffiti removal techniques will take several hours to several days, depending on the extent of graffiti on a structure.

Graffiti removal does not typically involve soil disturbance and is not likely to alter hydrology of any nearby aquatic habitats. Small projects may be limited to a hand-operated pressure washing machine. Larger projects may require construction equipment (*e.g.*, bucket truck) to lift a person to the appropriate height to treat and remove the graffiti. Chemicals or abrasives are a potential source of contamination if used to treat and remove graffiti from structures such as bridges or noise walls. When chemicals or abrasives are used, precautions are taken to protect the surrounding area from contamination.

16. Geotechnical Borings

Geotechnical survey borings or test pit excavations are performed to obtain information on subsurface conditions, determine the presence or extent of contamination in subsurface soils or groundwater, or obtain seismic information. Typical activities include use of vehicle-mounted boring equipment followed by appropriate sealing of boring holes.

Geotechnical borings may penetrate a number of strata and may affect the integrity of the hydrogeological conditions at the site. Sealing a geotechnical boring is a carefully controlled practice of hole abandonment. Sealing boring holes with the appropriate sealants under strict quality control conditions helps to prevent the movement of contaminants and the loss or commingling of groundwater.

Proper sealing requires the selection and placement of the appropriate sealants. Four potential sealants may be used: neat cement grout, cement/bentonite grout, other Portland cement-based grouts, or concrete (for holes larger than 60 millimeters in diameter). While some proper sealing techniques are material dependent, others are placement dependent.

The extent of the area to be affected by installation or sealing of a geotechnical boring depends on the required access, the size of the boring hole, and the specific actions required to either install or seal the hole. The disturbance footprint is usually confined to the boring hole and the access area. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary (see *Stream/Wetland Work* and *Dewatering*). The duration of geotechnical boring installation or sealing can take several days to several weeks.

For construction access, including cutting and/or removal of vegetation, see the *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category and *Temporary Access Road/Temporary Driveway Construction and Removal* under the *Temporary Construction Site Facilities and Staging Areas* category, as appropriate.

Geotechnical boring installation and sealing involves soil/sediment disturbance. If applicable, downstream sedimentation can be minimized through standard SESC practices (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, or Removal* category). Geotechnical borings are not likely to directly alter hydrology of any nearby aquatic habitats. However, geotechnical borings can alter the integrity of subsurface hydrogeological conditions. Geotechnical boring work typically involves motorized vehicles and construction equipment. Most projects will require vehicle-mounted boring equipment. Loaders, dump trucks, or concrete trucks may be required for sealing borings. Raw concrete, grout, and fuel may be present for boring installation and sealing activities.

17. Roadways

Roadways may include principal and minor arterial highways, collector roads, and local roads. In order to meet the needs and demands of continued growth and expansion and improved safety standards, and due to general wear and tear, roadways often require maintenance, resurfacing, rehabilitation, and reconstruction. New roadway construction is often more extensive, but may be required in order to maximize efficiency of the transportation network and driver safety.

Roadway maintenance activities include street sweeping and winter maintenance. Winter maintenance includes plowing snow, applying anti-icing/deicing materials to roadways, and applying abrasives (*e.g.*, fine grit or coarse sand materials). For storage of deicing materials, see *Maintenance Yards* category. Hazardous tree removal is another maintenance activity (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category).

Roadway resurfacing and patching activities include crack sealing, pothole repair, patch work for pavement repair, milling and resurfacing of pavement, high friction surface treatment (*e.g.*, skid resistant treatment), overlay, and slurry sealing/oiling. These activities are limited to the existing pavement.

Roadway rehabilitation and reconstruction activities include rubblization (including work below the pavement box) and intersection/interchange improvement and reconstruction. Minor safety work may include cut-backs at corners or driveways. If a project involves drainage, see *Drainage Facilities* category. For traffic signals, see *Appurtenant Features* and *Cameras, Intelligent Transportation System, and Utilities* categories. For ADA work, see *Bicycle and Pedestrian Facilities* category.

New roadway construction may include widening of a roadway, roadway realignment, construction of a new interchange, construction of a new roadway/bypass, or removal of a roadway or paved surface. Roadway widening activities can be minor (*e.g.*, to bring a lane or shoulder up to standard width) or major (with the addition of a travel lane or shoulder). Roadway alignment activities may be required to correct substandard roadway geometry (*e.g.*, a dangerous curve), more extensive realignment, realignment of an intersection, and the addition of ramps at interchanges. After the removal of a roadway or paved surface, the area should be restored to a vegetated condition (see *Restoration of Temporary Impacts* and *Landscaping* categories). Typical safety delineator methods include lane and shoulder striping/restriping, raised pavement markings, stop bars, and markings used to delineate pedestrian crosswalks or bicycle lanes. Rumble strip grinding is another safety delineator measure. For ADA requirements, see *Bicycle and Pedestrian Facilities* category.

The extent of the area to be affected by roadway activities depends on the size of the roadway and the specific actions required. The disturbance can range from minor repair (*e.g.*, crack sealing, filling potholes) to a newly constructed, widened, or realigned roadway footprint. The duration of roadway work depends on the scope of the activity. For example, minor repairs could take days; whereas, new roadway construction could take months to years.

Roadway maintenance, some types of roadway repairs, and roadway reconstruction, widening, or new construction typically involve soil disturbance. Impacts are minimized by following the appropriate SESC measures (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Roadway activities are not likely to alter hydrology or groundwater, with the exception of new or widened roadway construction. For roadway maintenance beyond the limits of the traveled lanes (*e.g.*, mowing, shoulders), see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category. Roadway work typically involves motorized vehicles and construction equipment. Smaller maintenance activities may be limited to street sweeping trucks or snow plows. Larger projects could require excavators, loaders, dump trucks, milling machines, pavers, rollers, other heavy equipment, or concrete trucks. Raw concrete, grout, and fuel may be present for certain types of roadway maintenance, repair, reconstruction, and new construction. In addition, roadway winter maintenance activities involving deicing may present a source of contamination.

18. Dams

Numerous embankment and gravity dams exist throughout New Jersey. Some of these dams support municipal, county, and State roadways. Dam maintenance, rehabilitation/reconstruction, replacement, and removal activities are implemented to prolong the use and function of the dam and roadway; to protect associated natural resources, public health, and downstream private/public property; and to ensure motorist safety. In general, most dams within New Jersey are constructed with soil, stone, or concrete. Wooden timbers were also used at times in dam construction. Dams located within New Jersey are subject to the Dam Safety Act of 1981 (N.J.S.A. 58:4).

General construction procedures and practices for dam projects include general dam/spillway inspection (*e.g.*, on foot or by boat), maintenance, rehabilitation/reconstruction of the existing spillway with or without increased capacity, building a second auxiliary spillway, and providing overtopping protection. There is a high variability of the disturbance footprint, depending on the existing condition, size, location, associated impoundment/stream, and additional uses (*e.g.*, roadway). Disturbance footprints can range from in-kind replacement to a new, enlarged spillway or dam footprint.

Dam/spillway maintenance activities may include removal of debris from spillway and stormwater outfalls; repairing/lubricating outlet gate and valve; clearing and grubbing of brush and woody vegetation along the length of the dam structure (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category); removal of debris from existing subsurface drains and repair of any cracked pipes; removal of burrowing animals and their dens from the dam; stabilizing of eroded areas, seeps, or gullies (see *Slope Stabilization*); fertilizing/seeding and mowing grass areas (see *Landscaping*); and filling potholes or resurfacing pavement along the crest of the dam (see *Roadways*). Dam/spillway maintenance activities generally occur within the existing footprint of the dam structure and may range from days to weeks to complete. Soil and sediment disturbance generally occurs within the existing footprint or immediately adjacent to the existing dam.

Dam/spillway rehabilitation/reconstruction/replacement activities may include raising the dam crest, improving the existing service spillway (same footprint), improving the existing spillway (larger footprint) to handle the capacity of the spillway design flood, construction of a new auxiliary spillway, repair/replacement/installation of underdrains, and overtopping protection. When alternatives such as improving the service (capacity) of the spillway, raising the crest of the dam, or constructing an auxiliary spillway are not possible, overtopping protection is often utilized to protect an embankment dam and downstream property/population. Alternatives for overtopping protection consist of a variety of different materials depending on the situation including concrete work, rock fill, vegetative cover, and various geosynthetic materials. Dam/spillway rehabilitation/reconstruction/replacement activities can extend beyond the existing footprint of the dam structure and may range from weeks to several months to complete.

Commonly used equipment for dam/spillway maintenance and construction activities may range from hand tools, including wheelbarrows, for minor maintenance to cranes, barges, backhoe/front-end loaders, bulldozers, dump trucks, impact and vibratory pile/sheet drivers, stump grinders, compacting rollers, and other heavy equipment. In most cases, the equipment is

operated from the crest of the dam or the dam abutments. In some cases, a floating barge is utilized.

General dam maintenance, rehabilitation/reconstruction, and replacement activities include clearing and grubbing of vegetation along the dam structure (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category). In-water dam/spillway construction activities typically involve sediment disturbance. Sedimentation of the impoundment and downstream is minimized through standard SESC practices (see *Soil Erosion and Sediment Control/Water Quality Control Measures/Caution Fence Installation, Maintenance, and Removal* category). Dam related construction activities are not likely to affect groundwater, but have the potential to alter the hydrology of nearby surface water. Cofferdams (see *Dewatering*) are often used during new/reconstructed spillway activities to provide worker access to formerly submerged areas, while preventing sedimentation of the adjacent or downstream waterway. Often a diversion of flow is necessary with certain dam-related tasks, and maintaining the flow of the downstream channel is generally required (see *Stream/Wetland Work*).

19. Cameras, Intelligent Transportation System (ITS), and Utilities

Cameras and Intelligent Transportation Systems (ITS) serve to integrate technological solutions into the current transportation system for the purposes of improved efficiency and safety. Utility lines provide electric, water, gas, sewage, and telephone/cable/internet services to people and businesses, as well as to appurtenant features of a roadway such as lighting and traffic control systems (see *Appurtenant Features* category).

Typical activities for cameras include the installation of new cameras and the replacement of existing cameras. Installation of new cameras includes mounting cameras on existing poles, posts, or traffic signals, as well as installing cameras on new poles or posts with new footings. Intelligent Transportation System highway projects typically include installation, repair, or replacement of fiber-optic cables, traffic cameras, VMS, DMS, traffic information signs, weather stations, and highway advisory radio systems.

Utility lines (*e.g.*, electric, telephone, fiber optic, water supply, and sewer) may require installation or relocation during a roadway or bridge project. Utility line relocation and installation activities can occur above or below ground (*e.g.*, jacking/directional drilling and trenching), which requires more extensive excavation and grading.

If any of the camera, ITS, or utility activities require the construction of a foundation, concrete spread footing, drilled concrete shaft, or driven pile may be used. The drilled shaft may encounter groundwater depending on the shaft depth. Once the foundation is completed, final grading is performed around it. The new pole can then be erected. This type of work can range from a two-person operation to a large crane, depending on the pole height and weight. The camera, ITS component, or utility can then be installed and the temporarily disturbed soil around the structure can be revegetated.

The extent of the area to be affected by camera, ITS, or utility activities depends on the type and size of the feature and the specific actions required. The disturbance footprint can range from

minor replacement of a camera on an existing pole or post to new installation or relocation of utility lines. The duration of the activity could range from days to weeks depending on the type of the pole and pole foundation. A longer duration would be required for concrete curing or the installation/relocation of utilities. There are limited alternative methods of construction and maintenance, depending on the type and location of the pole and pole foundation.

The activities in this category may require tree and shrub clearing (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category). Topsoil must be removed and retained at an approved stockpile location for reuse or disposal. Some soil disturbance will occur, but generally in a small area; this can be controlled with proper SESC measures (see *Soil Erosion and Sediment Control/Water Quality Control Measures/Caution Fence Installation, Maintenance, and Removal* category). It is unlikely that surface water would be affected by these activities. Groundwater could be encountered depending on the type and depth of the foundation. None of the associated activities are expected to alter hydrology of any nearby aquatic habitats. The type and use of motorized vehicles, construction equipment, and machinery is variable dependent on the type of the pole and pole foundation. The typical construction equipment includes a drill rig, concrete truck, and a crane. Typical contaminants may include uncured concrete, fuel, and fluid leaks. Directional drilling has a potential to release drilling fluids and mud (*i.e.*, frac-out) to the surface environment; these can be contained through appropriate SESC measures.

20. Railroad Operations Improvements

New Jersey's rail system serves to transport people and freight throughout the State. Freight rail is a vital part of the New Jersey economy. With prominent passenger and freight rail systems throughout New Jersey, maintenance and repair of the railroad crossings are essential to passenger safety and economic efficiency.

Railroad operation improvement activities include rail replacement; installation, repair, and replacement of railroad signage; installation of pavement markings; and railroad crossings. For rail replacement (without changing the baseline condition of the railroad), a rail car can be used on the tracks to remove and lay down new rail. For other railroad improvements, such as the repair, replacement, upgrade, or new installation of existing warning devices (*e.g.*, signals, lights, gates/arm bars, and warning bells), and the installation or replacement of signage, see *Traffic Signal Equipment, Signal System Improvement,* and *Signage* under the *Appurtenant Features* category. For pavement markings, see *Striping/Pavement Markings Installation* under the *Roadways* category. For railroad crossing roadway maintenance/grade crossing resurfacing (*e.g.*, limited resurfacing 100 feet from either side of the track), see *Roadway Resurfacing and Patching* and *Milling and Resurfacing of Pavement* under the *Roadways* category. For roadway vegetation maintenance, see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category.

The extent of the area to be affected by railroad operation and improvement activities depends on the size of the railroad (or railroad features) and the specific actions required. The disturbance footprint can range from minor repair, replacement or upgrades (*e.g.*, railroad signage, signals, lights, and warning bells) to the replacement of rails. The duration of railroad work depends on the scope of the activity. For example, minor repairs or installations of appurtenant railroad

safety features could take one day to several days; whereas, replacement of the rails on a railroad could take weeks to months.

Certain railroad operation improvements and rail replacement activities may involve soil disturbance. Impacts are minimized by following the appropriate SESC measures (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Railroad activities are not likely to alter hydrology or groundwater. Railroad work typically involves motorized vehicles and construction equipment. Smaller maintenance activities may be limited to hand tools. Larger projects could require a loader, dump truck, milling machine, paver, roller, or concrete truck. Raw concrete, grout, and fuel may be present for certain types of railroad improvement installations, maintenance, repair, or reconstruction activities In addition, other contaminants may be present as a result of rail operations (*e.g.*, creosote-treated railroad ties, railroad ballast, and fluid and fuel leaks from trains).

21. Maintenance Yards

The NJDOT currently operates and maintains numerous maintenance yards within the State. Typical operations conducted at maintenance yards include storage, repair and refueling of equipment/vehicles; storage of bulk materials, such as mulch, yard debris, stone, aggregate, gravel, and sand; storage of chemicals, such as degreasers, fuels, deicing materials, and herbicides; and at some locations the washing of equipment/vehicles. Other activities may include the repair, rehabilitation, expansion, or replacement of existing buildings/structures and the construction of new buildings/structures. The maintenance yards can range in size and level of development. Some are only partially paved while others are a fully paved maintenance facilities equipped with vehicle/equipment maintenance structures, storage structures and areas, washing/refueling areas, and deicing material storage structures. A number of these maintenance facilities have on-site stormwater basins.

The NJDOT's Stormwater Management Program required by NJDEP's Highway Agency Stormwater General Permit (NJ0141887) focuses on eliminating and/or minimizing the amounts of pollutants entering State waters from existing and new maintenance yard operations, including maintenance activities at service areas and ancillary operations. The NJDOT has generated Stormwater Pollution Prevention Plans (SPPP) to serve as a mechanism for the implementation of the requirements of this permit. The Highway Agency Stormwater General Permit also provides BMPs that must be implemented by all maintenance yards operated by the NJDOT. The BMPs address fueling activities, vehicle maintenance, general good housekeeping practices, and salt and deicing material handling and storage.

Soil disturbance associated with daily operations at maintenance yards is minimal. Disturbance of soils may occur if an existing drainage or stormwater management facility (*e.g.*, basin or outfall) needs rehabilitation or upgrade (see *Drainage Facilities* and *Stormwater Management Facilities*). Depending on the type of material, SESC measures may be installed around material stockpile areas, which should not be stored in areas prone to receive stormwater runoff to prevent the material from being washed into adjacent waterways or on-site storm drain inlets. Standard SESC measures serve to minimize disturbance to adjacent wetlands/waterways (see *Soil Erosion*

and Sediment Control/Water Quality Control Measures/Caution Fence Installation, Maintenance and Removal category).

Daily operations at maintenance yards are not anticipated to have the potential to alter the hydrology of nearby surface or groundwater.

Maintenance yards can be a point source for contaminants entering into adjacent waterways or groundwater due to the maintenance and storage of vehicles and equipment, and storage of degreasers, herbicides, fuel, and deicing materials, if not managed properly. Sand, which is often stored year-round as construction material, can be stored under a tarp or uncovered and must be at least 50 feet from all concentrated surface water flows (to include inlets, ditches, and catch basins). The NJDOT currently stores non-liquid deicing materials (*e.g.*, NaCl) in permanent dome-style structures, and liquid deicing materials (*e.g.*, CaCl and NaCl brine) in above-ground tanks. Inspection for spilled salt is completed after loading and unloading operations. The NJDOT's compliance with the NJDEP's Highway Agency Stormwater General Permit (NJ0141887) with regards to material storage areas and good housekeeping BMPs reduce the potential for environmental contamination.

Fuel for vehicles and dispensing equipment may be stored on site in underground storage tanks or above-ground storage tanks. Above-ground storage tanks should be constructed within a secondary containment in the event of a leak. Underground storage tanks and dispensing equipment are generally equipped with a leak detecting system or by monitoring nearby groundwater via monitoring wells.

Washing of vehicles and equipment with surfactants (degreasers and detergents) and/or high pressure water resulting in wastewater discharges to surface waters (inlets, swales or any other stormwater conveyance systems) or groundwater is not be performed at any location, unless the facility has a dedicated and functional vehicle and equipment wash bay. Only yards that are connected to a sanitary sewer are authorized to rinse vehicles and equipment in this fashion.

Rinsing of vehicles and equipment subsequent to a winter snow event is permissible provided only water under normal pressure is used. Prior to rinsing, heavy deposits of salt are removed from the vehicles and equipment to the maximum extent practical utilizing dry methods (*e.g.*, shoveling and sweeping). Excess salt is returned to the storage area for reuse or placed in a container (*e.g.*, plastic bag or sealed bucket) for disposal.

For vegetation maintenance, see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category*;* for stormwater management facility maintenance, see *Stormwater Management Facilities;* and for accidental fuel spill/potential contaminant release, see *Accidental Fuel/Contamination Spill*. Improvements to existing structures may involve demolition activities, see *Demolition*.

Construction activities may include repair/rehabilitation or replacement of existing structures, new pavement areas at existing yards, new buildings or structures at existing yards, new drainage and/or stormwater management facilities at existing yards, or construction of an entirely new maintenance yard and its supporting structures/areas.

The NJDEP has recommendations for new permanent structures. Any new yard should be located at least 200 feet away from streams, wells, reservoirs, and groundwater sources. Structures should not be built in designated well-head protection areas. The top elevation of the foundation pad and access should be constructed higher than the 100-year storm elevation. Site drainage should be controlled to flow away from material storage areas. Deicing material should be stored within a permanent structure anchored to a permanent foundation.

For activities associated with new construction, also see the following categories, as appropriate: *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance; Drainage Facilities; Stormwater Management Facilities; Soil Erosion and Sediment Control/Water Quality Control Measures/Caution Fence Installation, Maintenance and Removal; Landscaping; Geotechnical Borings; Roadways; Stream/Wetland Work; Dewatering; Survey Work – Topographic, Biological, and Archeological; Temporary Construction Site Facilities and Staging Areas;* and *Restoration of Temporary Impacts.*

Soil disturbance associated with maintenance yard construction activities depends on the footprint of the proposed structures (*e.g.*, maintenance structures, paved parking areas, material storage structures/areas, stormwater facilities, or drainage facilities). The location of the footprint of disturbance could potentially impact bog turtle habitat depending on its proximity. A major concern with maintenance yards is the migration of contaminants from the yard into the groundwater or adjacent wetlands/waterways that may support bog turtles.

Construction of a new maintenance yard or new construction at an existing yard may have the potential to alter the hydrology of nearby groundwater. Depending on the amount of precipitation and size of the existing drainage area/system, stormwater that is collected within the maintenance yard and discharged from the site may result in an increase to the hydrology of nearby waterways/wetlands. Construction activities at existing maintenance yards may range from weeks to months. Construction of a new maintenance yard may take months to a year or longer.

Commonly used equipment for maintenance yard construction activities may include cranes, backhoe/front-end loaders, bulldozers, dump trucks, graders, excavators, concrete saws, jackhammers, chain saws, stump grinders, generators, compressors, compacting rollers, and other heavy equipment.

Winter roadway maintenance is addressed under *Roadway Maintenance* in the *Roadways* category.

22. Noise Barriers

Noise barriers are designed to reduce traffic noise levels at ground-level properties located adjacent to the highway. They can be formed from high vertical walls, earth mounds or berms along the road, or from a combination of these methods. Earth berms tend to be more visually appealing and effective at reducing noise levels; however, they require a large amount of land relative to walls. A variety of materials can be used to construct noise barriers, such as masonry, wood, concrete, earth, and metal.

Noise barrier construction and repair typically involve soil disturbance, but can be controlled with the implementation of standard SESC practices (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Maintenance of noise barriers varies depending on the location and material of the structure. Regular maintenance to ensure the structural soundness and safety of the barrier is important.

The extent of the area to be affected by noise barrier construction and maintenance depends on the location of the structure and the specific actions required. The disturbance footprint can range from minor (*e.g.*, repair work) to major (*e.g.*, construction of a new barrier). The duration of construction depends on the type of work, the size of the barrier, the material chosen, and site-specific environmental factors (*e.g.*, soil composition). Most noise barrier projects may take weeks to months to complete.

Alteration of the hydrology of any nearby aquatic habitats is possible due to the excavation for the foundation, but the impact is typically minimal. The noise barrier itself may alter hydrology by preventing the movement of water through it; however, those effects can be minimized through appropriate design to accommodate drainage. Small projects may be limited to gap sealing or other minor repairs. Larger projects could require a crane or other heavy equipment. Raw concrete, grout, corrosion inhibitor, and fuel may be present during construction or maintenance activities; however, they are generally not a concern.

23. Transportation Roadside Facilities

The NJDOT operates and maintains transportation roadside facilities within the State, which include park-and-ride facilities, truck weigh stations, rest areas and scenic overlooks. (For scenic overlooks, see *Transportation Alternatives/Enhancements* category.) Some of these facilities are fully paved and are usually developed with a drainage system and may have stormwater management facilities.

General maintenance and construction activities associated with transportation roadside facilities may include parking areas, landscaping (see *Landscaping* category), repair or improvements to existing drainage or stormwater facilities, expansion of an existing facility (*e.g.*, enlarged parking area, additional building/structure), new drainage and/or stormwater management features at existing facilities; and construction of an entirely new facility. Trash receptacles are provided and maintained at some of these locations.

Construction associated with minor activities may generally range from several days to several weeks, while new construction at existing facilities or construction of a new facility may range from several months to a year.

Disturbance of soils at existing transportation roadside facilities may occur if an existing drainage or stormwater management facility (*e.g.*, basin, outfall) needs rehabilitation or upgrade (see *Drainage Facilities* and *Stormwater Management Facilities),* or if a parking area is expanded. Construction of a new transportation roadside facility may also involve soil disturbance. The amount of soil disturbance depends on the project footprint, but can be controlled by the implementation of standard SESC measures (see *Soil Erosion and Sediment*

Control/Water Quality Control Measures/Caution Fence Installation, Maintenance and Removal category*).*

For vegetation maintenance, see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category and for stormwater management facility maintenance, see *Stormwater Management Facilities.* Improvements to existing structures may involve demolition activities (see *Demolition*).

For activities associated with new construction, also see the following categories, as appropriate: *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance; Shoulder Maintenance; Drainage Facilities; Stormwater Management Facilities; Soil Erosion and Sediment Control/Water Quality Control Measures/Caution Fence Installation, Maintenance and Removal; Landscaping; Geotechnical Borings; Roadways; Stream/Wetland Work; Dewatering; Survey Work – Topographic, Biological, and Archeological; Temporary Construction Site Facilities and Staging Areas;* and *Restoration of Temporary Impacts.*

Construction of a new facility or new construction at an existing transportation roadside facility may have the potential to alter the groundwater hydrology. Depending on the amount of precipitation and size of the existing drainage area/system, stormwater collected within the facility and discharged from the site may increase hydrologic inputs to nearby waterways. The location of the footprint of disturbance could potentially impact bog turtle habitat, depending on its proximity. Commonly used equipment for transportation roadside facility construction activities includes: cranes, backhoe/front-end loaders, bulldozers, dump trucks, graders, excavators, concrete saws, jackhammers, chain saws, stump grinders, generators, compressors, compacting rollers, and other heavy equipment.

24. Stream/Wetland Work

Wetlands are among the most productive ecosystems andprovide habitat for a diversity of fish and wildlife, including many species that cannot survive elsewhere. Wetlands also store floodwaters, protect shores from wave action, improve water quality by absorbing pollutants, and maintain surface water flow during dry periods. Due to these attributes, Federal and State regulations have been established to protect and preserve wetlands from human activities.

Various mitigation/restoration/enhancement activities can be conducted in streams and wetlands, such as channel restoration or creation (*e.g.*, daylighting a culverted stream), hydrologic wetland restoration enhancement, wetland creation, wetland and riparian vegetation planting, and mechanical or biological invasive species control. For invasive species control involving herbicides, see the *Landscaping* category. For monitoring of mitigation sites, see the *Survey Work – Topographic, Biological, and Archeological* category.

Other activities involving streams may include stream cleaning and stream modifications, such as stream relocation or channelization, which may be required for roadway construction.

When working within a stream, temporary diversion of the water is often necessary to provide in-water access. For dewatering, see *Dewatering* category. Temporary diversions are installed to protect and/or facilitate construction activities.

The extent of the area to be affected by stream and wetland work depends upon the size of the stream channel or wetland and the specific actions required. The disturbance footprint for stream work can range from minor (*e.g.*, stream cleaning) to a larger disturbance (*e.g.*, stream relocation). The disturbance footprint for wetland work can range from minor work in previously disturbed wetlands to larger disturbances to previously undisturbed wetlands. Temporary disturbance is greater when in-water access and/or waterway diversion is necessary. The duration of stream and wetland work depends on the scope of the activity. For example, minor construction could take days to weeks; whereas, major construction could take several weeks to several months.

Stream and wetland work typically involve soil/sediment disturbance. Downstream sedimentation is minimized through standard SESC practices (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Stream and wetland work may temporarily alter the hydrology of any nearby aquatic habitats. Cofferdams may be utilized to contain construction activities and minimize negative impacts to aquatic species while conducting stream work.

Depending on the specific activity, motorized vehicles and construction equipment may be utilized. Small projects may be limited to hand tools, such as a wheelbarrow and rake or shovel (*e.g.*, sediment/debris removal from streams). Larger projects could require a crane, loader, or dump truck. A temporary floating platform/barge may be used to transport materials/equipment to work areas, depending on the size and depth of the stream. Contaminants, such as fuel, may be present for certain types of stream and wetland work. However, contamination concern during these activities can be greatly reduced through proper inspection and maintenance of applicable machinery and overall regulatory compliance.

25. Dewatering

Some common construction activities that may require dewatering include excavations for foundations, bridge piers, and underground utilities. During construction, groundwater or surface water levels must be temporarily lowered to prevent water seepage into the excavation site and to ensure slope stability. This is necessary to safely facilitate the construction process and work can be performed in dry conditions.

Dewatering of streams can be made possible when contained within cofferdams. Cofferdam materials include sandbags covered with plastic, a portadam or similar structure, steel sheet piling, and Jersey barrier covered with plastic. Cofferdams are often installed to create an isolated work area that can be dewatered for stream work or improvements. Cofferdams may consist of large casings (hollow cylinders) or structures created out of steel sheet piles. Some types of cofferdams may be installed with vibratory hammers. However, impact pile driving may be required when the substrate consists of hard materials (bedrock).

Dewatering typically involves sediment disturbance through excavation and suspended sediments in the pumped water. Removal of suspended sediments in the water from excavated areas through filtration and/or settlement prior to discharging the water is required. This can be done with removable pumping stations, sump pits, portable sedimentation tanks, and/or silt control bags. Filtered water from inside the cofferdam area is pumped back into the stream

outside of the cofferdam. Water discharged from excavated areas on construction sites may be a significant contributor of sediment to surface waters during construction. Standard SESC practices are utilized to minimize sedimentation of aquatic habitats (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Filters and similar materials are readily available and are easy to install and maintain. The hydrology of any nearby aquatic habitats may be temporarily altered through the lowering of groundwater or surface water resulting from these activities.

The extent of the area to be affected by dewatering depends on the size of the excavation or project site and the specific dewatering method used. The duration of dewatering depends on the scope of the construction activity. For example, minor excavations could last days; whereas, major excavations could take weeks to many months. The equipment needed varies depending on the dewatering method selected. Typical equipment includes various pumps, sediment control bags, sedimentation tanks, and cofferdams. Motorized vehicles are required to transport the large equipment trailers. Fluid leaks from vehicles and/or machinery are a potential source of contamination. However, this concern should be minimal with appropriate inspection and maintenance, as well as keeping equipment from entering or crossing waterways.

26. Survey Work – Topographic, Biological, and Archeological

Topographic surveys are conducted to determine the configuration of the ground and assess factors such as potential stability issues, earthwork volume, and slope strengthening options. This work utilizes light equipment to take measurements of the relative positions of man-made and natural features on the ground and present that information numerically and graphically. Survey work may be conducted for rivers and streams (*i.e.*, depth, width, flow direction, and invert levels), slopes, berms, drainage system components and extent, retaining walls, existing vegetation (*i.e.*, density of vegetation and the location of trees), and project boundaries.

The extent of the area to be affected by topographic surveys is minimal and depends on the specific actions required. The disturbance footprint would likely be minimal, such as the clearing of overgrown vegetation (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category) to improve sight lines or accessibility. The duration of the survey work depends on the size of the project area and the scope of the activity. For example, small project areas with simple proposed plans may take days to weeks; whereas, large project areas with more complex proposed development could take several weeks. Topographic surveys rarely involve soil disturbance and are unlikely to alter the hydrology of any nearby aquatic habitats. Common equipment used during land surveying includes tripods, rods, levels, prisms, measuring tape, and data collectors. Contaminants are generally not a concern for these surveys.

Biological surveys include scientific studies of organisms to assess the condition of that organism or the environment it inhabits. These surveys or assessments are often conducted when a project is proposed in a location where threatened or endangered species may be present. Biological surveys also include the delineation of wetland boundaries. This includes walking through habitat, taking measurements and using hand augers or shovels for taking soil samples. The soil boring holes are backfilled by hand.

The extent of the area to be affected by biological surveys is minimal and depends on the specific actions required. The disturbance footprint for this work would likely be minimal, as these surveys largely rely on physical observation. The duration of the survey work depends on the size of the project area. For example, small project areas may take days to weeks; whereas, large project areas could take a few weeks to thoroughly survey the entire area. Biological surveys rarely involve soil disturbance, other than taking soil borings, and are unlikely to alter the hydrology of any nearby aquatic habitats. The equipment that is required to conduct these surveys is often minimal (*e.g.*, hand-held soil auger for a wetland delineation) and depends on the specific species and the scope of work for a wildlife or plant survey. A boat or underwater camera may be necessary when surveying an aquatic organism. Contaminants are generally not a concern for these surveys.

Archeological surveys are conducted to locate archeological sites and evaluate their eligibility for listing in the New Jersey and National Registers of Historic Places. The nature of the Area of Potential Effects (APE) and proposed project, along with the presence, absence, or potential presence of historic properties within the APE are evaluated to determine if a survey is needed. Field work for these surveys includes ground-level and subsurface exploration. Subsurface exploration is conducted when the archeologists have reason to believe a particular area may contain archeological resources. These endeavors can be as minor as digging and refilling post holes or shovel test pits or they can be extensive and require heavy machinery to dig larger excavations. Some of the common equipment/machinery includes posthole diggers, shovels, backhoes, road graders, tractor-drawn plows, and powered and hand-driven cultivators. Ground-penetrating radar is another tool that can be used to obtain subsurface imagery in a nondestructive manner. Shovel-testing is the most widely used technique, as it is less expensive than remote sensing.

The extent of the area to be affected by archeological surveys depends on the size of the APE associated with the proposed project. The disturbance footprint can range from minor (*e.g.*, physical observations of the site) to major excavation activities. The duration of survey work depends on the size of the project area and the history of the location. For example, small project areas that have a low probability of containing archeological resources may take days to weeks to survey. On the other hand, large project areas with high likelihood of archeological resources could take weeks to months to thoroughly survey the entire area.

Archeological surveys involve soil disturbance; the extent of disturbance depends on the degree of subsurface exploration. Impacts are minimized through standard SESC practices (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Excavation associated with these surveys is unlikely to alter the hydrology of any nearby aquatic habitats. Fluid leaks from excavation machinery is a potential source of contamination. However, this concern should be minimal with appropriate inspection and maintenance.

27. Temporary Construction Site Facilities and Staging Areas

Staging areas are used for delivery and storage of construction materials and equipment, contractor office and storage trailers, and employee parking. These areas are typically contractor-selected. These areas are often fenced and located in proximity to the construction site.

Temporary fencing prevents machinery, equipment, materials storage, and construction activity from intruding into adjacent properties, wetland and stream buffers, and shoreline areas (see *Appurtenant Features* category). Office trailers may be placed on temporary foundations and are often connected to available utilities, including electric and telephone (see *Cameras, Intelligent Transportation System (ITS), and Utilities*). Connecting to these utilities may include installing poles. After construction is complete, staging areas are disconnected from any utilities and restored (see *Landscaping* category).

Depending on site conditions, construction staging areas vary in size and may require vegetation clearing, grubbing, and grading or excavation to level the site (see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category*).* Extensive alterations to establish a staging area are unlikely. Cleared vegetation is usually hauled off-site. Excess material (*e.g.*, soil, rock, and debris) is disposed of at off-site facilities or reused as appropriate in construction.

Temporary construction site facilities and staging areas may include temporary access roads and driveways, temporary field offices (*e.g.*, trailers or, contractor's yard), construction and equipment staging areas, on- or off-site material storage areas (*e.g.*, temporary stockpiles of soil or materials), and off-site borrow areas. Temporary access roads and driveways can be constructed using timber or composite mats, stone, gravel, and/or pavement. Completion of the project includes the removal of temporary construction site facilities and the restoration to their original condition, unless they are part of a permanent impact area. For landscaping or restoration after removal, see *Landscaping* and *Restoration of Temporary Impacts* categories. If cutting and/or removing vegetation, including trees, is required to install or remove a temporary construction site facility, see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category. Off-site use areas may include borrow areas where soil or stone is obtained and relocated for use in the project area.

Staging, fueling, and storage areas are typically located in areas that minimize potential effects to sensitive areas. Temporary SESC measures are implemented prior to ground disturbance on these sites (see *Soil Erosion and Sediment Control, Water Quality Control Measures, and Caution Fence Installation, Maintenance, and Removal* category). Specialized BMPs are employed around concrete-handling areas to prevent uncured cement from entering and contaminating waterbodies or stormwater facilities. Examples of additional BMPs include marking clearing limits, establishing construction access, controlling runoff flow rates (*e.g.*, sedimentation ponds and check dams), installing sediment controls and soil stabilization (*e.g.*, silt fence, coir blankets, and temporary seeding), protecting slopes, protecting drain inlets, and preventing and/or containing contaminant spills.

The extent of the area to be affected by temporary construction site facilities or staging areas depends on the size of the site and the specific actions required. The disturbance footprint can range from temporary access roads or driveways to installation of temporary field offices, contractor's trailers, or construction equipment staging areas. Temporary disturbance is greater when site preparation and vegetation related activities are needed. The duration of work depends on the scope of the activity and the amount of site preparation required. For example, installing a

trailer office hooked up to utility lines could take days to a week; whereas, constructing a temporary construction access road may take several weeks.

Temporary construction site facilities and staging areas typically involve soil disturbance. If a waterway is located in or near the project area, downstream sedimentation is minimized through standard SESC practices. Most construction or removal work for these facilities and staging areas are not likely to alter the hydrology of any nearby aquatic habitats. However, installation of a temporary, impervious construction access road could temporarily alter hydrology. Most facility and staging area work involves motorized vehicles and construction equipment. Larger projects could require cranes, loaders, dump trucks, excavators, other heavy equipment, or concrete trucks. Raw concrete, grout, fuel, chemicals, and other materials may be present for construction of the facilities or stored at the staging area. However, contaminants are generally not a concern for most activities regarding the construction or removal of temporary construction site facilities.

28. Foot Access Through or Near Bog Turtle Habitat

Some construction projects may require foot access through or near bog turtle habitat. For example, the project may be related to culvert or drainage facility work, but in order to get to the work area, workers need access through/near bog turtle habitat. Thus, foot access (sometimes including a path) may be required. If vegetation removal is required to create foot access through or near bog turtle habitat, see *Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance* category.

The extent of the area to be affected by foot access through or near bog turtle habitat depends on the need for a path, its length and width, and the specific actions required (*e.g.*, if tree or other vegetation removal is necessary). The disturbance will generally be contained to the access path's footprint. An actual path may not always be needed. Potential impacts to bog turtles and their habitat can be minimized by avoiding stepping on the tops of vegetation hummocks and carefully looking for turtles and their nests. The duration of work depends on the scope of the activity. For example, vegetation clearing for a foot access path could take a few hours to a day; whereas, an access path that requires tree removal may take several days.

Construction of a foot access path through or near bog turtle habitat may involve soil disturbance. Downstream sedimentation is minimized by following the appropriate SESC measures (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). A foot access path is not likely to alter hydrology or groundwater. Typical access path construction work may involve minimal construction equipment. Most of the work can be completed with a machete, pruners, or a mower. If tree removal is required, more extensive equipment may be necessary. Other than fuel, contaminants are not anticipated for foot access path construction activities. If restoration is required, see *Restoration of Temporary Impacts* category.

29. Restoration of Temporary Impacts

Many construction activities result in temporary impacts to a project area. This may include temporary construction staging areas and material/equipment storage areas. Site preparation

often involves temporary vegetation clearing and construction of temporary access roads. Soil erosion and sediment controls, water quality measures, installation of caution fence, and dewatering activities all pose temporary impacts. After a project has been completed, in most cases, the project area and its surrounding environment must be restored to its original condition and temporary impacts must be rectified. However, restoration or re-planting may not be recommended in the wetland portion of bog turtle habitat. Restoration involving wetland or upland portions of bog turtle habitat must be coordinated with the Service.

Grading is one common activity for restoring temporary impacts in a project area. Generally, grading means cutting soil from higher points in the landscape and filling in lower places to make a level area. Grading is often used to level areas before plantings, which help to control erosion along highway slopes, ditch areas and roadway shoulders. For restoring temporary impacts through landscaping, see *Landscaping* category. For removal of a temporary access road/driveway or removal of temporarily placed man-made materials, see *Temporary Construction Site Facilities and Staging Areas* category.

The extent of the area to be affected by restoration activities depends on the size and range of the temporary impacts and the specific actions required. Restoration of the disturbance footprint can range from areas with minor temporary impacts (*e.g.*, temporary vegetation clearing) to larger temporary access roads or construction site facilities. The duration of work depends on the scope of the activity. For example, grading and planting to restore temporary vegetation clearing may only take hours to several days; whereas, removal of a temporary access road/driveway or construction site facilities could take several days to weeks.

Restoration of temporary impacts may involve soil/sediment disturbance during grading activities. If applicable, downstream sedimentation is minimized by following the appropriate SESC measures (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Restoration of temporary impacts is not likely to alter hydrology or groundwater. Typical restoration work may involve motorized vehicles and minimal construction equipment. Smaller projects may only require a wheelbarrow and shovels; whereas, larger restoration projects could require graders, loaders, dump trucks, or other heavy equipment. Other than fuel, there are no likely contaminants used during restoration activities.

30. Accidental Fuel / Contaminant Spill

Safety precautions and measures are taken when working with fuel or possible contaminants at a construction site, maintenance work site, or maintenance facility. These preventative measures help to reduce the likelihood of a spill or contamination in bog turtle habitat. For example, refueling operations should be conducted at a minimum of 50 feet to 150 feet from a waterbody, wetland, or other environmentally sensitive area, and a minimum of 300 feet from the wetland portion of bog turtle habitat. Leaking equipment should be immediately repaired or removed from the project limits. Before the start of construction operations, emergency spill kits should be placed within the project limits. Oil-only emergency spill kits should be replenished as necessary (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). These types of actions help to prevent spills from becoming larger environmental concerns.

In the case of an accidental fuel or contaminant spill, certain steps must be taken. If a spill occurs, it should immediately be contained and the NJDEP Hotline (1-877-927-6337 or 1-877-WARN-DEP) and the Resident Engineer for the project should immediately be notified. The Service should also be notified. In addition, for releases in excess of RQ established under 40 CFR 110, 117, and 302 that occur within a 24-hour period, the National Response Center (1-800-424-802) should also be contacted. The spill should be cleaned up and remediated as directed by the NJDEP (and National Response Center, if applicable). The contaminated material should be separately stockpiled and disposed of appropriately. Depending on the type and length of time of the spill, excavation of the contaminated materials may be required.

The extent of the area to be affected by an accidental fuel or contaminant spill depends on the type of spill, the length of time of the spill, and the specific actions required (*e.g.*, if excavation is required). The disturbance footprint can range from minor spills to larger spills impacting wetlands or waterbodies, in which downstream areas could be impacted. The duration of work depends on the scope of the activity and the size and duration of the spill. For example, clean-up of minor, contained spills could take hours to days; whereas, a larger spill or one that has been occurring over a longer period of time could take days to weeks.

Accidental fuel or contaminant spills may involve soil/sediment disturbance if excavation is required for clean-up. Sedimentation is minimized by following the appropriate SESC measures (see *Soil Erosion and Sediment Control, Water Quality Measures, and Caution Fence Installation, Maintenance, and Removal* category). Fuel or contaminant spills likely will not alter hydrology, but could affect surface water or groundwater quality. Typical spill response work may involve emergency spill kits, absorbent booms, motorized vehicles, and minimal construction equipment. Smaller spills may only require an emergency spill kit; whereas, larger spill responses that involve excavation could require, excavators, loaders, or dump trucks. The primary contaminant in regards to this activity is the fuel or the source of the contaminant spill.

Conservation Measures

The Service's Consultation Handbook defines "Conservation Measures" as "*actions to benefit or promote the recovery of listed species that are included by a Federal agency as an integral part of a proposed action under ESA consultation. These actions will be taken by the Federal agency or applicant, and serve to minimize or compensate for, project effects on the species under review*" (Service and National Marine Fisheries Service (NMFS) 1998). Conservation Measures (CMs) may include actions that the Federal agency or applicant have committed to complete in a biological assessment or similar document. When used in the context of the ESA, "Conservation Measures" represent actions pledged in the project description that the action agency or the applicant will implement to further the recovery of the species under review. Such measures may be tasks recommended in the species' recovery plan, should be closely related to the action, and should be achievable within the authority of the action agency or applicant. Since CMs are part of the proposed action, their implementation is required under the terms of the consultation (Service and NMFS 1998). In developing CMs, the Service recommends use of the full mitigation sequence (*i.e.*, avoid first, then minimize, then compensate), to achieve, at a minimum, "no net loss" in the species' conservation. The mitigation sequence should be observed, except where specific circumstances may warrant a departure from this preferred sequence.

The NJDOT has worked cooperatively with the Service, ENSP, and DLUR to develop the following CMs to avoid, minimize, and offset adverse effects to bog turtles stemming from the road-related activities covered by this PBO. The project-level CMs represent a menu of possible bog turtle conservation practices; not all CMs are applicable to every activity or circumstance. When and where each CM will be implemented is indicated in the Effects Matrix (Appendix B), as determined using the procedures in the User's Guide (Appendix A). All applicable project-level CMs, as indicated in the Effects Matrix, will be implemented as written for all FHWA activities, except when minor deviations for a specific project have been approved by the Service and have been found unlikely to increase the likelihood or severity of adverse effect to bog turtles. For activities similar to those covered by this PBO, this framework of CMs can also be used or adapted by other Federal action agencies in the course of conducting their own consultations. The CMs can also be used by non-Federal project proponents in the course of designing and carrying out similar projects, in order to avoid the risk of incidental take of bog turtles. In addition to 22 project-level CMs, the NJDOT agrees to implement four programmatic CMs (CMs 23 through 26), as described below.

