

Programmatic Environmental Assessment

# **Utility Repair, Replacement, and Realignment**

## **Commonwealth of Puerto Rico**

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**Federal Emergency Management Agency Region II**  
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## ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effects
BCE	Before the Common Era
BFE	Base Flood Elevation
BMP	Best Management Practice
CAA	Clean Air Act
CBRA	Coastal Barrier Resources Act
CBRS	Coastal Barrier Resources System
CE	Common Era
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Communities of Concern
COR3	Central Office of Recovery, Reconstruction and Resiliency
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibels
dBA	Decibels (weighted)
DCH	Designated Critical Habitat
DNL	Day Night Average Sound Level (aka Ldn)
EA	Environmental Assessment
EJ	Environmental Justice
EO	Executive Order
ESA	Endangered Species Act
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
Ft	Feet
HMGP	Hazard Mitigation Grant Program
HUD	US Department of Housing and Urban Development
IPaC	Information for Planning and Consultation
Km	Kilometers
Leq	Equivalent Noise Level
LNG	Liquified Natural Gas
M	Meters
MBTA	Migratory Bird Treaty Act
Mi	Miles
MTA	Maritime Transport Authority

MOT	Maintenance of Traffic
MRLC	Multi Resolution Land Characteristic Consortium
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NLCD	National Land Cover Database
NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmospheric Association
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
OPA	Otherwise Protected Areas
OSHA	Occupational Health and Safety Administration
PCB	Polychlorinated biphenyls
PEA	Programmatic Environmental Assessment
PPE	Personal Protective Equipment
PRASA	Puerto Rico Aqueduct and Sewer Authority
PRCZMP	Puerto Rico Coastal Zone Management Plan
PRDLHRBLS	Department of Labor and Human Resources, Bureau of Labor Statistics
PRDNER	Puerto Rico Department of Natural and Environment Resources
PRDTOP	Puerto Rico Department of Transportation and Public Works
PREPA	Puerto Rico Electric and Power Authority
PREQB	Puerto Rico Environmental Quality Board
PRHTA	Puerto Rico Highway and Transportation Authority
PRPB	Puerto Rico Planning Board
PRSN	Puerto Rico Seismic Survey
RCRA	Resource Conservation and Recovery Act
REC	Record of Environmental Consideration
RHA	Rivers and Harbors Act
ROW	Right of Way
SDWA	Safe Drinking Water Act
SEA	Supplemental Environmental Assessment
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SPCC	Spill Control and Countermeasure Plan
SPL	Sound Pressure Level
SSA	Sole Source Aquifer
SWPPP	Stormwater Pollution Prevention Plan
T&E	Threatened and Endangered
USACE	United States Army Corps of Engineers

USC	United States Code
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USDHS	United States Department of Homeland Security
USDOT	United States Department of Transportation
USEDA	United State Economic Development Agency
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
WOTUS	Waters of the U.S.
WWTP	Waste Water Treatment Plant

## 1.0 INTRODUCTION

The mission of the Federal Emergency Management Agency (FEMA) is to reduce the loss of life and property and protect our institutions from all hazards by leading and supporting the nation in a comprehensive, risk-based emergency management program of mitigation, preparedness, response, and recovery. Beginning September 17, 2017, Hurricane Maria caused significant damages to Puerto Rico (“Commonwealth”). President Donald J. Trump issued a disaster declaration for Hurricane Maria on September 20, 2017 encompassing the entire territory. The declaration authorized federal public assistance to affected communities and certain non-profit organizations per FEMA, and in accordance with the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1974 (42 USC 5172) as amended; the Sandy Recovery Improvement Act (SRIA) of 2013; and the Bipartisan Budget Act of 2018 (Public Law 115-123). The Central Office of Recovery, Reconstruction and Resiliency (COR3) is the Applicant for FEMA grants and multiple agencies may be Subapplicant for specific projects.