See the glossary (Appendix E) for definitions of *known*, *potential*, and *aquatic corridor* habitat, as used in the CMs and throughout this PBO. Where the term *habitat* is used, it means known, potential, and/or aquatic corridor habitat, but does not include upland corridor habitat. The term *habitat* excludes certain areas of previous development or ongoing disturbance; see glossary. Where the term *wetland habitat* (or *wetland portion of the habitat*) is used, it means the wetland portion of known and potential habitat, and does not include stream-adjacent wetlands associated with aquatic corridor habitat.

Project-Level Measures

The first 22 CMs are measures that will be applied to individual activities covered by this PBO to avoid and minimize direct and indirect effects to bog turtles and bog turtle habitats. As discussed above, see User's Guide (Appendix A) and Effects Matrix (Appendix B) to determine which CMs apply to each individual project. Those CMs with gray shading should be considered for all projects, but are only listed in the Effects Matrix for the most applicable activities. See User's Guide (Appendix A) for additional notes, procedures, and important information.

1. Direct Habitat Impacts

Avoid/minimize direct modifications to known/potential habitat (*e.g.*, flooding, filling, draining, ditching, tiling, excavating, sediment removal, shading, clearing, new infrastructure). Avoid/minimize direct modification to aquatic corridor habitat (*e.g.*, channelizing, diverting, stabilizing, impounding, dredging, sediment removal, shading, clearing, new infrastructure). Avoid these activities if possible. If avoidance is not possible, minimize these activities; compensatory mitigation may be necessary for any unavoidable impacts.

2. Reserved

This CM is reserved for future updates to the PBO.

3. Upland Buffers

Avoid/minimize impairing upland buffers. When possible, expand and/or enhance upland buffers. Unavoidable buffer impacts that are expected to degrade adjacent wetland habitat and/or to impede bog turtle passage may require compensatory mitigation.

a. Goal of at least 300 feet from the wetland portion of known and potential habitat. Goal of at least 150 feet from aquatic corridor habitat. In some cases, but not all cases, these buffers will be within the upland portion of known habitat.

b. Within the buffer distances listed in CM 3a, minimize the area and duration of temporary disturbance.

c. Within the buffer distances listed in CM 3a, minimize the area of new infrastructure (*e.g.*, riprap, pavement, stormwater facilities).

d. Avoid placing benches and bicycle racks within 50 feet of the wetland portion of the habitat. Avoid placing trash receptacles within 100 feet of the wetland portion of habitat. Between 100 feet and 300 feet from the wetland portion of habitat, any trash receptacles must be predator-resistant.

e. If maintained portions of a right-of-way occur within the buffer distances given in CM 3a, design and maintain them to function as buffers to the maximum extent practicable (*e.g.*, see CM 3f). Buffer functions include maintaining water quality and hydrologic conditions in the wetlands, buffering the wetlands from invasive vegetation and human encroachment, and serving as cover and/or dispersal habitat for bog turtles.

f. Seek opportunities to improve upon baseline conditions within the buffer area (*e.g.*, removal of impervious surface, removal of invasive species, selection of native plant material that would be an effective stormwater filter strip) to the maximum extent practicable.

4. Landscaping

Planting: When planting within the buffer distances listed in CM 3a, use only native plant species if possible. Within 100 feet of the wetland portion of habitat, submit a planting plan to the Service if proposed plantings include woody species or non-native plants. Do not plant or seed in the wetland portion of habitat.

Other landscaping: When landscaping within the buffer distances listed in CM 3a, use only weed-free and dye-free mulches and soils. Within 50 feet of the wetland portion of habitat, submit a landscaping plan to the Service if mulch is proposed. Do not use mulch in the wetland portion of habitat. (See CMs 15c and 15d regarding soil stabilization methods.)

5. Equipment Washing

Thoroughly wash equipment offsite (*i.e.*, greater than 300 feet from wetland portion of habitat) before use to minimize the spread of invasive species, the spread of pathogens, or contamination

with deicing materials. This requirement to pre-wash equipment offsite applies to any equipment (including hand tools) that will be used in the wetland portion of habitat. (Note that CM 10 also requires specific protocols for disinfecting equipment prior to use in wetlands, which, when applicable, supersede the more general pre-washing requirement of CM 5.) This pre-washing requirement also applies to equipment that will be used in the upland portion of habitat or in upland buffers (as established in CM 3a) if there will be sediment-generating ground disturbance upslope of wetland habitat. (This pre-washing requirement does not apply to equipment that will be used only within areas of existing pavement or median strips.) For projects where Service review is required and where activities are proposed in highly sensitive areas adjacent to known habitat, the Service may request an environmental monitor on-site and/or post-construction monitoring and treatment for any invasive plant species.

In addition to pre-washing, for all equipment used in the wetland, rinse off any debris with water after use. Post-use rinsing should occur at the job site in an upland area at least 50 feet from the wetland.

6. Vegetation Management

Follow the *Guidelines for Avoiding Adverse Impacts and Improving Bog Turtle Habitat from Vegetation Management*,[6] or the most recent version as revised by the Service and the New Jersey Division of Fish and Wildlife (NJDFW).

7. Environmental Contaminants: Post-Construction Impacts

This CM may be modified to add additional BMPs to address likely impacts to bog turtle habitat from environmental contaminants stemming from the presence, routine maintenance, winter maintenance (*e.g.*, deicing), and operation of New Jersey's road network. Also see CM 23.

a. Do not use coal-tar sealants on parking lots or driveways within 300 feet of wetland habitat. (At the time of this PBO, we are not aware of any use of coal-tar sealants on roads in New Jersey.)

b. For driveways or parking lots within 300 feet of bog turtle habitat, pile plowed snow as far away from the wetland as possible; do not push plowed snow into the wetland.

8. Environmental Contaminants: Construction Impacts

Prevent construction materials and potential contaminants from entering habitat.

a. Follow proper storage and controls (including inlet protection) to prevent raw concrete, grout, adhesives, petroleum products, fertilizer, herbicide (*e.g.*, avoid overspray and drift), and other contaminants from entering habitat. Do not refuel vehicles within 300 feet of the wetland portion of habitat. Ensure that work crews have the appropriate number and type of spill kits on site during work, as per NJDOT specifications. Ensure that work crews have a current list of contacts to be notified in the event of a spill,

[6] https://www.fws.gov/northeast/njfieldoffice/pdf/bog_turtle_row.pdf

including the NJDEP Emergency Hotline (1-877-WARN-DEP), which should be contacted for any spill, and the National Response Center (1-800-424-8802), which should be contacted for a discharge of petroleum product or the release of a hazardous material in excess of RQ established under 40 CFR 110, 117, and 302 that occur within a 24-hour period.

b. Use a NJDOT-approved containment system (*e.g.*, NJDOT Specifications Section 554 Painting Existing Bridges - 554.03.01 Pollution Control System and 554.03.02 Cleaning and Painting) to contain, capture, and collect dust, blasting residues, spent blasting medium, rust particles, paint particles, other particulate matter, and larger construction debris associated with work (including preparation work, painting, and demolition) to prevent these materials from entering habitat. Additional measures may include inlet protection, under-bridge shielding, vacuum truck, or sweeper. Ensure that all captured material, as well as all effluent (*e.g.*, from power washing, hydraulic directional drilling mud), is collected and properly disposed of and does not enter the aquatic environment.

9. Disposal of Natural Materials

Do not dispose of or stockpile soil, sediment, cut vegetation, rock, or natural debris in habitat. Do not locate stockpiles within 150 feet of the wetland portion of habitat. Do not move any material that contains invasive species for reuse in a new location, other than to areas that will be covered by impervious surface. (If material re-use as topsoil is proposed in a new area that will not be covered by impervious surface, a pre-project survey should be carried out for significant areas dominated by invasive vegetation.) Follow proper off-site disposal specifications/ protocols, including for potentially contaminated soils/sediments (*e.g.*, soil excavated from around the base of timber piles). Also see CM 21.

10. Equipment Disinfection

Follow the February 2014 *Northeast Partners for Amphibians and Reptiles Conservation Disinfection of Field Equipment to Minimize Risk of Spread of Chytridiomycosis and Ranavirus*,[7] or the most current guidance endorsed by the Service to minimize the spread of wildlife disease. This CM is only applicable in wetland portions of habitat. This CM is currently only applicable for small equipment (*e.g.*, boots, handheld tools), that come in contact with soil in wetland portions of habitat. Guidelines for the disinfection of larger/heavy equipment may be forthcoming and should be followed upon issuance.

11. Public Access

Do not construct, install, or alter infrastructure or vegetation in ways that intentionally promote public access to habitat. To the extent practical, do not construct, install, or alter infrastructure or vegetation in ways that could facilitate public access to habitat. Design, operate, and decommission temporary access routes to minimize public accessibility of the habitat during and after construction.

[7] http://northeastparc.org/emerging-diseases/

12. Habitat Avoidance

No intrusion of project activities into habitat.

a. No entry of personnel on foot. No vehicle entry. No intrusion via hand tools or motorized equipment. No intrusion into habitat from equipment positioned outside of habitat (*e.g.*, crane, backhoe). No staging or storage of vehicles, materials or equipment. No temporary work areas or access routes.

b. The "no entry" area will be delineated with orange silt fence, orange heavy-duty silt fence, brightly colored flagging, signage or other appropriate means. This requirement may be combined with the requirements of CM 15a or CM 17, if applicable. Install these items as close to the work area as possible, allowing enough area to perform construction and associated activities. Do not use caution fence for this purpose. "No entry" area fencing/markings will be removed upon completion of the project. This CM does not apply to any of the following circumstances:
   i. projects for which all activities will be at least 50 feet away from the wetland portion of habitat;
   ii. activities that are separated from the wetland portion of the habitat by ground-level infrastructure (*e.g.*, a roadway or sidewalk between the work area and the wetland habitat);
   iii. projects for which all activities will be entirely restricted to, or constructed from, existing areas of pavement (including work conducted from a bridge deck or roadway); railbeds; maintained unpaved roadways or trails; median strips; maintained, vegetated rights-of-way, berms, or slopes (other than those areas referenced under (v) below); or stormwater management facilities that normally contain standing water or in which vegetation is regularly mowed or removed, provided that there is no intrusion into habitat from equipment positioned outside of habitat;
   iv. tree/shrub trimming/pruning;
   v. mowing outside of marked areas (ENSP will develop and maintain a list, and NJDOT will permanently mark on the ground, areas with a mowing restriction); and
   vi. activities within 50 feet of the wetland portion of the habitat where the disturbance area will be less than 250 square feet AND where heavy construction equipment will not be used.

c. Install and maintain a fence or other visual marker around permanent facilities within 300 feet of habitat.

13. Temporary Habitat Impacts

Minimize temporary impacts from work in habitat.

a. Minimize the footprint and duration of activity in habitat. Avoid stepping on hummocks and other areas of elevated vegetation that might contain obscured turtle eggs or nests. Schedule work in habitat between October 16 and March 31 to the extent practicable

unless CM 14b and/or CM 14c also apply. If activity between April 1 and October 15 cannot be avoided, limit activity to daylight hours.

b. No soil disturbance. This CM does not apply to streambed/streambank disturbance, hand coring of soil samples, or driving a sign post or fence post.

c. For vegetation and/or soil disturbance in the wetland portion of habitat, implement all of the following:
   i. For vegetation or soil disturbance greater than 250 square feet, prepare and implement a Service-approved post-construction monitoring and invasive species control plan.
   ii. No vegetation planting/seeding in wetland portion of habitat (consistent with CM 4).
   iii. Avoid pulling woody vegetation out by the roots. Leave root balls from herbicide-treated or cut woody vegetation in place, if possible.

d. No vehicles (including motorized construction equipment) in habitat.

e. No vehicles (including motorized construction equipment) in habitat, if possible.

f. If use of vehicles (including motorized construction equipment) in upland portions of habitat cannot be avoided, implement CM 17 ("exclude turtles from work areas").

g. If use of vehicles (including motorized construction equipment) in wetland portions of habitat cannot be avoided, implement all of the following:
   i. Have a Phase 1 survey[8] conducted by a Recognized, Qualified Bog Turtle Surveyor,[9] in order to map the most suitable nesting and hibernation areas.
   ii. Flag/mark the most suitable nesting and hibernation areas as "no entry" by personnel on foot or in vehicles. Have any unavoidable intrusion(s) into the "no entry" area(s) overseen by a Recognized, Qualified Bog Turtle Surveyor (as per 13.g.iv).
   iii. Use low ground pressure mats (*e.g.*, timber mats) in wetlands, and the lightest possible equipment, to minimize soil compaction. (If all equipment is less than 3 pounds per square inch, then mats may not be needed; contact the Service to see if mats can be waived.)
   iv. Have a Recognized, Qualified Bog Turtle Surveyor thoroughly search the area where mats are needed to ensure no bog turtles are present prior to mat placement, and on site to provide oversight during placement of the wetland mats, and to oversee any planned intrusion(s) into the marked "no entry" areas. Have a Recognized, Qualified Bog Turtle Surveyor "on call" each day that vehicles will be used in wetland habitat. In addition, provide for Service approval the name, contact information and qualifications of a responsible point of contact (*e.g.*, an environmental professional with relevant experience, may or may not be a Recognized, Qualified Bog Turtle Surveyor) who will monitor daily work (*e.g.*, driving on the mats) and adherence to the "no entry" area(s).

[8] https://www.fws.gov/northeast/njfieldoffice/pdf/BTSurveyPhases1and2.pdf
[9] https://www.fws.gov/northeast/njfieldoffice/pdf/BogTurtleSurveyors.pdf

v. Prepare and implement a project-specific bog turtle monitoring plan for the duration of vehicle use. On a case-by-case basis, the Service may recommend turtle exclusion fence as described in CM 17 (also see CM 14c).

h. No activity in wetland portion of habitat. This does not apply to existing vegetated stormwater management facilities that are classified as wetlands.

i. Between April 1 and October 15, exclude turtles from excavated/bored pits or holes that will remain open and unattended for more than 12 consecutive hours. Exclusion may be achieved by fencing described in CM 17a, or by securely covering the pit/hole. No additional exclusionary measures are needed for pits/holes within work areas that are already delimited by fence under CM 15a or CM 17a so as to preclude turtle entry. This CM applies only in, or within 50 feet of, the wetland portion of known habitat.

14. Seasonal Restrictions in Wetland Habitat

If both vehicle use and soil disturbance in wetland habitat are necessary, contact the Service – in most cases work between April 1 and October 15 will be preferred and CM 14c will be needed. In certain cases, if the Service recommends work between October 16 and March 31, a project-specific monitoring plan may be needed.

a. No vehicle use in wetland portions of habitat between April 1 and October 15.

b. No soil disturbance (*e.g.*, grading, excavation, stump removal, pile driving) in wetland portions of habitat between October 16 and March 31. This restriction does not apply to hand coring of soil samples, post hole digging, shovel test pits, or driving a sign post or fence post without footings/foundations.

c. If vehicle use in wetland portions of habitat between April 1 and October 15 cannot be avoided (*i.e.*, in order to comply with CM 14b), then the monitoring plan prepared under CM 13g(v) must provide for daily inspection of the work area by a Recognized, Qualified Bog Turtle Surveyor to make sure bog turtles are not in the work area.

15. Sediment and Erosion Controls

a. Install heavy-duty silt fence (NJDOT Construction Detail CD-158-1.3) OR redundant sediment/erosion controls. Redundant controls consist of two rows of silt fence (each row following CD-158-1.1), or a single row of silt fence (CD-158-1.1) along with hay bales (CD-158-1.6) placed on the upland side of the silt fence. This requirement may be combined with the requirements of CM 12b or CM 17, if applicable. (Updates to NJDOT CD-158-1 will be reviewed by the Service.) Inspect and correct problems with the fence on a daily basis. Maintain a daily log of fence condition and any problems/corrective measures, and provide a copy of the log to the Service upon request. Promptly remove fence and hay bales upon re-establishment of vegetation.
   i. This CM applies only in uplands, including upland portions of habitat, unless otherwise recommended by the Service. This CM does not apply beyond 300 feet from the wetland portion of habitat unless otherwise required by the NJDOT Bureau

of Landscape Architecture and Environmental Solutions (BLAES) or the Division of Environmental Resources (DER).

ii. Between 50 feet and 300 feet from the wetland portion of habitat, this CM only applies when and where silt fence is required by the project's Soil Erosion and Sediment Control Plan OR when silt fence is otherwise required by the NJDOT BLAES or DER.

iii. Within 50 feet of the wetland portion of habitat, this CM applies to any land disturbance (*e.g.*, excavating, grading, removing accumulated sediment along roadside, filling) unless otherwise indicated by the NJDOT BLAES or DER.

iv. If activities (*e.g.*, filling, ditch cleaning) warrant the placement of silt fence or other erosion control measures in the wetland portion of habitat, contact the Service to develop a site-specific plan.

b. Minimize the area and duration of exposed soils. If sedimentation or inadvertent fill of bog turtle habitat is documented as a result of any activity covered under the PBO, immediately notify the Service and ENSP. Work with the Service and ENSP to develop and implement an appropriate plan of corrective action.

c. Promptly re-vegetate areas of temporary disturbance with native, herbaceous species. This CM applies only in uplands, including upland portions of habitat (consistent with CM 4). The type of seeding may depend on land use (*e.g.*, housing development sidewalk/curb, lawn). Within 300 feet of the wetland portion of habitat, use only native plant species, if possible. Within 100 feet of the wetland portion of habitat, submit a planting plan to the Service if proposed plantings include woody species or non-native plants. Do not plant or seed in the wetland portion of habitat. (See CM 4 if mulch is proposed.)

d. Use jute matting or other biodegradable erosion control measures on disturbed areas until re-vegetated in accordance with the *NJDOT Soil Erosion and Sediment Control Standards* or the *Standards for Soil Erosion and Sediment Control in New Jersey*, as applicable. This CM applies only in uplands, including upland portions of habitat. Within 50 feet of the wetland portion of habitat, do not use soil stabilizing materials that could trap bog turtles (*e.g.*, materials with holes like mesh or netting).

e. No soil disturbance.

f. Employ all practicable soil erosion and sediment control practices and/or construction techniques to minimize sedimentation of downstream aquatic habitats by using a NJDOT-approved containment system for in-stream work including, but not limited to, cofferdams and floating turbidity curtains. Dewatering effluent must be appropriately filtered prior to discharge (*e.g.*, via temporary sediment basins and/or filter bags placed in upland areas).

g. Construct stormwater management infrastructure prior to all other components of the project to control stormwater and sediment during the course of construction, where appropriate.

h. Promptly remove caution fence upon completion of the project. **NOTE:** Do not use caution fence within 50 feet of wetland portion of habitat or within the wetland itself.

i. Prevent erosion of soil stockpiles through the use of tarps, hay bales, silt fence, or other means known to be effective. Also see CM 9.

16. Restricted Vehicle Use

No vehicle use, including motorized construction equipment, other than within existing: areas of pavement (including work conducted from a bridge deck or roadway); railbeds; maintained unpaved roadways or trails; median strips; maintained, vegetated rights-of-way, berms, or slopes; or stormwater management facilities that normally contain standing water or in which vegetation is regularly mowed or removed. No intrusion into habitat from equipment positioned outside of habitat. This CM does not apply to the use of remote control vehicles in culverts.

17. Turtle Exclusion Fencing

For work between April 1 and October 15, exclude turtles from work areas before using vehicles, including motorized construction equipment. This CM does not apply to vehicle use within the following existing features: areas of pavement (including work conducted from a bridge deck or roadway); railbeds; maintained unpaved roadways or trails; median strips; maintained, vegetated rights-of-way, berms, or slopes; or stormwater management facilities that normally contain standing water or in which vegetation is regularly mowed or removed. This CM applies only in uplands, including upland portions of habitat, except when indicated by the Service under CM 13.g.v. This CM can be combined with requirements under CM 12b or 15a, if applicable. This CM includes all of the following steps.

a. Install heavy-duty silt fence (NJDOT Construction Detail CD-158-1.3) OR redundant turtle exclusion fence. Redundant fence consists of either two rows of silt fence (each row following CD-158-1.1), or a single row of silt fence (CD-158-1.1) along with hay bales (CD-158-1.6) placed along the upland side of the silt fence. (Updates to NJDOT CD-158-1 will be reviewed by the Service.) Construct the silt fence with solid sheeting (*i.e.*, no holes or projections) at least 2 feet high stretched taught and embedded in the ground as per NJDOT construction details, to prevent entry of turtles.

b. Within 50 feet of the wetland portion of habitat, have fence installation overseen by a Recognized Qualified Bog Turtle Surveyor, who will be responsible for ensuring that the extent, configuration, and placement of fence is sufficient to preclude turtle entry into the work zone.

c. Once fenced, have work areas inspected for transient or burrowing bog turtles before vehicle use to make sure bog turtles are not in the work area. Inspection must be conducted by a Recognized, Qualified Bog Turtle Surveyor.

d. Inspect and correct problems found with the fence on a daily basis. Maintain a daily log of fence condition and any problems/corrective measures. Provide a copy of the log to the Service upon request.

e. If exclusion fence is breached or compromised for greater than 24 hours, have the entire work area inspected for turtles by a Recognized, Qualified Bog Turtle Surveyor before resuming vehicle use.

f. Promptly remove the fence upon termination of vehicle use unless the fence is still needed for sediment and erosion control and/or is still required under CM 12b.

18. Hydrologic Impacts

Avoid/minimize adverse hydrologic impacts (surface water and/or groundwater changes) to the wetland portion of habitat. Adverse surface water impacts could involve changes in water quality, sedimentation, velocity, volume, or flashiness (*e.g.*, stemming from surface discharges of stormwater via pipe or overland flow, from in-stream work, or from placement or expansion of infrastructure in habitat). Adverse groundwater impacts could involve changes in base flows, seeps/springs, or depth to groundwater (*e.g.*, stemming from decreases in groundwater recharge, or from puncture of the clay layer beneath a perched water table). Compensatory mitigation may be necessary if adverse hydrologic changes to the wetland portion of habitat cannot be avoided. In addition to avoiding/minimizing adverse impacts, where feasible, pursue opportunities to improve hydrologic conditions in the wetland portion of habitat. This CM includes all of the following steps unless otherwise indicated in the Effects Matrix.

a. Assess and minimize adverse hydrologic changes with the goal of maintaining hydrology as detailed under CM 18c.
   i. The assessment may be qualitative if Hydrology and Hydraulic (H&H) data are not otherwise required by applicable regulations.
   ii. For projects where H&H data are required, the assessment must demonstrate that the project maintains the existing (pre-project) groundwater recharge as required by State regulations, unless implementing that standard is deemed infeasible by the appropriate State regulatory authority.
   iii. For projects meeting the following criteria, contact the Service to determine if it is necessary to conduct a full quantitative assessment of project impacts on the wetland portion of the habitat. These criteria include: new, enlarged, or relocated stormwater outfalls that discharge to habitat; new, enlarged, or relocated infrastructure in habitat; direct flooding, filling, draining, excavating, ditching, or tiling of habitat; bridge or culvert work that is likely to alter stream flow associated with habitat; temporary dewatering within habitat; 0.25 acre net increase in impervious surface within 300 feet of the wetland portion of habitat; or any other activities that NJDOT believes to have potential to alter wetland hydrology. When necessary, the full quantitative assessment must include a determination as to whether the project will result in a

change in the hydrologic regime at the location of the habitat. This full quantitative assessment must be addressed through a wetland water budget analysis or by showing that the flow rates, durations, and volumes of hydrologic inputs to the wetland are consistent with pre-project conditions for the storm recurrence interval(s) most relevant to bog turtle habitat, which will be determined on a case-by-case basis. For certain projects that meet the criteria in this CM (18.a.iii) and that have potential for particularly severe habitat impacts, the Service may also recommend development and implementation of a post-construction hydrologic monitoring and/or adaptive management plan, which may include provisions for corrective actions, additional compensatory mitigation, or both.

iv. Seek to maintain/mimic each season's pre-project hydrologic conditions in the wetland portion of habitat. See CM 18c.

b. If practicable, proactively seek opportunities to correct any existing impairments to baseline hydrologic conditions, incidental to the project. For example, increase recharge to the wetland portion of habitat (*e.g.*, if recharge had been previously reduced by existing impervious surface); abate surface water point discharges that may be eroding or degrading the wetland portion of habitat; better mimic natural surface water inputs to the wetland; improve water quality; or manage vegetation. Use H&H data, if available. Coordinate any such effort with the Service early in planning.

c. Ensure appropriate surface water inputs (*e.g.*, volumes, velocities, timing), and ensure adequate recharge of groundwater, in order to maintain or improve baseline conditions in the wetland portion of habitat.

i. Minimize net increases in impervious surface. Consider the use of permeable pavement, if practicable.

ii. If H&H data are required under CM 18a, seek to mimic the pre-project hydrograph for the wetland for the storm recurrence interval(s) most relevant to bog turtle habitat, which will be determined on a case-by-case basis.

iii. If H&H data are evaluated under CM 18a, seek to recharge 100 percent of the wetland's pre-project annual average recharge volume, *i.e.,* ensure that the project site's drainage is recharged at depths and locations (considering direction of subsurface flow) that will continue to support the wetland portion of habitat, especially during dry periods. Project features to retain recharge/infiltration rates must be designed such that they continue to provide hydrology to the target wetland(s), not just to the aquifer generally. For example, if the habitat is fed by shallow groundwater and the recharge is proposed deep (bypassing the shallow groundwater), this may result in degradation of habitat even though total recharge volumes are the same.

d. Minimize soil compaction in accordance with the Standard for Land Grading in the *Standards for Soil Erosion and Sediment Control in New Jersey*. Utilize BMPs for minimizing compaction (*e.g.*, use lightweight equipment, avoid/minimize driving over areas that were recently graded, use timber mats in wetland habitat – see CM 13g).

e. Avoid new surface water discharges (including scuppers) in or up-gradient of (*i.e.*, draining to) bog turtle habitat. If a new discharge cannot be avoided, coordinate the siting and design (including outlet protection) with the Service and seek to avoid or minimize adverse impacts to the wetland portion of habitat.

f. For activities likely to result in a sudden hydrologic change within the habitat (*e.g.*, dewatering, impounding, removal of a stream/ditch/culvert blockage, stream relocation), consult with the Service regarding seasonal timing.

19. Existing Drainage Systems

Avoid/minimize adverse impacts from work on existing drainage systems.

a. When cleaning out a stormwater or drainage system that discharges to habitat, use a vacuum truck. If flushing is necessary to loosen sediment or debris, ensure water/material does not reach the outfall. When cleaning out sedimentation basins/traps, ensure material does not enter habitat.

b. When adding a new inlet to an existing stormwater or drainage system that discharges to habitat, ensure that the action will not increase discharge peaks or velocities to the point that they become erosive or more erosive, and will not increase discharge volumes.

c. Do not relocate outfalls (including scuppers) such that an existing stormwater system would start draining to habitat.

20. Bog Turtle Passage

Actively promote, and avoid impeding or impairing, safe bog turtle passage and connectivity among habitat patches.

a. Avoid new projects, as well as new or modified road-related infrastructure or features that are likely to inhibit bog turtle passage. Examples of features that could inhibit passage include steep slopes, culverts not designed for turtle use, fencing, median barriers, noise barriers, road widening, increased traffic volumes, and fragmentation or outright loss of upland corridor habitat. If this adverse effect cannot be completely avoided, it will be minimized, and compensatory mitigation may be required.

b. If practicable, proactively improve baseline passage/connectivity conditions opportunistically with the project. There may be circumstances where New Jersey regulations require this measure. This may include both the construction and improvement of turtle passage systems (*e.g.*, under-road tunnels and guide fence) and the planting, restoration, or maintenance of suitable vegetation. Improvements may include guide fence, where feasible.

c. In specific circumstances, especially where an existing turtle passage mechanism is already in place, guide fence may be recommended to keep bog turtles off the roadway. There may be circumstances where New Jersey regulations require this measure.

d. Prepare an assessment of the project's potential to induce, facilitate, or encourage development following project completion, focusing on the potential of such development to impact the bog turtle. If possible, evaluate the potential for induced development to impact bog turtle passage, impair connectivity among habitat patches, and/or degrade any nearby bog turtle habitat(s). The level of detail of the assessment should be proportional to the likelihood and expected severity of impacts to the bog turtle.

21. Waste Disposal

Do not dispose of or stockpile any excavated man-made materials (*e.g.*, pavement), construction materials (including riprap and gravel), or other man-made items or substances in habitat. Do not locate stockpiles within 150 feet of the wetland portion of habitat. Follow proper off-site disposal specifications /protocols for all material and debris, as well as for potentially contaminated materials. Ensure that trash and recycling receptacles at NJDOT owned or operated facilities (*e.g.*, maintenance yards) and construction sites within 300 feet of wetland habitat are regularly emptied and remain in good condition. Also see CM 9.

22. Bog Turtle Encounters

Procedures for encountering bog turtles or other wildlife. All the following CMs apply to all projects and activities.

a. If an apparently healthy, uninjured bog turtle is found in a construction zone (*e.g.*, within the work area) upon initial inspection of the construction zone or during construction: (i) alert the on-site turtle construction monitor, if present, to relocate the turtle OR document the occurrence (observer, location, date, and time) and photograph the animal (both top and bottom) and relocate it a safe distance away from the work space to an area of suitable habitat; AND (ii) contact the Service and ENSP immediately; AND (iii) stop work within 300 feet of wetland habitat until further consultation is completed pursuant to the ESA. Do not relocate a turtle to the opposite side of a road from where it was found.

b. If an apparently healthy, uninjured bog turtle is found near a construction zone (*e.g.*, outside of the work area), and not within suitable habitat, alert the on-site turtle construction monitor, if present, OR document the occurrence (observer, location, date, and time) and photograph the turtle (both top and bottom) and relocate it a safe distance away from the work space to an area of suitable habitat. Do not relocate a turtle to the opposite side of a road from where it was found. Notify the Service and ENSP within 24 hours.

c. If an apparently healthy, uninjured bog turtle is found near a construction zone (*e.g.*, outside of work area) within an area of suitable habitat, alert the on-site turtle construction monitor, if present, OR document the occurrence (observer, location, date, and time) and photograph the turtle if possible (without handling it), and notify the Service and ENSP within 24 hours. Do not relocate the turtle.

d. If an apparently injured, sick, or dead bog turtle is found anywhere, alert the on-site turtle construction monitor, if present, OR immediately notify the Service and ENSP. Stop work within 300 feet of wetland habitat if the animal was found in a construction zone.

e. If apparently injured or sick wildlife (other than bog turtles; see 22d above) are found, contact a State-licensed wildlife rehabilitator.[10] Minimize handling or moving the animal except as instructed by a licensed rehabilitator, or unless the animal or any human is in

   imminent danger. If no rehabilitator can be reached, contact the local animal control authority.

f. To the extent practicable, report rare wildlife sightings using ENSP's standard form.[11]

g. Personnel are advised to wash their hands thoroughly with soap and water after handling wildlife and, ideally, before, as well.

Programmatic Measures

In addition to 22 project-level CMs, the NJDOT has agreed to implement four programmatic CMs (CMs 23 through 26), as described below. These CMs were developed to address issues best considered at the statewide level, rather than project by project.

23. Environmental Contaminants

To address potential impacts to bog turtle habitat from environmental contaminants stemming from the presence, maintenance, and operation of New Jersey's road network, the agencies (NJDOT, ENSP, and the Service) commit to the following.

a. In its role in the emergency response community, the Service will facilitate the integration of publicly available bog turtle habitat mapping (*e.g.*, unedited Landscape Project mapping) into relevant agency response systems. The Service will work with other agencies to integrate consideration of bog turtle biology and habitat into relevant response plans, such as the USEPA Inland Plan and U.S. Coast Guard Area Contingency Plans.

b. Within 1 year of the PBO, NJDOT will complete a GIS-based inventory of State-owned, timber pile-supported bridges within known bog turtle wetlands across the programmatic action area, as well as aquatic corridor habitats within 0.25 mile upstream of known habitat. Over the next 2 to 5 years, the ENSP and the Service will ask all staff, volunteers, and Recognized, Qualified Bog Turtle Surveyors to note, document, and report other wooden structures in known bog turtle wetlands. Based on the results of these efforts, NJDOT, ENSP, and the Service will revisit the issue of potential contaminant leaching from treated lumber, and discuss if further study and/or corrective action are warranted.

[10] http://www.nj.gov/dep/fgw/pdf/rehab_list.pdf
[11] http://www.njfishandwildlife.com/ensp/rprtform.htm

c. Within 6 months of the PBO, NJDOT will meet with ENSP and the Service to discuss the design, initiation, and funding options for a pilot study to look at post-construction contaminant impacts of the road network in bog turtle wetlands, such as: (i) concentrations of deicing materials, and associated changes in pH, salinity, and alkalinity, focused immediately following winter weather events; and (ii) concentrations of relevant contaminants associated with road construction and maintenance (*e.g.*, semi-volatile organic compounds, select heavy metals), focused on the first few precipitation events following road, shoulder, or parking lot paving or sealing. Within bog turtle wetlands, the pilot study will attempt to characterize the temporal and spatial distribution of these and any other priority contaminants identified by the agencies. The agencies will consider working with college/graduate students to assist with a literature review. Contingent on securing funding, the agencies will aim to complete the pilot study, including a preliminary ecological risk assessment to bog turtle adults, eggs, habitat quality and quantity, and food resources, within 5 years of the PBO.

d. Based on the results of the wooden structure inventory (b) and pilot contaminant study (c), NJDOT will seek funding for a larger study of road-associated contaminant impacts to bog turtle habitat, as appropriate and in coordination with the Service and ENSP.

e. The NJDOT, the Service, and ENSP will work cooperatively to prepare an assessment of best available information regarding BMPs to abate environmental contaminants in freshwater wetlands stemming from the presence, routine maintenance, winter maintenance (*e.g.*, deicing), and operation of the road network. Service staff will take the lead in conducting a literature review. The assessment will look at contamination stemming from deicing materials; road paving and sealing materials; road runoff (*e.g.*, nutrients, oils, particulates); and contaminants coming directly from vehicles (*e.g.*, tailpipe emissions, vehicle fluids, dust such as from brake pads). The agencies will aim to complete the assessment within 1 year of the PBO. Based on the results of the assessment, NJDOT, ENSP and the Service will evaluate if any BMPs can be implemented across the programmatic action area, or at least in limited areas or on a trial basis. Based on the assessment, which will be updated periodically as possible, the agencies will discuss appropriate revisions of CM 7 at each annual meeting (see CM 26). Examples of BMPs might include, but not be limited to, the use of alternative or least-impact deicing materials near bog turtle habitat, alternative materials such as seal coats, avoiding use of creosote or CCA-treated lumber in bog turtle wetlands, and implementation of vegetated or mechanical filtration systems between roadways and habitat.

24. Compensatory Mitigation

The NJDOT has committed to work with the Service, the ENSP, and DLUR to develop and refine a compensatory mitigation plan, including the development of a bog turtle In-Lieu Fee (ILF) Program Mitigation Instrument. A preliminary mitigation framework, Appendix C, will guide development of the plan. The final mitigation plan will reflect NJDOT's conservation goal for this consultation, which is to offset adverse impacts to the bog turtle and promote the recovery of the species. Within 3 months of issuance of this PBO, the NJDOT, the Service, and the NJDEP will discuss next steps in developing the mitigation plan. The agencies' shared goal is

to have a plan approved and a functional instrument/program in place within 24 months of the date of this PBO.

25. Training

The Service, NJDOT, ENSP and DLUR will develop an outreach initiative to be presented to each of the three NJDOT regions (North, Central, and South), with emphasis on educating NJDOT Operations/Maintenance staff on the life stages of the bog turtle, habitat and other resource needs, threats, and recovery goals. The initiative will include ways to improve coordination, implement emergency procedures and protocols, and describe BMPs and CMs that will further the recovery of the species.

Training materials will include:

- Outreach Workshop Education Curriculum
    - Bog turtle fact sheets and turtle identification guide.
- User's Guide (Appendix A to this PBO)

Training will include:

- Three Outreach Workshops by region in New Jersey (North, Central, and South)
    - Up to 3 hours of presentation material and/or interactive scenarios using programmatic tools and resources.
    - Up to 3 hours of field training including habitat identification and suitability assessment, and turtle survey techniques.
    - Training needs will vary across different NJDOT staff. Workshops will be structured to recognize different training needs while making efficient use of the trainers' time. All staff will receive training on basic bog turtle biology, threats, and legal protections.
        - Environmental staff will need in-depth training on the CMs, User's Guide, and PBO procedures. (For these staff, web-based training may be offered instead of, or in addition to, the in-person Workshops.)
        - Staff seeking to become Certified NJDOT Bog Turtle Technicians will need extensive training on identifying habitat. (For these staff, additional field days will be scheduled beyond the workshops.)
        - Operations/maintenance and construction personnel will need basic training on both the CMs and bog turtle habitat.
    - Additional and supplemental field opportunities will be available on an annual basis during the bog turtle field season from April to June.

Delivery schedule: Within 6 months of the completion of this PBO, the Outreach Workshop presentation and curriculum materials will be prepared and scheduling for the sessions will begin. Field Workshops will be scheduled for spring 2020.

26. Coordination and Adaptive Management

Throughout this PBO, the NJDOT, the Service, and the NJDEP make various commitments to ongoing inter-agency coordination, and to updating this consultation as new information becomes available. The overall nature and level of adverse effects described in this PBO will not

be exceeded. Likewise, the amount of incidental take authorized in this PBO, and in any subsequent Tier 2 consultations, will not be exceeded. However, the specifics of the CMs may be adjusted if the agencies (with Service concurrence) determine, based on new data or new reviews of existing data, that modified or alternative practices can: (a) reduce adverse effects to bog turtles; (b) improve the effectiveness or efficiency of road-related activities without increasing adverse effects to bog turtles; or (c) both. In addition, the User's Guide may be revised to improve the efficiency of project review and agency communication. The agencies' various commitments to coordination and adaptive management are summarized here for convenience.

- *User's Guide, Appendix A, Note 4 on the Matrix and Conservation Measures*: The Service, NJDOT, and NJDFW will meet annually to update GIS mapping tools and to review PBO implementation, and will also periodically, as needed, issue addenda to the PBO to update or adjust CMs and/or activity descriptions based on lessons learned, new information, and/or new NJDOT practices. The Service and NJDOT will ensure that CM interpretation and any addenda are consistent with the jeopardy analysis included in the PBO (*i.e.*, the nature and severity of effects evaluated in the PBO will not be exceeded).

- *User's Guide, Appendix A, Project Review Procedures Step 9*: For the first 6 months following completion of this PBO, the NJDOT will forward Bog Turtle Project Worksheets to the Service via email for projects where the Effects Matrix does NOT indicate Service review is required and where all applicable CMs will be fully implemented as written. Worksheets for such projects will be emailed (for the first 6 months) to NJFO_ProjectReview@fws.gov with the subject line "NJDOT Transition Period notification for [Project Name]." Specific to this category of projects, if the Service does not reply within 10 days, NJDOT can presume concurrence and proceed with the project. This transition period is to ensure that both agencies have a consistent understanding of how the CMs and review procedures should be implemented. After the first 6 months, the NJDOT and the Service will revisit the protocols to determine if notifications for this category of project can be stopped.

- *User's Guide, Appendix A, Project Review Procedures Steps 9 and 10*: If the applicable cells of the Effects Matrix indicate that Service review is required, NJDOT will submit the project for Tier 2 consultation. The NJDOT will also submit for Tier 2 consultation any project for which any applicable CM(s) cannot be fully implemented as written, unless the Service has already advised (under Step 8) that Tier 2 review is not needed. The NJDOT will also submit for Tier 2 consultation any activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit. The NJDOT will coordinate with the Service to complete Tier 2 consultation when necessary.

- *CM 12b*: ENSP will develop and maintain a list, and NJDOT will permanently mark on the ground, areas with a mowing restriction.

- *CM 23a (paraphrased)*: The Service will work with other agencies to integrate consideration of bog turtles into relevant inter-agency spill response plans.

- *CM 23b (paraphrased)*: Based on the results of efforts to inventory wooden structures in bog turtle wetlands, over the next 2 to 5 years, NJDOT, ENSP, and the Service will revisit the issue of potential contaminant leaching from treated lumber and discuss if further study and/or corrective action are warranted.

- *CM 23c (paraphrased)*: Within 6 months of the PBO, NJDOT will meet with ENSP and the Service to discuss the design, initiation, and funding options for a pilot study to look at post-construction contaminant impacts of the road network on bog turtle wetlands. Contingent on securing funding, the agencies will aim to complete the pilot study within 5 years of the PBO.

- *CM 23d (paraphrased)*: Based on the results of other efforts, NJDOT will seek funding for a larger study of road-associated contaminant impacts to bog turtle habitat, as appropriate and in coordination with the Service and ENSP.

- *CM 23e (paraphrased)*: The agencies will aim to complete an assessment of best available information regarding BMPs to abate environmental contaminants stemming from the road network within 1 year of the PBO. Based on the results of the assessment, NJDOT, ENSP and the Service will evaluate if any BMPs can be implemented. Based on the assessment, which will be updated periodically as possible, the agencies will discuss appropriate revisions of CM 7 at each annual meeting.

- *CM 24 (paraphrased)*: Within 3 months of issuance of this PBO, the NJDOT, the Service, and the NJDEP will discuss next steps in developing the mitigation plan. The agencies' shared goal is to have a plan approved and a functional program in place within 24 months of the date of this PBO.

- *CM 25 (paraphrased)*: Within 6 months of the completion of this PBO, the Outreach Workshop presentation and curriculum materials will be prepared and scheduling for the sessions will begin. Field Workshops will be scheduled for spring 2020.

ACTION AREA

The action area is defined by ESA regulations (50 CFR 402.02) as, "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The Service has determined that the action area for this programmatic consultation includes all known, potential, aquatic corridor, and upland bog turtle habitat in New Jersey. See the glossary (Appendix E) for definitions of these terms. During the Tier 2 consultation process, a project-specific footprint will be delineated by NJDOT for each action proposed under this PBO. Likely effects extending beyond the actual footprint (*i.e.*, the project-level action area) have been factored into the Effects Matrix. Thus, the full action area of each project does not need to be delineated, only the project footprint. See User's Guide (Appendix A).

Figure 1 shows the programmatic action area as currently mapped. The definition of the programmatic action area will not change over the life of the PBO. However, mapping to depict the programmatic action area (as shown in Figure 1) is subject to revision as new information

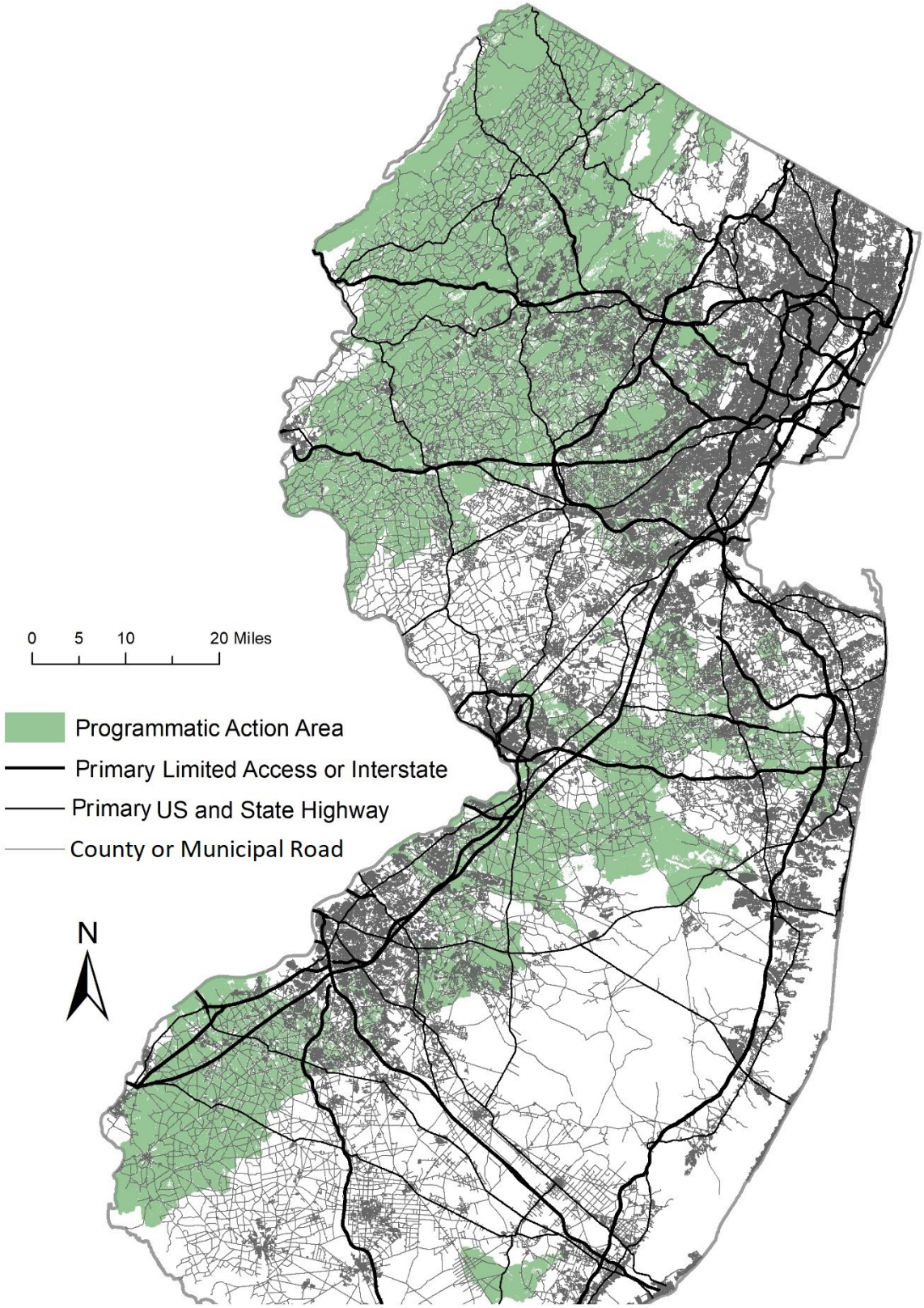

Figure 2. Programmatic Action Area and New Jersey Road Network

becomes available about the range of the bog turtle in New Jersey. As depicted in Figure 1, the programmatic action area includes all currently known and mapped bog turtle habitat in New Jersey. As of the date of this PBO, the State's Landscape Project has mapped about 53,505 acres of bog turtle habitat[12] in New Jersey, of which about 25,812 acres are classified as wetland. In addition to known (mapped) bog turtle habitat, the programmatic action area also includes areas of undeveloped uplands within the watersheds that support bog turtles, because bog turtle wetlands are sensitive to the levels of development in the surrounding drainage basin (Service 2001). The programmatic action area covers parts of every county in New Jersey except Bergen, Hudson, Cumberland, and Cape May. Figure 2 shows the current delineation of the programmatic action area relative to New Jersey's road network.