This Programmatic Environmental Assessment (PEA) is prepared in accordance with Section 102 of the National Environmental Policy Act (NEPA) of 1969, as amended; and the Regulations for implementation of the NEPA (40 Code of Federal Regulations [CFR] Parts 1500 to 1508). The purpose of this PEA is to consider the potential environmental impacts of potential project alternatives, including a no action alternative, and to determine whether to prepare a Finding of No Significant Impact (FONSI) or an Environmental Impact Statement (EIS). In accordance with above referenced regulations, FEMA Directive 108-1, and FEMA Instruction 108-1-1, FEMA, during the decision-making process, evaluates and considers the environmental consequences of major federal actions it funds or undertakes.

If a proposed project meets the scope, impacts, and mitigation covered in this PEA, then FEMA will only prepare a record of environmental consideration (REC) as required, in addition to all applicable federal, state, and local consultations and permits. FEMA will prepare a REC for projects that meet FEMA’s statutory or categorical exclusions that otherwise do not necessitate higher levels of NEPA review. If the scope of an action triggers additional analysis, FEMA will engage in the appropriate analysis or consultation requirement, prepare a REC, a tiered Environmental Assessment (EA), or Supplemental EA (SEA) under this PEA with the additional information.



## **2.0 PURPOSE AND NEED**

Hurricane Maria's wind, rain, and floodwater damaged many of the Commonwealth's utilities. The purpose of this action is to provide grant funding to restore damaged utilities and increase their resiliency for future weather events. Under the Stafford Act, FEMA has authority to provide funding for cost-effective hazard mitigation and resiliency measures for facilities damaged by Hurricane Maria. Additionally, FEMA is authorized to provide funding to eligible grant Applicants for cost-effective activities that have the purpose of reducing or eliminating risks to life and property from hazards and their effects. In addition, the Public Assistance Alternate Procedures provided by the Bipartisan Budget Act of 2018 along with Stafford Act sections 404 and 406 hazard mitigation encourage flexibility in recovery. Geography, climate, and demographic trends have led to the development of a complex infrastructure of utility systems across Puerto Rico. Aging infrastructure, the need for increased capacity, and damage due to disaster events all have the potential to limit the ability of these utility systems to function as designed. Failure of these systems can cause injury, loss of life, and environmental issues. For example, failing transmission lines may start fires or present an electrocution risk, or waste systems may discharge pollutants into waterways. Should utility systems fail, local governments may be unable to provide critical services including fire suppression, emergency communication, power generation, potable water, and wastewater treatment. Additionally, the lack of utilities such as electricity and water can be life-threatening for at-risk populations like the elderly, young, and the sick. In an effort to restore these services and/or mitigate these impacts, federal agencies led by FEMA may provide funds for utility system restoration, replacement, upgrade, expansion, redesign, or relocation.

The need for the action is to re-establish a safe and reliable network of utilities (through repair, replacement, or relocation) in order to reconnect the communities affected by the storm with safe and efficient delivery of energy, water, sewer service, and communications, and help reduce the potential for future damages by upgrading damaged utilities in accordance with current engineering codes and standards. The grant funding is necessary to address these concerns and reduce the damage and disruption caused by future disasters throughout the Commonwealth.

### 3.0 PROJECT LOCATION AND BACKGROUND

Puerto Rico is the smallest of the Greater Antilles of the West Indies and consists of the main island of Puerto Rico and various smaller islands, including Vieques, Culebra (**Figure 1** in **Appendix A**), Mona, Desecheo, and Caja de Muertos. Of the smaller islands, only Culebra and Vieques have year-round inhabitants. The length of the main island from east to west is 180 kilometers (km) (112 miles [mi]) and is 65 km (40 mi) from north to south. The Commonwealth of Puerto Rico is comprised of its territorial ocean waters and has a combined land area of approximately 13,800 square (sq) km (5,328 square [sq] mi) including:

- Puerto Rico - 8,713 sq km (5,328 sq mi) (land mass only),
- Vieques is 132 sq km (51 sq mi),
- Culebra is 30 sq km (12 sq mi),
- Mona is 54 sq km (21 sq mi), and
- Territorial Waters: 4,921 sq km (1,900 sq mi) (Gómez-Gómez 2014).