STATUS OF THE SPECIES

Biology and Habitat

Regulations implementing Section 7 of the ESA (50 CFR 402.14(g)(2)), direct the Service to "evaluate the current status of the listed species . . ." One of North America's smallest turtles, the bog turtle occurs from New York to Georgia (Service 2001). The discrete northern population (occurring in New York, New Jersey, Pennsylvania, Delaware, and Maryland) is listed as threatened under the ESA, while the southern population is listed only for similarity of appearance (Service 1997). No critical habitat has been designated for the bog turtle under the ESA. Bog turtles usually occur in small, discrete populations occupying suitable wetland habitat dispersed along a watershed. These wetlands are a mosaic of micro-habitats that include dry pockets, saturated areas, and areas that are periodically flooded. The turtles depend upon this diversity of micro-habitats for foraging, nesting, basking, hibernation, [13] shelter, and other needs (Service 2001). A summary of the bog turtle's resource needs is provided in Appendix D.

Bog turtles inhabit a variety of wetland types throughout their range, but generally occur in small, open-canopy, herbaceous sedge meadows and fens bordered by more thickly vegetated and wooded areas. Seepage-fed or spring-fed emergent wetlands associated with streams are the primary habitat. Often occurring at or near the headwaters of streams or small tributaries, these primary habitats are used by bog turtles for nesting, basking, and foraging. These habitats are characterized by native sedges, grasses, forbs, scattered shrubs, and by perennially saturated mucky soils. Pedestal vegetation, such as tussock sedge (*Carex stricta*) and *Sphagnum* moss, is important for nesting and basking (Service 2001, Zappalorti *et al.* 2015). Bog turtle habitats often feature subsurface water flow and typically contain rivulets or watery trails created by naturally flowing water or by wildlife (Service 2001). Bog turtles feed on a varied diet including insects, slugs, earthworms, other invertebrates, moss, other plants, frogs, and carrion (Service 2001, Melendez 2017). Although bog turtles are dependent on suitable open-canopy wetlands for many of their life history functions, they also utilize more densely vegetated areas for hibernation. Hibernation sites are often associated with woody roots, and can include shrubby

[12] Based on documented bog turtle observations since 1980.

[13] The term hibernation is used throughout this document. However, many biologists reserve the term hibernation to mean a period of winter dormancy in mammals, and use the term brumation for a similar phenomenon in reptiles. Among the minor difference between hibernation and brumation recognized by various authors is the fact that brumating reptiles may periodically "wake" to drink.

hummocks, spring-fed rivulets, wildlife (*e.g.*, muskrat, vole) burrows, and sedge clumps (Service 2001, Smith and Cherry 2016).

Bog turtles inhabit sub-climax seral wetland stages and are dependent on riparian systems that are unfragmented and sufficiently dynamic to allow the natural creation of meadows and open habitat to compensate for the closing-over of habitats caused by ecological succession (Service 2001). Kiviat (1978) reported that bog turtles were able to disperse between habitat patches of changing vegetation within a long-term, stable, wetland complex. He found that beaver, deer, and cattle may be instrumental in maintaining the open-canopy wetlands essential for this species' survival. Unless disrupted by fire, beaver (*Castor canadensis*) activity, grazing, or periodic wet years, open-canopy wetlands are slowly invaded by woody vegetation and undergo a transition into closed-canopy, wooded swamplands that are unsuitable for bog turtles. Historically, bog turtles probably moved from one open-canopy wetland patch to another, as succession closed wetland canopies in some areas and natural processes (*e.g.*, beaver activity, fire, seasonal flooding) opened canopies in other areas.

The continued existence of suitable habitat mosaics, as well as the ecological connections between these areas, are required to maintain bog turtle populations. As discussed above, bog turtles require dispersal habitat (*i.e.*, connections between core wetlands) to respond to changing wetland conditions (*e.g.*, vegetative succession, habitat degradation). Dispersal movements are also necessary to escape other unfavorable conditions in the natal habitat (*e.g.*, high predation or competition), to facilitate genetic exchange, and to colonize new areas (Croteau 2010). Bog turtles may be incidentally found in a wide variety of habitats when making relatively long-distance movements (Service 2001). Because clusters of core bog turtle wetlands are often found within a single watershed, stream corridors are thought to be important for dispersal, and there is some direct evidence from the southern population that bog turtles use stream corridors for dispersal. However, there are also documented instances of bog turtles moving long distances across upland habitats, including deciduous and coniferous forests, agricultural lands, and developed areas, as well as records of bog turtles found on roads far from wetlands or streams (Travis *et al.* 2018).

Status and Threats

The primary threats to the survival of the bog turtle include the continued loss, alteration, and fragmentation of its highly specialized wetland habitat; suppression of the ecological systems and processes that sustain these habitats; and the loss of long-lived adult turtles from wild populations for a lucrative, illegal wildlife trade. Habitat fragmentation exposes remaining habitat patches to invasive vegetation and hydrologic impairment and limits connectivity between patches. Fragmentation also exposes adult turtles to an elevated risk of incidental mortality including being crushed on roads, as well as increased exposure to predation, collection, and pathogens (Service 2001).[14] The New York Natural Heritage Program rated the bog turtle as extremely vulnerable (*i.e.*, the highest vulnerability category) to the effects of climate change, due to dispersal barriers and their aquatic nature (Schlesinger *et al.* 2011).

[14] Additional information on bog turtle life history, population dynamics, threats, and conservation needs can be found online at: https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=C048

Resiliency, Redundancy and Representation

To assess the current status of a species, it is helpful to understand the species' conservation needs, which are generally described in terms of reproduction, numbers, and distribution (RND). Table 1 provides information on bog turtle populations in the northern range, summarizing our current understanding of RND. The Service frequently characterizes RND for a given species via the conservation principles of resiliency[15] (ability of species/populations to withstand stochastic events, which is measured in metrics such as numbers, growth rates), redundancy (ability of a species to withstand catastrophic events, which is measured in metrics such as number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions which may include behavioral, morphological, genetic, geographic, or other variation). Resiliency, redundancy, and representation are collectively known as the "three Rs."

Since the time of listing, increased survey efforts have detected new bog turtle sites, and habitat management has resulted in the restoration and expansion of suitable core habitats across the northern population. As of 1996, just prior to listing, bog turtles were known from 191 wetlands in 7 States in the northern part of the species range. At the time of the recovery plan (2001), that number had grown to 350 wetlands in the same 7 States. As of 2018, bog turtles were known from 500 wetlands in those same 7 States (Table 1).

With regard to resiliency, extant populations in many locations are highly fragmented due to encroachment of residential and commercial development and transportation infrastructure, which cumulatively eliminate connecting corridors to other bog turtle wetlands. Many habitats are also degraded by vegetative succession, hydrologic changes, and invasive plant species. These populations are considered to have reduced resiliency. Conversely, resiliency at certain bog turtle sites is improving due to substantial restoration efforts to improve vegetative conditions, hydrology, and connectivity among sites. See Table 1 for an overview of bog turtle site conditions, which are measures of resiliency.

With regard to redundancy, loss of populations in western Pennsylvania and northern New York represented reduced redundancy across the range prior to listing. Since listing, however, the density of known bog turtle sites within several geographic areas has increased, largely due to increased survey effort. The overall larger number of known core habitats since listing represents increased redundancy in some parts of the northern population. However, other bog turtle habitats that were active (extant) at the time of listing are now historic or will soon become historic absent any new turtle sightings. These population losses represent reduced redundancy within particular recovery units or watersheds. We note that there have been changes in how populations are mapped and defined. In the recovery plan, biologists followed a Population Analysis Site procedure to define sites and populations, while more recently, biologists have re-mapped extant core habitats guided by collaboration through the federally funded Multistate Recovery Actions for the Bog Turtle and Associated Headwater Wetland Species of Greatest Conservation Need grant. Due to this change in mapping methodology, we cannot compare

[15] The NJDOT and FHWA use the term "resilience" to mean "the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to and recover rapidly from disruptions (manmade or natural)." As used by NJDOT and FHWA, "resilience" is similar to the meaning of that term in the context of the 3Rs, but refers to roadways and other transportation infrastructure instead of biological populations.

Table 1. Bog turtle extant wetland population summary by recovery unit 1988 to 2018 (Erb 2019). Shaded recovery units are partially or entirely in New Jersey.

Recovery Unit	Number of Extant Populations (1)	Number of Extant Populations by Recruitment Condition (2)	Number of Extant Populations by Viability Condition (3)	Number of Extant Populations with Habitat Management (4)	2001 Recovery Target (Number of Secured Sites)
Delaware	219 (NJ=89)	Good: 49 (NJ=10) Fair: 29 (NJ=14) Poor: 141 (NJ=65)	Good: 21 (NJ=7) Fair: 48 (NJ=17) Poor: 150 (NJ=65)	61	80
Hudson-Housatonic	127 (NJ=67)	Good: 31 (NJ=16) Fair: 27 (NJ=11) Poor: 69 (NJ=40)	Good: 30 (NJ=17) Fair: 30 (NJ=14) Poor: 67 (NJ=36)	27	40
Outer Coastal Plain	4 (NJ=4)	Good: 0 (NJ=0) Fair: 0 (NJ=0) Poor: 4 (NJ=4)	Good: 0 (NJ=0) Fair: 0 (NJ=0) Poor: 4 (NJ=4)	0	5
Prairie Peninsula-Lake Plain	5 (NJ=0)	Good: 2 (NJ=0) Fair: 1 (NJ=0) Poor: 2 (NJ=0)	Good: 3 (NJ=0) Fair: 2 (NJ=0) Poor: 0 (NJ=0)	4	10
Susquehanna-Potomac	145 (NJ=0)	Good: 55 (NJ=0) Fair: 16 (NJ=0) Poor: 74 (NJ=0)	Good: 24 (NJ=0) Fair: 53 (NJ=0) Poor: 68 (NJ=0)	46	50
Total	**500 (NJ=160)**	**Good: 137 (NJ=26)** **Fair: 73 (NJ=25)** **Poor: 290 (NJ=109)**	**Good: 78 (NJ=24)** **Fair: 133 (NJ=31)** **Poor: 289 (NJ=105)**	**138**	**185**

(1) The number of secured sites, as defined in the recovery plan, is not known at this time.
(2) Per the ranking methodology, "good" means that a population is known to have recruitment. "Fair" means that reproduction is unknown for a population. "Poor" indicates that the population is not reproducing and is not viable without intervention.
(3) Per the ranking methodology, "good" means that a population is thought to be viable based on current knowledge of the population and habitat condition, and assuming that at least 16 individuals can maintain a population. "Fair" indicates that a population may be viable. "Poor" means that a population is not likely to be viable without intervention.
(4) Habitat management is a tool used to help achieve viability at a site by enhancing or restoring suitable habitat (*e.g.*, removing invasive species and/or woody vegetation) for bog turtles.

between population numbers in the recovery plan versus current regional conservation plans (*i.e.*, we cannot directly compare the delisting criteria in the recovery plan, listed below, with the numbers in Table 1).

With regard to representation, there were range reductions prior to listing, with populations lost from western Pennsylvania and northern New York. These range reductions potentially reduced representation, possibly including the loss of genetic variation. In some recovery units and watersheds, the lack of new turtle observations from isolated populations might further reduce representation if more sites become extirpated. There is the potential for substantially reduced representation in the Outer Coastal Plain recovery unit in New Jersey if older, extant populations do not produce new observations in the next few years, and if no additional, new populations are discovered.

Delisting Criteria

To address RND and the three Rs, the Service has developed a recovery program that seeks to abate the primary threats and maintain healthy populations across multiple recovery units. The Service developed five recovery units to ensure long-term survival of the species across a range of habitats and to maintain genetic variation (Figure 3). Recovery units are management subsets of a listed species that are created to establish recovery goals or carry out management actions. The recovery plan outlines the following four criteria as targets for delisting:

1. Long-range protection is secured for at least 185 populations distributed among five recovery units: Prairie Peninsula/Lake Plain Recovery Unit (10 populations), Outer Coastal Plain Recovery Unit (5 populations), Hudson/Housatonic Recovery Unit (40 populations), Susquehanna/Potomac Recovery Unit (50 populations), and Delaware Recovery Unit (80 populations);

2. Monitoring at 5-year intervals over a 25-year period shows that these 185 populations are stable or increasing;

3. Illicit collection and trade no longer constitute a threat to this species' survival; and

4. Long-term habitat dynamics, at all relevant scales, are sufficiently understood to monitor and manage threats to both habitats and turtles, including succession, invasive wetland plants, hydrology, and predation.

Substantial progress has been made toward bog turtle recovery, but the delisting criteria are not yet met. A forthcoming Bog Turtle Conservation Plan for the Northern Population will provide detailed information to help the Service assess progress toward the delisting targets, and perhaps update those targets as appropriate. Criteria #1, 2, and 4: Work is being completed and analyzed through the federally funded Multistate Recovery Actions for the Bog Turtle and Associated Headwater Wetland Species of Greatest Conservation Need grant (which will result in the northern population Bog Turtle Conservation Plan). Regional collaboration under the grant has provided structure to standardize population monitoring across States and between years to facilitate review of criteria goals. Standardized habitat monitoring has been implemented to better understand long-term habitat dynamics. Research on long-term habitat dynamics has

proceeded since the recovery plan, and threats are being actively managed at many sites. The plan will provide summaries and statistics on population and habitat monitoring progress in addition to 2001 recovery plan targets. Available data have been synthesized to assess extant populations by recovery unit; see Table 1. The permanent protection of bog turtle core habitats remains a priority. Criterion 3: Illegal collection remains a threat to bog turtle populations; see Cumulative Effects, below.

The Consultation Handbook (Service and NMFS 1998) states that, when the Service's review in a BO focuses on the effects of the action on a discrete recovery unit, the species status section of the BO is to describe the status of that unit and its significance to the species as listed. New Jersey has three bog turtle recovery units: Hudson/Housatonic, Delaware, and Outer Coastal Plain. There are large numbers of extant populations in New Jersey relative to the total number of extant populations in the northern population. New Jersey supports 53 percent of the populations in the Hudson/Housatonic, 40 percent of those in the Delaware, and 100 percent of the Outer Coastal Plain populations (Table 1). Improving and maintaining the resiliency and redundancy of New Jersey populations across all three recovery units is imperative to meeting range-wide recovery goals. As the Outer Coastal Plain recovery unit is entirely within New Jersey, and because population numbers remain quite small in this area, special attention is needed to understand and prioritize the needs of this recovery unit.

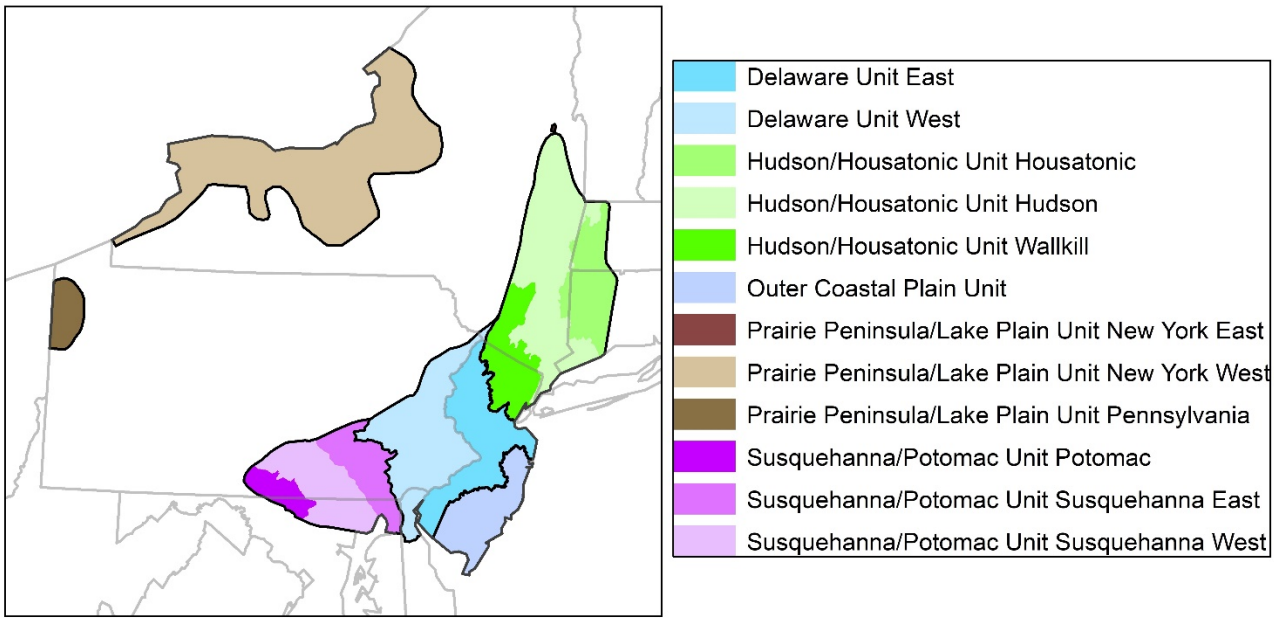

Figure 3. Bog Turtle Recovery Units and Subunits

Recovery units are outlined in black, while subunits are color-coded as shown in the map legend. The colored polygons correspond to ecoregions and overestimate the current range of the bog turtle.

ENVIRONMENTAL BASELINE

In the context of consultations under Section 7 of the ESA, the environmental baseline is the past and present impacts of all Federal, State, or private actions and other human activities in an action area, the anticipated impacts of all proposed Federal projects in an action area that have

already undergone Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process (50 CFR 402.02). In determining whether a proposed action is likely to jeopardize the continued existence of a species, the action is viewed against the aggregate effects of everything that has led to the species' current status and those non-Federal actions likely to affect the species in the future.

Status of the Species in the Action Area

New Jersey includes parts of the Hudson/Housatonic and Delaware bog turtle Recovery Units, and contains the entirety of the Outer Coastal Plains Recovery Unit (Figure 3). Historically, bog turtle populations occurred in 18 of New Jersey's 21 counties. Today, extant bog turtle occurrences (1988 to 2018) exist in ten counties in New Jersey: Atlantic, Burlington, Gloucester, Hunterdon, Mercer, Monmouth, Morris, Salem, Sussex, and Warren (NJDFW 2018). New Jersey supports 160 extant populations (see Table 1), the second largest number of extant populations of any State in the northern part of the range behind Pennsylvania (Erb 2019). The ENSP has estimated these 160 core habitats support a population of 1,500 individual turtles (NJDFW 2018). Approximately one-third of New Jersey's extant populations are believed to exhibit some recruitment and have good or fair viability condition (Table 1).

Factors Affecting the Species' Environment within the Action Area

Outright loss and alteration of the bog turtle's highly specialized wetland habitat, as well as the ecological systems that sustain these habitats, are considered the most significant threats to this species (Service 2001). New Jersey is the most densely populated State in the United States (New Jersey Department of Environmental Protection [NJDEP] 2017), and has the highest percentage of urbanized land area of any State (Lathrop *et al.* 2016). As of 2012, over 31 percent of New Jersey's 5 million acres were urbanized, surpassing any other land-use type in total number of acres (Lathrop *et al.* 2016).

With existing regulatory mechanisms in New Jersey, direct development or modification of occupied bog turtle habitat is now extremely uncommon in this State. However, development between 150 and 300 feet from bog turtle wetlands is commonplace, and the cumulative, indirect effects of such development pose a significant threat to the viability of bog turtle populations in the State. The increase in developed land in New Jersey has disrupted the hydrology that supports bog turtle wetlands. Increasing levels of impervious surface and soil compaction, which result from development, increase the magnitude and duration of flooding during storm events and decrease groundwater recharge that sustains the wetlands during dry periods (Wright *et al.* 2006). Impervious surfaces, such as roadways, parking lots, and rooftops, also carry pollutants such as surfactants, petroleum products, and sediments, thereby affecting not only the quantity but also the quality of hydrologic inputs (Wright *et al.* 2006). Despite reductions in pollution realized due to the implementation of effective stormwater management BMPs and other State regulations and programs, pollutants are still part of the baseline condition of many of New Jersey's watersheds, including areas that support bog turtles. Analysis shows a correlation between biological impairment of New Jersey's streams and anthropogenic factors such as land use, total urban land, total upstream wastewater flow, increase in impervious surface, and decrease in forests and wetlands in the drainage basin (NJDEP 2017).

Residential and commercial development typically go hand-in-hand with expansion of transportation infrastructure (NJDOT and NJ Transit 2008, NJDOT *et al.* 2011). Land-use analysis suggests that the entire State of New Jersey may be approaching full build-out (Hasse and Lathrop 2001). Similarly, various lines of evidence suggest that New Jersey's roadway network is already largely built out. New Jersey has the highest road density of any State (National Research Council [NRC] 2005), and the State has the most heavily traveled roads in the Northeast corridor (NJDOT *et al.* 2011). The NJDOT and NJ Transit (2008) characterized the State's highway system as "mature and well-developed." New Jersey's Capital Investment Strategy for Fiscal Years (FY) 2009 to 2018 stated, "a reduced level of investment is expected for implementing major interchange and widening projects on the state highway system" (New Jersey Statewide Capital Investment Strategy Task Force 2008). These conclusions were reaffirmed by the FY 2012 to 2021 Capital Investment Strategy, which found that New Jersey's transportation network is "extensive and well-developed" (NJDOT *et al.* 2011). The NJDOT's overall capital investment strategy is to first improve safety and maintain infrastructure assets in a state of good-repair, as well as enhance mobility in the most cost-effective manner (NJDOT *et al.* 2011). The FY 2012 to 2021 strategy noted, "NJDOT has necessarily shifted its strategic focus for congestion relief away from major capacity increases and new alignments, and instead is aggressively targeting system inefficiency and demands through bottleneck mitigation, improved system operations, and transportation demand management. These more sustainable solutions, when combined with smart land use decisions, more robust public transportation, multi-modal options and advanced technology will allow the Department to continue its congestion-fighting efforts in spite of these fiscally challenging times" (NJDOT *et al.* 2011).

The density of the road network; the volume of traffic on a road; the road's size, location, topography; and other factors have major roles in the intensity of environmental effects associated with roads (NRC 2005). Beyond outright habitat loss, the inter-related effects of development and roadways are impacting New Jersey's wildlife populations through habitat fragmentation, barriers to movement, and roadway mortality (NJDFW 2019). In addition, habitats adjacent to roadways can be impacted in a variety of ways. The "road-effect zone" is the distance from a stretch of road inwhich ecological effects can be detected. Biodiversity along roads typically differs from that in the surrounding landscape. The roadside between the paved road and prevailing land cover often has lower productivity and different species composition than the surrounding landscape. Plants along roads must survive vehicular pollution, exposure to bright sunlight, dry soils, and regular mowing. Roadside areas can facilitate the establishment of non-native plants transported by vehicles, among other mechanisms, including the clearing of land during road construction. Roadside plantings in the United States once consisted of grasses and herbs (often of European origin) known to thrive in stressful conditions. The native habitat conditions of a roadside are frequently altered, but when the surrounding landscape is developed, roadsides can include some of the last remaining habitats, especially for certain native plant species and some insects, birds, and small mammals (NRC 2005).

The indirect, cumulative effects of the road network can be substantial, for example, effects on food web components. The incremental effects of many impacts over time could be significant to resources such as wetlands or wildlife. Aquatic environments and organisms are highly sensitive to road and traffic densities (NRC 2005). The presence of roadways potentially affects wetland species in several ways including: alteration of the supporting physical habitat and chemical

environment; modification of animal behavior; increased mortality from collisions with vehicles; spread of invasive and exotic species; and increased human access and alteration (Trombulak and Frissell 2000, NRC 2005). The effects of roads on wetland diversity take about 30 to 40 years to be fully realized (NRC 2005). Wetland species diversity is negatively correlated with paved roads up to 1.25 miles away (Findlay and Houlahan 1997, NRC 2005).

Bog turtle populations are distributed across New Jersey in a disjunct manner, often with a mile or more of residential/commercial development and multiple roadways between the next closest bog turtle site. In New Jersey, approximately 59 miles of roadways border or cross an estimated 83 square miles of bog turtle habitat (Zarate, unpublished data). Several bog turtle 'core habitats' in New Jersey are bisected by roadways and, as a result, bog turtles may be using habitat less than 5 feet from a paved roadway. The farthest 'core habitat' from a roadway in New Jersey was documented to be approximately 2,500 feet (0.47 mile), but the majority of 'core habitats' occur less than 500 feet from a road (Protus, unpublished data). Stream corridors across New Jersey are generally intact, but stream crossing structures installed under roadways (*e.g.*, culverts) typically do not accommodate turtle passage. Several roadway corridors in New Jersey proximate to bog turtle habitat experience heavy traffic volumes and high-speed vehicle traffic, making the roads functional barriers to bog turtle dispersal. Bog turtle populations in New Jersey periodically lose individuals due to road strikes while individuals are moving between habitats. For example, at one particular New Jersey bog turtle site, five percent of the known bog turtle population inhabiting the wetland adjacent to a road was known to be struck and killed by vehicles over a 5-year period (Zarate pers. comm. 2018). As with many long-lived species, loss of just a few individuals can have adverse impacts on the viability of a turtle population (Congdon *et al.*1994, Gibbs and Shriver 2002).

Habitat fragmentation also negatively impacts many bog turtle populations in New Jersey by creating "edge effects." Suburban and edge environments are preferred by many animals that prey on bog turtle eggs, young, and adults. Invasive plant species are also a common feature of disturbed, edge environments and often become a persistent problem in nearby bog turtle habitats. Fast-growing invasives tend to compound the issue of natural woody vegetation succession at many bog turtle sites and typically require management intervention by natural resource agencies to maintain or restore habitat suitability.

The other major range-wide threat to bog turtle populations, illegal collection (Service 2001), also affects the status of the bog turtle within the Programmatic Action area. Illegal collection can be worsened by roads that provide human access to habitats (Attum *et al.* 2008). As discussed above, most of New Jersey's bog turtle sites are in close proximity to a road, and loss of even a few individual bog turtles can impact the viability of a local population due to the demographics of this species (Gibbs and Shriver 2002).

Many of the baseline factors affecting the bog turtle in New Jersey, discussed above, are also expected to be perpetuated as indirect effects of the continued maintenance and operation of the State's road network, and are therefore discussed in more detail below, under Effects of the Action.

EFFECTS OF THE ACTION

Roadway projects can result in a range of adverse effects to bog turtles, chiefly direct mortality and habitat loss/degradation, but also including exposure to pathogens and environmental contaminants and reduced habitat connectivity. Several indirect effects to bog turtles can also occur as a result of the continued operation/utilization of the road network, which would not occur "but for" the ongoing maintenance of that network by means of the routine activities described in this PBO. As discussed below and shown in Table 2, many of the potential adverse effects to bog turtles from the operation, maintenance, improvement, and expansion of the road network are entirely avoided, substantially reduced, or largely offset by the framework of CMs. Implementation of the CMs is central to the activity-level determinations shown in the Effects Matrix (Appendix B), and to the Service's jeopardy analysis. Several CMs also include opportunistically improving bog turtle habitat conditions and/or connectivity; thus, some activities carried out under this PBO may result in beneficial effects to this species.

The NJDOT, ENSP, and the Service have worked cooperatively to develop a list of over 150 specific road-related activities carried out or overseen by NJDOT. The agencies worked together to: assess likely effects of each activity on the bog turtle, apply appropriate CMs from the above list, determine when Service review should be conducted, and make determinations (NE, NLAA, or LAA) for each activity considering the distance to bog turtle habitat. This information is given in Appendix B, Effects Matrix. A User's Guide (Appendix A) explains how to use the CM list and the Effects Matrix to conduct project reviews. In the following effects analysis, including the Effects Table (Table 2), we do not attempt to address any of the individual activity types listed in the Effects Matrix. Instead, we present a generalized overview of likely effects to bog turtles from all road activities covered by this PBO over the next 20 years.

Direct Effects

Direct effects to species can include trapping, handling, injury, mortality, or removal of individuals.

Injury and Mortality

People may need to access bog turtle wetlands on foot or via vehicle for a variety of purposes related to road projects, such as physical and biological surveys, project planning/design, maintenance of roadway infrastructure, and during construction.

People walking through the wetland portion of bog turtle habitat may crush nests. The CMs (12, 13a, 13h) are expected to minimize this risk. However, over the 20-year life of the PBO, we expect one nest may be damaged or destroyed by a person walking through a wetland for purposes related to a roadway project. Juvenile and adult turtles are unlikely to be injured by foot traffic, as they can move out of the way or, if stepped on, would likely get pushed into the mucky substrate rather than suffer an injury. We do not expect any physical injury to any bog turtle life stage as a result of road-related human foot traffic in upland or developed areas because nests do not occur in such areas, older life stages spend limited time in these areas, and humans would likely avoid stepping on any juvenile/adult turtles. It is possible for a nest or turtle to be injured or killed in the course of vegetation removal. For example, a nest could be destroyed when

removing a tussock or a hibernating turtle could be pulled out along with a woody root mass. Based on CMs 6 and 13, we do not expect this to occur.

Use of vehicles or motorized construction equipment in wetlands can crush nests and can injure or kill hatchling, juvenile, or adult bog turtles. Because the CMs for vehicle use in the wetland portion of bog turtle habitat (13g and 14a) require extreme caution, we do not expect any bog turtle life stages to be injured or killed from vehicle use in wetlands. Based on CM 17, we do not expect any turtles to be run over in undeveloped uplands. However, CM 17 does not apply to vehicle use within existing areas of pavement or other developed areas. Transient turtles in such areas are already exposed to baseline levels of vehicle traffic, which can and sometimes does result in bog turtle road mortality (Service 2001, Zarate pers. comm. 2018). Due to the sheer volume and extent of normal traffic, bog turtles are far less likely to get run over by a construction vehicle than by ordinary (non-construction) vehicles. However, the likelihood that a construction vehicle will hit a turtle over the 20-year life of this PBO is not discountable, based on the proximity of most bog turtle habitats to one or more roads, as discussed above. Therefore, the jeopardy analysis assumes one adult turtle mortality due to the operation of a construction vehicle in a roadway or other developed area.

Some level of bog turtle mortality on roads from the ongoing use of the road network (*e.g.*, turtles hit by vehicles not related to any roadway project) is expected to continue. Modeling by Gibbs and Shriver (2002) found that road networks typical of the northeastern States have the potential to limit populations of semi-aquatic turtles. Long-term demographic studies indicate that as little as 2 to 3 percent additive annual mortality likely exceeds the level most turtle species can absorb and still maintain positive population growth rates. Based on this threshold and the road mortality modeling, areas with more than 1 kilometer of roads per square kilometer and traffic volumes over 100 vehicles per lane per day – conditions that characterize much of the eastern United States – are expected to contribute excessively to adult mortality rates of semi-aquatic turtles. Based on road and traffic density, turtle populations in the northeast might lose more than 5 percent of individuals annually. The demographic traits and mobility of some turtles may imperil population persistence within road networks typical of the northeast (Gibbs and Shriver 2002). Relative to other semi-aquatic turtles, road mortality risk may be less for bog turtles because of their reluctance to leave core habitats, but is still one of the greatest risks for dispersing bog turtles (Travis *et al.* 2018).

It is impossible to distinguish the incremental contribution of activities covered by this PBO to ongoing road mortality (*i.e.*, the role of PBO-covered projects in enabling the continued operation of the road network), versus the environmental baseline conditions that are the result of past actions and versus the future cumulative effects from non-Federal actions. We expect rates of road mortality to remain approximately stable over the next 20 years. Increasing traffic volumes, along with certain activities covered by this PBO (*e.g.*, widening, new roads) (NJDOT and NJ Transit 2008), may increase road mortality in some areas. However, more awareness of bog turtles during project design, as well as proactive efforts to improve connectivity and turtle passage (stemming from CMs 20 and 24, as well as State regulations and conservation initiatives like the new *Connecting Habitat Across New Jersey* project (NJDFW 2019)) are likely to reduce road mortality rates in other areas.

Capture, Handling, and Entrapping

Over the life of this PBO, bog turtles will likely be captured and handled, for example in the course of carrying out CMs (13g, 17, 22) and Phase 2 and 3 surveys. No healthy animals will be removed from the wild, and CM 22 provides for minimal and appropriate handling and relocation of turtles away from construction areas. Across the programmatic action area, we expect up to 2 adult turtles per year, or 40 turtles total, will be briefly detained (typically 30 minutes or less), handled, and/or relocated in connection with roadway projects. We do not anticipate any mortality or injury of these 40 turtles, or any impacts to their survival rates or reproductive success.

If fencing is not properly maintained, bog turtles may become temporarily trapped behind fences installed as part of CMs 12, 15 or 17, or for other purposes. We expect the CMs will minimize but not eliminate this risk. For example, turtles may become trapped if fencing is damaged by a storm event (during which the required daily inspections may not be possible) or by a vehicle strike, vandalism, or fallen tree limb (which could occur between the daily inspections). Further, fencing deployed for purposes other than CM 15 and 17 (including for CM 12b) is not subject to the daily inspection/maintenance requirements; however, we expect such fencing will typically be used at some distance from bog turtle habitat. Considering all these factors, we expect up to five turtles may be temporarily trapped by fencing associated with roadway projects over the life of this PBO. Based on the CMs, we expect all such turtles will be detected and relocated within 48 hours. We project that one such turtle may experience injury or death as a result of becoming trapped behind fencing, due to lack of cover, food, or water.

Based on CMs 12b, 15h, and 17, we do not expect any turtles to become entangled in fencing material (*i.e.*, fencing with holes, such as caution fence, is not to be used near habitat). Based on CM 13i, we do not expect any turtles to become trapped in open pits or holes.

Indirect Effects

Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). For this consultation, indirect effects primarily occur by way of habitat modification, which can eventually impact the ability of bog turtles to breed, feed, shelter, and disperse. Indirect effects can also occur in the form of bog turtle health impacts that occur later in time as a result of exposure to human-facilitated pathogens or environmental contaminants. Still other indirect effects may occur as a result of infrastructure changes that facilitate human access into bog turtle habitat, or that induce higher traffic volumes or secondary development.

Beneficial Effects

Most road projects today involve modifications to existing roadways (NRC 2005), and this may be particularly true in New Jersey, where the road network appears to be largely built out. The planning, operation, and maintenance of such projects often are opportunities for improving ecological conditions, and a growing body of information describes practices for improving aquatic and terrestrial habitats (NRC 2005). Through several of the CMs (*e.g.*, 3f, 18b, 20b), the NJDOT has committed to seek opportunities for improving conditions for bog turtles incidental

to the primary purpose of a roadway project. Thus, we expect that at least a few bog turtle sites will experience improved conditions as a result of activities carried out under this PBO.

Vegetation

Killing, damaging, or removing vegetation within the wetland portion of habitat can eliminate tussocks that bog turtles require for nesting and basking, and can modify or eliminate subterranean root structures that bog turtles require for hibernation (Service 2001, Zappalorti *et al.* 2015, Smith and Cherry 2016). Reduced or altered vegetation can also impact the invertebrate and plant communities that comprise the bog turtle's diet (Service 2001, Melendez 2017). Altered or reduced vegetation can also create an opportunity for woody or invasive plant species to take hold or expand, which in time often reduces the carrying capacity of the habitat due to physical and/or hydrologic changes (Service 2001, Morrow *et al*. 2001, Sirois *et al.* 2014). Killing, damaging, or removing upland vegetation adjacent to wetland habitats typically reduces the ability of those uplands to serve buffer functions. The functions of buffers include maintaining water quality and hydrologic conditions in the wetland; insulating the wetlands from invasive vegetation and human encroachment (Service 2001); and serving as cover and/or dispersal habitat for turtles (Semlitsch and Bodie 2003, Travis *et al.* 2017). We expect that CMs 1, 3, 6, and 13c and the Tier 2 consultation process will minimize but not eliminate habitat degradation stemming from vegetation removal. We expect that any unavoidable impacts from vegetation removal will be fully offset by the compensatory mitigation program (CM 24).

Herbicides are routinely used in and near wetlands for various roadway activities (see Description of Covered Activities, above). Potential effects to bog turtles from direct and indirect exposure to herbicides are considered under Environmental Contaminants, below. Effects to bog turtles from the vegetative changes resulting from herbicide use (*i.e.*, killing vegetation) were considered in the preceding paragraph.

Planting vegetation in or near the wetland portion of bog turtle habitat can reduce the capacity of the habitat to support a bog turtle population if the selected plant species are not compatible with the turtle's resource needs (see Appendix D). Habitat degradation from vegetation planting will be fully avoided by CMs 4 and 13c.

The presence of humans and equipment (both motorized and non-motorized) in and near wetlands is known to facilitate the introduction or spread of invasive vegetation (Zedler and Kercher 2004, Wright *et al.* 2006). This applies to both short-term activities, such as roadway construction and maintenance operations (Halloran *et al.* 2013), and to long-term human proximity, such as that stemming from the presence of development and the utilization of the road network (Wright *et al.* 2006, Mortensen *et al.* 2009, Zimmerman *et al.* 2014). Specific to roadways, invasion of non-native plants can occur from vehicles transporting non-native seeds into natural areas and clearing land during road construction. Both directly and indirectly, roadside areas are habitats for non-native invasive species and can serve as corridors for the expansion of non-native species (NRC 2005, Mortensen *et al.* 2009, Halloran *et al.* 2013). Invasive vegetation is a significant threat to bog turtle populations (Service 2001, Morrow *et al.* 2001, Sirois *et al.* 2014).

We expect CMs 5, 9, 10, 11, 12, 13, and 20d to reduce but not eliminate the introduction and spread of invasive vegetation along roadways. Based on the proximity of most New Jersey bog turtle sites to roadways, we conclude that roadway projects, along with continued operation/utilization of the road network, will result in some increase in invasive vegetation within bog turtle habitat over the life of this PBO. Due to both roadway projects and the ongoing operation of the road network (*i.e.*, high levels of humans and vehicles), occurrences of invasive vegetation are likely to be more common and more severe near roadways compared to more remote habitats (NRC 2005, Mortensen *et al*. 2009). However, we are unable to predict the acreage or locations of bog turtle habitats that are likely to be invaded, the severity with which habitats will be invaded, or the ability of land managers to limit or control the invasions. Further, it will rarely be possible to definitively attribute a new or expanded invasion to the road network versus other possible causes or contributing factors.

Shading from structures such as bridges can alter the vegetation of estuarine wetlands (SanClements 2003). Less is known about the potential for shading to alter freshwater wetland plant communities. Even if vegetation composition and structure remain suitable for bog turtles, shading can deter nesting, basking, and other normal activities. Nesting areas are typically open canopy, with limited closure or shade, to allow for solar exposure for the incubating eggs (Service 2001, Zappalorti *et al*. 2015). Thus, shading can directly reduce the quality and quantity of bog turtle habitat, and may possibly also cause further habitat effects by altering plant communities. We expect few new bridges or other structures likely to result in shading of bog turtle habitat will be constructed over the life of this PBO, because New Jersey's road network appears to be largely built out and because new projects face considerable regulatory and logistical hurdles and funding constraints. However, some new structures are possible, and shading may be increased if existing structures are expanded or reconfigured. We expect that adverse effects from shading will be minimized under CM 1, and that unavoidable impacts will be fully offset by the compensatory mitigation program (CM 24).

Sediment

Vegetation removal and soil disturbance are known to result in soil erosion. Construction sites can be a significant source of sediment to a wetland, particularly if adequate erosion and sediment control practices are not installed (Wright *et al.* 2006). Roadway projects disturb soils by a variety of means including grubbing, grading, and excavating. Through direct surface runoff or following conveyance suspended in streams, eroded sediments can be deposited in wetlands where they can smother vegetation, favor invasive plant species, reduce microtopographic variation, cover the mucky substrates that bog turtles require, depress or alter the prey base, and cause localized changes in hydrologic conditions (Luo *et al*. 1997, Wright *et al.* 2006). Because CMs 9, 15, and 19a require high standards of SESC in and near bog turtle habitat, we expect that any inadvertent sedimentation of bog turtle habitat due to roadway projects over the life of this PBO will be negligible. In the event of an extreme sedimentation event, it is possible for a bog turtles and/or eggs to become buried and die. Based on the CMs, we do not expect this to occur.

However, the continued maintenance and operation of the road network is expected to continue contributing to the sedimentation of bog turtle habitat. For example, many areas of existing impervious surface were constructed before the State's current set of Stormwater Management Rules, but continue to be maintained by NJDOT activities. Such areas may result in sediment-

laden runoff reaching bog turtle wetlands (Kaplan and Ayers 2002, NRC 2005, Wright *et al.* 2006). Similarly, older culverts or streambank stabilization structures, constructed under earlier, less-stringent rules but still maintained by NJDOT, may contribute to localized erosion of sediments (Vaughan 2002, Park *et al.* 2008) that ultimately reach bog turtle habitat. We are unable to predict the acreage or locations of bog turtle habitats that are likely to be impacted by sedimentation, the severity with which the habitat will be impacted, or the ability of land managers to limit or correct the problem. Further, it will rarely be possible to definitively attribute a new or expanded area of sedimentation to the road network versus other possible causes or contributing factors.

Filling a wetland (*i.e.*, placement of soil/sediment or other material, often to create upland conditions) destroys its value as bog turtle habitat (Service 2001). We expect CMs 9 and 21 will prevent unintentional wetland fills (*i.e.*, fills that are not part of an approved project). We expect few instances of intentional, authorized fill over the life of this PBO, based on CM 1, New Jersey's wetland regulatory program, and past practices (agency staff recall very few fills in bog turtle habitat being necessary for NJDOT activities over the past 15 to 20 years). However, based on the proximity of most bog turtle habitats to one or more roads, it is possible that minor encroachment involving fill may occasionally be necessary for expansion or reconfiguration of roads or associated infrastructure. We expect an average of about 0.05 acre per year of unavoidable wetland fill in bog turtle habitat, or about 1 acre over 20 years. This level of wetland fill would destroy about 0.004 percent of bog turtle wetlands in New Jersey. (As of the date of this PBO, the State's Landscape Project has mapped about 53,505 acres of bog turtle habitat in New Jersey, of which about 25,812 acres are classified as wetland.) We expect that this level of wetland fill will be spread across numerous bog turtle sites, and that no authorized fills will impact more than 5 percent (by area) of any particular bog turtle wetland.

Of course, not all habitat impacts are the same. Even a small fill in the core of a small, high-quality bog turtle wetland could substantially reduce reproductive success or depress survival of adults. Without careful planning, larger fills could risk local extirpation of a bog turtle population. We expect that, together, CM 1 and the Tier 2 consultation process will minimize the total number and total acreage of fills, and will minimize the resulting impacts of those fills on bog turtle populations. We further expect that any remaining (unavoidable) impacts will be fully offset by the compensatory mitigation program (CM 24).

Hydrology

Certain activities have the potential to result in a sudden hydrologic change within the habitat (*e.g.*, dewatering, impounding, removal of a stream/ditch/culvert blockage, stream relocation). Based on CM 18f, we do not expect any bog turtles or eggs to be injured or killed by sudden hydrologic changes.

Construction of new or expanded infrastructure in an aquatic environment, including new stormwater outfalls, generally alters hydrologic conditions. In addition, intentional hydrologic modifications of wetlands (*e.g.*, flooding, draining, ditching, tiling, excavating) and streams (*e.g.*, channelizing, diverting, stabilizing, impounding, dredging) historically degraded or destroyed many bog turtle habitats (Service 2001). Such activities are currently rare in New Jersey's bog turtle habitats, in part due to the State's wetland and other regulatory programs. Based on State

regulations; CMs 1, 18, and 19; and the Tier 2 consultation process, we expect few instances of such activities in bog turtle habitat associated with roadway activities over the life of this PBO. We expect that all direct impacts to bog turtle habitat will be minimized, that many of these impacts will be temporary, and that longer-lasting effects will be fully offset by the compensatory mitigation program (CM 24).

The hydrology of bog turtle habitats can also be impacted indirectly by development in upland portions of the watershed (Service 2001). In natural settings, very little annual rainfall is converted to runoff and about half is infiltrated into the underlying soils and water table. This infiltrated water supplies aquifers and supports adjacent surface waters during dry periods (base flow). Due mainly to soil compaction and construction of impervious surfaces, less annual rainfall is infiltrated and more volume is converted to runoff as watersheds become more developed. The shift away from infiltration reduces groundwater recharge, threatening aquifer supplies and impacting groundwater base flow to streams and wetlands, especially during periods of low rainfall (Schueler 1994, Arnold and Gibbons 1996, Kaplan and Ayers 2000, Wright *et al*. 2006, NJDEP 2019a). As impervious cover increases, surface runoff increases in volume and velocity while infiltration and soil percolation decrease. The annual volume of stormwater runoff can increase by 2 to l6 times its predevelopment level with proportional reductions in groundwater recharge (Schueler 1994, Arnold and Gibbons 1996, Kaplan and Ayers 2000, Wright *et al.* 2006). Development in the watersheds of headwater streams, and the associated higher peak stream flows, have also been strongly linked to active channel enlargement by widening of the stream banks or lowering (incising) of the streambed, leading to increased sediment production, lowering of the water table, and decreased base flows (Wright *et al.* 2006, NJDEP 2019a).

Numerous studies show that about l0 percent impervious surface in a watershed tends to be a threshold above which aquatic resources start to degrade (Schueler 1994, Arnold and Gibbons 1996, Booth and Jackson 1997, Kaplan and Ayers 2000, NJDEP 2019a), although there is disagreement whether thresholds can be applied uniformly to all watersheds (Wright *et al.* 2006). A second threshold appears to exist at around 25 to 30 percent impervious cover, above which most indicators of stream quality tend to shift to poor conditions (Kaplan and Ayers 2000). Small subwatersheds (less than 5 square miles) that support headwaters – an important habitat for bog turtles – are even more sensitive, showing adverse impacts to some aquatic resources above 2 percent impervious surface (NJDEP 2019a).

In addition to the contribution of the road network to a watershed's overall percentage of impervious surface, roads can also impact wetland hydrology by altering topographic or geologic conditions, and by constricting flows. Roads change the local physical environment by interacting with underlying topography, aspect, geology, soils, ecological conditions, and land cover. For example, new patterns of water runoff can develop as the local topography is altered, and those changed patterns can result in altered storm hydrographs, changed groundwater recharge, and increased delivery of sediments and contaminants (NRC 2005). Flow constrictions can be caused by the construction of roads or other structures across individual wetlands, or upstream or downstream of them. Perhaps the most common cause of flow constriction is when culverts are installed as a conduit to move water underneath a road. Although most culverts are

sized to carry flow up to the 100-year[16] recurrence design storm, they often lose hydraulic capacity due to sedimentation and increased peak flows from new upstream development. Undersized culverts cannot fully convey the increased flows from the watershed and create a constriction to flow that can impact the hydrology of both upstream and downstream wetlands. While much research has focused on the hydrologic impact of larger road and highway crossings, smaller, local road crossings are much more common in the urbanized landscape and may exert a stronger hydrologic impact (Wright *et al.* 2006).

Summarizing the indirect effects described above, there are several ways that development of the supporting watershed can result in hydrologic stressors within a wetland, including: increased ponding, increased water level fluctuations, flow constrictions, and decreased groundwater discharge. Each of these hydrologic stressors can impact the plant and animal communities of the wetland (Wright *et al.* 2006). Bog turtles are sensitive to such hydrologic changes, which are an important threat to this species. The hydrologic systems that maintain bog turtle habitat can be affected by changes in imperviousness extending for more than a mile from the wetland. Bog turtle habitats are sustained by groundwater regimes that are sensitive to changes in subsurface water supplies. Roads – and development more generally – may alter both the supply and quality of the water entering the turtle's habitat (Service 2001). Several studies have documented how relatively small changes in hydrology affect bog turtles and their use of wetlands (Sirois *et al.* 2014). External activities at the landscape level can greatly diminish the suitability of a wetland to support bog turtles (Service 2001).

Based on CMs 3, 18, and 19 and the Tier 2 consultation process, we expect that soil compaction and net changes in impervious surface from roadway projects will be minimized, as will resulting hydrologic impacts to bog turtle habitat. We expect that any unavoidable impacts will be fully offset by the compensatory mitigation program (CM 24). However, separate from the impacts of any particular roadway project, the continued maintenance of New Jersey's road network contributes to some level of ongoing hydrologic impairment of bog turtle habitat. For example, many areas of existing impervious surface were constructed before the State's current set of Stormwater Management Rules, but continue to be maintained by NJDOT activities. Such areas may result in high volumes of high-velocity runoff reaching bog turtle wetlands, with corresponding reductions in base flows (*i.e.*, too much water reaches the habitat during wet periods, and not enough during dry periods). We are unable to predict the acreage or locations of bog turtle habitats that are likely to be further impacted by hydrologic impairment over the next 20 years, the severity with which the habitat will be impacted, or the ability of land managers to limit or correct the problem. Further, it will rarely be possible to definitively attribute a new or expanded area of hydrologic degradation to the road network versus other possible causes or contributing factors.

Pathogens

In recent years, the Service has received multiple reports of dead and apparently diseased bog turtles from New York, Delaware, Massachusetts, New Jersey, Maryland, and Pennsylvania. For example, in 2014, there were dead turtles found in Pennsylvania, New Jersey, and North Carolina. Most notably, 14 bog turtles were found dead at one site in early May 2014 in

[16] The current standard for new culverts in New Jersey is the 100-year design storm (NJDOT 2015).

Pennsylvania, and 4 were found at one site in New Jersey between mid-April and mid-June of that year. In August 2009 (updates in 2013 and 2018), the Service issued an Advisory Bulletin for all surveyors, researchers, and agency biologists working with bog turtles with procedures to follow should dead, dying, or injured bog turtles be found. At this time, no causative agent(s) of many observed symptoms or mortalities has been identified. The vast majority of test results are inconclusive due to predation or decay, but some results have shown a variety of potential causative factors including injury, infection, pneumonia, and carcinoma. Positive detections of pathogens such as *Mycoplasma*, *Herpesviruses*, and *Ranavirus* on bog turtles have been documented, but not attributed to the death of individuals to date. Despite this, the Service takes this matter seriously due to the ever-increasing threat of disease and fungal pathogens on wildlife. To reduce the risk of spreading the agent(s) responsible for the observed mortality and disease, the Service recommends that all individuals entering bog turtle wetlands follow the most current version of the *Northeast Partners for Amphibian and Reptile Conservation Disinfection of Field Equipment to Minimize Risk of Spread of Chytridiomycosis and Ranavirus* (last updated February 2014) (Service 2018).

It is likely that individuals will regularly enter bog turtle wetlands for purposes related to roadway projects over the life of this PBO. We expect that people will enter various bog turtle wetlands an average of 20 to 80 days per year, for purposes directly or indirectly related to roadway projects including individuals carrying out Phase 1, 2, or 3 bog turtle surveys pursuant to this PBO. Many individuals with a need to enter a bog turtle wetland would only do so once, but some individuals might need to enter repeatedly. For example, a Phase 2 survey might involve 5 people entering the wetland, and moving around the habitat intensively, on 4 occasions in 1 year. A Phase 3 survey can involve 2 people entering the wetland for 20 to 30 consecutive days. For other activities related to roadway projects, such as wetland delineations, topographic surveys, historic/archeological surveys, and other field work related to project design, the frequency and duration of human entry into bog turtle wetlands are likely to be variable but typically less intensive than for bog turtle surveys.

Relative to current levels of intrusion, more individuals may end up in habitat more often following issuance of the PBO, due to greater awareness and education of the need to avoid and minimize impacts to bog turtles and their habitats. For example, the number of bog turtle surveys for roadway projects may increase due to the robust review procedures established by this PBO. However, we also expect greater awareness of, and adherence to, the disinfection protocols. We expect CM 10 will substantially reduce, but not eliminate, the risk that a bog turtle pathogen will be inadvertently spread by individuals engaged in some aspect of a roadway project. In addition, the continued utilization, operation, and maintenance of New Jersey's road network may incrementally increase the risk of novel pathogens entering bog turtle habitat because pathogens can be transported into new environments by vehicles (NRC 2005) and because roads facilitate access to wetlands by people for purposes unrelated to road projects (*e.g.*, off-road vehicle use, recreation, dumping; see Human Access, below). We are unable to quantify the risk that roadway projects or operations will facilitate the spread of pathogens, predict the location(s) of bog turtle habitat(s) that are likely to be infected by a new pathogen, the severity with which a bog turtle population will respond to any such pathogen, or the ability of resource agencies to identify, limit or correct the problem. Further, it will rarely be possible to definitively attribute a bog turtle

mortality event to roadway activities versus other possible causes or contributing factors, even if in the future one or more causative pathogens are identified.

Environmental Contaminants

A number of activities associated with roadway projects can lead to the inadvertent release of environmental contaminants to bog turtle habitat during construction. For example, certain road-related activities may involve milling, paving, asphalt sealing, raw concrete, adhesives, grout, fuel, lubricants, paint, airborne particulates, demolition debris, herbicides, and pesticides. Based on CM 8, we expect that release of such materials to bog turtle habitats as a result of roadway projects will be substantially reduced but not eliminated.

In addition, the utilization, operation, and maintenance of the road network results in elevated levels of contaminants near roadways (Dorman *et al.* 1988, Sabin *et al.* 1986, Karraker *et al* 2008, NRC 2005, Nemeth *et al.* 2010). The most observable abiotic environmental consequence of roads is the contribution of motor vehicles on paved roads to water pollution, although this contribution cannot be disassociated from the surrounding land use. Vehicle-generated pollutants (such as nitrogen oxides, petroleum, lead, copper, chromium, zinc, and nickel) are the primary pollutants associated with road use, for example stemming from brake-lining and tire wear; leakage of oil, lubricants, and hydraulic fluids; and cargo spillage (NRC 2005). Along with pollutants from spills, litter, and adjacent land uses, vehicle-generated pollutants accumulate on impervious roads and enter waterways via surface runoff or atmospheric deposition. Air pollution from vehicle exhaust (*e.g.*, volatile organic compounds, nitrogen oxides, carbon monoxide, and particulate matter) can alter the composition of roadside vegetation, promoting a few dominant plant species at the expense of more sensitive species, such as ferns, lichens, and mosses (NRC 2005), which are components of bog turtle habitat. Mosses in particular provide important nesting substrate (Service 2001). This effect can extend up to 115 feet from two-lane highways and up to 660 feet from multi-lane highways. Heavy metals can degrade habitat quality in the road-effect zone up to 330 feet. In general, an increase in traffic density correlates with an increase in the atmospheric deposition and the aquatic concentration of vehicle-emitted chemicals, such as heavy metals. Nutrients, such as nitrogen from automobile exhausts, have been observed to spread via atmospheric transport and accumulate in wetlands (NRC 2005). Excessive nutrient levels can cause rapid vegetation growth and canopy closure, eliminating areas of high sun exposure that bog turtles require (Service 2001, Zappalorti *et al*. 2015). In addition to altering vegetative conditions, contaminants may also reduce the species diversity or abundance of invertebrate communities (Riens *et al.* 2013, Meyer *et al*. 2015), which comprise an important part of the bog turtle diet (Service 2001, Melendez *et al.* 2017); thus, environmental contaminants have the potential to impact the bog turtle's food supply.

Not all contamination associated with roadway infrastructure stems from vehicle traffic. For example, herbicides are routinely used in and near wetlands for various roadway activities (see Description of Covered Activities, above). Based on CM 6, we expect any direct or indirect effects to bog turtles from exposure to herbicides to be negligible. Another example of potential contaminants not associated with vehicle traffic is parking lot seal coats. Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) in runoff from coal-tar sealed parking lots are significantly higher than other types of urban land cover, impacting aquatic species including invertebrates at the base of the food chain. Coal-tar-sealcoat runoff can

remain a risk to aquatic life for months after application. Parking lot sealcoat may dominate loading of PAHs to urban water bodies in the United States (Mahler *et al.* 2005, Wright *et al.* 2006, McClure 2012, U.S. Geological Survey [USGS] 2016). Although coal-tar sealcoat is not typically used on roadways, contaminants can also be generated from roadway pavement. Nemeth *et al.* (2010) found petroleum hydrocarbons in water collected during the first-flush period of rainstorms, and in laboratory-generated runoff samples, from both virgin hot mix asphalt and reclaimed asphalt pavement. Hydrocarbon levels were generally low, but higher from reclaimed asphalt pavement. While the concentrations of toxic hydrocarbons entering the environment from asphalt surfaces may be relatively low, the total volume of deposited toxins may be significant given the extent of roadways (Nemeth *et al.* 2010), especially in New Jersey.

Routine application of deicing materials is necessary for the safe operation of the road network, but is known to impact wetlands and other aquatic environments (Trombulak and Frissell 2000). The use of road salt results in accumulation of sodium and chloride ions in runoff, thereby increasing concentrations of those ions in the soil, groundwater, and surface waters. The increase in the concentrations of ions reduces the soil's ability for ion exchange, decreasing permeability and aeration, and increasing alkalinity of the soil. Chloride may also combine with heavy metals in wetland soils, rendering the metals more water-soluble and more available for uptake by plant roots. Elevated chloride levels have been documented up to 1,000 feet from the road, and chloride concentrations found in roadside soils often exceed the tolerance thresholds of nearby wetland vegetation. Many plant species are sensitive to high chloride levels and may die back or fail to germinate under these conditions. Runoff contaminated with road salt can cause a shift in plant community structure when salt-sensitive plant species are replaced by less sensitive species, such as cattails (*Typha* spp.), giant reed (*Phragmites australis*), and purple loosestrife (*Lythrum salicaria*). Salt-related vegetation changes can also affect wildlife by adversely altering habitat, inhibiting road crossing by amphibian species, and causing behavioral and toxicological impacts on birds and mammals. Both acute and chronic toxic effects of chloride on aquatic systems have been well documented. Chronic concentrations of chloride as low as 210 milligrams per liter have been found to be harmful to some forms of aquatic life. Chloride levels exceeding 1,000 milligrams per liter can have lethal and sublethal effects on a wide range of aquatic plants and invertebrates. Harmful effects of deicing materials have been documented in amphibian species. Wetlands receiving excessive chloride are likely to experience reduced biodiversity, a loss of sensitive species, and an increase in salt-tolerant invasive species (NRC 2005, Wright *et al.* 2006, Karraker *et al.* 2008).

We are not aware of any studies looking at direct physiological effects of contaminants on bog turtle health, survival, or reproduction. Some studies of other turtle species have found elevated contaminant levels or adverse effects (Manolis 2002, Tuberville *et al.* undated, Rowe 2008, Green *et al.* 2010, Haskins *et al.* 2017), but other studies have not (Albers *et al*. 1986, Gibbs *et al*. 2017). Long-lived species of high trophic status, such as turtles, are subject to having contaminants accumulated or trophically magnified in their prey and are therefore most likely to establish high body burdens of persistent, bioaccumulative contaminants. In addition to trophic position, models suggest that air-breathing animals (like turtles) have a reduced capacity to eliminate some contaminants and thus a greater propensity for bioaccumulation, relative to organisms possessing aquatic respiration. Contaminants can be passed from females to offspring, either from body stores or from the female's diet during egg development (Rowe 2008). Turtles

are late-maturing, long-lived, and largely sedentary higher-order predators. These attributes may make turtles useful meters of bioaccumulation of contaminants, but poor indicators of contaminant effects on populations. This is because the demographic parameters perhaps most sensitive to contaminant-associated effects, such as clutch size, egg survival, and hatchling survival, are also those to which population growth in turtles is least sensitive (Gibbs *et al.* 2017).

The provisions of CM 23 are expected to produce at least cursory information about the effects of roadway-related contaminant loads on bog turtle habitats and populations in New Jersey. Information generated from CM 23 and that may become available from other sources will be used to regularly update CMs 7 and 8, in order to minimize adverse effects to bog turtles. We expect the CMs to reduce but not eliminate potentially harmful exposure of bog turtles to environmental contaminants associated with roadways. Based on the proximity of most New Jersey bog turtle sites to roadways, we conclude that roadway projects, along with continued operation/utilization of the road network, will result in some elevated contaminant levels within bog turtle habitat over the life of this PBO. However, we are unable to predict the acreage or locations of bog turtle habitats that are likely to be contaminated, the severity with which habitats will be contaminated, or the ability of land managers to limit or control the effects of the contamination. Further, it will rarely be possible to definitively attribute contaminant levels in a particular wetland to the road network versus other possible causes or contributing factors.

Human Access

Human activity in and near bog turtle habitat can crush nests, damage vegetative structure, and facilitate the spread of invasive plants and/or pathogens. Human vehicle use in habitat can also injure juvenile and adult turtles and compact soils. All of these effects were discussed above, and impacts from human entry and vehicle use associated with roadway projects are avoided or minimized by CMs 3b, 5, 9, 10, 12, 13, 16, 17, 21, and 22.

However, facilitating non-project-related human access to bog turtle habitat, both during and after the project itself, is an additional potential effect of the activities covered by this PBO. This includes both deliberate and unintentional facilitation of human access. For example, a new trail could, by design, bring many more people in or near habitat. Or removal of a fence or dense thicket may unintentionally enable unauthorized entry into the habitat by people, pets, and vehicles. Whether a deliberate project feature or unintentional facilitation, increased human access to habitat can result in human entry for purposes unrelated to road projects (NRC 2005), such as recreation, illegal dumping, and unauthorized use of off-road vehicles. New Jersey has well-documented problems with illegal dumping and vehicle use on State lands and other natural areas (NJDEP 2002, Sitrin 2018, NJDEP 2019b). Increased human access also facilitates an additional impact that was not previously considered – illegal collection. Roads provide human access to wetlands where wildlife collectors can remove highly valued species, further contributing to population declines (Attum *et al.* 2008). Poaching of bog turtles for commercial or private use ranks second in threats to this species, after habitat loss. Their small size, attractive shell and coloration, and rarity make the bog turtle a prize eagerly pursued by unscrupulous collectors, both in the United States and overseas, resulting in illegal collecting for an illicit pet trade (Service 2001). Making bog turtle habitats more visible or accessible to the public can worsen the ongoing threat to bog turtle populations from illegal collection.

Based on CM 11, we expect the adverse effect of increased human access to be generally avoided. We do not expect any projects covered by this PBO to include deliberate features to increase human access to bog turtle habitat. We expect that projects covered by this consultation will incorporate all practicable measures to deter unauthorized human access to habitat during and after construction.

Habitat Fragmentation

As discussed under Status of the Species, above, ecological connections among suitable habitat mosaics are required to maintain bog turtle populations. Bog turtles require early successional wetland habitats and are dependent on unfragmented riparian and upland habitats for longer-distance dispersal movements. Roads and other infrastructure can fragment bog turtle habitats (Service 2001, Travis *et al.* 2018). Fragmentation occurs when a large expanse of habitat is transformed into a number of smaller patches, isolated from each other by a matrix of dissimilar habitats or by development. Habitat fragmentation describes changes in habitat configuration and can be independent of, or in addition, to the effects of outright habitat loss (The Wildlife Society 2017). Notwithstanding a range of well-documented adverse effects of fragmentation (discussed below), the total amount of habitat loss in a landscape generally has greater impacts on wildlife populations (Fahrig 1997, Quesnelle *et al.* 2013). However, species with specific microhabitat requirements and poor dispersal abilities (*i.e.*, bog turtle characteristics) may be particularly impacted by habitat fragmentation (Faaborg *et al*. 1993). Due to their linear nature, roads create a disproportionate amount of habitat fragmentation, resulting in loss of habitat connectivity. Although other factors contribute to fragmentation, roads are clearly a major factor (NRC 2005). Fragmentation can affect wildlife populations through edge effects, patch size effects, and isolation (The Wildlife Society 2017).

Edge effects are a phenomenon whereby the perimeters of a habitat – particularly where it abuts human-dominated land uses – differ from interior portions of the habitat in ways that can negatively impact certain species. Relative to interior portions of a habitat, areas near the edge can have more invasive vegetation, modified hydrology, altered microclimates, higher levels of environmental contaminants, higher risk of wildlife pathogens and disease, and more predators (especially human-associated predators, such as raccoons (*Procyon lotor*), skunks (*Mephitis mephitis*), opossums (*Didelphis virginiana*), foxes (*Vulpes* spp.), and crows (*Corvus* spp.)) (Faaborg *et al*. 1993, Muricia 1995, Maryland Partners in Flight 1998, Baldwin *et al.* 2004, Attum *et al.* 2008, Suzan *et al.* 2012, The Wildlife Society 2017). Edge effects have been studied most extensively with regard to forest birds (Faaborg *et al.* 1993, Muricia 1995), but can also impact wetlands and herpetofauna (Findlay and Houlahan 1997, Attum *et al.* 2008, Anderson *et al.* 2013). Edge effects can extend 100 to 2,000 feet (typically 150 to 300 feet) into a forested habitat (Faaborg *et al.* 1993, Murcia 1995), but it is not well known how far edge effects typically extend into emergent wetlands. Edge effects can be intensified when multiple edges intersect, a common feature in fragmented landscapes (Fletcher 2005). Anderson *et al.* (2013) found that edges adversely impact the abundance of some, but not all, species of amphibians. Studying nests of three terrestrial or semi-aquatic freshwater turtle species, Temple (1987) found a significantly higher predation rate near habitat edges. These results may be of particular relevance to bog turtles because Zappalorti *et al.* (2017) found that egg depredation may be a limiting factor for bog turtle hatching success, with predation accounting for 80 percent of egg mortality at unprotected nests in that study.

Edge effects are related to patch size effects. Although the shape of the habitat patch is also a factor, a small habitat typically has a higher percentage of edge-impacted area than a large habitat (Faaborg *et al.* 1993, Maryland Partners in Flight 1998). Partially due to edge effects, two small habitats may support a smaller total number of animals of a particular species (*i.e.*, have a lower carrying capacity) than one large habitat, even if the total acreage of the two small habitats is the same as the large one. Species are likely to become extirpated from a habitat patch if it drops below the minimum area requirements of that species, or if too much of the patch becomes impacted by edge effects (Faaborg *et al.* 1993, Maryland Partners in Flight 1998). Findlay and Houlahan (1997) found a strong positive relationship between wetland area and species richness across many taxa including herptile species. Attum *et al.* (2008) found that two common wetland reptile species (one snake and one turtle) were more likely to occur in larger, less isolated wetlands.

Isolation effects occur when physical barriers to movement and/or strongly unsuitable land cover types (*e.g.*, development, incompatible habitats) prevent animals from moving among habitat patches. Isolation can cause inbreeding, limit access to resources, and increase mortality (The Wildlife Society 2017). Aside from fragmenting individual habitat patches, the road network and associated traffic and infrastructure (*e.g.*, fences, walls, median barriers, steep slopes, culverts) can also act as barriers to turtle movements among those patches (Gibbs and Shriver 2002, Baldwin *et al.* 2004, Attum *et al.* 2008, Shepard *et al.* 2008). Gibbs (1998) found roads to be an important hindrance to the movements of forest amphibians. Shepard *et al.* (2008) found that two box turtle species (*Terrapene* spp.) showed strong behavioral avoidance to crossing roads that, along with documented road mortality, indicates roads are important barriers to these species. Traffic volumes typical of many major and arterial highways suggest that such roads are essentially impenetrable at a local level to any wandering turtle (Gibbs and Shriver 2002). Joyal *et al.* (2001) found that wetland occupancy of two rare turtle species was negatively related to the degree of wetland isolation. For species like turtles that are long-lived and late-maturing, negative genetic effects of isolated populations might not be observable over short time-scales, placing populations at high risk of extinction because of a failure to detect an incrementally worsening problem (Shepard *et al*. 2008).

Landscape-level analyses show the importance of habitat connectivity for reptiles, and the effects of roadway networks. Within 1.25 miles of a wetland, Findlay and Houlahan (1997) found that herptile species richness was negatively correlated with the density of paved roads and showed a strong positive correlation with the proportion of forest cover. Similarly, Attum *et al.* (2008) found that two rare reptile species (one snake and one turtle) were more likely to occur in wetlands farther away from roads and with more surrounding forest. In influencing the occurrence of two threatened freshwater wetland turtle species, Quesnelle *et al.* (2013) found that the amount of forest in the surrounding landscape was more important than other landscape variables, even more important than the amount of wetland in the landscape.

New Jersey's existing road network has fragmented a number of bog turtle habitats (Zarate pers. comm. 2018), a fact that is reflected in the environmental baseline. The environmental baseline for this consultation includes not only New Jersey's existing road network, but also the State's existing patterns of development and prevailing land management practices, all of which work together to substantially suppress the natural processes (*e.g.*, fire, beaver) that historically created

new bog turtle habitats and maintained existing ones. The environmental baseline also includes a highly fragmented landscape that already limits the ability of bog turtles to move among habitats (NJDFW 2019). Based on New Jersey's wetland and other land use regulations, and on CM 1, we do not expect any new roadways to be built through bog turtle habitat – creating wholly new fragmentation – over the next 20 years. Likewise, based on New Jersey's land use regulations, CM 20, and the fact that the State's road network appears to be largely built out, we do not expect any new roads to result in brand new barriers to bog turtle movement over the life of this PBO. In fact, CM 20b and the compensatory mitigation program may actually result in net increases in connectivity across the programmatic action area. However, certain roadway projects may worsen fragmentation at a local or regional scale. For example, addition of a median barrier or noise barrier, or modifications to a stream corridor, could reduce connectivity. Likewise, widening an existing two-lane road to four lanes may create a more substantial barrier to movement (Gibbs and Shriver 2002). Widening existing road corridors also exacerbates other fragmentation effects, because the distance that edge effects extend into a habitat is typically related to the width of the corridor that fragments the habitat (Maryland Partners in Flight 1998, Bentrup 2008). We expect that CM 20 will minimize such effects, and that the compensatory mitigation program will fully offset any unavoidable reductions of connectivity.

Induced Traffic and Development

New or widened roads can indirectly result in higher overall levels of driving and traffic (Cervero 2010, Gorham 2011, Duranton and Turner 2011). As discussed above, increased traffic volumes can increase the spread of pathogens and invasive plants; levels of environmental contaminants; isolation of wildlife populations; and rates of road mortality (Gibbs and Shriver 2002, Baldwin *et al.* 2004, NRC 2005, Attum *et al.* 2008, Shepard *et al.* 2008). The potential for increased traffic volumes, and the potential resulting impact to bog turtles, will be evaluated and minimized under CM 20.

By increasing accessibility, road construction or improvement often results in subsequent development of adjacent areas for residential and commercial uses (NRC 2005, Ewing 2008, Boarnet and Chalermpong 2010, Cervero 2010). Based on New Jersey's land use regulations, CM 20, and the fact that the State's road network appears to be largely built out, we expect indirect effects to bog turtle from induced development over the life of this PBO will be small.

In addition to CM 20 and the Tier 2 process, NJDOT must also consider the potential for induced growth, development, and traffic as part of its environmental review (FHWA 2010).

Effects Table

Table 2. Potential effects of road-related sub-activities on bog turtles. See Appendix D for a summary of the bog turtle's resource needs.

Sub-activity	***Direct interaction***	***Indirect interaction*** *(STRESSOR to resource)*	***Resource*** *or* ***Individuals***	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Dispersal)*	***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Conservation Measures (CMs) for Avoidance, Minimization, and Mitigation***	***Effects Summary***
Human foot traffic/ hand tools	Crushing	NA	Individuals	Eggs	NA	Injury or mortality	Reduced survivorship (nest gets stepped on)	Reduction in numbers	11, 12,13, 22	Risk is substantially reduced, but not eliminated by CMs.
Human foot traffic/ hand tools	Exposure to human-spread pathogens	NA	Individuals	Hatchlings, juveniles, adults	NA	Potential illness or mortality	Ranges from negligible to reduced survivorship (of infected turtles)	Ranges from negligible to reduction in numbers	10, 11, 12, 13, 22	Risk is substantially reduced, but not eliminated by CMs. High uncertainty around likelihood and severity of effects.
Human foot traffic/ hand tools	NA	Spread of invasive vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of invasion – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship and/or reduced reproduction; also see Vegetation changes	Ranges from negligible to reduction in numbers	5, 9, 10, 11, 12, 13	Risk is substantially reduced, but not eliminated by CMs.
Use of vehicles/ heavy equipment	Crushing	NA	Individuals	Eggs, hatchlings, juveniles, adults	NA	Injury or mortality	Reduced survivorship (nest or animal gets run over)	Reduction in numbers	3, 11, 12, 13, 14, 16, 17	Risk is substantially reduced, but not eliminated by CMs.
Use of vehicles/ heavy equipment	Exposure to human-spread pathogens	NA	Individuals	Hatchlings, juveniles, adults	NA	Potential illness or mortality	Ranges from negligible to reduced survivorship (of infected turtles)	Ranges from negligible to reduction in numbers	10, 11, 12, 13, 22	Risk is substantially reduced, but not eliminated by CMs. High uncertainty around likelihood and severity of effects.
Use of vehicles/ heavy equipment	NA	Spread of invasive vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of invasion – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship and/or reduced reproduction; also see Vegetation changes	Ranges from negligible to reduction in numbers	5, 9, 10, 11, 12, 13	Risk is substantially reduced, but not eliminated by CMs.
Use of vehicles/ heavy equipment	NA	Wetland soil compaction	Resource	Hatchlings, juveniles, adults	Feeding, sheltering	Range of response from displacement to mortality.	Ranges from negligible to reduced survivorship (if animals can no longer borrow for food, cover or temperature regulation)	Ranges from negligible to reduction in numbers	12, 13, 14	Risk is substantially reduced, but not eliminated by CMs.
Use of vehicles/ heavy equipment	NA	Upland soil compaction	Resource	Eggs, Hatchlings, juveniles, adults	Breeding, feeding, sheltering	See impervious surface, which has similar effects.	See impervious surface, which has similar effects.	See impervious surface, which has similar effects.	18	Based on the CMs, we expect indirect effects of compacted upland soils (*i.e.*, via associated runoff) will be negligible
Vegetation changes[17]	Disturbance/ injury	NA	Individuals	Eggs, hibernating juveniles/ adults	NA	Range of response from temporary disturbance to mortality	Ranges from temporary disturbance (hibernating turtle pulled out with woody roots) to reduced survivorship (nest damaged/ destroyed upon removing pedestal vegetation)	Ranges from negligible to reduction in numbers	1, 6, 12, 13, 14, 22	Based on the CMs we do not expect this to occur.
Vegetation changes	Exposure to herbicide	NA	Individuals	Eggs, hatchlings, juveniles, adults	NA	See contaminant-generating activities.	See contaminant-generating activities.	See contaminant-generating activities.	1, 6, 8, 13	Based on the CMs, we expect effects to be negligible.

[17] *e.g.*, clearing, planting, shading, herbicide use, other activities that directly change plant species composition or structure

Sub-activity	***Direct interaction***	***Indirect interaction*** *(STRESSOR to resource)*	***Resource*** *or* ***Individuals***	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Dispersal)*	***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Conservation Measures (CMs) for Avoidance, Minimization, and Mitigation***	***Effects Summary***
Vegetation changes	**NA**	Reduced pedestal vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of reductions – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no longer have sufficient area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest); also see Spread of invasive vegetation	Ranges from negligible to reduction in numbers	1, 4, 6, 12, 13, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Vegetation changes	**NA**	Reduced root structure	Resource	Hibernating juveniles/ adults	Sheltering	Range of response depending on scope of reductions – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no longer have suitable places to hibernate); also see Spread of invasive vegetation	Ranges from negligible to reduction in numbers	1, 4, 6, 12, 13, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Vegetation changes	**NA**	Altered food resources	Resource	Hatchlings, juveniles, adults	Feeding	Range of response depending on scope of reductions – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if vegetation changes cause a substantial reduction in suitable food resources)	Ranges from negligible to reduction in numbers	1, 4, 6, 12, 13, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Vegetation changes	**NA**	Spread of invasive vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of invasion – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship and/or reduced reproduction; also see Vegetation changes	Ranges from negligible to reduction in numbers	3, 5,6, 9, 10, 12, 13	Risk is substantially reduced, but not eliminated by CMs.
Vegetation changes	**NA**	Reduced / impaired buffer vegetation	Resource	Juveniles, adults	Dispersal	Range of response depending on scope of reduction/ impairment – from negligible to curtailment of dispersal movements	Ranges from negligible to reduced survivorship (if animals cannot emigrate and face high competition, predation or other unfavorable conditions at their original site) and/or reduced reproduction (if animals cannot emigrate and risk inbreeding at their original site); also lost opportunity to colonize new habitat	Ranges from negligible to reduction in numbers to reduction in distribution	3, 4, 20, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Sediment-generating activities[18]	Burial	**NA**	Individuals	Eggs, hibernating juveniles/ adults	**NA**	Range of response depending on scope of sedimentation – from negligible to disturbance to mortality	Ranges from temporary disturbance (if animals break hibernation to relocate) to reduced survivorship (eggs/turtles are smothered)	Ranges from negligible to reduction in numbers	3, 9, 12, 13, 14, 15, 19a	Based on the CMs, we do not expect this to occur.
Sediment-generating activities	**NA**	Reduced pedestal vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of reductions – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no longer have sufficient area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest); also see Spread of invasive vegetation	Ranges from negligible to reduction in numbers	3, 9, 12, 13, 15, 19a	Based on the CMs, we expect any inadvertent sedimentation of bog turtle habitat will be negligible.
Sediment-generating activities	**NA**	Spread of invasive vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of invasion – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship and/or reduced reproduction; also see Vegetation changes	Ranges from negligible to reduction in numbers	3, 5, 9, 10, 12, 13, 15, 19a	Based on the CMs, we expect any inadvertent sedimentation of bog turtle habitat will be negligible.
Sediment-generating activities	**NA**	Reduced mucky substrate	Resource	Hatchlings, juveniles, adults	Feeding, sheltering	Range of response depending on scope of sedimentation – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no longer have sufficient area for cover, temperature regulation, or foraging)	Ranges from negligible to reduction in numbers	3, 9, 12, 13, 15, 19a	Based on the CMs, we expect any inadvertent sedimentation of bog turtle habitat will be negligible.

[18] *e.g.*, grubbing, grading, excavating, other activities that result in unintended sediment deposition in habitat

Sub-activity	***Direct interaction***	***Indirect interaction*** *(STRESSOR to resource)*	***Resource*** *or* ***Individuals***	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Dispersal)*	***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Conservation Measures (CMs) for Avoidance, Minimization, and Mitigation***	***Effects Summary***
Sediment-generating activities	**NA**	Altered food resources	Resource	Hatchlings, juveniles, adults	Feeding	Range of response depending on scope of sedimentation – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if sedimentation causes a substantial reduction in suitable food resources)	Ranges from negligible to reduction in numbers	3, 9, 12, 13, 15, 19a	Based on the CMs, we expect any inadvertent sedimentation of bog turtle habitat will be negligible.
Sediment-generating activities	**NA**	Altered hydrology	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of sedimentation – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no longer have sufficient area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest)	Ranges from negligible to reduction in numbers	3, 9, 12, 13, 15, 19a	Based on the CMs, we expect any inadvertent sedimentation of bog turtle habitat will be negligible.
Wetland fill	Burial	**NA**	Individuals	Eggs, hatchlings, juveniles, adults	**NA**	Range of response depending on scope of fill – from disturbance to mortality	Ranges from temporary disturbance (if animals break hibernation to relocate) to reduced survivorship (if eggs/turtles are smothered)	Reduction in numbers	1, 13, 14	Based on the CMs, we do not expect this to occur.
Wetland fill	**NA**	Reduced pedestal vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of fill – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability of area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest)	Reduction in numbers	1, 13, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland fill	**NA**	Reduced root structure	Resource	Hibernating juveniles/ adults	Sheltering	Range of response depending on scope of fill – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability suitable places to hibernate)	Reduction in numbers	1, 13, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland fill	**NA**	Reduced mucky substrate	Resource	Hatchlings, juveniles, adults	Feeding, sheltering	Range of response depending on scope of fill – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability of area for cover, temperature regulation, and foraging)	Reduction in numbers	1, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland fill	**NA**	Altered food resources	Resource	Hatchlings, juveniles, adults	Feeding	Range of response depending on scope of fill – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if fill cause a substantial reduction in suitable food resources)	Ranges from negligible to reduction in numbers	1, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland fill	**NA**	Loss of wetland hydrology	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of fill – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability of area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest)	Reduction in numbers	1, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland / stream modification[19]	Sudden flooding	**NA**	Individuals	Eggs, hibernating juveniles/ adults	**NA**	Range of response from displacement to mortality	Ranges from temporary disturbance (if animals break hibernation to relocate) to reduced survivorship (if eggs/turtles are drowned)	Reduction in numbers	1, 18	Based on the CMs, we do not expect this to occur.
Wetland / stream modification	**NA**	Reduced pedestal vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of modification – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability of area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest)	Reduction in numbers	1, 13, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.

[19] *e.g.*, flooding, draining, ditching, tiling, excavating, channelizing, diverting, stabilizing, impounding, dredging, water withdrawal

Sub-activity	***Direct interaction***	***Indirect interaction*** *(STRESSOR to resource)*	***Resource*** *or* ***Individuals***	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Dispersal)*	***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Conservation Measures (CMs) for Avoidance, Minimization, and Mitigation***	***Effects Summary***
Wetland / stream modification	NA	Reduced root structure	Resource	Hibernating juveniles/ adults	Sheltering	Range of response depending on scope of modification – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability suitable places to hibernate)	Reduction in numbers	1, 13, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland / stream modification	NA	Reduced mucky substrate	Resource	Hatchlings, juveniles, adults	Feeding, sheltering	Range of response depending on scope of modification – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability of area for cover, temperature regulation, and foraging)	Reduction in numbers	1, 13, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland / stream modification	NA	Altered food resources	Resource	Hatchlings, juveniles, adults	Feeding	Range of response depending on scope of modification – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if fill cause a substantial reduction in suitable food resources)	Ranges from negligible to reduction in numbers	1, 13, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland / stream modification	NA	Altered / lost wetland hydrology (*e.g.*, ponding, drying, erosion)	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of modification – from displacement to mortality	Reduced survivorship (at least some effects are expected on availability of area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest)	Reduction in numbers	1, 13, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland / stream modification	NA	Altered stream hydrology	Resource	Juveniles, adults	Sheltering	Range of response depending on scope of modification – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no long have sufficient dry weather refugia)	Ranges from negligible to reduction in numbers	1, 13, 18, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Wetland / stream modification	NA	Altered stream hydrology	Resource	Juveniles, adults	Dispersal	Range of response depending on scope of reduction/ impairment – from negligible to curtailment of dispersal movements	Ranges from negligible to reduced survivorship (if animals cannot emigrate and face high competition, predation or other unfavorable conditions at their original site) and/or reduced reproduction (if animals cannot emigrate and risk inbreeding at their original site); also lost opportunity to colonize new habitat	Ranges from negligible to reduction in numbers to reduction in distribution	1, 13, 18, 20, 24	Based on CMs, effects are expected to be small, and fully offset by compensatory mitigation.
Stormwater point discharge	NA	Habitat changes	Resources	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	See Sediment-generating activities, Wetland/ stream modification, and Contaminant-generating activities; also see various activities involving Spread of invasive vegetation	See Sediment-generating activities, Wetland/ stream modification, and Contaminant-generating activities; also see various activities involving Spread of invasive vegetation.	See Sediment-generating activities, Wetland/ stream modification, and Contaminant-generating activities; also see various activities involving Spread of invasive vegetation.	18, 19, 24	Based on CMs, effects are expected to be small, and largely offset by compensatory mitigation
Contaminant-generating activities[20]	Impaired health	NA	Individuals	Eggs, hatchlings, juveniles, adults	NA	Potential illness or mortality	Ranges from negligible to reduced survivorship (of affected turtles)	Ranges from negligible to reduction in numbers	7, 8, 21, 25	Risk is substantially reduced, but not eliminated by CMs.
Contaminant-generating activities	NA	Reduced pedestal vegetation	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of reductions – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if animals no longer have sufficient area for cover or temperature regulation) and/or reduced reproduction (if animals no longer have suitable places to nest); also see Spread of invasive vegetation	Ranges from negligible to reduction in numbers	7, 8, 21, 25	Risk is substantially reduced, but not eliminated by CMs.

[20] *e.g.*, potential addition to habitat of contaminants such as petroleum products, pesticides, herbicides, raw concrete, adhesives, demolition debris, airborne particulates, deicing materials, trash/debris, vehicle dust/exhaust/leaks.

Sub-activity	***Direct interaction***	***Indirect interaction*** *(STRESSOR to resource)*	***Resource*** *or* ***Individuals***	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Dispersal)*	***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Conservation Measures (CMs) for Avoidance, Minimization, and Mitigation***	***Effects Summary***
Contaminant-generating activities	**NA**	Altered food resources	Resource	Hatchlings, juveniles, adults	Feeding	Range of response depending on scope of modification – from negligible to displacement to mortality	Ranges from negligible to reduced survivorship (if fill cause a substantial reduction in suitable food resources)	Ranges from negligible to reduction in numbers	7, 8, 21, 25	Risk is substantially reduced, but not eliminated by CMs.
Impervious surface (and associated infrastructure)[21]	Crushing by vehicle traffic	**NA**	Individuals	Juveniles, adults	**NA**	Injury or mortality	Reduced survivorship (animal gets run over)	Reduction in numbers	20	Risk is substantially reduced, but not eliminated by CMs.
Impervious surface (and associated infrastructure)	Blocking animal movement	**NA**	Individuals	Juveniles, adults	**NA**	Range of response depending on scope of blockage – from negligible to curtailment of dispersal movements	Ranges from negligible to reduced survivorship (if animals cannot emigrate and face high competition, predation or other unfavorable conditions at their original site) and/or reduced reproduction (if animals cannot emigrate and risk inbreeding at their original site); also lost opportunity to colonize new habitat	Ranges from negligible to reduction in numbers to reduction in distribution	20	Risk is substantially reduced, but not eliminated by CMs.
Impervious surface (and associated infrastructure)	**NA**	Various habitat changes from associated stormwater runoff and reduced groundwater recharge	Resources	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	See Sediment-generating activities, Wetland/ stream modification, and Contaminant-generating activities; also see various activities involving Spread of invasive vegetation.	See Sediment-generating activities, Wetland/ stream modification, and Contaminant-generating activities; also see various activities involving Spread of invasive vegetation.	See Sediment-generating activities, Wetland/ stream modification, and Contaminant-generating activities; also see various activities involving Spread of invasive vegetation.	3, 18, 24	Based on CMs, effects from new impervious surface are expected to be small, and largely offset by compensatory mitigation.
Impervious surface (and associated infrastructure)	**NA**	Habitat fragmentation (increased ratio of edge to interior habitat)	Resource	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	Range of response depending on scope of fragmentation from negligible to displacement to mortality	Ranges from negligible to reduced survivorship and/or reduced reproduction (from increased competition or predation pressure; from habitat degradation – see Wetland / stream modification and Spread of invasive vegetation)	Ranges from negligible to reduction in numbers	1, 3, 5, 9, 20, 24	Based on CMs, effects from new impervious surface are expected to be small, and largely offset by compensatory mitigation.
Impervious surface (and associated infrastructure)	Increased human access to habitat	**NA**	Individuals	Eggs, hatchlings, juveniles, adults	**NA**	Range of response depending on scope of access from disturbance to mortality	Ranges from temporary disturbance (animal flees human) to reduced survivorship (nest get stepped on, nest or turtles gets run over; see also Exposure to human-spread pathogens) to removal from the wild from illegal collection	Ranges from negligible to reduction in numbers	11	Risk is substantially reduced, but not eliminated by CMs.
Impervious surface (and associated infrastructure)	**NA**	Increased human access to habitat (various habitat changes)	Resources	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	See Foot traffic; Use of vehicles; Spread of invasive vegetation. Extensive driving may also result in Vegetation changes.	See Foot traffic; Use of vehicles; Spread of invasive vegetation. Extensive driving may also result in Vegetation changes.	See Foot traffic; Use of vehicles; Spread of invasive vegetation. Extensive driving may also result in Vegetation changes.	11	Risk is substantially reduced, but not eliminated by CMs.
Impervious surface (and associated infrastructure)	Induced development (increased human access to habitat)	**NA**	Individuals	Hatchlings, juveniles, adults	**NA**	Range of response depending on scope of access from disturbance to mortality	Ranges from temporary disturbance (animal flees human) to reduced survivorship (nest get stepped on, nest or turtles gets run over; see also Exposure to human-spread pathogens) to removal from the wild from illegal collection	Ranges from negligible to reduction in numbers	20	Risk is substantially reduced, but not eliminated by CMs.