The Commonwealth of Puerto Rico is made up of the following 78 municipalities:

*Adjuntas, Aguada, Aguadilla, Aguas Buenas, Aibonito, Anasco, Arecibo, Arroyo, Barceloneta, Barranquitas, Bayamón, Cabo Rojo, Caguas, Camuy, Canovanas, Carolina, Catano, Cayey, Ceiba, Ciales, Cidra, Coamo, Comerio, Corozal, Culebra, Dorado, Fajardo, Florida, Guanica, Guayama, Guayanilla, Guaynabo, Gurabo, Hatillo, Hormigueros, Humacao, Isabela, Jayuya, Juana Diaz, Juncos, Lajas, Lares, Las Marias, Las Piedras, Loiza, Luquillo, Manati, Maricao, Maunabo, Mayaguez, Moca, Morovis, Naguabo, Naranjito, Orocovi, Patillas, Penuelas, Ponce, Quebradillas, Rincon, Rio Grande, Sabana Grande, Salinas, San German, San Juan, San Lorenzo, San Sebastian, Santa Isabel, Toa Alta, Toa Baja, Trujillo Alto, Utuado, Vega Alta, Vega Baja, Vieques, Villabla, Yabucoa, and Yauco.*

Puerto Rico is mountainous with extensive coastal areas in the north and south. The main mountain range is called “La Cordillera Central” (The Central Range). There are a total of 5,385 mi of rivers and streams on the main island (USDI-NPS, 2019). The Association of State Dam Safety Officials in 2018 lists 37 dams in the National Dam Inventory in Puerto Rico and the 36 Commonwealth regulated dams are “High Hazard” dams meaning a dam’s failure would cause loss of human life and significant property damage. Rivers in the northern region of the island are typically longer and with higher flow rates than those of the south, since the south receives less rain than the central and northern regions.

## **4.0 ALTERNATIVES**

FEMA is evaluating the following alternatives in this PEA to address the purpose and need. These alternatives represent classes of actions described below and implemented individually or in combination with one another. Additionally, potential scopes of work that would be detailed characteristic of the actions for each alternative in this section as well. Depending upon the recovery or mitigation action, FEMA may determine that there is only one viable option which fulfills the purpose and need. This evaluation is based upon engineering constraints, environmental impacts, and available property.

The utilities covered under this PEA are defined as: water storage facilities, water pump stations, treatment plants for potable water/wastewater and their delivery systems; supplemental power generation, transmission, and distribution facilities, including, but not limited to, wind turbines, solar farms, generators, substations, and power lines; natural gas transmission and distribution facilities; stormwater, sewage, and wastewater collection systems and treatment plants; and communication systems. Communication systems include cell towers, transmission lines, and towers which may have associated fiber optic lines attached to them or underground conduits with fiber optic. Various federal agencies may participate in funding the rebuild, upgrade, or repair of utilities. In accordance with the procedures documented in **Section 1** for implementing this PEA, utility projects that constitute a more substantive action such as a new sewer treatment facility may require a supplement analysis and a SEA to fully comply with NEPA.

For all Action Alternatives, a tiered EA or separate NEPA process may be required if an action's impacts on any resource cannot be mitigated to less than major impacts according to the scale in Section 5. Construction areas, including cleared staging areas and access roads that are greater than five acres for previously disturbed areas that require minimal clearing and up to two acres for undeveloped land requiring clearing, grubbing, or ground disturbance, would be considered on a case-by-case basis to avoid any major impacts to sensitive resources. If a proposed project exceeds the geographical constraints considered for this PEA, it can be evaluated by a FEMA approved specialist for the purpose of determining if its impacts are in alignment with what has been determined herein or if additional NEPA documentation is required.

### **4.1 Alternative 1: No Action Alternative**

The Council of Environmental Quality (CEQ) regulations require an environmental analysis of the No Action Alternative to serve as a benchmark against the Action Alternatives. The CEQ defines the No Action Alternative as the environmental baseline conditions that would result if none of the other alternatives occurred. Under the No Action Alternative, FEMA would not provide grant funding and the local governments of Puerto Rico would have to fund permanent projects from other sources.

Selection of the No Action Alternative would simply maintain the existing conditions which would impact the Applicant's ability to address its infrastructure needs and mitigate potential hazards. Utilities stabilized with temporary, emergency measures would remain in their current state, but FEMA would not fund permanent repairs or improvements. The No Action Alternative does not meet the project's purpose and need, or objectives.

## 4.2 Alternative 2: Repair, Replacement, and Upgrade of Utilities

This alternative applies to the repair, replacement, and upgrading of an existing utility within a maintained Right of Way (ROW) at an existing location. Standard actions including mobilizing construction equipment and materials to project sites, establishment of a staging area, and post-construction site restoration. Construction activities may entail using large cranes, excavators, dump trucks, jackhammers, skid-steer loaders, bulldozers, cement trucks, pickup trucks, and flatbed trucks. Potential actions may involve minor excavations, permanent access roads, placement of concrete footers and pads or fill material, and construction of a new facility at an existing site with ground disturbance up to five acres in previously disturbed areas and two acres in previously undisturbed areas. Non-recyclable waste material disposal will be at onshore facilities licensed by the Puerto Rico Environmental Quality Board (PREQB) to receive such materials. Existing disturbed sites, such as empty lots or maintained cleared areas, receive preference for staging areas, when available. During construction, temporary staging areas and access roads can be up to five acres for previously disturbed areas that require minimal clearing and up to two acres for undeveloped land requiring clearing, grubbing, or ground disturbance.

**Repair, Replacement, and Upgrading of Utility Lines:** Principle activities will involve replacing or hardening existing direct-embedded poles with enhanced support such as perimeter injected concrete grout or other soil stabilization methodologies; upgrading damaged poles, structures, insulators and hardware to a higher wind loading standard; strengthening utility poles with guy wires; and installation of underground power lines in select areas prone to damage by high winds. All activities may require maintenance or reconstruction of access to the utility structures if the disturbance is within the thresholds stated above. This alternative includes equipment upgrades only, not substantial deviations of footprint. Upgrading or rebuilding up to 20 linear miles of pipeline, transmission or distribution line, which may involve minor linear variations to accommodate current codes and standards if done within the previously developed road, pipeline, or powerline ROW, aligning with United States Department of Energy (USDOE) standards. The following are typical activities associated with utility line projects:

- **Utility Pole Installation:** New monopoles will be either pre-stress spun concrete poles or steel poles as required by current codes and standards to provide strength, durability, and long service life. Fiber optic lines may replace overhead ground wires or otherwise installed on electrical infrastructure along with their corresponding splice boxes. The installation of utility poles may require minor excavation of soil as poles will most likely involve placement in holes augured by auger rigs. Large steel monopoles will require concrete pours to anchor the base below ground as well as a concrete pad surrounding the base at ground level. The typical depth of utility pole installation may vary between 5 and 14 feet below land surface (PREPA 2000).
- **Trench Installation:** The placement of utilities and other utility-related equipment in trenches may require the excavation of soil and pavement. Underground lines will undergo installation in trenches. Based on PREPA's typical design standards for buried utilities, trenches may extend to a depth of 55 inches below land surface with widths of approximately 12 inches (PREPA 2000). Upon completion of placement of utilities in the trenches, the trenches will be backfilled, unless otherwise directed by licensed engineers. Associated actions may involve the maintenance of vegetation.

- **Directionally-Drilled Installations:** Directional drilling methods utilize steerable drilling systems to install both small and large diameter lines. Typical hole diameter is between 1 inch to 5 inches along the proposed design centerline. Boring depth is dependent on-site conditions.