[21] *e.g.* in uplands, not in wetland habitat. For infrastructure in wetland habitat, see Use of heavy equipment/vehicles, Wetland fill, and Wetland/stream modification.

Sub-activity	***Direct interaction***	***Indirect interaction*** *(STRESSOR to resource)*	***Resource*** *or* ***Individuals***	***Life stage*** *(of the species)*	***Conservation Functions of the Resource*** *(Breeding, Feeding, Sheltering, Dispersal)*	***Species' Responses to Exposure*** *to Direct interaction or Indirect interaction (Stressor)*	***Effect to individuals***	***Effect to population***	***Conservation Measures (CMs) for Avoidance, Minimization, and Mitigation***	***Effects Summary***
Impervious surface (and associated infrastructure)	NA	Induced development (various habitat changes)	Resources	Eggs, hatchlings, juveniles, adults	Breeding, feeding, sheltering	See Sediment-generating activities; Wetland fill; Wetland/stream modification; Stormwater point discharge; and Contaminant-generating; and preceding rows under Impervious surface.	See Sediment-generating activities; Wetland fill; Wetland/stream modification; Stormwater point discharge; and Contaminant-generating; and preceding rows under Impervious surface.	See Sediment-generating activities; Wetland fill; Wetland/stream modification; Stormwater point discharge; and Contaminant-generating; and preceding rows under Impervious surface	20	Risk is substantially reduced, but not eliminated by CMs.

CUMULATIVE EFFECTS

As used in the context of consultations under Section 7 of the ESA, cumulative effects are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02).

Some level of non-Federal roadway projects will continue over the life of this PBO. The major roadways, including interstate highways, freeways, and major arterials, are mainly under the jurisdiction of NJDOT and to a lesser degree one of the toll road authorities. With some exceptions, however, most of the minor arterial and collector roads are under county jurisdiction. The county roads account for approximately 17 percent of the total roadway miles statewide. Local streets and roads are owned and operated by municipal governments. The roads under municipal jurisdiction comprise the significantly largest roadway mileage (74 percent), but service the least amount of traffic volume (NJDOT *et al.* 2011).

Because NJDOT has committed to following the PBO for those non-Federal projects that are being constructed or advanced by NJDOT, we expect the individual impacts of such projects on bog turtles to be minor. Some non-Federal projects that fit into this category include certain State-funded projects, such as many operations and maintenance activities on Federal and State roads. For other non-Federal projects that utilize NJDOT-administered State funds (*e.g.*, certain State grant programs), the project sponsor is responsible for obtaining all environmental permits and approvals. For such roadway projects, as well as those fully funded by local (*e.g.,* county or municipal) governments or private entities, project sponsors may elect to adopt the CMs in this PBO, but such projects will not necessarily follow this PBO. All such projects would still be subject to State wetland and other land use regulations, subject to Section 9 of the ESA, and eligible for technical assistance upon request to the Service. Some cumulative (*i.e.*, landscape level) effects to bog turtles from the continued operation and maintenance of the road network, much of which is carried out through non-Federal projects, are expected to occur and were considered under Indirect Effects, above. Specifically, we expect that habitat degradation will continue or worsen in some areas from road-associated changes such as invasive vegetation, sedimentation, hydrologic impairments, and environmental contaminants. Non-Federal activities to maintain and operate the road network may also contribute to road mortality, facilitate the spread of pathogens, facilitate human access to wetlands, and inhibit bog turtle movements among habitat patches. However, an array of non-Federal road operations and maintenance activities are also part of the environmental baseline of this consultation, and have been ongoing for decades. The NJDOT has committed to apply the provisions and procedures of this PBO to certain non-Federal activities as mentioned above, and the Service and ENSP have committed to providing training on bog turtle biology and habitat and on this PBO. Based on these commitments, we expect that the cumulative effects to bog turtles from the continued operation and maintenance (which are primarily non-Federal) of the road network may actually decrease, even if there are localized expansions of the road network itself (which may involve FHWA funding). Other cumulative effects are not directly related to the road activities covered by this PBO; specifically, ongoing land development and illegal bog turtle collection.

Suburban and urban development are expected to continue across the programmatic action area. Most development activities do not have a Federal nexus, particularly in New Jersey, where the

State has assumed the Clean Water Act Section 404 Federal wetland permitting program. Based on New Jersey's land use regulations, we expect minimal direct habitat modification (*e.g.*, wetland filling, draining) to result from development over the next 20 years. Development within 150 feet of bog turtle wetlands is also regulated by the State and reviewed for potential impacts to this species. However, development of the supporting watersheds, including upland buffers 150 to 300 feet from the wetland, is often unregulated, currently common, and expected to continue (see Environmental Baseline and Indirect Effects, above, for discussion of how upland development impacts bog turtle habitat and populations). Based on development rates from 1986 to 1995, and a State commitment to open space preservation as of 2001, Hasse and Lathrop (2001) projected that all remaining available land in New Jersey would be developed by the 2040s, making New Jersey the first State in the nation to reach build-out. From 1986 to 2012, New Jersey urbanized 547 square miles, adding 29 percent to the State's pre-1986 urban footprint. From 1986 to 2007, New Jersey's urban growth rate was nearly twice as fast as its population growth. However, the period from 2007 to 2012 saw urbanization occurring at less than the growth rate of population for the first time since before the mid-1980s, suggesting a slowing of "suburban sprawl" and a move toward "smart growth" (*i.e.*, more compact development). However, it is too soon to tell whether the urban sprawl that New Jersey experienced in the late 20th and early 21st century is a thing of the past or only in temporary abeyance (Lathrop *et al.* 2016). While the rates and patterns of development cannot be predicted precisely over the life of this PBO, development pressures in New Jersey remain high and some level of development in watersheds that support bog turtles is virtually certain to continue.

The other major threat to bog turtle populations, illegal collection (Service 2001), is also expected to continue over the next 20 years. Since the 2001 recovery plan, law enforcement investigations have found that demand for bog turtles in the illegal pet trade remains strong, with individual turtles commanding exceptionally high prices on international black markets (Bessey pers. comm. 2018). The illegal market for several native U.S. turtle species has expanded considerably in the past 5 years, and bog turtles remain among the most sought-after species. There is some recent evidence of poaching, or attempted poaching, in New Jersey (Bessey pers. comm. 2018). Over the life of this PBO, we expect at least a few turtles to be lost from wild populations as a result of illegal collection, despite the efforts of State and Federal land managers and law enforcement to stem this activity.

JEOPARDY ANALYSIS

"Jeopardize the continued existence" of a species, as defined in regulations implementing the ESA, means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery in the wild by reducing the reproduction, numbers, and distribution of that species (50 CFR 402.02). The following analysis relies on four components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. The jeopardy analysis in this PBO emphasizes the recovery unit-wide survival and recovery needs of the bog turtle and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the covered activities, taken together with cumulative effects, for purposes of making the jeopardy determination.

Effects to Individuals

Over the 20-year life of the PBO, we expect:

- One nest may be damaged or destroyed by a person walking through a wetland for purposes related to a roadway project.

- One adult turtle mortality may occur due to operation of a construction vehicle in a developed area.[22]

- Up to 2 adult turtles per year, or 40 turtles total over the life of the PBO, will be briefly detained (typically 30 minutes or less), handled, and/or relocated in connection with roadway projects. We do not anticipate any mortality or injury of these 40 turtles, or any impacts to their survival or reproductive success.

- Up to five turtles may be temporarily trapped behind fencing associated with roadway projects over the life of this PBO. Based on the CMs, we expect all such turtles will be detected and relocated within 48 hours. We project that one such turtle may experience injury or death as a result of becoming trapped behind fencing, due to lack of cover, food, or water.

- Additional individual turtles (hatchlings, juveniles, adults) may be briefly disturbed by people or vehicles moving through the habitat for purposes connected to roadway projects. The animals may flee or burrow, temporarily interrupting other normal behaviors such as foraging or basking. We do not expect such disturbances to impact the health, survival, or reproductive capacity of any individuals.

All of the direct effects to individual animals described above are substantially limited by the framework of CMs. We expect other potential direct effects to turtles from road-related activities will be entirely avoided by the CMs, such as injury or mortality from vehicle use in habitat, entanglement in fencing material, and entrapment in pits or holes.

In addition to direct impacts to individuals, some bog turtles may be exposed to degraded habitat conditions clearly stemming from the road activities covered by this PBO. For example, work in wetlands may alter vegetation, which could reduce the availability of basking or nesting sites, and could create an opening for invasive species. Based on the CMs, New Jersey's wetland regulatory program, past NJDOT practices, and NJDOT's conservation goal for this PBO, we expect the vast majority of habitat impacts from activities covered by the PBO will be localized and temporary. In such cases, we expect individual turtles will be exposed to degraded habitat for no more than one active season, and we do not expect impacts to the survival or reproductive success of any individuals.

[22] CM 17 does not apply to vehicle use within existing areas of pavement or other developed areas. Transient turtles in such areas are already exposed to baseline levels of vehicle traffic, which can and sometimes does result in bog turtle road mortality (Zarate pers. comm. 2018). Due to the sheer volume and extent of normal traffic, bog turtles are far less likely to get run over by a construction vehicle than by ordinary (non-construction) vehicles. However, the likelihood that a construction vehicle will hit a turtle over the 20-year life of this PBO is not discountable.

On rare occasion, individual turtles may be exposed to permanent habitat degradation or loss clearly stemming from the road activities covered by this PBO. We expect that the lost conservation value of such habitat will be fully offset by the compensatory mitigation program (CM 24). However, the mitigation may not take place at the same bog turtle site as the impact. Thus, some turtles may experience a long-term benefit while others experience a long-term adverse effect, which could potentially include reduced survival and/or reproductive success. The expected effects of these impacts on populations are discussed below.

In addition to the potential for NJDOT construction and maintenance activities to directly impact bog turtles and their habitat, as discussed above, the activities covered by this PBO also enable the continued operation of New Jersey's road network. Essentially all bog turtles in New Jersey face some level or risk from vehicle strike (severe injury or death) stemming from the continued operation of the road network due to the close proximity of one or more roads to all bog turtle habitats in the State. (All bog turtle habitats are within 5 to 2,500 feet of a road; most are closer than 500 feet. See Environmental Baseline, above.) In addition, most individual turtles in New Jersey are exposed to at least partially degraded habitat conditions due to the presence and operation of the State's road network from a combination of factors such as invasive vegetation; sedimentation; hydrologic alteration; environmental contaminants; reduced effective habitat size/carrying capacity due to fragmentation; barriers to animal movement; elevated numbers and access of human-associated predators; human access to habitat that can spread pathogens, facilitate poaching, and facilitate unauthorized vehicle use and dumping; and suppression of natural processes (*e.g.*, beaver activity, fire) that would otherwise create and maintain habitat but are incompatible with nearby road infrastructure. Exposure to degraded habitat conditions likely contributes to reduced survival and reproductive rates of individual turtles at many of New Jersey's bog turtle sites. However, it is impossible to distinguish the incremental contribution of activities covered by this PBO to ongoing road mortality and habitat degradation, versus the environmental baseline conditions that are the result of past actions and versus the future cumulative effects from non-Federal actions.

Effects to Populations

As shown in Table 1, about 16 percent of New Jersey's extant populations are known to exhibit recruitment and around 34 percent of the populations were ranked as viable or potentially viable based on current information and evaluation methods (Erb 2019). We conclude that the primary factor limiting the viability of New Jersey's bog turtle populations is the State's extensively developed land use condition, as described under Environmental Baseline, above. New Jersey's high-density road network is both a cause and a result of intensive past and ongoing land development for residential, commercial, industrial, institutional, recreational, and other human purposes. Thus, the continued presence and operation of the State's road network is one factor limiting population viability of bog turtles in New Jersey. However, it is impossible to distinguish the incremental contribution of activities covered by this PBO to ongoing bog turtle population impacts (*i.e.*, the role of those activities in enabling and facilitating the continued operation of the road network), versus the environmental baseline conditions that are the result of past actions and versus the future cumulative effects from non-Federal actions.

Aside from the role of NJDOT activities in enabling the continued operation of the road network – considering only the activities themselves – we conclude that the activities covered by this

PBO may slightly reduce the viability of up to two bog turtle populations in New Jersey through injury or mortality. Due to the bog turtle's long life span, loss of a single adult (*e.g.*, from operation of a construction vehicle in a developed area, as discussed above) could have at least a small impact on viability, particularly if it were to occur at a small population with few reproductive animals. Loss of a single nest (*e.g.*, from foot traffic) is not expected to have an impact on population viability, as the egg life stage is characterized by widely varying survival rates (*e.g.*, from flooding, predation) (Whitlock 2002, Zappalorti *et al.* 2004, Macey 2015, Byer 2015). None of the other direct effects to individuals described above are expected to impact survival or reproductive rates, and are therefore not expected to reduce population viability.

In addition, two more populations may become slightly less viable due to permanent habitat degradation or loss resulting from activities covered by this PBO. As described above, even with compensatory mitigation, some individual turtles may show reduced survival and/or reproduction as a result of permanent habitat impacts stemming from road activities. In the vast majority of cases, however, we expect both the number of turtles exposed to permanent habitat modification, and the severity of response of those individuals, will be minimal based on the provisions of the CMs (1, 3, 18, 20) to assess and minimize impacts in close coordination with the Service. However, even with full and careful implementation of the CMs, it is possible that the effects of habitat modification may reduce population viability. Based on the CMs, New Jersey's wetland regulatory program, past NJDOT practices, and NJDOT's conservation goal for this PBO, we expect that permanent habitat modification stemming from PBO-covered activities will reduce viability at no more than two populations, and we expect the magnitude of that reduction to be small.

We expect that the landscape-scale mitigation will partially offset the role of NJDOT activities in enabling the continued operation of the road network. In addition, we expect that the ILF program will provide compensatory mitigation for impacts to habitat or individual turtles even in circumstances where the corresponding reductions in population viability are uncertain or unlikely. Further, through several of the CMs (*e.g.*, 3f, 18b, 20b), the NJDOT has committed to seek opportunities for improving conditions for bog turtles incidental to the primary purpose of a roadway project. Based on all of these commitments, we expect that the activities carried out under this PBO will meaningfully improve viability of four or more bog turtle populations over the life of this PBO. Viability gains may stem from mitigation efforts that improve connectivity/turtle passage, reduce road mortality, improve habitat, or a combination of these.

Effects to Species

According to the Consultation Handbook (Service and NMFS 1998), the Service's jeopardy analysis may be based on an assessment of impacts at the level of recovery units when those units are documented as necessary to both the survival and recovery of the species in a final recovery plan, for which a notice of availability has been published in the Federal Register. The Consultation Handbook also notes that, when the Service's review in a Biological Opinion (BO) focuses on the effects of the action on a discrete recovery unit, the species status section of the BO is to describe the status of that unit and its significance to the species as listed. The bog turtle recovery units, as currently defined and mapped, are shown in Figure 3. If the delineation of the recovery units changes over the life of this PBO, the Service and the NJDOT will work cooperatively to reassess this jeopardy analysis and, if necessary, issue an addendum to the PBO.

We have concluded, above, that up to four populations of bog turtles in New Jersey may experience reduced viability involving reductions in numbers and/or reproduction, but not in distribution. Therefore, we must assess aggregated consequences of the anticipated loss of long-term viability of the exposed populations on each recovery unit. We cannot predict in which recovery unit(s) the two impacted populations will be located. Therefore, we take a conservative approach (giving the benefit of the doubt to the species, as per the Consultation Handbook), and consider scenarios where all four impacted populations are in the same unit. We also consider the priority that will be placed on providing compensatory mitigation within the same unit as the impact. As shown in Table 1, New Jersey supports 53 percent of the populations in the Hudson/Housatonic (67 of 127), 40 percent of those in the Delaware (89/219), and 100 percent of the Outer Coastal Plain populations (4 of 4).

Minor reductions in viability in up to four populations in either the Hudson-Housatonic Recovery Unit or the Delaware Recovery Unit are not expected to impede the ability of these units to support recovery of the northern bog turtle. This conclusion is based on: (1) the number of populations in each of these units; (2) location of a substantial portion of each of these units outside of the programmatic action area of this PBO; (3) the priority that will be placed on providing compensatory mitigation within the same unit as the impact; and (4) NJDOT's commitment to mitigation, and its conservation goal to offset adverse impacts to the bog turtle and promote the recovery of the species.

Even minor reductions in viability of up to four populations in the Outer Coastal Plain Unit could impede the ability of this unit to support recovery of the northern bog turtle. As shown in Table 1, only four populations are known to occur in the Outer Coastal Plain, with limited potential to achieve recovery in this unit. All populations in this unit show poor conditions of both recruitment and viability (low resilience). A single bog turtle was discovered at a new site in the Outer Coastal Plain in 2018, in Atlantic County (see Figure 1). However, this single observation is not yet evidence of a population, and this site is disjunct and far from any other population. The likelihood of additional undiscovered populations in this unit is considered small. Most historic sites in the Outer Coastal Plain unit are located in Monmouth County, which is highly developed and offers limited opportunities for re-establishing viable populations. Although the status of the bog turtle in the Outer Coastal Plain unit is precarious, any activity covered by this PBO that would be likely to impact the viability of any population will undergo Tier 2 Service review (see Appendix A, User's Guide). The Service and the NJDOT will carefully review all projects in the Outer Coastal Plain Unit to ensure that the viability of these populations is not impacted and that NJDOT activities do not jeopardize the species in this unit.

Conclusion

We considered the current overall status of northern bog turtle, and specifically the species' status in the three recovery units that occur in New Jersey. The range-wide status of the bog turtle is considered stable to increasing, based on increased survey efforts that have detected new bog turtle sites and habitat management that has resulted in the creation or expansion of suitable core habitat at many known sites. At the recovery unit level, the Hudson-Housatonic and Delaware Recovery Units are also stable or increasing. However, population numbers remain low in the Outer Coastal Plain, with limited potential to achieve recovery in this unit.

We also considered the condition of this species within the action area (environmental baseline). We then assessed the effects of the activities covered by this PBO and the potential for cumulative effects in the action area on individuals, populations, and the species (each recovery unit) as a whole.

We conclude that the continued presence and operation of the State's road network is one factor limiting population viability of bog turtles in New Jersey. However, it is impossible to distinguish the incremental contribution of activities covered by this PBO to ongoing population impacts (*i.e.*, the role of those activities in enabling and facilitating the continued operation of the road network), versus the environmental baseline conditions that are the result of past actions and versus the future cumulative effects from non-Federal actions. We expect the ongoing effects of the existing road network will be considered as one among many factors in planning NJDOT's landscape-scale mitigation; thus the statewide ongoing effects will be partially offset.

Aside from the role of NJDOT activities in enabling the continued operation of the road network – considering only the direct and indirect effects of the activities themselves – we expect only minor reductions in overall numbers or habitat quantity/quality at up to four individual bog turtle sites, and that these will be fully offset by compensatory mitigation. Considering the mitigation program, the proactive nature of certain CMs (*e.g.*, 3f, 18b, 20b), and the NJDOT's conservation goal for this PBO, we expect there will be no net loss of conservation value at the scale of the programmatic action area. At the recovery unit scale, minor reductions in turtle numbers or habitat quantity/quality are not expected to impede the ability of the Hudson-Housatonic Recovery Unit or the Delaware Recovery Unit to support recovery of the northern bog turtle. However, even minor reductions in viability of populations in the Outer Coastal Plain Unit could impede the ability of this unit to support recovery of the northern bog turtle. Therefore, any activity covered by this PBO that would be likely to impact the viability of any population would undergo Tier 2 Service review. The Service and the NJDOT will particularly review projects in the Outer Coastal Plain Unit to ensure that the viability of these populations is not reduced. Considering effects at the scale of each of these three recovery units, it is the Service's Opinion that the covered activities, as described in this document, are not likely to jeopardize the continued existence of the bog turtle. At the time of this PBO, no critical habitat has been designated for this species; therefore, no critical habitat will be affected.

INCIDENTAL TAKE STATEMENT

DEFINITION OF INCIDENTAL TAKE

Section 9 of the ESA and the federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. *Take* is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Regulations implementing the ESA (50 CFR 17.3) define *harm* as an act which actually kills or injures wildlife; such act may include (but is not limited to) significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. *Incidental take* is defined as take that is incidental to, and not the purpose of carrying out an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered a prohibited taking

under the ESA, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

EXTENT OF ANTICIPATED TAKE

Final regulations published on May 11, 2015 (*Federal Register* Vol. 80, No. 90, p. 26845) define *framework programmatic action*, for purposes of an Incidental Take Statement, as a Federal action that approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further Section 7 consultation. These regulations define *mixed programmatic action,* for purposes of an Incidental Take Statement, as a Federal action that approves action(s) that will not be subject to further Section 7 consultation, and also approves a framework for the development of future action(s) that are authorized, funded, or carried out at a later time and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further Section 7 consultation. Under these regulations, for a framework programmatic action, an Incidental Take Statement is not required at the programmatic level; any incidental take resulting from any action subsequently authorized, funded, or carried out under the program will be addressed in subsequent (Tier 2) Section 7 consultation, as appropriate. For a mixed programmatic action, an Incidental Take Statement is required at the programmatic level only for those program actions that are reasonably certain to cause take and are not subject to further Section 7 consultation.

This PBO constitutes consultation on a framework programmatic action. As such, this Incidental Take Statement covers only those aspects of incidental take that are best addressed at a landscape level. We will not attempt to apportion this estimated maximum landscape-scale take among various projects during the Tier 2 process because we do not believe this take can be reasonably assessed at the scale of individual projects or activities. Additional take that can be assessed project-by-project was considered in the Effects Analysis, above, and will be accounted for in future Incidental Take Statements issued as part of the Tier 2 process.

The only incidental take authorized in this PBO is as follows.

1. Over the 20-year life of the PBO, we expect one nest may be damaged or destroyed by a person walking through a wetland for purposes related to a roadway project.

2. Over the 20-year life of the PBO, we expect one adult turtle mortality due to operation of a construction vehicle in a developed area.[23]
3. Across the programmatic action area, we expect up to 2 adult turtles per year, or 40 turtles total over the life of the PBO, will be briefly detained (typically 30 minutes or less), handled, and/or relocated in connection with roadway projects. We do not

[23] CM 17 does not apply to vehicle use within existing areas of pavement or other developed areas. Transient turtles in such areas are already exposed to baseline levels of vehicle traffic, which can and sometimes does result in bog turtle road mortality (Zarate pers. comm. 2018). Due to the sheer volume and extent of normal traffic, bog turtles are far less likely to get run over by a construction vehicle than by ordinary (non-construction) vehicles. However, the likelihood that a construction vehicle will hit a turtle over the 20-year life of this PBO is not discountable.

anticipate any mortality or injury of these 40 turtles, or any impacts to their survival or reproductive success.

4. Over the 20-year life of the PBO, we expect up to five turtles may be temporarily trapped behind fencing associated with roadway projects. Based on the CMs, we expect all such turtles will be detected and relocated within 48 hours. We project that one such turtle may experience injury or death as a result of becoming trapped behind fencing, due to lack of cover, food, or water.

5. We estimate that up to 5 percent of New Jersey's bog turtle wetlands (or roughly 1,300 acres) are (and will continue to be) indirectly degraded by the continued presence and operation of the State's road network from a combination of factors such as invasive vegetation; sedimentation; hydrologic alteration; environmental contaminants; reduced effective habitat size/carrying capacity due to fragmentation; barriers to animal movement; elevated populations and access of human-associated predators; human access to habitat that can spread pathogens, facilitate poaching, and facilitate vehicle use in wetlands; and suppression of natural processes (*e.g.*, beaver activity, fire) that would otherwise create and maintain habitat but are incompatible in proximity to road infrastructure. In addition, essentially all bog turtles in New Jersey face at least some level of risk from road mortality from the continued presence and operation of the State's road network. However, it is impossible to distinguish the incremental contribution of activities covered by this PBO to ongoing habitat degradation and road mortality, versus the environmental baseline conditions that are the result of past activities and versus the future cumulative effects from non-Federal activities.[24, 25]

6. During the 24-month timeline for establishing a bog turtle ILF Program Mitigation Instrument, we expect up to 0.10 acre (0.05 acre per year) of unavoidable wetland fill or other direct modification of bog turtle habitat, such as ditching. Over this timeframe, any direct, unavoidable habitat modification (up to 0.10 acre) will be evaluated and apportioned at the project level (*i.e.*, during the Tier 2 process), but will not need to be accounted for in a project-level Incidental Take Statement. (If any unavoidable impacts occur prior to execution of the mitigation instrument, a higher ratio may be needed to compensate for the temporal loss of conservation value; see Appendix C).

[24] This aspect of incidental take is related only to ongoing effects of the existing road network, which continues to operate only due to the maintenance activities covered by this PBO. Additional incidental take may occur as a result of individual road maintenance or improvement projects or activities covered by the PBO, and will be evaluated during the Tier 2 process, which will also involve assessment of appropriate compensatory mitigation under CM 24.
[25] We expect the ongoing effects of the existing road network will be considered as one among many factors in planning NJDOT's landscape-scale mitigation. However, we do not expect that the landscape-scale mitigation will fully offset these statewide ongoing effects, in part because it is unclear how much of these effects can be attributed to activities covered by this PBO versus environmental baseline (*e.g.*, past actions) and cumulative future (*i.e,* non-Federal) actions.

EFFECT OF THE TAKE

The Service has determined that the level of take anticipated, as described above, from the Federal actions covered by this PBO is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

Reasonable and Prudent Measures (RPMs) are measures considered necessary or appropriate to minimize the amount or extent of anticipated incidental take of the species. The Service has concluded that no RPMs are necessary to minimize take of bog turtles, due to the comprehensive set of CMs developed cooperatively by the NJDOT, the ENSP, and the Service.

CONSERVATION RECOMMENDATIONS

Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

1. In coordination with the Service and ENSP, carry out a large-scale study of road-associated contaminant impacts to bog turtle habitat, as referenced under CM 23d.

2. In coordination with the Service and ENSP, establish a program of staffed and/or automated monitoring at high-value bog turtle sites that are in very close proximity to roads. The goal of the monitoring is to detect, assess, and deter unauthorized entry for purposes such as off-road vehicle use, trash dumping, and illegal collection of bog turtles.

3. In coordination with the Service and ENSP, establish a program for early detection and containment of invasive plant species at high-value bog turtle sites that are in very close proximity to roads.

4. In coordination with the Service and ENSP, carry out the highest priority road-related conservation actions in the Bog Turtle Conservation Plan for the Northern Population (Erb 2019).

REINITIATION – CLOSING STATEMENT

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR 402.16, re-initiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

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APPENDIX A. USER'S GUIDE

This User's Guide is intended as a stand-alone resource to assist roadway project proponents in working through the steps necessary to delineate bog turtle habitat, apply appropriate Conservation Measures (CMs) as set forth in the Effects Matrix (Appendix B), and, when necessary, to submit project information for Service review.

HABITAT DEFINITIONS

Known habitat is identified by a custom Landscape Project[26] mapping product that retains all wetland portions of patches valued for bog turtle, but truncates upland portions of such patches at 300 feet from the wetland boundary. The custom Landscape Project mapping will be updated and provided to NJDOT following each public release of a Landscape Project update. Known habitat also includes the entire contiguous wetland in which there has been a positive Phase 2 or Phase 3 survey[27] result or in which a bog turtle has been found through other means (but is not yet valued for bog turtle by the Landscape Project.) These known sites that have not yet been entered into the Landscape Project will be tracked by NJDFW in an Interim GIS layer and shared with NJDOT at least every 6 months.

Potential habitat is the area of suitable habitat identified by a positive Phase 1 survey, plus all contiguous wetlands, where NJDOT elects to assume presence of bog turtles rather than proceed with a Phase 2/Phase 3 survey effort. The NJDOT may also elect to presume that any freshwater wetland is potential habitat instead of conducting the Phase 1 survey.

Aquatic corridor habitat is defined as streams connected to known habitat extending 1.0 mile upstream and 0.5 mile downstream of the known habitat AND any streams connected to potential habitat extending 500 feet upstream and 300 feet downstream of the potential habitat.

Upland corridor habitat is defined as upland areas between known/potential habitats or bog turtle populations that are separated by no more than 0.9 mile , where the known/potential habitats or populations are not separated by a major barrier such as a 4-lane roadway, a high-volume 2-lane roadway, man-made dams or impoundments, railways with intact rails, or steep cliffs.

Wetland habitat (or wetland portion of habitat) is defined as the wetland portion of known and potential habitat.

Upland habitat (or upland portion of habitat) is defined as the upland portion of known (*i.e.*, Landscape-mapped) habitat, and does not include upland corridor habitat.

*Where the term **"habitat"** is used in the Conservation Measures or in the Effects Matrix*, it means known, potential, and/or aquatic corridor habitat, but <u>does not include</u> upland corridor habitat.

[26] http://www.state.nj.us/dep/fgw/ensp/landscape/
[27] https://www.fws.gov/northeast/njfieldoffice/pdf/bogturtlesurvey.pdf

Where the term "habitat" is used in the Conservation Measures or in the Effects Matrix, it does not include existing:

1) pavement, railways, or sidewalks;
2) maintained linear vegetated upland areas adjacent to a roadway, railway, sidewalk or paved trail (*e.g.*, mowed area adjacent to a roadway);
3) mowed ramp infields where no wetlands or streams are present;
4) stormwater management facilities that normally contain standing water or in which vegetation is regularly mowed or removed (*e.g.*, detention or retention basins), and mowed areas surrounding such stormwater management facilities;
5) buildings.

Activities limited to these excluded areas (1 through 5, above) would not be classified in the right-hand column of the Effects Matrix.

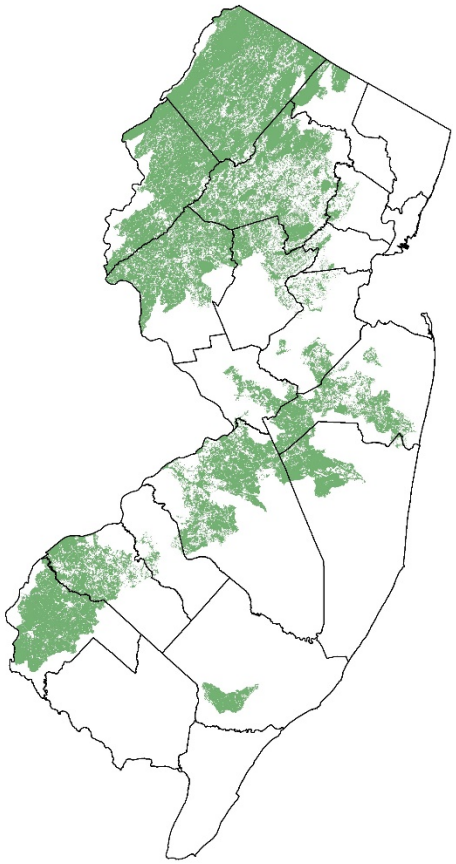

Figure A-4. Programmatic Action Area

The programmatic action area is the entire range of the bog turtle in New Jersey. Mapping to depict the programmatic action area (as shown in in Figure A-4) is subject to revision as new information becomes available.

ABBREVIATIONS

CMs = Conservation Measures
DLUR = Division of Land Use Regulation
ESA = Endangered Species Act
Service = U.S. Fish and Wildlife Service
IPaC = Information for Planning and Consultation
LAA = Likely to Adversely Affect
NA = Not Applicable
NE =No Effect
NJDEP = New Jersey Department of Environmental Protection
NJDFW = New Jersey Division of Fish & Wildlife
NJDOT = New Jersey Department of Transportation
NLAA = Not Likely to Adversely Affect
PBO = Programmatic Biological Opinion

NOTES ON THE EFFECTS MATRIX AND CONSERVATION MEASURES

1. In the list of Conservation Measures, CMs with gray shading should be considered for all projects, but are only listed in the matrix for the most applicable activities.

2. In addition to compliance with all applicable CMs, the project sponsor is required to comply with all additional NJDOT environmental commitments and other applicable regulatory requirements.

3. Even if Service review is not indicated in the matrix, coordination with the Service is required if any CMs cannot be fully implemented. The Service will work cooperatively with the project sponsor to minimize project impacts and evaluate if the project can still be covered by the PBO.

4. The PBO will be in effect for 20 years. Over that time, the Service and NJDOT will maintain an administrative record regarding the interpretation of the CMs and how they apply to particular projects and circumstances. The Service, NJDOT, and NJDFW will meet annually to update GIS mapping tools and to review PBO implementation, and will also periodically, as needed, issue addenda to the PBO to update or adjust CMs and/or activity descriptions based on lessons learned, new information, and/or new NJDOT practices. The Service and NJDOT will ensure that CM interpretation and any addenda are consistent with the jeopardy analysis included in the PBO (*i.e.*, the nature and severity of effects evaluated in the PBO will not be exceeded).

PROJECT REVIEW PROCEDURES

1. Visit the Service Project Review web page, obtain an IPaC report, and follow the instructions for either normal[28] or emergency[29] consultation, as appropriate.
   a. For all species on the IPaC report other than bog turtle, proceed with project review as directed in NJDOT's custom screening chart.
   b. If the project is funded, sponsored, or required by a Federal agency OTHER THAN the Federal Highway Administration (FHWA), proceed with project review for bog turtle as directed in the NJDOT-specific custom screening chart.

[28] https://www.fws.gov/northeast/njfieldoffice/endangered/consultation.html
[29] https://www.fws.gov/northeast/njfieldoffice/pdf/EmergencyConsultation.pdf

c. Regardless of whether or not bog turtle is listed on the IPaC report, proceed to step 2 for all FHWA and non-Federal roadway or roadway-related projects that have NJDOT involvement.

2. Use the GIS layer[30] called Programmatic Action Area[31] to determine if all or part of the project is within the action area of the PBO. (See Figure A-4.)
   a. If the project is entirely or partially within the Programmatic Action Area (see special circumstances described in steps 2c and 2d below), proceed to step 3.
   b. If the project is entirely outside of the Programmatic Action Area (see special circumstances described in steps 2c and 2d below), the project is NE for bog turtle. Retain documentation in project files. No further action needed under this PBO.
   c. If the action area of this PBO (as depicted on the most current version of the Action Area GIS layer) is bounded by a road (based on the most recent available aerial or road network mapping), then:
      i. Activities within that roadway and/or within the programmatic action area are subject to this PBO; proceed to step 3.
      ii. Discrete project activities (*e.g.*, guiderail, sidewalk, or shoulder work) that are entirely on the side of the road that is outside the programmatic action area are NE for bog turtle. Retain documentation in project files. No further action needed under this PBO.
      iii. Where a single activity is partially within and partially outside the programmatic action area, the entire activity is subject to the PBO; proceed to step 3. Some examples may include intersection reconfiguration, culvert work, and drainage improvements.
   d. Where a project activity is mostly outside the programmatic action area but at least partially within, the entire activity is subject to the PBO; proceed to step 3. However, NJDOT may elect to contact the Service to discuss where and how the PBO should apply (*e.g.*, a long linear project that crosses the action area only for a short distance).

3. Determine if the project is a necessary response to an emergency. In the context of the ESA, an **emergency** is *a situation involving an act of God, disasters, casualties, national defense or security emergencies, etc., and includes response activities that must be taken to prevent imminent loss of human life or property*. Predictable events usually do not qualify as emergencies under the ESA consultation regulations unless there is a significant unexpected human health risk. Under no circumstances should implementation of the CMs in the PBO (including coordination with the Service) obstruct or impede an emergency response where human life is at stake.
   a. If yes, proceed with the emergency response immediately, implementing any applicable CMs only to the extent that doing so does not hinder the emergency response. As soon as possible, notify the Service by telephone call or email directly to designated staff points

[30] The term "GIS layer(s)" refers to mapping layers that will be available in a custom GIS project, which has been developed by NJDFW in cooperation with the Service and NJDOT specifically for use in implementing this PBO.
[31] The Action Area of the PBO includes the entire range of the bog turtle in New Jersey, see Figure A-4. This is not to be confused with the "action area" of each individual project; see glossary. Note that this definition for the Action Area of the PBO will not change over the life of the PBO, but the actual geographic extent may change if bog turtle sites become extirpated or new ones are discovered.

of contact – the Service and NJDOT will maintain a current contact list. Upon notification (*i.e.*, initiation of emergency Tier 2 consultation[32]), Service staff may offer conservation recommendations (likely a subset of the CMs, or possibly alternatives to certain CMs) that should be implemented only if they do not hinder the emergency response. Following the emergency, contact the Service within 1 business day to determine if further Tier 2 consultation is needed and evaluate the need for an after-the-fact incidental take statement. (See Table A-4.)

b. If no, proceed to step 4. Note that urgent projects, which are time-sensitive but do not meet the above definition of an emergency, are addressed under step 9, below.

4. Identify all the activities (*i.e.*, rows) in the Effects Matrix that will be included in the project. Use the *Checklist of Applicable Activity Rows from the Effects Matrix* in the *Bog Turtle Project Worksheet* at the end of this guide. If the project includes activities that are not listed in any row of the matrix, contact the Service.

5. Delineate the footprint of the project, including areas of permanent and temporary impact, access, staging, and storage. See Figure A-5. Relative to the project footprint:
   a. Use the GIS layer called Recovery Units to determine in which unit(s) the project is located.
   b. Use the GIS layers called Custom Landscape Project and Interim, which together show all known bog turtle habitat, to locate the nearest known habitat.
   c. Use the GIS layer called Wetlands, as well as on-the-ground reconnaissance (*e.g.*, wetland delineation), to locate the nearest freshwater wetland other than Phragmites Dominant Urban Area, Unvegetated Flats, or Disturbed Tidal Wetlands, as depicted by the 2012 Land Use Land Cover or the 2012 Wetlands GIS layer (or the most current version of the State's freshwater wetland mapping).
   d. Use the GIS layer called Streams to locate the nearest aquatic corridor habitat as defined in this document. The current Streams layer is dated 2002, and will be updated as newer Streams layers become available from the State.

6. If the nearest freshwater wetland is within 300 feet of the project footprint – or if the nearest aquatic corridor habitat is within 300 feet and was so classified based on connection to a wetland of unknown habitat suitability – either assume suitability and treat that wetland as potential habitat OR have a Phase 1 survey[33] conducted by a Certified NJDOT Bog Turtle Technician or by a Recognized Qualified Bog Turtle Surveyor.[34] Assuming suitability may be more appropriate where there is no work in the wetland, or only a minor intrusion. However, for projects with more substantial disturbance to the wetland and/or adjacent upland buffers, or potential for hydrologic change, a Phase 1 survey should be conducted.

   As per the guidelines, Phase 1 surveys should include inspection of the entire contiguous wetland, including areas more than 300 feet from the project area.[35] In some cases, however,

[32] Tier 2 consultation is the project-level review conducted under the auspices of, and in accordance with, the PBO.
[33] https://www.fws.gov/northeast/njfieldoffice/pdf/BTSurveyPhases1and2.pdf
[34] https://www.fws.gov/northeast/njfieldoffice/pdf/BogTurtleSurveyors.pdf
[35] If the Phase 1 survey documents suitable habitat within 300 feet of the project area, then no further on-the-ground survey effort or desktop review is needed.

it may not be possible to survey all portions of the wetland more than 300 feet from the project area; for example if landowner access is denied, if the wetland is extremely large or extends along a considerable length of stream, or if there are other logistical issues. In such cases, NJDOT should document the reason(s) why the survey was truncated at 300 feet and proceed with desktop review, as follows. For the desktop review, a surveyor (*i.e.*, Certified NJDOT Bog Turtle Technician or Recognized Qualified Bog Turtle Surveyor) should review the best available wetland mapping data and infrared aerial imagery (most recent available) for the site to assess whether emergent wetland habitat exists within the unsurveyed portions of the wetland. (Note that herbaceous wetlands, agricultural wetlands (modified), and wetland right-of-ways (modified) are considered emergent wetland cover types.) The surveyor should also review infrared aerial imagery (most recent available) for the wetland to confirm that the cover types shown on the wetland mapping layer are accurate. If the on-the-ground Phase 1 survey effort conducted within 300 feet of the project footprint is negative (suitable habitat absent) but emergent wetland habitat is determined to exist in the contiguous wetland beyond the surveyed area, the entire wetland should be considered to have a positive Phase 1 survey result.

a. If the Phase 1 survey is negative, the wetland is <u>not</u> considered potential habitat.
b. If the Phase 1 survey is positive, the entire wetland is considered potential habitat <u>unless/until</u> a Recognized, Qualified Bog Turtle surveyor has conducted a Phase 2 (and possibly a Phase 3) presence/absence survey for bog turtles, and the Service has concurred with the results.
    i. If turtles are found during a Phase 2 or Phase 3 survey, or under any other circumstances, a potential habitat becomes a known habitat.
    ii. If the Service has concurred with a negative Phase 2/3 survey report, that wetland is no longer considered potential habitat.
c. The Phase 1 survey is not necessary if the wetland in question is already known habitat as shown in the GIS layers called Custom Landscape Project or Interim.

7. Use the results of steps 5 and 6, above, to determine the applicable column(s) in the Effects Matrix, based on the distance of the project to the nearest known, potential, or aquatic corridor bog turtle habitat. Different columns may apply to different activities (components) of the same project. Further, the same activity (row in the Effects Matrix) may be geographically subdivided based on distance from habitat (*e.g.*, the "within 300 feet of habitat" column may apply to only a small portion of a linear resurfacing activity.) The Service may be contacted for assistance in determining the geographic limits to which each set of CMs (each column) should be applied to each activity.

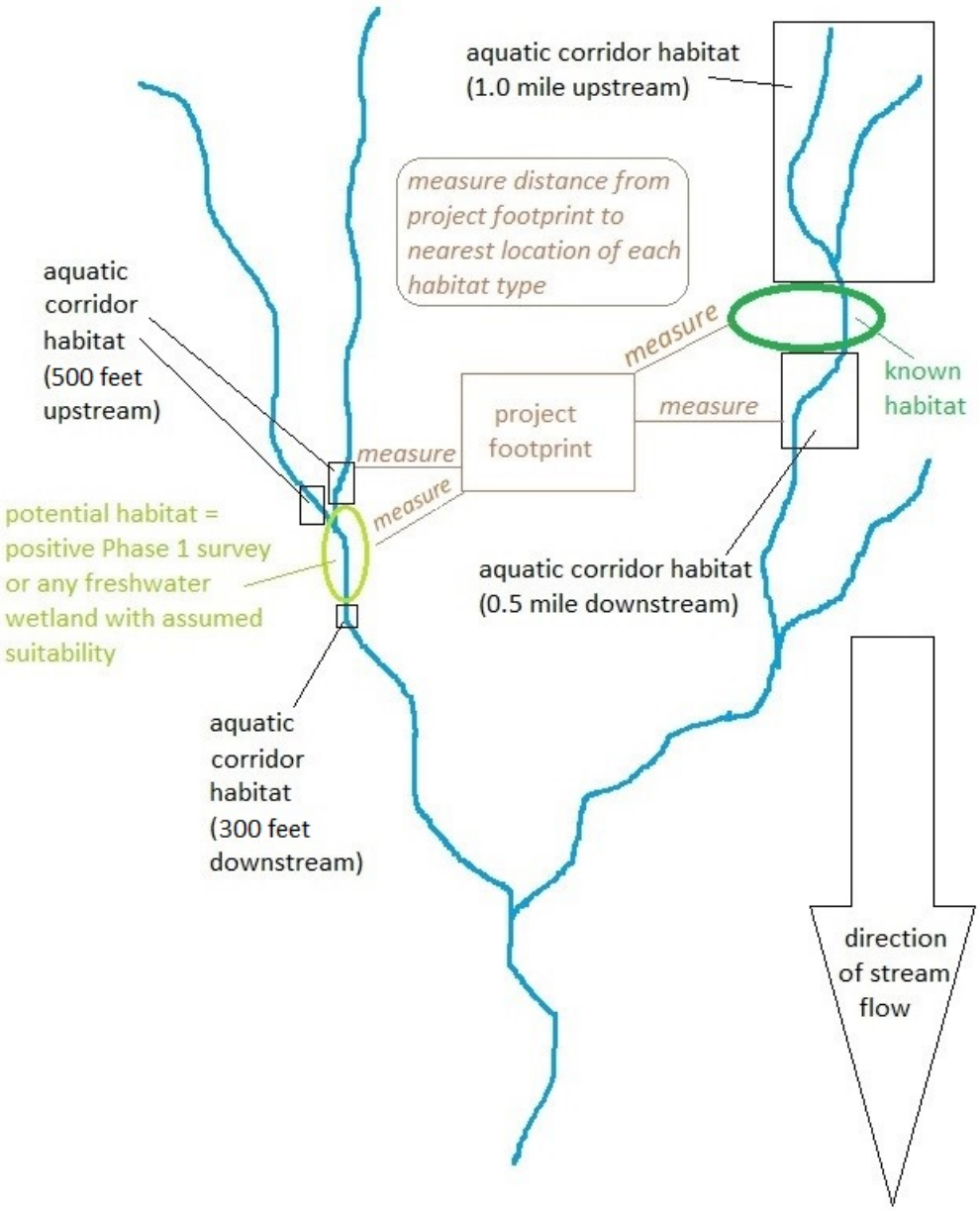

Figure A-5. Schematic for Measuring Distance to Various Habitat Types

8. Based on the row(s) identified in step 4 and the column(s) identified in step 7, use the Effects Matrix to complete the *Checklist of Applicable Conservation Measures* in the *Bog Turtle Project Worksheet* (below) to guide the rest of project planning. If a project involves several activities (*i.e.*, multiple rows in the matrix), all of the indicated CMs will apply. If any CMs conflict, the more flexible ones apply (*e.g.*, 13c instead of 13b; 13e/13f/13g instead of 13d; 15a/15b/15c/15d instead of 15e; 17 instead of 16). Please remember that CMs shaded in gray should always be considered for inclusion, if applicable. NJDOT may elect to contact the Service for clarification on how CMs should be applied or implemented for specific activities. NJDOT may also contact the Service to discuss waiving or modifying a particular CM if it does not seem appropriate or practical under specific circumstances – in addition to advising on the CM(s) in question, the Service will also advise if Tier 2 consultation is needed (see Step 9).

9. If all the applicable cells of the Effects Matrix indicate that Service review is not required and if all applicable CMs can be fully implemented as written and no activities are proposed within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit, retain a copy of *the Bog Turtle Project Worksheet* with the project file, and proceed with the project following conclusion of consultation for other species (step 1).[36] If the applicable cells of the Effects Matrix indicate[37] that Service review is required, submit the project for Tier 2 consultation. Also submit for Tier 2 consultation any project for which any applicable CM(s) cannot be fully implemented as written, unless the Service has advised (under Step 8) that Tier 2 review is not needed. Also submit for Tier 2 consultation any project that includes activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit.
   a. Include all the information listed on the Service's web site.[38]
   b. Include the completed *Bog Turtle Project Worksheet* at the end of this guide.
   c. Include confirmation that all applicable CMs will be applied, or explanation of how and why the project will deviate from the CMs. As necessary and appropriate, include a brief description of how the CMs will be implemented.
   d. Indicate if the project is a response to an **urgent** situation, which is defined for this consultation as *a situation requiring response activities or corrective action on the order of weeks or months in order to protect human life, health, or safety, or to prevent loss of property*. Urgent situations include, but are not limited to, NJDOT Priority 1 and 2 projects. Expedited review procedures for Priority 1, Priority 2, and other urgent projects are described in step 10 below.

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[36] For the first 6 months following completion of this PBO, the NJDOT will forward copies to the Service via email for projects where the Effects Matrix does NOT indicate Service review is required and where all applicable CMs will be fully implemented as written. Worksheets for such projects will be emailed (for the first 6 months) to NJFO_ProjectReview@fws.gov with the subject line "NJDOT Transition Period notification for [Project Name]." Specific to this category of projects, if the Service does not reply within 10 days, NJDOT can presume concurrence and proceed with the project (upon completion of review for other listed species as per step 1). This transition period is to ensure that both agencies have a consistent understanding of how the CMs and review procedures should be implemented. After the first 6 months, the NJDOT and the Service will revisit the issue to determine if notification for this category of project can be stopped.

[37] In addition to containing the words "Service review," these cells are also distinguished by peach shading. Please note that some cells may contain the words "could be NLAA or LAA"; in these circumstances a determination will be made during Service review.

[38] https://www.fws.gov/northeast/njfieldoffice/endangered/consultation.html#submit

e. Indicate if the project is an NJDOT Priority 1 or Priority 2 Project. In accordance with NJDOT's Priority Repair Procedure (revised January 2008), repairs under the Priority 1 category must be done as soon possible, and should start no later than 30 days from when Maintenance Engineering is made aware of the problem. Repairs under the Priority 2 category should be done within approximately 3 months; therefore should begin within 60 days from when Maintenance Engineering is made aware of the problem.
f. Email all of the above information to NJFO_ProjectReview@fws.gov. Include one of the following in the subject line:
NJDOT Priority 1 Notification for [Project Name]
NJDOT Priority 2 Notification for [Project Name]
NJDOT Urgent Tier 2 for [Project Name]
NJDOT Tier 2 for [Project Name]
Do not use this email address to initiate emergency Tier 2 consultation; see step 3, above, for emergency consultation procedures.

10. Coordinate with the Service to complete Tier 2 consultation, if necessary (as specified in step 9). See Table A-3. As a reminder, this Tier 2 process only applies to bog turtle. See step 1 for procedures regarding other listed species.
    a. A preliminary Service response will acknowledge receipt of the submission and inform NJDOT which Service biologist has been assigned to review the project. Following the preliminary response, the project representative can coordinate directly with the assigned Service biologist.
    b. Regular (non-urgent) Tier 2 consultations:
        i. The Service will provide a preliminary response to Tier 2 submissions within 15 days[39].
        ii. The Service will aim to conclude NLAA Tier 2 consultations within 30 days.
        iii. The Service will aim to conclude LAA Tier 2 consultations (including incidental take statements) within 45 days.
    c. Urgent Tier 2 consultations other than NJDOT Priority 1 and Priority 2 projects:
        i. The Service will provide a preliminary response to urgent Tier 2 submissions within 5 days.
        ii. The Service will aim to conclude urgent NLAA Tier 2 consultations within 20 days.
        iii. The Service will aim to conclude urgent LAA Tier 2 consultations (including incidental take statements) within 45 days, but will attempt to expedite the consultation to the extent possible with available staff resources.
    d. Under most (but not all) circumstances, the Tier 2 submissions for NJDOT Priority 1 and Priority 2 projects will be considered notifications, meaning work may proceed if the Service does not respond within the timeframes listed at d.i and d.ii below:
        i. If the criteria under d.iii below are met, work may proceed on a Priority 1 project if the Service does not respond within 5 days.
        ii. If the criteria under d.iii below are met, work may proceed on a Priority 2 project if the Service does not respond within 10 days.

[39] All Service response timeframes listed in step 10 refer to calendar days from the date of NJDOT email submission.

iii. If no other species require consultation (as per Step 1), work may proceed on NJDOT Priority 1 and Priority 2 projects as indicated under d.i and d.ii, above, only if all applicable CMs will be applied as written and the matrix indicates only NLAA and the work will not occur within habitat and no work is proposed within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit.

iv. If the Service responds to an NJDOT Priority 1 or Priority 2 notification OR if any CMs cannot be fully implemented as written OR if the matrix indicates that the activity is or could be LAA OR if the project involves activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit, then work may not begin until Tier 2 consultation is complete. The Service will aim to complete Tier 2 consultation within 10 days of receiving NJDOT email notification for Priority 1 projects, and within 20 days of receiving NJDOT email notification for Priority 2 projects.

e. The above timeframes may be longer or shorter depending on Service staffing levels, other priority work, project complexity, and the need for a site visit or meeting.

11. Coordinate with DLUR for projects that require an NJDEP Freshwater Wetlands Permit (FWW).
    a. If possible, complete consultation with the Service prior to submission of the FWW Permit application. Include the following documentation in the FWW Permit application: EITHER (i) a concurrence letter or form from the Service concluding consultation for all species OR (ii) a statement that no Service review is required for bog turtle under this PBO and no Service review is required for other species as per the NJDOT custom screening chart.
    b. If it is not possible to conclude Service consultation prior to submission of the FWW Permit application, indicate in the permit application that the project is covered by this PBO. Include the following documentation in the FWW Permit application: EITHER (i) a statement that project information has been submitted to the Service for review for all species OR (ii) a statement that no Service review is required for bog turtle under this PBO and no Service review is required for other species as per the NJDOT custom screening chart.

12. Reinitiate Tier 2 consultation if project plans change at any time before or during implementation, for example, changes regarding: seasonal timing, footprint of disturbance, net change in area of imperious surface, or ability of the project to adhere to the CMs as written.

Table A-3. Decision Tree for Review Procedures Steps 3 and 10

	Emergency	NJDOT Priority 1	NJDOT Priority 2	Urgent	Regular
1	Proceed with the emergency response. Implement CMs only if doing so will not impede response. Go to Row 2.	Will all applicable CMs be carried out as written? Yes = Go to Row 2. No = Go to Row 6.	Will all applicable CMs be carried out as written? Yes = Go to Row 2. No = Go to Row 6.	Will all applicable CMs be carried out as written? Yes = Go to Row 2. No = Go to Row 4.	Will all applicable CMs be carried out as written? Yes = Go to Row 2. No = Go to Row 4.
2	Notify the Service of the emergency as soon as possible. The Service may offer recommendations to be implemented only if they will not impede the response. Go to Row 3	Does the Matrix indicate Service review is required? Yes = Go to Row 3. No = Go to Row 4.	Does the Matrix indicate Service review is required? Yes = Go to Row 3. No = Go to Row 4.	Does the Matrix indicate Service review is required? Yes = Go to Row 4. No = Go to Row 3.	Does the Matrix indicate Service review is required? Yes = Go to Row 4. No = Go to Row 3.
3	Contact the Service within 1 business day following the emergency. Go to Row 4.	What is the ESA determination for this activity, as per the Matrix? NLAA = Go to Row . NLAA/LAA = Go to Row 6. LAA = Go to Row 6.	What is the ESA determination for this activity, as per the Matrix? NLAA = Go to Row . NLAA/LAA = Go to Row 6. LAA = Go to Row 6.	Does the project include activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit? Yes = Go to Row 4. No = Go to Row 6.	Does the project include activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit? Yes = Go to Row 4. No = Go to Row 6.
4	If necessary, complete after-the-fact consultation for bog turtle and other species. End.	Does the project include activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit? Yes = Go to Row 6. No = Go to Row 5.	Does the project include activities within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit? Yes = Go to Row 6. No = Go to Row 5.	Email NJDOT Urgent Tier 2. Preliminary Service response within 5 days. Go to Row 5.	Email NJDOT Tier 2. Preliminary Service response within 15 days. Go to Row 5.
5		Email NJDOT Priority 1 notification. Service response within 5 days? Yes = Go to Row 6. No = Go to Row 7.	Email NJDOT Priority 2 notification. Service response within 10 days? Yes = Go to Row 6. No = Go to Row 7.	Work with the Service to conclude Tier 2 consultation. The Service will aim to complete within the following time frames: Informal: 20 days. Formal: 45 days (expedited) Go to Row 6.	Work with the Service to conclude Tier 2 consultation. The Service will aim to complete within the following time frames: Informal: 30 days. Formal: 45 days. Go to Row 6.
6		Email NJDOT Priority 1 notification (unless already done in Row 4). Work with the Service to conclude Tier 2 consultation. (The Service will aim to complete Tier 2 within 10 days.) Go to Row 6.	Email NJDOT Priority 2 notification (unless already done in Row 4). Work with the Service to conclude Tier 2 consultation. (The Service will aim to complete Tier 2 within 20 days.) Go to Row 6.	Complete consultation for other species as needed. Proceed with the project including applicable CMs. End.	Complete consultation for other species as needed. Proceed with the project including applicable CMs. End.
7		Complete consultation for other species as needed. Proceed with the project including applicable CMs. End.	Complete consultation for other species as needed. Proceed with the project including applicable CMs. End.		

NON-FEDERAL ACTIVITIES

1. Projects that do not involve any Federal Highway Administration (FHWA) funding or involvement will follow the procedures listed above.

2. The Service will provide NLAA Tier 2 consultations as technical assistance on non-Federal projects.

3. If adverse effects cannot be avoided and incidental take is likely to occur as a result of a non-Federal project, the Service and NJDOT will work with the project sponsor to identify one of the following courses of action:
   a. Utilize at least some FHWA funding for the project (conversion to a Federal project).
   b. Address adverse effects through the 1993 Memorandum of Agreement regarding State assumption of the Section 404 wetland program (revised in 2018).[40]
   c. Prepare a Habitat Conservation Plan[41] and incidental take permit application under Section 10 of the ESA.

PROJECTS IN OR ADJACENT TO STREAMS

All streams located within 300 feet of known or potential habitat – and hydrologically connected to such habitat – are included in the definition of aquatic corridor habitat (see habitat definitions, above) and are, therefore, considered to be "within habitat." As a result, those activity rows in the matrix that are specific to work in or adjacent to a stream (*e.g.*, activities related to culverts, streambanks, most bridges) will almost never be classified as occurring in the middle column in the matrix (within 300 feet of habitat). The vast majority of stream projects will either be classified as greater than 300 feet from habitat (left column), or within habitat (right column). One unusual circumstance in which a stream project may be classified as located within 300 feet of habitat (middle column) is where the project footprint is separated from the habitat by a drainage divide, such that there is less than 300 feet between the two but surface water at the project site does not flow toward the habitat. Figure A-6 below shows a hypothetical example of how this could occur.

[40] https://www.fws.gov/northeast/njfieldoffice/pdf/MOAUSFWS.pdf
[41] https://www.fws.gov/endangered/what-we-do/hcp-overview.html

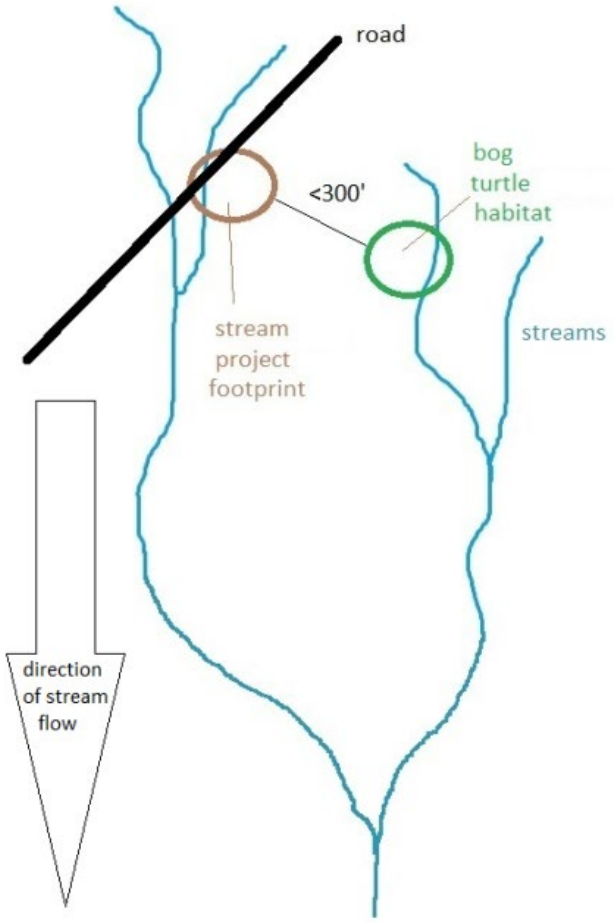

Figure A-6. Hypothetical Example of Stream Work in Middle Column of Effects Matrix

BOG TURTLE PROJECT WORKSHEET

Cover Sheet

Project Name:

Municipality:

County:

Recovery Unit(s):

Date:

NJDOT Contact Name:

NJDOT Contact Phone:

NJDOT Contact Email:

Project Category:

Circle One: Regular Urgent NJDOT Priority 1 NJDOT Priority 2

Project footprint distance to nearest known habitat:

Circle One: Greater than 300 feet Within 300 feet Within Habitat

Project footprint distance to nearest potential habitat:

Circle One: Greater than 300 feet Within 300 feet Within Habitat

Circle One: Positive Phase 1 survey Assume Suitable

Project footprint distance to nearest aquatic corridor habitat:

Circle One: Greater than 300 feet Within 300 feet Within Habitat

Notes/Comments:

Checklist of Applicable Activity Rows from the Effects Matrix

See the Effects Matrix for further details and caveats. Check all that apply.

1. Soil Erosion and Sediment Control, Water Quality Measures and Caution Fence
    - Fence/Hay Bales
    - Within Waterbody
    - Temporary Slope Drains
    - Inlet Protection
    - Temporary Stone Outlet Sediment Traps
    - Sedimentation/Dewatering Basin
    - Sediment Control Bag/Tank
    - Erosion Control Mats/Blankets
    - Concrete Washout Facility
    - Construction Driveway
    - Pollution Control Items
2. Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance
    - Vegetation Removal/Control
    - Grubbing
    - Clear Zone and Sight Distance Maintenance Other than Vegetation Management
    - Road Shoulder Maintenance
3. Drainage Facilities
    - Drainage Facility Inspection, Maintenance, and Repair
        - ☐ Video inspection of pipe
        - ☐ Inlet (catch basin)/drainage pipe cleanout
            - Pipe does not outfall to habitat
            - Pipe does outfall to habitat
        - ☐ Outfall clean-out
        - ☐ Repair of drainage pipes
        - ☐ Repair of headwalls, wingwalls, flared end sections, outfall structures
        - ☐ Outfall protection
    - Inlet Replacement/Installation
        - ☐ Inlet replacement (in-kind)
        - ☐ Inlet upgrade or new inlet installation (connecting to existing drainage facility) (may include new section of pipe)
    - Drainage Facility Reconstruction/Replacement
        - ☐ Reconstruction/replacement of headwalls, wingwalls, flared end sections, outfall structures; may need a new footing. In-kind replacement AND in same location/alignment as existing.
        - ☐ Replacement of headwalls, wingwalls, flared end sections, outfall structures; may need a new footing. Out-of-kind replacement AND/OR in different location/alignment as existing.
        - ☐ Replacement of drainage pipe
    - Drainage Facility Construction
        - ☐ Drainage Facility Construction: with new outfall

4. Stormwater Management Facilities
    - Stormwater Management Facility Maintenance
        - Maintenance that applies to all stormwater management facilities that include vegetation that is not regularly mowed or removed AND that are immediately adjacent to habitat (*i.e.*, are not separated by development, pavement, sidewalk, or mowed lawn).
        - Maintenance not covered under the preceding bullet.
        - Stormwater management facility maintenance/clean-out (Manufactured Treatment Devices [MTDs] or underground detention basins).
        - Stormwater management facility maintenance (pervious paving systems)
    - Stormwater Management Facility Construction
        - Construction of stormwater management facilities other than those listed in the following three bullets.
        - Installation of manufactured treatment devices (MTDs)
        - Pervious paving systems
        - Rain gardens
5. Stream Culverts
    - Culvert Inspection, Maintenance, and Repair
        - Culvert Inspection
        - Culvert clean-out
        - Culvert repair - includes repairs to headwall/wingwalls/culvert/footings/terrestrial wildlife passage shelf
        - Culvert repair – lining of culvert
        - Scour repair – minor (*e.g.*, filling in a hole)
        - Scour repair – more extensive repair/protection (*e.g.*, across streambed)
    - Culvert Reconstruction/Extension
        - Culvert reconstruction
        - Culvert extension
    - Culvert Replacement
        - In-kind replacement AND in same location/alignment as existing
        - Out-of-kind replacement AND/OR in different location/alignment as existing
    - New Culvert Construction
        - New culvert installation
6. Bridges
    - Bridges Over Roadways or Railroads
    - Bridges Over Waterbodies
        - Bridge Inspection
            - By snooper truck
            - By boat/barge
            - On foot
        - Bridge Superstructure Maintenance and Repair
            - Scuppers
            - Bridge painting/cleaning
            - Bridge deck resurfacing/overlay and patching

        - Bridge superstructure repairs
    - Bridge Substructure Repair
        - Spalling repair, crack sealing
        - Repair of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf
        - Scour and undermining repair – minor (*e.g.*, filling in a hole)
        - Scour and undermining repair - more extensive scour repair/protection (*e.g.*, across streambed)
        - Bridge timber pile repairs, installation of steel collars, replacement of fender system walers, in-kind dolphin repair
    - Bridge Reconstruction/Rehabilitation
        - Superstructure
            - Bridge deck rehabilitation
            - Bridge superstructure: reconstruction or replacement of parapets, railing, beams, stringers, girders, curb, sidewalk, and/or deck
        - Substructure
            - Reconstruction/replacement of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf
            - Bridge pile replacement via pile driving
            - Bridge foundation replacement via drilled shafts
            - Replacement of existing fender system; in-kind dolphin replacement; installation of new fender system; installation of dolphins (new or additional)
    - Bridge Widening
        - Bridge widening that does not involve addition or modification of wingwalls, abutments, piers, footings
        - Bridge widening that includes addition or modification of wingwalls, abutments, piers, footings
    - Bridge Replacement
        - In-kind bridge replacement AND in same location/alignment as existing
        - Out-of-kind bridge replacement AND/OR in different location/alignment as existing
    - New Bridge Construction
        - New bridge (includes construction of permanent or temporary bridge)
7. Terrestrial Wildlife Passage
    - Culvert Shelf
        - Repair, reconstruction, or in-kind replacement of terrestrial wildlife passage shelf in culvert
        - Installation of new or out-of-kind replacement of terrestrial wildlife passage shelf
    - Dry Passage
        - Culverts (dry passage) for terrestrial wildlife
    - Bridge Shelf

        - Repair, reconstruction, or in-kind replacement of terrestrial wildlife passage shelf in bridge
        - Installation of new or out-of-kind replacement of terrestrial wildlife passage shelf
8. Demolition
    - Bridge
    - Building
9. Rockfall Safety Measures
    - Netting, Pinning, Slope Scaling, Large Block Removal
    - Construction of Catchment Fence
    - Blasting (controlled blasting with use of blanket)
10. Slope Stabilization
    - Streambank Stabilization
        - Vegetated Treatment, Bioengineering, Erosion Control Mats
        - Placement of Riprap, Gabion Baskets/Mattress, Articulated Concrete Block Mattress
        - Repair/Reconstruction/Replacement of Retaining Wall or Bulkhead
        - Construction of Retaining Wall or Bulkhead (includes extension of existing wall/bulkhead or other enlargement of the footprint)
    - Roadway Slope Stabilization
        - Vegetated Treatment, Bioengineering, Erosion Control Mats
        - Placement of Riprap, Gabion Baskets/Mattress, Articulated Concrete Block Mattress
        - Repair/Reconstruction of Retaining Wall
        - Construction of Retaining Wall (includes extension of existing wall or other enlargement of the footprint)
11. Appurtenant Features
    - Guiderail/Median Barriers
        - Guiderail – repair (includes replacement/upgrade of beam)
        - Guiderail - replacement/reset/upgrade of existing guiderail, installation of new guiderail, vegetated/non-vegetated treatment
        - Median Barriers
    - Signage
        - Signs with posts (no footing or foundation)
        - Signs structures with footing or foundation
    - Traffic Signals
        - Traffic signal equipment (replacement/upgrade of existing and installation of new)
        - Signal system improvement (repair/installation of loops and sensors within existing pavement)
    - Lighting
        - Lighting (replacement of existing or installation of new)
    - Fence
        - Fence (repair, replace, install new)
    - Curbing
        - Curb work (repair, reconstruct, replace, install new)

- Streetscape
  - Streetscape (*e.g.*, benches, bicycle racks, town clocks, planters, trash receptacles)

12. Bicycle/Pedestrian Facilities (Sidewalks, Trails, ADA)
    - Sidewalk or Multi-Use Trail Near Roadway – repair/reconstruction/replacement of existing sidewalk and bicycle/pedestrian facilities
    - Sidewalk or Multi-Use Trail Near Roadway – installation of new or installation/completion of missing sections
    - Trail Not Along Roadway (includes rail/canal alignments converted to trails)
    - Americans with Disabilities Act (ADA) Requirements
13. Transportation Alternatives/Enhancements
    - Bicycle/pedestrian facilities and preservation of abandoned railway corridors
    - Acquisition of scenic easements and scenic or historic sites; and historic preservation
    - Scenic or historic highways and establishment of transportation-related museums
    - Landscaping/streetscaping/scenic beautification
    - Rehabilitation and operation of historic transportation buildings, structures, and facilities
    - Inventory and control of outdoor advertising
    - Archeological planning and research
    - Environmental mitigation – to address water pollution due to highway runoff
    - Environmental mitigation – to reduce vehicle-caused wildlife mortality while maintaining habitat connectivity
14. Landscaping
    - Placement of Topsoil, Seeding, Plantings, Fertilizing, Mulching, Erosion Control Mats
    - Use of Herbicide
15. Graffiti Removal
    - Graffiti Removal (*e.g.*, on bridge, noise wall)
16. Geotechnical Borings
    - Geotechnical Borings (*e.g.*, vehicle-mounted equipment, boring hole sealing)
17. Roadways
    - Roadway Maintenance
      - Street Sweeping
      - Winter Maintenance
    - Safety Delineator Measures
      - Striping/pavement markings installation
      - Rumble strip grinding
    - Roadway Resurfacing and Patching
      - Crack sealing, pothole repair and patch work for pavement repair
      - Milling and resurfacing of pavement, high friction surface treatment, overlay, slurry sealing/oiling
    - Roadway Rehabilitation/Reconstruction
      - Roadway rehabilitation, rubblization, reconstruction
      - Intersection/interchange improvement/reconstruction
    - New Roadway Construction

- Widening of roadway – minor widening
- Widening of roadway – addition of lane/shoulder
- Road realignment
- New interchange
- New roadway/bypass
- Removal of roadway/paved surface and restore to vegetated condition

18. Dams
    - Dam Inspection
    - Dam Maintenance
    - Dam Rehabilitation/Reconstruction
    - Dam Replacement
19. Cameras/Intelligent Transportation System/Utilities
    - Cameras – replacement of existing cameras, installation of new cameras on existing poles/posts/traffic signals
    - Cameras – on new poles/posts, with new footings
    - Intelligent Transportation System (ITS) components installation
    - Utility line relocation/installation
20. Railroad Operations Improvements
    - Railroad Operations Improvements Other than Rail Replacement
    - Railroad Operations Improvements – Rail Replacement
21. Maintenance Yards
    - Existing Maintenance Yards and Garages – Maintenance and Operations
    - New Maintenance Yard and Garage Construction
22. Noise Barriers
    - Repair or Reconstruction of Noise Barrier
    - New Noise Barrier Installation
23. Transportation Roadside Facilities
    - Park and Ride Facility/Rest Area/Truck Weigh Station/Parking Lot
24. Stream/Wetland Work
    - Stream/Waterbody Cleaning
    - Mitigation/Restoration Work
    - Stream Modification
    - Temporary Stream Diversion
25. Dewatering
    - Dewatering of Stream
    - Dewatering of Groundwater Outside of Stream
26. Survey Work – Topographic, Biological, and Archeological
    - Survey Work (includes Topographic, Biological, and certain Archeological Survey work; does not include test pits)
    - Archeological Test Pits/Excavations
27. Temporary Construction Site Facilities and Staging Areas
    - Temporary Access Road/Temporary Driveway Construction and Removal
    - Temporary Construction Site Facilities and Removal
    - Off-site Use Areas
28. Foot Access through or near Bog Turtle Habitat
    - Foot Access Through or Adjacent to Bog Turtle Habitat

29. Restoration of Temporary Impacts
    - Restoration of Temporarily Impacted Areas to Original Condition
30. Accidental Fuel/Contaminant Spill
    - Accidental Fuel Spill/Potential Contaminant Release at NJDOT Construction or Maintenance Work Site or Maintenance Facility and Response to Spill

Checklist of Applicable Conservation Measures

Instructions: Check all CMs that apply to the project, based on the cells in the Effects Matrix identified using the Project Review Procedures (above). Check "entire" if the CM applies to the entire project footprint; check "partial" if the CM applies to only a portion of the footprint.

Note 1: Some CMs indicated in the Effects Matrix have thresholds or exclusions and may not apply to a given project. Do not mark such CMs in the following checklist, but do include a brief explanation in the notes box below.

Note 2: CMs with gray shading should be considered for all projects, but are only listed in the matrix for the most applicable activities.

Conservation Measure	Entire Foot-print	Partial Foot-print	If Partial, Area(s) Where CM Applies (*e.g.*, mile posts, coordinates, or landmark(s))	Conservation Measure	Entire Foot-print	Partial Foot-print	If Partial, Area(s) Where CM Applies (*e.g.*, mile posts, coordinates, or landmark(s))
CM 1				CM 13h			
CM 2				CM 13i			
CM 3a				CM 14a			
CM 3b				CM 14b			
CM 3c				CM 14c			
CM 3d				CM 15a			
CM 3e				CM 15b			
CM 3f				CM 15c			
CM 4				CM 15d			
CM 5				CM 15e			
CM 6				CM 15f			
CM 7				CM 15g			
CM 8a				CM 15h			
CM 8b				CM 15i			
CM 9				CM 16			
CM 10				CM 17			
CM 11				CM 18 (all)			
CM 12a				CM 18b (only)			
CM 12b				CM 18e (only)			
CM 13a				CM 19			
CM 13b				CM 20a			
CM 13c				CM 20b			
CM 13d				CM 20c			
CM 13e				CM 20d			
CM 13f				CM 21			
CM 13g				CM 22			

Note 3: NJDOT may contact the Service to discuss waiving or modifying a particular CM if it does not seem appropriate or practical under specific circumstances. The Service and NJDOT will maintain an administrative record regarding the interpretation of the CMs and how they apply to particular projects and circumstances. The Service, NJDOT, and NJDFW will meet annually to review PBO implementation, and will also periodically, as needed, issue addenda to

the PBO to update or adjust CMs and/or activity descriptions based on lessons learned, new information, and/or new NJDOT practices. The Service and NJDOT will ensure that CM interpretation and any addenda are consistent with the jeopardy analysis included in the PBO (*i.e.*, the nature and severity of effects evaluated in the PBO will not be exceeded).

Note 4: Service review is necessary if: (a) review is indicated in the Effects Matrix (*i.e.*, peach-shaded cells); (b) CMs cannot be implemented as written (unless review is waived by the Service as per step 8 in the User's Guide); or (c) activities are proposed within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit.

Note 5: Based on project specifics and distance from habitat, the level of effort to address CM 18 or CM 20 where they are included in the "More than 300 Feet from Habitat" column in the Effects Matrix should be proportional to the level of potential impacts, and in certain circumstances, may be able to be satisfied just by a brief explanation below.

Please provide an explanation if any CMs required by the Matrix (checked off in the above list) cannot be implemented as written or if a CM clearly does not apply to a specific activity for a given project.

(Continue on separate page, if needed.)

Service Review Required

Circle One: Yes No

If "Yes," is this a Priority 1 or Priority 2 "Notification" (*i.e.*, all criteria in Step 10.d.iii are met)?

Circle One: Yes No

APPENDIX B. EFFECTS MATRIX

NOTES: (1) Use of the word "category" in the Effects Matrix, below, may refer to category headings (numbered), subheadings, or specific activities (individual, unshaded rows). For additional information regarding the activities, see Description of Covered Activities section.
(2) See User's Guide (Appendix A) for definition of "habitat" and detailed information on how to use this Effects Matrix and when/how to submit projects for Service review. Service review is necessary if: (a) review is indicated in the Effects Matrix (*i.e.*, peach-shaded cells); (b) CMs cannot be implemented as written (unless review is waived by the Service as per step 8 in the User's Guide); or (c) activities are proposed within 300 feet of known habitat in the Outer Coastal Plain Recovery Unit.
(3) NE = No effect. NLAA = Not likely to adversely affect. LAA = Likely to adversely affect. NA = Not applicable.
(4) See Glossary (Appendix E) for clarification of terms.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
1. SOIL EROSION AND SEDIMENT CONTROL, WATER QUALITY MEASURES, AND CAUTION FENCE			
NOTE: The proposed construction activity necessitating the items in this category will likely require Service review and additional CMs.			
Fence/hay bales EXCEPT when deployed as part of CMs: 12b, 15a, and 17 - Silt fence - Heavy duty silt fence - Caution Fence - Haybales	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 15h, 21, 22	NLAA with CMs: 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15h, 21, 22
Within waterbody - Haybale check dams with temporary stone outlets - Temporary stone check dams - Floating turbidity barrier - Staked turbidity barrier (in stream)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with CMs: 1, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15f, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Temporary slope drains (may include riprap or other energy dissipating measure)	NLAA with CMs: 12a, 18e, 21, 22	NLAA with CMs: 3a, 3b, 3c, 9, 12a, 12b, 15b, 15c, 15d, 17, 18e, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15b, 15c, 15d, 18e, 21, 22
Inlet protection - Inlet filters - Temporary inlet sediment traps	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 16, 21, 22	NA
Temporary stone outlet sediment traps	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 15b, 15c, 15d, 17, 19a, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15b, 15c, 15d, 19a, 21, 22
- Sedimentation/dewatering basin This activity includes the discharge of filtered water. However, see Dewatering category for cofferdam and dewatering related work itself.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 5, 9, *12a, 12b, 15b, 15c, 17, 18e, 19a, 21, 22 *Other than placement of discharge hose.	NLAA with CMs: 3a, 3b, 5, 9, 10, 13a, 13e, 13f, 13h, 15b, 15c, 18e, 19a, 21, 22 Sedimentation/dewatering basin will not be located in wetland portion of habitat. Discharge of filtered water to habitat from a sedimentation or dewatering basin is covered by the previous column of this row if the sedimentation or dewatering basin is located outside of the habitat, but within 300 feet.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
- Sediment control bag - Sediment control tank This activity includes the discharge of filtered water. However, see Dewatering category for cofferdam and dewatering related work itself.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, *12a, 15e, 17, 18e, 21, 22 *Other than placement of discharge hose.	NLAA with CMs: 5, 9, 10, 13a, 13e, 13f, 13h, 18e, 21, 22 Sediment control bags and tanks will not be located in wetland portion of habitat. Discharge of filtered water to habitat from a sediment control bag/tank is covered by the previous column of this row if the sediment control bag/tank is located outside of the habitat, but within 300 feet.
- Erosion control mats/blankets EXCEPT when deployed as part of CM 15d - Biodegradable - Not biodegradable	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 21, 22	NLAA with CMs: 5, 10, 13a, 13e, 13f, 13g, 13h, 14a, 21, 22
Concrete washout facility - Pre-fabricated or roll-off container - Containment area temporarily constructed on site - At or above ground level (*i.e.*, no excavation) - Grading to level an area	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 12a, *15b, *15c, *15d, 17, 21, 22 *Applies only if grading is needed.	NLAA with Service review and CMs: 5, 8a, 10, 13a, 13b, 13e, 13f, 13h, 15e, 21, 22
Construction driveway (per NJDOT Specification 158.03.02)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 11, 12a, 15a, 15b, 15c, 17, 21, 22	LAA with Service review and CMs: 1, 3a, 3b, 3c, 5, 9, 10, 11, 13a, 13e, 13f, 13h, 15a, 15b, 15c, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Pollution Control Items - Absorbent Boom - Oil-Only emergency spill kit - Oil-water separator The required pollution control equipment is stored and maintained within limits of project construction area or offsite in existing developed area. See CM 8a for spill response contingencies. In the event of a spill, see category regarding Accidental Fuel Spill/Potential Contaminant Release at NJDOT Construction or Maintenance Work Site or Maintenance Facility and Response to Spill.	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22]	NE [CM 13a, 13h, 21, 22]
2. VEGETATION MANAGEMENT, CLEAR ZONE/SIGHT DISTANCE MAINTENANCE, AND SHOULDER MAINTENANCE			
Vegetation Removal/Control for the following: Clear Zone and Sight Distance Maintenance, Road Shoulder Maintenance, Hazard Tree Removal, Landscaping Maintenance, Site Preparation, vegetation management for outdoor advertising, etc. - Includes, but not limited to, selective tree/vegetation removal; tree/vegetation clearing; pruning/trimming trees/shrubs; mowing; herbicide use (*e.g.*, for guiderail maintenance) For Herbicide use, see Landscaping - Use of Herbicide category. Does not include Grubbing (see Grubbing category), earthwork, or grading.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3e, 3f, 9, 11, 12a, 12b, 15b, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3e, 3f, 5, 6, 9, 10, 11, 13a, 13b, 13c, 13e, 13f, 13g, 14a, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Grubbing - Removal of roots/stumps from soil (after clearing of vegetation)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 21, 22	LAA with Service review and CMs: 1, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a 14b, 14c, 15a, 15b, 15c, 15d, 21, 22
Clear Zone and Sight Distance Maintenance other than Vegetation Management - Includes, but not limited to, safety hazard elimination/obstruction removal; fixed object removal; debris removal If this maintenance includes vegetation removal/control, see Vegetation Removal/Control Category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3f, 9, 11, 12a, 17, 21 22	NA
Road Shoulder Maintenance: Includes road shoulder maintenance to alleviate flooding/ponding (*e.g.*, removal of sediment/debris build-up along edge of road [could be vegetated; could be under guiderail]) if precautions taken to prevent sedimentation of nearby habitat If this maintenance includes vegetation removal/control, see Vegetation Removal/Control Category. For pavement related work, see appropriate Roadways category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3e, 5, 9, 12a, 15a, 15b, 15c, 16, 21, 22	NLAA with CMs: 3e, 5, 9, 13h, 15a, 15b, 15c, 17, 21, 22
3. DRAINAGE FACILITIES			
Drainage Facility Inspection, Maintenance, and Repair			
Video inspection of pipe	NE [CMs: 12a, 21, 22]	NLAA with CM: 12a, 16, 21, 22	NA
Inlet (catch basin)/drainage pipe clean-out (may include use of vacuum truck). Also, perhaps flushing to loosen material -- debris is vacuumed out and water is not permitted to reach outfall. Includes sediment/debris removal and proper disposal of sediment/debris. ***Pipe does not outfall to habitat.***	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 17, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Inlet (catch basin)/drainage pipe clean-out (same as previous). ***Pipe outfalls to habitat.***	NLAA with CMs: 19a, 12a, 21, 22	NLAA with CMs: 9, 12a, 12b, 17, 19a, 21, 22 This cell includes cleanout via vacuum truck when the truck will remain on a roadway or developed area and there will be no discharge to habitat.	If work involves access via the outfall end of pipe: NLAA with Service review and CMs: 1, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 19a, 21, 22
Outfall clean-out. Includes - Sediment/debris removal by hand (*e.g.*, shovels, hoses, hydraulic pump) - Sediment/debris removal by machinery - Only within outfall itself - Also beyond outfall (may include sediment removal from ditch, stream, wetlands or adjacent upland area) - Proper disposal of sediment/debris	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22	NLAA with Service review and CMs: 1, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 21, 22
Repair of drainage pipes - Lining of drainage pipes - Using same lining method (if existing pipe is already lined) - Using different lining method (high-density plastic sleeve, sprayed on shotcrete coating) - Patching - Steel rib reinforcement - May include access via the outfall end of pipe If work includes repair of the outfall structure, see category that includes repair of outfall structures. If work includes drainage pipe cleaning, see Inlet (catch basin)/drainage pipe clean-out category.	Pipe does not outfall to habitat (and inlet or section of pipe being repaired/lined is accessed >300' from habitat) = NE [CMs: 12a, 21, 22] Pipe outfalls to habitat (but inlet or section of pipe being repaired/lined is accessed >300' from habitat) = NLAA with CMs: 8a, 12a, 21, 22	NLAA with CMs: 8a, 12a, 15e, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 5, 8a, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Repair of headwalls, wingwalls, flared end sections, outfall structures, (*e.g.*, fill cracks); different from Reconstruction/replacement, below. Does not include outfall cleanout, above, or riprap or other type of outfall protection, below. See appropriate categories for that type of work.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 12a, 17, 21, 22	NLAA with Service review and CMs: 5, 8a, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Outfall protection - Placement of riprap - Gabion baskets/mattress - Articulated concrete block mattress	NE [CMs: 12a, 21, 22]	NLAA with CMs 3a, 3b, 3c, 5, 8a, 9, 12a, 12b, 15a, 15b, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 21, 22
Inlet Replacement/Installation			
Inlet replacement (in-kind)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 12a, 15b, 16, 21, 22	NA
Inlet upgrade or new inlet installation (connecting to existing drainage facility). This may include new section of pipe. **If this includes new section of pipe that will be a new outfall,** see Drainage facility construction (new) with new outfall (includes new inlets) category.	Existing drainage system does not outfall to habitat = NE [CMs: 12a, 21, 22] Drainage system outfalls to habitat = NLAA with CM and Service review: 12a, 19b, 21, 22	NLAA with CMs: (Service review if discharging to habitat): 8a, 12a, 15a, 15b, 17, 19b, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Drainage Facility Reconstruction/Replacement			
Reconstruction/replacement of headwalls, wingwalls, flared end sections, outfall structures; may need a new footing. Also includes replacement of outfall protection within existing footprint. Does not include outfall cleanout or new/additional outfall protection. - In-kind replacement AND - In same location/alignment as existing **NOTE:** A change in the type of outfall protection within the existing footprint is considered an in-kind replacement. For outfall clean-out, see Outfall Clean-out category. For new/additional outfall protection, see Outfall Protection category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: (Service review unless outfall is within an existing basin): 3a, 3b, 3c, 5, 8a, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 21, 22
Replacement of headwalls, wingwalls, flared end sections, outfall structures; may need a new footing. Also includes replacement of outfall protection within existing footprint. Does not include outfall cleanout or new /additional outfall protection. - Out-of-kind replacement AND/OR - In different location/alignment as existing **NOTE:** A change in the type of outfall protection within the existing footprint is considered an in-kind replacement. For outfall clean-out, see Outfall Clean-out category. For new/additional outfall protection, see Outfall Protection category.	NLAA with CM: 12a, 19c, 21, 22	NLAA with CMs: (Service review unless existing and replacement outfalls are both within an existing basin): 3a, 3b, 3c, 5, 8a, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 19c, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 19c, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Replacement of drainage pipe. Could be under existing pavement, within stormwater basins, or under maintained vegetated portions of existing roadways (*e.g.*, medians, roadway berms, and slopes). Could be directly connecting to outfall or elsewhere in drainage system. May include access at the end of pipe. If work includes replacement of outfall structure, see category that includes replacement of outfall structures. If work includes drainage pipe cleaning, see Inlet (catch basin)/drainage pipe clean-out category.	Pipe outfall does not drain to habitat = NE [CMs: 12a, 21, 22] Pipe outfall drains to habitat, in-kind replacement = NLAA with CMs: 8a, 12a, 19a, 21, 22 Pipe outfall drains to habitat, out-of-kind replacement = Service review (could be NLAA or LAA) with CMs: 8a, 12a, 18, 21, 22	Service review only for out-of-kind replacement where pipe outfalls to habitat (could be NLAA or LAA), otherwise NLAA. CMs apply regardless: 3a, 3b, 3c, 5, 8a, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, *18, 21, 22 *Applies only for out-of-kind replacement where pipe outfalls to habitat.	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, *18b, 21, 22 *Applies only for out-of-kind replacement.
Drainage Facility Construction			
Drainage facility construction (new) with new outfall (includes new inlets) - Installation of new pipe - Trenching - More extensive excavation/grading - Construction of headwalls, wingwalls, flared end sections, outfall structures, riprap or other type of outfall protection	No proposed outfall to habitat = NE [CMs: 12a, 21, 22] Proposed outfall drains to habitat = LAA and Service review with CMs: 12a, 18, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 5, 8a, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, *18, 21, 22 *Applies only if the new system outfalls to habitat.	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
4. STORMWATER MANAGEMENT FACILITIES			
Stormwater Management Facility Maintenance			