The Puerto Rico Energy and Power Authority (PREPA) has standard design requirements for both overhead transmission and distribution lines and underground transmission lines. The applicable ROW standard for overhead utilities involving the primary and secondary distribution of power is 10 feet. For the overhead transmission of power, the ROW width depends on the voltage of power transmitted and if the project is in a rural or urban area. The applicable ROW standards for overhead transmission of power are as follows:

- For ROW widths involving the transmission of 38 kilovolts (kV), the applicable standard is 25 feet in urban areas and 50 feet in rural area;
- ROW widths involving the transmission of 115 kilovolts (kV), the standard ranges from 30 to 40 feet in urban areas and 100 feet in rural areas;
- For ROW widths involving the transmission of 230 kilovolts (kV), the standard ranges from 40 to 60 feet in urban areas and 100 feet in rural areas; and
- Finally, ROW width standards for 345 kV is 50 to 70 feet for urban areas and 100 to 200 feet in rural areas (PREPA 2007).
- For the underground transmission of power, the ROW's vary between 20 feet for the lower voltages and 50 feet for the highest voltages (PREPA 2007).

**Hazard Mitigation for Power Generation and Substations:** Critical components of power generating stations, such as turbines and boilers are often located outside structures and in areas susceptible to weather, salt mist, and flooding. Power substations usually are comprised of a fenced outdoor yard containing switches, transformers, circuit breakers, capacity banks, control buildings, and other appurtenances. Standard activities include mobilization, establishment of a staging area, waste disposal, and post construction site restoration. Project areas will be cleared of vegetation and rock; and will be graded, graveled and secured with fencing. The site clearing and grading would occur prior to building new infrastructure. The gravel source would be from a local gravel quarry within the Commonwealth of Puerto Rico. The following are typical activities associated with the hardening of facilities that contain power generation or transmission and distribution:

- **Installation of Flood Barriers:** Associated activities will include installation of perimeter flood walls which may be comprised of either wire mesh-lined flood barriers or concrete walls. Associated actions may include the design of flood barriers using federal and local flood modeling.
- **Installation of High Capacity Pumps:** Complete with installation of redundant power sources, including onsite stand-by generation, and elevation of structures that may house various components of the power generation system or substation.

- **Reconstruction of communication systems:** Reconstruction of existing communication towers, access, sites, and control buildings. installation of fiber optic cable either on overhead utility structures or underground.

**Replacement of Stormwater, Potable Water, and Wastewater Systems:** Upgrades to potable water and wastewater systems will involve open cut trenching and replacement of existing pipes with right sized piping that meets current codes and standards. Associated activities may involve establishment of staging areas; removal of piping and pumps; installation of piping and pumps; and the disposal of old piping, broken pavements, and old pumps. Stormwater systems would include conduits, canals, water overflow ponds, trenches, and gutters, manholes, grates, and appurtenances. Site work may include surface grading, conduit replacements, trenching, concrete applications, cutting and resurfacing of pavement or curb and gutter, and hardware placement.

Standard activities include mobilization, establishment of a staging area, waste disposal, and post construction site restoration. Associated activities include electrical work and plumbing. The following are projects classes typical of Stormwater, Potable and Wastewater Conveyances:

- **Sewer System:** The installation specifications for modern sewer systems rely upon pipelines referred to as force mains and operate by a series of pumps and lift stations. The diameter of pipes used in the construction of force mains are typically between 2 and 36 inches. Although force main pipes installation is just below the land surface, trench dimensions will be dependent on pipe diameter and site conditions (EPA 2000).
- **Potable Water:** Potable water lines are determined by site conditions and standards and codes. Potable water lines can vary greatly with typical lines being between a ½ inch and 12 inches. The installation of potable water pipes requires the excavation of trenches 2 meters wider than the diameter of the pipe (PRASA 1975). For instance, if a pipe has a one meter diameter, the total width of the trench would be 3 meters. Typically trench depth will be dependent on pipe size and site conditions as well as the anticipated loads on the pipe and the material constituent of that pipe. In areas where trucks are likely to drive over the system, the trench may have to be deeper or the pipe constructed out of more durable material.
- **Stormwater:** Upon reaching the main storm drainage system, stormwater conveyance is along and through the ROW to its discharge point via storm drains connected by access holes or other access structures. Some situations require stormwater pump stations also be a part of the conveyance system and temporary holding ponds to receive excessive water during an event. The installation of stormwater pipes requires the excavation of trenches 2 meters wider than the diameter of the pipe (PRASA 1975). Stormwater pipes can vary between 4 and 60 inches in size. Trench depth would be dependent on pipe size, material, and site conditions. In areas where trucks are likely to drive over the system, the trench depth may be deeper, or the pipe constructed out of more durable material.