Stormwater Management Facility Maintenance (retention [wet pond]/detention/extended detention basins, infiltration basins, bio-infiltration basins, bioretention basins, ditches, swales, bioretention swales, vegetative filter strips, bio-infiltration strips, sand filters, standard constructed wetlands, subsurface gravel wetlands, rain gardens)
NOTE: This row applies to all stormwater management facilities that include vegetation that is not regularly mowed or removed AND that are immediately adjacent to habitat (*i.e.*, are not separated by development, pavement, or mowed lawn). See the following row for stormwater management facilities that are not covered here.
NOTE: This row applies only to work inside of the stormwater management facility necessary for normal maintenance of the facility. For work involving the outfall structure, see categories for Outfall clean-out and/or Repair of headwalls, wingwalls, flared end sections, outfall structures as appropriate.
- Mowing
- Vegetation removal/trimming (if herbicide will be used, see Use of Herbicide category)
- Invasive vegetation removal/control
- Sediment removal
  - By shovel
  - By small lightweight equipment
- Debris removal
  - Proper disposal of sediment/debris
  - Re-grade to original, if necessary
- Slope stabilization
- Replace gravel/sand layers
- Replace/repair stormwater management facility structures
- Includes riprap/gabion basket work in basins/ditches
	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 17, 21, 22	NLAA with CMs: 9, 13e, 13f, 13h, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Stormwater Management Facility Maintenance (retention [wet pond]/detention/extended detention basins, infiltration basins, bio-infiltration basins, bioretention basins, ditches, swales, bioretention swales, vegetative filter strips, bio-infiltration strips, sand filters, standard constructed wetlands, subsurface gravel wetlands) **NOTE:** This row applies to all stormwater management facilities that are not covered under the preceding row. **NOTE:** This row applies only to work inside of the stormwater management facility necessary for normal maintenance of the facility. For work involving the outfall structure, see categories for Outfall clean-out and/or Repair of headwalls, wingwalls, flared end sections, outfall structures as appropriate. - Mowing - Vegetation removal/trimming (if herbicide will be used, see Use of Herbicide category) - Invasive vegetation removal/control - Sediment removal - By shovel - By small lightweight equipment - Debris removal - Proper disposal of sediment/debris - Re-grade to original, if necessary - Slope stabilization - Replace gravel/sand layers - Replace/repair stormwater management facility structures - Includes riprap/gabion basket work in basins/ditches	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 21, 22	NA
Stormwater Management Facility Maintenance/Clean-out (Manufactured Treatment Devices[MTDs] or underground detention system) - May include use of vacuum truck	NLAA with CMs: 12a, 19a, 21, 22	NLAA with CMs: 9, 12a, 16, 19a, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Stormwater Management Facility Maintenance (pervious paving systems) - Vacuum sweeping - Power washing - Sediment/debris removal - Proper disposal of sediment/debris This row does not include Replace/repair underdrains or Replace sub-base. For those activities, see category for Roadway rehabilitation, rubblization (includes work below the pavement box), reconstruction and/or category for Replacement of drainage pipe.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 16, 21, 22	NA
Stormwater Management Facility Construction			
Stormwater Management Facility Construction (retention [wet pond]/detention/extended detention basins, infiltration basins, bio-infiltration basins, bioretention basins, ditches, swales, bioretention swales, vegetative filter strips, bio-infiltration strips, sand filters, standard constructed wetlands, subsurface gravel wetlands, underground detention basins) **NOTE:** This row is only for construction of the stormwater management facility itself. For other components, see category for Drainage facility construction (new) with new outfall (includes new inlets).	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b 3c, 4, 5, 8a, 9, 11, 12a, 12b, 15a, 15b, 15c, 15g, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 11, 13a, 13e, 13f, 13h, 15a, 15b, 15c, 15g, 21, 22
Stormwater Management Facility Construction – installation of manufactured treatment devices (MTDs) **NOTE:** This row is only for construction of the MTD itself. For other components, see category for Drainage facility construction (new) with new outfall (includes new inlets).	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b 3c, 5, 8a, 9, 12a, 15a, 15b, 15c, 17, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Stormwater Management Facility Construction - pervious paving systems See appropriate category(ies) for Roadway Rehabilitation/Reconstruction or New Roadway Construction. If project involves construction of underdrains, also see category for Drainage facility construction (new) with new outfall (includes new inlets).	See other categories	See other categories	See other categories
Stormwater Management Facility Construction - Rain Gardens	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 3e, 3f, 4, 5, 9, 12a, 15b, 17, 18b, 21, 22	NA
5. STREAM CULVERTS			
Culvert Inspection, Maintenance, and Repair			
Culvert Inspection May include video inspection, walking through culvert, small remote control vehicle.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with CMs: 10, 13a, 13b, 13f, 16, 21, 22
Culvert clean-out – includes: - Sediment/debris removal by hand (*e.g.*, shovels, hoses, hydraulic pump) - Sediment/debris removal by machinery - Only within culvert itself - Also beyond culvert (may include sediment removal from ditch, stream, wetlands or adjacent upland area) - Proper disposal of sediment/debris	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Culvert Repair – includes repairs to headwall/wingwalls/culvert/footings/terrestrial wildlife passage shelf; different from Reconstruction, below. If existing terrestrial wildlife passage shelf has associated guide fence in need of repair, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 5, 8a, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 20a, 20b, 21, 22
Culvert Repair – lining of culvert - Using same lining method (if existing culvert is already lined) - Using different lining method (*e.g.*, high-density plastic sleeve, sprayed on shotcrete coating)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with Service review and CMs: 1, 5, 8a, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 18, 20a, 20b, 21, 22
Scour repair – minor (*e.g.*, filling in a hole) To restore to original streambed elevation. - Placement of riprap - Grout bags - Other suitable material	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15f, 18, 20a, 20b, 21, 22
Scour repair - more extensive scour repair/protection (*e.g.*, across streambed) To restore to original streambed elevation. - Gabion baskets/mattress - Articulated concrete block mattress - Other types of concrete armoring - Placement of riprap	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Culvert Reconstruction/Extension			
Culvert reconstruction - Reconstruction/replacement of headwall/wingwalls/culvert/footings/terrestrial wildlife passage shelf Does not include culvert cleanout. See Culvert Cleanout category. Does not include out-of-kind replacement of terrestrial wildlife passage shelf. See Culvert Shelf – installation of new or out-of-kind replacement under the Terrestrial Wildlife Passage category. If existing terrestrial wildlife passage shelf has associated guide fence in need of reconstruction/replacement, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
Culvert extension Does not include culvert cleanout, above.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
Culvert Replacement			
Culvert Replacement Does not include culvert clean-out. - In-kind replacement AND - In same location/alignment as existing For culvert clean-out, see Culvert Clean-out category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Culvert Replacement Does not include culvert cleanout. - Out-of-kind replacement AND/OR - In different location/alignment as existing For culvert clean-out, see Culvert Clean-out category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
New Culvert Construction			
New culvert installation	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
6. BRIDGES			
Bridges over Roadways or Railroads			
Bridges over Roadways or Railroads - Inspection, maintenance, repair, reconstruction/rehabilitation, widening, replacement, and new construction **NOTE:** For this row, based on the type of work, not all of the CMs may apply.	NE [CMs: 12a, 21, 22]	Service review (could be NLAA or LAA) with CMs: 3a, 3b, 3e, 5, 8a, 8b, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridges over Waterbodies			
Bridge Inspection			
Bridge Inspection – by snooper truck or suspended scaffolding (access from bridge deck)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Inspection from on a bridge over habitat: NLAA with CMs: 12a, 21, 22
Bridge Inspection – by boat/barge	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22] See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	If the crew can stay in the boat: NE [CM 21, 22] If the crew has to land the boat and get out and walk around (this will be similar to inspection on foot): NLAA with CMs: 10, 13a, 13b, 13d, 21, 22
Bridge Inspection – on foot	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22] See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with CMs: 10, 13a, 13b, 13d, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridge Superstructure Maintenance and Repair			
Scuppers - Clean out (may include vacuum truck) - Repair - Replacement	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 17, 19c, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	All activity over (above) habitat = NLAA with CMs: 8a, 8b, 9, 12a, 16, 21, 22 Some activity below bridge (actually in habitat) = NLAA with Service review and CMs: 5, 8a, 8b, 9, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Bridge painting/cleaning – includes corrosion (rust) inhibitor, surface preparation (*e.g.*, scraping, power washing, abrasive blast cleaning, application of waterproofing, use of a containment system to capture dust/debris	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8b, 12a, 12b, 15e, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with Service review and CMs: 5, 8b, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Bridge deck resurfacing/overlay and patching - Crack sealing, spalling repair - Pothole repair and patch work for pavement repair - High friction surface treatment (a.k.a. skid resistant treatment) - Milling and resurfacing of pavement	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	All activity over (above) habitat = NLAA with CMs: 8a, 12a, 16, 21, 22 Some activity below bridge (actually in habitat) = NLAA with Service review and CMs: 5, 8a, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridge superstructure repairs (includes repairs to parapets, railing, beams, stringers, girders, curb and sidewalk. May also include replacement of bridge joints, bearings, and bearing seats.)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	All activity over (above) habitat = NLAA with CMs: 8a, 8b, 12a, 16, 21, 22 Some activity below bridge (actually in habitat) = NLAA with Service review and CMs: 5, 8a, 8b, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Bridge Substructure Repair			
Spalling repair, crack sealing	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	All activity over (above) habitat = NLAA with CMs: 8a, 8b, 12a, 16, 21, 22 Some activity below bridge (actually in habitat) = NLAA with Service review and CMs: 5, 8a, 8b, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Repair of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf If existing terrestrial wildlife passage shelf has associated guide fence in need of repair, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 8b, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Scour and undermining repair – minor To restore to original streambed elevation. - Repair of undermined wingwalls/abutments/piers or exposed wingwall/abutment/pier footings (*e.g.*, filling in a hole) - Placement of riprap - Grout bags - Other suitable material	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 10, 13a, 13b, 13e, 13f, 13g, 14a, 14b, 14c, 15f, 21, 22
Scour and undermining repair - more extensive scour repair/protection (*e.g.*, across streambed) - Gabion baskets/mattress - Articulated concrete block mattress - Other types of concrete armoring - Placement of riprap	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
Bridge timber pile repairs, installation of steel collars, replacement of fender system walers, in-kind dolphin repair	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with CMs: 5, 10, 13a, 13b, 13e, 13f, 13g, 14a, 21, 22 Service review only if vehicles needed in habitat

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridge Reconstruction/Rehabilitation			
Superstructure			
Bridge deck rehabilitation	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	All activity over (above) habitat = NLAA with CMs: 8a, 8b, 12a, 16, 21, 22 Some activity below bridge (actually in habitat) = NLAA with Service review and CMs: 5, 8a, 8b, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Bridge superstructure: reconstruction or replacement of parapets, railing, beams, stringers, girders, curb, sidewalk, and/or deck	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	All activity over (above) habitat = NLAA with CMs: 8a, 8b, 12a, 16, 21, 22 Some activity below bridge (actually in habitat) = NLAA with Service review and CMs: 5, 8a, 8b, 10, 13a, 13b, 13e, 13f, 13g, 14a, 15e, 21, 22
Substructure			
Reconstruction/replacement of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf Does not include out-of-kind replacement of terrestrial wildlife passage shelf. See Bridge Shelf - installation of new or out-of-kind replacement under the Terrestrial Wildlife Passage category. If existing terrestrial wildlife passage shelf has associated guide fence in need of reconstruction/replacement, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 9, 8a, 8b, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridge pile replacement via pile driving (*e.g.*, timber or pre-stressed concrete piles) (could be on land or in water) - Impact Hammer - Vibratory	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 21, 22
Bridge foundation replacement via drilled shafts (*e.g.*, concrete) (could be on land or in water)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 21, 22
- Replacement of existing fender system - In-kind dolphin replacement - Installation of new fender system - Installation of dolphins (new or additional) **NOTE:** If activity includes pile driving, see Bridge Pile Replacement via Pile Driving Category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review only if vehicles needed in habitat, but not for barge or boat use. NLAA with CMs: 5, 9, 10, 13a, 13b, 13e, 13f, 13g, 14a, 21, 22
Bridge Widening			
Bridge widening that does not involve addition or modification of wingwalls, abutments, piers, footings (*e.g.*, to bring existing lane or shoulder up to standard width, or addition of a sidewalk) **NOTE:** For widening of roadway approaches, see Widening of Roadway categories.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 8b, 10, 13a, 13b, 13c, 13e, 13f, 13g, 14a, 18, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridge widening that includes addition or modification of wingwalls, abutments, piers, footings (*e.g.*, addition of lane/shoulder) **NOTE:** For widening of roadway approaches, see Widening of Roadway categories.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 20a, 20b, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
Bridge Replacement			
In-kind bridge replacement AND In same location/alignment as existing	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 5, 9, 12a, 12b, 17, 20a, 20b, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18 (18b only), 19c, 20a, 20b, 21, 22
Out-of-kind bridge replacement AND/OR In different location/alignment as existing	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 11, 12a, 12b, 17, 20a, 20b, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3f, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 19c, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
New Bridge Construction			
New bridge (includes construction of permanent or temporary bridge)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 11, 12a, 12b, 17, 20a, 20b, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	LAA with Service review and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
7. TERRESTRIAL WILDLIFE PASSAGE			
Culvert Shelf			
Culvert shelf - Repair, reconstruction, or in-kind replacement of terrestrial wildlife passage shelf in culvert For repair of shelf, see Culvert Repair for headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. For reconstruction/ in-kind replacement of shelf, see Culvert Reconstruction for Reconstruction/ replacement of headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. If new or replacement guide fence is proposed in association with terrestrial wildlife passage shelf, see Fence category.	For repair of shelf, see Culvert Repair for headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. For reconstruction/ in-kind replacement of shelf, see Culvert Reconstruction for Reconstruction/ replacement of headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. If new or replacement guide fence is proposed in association with terrestrial wildlife passage shelf, see Fence category.	For repair of shelf, see Culvert Repair for headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. For reconstruction/ in-kind replacement of shelf, see Culvert Reconstruction for Reconstruction/ replacement of headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. If new or replacement guide fence is proposed in association with terrestrial wildlife passage shelf, see Fence category.	For repair of shelf, see Culvert Repair for headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. For reconstruction/ in-kind replacement of shelf, see Culvert Reconstruction for Reconstruction/ replacement of headwall/ wingwalls/ culvert/ footings/ terrestrial wildlife passage shelf category. If new or replacement guide fence is proposed in association with terrestrial wildlife passage shelf, see Fence category.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Culvert Shelf - Installation of new or out-of-kind replacement of terrestrial wildlife passage shelf If new or replacement guide fence is proposed in association with terrestrial wildlife passage shelf, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 20b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22
Dry Passage			
Culverts (dry passage) for terrestrial wildlife - Installation of new; or repair, reconstruction, or replacement of existing - Could include guide fence If new or replacement guide fence is proposed in association with dry passage culvert, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with Service review and CMs: 3b, 3f, 5, 8a, 9, 11, 12a, 12b, 17, 20b, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3b, 3f, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Bridge Shelf			
Bridge shelf - Repair, reconstruction, or in-kind replacement of terrestrial wildlife passage shelf in bridge For repair of shelf, see Bridge Substructure repair of, wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. For reconstruction/in-kind replacement of shelf, see Bridge Substructure reconstruction/replacement of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. If existing terrestrial wildlife passage shelf has associated guide fence in need of reconstruction/replacement, see Fence category.	For repair of shelf, see Bridge Substructure repair of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. For reconstruction/in-kind replacement of shelf, see Bridge Substructure reconstruction/replacement of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. If existing terrestrial wildlife passage shelf has associated guide fence in need of reconstruction/replacement, see Fence category.	For repair of shelf, see Bridge Substructure repair of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. For reconstruction/in-kind replacement of shelf, see Bridge Substructure reconstruction/replacement of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. If existing terrestrial wildlife passage shelf has associated guide fence in need of reconstruction/replacement, see Fence category.	For repair of shelf, see Bridge Substructure repair of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. For reconstruction/in-kind replacement of shelf, see Bridge Substructure reconstruction/replacement of wingwalls, abutments, piers, footings, terrestrial wildlife passage shelf category. If existing terrestrial wildlife passage shelf has associated guide fence in need of reconstruction/replacement, see Fence category.
Bridge Shelf - Installation of new or out-of-kind replacement of terrestrial wildlife passage shelf If new or replacement guide fence is proposed in association with terrestrial wildlife passage shelf, see Fence category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 20b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
8. DEMOLITION			
Bridge - Use of heavy equipment - Debris removal and proper disposal	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3f, 5, 8b, 12a, 12b, 15a, 15b, 15c, 17, 20b, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 5, 8b, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15f, 18, 20b, 21, 22
Building - Use of heavy equipment - Debris removal and proper disposal	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3f, 5, 8b, 12a, 12b, 15a, 15b, 15c, 17, 21, 22	NA
9. ROCKFALL SAFETY MEASURES			
Netting, pinning, slope scaling, large block removal	NE [CMs: 12a, 21, 22]	NE [CMs: 9, 12a, 21, 22]	NA
Construction of catchment fence (may include grading of catchment area)	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22] If activity includes grading of catchment area: NLAA with CMs: 5, 9, 12a, 15a, 15b, 15c, 15d, 17, 21, 22	NA
Blasting (controlled blasting with use of blanket)	NE [CMs: 12a, 21, 22]	NE [CMs: 9, 12a, 21, 22]	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
10. SLOPE STABILIZATION			
Streambank Stabilization			
Streambank Stabilization - Vegetated Treatment (*e.g.*, seeding, plantings) - Bioengineering - Erosion control mats - Biodegradable - Not biodegradable	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3f, 4, 9, 12a, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with Service review and CMs: 1, 3a, 3b, 3f, 4, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15b, 18 (18b only), 21, 22
Streambank Stabilization - Placement of riprap - Gabion baskets/mattress - Articulated concrete block mattress	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 4, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 4, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20b, 21, 22
Repair/Reconstruction/Replacement of retaining wall or bulkhead - Mechanically stabilized earth wall - Stone wall - Concrete - Sheet piling - Pile driving - H-piles/Soldier piles - Drilled shafts - Wood - Plastic - Soil Nail Walls - Geosynthetic reinforced soil - Install underdrain system	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Construction of retaining wall or bulkhead (includes extension of existing wall/bulkhead or other enlargement of the footprint) - Mechanically stabilized earth wall - Stone wall - Concrete - Sheet piling - Pile driving - H-piles/Soldier piles - Drilled shafts - Wood - Plastic - Soil Nail Wall - Geosynthetic reinforced soil - Install underdrain system	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 20a, 21, 22
Roadway Slope Stabilization			
NOTE: This includes slope erosion prevention work and/or slope repair/reconstruction after erosion has occurred. **NOTE:** If the roadway embankment is also a waterway embankment, see Streambank Stabilization categories.			
- Vegetated treatment (*e.g.*, seeding, plantings) - Bioengineering - Erosion control mats - Biodegradable - Not biodegradable	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3f, 4, 9, 12a, 15b, 17, 21, 22	NLAA with Service review and CMs: 1, 3a, 3b, 3f, 4, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15b, 18 (18b only), 21, 22
- Placement of riprap - Gabion baskets/mattress - Articulated concrete block mattress	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 3e, 4, 5, 8a, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 4, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Repair or reconstruction of retaining wall - Mechanically stabilized earth wall - Stone wall - Concrete - Sheet piling - Pile driving - H-piles/Soldier piles - Drilled shafts - Soil Nail Wall - Geosynthetic reinforced soil - Install underdrain system	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 8a, 8b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 20b, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 20b, 21, 22
Construction of retaining wall (includes extension of existing wall or other enlargement of the footprint) - Mechanically stabilized earth wall - Stone wall - Concrete - Sheet piling - Pile driving - H-piles/Soldier piles - Drilled shafts - Soil Nail Walls - Geosynthetic reinforced soil - Install underdrain system	NE [CM 12a, 20a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 20a, 20b, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 20a, 20b, 21, 22
11. APPURTENANT FEATURES			
Guiderail/Median Barriers			
Guiderail - Repair (includes replacement/upgrade of beam)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 16, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Guiderail - Replacement/reset/upgrade of existing guiderail - Installation of new guiderail - Vegetated treatment -Non-vegetated treatment - Broken stone - Pavement/porous pavement - Polyester mat	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 3e, 3f, 4, 5, 9, 11, 12a, 15a, 15b, 17, 18, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 3e, 3f, 4, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 18, 21, 22
Median Barriers - Repair/replacement of existing median barriers - Installation of new median barriers (*e.g.*, median crossover projects)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 16, 21, 22	NA
Signage			
Signs with posts (no footing or foundation) (includes variable message signs [VMS]/dynamic message signs [DMS] with no footing, foundation or concrete pad - Repair of existing signs - Replacement of existing signs - In existing location - Offset from existing location - Installation of new signs - Removal of existing signs	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 12a, 16, 21, 22	NLAA with CMs: (Service review only for new sign installation in wetland portion of habitat) 1, 3a, 3b, 3c, 5, 10, 13a, 13d, 14b, 21, 22
Sign structures with footing or foundation (includes variable message signs [VMS]/dynamic message signs [DMS] with footing, foundation or concrete pad; also includes associated electrical equipment; also includes billboards) - Repair/maintenance of existing signs - Replacement of existing signs - In existing location - Offset from existing location - Installation of new signs - Removal of existing signs	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 8a, 9, 12a, 13i, 15b, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 13i, 14a, 14b, 14c, 15b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Traffic Signals			
Traffic Signal Equipment - Replacement/upgrade of existing signals/equipment (*e.g.*, poles, signal heads, upgrade/new pedestrian signals [including pedestrian signal heads and pedestrian push buttons] at existing signal, electrical equipment cabinet at existing location or in near proximity) - Installation of new signals/equipment (*e.g.*, new poles in a new location, new electrical equipment cabinet in new location) This does not include trenching (*e.g.*, for installation of wiring) (see Utility line relocation/installation category)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 8a, 9, 12a, 15b, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13h, 15b, 21, 22
Signal System Improvement - Repair of loops and sensors within existing pavement - Installation of loops and sensors within existing pavement See milling and resurfacing category (certain CMs may not apply if all work is within existing pavement) This does not include trenching (*e.g.*, for installation of wiring) (see Utility line relocation/installation category)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 16, 21, 22	NA
Lighting			
Lighting - Replacement of existing roadway/bridge lighting - Installation of new roadway/bridge lighting This does not include trenching (*e.g.*, for installation of wiring) (see Utility line relocation/installation category)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 8a, 9, 11, 12a, 13i, 15b, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13h, 13i, 15b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Fence			
Fence (*e.g.*, chain link, wood) - Repair existing fence - Replacement of existing fence - Installation of new fence - May include footings This includes permanent and temporary fence. This includes guide fence associated with terrestrial wildlife passage and/or to prevent wildlife from entering the roadway. This does not include silt fence and/or caution fence (See Erosion Control/Water Quality Control Measures/Caution Fence Installation category)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 8a, 9, 12a, 13i, 15b, 17, 20a, 20b, 20c, 21, 22	NLAA with Service review and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 13a, 13e, 13f, 13h, 13i, 15b, 20a, 20b, 20c, 21, 22
Curbing			
Curb Work - Repair existing curb - Reconstruction of existing curb - Replacement of existing curb - Installation of new curb	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 8a, 9, 12a, 15a, 15b, 15c, 15d, 17, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Streetscape			
Streetscape - Includes street furniture (*e.g.*, benches, bicycle racks, town clocks, planters, trash receptacles) This does not include landscaping (*e.g.*, planting street trees). (See Landscaping category.) This does not include pedestrian facilities. (See Sidewalk or multi-use trail near roadway categories.) This does not include lighting. (See Lighting category.)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3d, 11, 12a, 16, 21, 22	NA for wetland portion of habitat. NLAA for upland portion of habitat with CMs: 3d, 11, 12a, 16, 21, 22
12. BICYCLE/PEDESTRIAN FACILITIES (SIDEWALKS, TRAILS, ADA)			
Sidewalk or multi-use trail near roadway - Repair/reconstruction/replacement of existing sidewalk and bicycle/pedestrian facilities Does not include street furniture/trash receptacles. (See Streetscape under the Appurtenant Features category.)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 8a, 12a, 15a, 15b, 15c, 15d, 16, 21, 22	NA
Sidewalk or multi-use trail near roadway - Installation of new sidewalk and bicycle/pedestrian facilities - Installation/completion of missing sections of existing sidewalk to connect them Does not include street furniture/trash receptacles. (See Streetscape under the Appurtenant Features category.)	NE [CMs: 12a, 21, 22]	NLAA with Service review and CMs: 3a, 3b, 3c, 3e, 4, 5, 8a, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 21, 22	LAA with Service review and CMs: 1, 3a, 3b, 3c, 3e, 4, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20a, 21, 22
Trail not along roadway (includes rails to trails projects) - Paved - Unpaved Does not include street furniture/trash receptacles. (See Streetscape under the Appurtenant Features category.)	NE [CM 12a, 20a, 21, 22]	NLAA with Service review and CMs: 3a, 3b, 3c, 3e, 3f, 4, 5, 8a, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 21, 22	LAA with Service review and CMs: 1, 3a, 3b, 3c, 3e, 3f, 4, 5, 8a, 9, 10, 11, 13a, 13c, 13e, 13f, 13h, 15a, 15b, 15c, 15d, 18, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Americans with Disabilities Act (ADA) Requirements - Includes depressed curbing, ramps, detectable warning surfaces, etc.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 12a, 15b, 16, 21, 22	NA
13. TRANSPORTATION ALTERNATIVES/ENHANCEMENTS			
NOTE: This may include activities that are already separately listed. If a Transportation Alternative/Enhancement activity is not listed in this category, see appropriate rows within other categories.			
- Bicycle/pedestrian facilities - Preservation of abandoned railway corridors (including the conversion and use for pedestrian/bicycle trails) (See Sidewalk or Multi-use trail near roadway or Trail not along roadway categories, as applicable)	See Sidewalk or Multi-use trail near roadway or Trail not along roadway categories, as applicable.	See Sidewalk or Multi-use trail near roadway or Trail not along roadway categories, as applicable.	See Sidewalk or Multi-use trail near roadway or Trail not along roadway categories, as applicable.
- Acquisition of scenic easements and scenic or historic sites - Historic preservation This does not involve any construction or activity on the ground.	NE	NE	NE
- Scenic or historic highways (including the provision of tourist/welcome center facilities, scenic overlooks) - Establishment of transportation-related museums - Renovation of existing building (including expansion) - Construction of new building This does not include landscaping. (See Landscaping category.)	NLAA with CMs: 12a, 18, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3d, 5, 7a, 7b, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 3d, 5, 7a, 7b, 8a, 8b, 9, 11, 13a, 13e, 13f, 13h, 15a, 15b, 15c, 15d, 18, 20a, 20b, 20d, 21, 22
Landscaping/streetscaping/scenic beautification (See Landscaping category, or Streetscape under Appurtenant Features category, as appropriate.)	See Landscaping category, or Streetscape under Appurtenant Features category, as appropriate	See Landscaping category, or Streetscape under Appurtenant Features category, as appropriate	See Landscaping category, or Streetscape under Appurtenant Features category, as appropriate

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Rehabilitation and operation of historic transportation buildings, structures, and facilities (including historic railroad facilities and canals) Does not include expansion of buildings, new building construction, new or expanded pavement, new railroad track.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3d, 7a, 7b, 8a, 8b, 11, 12a, 15e, 16, 20d, 21, 22	NA
Inventory and control of outdoor advertising (For repair/maintenance or removal, see Sign structures with footing or foundation category.) (If activity involves vegetation removal, see Vegetation Removal/Control category.)	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22]
Archeological planning and research (See appropriate category(ies) regarding Survey Work and/or Archeological Test Pits/Excavations.)	See appropriate category(ies) regarding Survey Work and/or Archeological Test Pits/Excavations.	See appropriate category(ies) regarding Survey Work and/or Archeological Test Pits/Excavations.	See appropriate category(ies) regarding Survey Work and/or Archeological Test Pits/Excavations.
Environmental mitigation - To address water pollution due to highway runoff, stream channel stabilization, and vegetation management, including invasive species prevention (See appropriate Stormwater management facilities; Streambank stabilization; and Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance categories.)	See appropriate Stormwater management facilities; Streambank stabilization; and Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance categories.	See appropriate Stormwater management facilities; Streambank stabilization; and Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance categories.	See appropriate Stormwater management facilities; Streambank stabilization; and Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance categories.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Environmental mitigation - To reduce vehicle-caused wildlife mortality while maintaining habitat connectivity - Guide fence - Underpass for dry passage (*e.g.*, pipe or arch or box-type culvert) - Overpass/bridge - Shelf inside stream culvert or bridge For guide fence, see Fence category. For underpass for dry passage, refer to Terrestrial Wildlife Passage category). For overpass/bridge, refer to appropriate Bridge category(ies.) For repair, reconstruction, or in-kind replacement of existing shelf, see appropriate Culvert or Bridge category(ies). For out-of-kind replacement of existing shelf or installation of new shelf, see Terrestrial Wildlife Passage category.	For guide fence, see Fence category. For underpass for dry passage, refer to Terrestrial Wildlife Passage category). For overpass/bridge, refer to appropriate Bridge category(ies.) For repair, reconstruction, or in-kind replacement of existing shelf, see appropriate Culvert or Bridge category(ies). For out-of-kind replacement of existing shelf or installation of new shelf, see Terrestrial Wildlife Passage category.	For guide fence, see Fence category. For underpass for dry passage, refer to Terrestrial Wildlife Passage category). For overpass/bridge, refer to appropriate Bridge category(ies.) For repair, reconstruction, or in-kind replacement of existing shelf, see appropriate Culvert or Bridge category(ies). For out-of-kind replacement of existing shelf or installation of new shelf, see Terrestrial Wildlife Passage category.	For guide fence, see Fence category. For underpass for dry passage, refer to Terrestrial Wildlife Passage category). For overpass/bridge, refer to appropriate Bridge category(ies.) For repair, reconstruction, or in-kind replacement of existing shelf, see appropriate Culvert or Bridge category(ies). For out-of-kind replacement of existing shelf or installation of new shelf, see Terrestrial Wildlife Passage category.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
14. LANDSCAPING			
- Placement of topsoil - Seeding - Plantings - Fertilizing - Mulching - Erosion control mats - Biodegradable - Not biodegradable For grading, see Restoration of Temporarily Impacted Areas category	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3e, 3f, 4, 8a, 9, 12a, 15b, 15c, 20b, 21, 22	Wetland portion of habitat: This activity is not allowable under the PBO as per CM 13c Upland portion of habitat: Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3e, 3f, 4, 5, 8a, 9, 10, 13d, 15b, 15c, 20b, 21, 22
- Use of herbicide (*e.g.*, for guiderail maintenance, invasive species control, clear zone and sight distance maintenance)	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3f, 8a, 11, 12a, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3f, 5, 6, 10, 11, 13a, 13b, 13c, 13e, 13f, 13g, 14a, 21, 22
15. GRAFFITI REMOVAL			
Graffiti Removal - On bridge - On noise wall	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 8b, 12a, 17, 21, 22	NA
16. GEOTECHNICAL BORINGS			
Geotechnical Borings - Vehicle-mounted boring equipment - Includes appropriately sealing boring holes (*e.g.*, with a bentonite clay grout) For access path (*e.g.*, cutting and/or removal of vegetation, including trees), see Vegetation Removal/Control category or Temporary Access Road/Temporary Driveway category, as appropriate.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 8a, 8b, 9, 12a, 13i, 15b, 17, 21, 22	NLAA with Service review and CMs: 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 13i, 14a, 14b, 14c, 15b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
17. ROADWAYS	(Some of these activities will not change the baseline condition of the roadway)		
Roadway Maintenance			
Street Sweeping	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8b, 12a, 16, 21, 22	NA
Winter Maintenance - Plowing snow - Applying anti-icing/deicing materials to roadways - Applying abrasives (*e.g.*, fine grit material, coarse sand material) to roadways For Storage of Deicing Materials, See Existing Maintenance Yards and Garages – Maintenance and Operations For Hazard Tree Removal, see Vegetation Removal/Control category	NE [CMs: 12a, 21, 22]	NLAA with CM 5	NA
Safety Delineator Measures			
Striping/Pavement Markings Installation - Includes lane/shoulder striping/restriping; raised pavement markings; stop bars; and markings used to delineate pedestrian crosswalks or bicycle lanes	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 12a, 16, 21, 22	NA
Rumble Strip Grinding	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8b, 12a, 16, 21, 22	NA
Roadway Resurfacing and Patching			
- Crack sealing - Pothole repair and patch work for pavement repair These activities are limited to being within limits of existing pavement/curb to curb.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 12a, 17, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
- Milling and resurfacing of pavement - High friction surface treatment (a.k.a. skid resistant treatment) - Overlay - Slurry sealing/oiling These activities are limited to being within limits of existing pavement/curb to curb.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 8a, 8b, 12a, 17, 21, 22	NA
Roadway Rehabilitation/Reconstruction			
Roadway rehabilitation, rubblization (includes work below the pavement box), reconstruction Does not include widening (see appropriate Widening of Roadway category). If project involves drainage work, see appropriate Drainage Facilities category).	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 8a, 8b, 9, 12a, 15a, 15b, 17, 18, 20a, 20b, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20a, 20b, 21, 22
Intersection/interchange improvement/reconstruction - Minor safety work (*e.g.*, cutbacks at corners or driveways) (For addition of turn lane, see Widening of Roadway – Addition of Lane/Shoulder category) (For realignment of intersection/interchange or addition of ramps, refer to Road Realignment category) (For traffic signals, see Traffic Signal Equipment category) (For ADA work, see Americans with Disability Act Requirements category)	NE [CMs: 12a, 21, 22]	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3e, 8a, 8b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
New Roadway Construction			
NOTE: Because of the larger scale of the activities in this category, they are likely to include other activities addressed elsewhere in the matrix.			
Widening of roadway - Minor widening (to bring lane or shoulder up to standard width)	NE [CMs: 12a, 21, 22]	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 21, 22
Widening of roadway - Addition of lane/shoulder	NLAA with Service review and CMs: 12a, 18, 20a, 20b, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 20c, 20d, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20a, 20b, 20c, 20d, 21, 22
Road realignment - To correct substandard roadway geometry (*e.g.*, a dangerous curve) - More extensive realignment - Realignment of intersection - Addition of ramps at interchanges	NLAA with Service review and CMs: 12a, 18, 20a, 20b, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 20c, 20d, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20a, 20b, 20c, 20d, 21, 22
New interchange	NLAA with Service review and CMs: 12a, 18, 20a, 20b, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 20c, 20d, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20a, 20b, 20c, 20d, 21, 22
New roadway/bypass	NLAA with Service review and CMs: 12a, 18, 20a, 20b, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 20c, 20d, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 3e, 5, 8a, 8b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 18, 20a, 20b, 20c, 20d, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Removal of roadway/paved surface and restore to vegetated condition	NE [CMs: 12a, 21, 22]	NLAA with Service review and CMs: 3d, 3e, 3f, 4, 5, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20b, 21, 22	NA
18. DAMS			
Dam Inspection (includes inspection of dam and spillway (*e.g.*, on foot or by boat))	NE [CMs: 12a, 21, 22]	NE [CMs: 12a, 21, 22] See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	If the crew can stay in the boat: NE [CM 21, 22] If the crew has to land the boat and get out and walk around, or if the inspection is on foot: NLAA with CMs: 10, 13a, 13b, 13d, 21, 22
Dam Maintenance - Includes: - Removal of debris from spillway - Repairing/lubricating outlet gate and valve - Removal of burrowing animals and their dens from the dam For clearing and grubbing of brush and woody vegetation or mowing of grass areas along the dam embankments, see Vegetation Management, Clear Zone/Sight Distance Maintenance, and Shoulder Maintenance category. For fertilizing and seeding, see Landscaping category. For filling potholes or resurfacing pavement along the crest of the dam, see Roadway Resurfacing and Patching category. For removal of debris from existing subsurface drains and outfalls, and repair of cracked pipes, see Drainage Facility Inspection, Maintenance, and Repair category. For stabilizing eroded areas, seeps, or gullies, see Streambank Stabilization category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 16, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with CMs: 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 21, 22 Service review is required only if it is necessary for vehicles to be staged in habitat.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Dam Rehabilitation/Reconstruction Includes: - Raising the dam's crest - Improving the existing service spillway (same footprint) - Improving the existing spillway (larger footprint) to handle the capacity of the spillway design flood - Construction of new auxiliary spillway - Overtopping protection For repair/replacement/installation of underdrains, see Drainage Facilities category. For reconstruction of embankment, see Streambank Stabilization category. For Dewatering, see Dewatering of Stream Category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 9, 12a, 12b, 18, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with Service review and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 18, 21, 22
Dam Replacement For repair/replacement/installation of underdrains, see Drainage Facilities category. For reconstruction of embankment, see Streambank Stabilization category. For Dewatering, see Dewatering of Stream Category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 9, 12a, 12b, 18, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	NLAA with Service review and CMs: 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 18, 20a, 20b, 21, 22
19. CAMERAS, INTELLIGENT TRANSPORTATION SYSTEM (ITS), AND UTILITIES			
Cameras - Replacement of existing cameras - Installation of new cameras - On existing poles/posts/traffic signals	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 17, 21, 22	NLAA with CMs: 5, 10, 13a, 13b, 13e, 13f, 13g, 14a, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Cameras - Cameras on new poles/posts - With footings	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 8a, 9, 12a, 13i, 17, 21, 22	NLAA with CMs: (Service review only for installation in wetland portion of habitat) 1, 3a, 3b, 3c, 5, 8a, 9, 10, 13a, 13c, 13e, 13f, 13h, 13i, 15b, 21, 22
Intelligent Transportation System (ITS) Components Installation All components of this activity are covered under other activities. For installation of fiber optic cables, see Utility Line Relocation/Installation category. For cameras, see Camera categories. For traffic signal-related activities, see Traffic Signals categories. For variable message signs (VMS)/dynamic message signs (DMS), see Signage categories.	See other categories	See other categories	See other categories
Utility Line Relocation/Installation - Includes electric lines, telephone lines, fiber optic cables - Includes water supply lines, sewer lines - Below ground - Jacking/directional drilling - Trenching - More extensive excavation/grading - Not under existing pavement - Above ground - Utility poles For Vegetation removal, see Vegetation Removal/Control category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 8a, 8b, 9, 12a, 13i, 15a, 15b, 15c, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 13i, 14a, 14b, 14c, 15a, 15b, 15c, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
20. RAILROAD OPERATIONS IMPROVEMENTS			
Railroad Operations Improvements Other than Rail Replacement All of the components of this activity are covered under other activities. For the following activities, see Traffic Signal Equipment, Signal System Improvement, and Signage under Appurtenant Features category: - Railroad warning device (includes signals, lights, gates/arm bars, warning bells) - Repair/replacement/upgrade of existing warning devices - Railroad warning device new installation - Install/replace signage For Pavement Markings, see Striping/Pavement Marking Installation under Roadways category. For the following activity(ies), see Roadway Resurfacing and Patching under Roadways category: - Railroad crossing roadway maintenance/grade crossing resurfacing - *e.g.*, limited resurfacing 100 feet from either side of track. (The distance may be less in some circumstances.) (see Milling and Resurfacing of Pavement category) For the following activity, see Vegetation Removal/Control category: - Railroad vegetation maintenance	See other categories	See other categories	See other categories

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Railroad Operations Improvements – Rail Replacement - Rail replacement (without changing the baseline condition of the railroad) - Using rail car on tracks to remove and lay down new rail	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 15b, 17, 21, 22	NA
21. MAINTENANCE YARDS			
Existing Maintenance Yards and Garages – Maintenance and Operations (includes for example, storage/repair of vehicles/equipment; storage of materials, such as mulch, yard debris, fuel, deicing materials, herbicides, stone, aggregate, gravel; vehicle washing) Also includes repair/rehabilitation/replacement of existing buildings/structures, repair/maintenance of existing pavement, expanded/new buildings/structures on existing pavement with no change in stormwater runoff. For Vegetation maintenance, see Vegetation Removal/Control category. For Stormwater management facility maintenance, see Stormwater Management Facility Maintenance category. For Accidental fuel spill/potential contaminant release, see Accidental Fuel Spill/Potential Contaminant Release category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 7a, 7b, 8a, 8b, 9, 12c, 21, 22	NA

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
New Maintenance Yard and Garage Construction (includes new pavement, new buildings/structures at Existing Maintenance Yards/Garages not included in Existing Maintenance Yards and Garages – Maintenance and Operations category) For Vegetation Removal, see Vegetation Removal/Control category For Stormwater Management Facility Construction, see Stormwater Management Facility Construction category	NLAA with CMs: 12a, 18, 21, 22	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3d, 5, 7a, 7b, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 3d, 5, 7a, 7b, 8a, 8b, 9, 11, 13a, 13e, 13f, 13h, 15a, 15b, 15c, 15d, 18, 20a, 20b, 21, 22
22. NOISE BARRIERS			
Repair or Reconstruction of Noise Barrier - Pile driving - Drilled shafts - Install underdrain system	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 8a, 8b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 20b, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 20b, 21, 22
New noise barrier installation (includes extension of existing barrier or other enlargement of the footprint) - Pile driving - Drilled shafts - Install underdrain system	NE [CM 12a, 20a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 5, 8a, 8b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 17, 20a, 20b, 21, 22	Service review (could be NLAA or LAA) with CMs: 1, 3a, 3b, 3c, 5, 8a, 8b, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 20a, 20b, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
23. TRANSPORTATION ROADSIDE FACILITIES			
Park and Ride Facility/Rest Area/Truck Weigh Station/Parking Lot - Improvements to existing facility involving addition or net gain of impervious surface or change in stormwater management requirements - New facility For Milling/Resurfacing, see category for Milling and Resurfacing of Pavement under Roadways category (but note CMs 7a, 7b still apply). For scenic overlooks, see Transportation Alternatives/Enhancements category. For Landscaping, see Landscaping category.	NE [CMs: 12a, 21, 22]	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 3c, 3d, 5, 7a, 7b, 8a, 8b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18, 20a, 20b, 20d, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 3d, 5, 7a, 7b, 8a, 8b, 9, 10, 11, 13a, 13e, 13f, 13h, 15a, 15b, 15c, 15d, 18, 20a, 20b, 20d, 21, 22
24. STREAM/WETLAND WORK			
Stream/Waterbody Cleaning (also includes waterbodies that drain less than 50 acres) - Sediment/debris removal - By hand - By machinery For stormwater management ditches, see Stormwater Management Facility Maintenance category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA) with CMs: 1, 5, 9, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 15f, 18, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Mitigation/Restoration Work - Wetland/riparian zone mitigation/restoration/enhancement - Wetland and riparian zone vegetation planting - Hydrologic wetland restoration/enhancement - Stream channel restoration - Stream channel creation (*e.g.*, daylighting a culverted stream) - Wetland creation - Mechanical or biological invasive species control - Site remediation (*i.e.*, abating pre-existing environmental contamination) For Streambank Stabilization, see Streambank Stabilization category. For invasive species control involving herbicide, see Use of Herbicides category. For Dewatering, see Dewatering of Stream Category.	NE [CMs: 12a, 21, 22]	Service review (could be NLAA or LAA). CMs to be determined based on project specifics. Wetland creation in this area may not be recommended.	Service review (could be NLAA or LAA). CMs to be determined based on project specifics. Certain of these activities may not be recommended in this area. All activities should be planned in close coordination with Service.
Stream Modification - Stream relocation - Stream channelization For Streambank Stabilization, see Streambank Stabilization category. For Dewatering, see Dewatering of Stream Category. Placement of fill material and grading/excavating associated with transportation infrastructure projects are addressed elsewhere within this Effects Matrix under the appropriate activity.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA). CMs to be determined based on project specifics. Certain of these activities may not be recommended in this area. All activities should be planned in close coordination with Service.