**Pump Stations and Wastewater Treatment Facilities:** Wastewater systems include collection sewers, pump stations and treatment facilities. This PEA considers ground disturbance for pump stations and treatment facilities up to five acres. There are two basic stages in the treatment of wastes, primary and secondary, outlined here. In the primary stage, solids are allowed to settle and removed from wastewater. The secondary stage uses biological processes to further purify

wastewater. The primary activity will be the upgrading of pumps and associated piping. The following are typical scopes of work for projects occurring at pump stations and wastewater treatment facilities:

- **Replacement of Pumps and Associated Piping:** This activity will include the removal and disposal of old pumps and piping, installation of pumps and piping that meet current codes and standards, installation of electrical and control systems, and backup power supplies.
- **Upgrade of Primary and Secondary Treatment:** This includes the addition of advanced treatment techniques that would allow purified effluent use in industrial, agricultural, and recreational purposes, and for drinking water.
- **Facility Hardening:** Associated activities will involve raising equipment to elevation above the base flood elevation (BFE), installing backup power supply, flood prevention barriers, and flood proofing existing buildings.

#### **4.3 Alternative 3: Realignment or Relocation of Utilities**

This alternative includes utility realignment or relocation according to the needs of Subapplicant and engineering recommendations. This may involve relocation of utilities up to 200 feet from an existing ROW; FEMA will evaluate to determine if greater distances are consistent with this PEA on a case-by-case basis. Relocated utilities may be either abandoned in place or removed and disposed in accordance with applicable laws. All relocated lines will connect to points along the existing system. The specific activities, disposal, staging, and acreage limits discussed in Alternative 2 apply to this alternative as well.

**Realigned or Relocated Linear Utilities:** Standard activities include mobilization, establishment of a staging area, waste disposal, and post-construction site restoration. Principle activities will involve installing new utility poles, conductors, or conduit routing. For utility lines servicing critical facilities or in high wind prone areas, power lines and fiber optic lines may have underground installation. The PREPA standard designs discussed in Alternative 2 will also apply to this alternative. Permanent single site work (such as substations), temporary access, and staging areas may have ground disturbance up to five acres in previously disturbed areas and two acres in previously undisturbed areas. The typical activities associated with utility line projects would be the same as described for Alternative 2 except that it includes pipelines or electric powerlines approximately 10 miles in length or less.

**Realigned or Relocated Wastewater, Potable water, and Stormwater Systems:** Standard practices will involve the realignment and relocation of wastewater, potable, and stormwater systems. The principle activities will involve open cut trenching for the placement of utilities that meets current codes and standards. Standard construction practices will include project mobilization, establishment of a staging area, waste disposal, and post construction site restoration. Typical site work will involve surface grading, conduit placements, electrical work, plumbing, trenching, concrete and pavement applications, and hardware placement. The typical activities associated with wastewater, potable, and stormwater projects are the same as described in alternative 2.

**Power Generation:** The primary activity will be the installation of on-site supplemental generation at critical facilities. On-site backup generation may involve combined heat and power systems, rooftop solar, fossil fuel powered standby generators, battery storage, and building energy management systems. Associated actions will involve the construction of on-site fuel storage, installation of transmission and distribution lines, and construction of substations or switch stations. Typical construction practices include minor excavations, placement of concrete footers and pads or fill material, grounding mats, and construction of new facilities at an existing site. This PEA does not include construction of new utility scale generation such as power plants or wind or solar farms that market and distribute power to the public. The following are typical activities associated with the types of supplemental power generation projects covered by this Alternative:

- **Solar Photovoltaic (PV):** Projects that involve the development of solar photovoltaic (PV) systems will include the installation of solar panels, battery storage, feeder automation control systems, load control equipment, and similar technologies. Solar PV array installation will be on stable, durable structures that can support the array and withstand wind, rain, hail, and corrosion. Battery storage of solar PV energy will be in a facility located outside the flood zone.
- **Standby Generators:** Fossil fuel powered generators will be located within the boundaries of existing facilities. The addition of new standby generators will require new electrical systems and controls. The type of concrete foundation would depend on the facility, size and weight of the generator, as well as the bearing capacity of underlying soils and would include piles, pile caps and elevated slabs. Design and construction criteria will be based on recommendations for licensed professionals. New standby generators support may require existing utility repair, replacement, or rerouting.
- **Conversion of Fuel Source:** This PEA allows for small non-power marketing plants the conversion from diesel to natural gas is a common practice that requires the reconfiguration of the generator's mechanics. The intention of this PEA is not for conversion of large public market supply power plants from coal to natural gas or similar actions. Associated actions permissible under this PEA are installing structures that can contain the fuel source and piping that extends from the storage container to the generator. Altering the mechanics, of the system may require additional modifications to the system controls.

**Pump Stations and Wastewater Treatment Facilities:** The primary activity will be installation of new pumps, piping, electrical, control systems, and backup power sources for pump stations and wastewater treatment facilities. Potential actions include minor excavations, placement of concrete footers and pads or fill material, and the construction of new on-site facilities. The following are typical activities associated with pump station and wastewater treatment facilities:

- **Installation of Pumps and Associated Piping:** The primary activity will be installing new pumps and piping per codes and standards. Pump and pipe size will be based on recommendations from licensed engineers. Installation of electrical and control systems including a backup power source. Associated activities would include installing a primary and backup power source. Standby power may require the installation of an above ground storage tank to for the purpose of storing fuel.



**Construction of Enclosures:** New structures to accommodate the required system controls, pumps are likely to be in new separate, standalone buildings; however, some existing building layouts may offer enough space to accommodate the new systems. Building sizes would vary by individual developments but would likely be between 250 and 2000 square feet. It is possible that some facilities may have to exceed 2000 square feet. Newly constructed facilities will be outside of the flood zone or protected to similar standards.

- **Facility Hardening:** Associated activities will involve raising equipment to elevation above the floodplain, installing backup power supply, flood prevention barriers, and flood proofing existing buildings.

#### **4.4 Alternative 4: Combination of the Alternatives**

This Alternative includes some combination of the No Action, Replacement, and/or Relocation alternatives. Individual utility segments can remain in their existing location and condition if FEMA and the Applicant determine that No Action is the safest, most cost-effective alternative. Some projects, depending on scope of work, may require replacement or relocation of contiguous portions of the utility to mitigate risk and restore infrastructure. This alternative is for the purpose of providing the post-disaster recovery effort with flexibility in the planning and decision-making process to address such contingencies.

## 5.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

The following sections discuss the potential environmental impacts and proposed mitigation measures associated with the No Action Alternative and the Action Alternatives. When possible, FEMA considers quantitative information to establish potential impacts; the potential qualitative impacts evaluated are based on the criteria listed in in **Table 1**.