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Temporary Stream Diversion (does not include dewatering) - Partial (*e.g.*, one side of stream at a time) vs complete diversion For Dewatering, see Dewatering of Stream Category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	Service review (could be NLAA or LAA). CMs to be determined based on project specifics.
25. DEWATERING			
Dewatering of stream - Installation of cofferdams - Sandbags covered with plastic - Portadam or similar structure - Sheet piling - Jersey barrier covered with plastic - Use of sediment controls (*e.g.*, floating turbidity barrier) - Pumping out water **NOTE:** For use of sediment controls (*e.g.*, sedimentation/dewatering basin, sediment control bag or tank) and discharge of filtered water, see Sedimentation/dewatering basin or Sediment control bag or tank categories.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 12b, 17, 21, 22 See User's Guide for an explanation of why activities involving stream work will rarely be classified in this middle column.	LAA with Service review and CMs: 1, 5, 10, 13a, 13c, 13e, 13f, 13g, 14a, 14b, 14c, 15b, 15f, 18, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Dewatering of groundwater outside of stream (*e.g.*, within an excavation) - Pumping out water **NOTE:** For use of sediment controls (*e.g.*, sedimentation/dewatering basin, sediment control bag or tank) and discharge of filtered water, see Sedimentation/dewatering basin or Sediment control bag or tank categories. **NOTE:** This activity does not include the excavation itself, only the dewatering.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 12a, 17, 18, 21, 22	NLAA* with CMs: 5, 10, 13a, 13e, 13f, 13g, 14a, 18, 21, 22 *Excavation itself will likely require Service review and additional CMs.
26. SURVEY WORK – TOPOGRAPHIC, BIOLOGICAL, AND ARCHEOLOGICAL			
Survey Work (Includes Topographic Survey, Biological Survey, and certain Archeological Survey work) - Walk through bog turtle habitat - Hand boring of soil samples (*e.g.*, soil auger, post hole digger) - Shovel tests Does not include test pits – See Archeological Test Pits/Excavations category. For access involving cutting and/or removal of vegetation, including trees, see Vegetation Removal/Control category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 9, 12a, 13i, 17, 21, 22	NLAA with CMs: 5, 9, 10, 13a, 13b, 13c, 13e, 13f, 13g, 13i, 14a, 14b, 14c, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Archeological Test Pits/Excavations For post hole digging, see Survey Work (includes Topographic Survey, Biological Survey, and certain Archeological Survey Work category). For access path (cutting and/or removal of vegetation, including trees), see Vegetation Removal/Control category or Temporary Access Road/Temporary Driveway category, as appropriate.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 5, 9, 12a, 13i, 17, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 5, 9, 10, 13a, 13b, 13c, 13e, 13f, 13g, 13i, 14a, 14b, 14c, 15a, 15b, 15c, 15d, 21, 22
27. TEMPORARY CONSTRUCTION SITE FACILITIES AND STAGING AREAS			
Temporary Access Road/Temporary Driveway Construction and Removal - Timber mats - Stone/gravel - Paved For access involving cutting and/or removal of vegetation, including trees, see Vegetation Removal/Control category. For landscaping after removal, see Landscaping category. **NOTE:** Some of the CMs may not apply if vehicular access is accomplished without construction of a temporary access road/driveway.	NLAA with CMs: 11, 12a, 18d, 20a, 20c, 21, 22	NLAA with Service review and CMs: 3a, 3b, 3c, 5, 7a, 7b, 9, 11, 12a, 12b, 15a, 15b, 15c, 15d, 17, 18d, 20a, 20c, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 7a, 7b, 9, 10, 11, 13a, 13c, 13e, 13f, 13g, 14a, 15a, 15b, 15c, 15d, 18d, 20a, 20c, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Temporary Construction Site Facilities and Removal - Temporary field office (on-site or off-site) (*e.g.*, includes trailer, contractor's yard). (CMs would not apply to an office set up in an existing permanent building/structure.) - Construction/equipment staging area/materials storage area (includes temporary stockpiles of soil/materials) (on-site or off-site) The area will be restored to original condition upon completion of work except for the area within the wetland portion of habitat or within permanently impacted areas. For cutting and/or removal of vegetation, including trees, see Vegetation Removal/Control category. For access to temporary construction facilities, see Temporary Access Road/Temporary Driveway category. For utility work, see Cameras, Intelligent Transportation System (ITS), and Utilities category. For landscaping after removal, see Landscaping category. **NOTE:** Some of the CMs may not apply if trailer/contractor's yard is located in a previously disturbed area.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 3a, 3b, 3c, 8a, 5, 7a, 7b, 9, 12a, 12b, 15a, 15b, 15c, 15d, 15i, 17, 18, 21, 22	Service review (could be NLAA or LAA) and CMs: 1, 3a, 3b, 3c, 5, 7a, 7b, 8a, 9, 10, 13a,13e, 13f, 13h, 15a, 15b, 15c, 15d, 15i, 18, 20a, 20c, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
Off-site Use Areas - Borrow areas - Temporary stockpile/storage areas For removal of vegetation, see Vegetation Removal/Control category.	NE [CMs: 12a, 21, 22]	Service review (could be NLAA or LAA) and CMs: 3a, 3b, 5, 9, 12a, 12b, 15a, 15b, 15c, 15d, 15i, 17, 21, 22	This activity is not allowed in wetland portion of habitat or aquatic corridor habitat, and is discouraged in upland portion of habitat. If necessary to conduct this activity in upland portion of habitat: LAA with Service review and CMs: 1, 3a, 3b, 5, 9, 13a, 13e, 13f, 13i, 15a, 15b, 15c, 15d, 15i, 18, 21, 22
28. FOOT ACCESS THROUGH OR NEAR BOG TURTLE HABITAT			
Foot access through or adjacent to bog turtle habitat For access involving cutting and/or removal of vegetation, including trees, see Vegetation Removal/Control category.	NA	NE [CMs: 12a, 21, 22]	NLAA with CMs: 10, 13a, 13b, 13d, 21, 22

ACTIVITY	MORE THAN 300 FEET FROM HABITAT	WITHIN 300 FEET OF HABITAT	WITHIN HABITAT
29. RESTORATION OF TEMPORARY IMPACTS			
Restoration of Temporarily Impacted Areas to Original Condition - Grading For Landscaping, see Landscaping category. For Removal of Temporary Access Road/Driveway, see Temporary Access Road/Temporary Driveway Construction and Removal category. For Removal of temporarily placed man-made materials, see Temporary Construction Site Facilities and Removal category.	NE [CMs: 12a, 21, 22]	NLAA with CMs: 5, 9, 12a, 15a, 15b, 15c, 15d, 17, 21, 22	For Wetland portion of habitat: Service review (could be NLAA or LAA). CMs to be determined based on project specifics. For Upland portion of habitat: Service review (could be NLAA or LAA) and CMs: 5, 9, 10, 13a, 13e, 13f, 15b, 15c, 15d, 20a, 20b, 21, 22 For wetland and upland portions of habitat, all activities should be planned in close coordination with Service.
30. ACCIDENTAL FUEL/CONTAMINANT SPILL			
Accidental Fuel Spill/Potential Contaminant Release at NJDOT Construction or Maintenance Work Site or Maintenance Facility and Response to Spill For other fuel or contaminant releases on roadways or adjacent areas (*e.g.*, over-turned tanker truck) and response to spill, see CM 23a.	NE, NLAA, or LAA with CMs: 8a, 21, 22	Service review (could be NLAA or LAA) and CMs: 8a, 21, 22 In addition to the emergency notifications listed in CM 8a, immediately notify the Service's New Jersey Field Office.	Service review (could be NLAA or LAA) and CMs: 8a, 21, 22 In addition to the emergency notifications listed in CM 8a, immediately notify the Service's New Jersey Field Office.

APPENDIX C. COMPENSATORY MITIGATION FRAMEWORK

CONSERVATION GOAL

The NJDOT's conservation goal for this consultation is to offset adverse impacts to the bog turtle and promote the recovery of the species. The Service and the NJDOT have developed compensatory mitigation measures and conservation priorities for implementation where projects using this consultation adversely affect bog turtles. The NJDOT will implement appropriate and practicable compensatory mitigation as described herein for adverse effects to bog turtles. The Service developed these measures after considering the effects of the action and the recovery actions identified in the Bog Turtle Northern Population Recovery Plan (Service 2001). To the extent practicable, and considering the statewide and range-wide recovery needs of the bog turtle, compensatory mitigation will be prioritized in the same recovery unit as the impacts.

MITIGATION PROGRAM ALTERNATIVES

Transportation Agencies have several pathways (options) to compensate for adverse impacts to the bog turtle. The conservation pathways include In-Lieu Fee (ILF) programs, conservation banks, and local conservation sites. The NJDOT may choose any of the conservation pathways described below to meet the requirements of this consultation.

Range-wide, state, regional or recovery unit-specific ILF program

The NJDOT may use a Service-approved range-wide (northern population), regional, or local ILF program. Action agencies, State resource agencies, and conservation groups may develop and use ILF programs. These programs may operate at the State, regional level, or recovery unit level, and must be approved by the Service.

The Service and the ENSP are developing a statewide ILF mitigation program for compensation of adverse effects to bog turtle habitat. The ILF program will provide a compensatory mitigation option for NJDOT projects utilizing this programmatic consultation, and may be expanded to address adverse impacts to bog turtles from other action agencies or project proponents. The ENSP will serve as the Program Administrator. They will receive the compensation fees, administer the ILF program in coordination with the Service, and be responsible for ensuring that compensation project implementation is consistent with the requirements of this consultation.

Conservation banks

The NJDOT may use a Service-approved bog turtle conservation bank appropriate for the action area of a project(s). Any individual or group may establish a bog turtle conservation bank.

Local conservation sites

The NJDOT may work directly with the Service and ENSP to select specific mitigation projects for their individual projects or programs. If a compensation project provides more habitat than required to compensate for a single project's impacts, the NJDOT may use the excess acres for future projects.

HABITAT COMPENSATORY MITIGATION MEASURES

Funds collected in New Jersey for bog turtle compensatory mitigation will be used on mitigation projects in New Jersey within the bog turtle recovery unit where the funds originated, unless the Service and ENSP agrees to use of funds for an out-of-recovery unit mitigation project. New Jersey is a part of three bog turtle recovery units: the Hudson/Housatonic unit, the Delaware unit, and the Outer Coastal Plain unit. The amount of compensatory mitigation required for unavoidable adverse impacts to bog turtle habitat will be determined in a forthcoming Mitigation Plan that will be added as an addendum to this PBO. Compensatory requirements and ratios will reflect the nature and timing of the impacting activity, as well as the quality of the habitat being affected in accordance with the most current Service bog turtle mitigation calculation metrics at the time of the action.

CONSERVATION PRIORITIES

The Service has prioritized the compensatory mitigation and conservation actions based on the conservation needs of bog turtles. The goal of the conservation program is to implement the highest priority compensatory actions for a project where practicable. In some circumstances, the Service and the ENSP may determine that a lower priority compensatory measure may provide a higher conservation value for bog turtles in a given area or circumstance.

1. Long-term protection of known occupied habitat
    a. Purchase or otherwise acquire fee title interest in one or more land parcels that meet the intents and priorities of this Conservation Program
    b. Secure conservation easements and associated land management agreements on one or more land parcels that meet the intents and priorities of this Conservation Program

2. Manage and maintain occupied bog turtle habitat to ensure suitability for bog turtles
    a. Long-term habitat management
        i. This includes restoration techniques such as plugging ditches and crushing drain tiles to restore site hydrology and long-term vegetation management practices such as establishing beneficial grazing regimes
    b. Short term habitat management
        i. Control/reversal of woody vegetation succession and invasive plant control

3. Maintain connectivity between known bog turtle populations
    a. Construction and monitoring of bog turtle passage structures to minimize road strikes
    b. Management of riparian corridors and other habitats to reduce barrier effects
    c. Land acquisitions to promote habitat connectivity.

4. Applied Research
    a. Applied research projects may be included in this conservation program if it is determined by the Service and the ENSP to be the highest practicable conservation effort available or if the research is expected to provide substantial

future conservation benefits. Applied research can yield specific information that will improve some aspect of the compensatory mitigation actions of this programmatic or overall conservation of the species. For example, surveys can be used to identify previously unknown bog turtle populations or research studies can investigate the potential impacts of roadway contaminants on bog turtles and suitable minimization measures.

5. Protection/Restoring Other Bog Turtle Conservation Lands
    a. Protection or management of suitable, unoccupied bog turtle habitats is a conservation option when mitigation projects associated with the above priorities are not readily available.

MITIGATION TIMING

If a conservation bank or ILF program is chosen to compensate for adverse effects on bog turtles, the purchase of species conservation credits and/or in-lieu fee contributions shall occur prior to construction of a transportation project covered under this programmatic consultation. The one exception will be projects determined to be emergency and/or projects that do not require advertisement for bidding prior to construction. In these cases, purchase of credits and/or in-lieu fee contributions shall be completed within 6 months of completion of the project. This timeframe allows for accurate compilation of the acres of habitat affected as a result of the emergency project and processing of finances. Implementing compensatory mitigation using any conservation pathway is preferable in advance of the impacts in order to avoid any temporal delays in conservation for the species. If any unavoidable impacts occur prior to execution of the mitigation instrument, a higher ratio may be needed to compensate for the temporal loss of conservation value.

LANDSCAPE-LEVEL CONNECTIVITY MITIGATION

Adverse impacts to bog turtle landscape connectivity are difficult to quantify on a project-by-project bases and lend themselves particularly well to landscape-scale mitigation. The NJDOT/FHWA will implement a Connectivity Offset Strategy (part of the Mitigation Plan) to abate the impacts of fragmentation and isolation of bog turtle habitats as a result of transportation project activities across the State. Connectivity improvement opportunities (*e.g.*, structural modifications, vegetation management) will be sought incidental to planned roadway projects.

MITIGATION PLAN DEVELOPMENT TIMEFRAME

Within 3 months of issuance of this PBO, the NJDOT, the Service, and the NJDEP will discuss next steps in developing the Mitigation Plan. The agencies' shared goal is to have a functional, approved program in place within 24 months of the date of this PBO.

APPENDIX D. BOG TURTLE RESOURCE NEEDS

Resource Need	Sub-need	Egg	Hatchling	Juvenile	Adult	Development	Nesting	Foraging	Movement	Escape	Cover	Temp regulation	Estivation	Brumation
Air temperature		x				x						x		
Air temperature			x					x	x	x		x	x	
Air temperature				x				x	x	x		x	x	x
Air temperature					x		x	x	x	x		x	x	x
Wetland vegetation	non-canopy (herbaceous vegetation and unvegetated areas)	x				x						x		
Wetland vegetation	non-canopy (herbaceous vegetation and unvegetated areas)		x	x	x					x	x	x		
Wetland vegetation	canopy (scrub-shrub or forested)		x	x	x				x	x	x	x	x	x
Wetland vegetation	woody/tussock roots			x	x						x	x	x	x
Wetland vegetation	pedestal-forming vegetation (e.g., tussock sedge)	x				x						x		
Wetland vegetation	pedestal-forming vegetation (e.g., tussock sedge)		x							x	x	x	x	
Wetland vegetation	pedestal-forming vegetation (e.g., tussock sedge)			x						x	x	x	x	x
Wetland vegetation	pedestal-forming vegetation (e.g., tussock sedge)				x		x			x	x	x	x	x
Wetland vegetation	sphagnum/humus/grass (to cover nests)	x				x						x		
Wetland vegetation	sphagnum/humus/grass (to cover nests)				x		x							
Wetland microtopography	elevated areas (e.g., tussocks)	x				x								
Wetland microtopography	elevated areas (e.g., tussocks)		x	x								x		
Wetland microtopography	elevated areas (e.g., tussocks)				x		x					x		
Wetland microtopography	rivulets/burrows		x					x	x	x	x	x	x	
Wetland microtopography	rivulets/burrows			x	x			x	x	x	x	x	x	x
Wetland substrate	soft muck at least 3” deep		x					x	x	x	x	x	x	
Wetland substrate	soft muck at least 3” deep			x	x			x	x	x	x	x	x	x
Wetland hydrology	year-round groundwater inputs (e.g., seeps, springs)		x					x				x	x	
Wetland hydrology	year-round groundwater inputs (e.g., seeps, springs)			x				x				x	x	x
Wetland hydrology	year-round groundwater inputs (e.g., seeps, springs)				x		x	x				x	x	x
Wetland hydrology	slow-moving surface and subsurface water		x					x	x	x		x	x	
Wetland hydrology	slow-moving surface and subsurface water			x	x			x	x	x		x	x	x
Wetland hydrology	near continuously saturated (not flooded) soils		x	x	x	maintain muck and all its functions								
Wetland hydrology	stable hydrologic inputs, generally small water fluctuations	x				x								
Wetland hydrology	stable hydrologic inputs, generally small water fluctuations		x					x	x	x	x	x	x	
Wetland hydrology	stable hydrologic inputs, generally small water fluctuations			x				x	x	x	x	x	x	x
Wetland hydrology	stable hydrologic inputs, generally small water fluctuations				x		x	x	x	x	x	x	x	x
Food resources	wetland invertebrates, plants, frogs, carrion		x	x	x			x						
Streams	refuge during dry weather		x	x	x						x	x	x	
Streams	hydrologic input to wetlands	x	x	x	x	maintain wetland hydrology and all its functions								
Streams	movement between wetlands			x	x				x					
Uplands	wetland habitat buffer	x	x	x	x	maintain water quality, wetland hydrology, wetland vegetation and all their functions								
Uplands	movement between wetlands			x	x				x					
Water quality		x	x	x	x	maintain food resources, wetland vegetation, and all their funcitons; directly support turtle health								

APPENDIX E. GLOSSARY

Absorbent Boom: linear floating tubes constructed with high absorbency inner fibers that can be connected together to form an absorbing perimeter around a spill. Absorbent booms can be used on both land and water based spills.

Abutment: the portion of the bridge substructure at either end of a bridge that transfers loads from the superstructure to the foundation and provides lateral support for the embankment.

Action Area: As defined by ESA regulations (50 CFR 402.02) action area means "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Specific to this PBO, see **Programmatic Action Area** and **Project-level Action Area.**

Aggregate: any of several hard, inert materials, such as sand, gravel, slag, or crushed stone, used for mixing with a cementing or bituminous material to form concrete, mortar, or plaster; or used alone as in railroad ballast or graded fill material (*e.g.*, for a roadway).

Appurtenant Feature: an element associated with a roadway, bridge, or dam such as a sign, utility pole, guiderail, sidewalk, or spillway.

Aquatic Corridor Habitat: is defined as streams connected to known habitat extending 1.0 mile upstream and 0.5 mile downstream of the known habitat AND any streams connected to potential habitat extending 500 feet upstream and 300 feet downstream of the potential habitat.

Aquatic Habitat: habitat associated with any body of water (*e.g.*, stream, river, lake, bay, ocean).

Articulated Concrete Block Mattress: Articulated concrete blocks are precast concrete blocks used over earth materials to provide a hard surface or to allow flow to pass safely without eroding the underlying surface. The blocks can be interlocking or connected with cables or anchors. Some articulated concrete blocks may be assembled/connected at the plant and installed as articulated concrete block mattress sections.

Berm: an artificial ridge or embankment generally constructed of earthen materials (*e.g.* soil and rock).

Best Management Practices (BMPs): structural features or non-structural strategies designed to minimize or mitigate environmental impacts (*e.g.*, those associated with stormwater runoff, including flooding, water pollution, erosion and sedimentation, and reduction in groundwater recharge).

Bioengineering: the use of live, woody and herbaceous plants in combination with structural components (*e.g.*, rock, wood, concrete, coconut fiber, or geotextiles) and hydrologic, hydraulic, and soil engineering principles, to stabilize or protect banks of streams, lakes, shorelines, excavated channels, and upland slopes from erosion.

Bio-infiltration Basin: a basin constructed with highly permeable soils and planted with suitable non-invasive (preferably native) vegetation to provide temporary storage of stormwater runoff. Most infiltration basins do not normally have a structural outlet to discharge runoff; instead, outflow from an infiltration basin is through surrounding soil.

Bioretention Basin: a basin constructed with a flat soil bottom and planted with suitable non-invasive (preferably native) vegetation creating a system that allows stormwater runoff entering the basin to be filtered through the soil planting bed and retained in the basin before infiltrating into the existing subsoil below the soil bed or being conveyed by an underdrain system.

Bioretention Swale: a swale constructed with a long, narrow, sloping soil bottom and planted with suitable non-invasive (preferably native) vegetation creating a system, that allows stormwater runoff entering the swale to be filtered through the soil planting bed before being conveyed downstream.

Boring: an exploration of subsurface material via soil cores used to determine the characteristics of the substrate. This may be conducted by hand auger or motorized equipment.

Bulkhead: timber, concrete, or steel sheeting often constructed as a wall adjacent to waterways or roadways to retain embankments or prevent erosion.

Catch Basin (also called Storm Drain Inlet or Curb Inlet): a receptacle (often concrete) that serves as the inlet to a storm drain system, and that typically includes a grate to capture debris before stormwater enters the basin.

Caution Fence: generally woven or plastic fencing that is often bright orange in color and is used as a temporary barrier around construction areas to mark off locations or keep pedestrians out of the work area or to prevent encroachment into environmentally sensitive areas from construction activities.

Certified NJDOT Bog Turtle Technician: a NJDOT employee that has been trained in the proper identification of suitable bog turtle habitat.

Channel: a linear topographic depression that continuously or intermittently confines and/or conducts surface water, not including transient erosional gullies and other ephemeral features that temporarily form after heavy rainfall. A channel can be naturally occurring or can be of human origin through excavation or construction, in which case it is referred to as "man-made." A channel includes both bed and banks.

Check Dam: a small, usually temporary, dam constructed across a swale, drainage ditch, or waterway to counteract erosion by reducing water flow velocity.

Clear Zone: the total roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a clear run-out area.

Clearing: the removal and disposal of surface material, such as weeds, trees, grass, brush, or other material without the removal of stumps, root balls, and root systems.

Cofferdam: a temporary enclosure built within a body of water and designed to allow the enclosed construction area to be dewatered to provide a dry work space. Cofferdams may be constructed of steel sheet piles, sandbags, or other materials.

Conservation Measures: detailed methods to avoid and minimize potential adverse effects to bog turtle habitat resulting from various construction activities.

Consultation: a required review of actions permitted, funded, or authorized by a Federal agency for effects on federally listed threatened or endangered species, as required by Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) (ESA). Consultation takes place between the Service and the Federal action agency, or the action agency's designated non-Federal representative. Also see *Tier 2 Informal Consultation* and *Tier 2 Formal Consultation*.

Culvert: a hydraulic structure that is typically used to convey surface waters through a roadway embankment. Culverts are differentiated from bridges as having spans typically less than 20 feet.

Dam: any artificial dike, levy, or other barrier, which impounds water. Sometimes roadway embankments serve as dams.

Detectable Warning Surface: a standardized surface feature built in or applied to walking surfaces or other elements to warn people who are visually impaired of specific hazards.

Detention Basin (also called detention facility): a man-made impoundment area created by constructing an embankment or excavating a pit, for the purpose of temporarily storing stormwater and for its controlled release.

Dewatering: the removal and discharge of sediment laden water from an excavated area, construction site, cofferdam, or sediment basin.

Disturbance: the placement of impervious surface, the exposure or movement of soil or bedrock, or the clearing, cutting, or removal of vegetation.

Ditch: a linear topographic depression with bed and banks of human construction, which conveys water to or from a site that is surrounded by uplands and is not located within a wetland. This does not include channelized or redirected natural water courses.

Dolphin: a man-made marine structure that extends above the water and is not connected to shore. Dolphins typically consist of a number of piles driven into the river/stream bed and are connected above the water level to provide a platform or fixing point. Dolphins may also be used to protect structures (*e.g.*, bridge piers) from possible impacts by passing boats.

Drainage Area: a geographic area within which stormwater runoff drains to a particular receiving waterbody or to a particular point along a receiving waterbody.

Dynamic Message Signs (DMS): both permanent and portable signs, which are vital components of Intelligent Transportation Systems (ITS) in communicating with motorists on the road. These signs provide the traveling public with warnings pertaining to traffic congestion, accidents, construction, speed restrictions, and weather events. They are also referred to as Variable Message Signs (VMS).

Effects Matrix: Appendix B to this PBO, which prescribes the various Conservation Measures (CMs 1 to 22) to specific activities based on proximity to bog turtle habitat, presents the effects determination under Section 7 of the ESA (*i.e.*, NE, NLAA, LAA), and indicates when project-level Service review (Tier 2 consultation) is required.

Emergency: a situation involving an act of God, disasters, casualties, national defense or security emergencies, etc., and includes response activities that must be taken to prevent imminent loss of human life or property. Predictable events usually do not qualify as emergencies under the ESA consultation regulations unless there is a significant unexpected human health risk. Under no circumstances should implementation of the CMs in the PBO (including coordination with the Service) obstruct or impede an emergency response where human life is at stake. See also **Urgent**.

Endangered Species: Under the ESA, any species which is in danger of extinction throughout all or a significant portion of its range. Under the New Jersey Endangered and Nongame Species Conservation Act (ENSCA), any species or subspecies of wildlife whose prospects of survival or recruitment are in jeopardy or are likely within the foreseeable future to become so; also includes any species or subspecies of wildlife appearing on any Federal endangered species list. The northern population of bog turtles is listed as threatened under the ESA and endangered under the ENSCA. See also **Threatened Species**.

Erosion Control Mat: a soil erosion and sediment control measure that utilizes stabilization fabric designed to support vegetation growth and reinforce the soil beneath. Mats can be made from both natural and synthetic materials.

Estivation: a prolonged torpor or dormancy of an animal in response to very hot or dry conditions.

Extended Detention Basin: a facility constructed through filling and/or excavation that provides longer term storage of stormwater runoff than a detention basin in order to promote the settlement of sediment and pollutants.

Fender System: a pile, row, or cluster of piles placed to protect a dock or bridge pier from damage by boats or floating objects.

Filling: the placement of sand, gravel, earth, or any other material.

Flared End Section: a precast concrete or metal structure at the end of a pipe that reduces erosion or scour caused by the pipe's discharge.

Floating Turbidity Barrier: a floating barrier used in waterways to prevent siltation of the waterway during construction. The floating turbidity barrier must be anchored or weighted at the bottom of the barrier to function properly.

Formal Consultation: a process under the ESA between the Service and a Federal agency or applicant that:(1) determines whether a proposed Federal action is likely to jeopardize the continued existence of listed species or destroy; (2) begins with a Federal agency's written request and submittal of a complete initiation package; and (3) concludes with the issuance of a Biological Opinion and incidental take statement by the Service. Formal consultation is required when the action agency has made a determination that the project is likely to adversely affect a federally listed species.

Frac-out: the inadvertent release to the surface of drilling fluids and mud resulting from directional drilling through fractured bedrock.

Gabion Basket: a protective structure that comprises wire mesh basket(s) filled with rock and used in multiples as a structural unit installed as a retaining wall or to withstand the erosive forces of moving water along the bank of a waterway. A gabion is not a "bulkhead" as defined elsewhere in this section.

Geosynthetic Reinforced Soil: closely-spaced layers of low-permeability synthetic membrane and compacted granular fill material used to provide a reinforced soil foundation.

Geotechnical Boring: a type of soil coring that reveals information about the subsoil structure, soil bearing pressure, groundwater table location, active soil load, and soil characteristics. This typically requires the use of machinery.

Geotextile: a broad range of "fabric" type materials that contain or filter soil or water. Fabrics may be permeable or impermeable and may or may not be degradable.

Girder: a horizontal supporting structural member often used for constructing bridges.

Grading: earthwork involving stripping, cutting, filling, or stockpiling of soil; leveling off to a smooth horizontal or sloping surface.

Grout Bag: a geotextile or similar material bag filled with grout or concrete that can be installed as a scour protection measure, channel lining, or to armor an embankment.

Grubbing: the removal and disposal of subsurface vegetative matter, such as roots, stumps, buried logs, or other debris.

Habitat: Where the term "habitat" is used in the Conservation Measures or in the Effects Matrix, it means known, potential, and/or aquatic corridor habitat, but does not include upland corridor habitat. Where the term "habitat" is used in the Conservation Measures or in the Effects Matrix, it does not include existing: (1) pavement, railways, or sidewalks; (2) maintained linear vegetated upland areas adjacent to a roadway, railway, sidewalk or paved trail (*e.g.*, mowed area adjacent to a roadway);(3) mowed ramp infields where no wetlands or streams are present;(4) stormwater management facilities that normally contain standing water or in which vegetation is regularly mowed or removed (*e.g.*, detention or retention basins), and mowed areas surrounding such stormwater management facilities; (5) buildings.

Headwall: a retaining wall attached to the end of a culvert or outfall to prevent erosion and undermining.

H-Pile: a square structural beam that is driven into the ground for deep foundation applications.

Hibernation: a seasonal period of inactivity in bog turtles; in New Jersey typically October 16 to March 31.

Hummock: a hummock is raised mound of vegetation growing in a cluster. Hummocks in bog turtle habitat may have small trees and shrubs growing out of them. The tops of hummocks can be used by bog turtles for basking and as nesting locations, while the root systems associated with hummocks provide daily refuge and cavities for hibernation.

Impervious Surface: a surface that has been covered with a layer of material that is highly resistant to infiltration by water.

Infiltration Basin: a facility constructed within highly permeable soils that provides temporary stormwater runoff storage, allowing percolation, and usually does not have an outlet structure.

Informal Consultation: a process under the ESA that includes all discussions and correspondence between the Service and a Federal agency or designated non-Federal representative, to determine whether a proposed Federal action may affect listed species.

In-Kind Replacement: the replacement of a structure in the same location and alignment, having the same dimensions and constructed of the same materials as the existing structure; a form of compensatory mitigation that involves the replacement of a community or ecosystem with the same physical and functional type as that of the impact area.

Inlet Protection: a temporary barrier (*e.g.*, an inlet filter or temporary inlet sediment trap) installed at a storm sewer inlet to prevent sediment from entering the storm sewer system.

Known Habitat: For the purposes of this PBO, known habitat is identified by a custom Landscape Project mapping product that retains all wetland portions of patches valued for bog turtle, but truncates upland portions of such patches at 300 feet from the wetland boundary. The custom Landscape Project mapping will be updated and provided to NJDOT following each public release of a Landscape Project update. Known habitat also includes the entire contiguous wetland in which there has been a positive Phase 2 or Phase 3 survey result or in which a bog turtle has been found through other means (but is not yet valued for bog turtle by the Landscape Project.) These known sites that have not yet been entered into the Landscape Project will be tracked by NJDFW in an Interim GIS layer and shared with NJDOT at least every 6 months.

Landscape Project: a pro-active, ecosystem-level approach for the long-term protection of imperiled species and their important habitats in New Jersey, designed to guide strategic wildlife habitat conservation. The Landscape Project provides wildlife habitat mapping for community land-use planning and species conservation. Developed and maintained by the ENSP, the goal of the Landscape Project is to protect New Jersey's biological diversity by maintaining and enhancing imperiled wildlife populations within healthy, functioning ecosystems.

Likely to Adversely Affect (LAA): As defined by the ESA Consultation Handbook, LAA is the appropriate finding in a biological assessment (or conclusion during informal consultation) if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of is "not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action is "likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, an is "likely to adversely affect" determination should be made. An is "likely to adversely affect" determination requires the initiation of formal section 7 consultation.

Listed Species: For purposes of this PBO, a species listed as threatened or endangered under the ESA. The bog turtle is also State-listed as endangered under the ENSCA. See Endangered Species and Threatened Species.

Manufactured Treatment Device (MTD): a prefabricated stormwater treatment structure utilizing settling, filtration, absorptive/adsorptive materials, vortex separation, and/or other appropriate technology to remove pollutants from stormwater runoff.

Mechanically Stabilized Earth Wall: a structure composed of pre-fabricated wall facing elements and a soil mass that is reinforced with metal or geosynthetic materials. These walls may function as retaining walls, bridge abutments, seawalls, or dikes.

Median: the area that separates opposing lanes of traffic on divided roadways.

Milling: the process of removing at least part of the pavement surface. This can be done to level or smooth the road surface in preparation for repaving.

Mitigation: Regulations implementing the National Environmental Policy Act (40 CFR 1508.20) and other relevant Federal and State natural resource laws define mitigation as a full sequence of first avoiding, then minimizing adverse impacts, and only then compensating for any remaining (unavoidable) impacts. The first parts of this sequence (avoid, minimize) are reflected in CMs 1 through 22 of this PBO. As used in this PBO in regard to offsetting unavoidable impacts to bog turtle habitat, "mitigation" refers only to the final step, which is compensatory mitigation. See CM 24 and Appendix C.

Motorized Construction Equipment: large powered or motorized equipment such bulldozers, cranes, backhoes, graders, pavers, rollers, excavators, loaders, milling machines, sheet/pile drivers, and stump grinders; does not include hand-held equipment such as powered saws, weed whackers, or jackhammers.

Muck: soft, saturated organic or mineral soil or peat. With regard to bog turtles, this term does not refer to a technical soil type. Bog turtle habitat is characterized by permanently saturated muck at least 3 to 5 inches deep in at least part of the wetland.

No Effect (NE): As defined by the ESA Consultation Handbook, NE is the appropriate conclusion when the action agency determines its proposed action will not affect a listed species.

Not Likely to Adversely Affect (NLAA): As defined by the ESA Consultation Handbook, NLAA is the appropriate conclusion when effects on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

Outfall Protection: measures taken to reduce erosion in the outfall discharge area. These measures may include permanent vegetative cover, riprap, or other armoring.

Outfall Structure: a discharge pipe (including any associated headwall, wingwalls, flared end section, or outfall protection) that conveys stormwater to its ultimate discharge point.

Out-of-Kind Replacement: the replacement of a structure in a different type, material, footprint, location and/or alignment than the existing structure; a form of compensatory mitigation that involves the replacement of a community or ecosystem with a different physical and functional type than the impact area.

Parapet: a concrete railing or barrier located on the bridge deck fascia and the tops of retaining walls.

Pathogen: a bacterium, virus, fungus, or other microorganism that can cause disease. *Mycoplasma*, *Herpesvirus*, and *Ranavirus* are pathogens known to be present in bog turtles.

Pedestal Vegetation: vegetation elevated above water or mucky soils, on which bog turtles prefer to nest or bask, such as tussock sedges or sphagnum moss.

Pervious Paving Systems: surfaces that allow water to pass through voids in the paving material or between pavers while providing a stable, load-bearing surface.

Phase 1 Bog Turtle Survey: an assessment of a wetland's soils, hydrology and vegetation to determine whether or not the area is suitable habitat for bog turtles (*i.e.*, potential bog turtle habitat). These surveys can be performed by a Recognized, Qualified Bog Turtle Surveyor or a Certified NJDOT Bog Turtle Technician. Guidelines for conducting Phase 1 bog turtle surveys are available on the Service New Jersey Field Office website. See User's Guide.

Phase 2 Bog Turtle Survey: a visual survey of suitable bog turtle habitat (*i.e.,* wetland with a positive Phase 1 survey) to determine presence or likely absence of bog turtles. These surveys can be performed only by a Recognized, Qualified Bog Turtle Surveyor with appropriate permits from the NJDFW. Phase 2 surveys should be coordinated with the Service in advance. Guidelines for conducting Phase 2 bog turtle surveys are available on the Service New Jersey Field Office website. See User's Guide.

Phase 3 Bog Turtle Survey: a trapping effort conducted in suitable bog turtle habitat (*i.e.,* wetland with a positive Phase 1 survey) to determine presence or likely absence of the bog turtles. This survey is conducted to supplement Phase 2 bog turtle survey efforts where vegetation cover is too thick to effectively survey using Phase 2 survey techniques alone (*e.g.,* dominated by multiflora rose, reed canary grass, *Phragmites*), or when Phase 2 survey results are negative but the quality and quantity of habitat are good and the site is located in a watershed of known occurrence. This survey can be performed only by a Recognized, Qualified Bog Turtle Surveyor with appropriate permits from the NJDFW and a Service-approved trapping plan. Guidelines for conducting Phase 3 bog turtle surveys can be obtained from Service upon request. See User's Guide.

Pier: the portion of the bridge substructure that transfers loads from the superstructure to the foundation and provides intermediate support for multi-span bridges.

Potential Habitat: As used in this PBO, potential habitat means an area of suitable habitat identified by a positive Phase 1 survey, plus all contiguous wetlands, where NJDOT elects to assume presence of bog turtles rather than proceed with a Phase 2/Phase 3 survey effort. The NJDOT may also elect to presume that any freshwater wetland is potential habitat instead of conducting the Phase 1 survey.

Programmatic Action Area: As used in this PBO, the programmatic action area is defined as the entire range of the bog turtle (*i.e.*, all known, potential, aquatic corridor, and upland bog turtle habitat) in New Jersey. This definition will not change over the life of this PBO, but mapping to depict the programmatic action area (Figure 1) is subject to revision as new information becomes available. Not to be confused with the "action area" of each individual project (see **Project-level Action Area**).

Programmatic Biological Opinion (PBO): A Biological Opinion is a document that includes: (1) the opinion of the Service as to whether or not a Federal action is likely to jeopardize the continued existence of listed species; (2) a summary of the information on which the opinion is based; and (3) a detailed discussion of the effects of the action on listed species. Programmatic Biological Opinions (PBOs) increase the efficiency of ESA Section 7 consultations by addressing multiple actions on a program, regional, or other basis. Programmatic consultation involves a two-tiered approach. Tier 1 consists of the programmatic consultation on the overall agency program, while Tier 2 involves streamlined consultations on individual actions carried out under a program.

Project-level Action Area (also called the action area of individual project): During the Tier 2 consultation process, a project-specific footprint will be delineated by NJDOT for each action proposed under this PBO. Likely effects extending beyond the actual footprint (*i.e.*, the project-level action area) have been factored into the Effects Matrix. Thus, the full action area of each project does not need to be delineated, only the project footprint. See User's Guide. Not to be confused with the "action area" of the PBO (see **Programmatic Action Area**).

Rain Garden: a perennial garden that functions as a basin to collect and filter stormwater runoff through ground infiltration.

Recognized, Qualified Bog Turtle Surveyor: an individual experienced in field herpetology that the Service's New Jersey Field Office and the ENSP currently recognize as qualified to identify bog turtle habitat and visually survey for the presence of bog turtles. A current list of Recognized, Qualified Bog Turtle Surveyors for New Jersey is found on the NJFO website.

Reconstruction: major work that could include renovation, rehabilitation, or alteration of a roadway or structure.

Recovery: Under the ESA, recovery means improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in section 4(a)(1) of the Act.

Recovery Unit: As defined by the ESA Consultation Handbook, recovery units are management subsets of a listed species that are created to establish recovery goals or carry out management actions. See Figure 3 for a map of bog turtle recovery units.

Repair: the restoration to a good or sound condition of materials, systems, and/or components that are worn, deteriorated or broken.

Resurfacing: the installation of a new asphalt or concrete layer over existing pavement or in conjunction with milling.

Retaining Wall: a structure designed to retain embankment and prevent erosion.

Retention Basin: a stormwater management basin that provides storage for a permanent pool of water.

Right-of-Way: the land, property, or interest therein acquired for or devoted to transportation purposes or construction of a public improvement.

Riparian Habitat: the natural areas present along the shores or the banks of a waterbody.

Riprap: angular broken rock placed on earth surfaces for protection against the action of water over an erodible surface.

Roadway Project: any/all activities covered by this PBO.

Rubblization: reducing existing concrete or asphalt into rubble at its current location, such as to create a base for new roadway pavement.

Rumble Strip: a series of milled depressions along the road centerline or on shoulders to alert motorists that have drifted out of their intended travel lanes.

Scour: the erosion of stream bed or bank material due to flowing water.

Scupper: a drain opening in a bridge for the purposes of draining water from the structure.

Sediment Control Tank/Bag: a tank or bag that allows suspended particles to settle out of water as the flow velocity of the water decreases.

Sheet Piling: long structural steel sheet sections with a vertical interlocking system that create a continuous wall.

Shotcrete: sprayed concrete that is conveyed through a hose and projected at high velocity onto a surface.

Sight Distance: the continuous length of highway ahead visible to the driver; the two types are passing and stopping sight distance.

Silt Control Tank/Bag: See **Sediment Control Tank/Bag**.

Silt Fence: a temporary sediment barrier made of woven, permeable synthetic filtration fabric stretched across supporting posts (steel or wood) that is installed to allow water to pass through while retaining the soil.

Site Preparation: physical activity that must occur before the construction of a project may commence. This may include vegetation removal and grading, but does not include the taking of soil borings or performing percolation tests.

Slope Scaling: the manual removal of unstable or potentially unstable rock utilizing hand tools as a form of rockfall mitigation.

Snooper Truck: a vehicle specialized to inspect the underside of a bridge while positioned on the superstructure by lowering personnel in a bucket.

Soil Nail Wall: a construction technique used to stabilize soil by inserting steel reinforcement bars into the soil and anchoring them to the soil strata.

Spillway: a control structure over or through which flows are discharged from an impoundment (e.g., a dam or basin).

Staked Turbidity Barriers: continuous panels of geotextile fabric staked into the ground at intervals that can contain and redirect sediment-laden stormwater runoff from construction sites.

Standard Constructed Wetland: a wetland system designed to maximize the removal of pollutants from stormwater runoff through settling and vegetative uptake/filtration.

Stormwater: water resulting from precipitation (including rain and snow) that runs off of the land surface, is transmitted to the subsurface, or is captured by storm sewers or other drainage facilities.

Stormwater Management Facility: a facility that receives, stores, conveys, or discharges stormwater runoff and is designed in accordance with applicable local, county, and State regulations. These facilities may include retention basins, detention basins, infiltration basins, or grassed swales.

Streetscape: refers to the visual effect and quality of a street. Landscaping, lighting, and street furniture are contributing elements to the streetscape.

Stringers: parallel beams that support a bridge deck and are often composed of steel.

Structure: any assembly of materials above, on, or below the surface of the land or water, including, but not limited to, buildings, fences, dams, pilings, footings, breakwaters, culverts, pipes, pipelines, piers, roadways, railroads, and bridges.

Substructure: the lower portion of a bridge that supports the superstructure and carries the loads to the ground through foundations. Substructure components include the pier, bent, abutment, and foundation.

Subsurface Gravel Wetland: a combination of a subsurface gravel bed and a surface marsh in order to maximize pollutant removal from stormwater.

Superstructure: the upper portion of a bridge above the substructure; components include bridge deck, girders, steel trusses, cable-stayed system, and cable-suspended system.

Swale: a linear topographic depression, either naturally occurring or man-made, that conveys stormwater and has no defined bed and banks.

Take: Under the ESA, take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed wildlife species, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.

Temporary Stone Check Dam: a temporary dam constructed with stone across a swale or ditch that serves to counteract erosion by reducing water flow velocity.

Terrestrial Wildlife Passage/Shelf: wildlife crossing accommodation provided under roads or railroads, or through bridges or stream culverts. The goal is to prevent or mitigate habitat fragmentation for terrestrial species by enabling wildlife movement through the obstruction and reducing wildlife-vehicle collisions.

Threatened Species: Under the ESA, any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. As utilized by the ENSP in carrying out the New Jersey Endangered and Nongame Species Conservation Act (ENSCA), those species who may become endangered if conditions surrounding them begin to or continue to deteriorate. The northern population of bog turtles is listed as threatened under the ESA and endangered under the ENSCA. See also **Endangered Species**.

Tier 2 Consultation: Programmatic consultation involves a two-tiered approach. Tier 1 consists of the programmatic consultation on the overall agency program, while Tier 2 involves streamlined consultations on individual actions carried out under a program. Both Tier 1 and Tier 2 consultations can be formal or informal. For Tier 2 consultation procedures specific to this PBO, see the User's Guide. Also see **Programmatic Biological Opinion, Formal Consultation** and **Informal Consultation**.

Tussock: an area of grasses growing in a thick clump, as opposed to a lawn. Tussocks in bog turtle habitat are mainly associated with tussock sedge (*Carex stricta*). The tops of tussocks can be used by bog turtles for basking and as nest locations.

Underground Detention Basin: a chamber constructed below the ground surface to store and slowly release stormwater while maximizing available land space.

Upland Corridor Habitat: As used in this PBO, upland corridor habitat is defined as upland areas between known/potential habitats or bog turtle populations that are separated by no more than 0.9 mile (1.5 km), where the known/potential habitats or populations are not separated by a major barrier such as a 4-lane roadway, a high-volume 2-lane roadway, man-made dams or impoundments, railways with intact rails, or steep cliffs.

Upland Habitat (or Upland Portion of Habitat): As used in this PBO, upland habitat means the upland portion of known (*i.e.*, Landscape-mapped) habitat, and that does not include upland corridor habitat.

Urgent: a situation requiring response activities or corrective action on the order of weeks or months in order to protect human life, health, or safety, or to prevent loss of property. Urgent activities do not meet the definition of "emergency" as used in this PBO. See **Emergency**.

Utility Line: a pipe, cable, line, or wire for the transport or transmission of gases, liquids, electrical energy, or communications. This term includes a pole or tower required to support a utility line, but does not include radio, television, or cell phone towers. The term "utility line" does not include a stormwater pipe.

Variable Message Signs (VMS): See **Dynamic Message Signs (DMS)**.

Vegetative Filter Strip: an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation as sheet flow.

Waler: horizontal beams between piles within a bulkhead.

Wetland Habitat (or wetland portion of the habitat): As used in this PBO, the wetland portion of known and potential habitat.

Wingwall: a wall at the end of an abutment or culvert for retaining slopes and preventing erosion.