**Table 1: Impact Significance and Context Evaluation Criteria for Potential Impacts**

Impact Scale	Criteria
No Effect	There would be no impact on the resource area.
Negligible	Changes would either be non-detectable or, if detected, would have effects that would be slight and local. Adverse impacts would be well below regulatory standards, as applicable.
Minor	Changes to the resource would be measurable, but the changes would be small and localized. Adverse impacts would be within or below regulatory standards, as applicable. Mitigation measures would reduce any potential adverse effects.
Moderate	Changes to the resource would be measurable and have either localized or regional scale impacts. Adverse impacts would be within or below regulatory standards, but alteration of historical conditions is on a short-term basis. Mitigation measures would be necessary, and the measures would reduce any potential adverse effects.
Major	Changes to the resource would be readily measurable and would have substantial impacts on regional levels. Adverse impacts would exceed regulatory standards. Required mitigation measures to offset the adverse effects will reduce impacts, though long-term changes to the resource may occur.

**Appendix C** summarizes the determination of effects. For the purposes of this PEA, the following definitions used throughout are as follows:

- **Direct impacts:** Caused by the action and occur at the same time and place as the action.
- **Indirect impacts:** Reasonably foreseeable effects occurring later in time or in a different location from the action site than direct impacts.
- **Cumulative impacts:** Result from individually minor, but collectively major actions that take place over time; incremental impacts of the action added to the impacts of other past, present, and reasonably foreseeable future actions, regardless of the person or agency or takes them.
- **Short-term impacts:** Impacts lasting less than project completion and site stabilization in duration.
- **Long-term impacts:** Impacts lasting beyond construction and site stabilization and based on the recovery or change to a resource.

FEMA is omitting the following two environmental resource topics because they do not apply to the project as covered by this PEA. **Table 2** presents eliminated topics from this PEA.

**Table 2: Eliminated Resource Topics**

<b>Topic*</b>	<b>Reason</b>
Bald and Golden Eagles	There are no bald eagles or golden eagles in Puerto Rico and therefore this section is not evaluated further.
Essential Fish Habitat	National Marine Fisheries Service (NMFS) Essential Fish Habitat (EFH) managed habitat will not be evaluated. This PEA covers only land-based and non-marine or non-EFH water projects. If there are potential impacts to EFH from an individual project, it will require a tiered or separate NEPA analysis.

\* Sections regarding the eliminated resource remain for consistency with PEA formatting.

## 5.1 GEOLOGY, TOPOGRAPHY, AND SOILS

Geologic and topographic characteristics such as shallow bedrock, steep slopes or excessive erodibility could affect the engineering design, method of construction, potential environmental impacts of the project and type of impact minimization measures that would be effective. Soil characteristics within a given area depend on the surficial parent material located in that area and described by “soil series” based on their origins, chemical and physical properties and slope.

Farmland Protection Policy Act (FPPA) of 1981 (7 U.S.C. § 4201 et seq.) protects prime and unique farmlands and farmlands of state and local importance from conversion to non-agricultural uses. Prime farmland is land with the best physical and chemical characteristics for the production of food, feed, forage, fiber and oilseed crops. Prime farmland is either used for food or fiber crops or is available for those crops; it is not urban, built-up land, or water areas. The definition of unique farmland is land that is for the production of certain high-value crops, such as citrus, tree nuts, olives, and fruits. The NRCS Web Soil Survey can be useful to determine whether there are prime or unique soils or soils of statewide or local importance at a site. The FPPA applies to not just lands currently under agricultural production but also forestland, pastureland, or other land types that can be converted to lands that can be used for agriculture purposes.

Executive Order (EO) 12699 – Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction establishes responsibilities regarding the seismic-related safety of buildings owned, leased or funded by Federal agencies. Under this EO, each Federal agency responsible for the design and construction of a Federal or federally-funded building must ensure that the design and construction of the building is in accordance with appropriate seismic design and construction standards. The 2018 building codes for Puerto Rico maintain the most recent codes and standards regarding seismic safety for the Commonwealth.

### 5.1.1 Existing Conditions

The principal physiographic feature of Puerto Rico is the Cordillera Central and the Sierra de Cayey, which form a continuous mountain range extending in an east-west direction nearly the entire length of the island. The foothills, which separate the coastal plain from the mountains, begin at an altitude of about 300 meters (m) (or 984 feet [ft]). Throughout most of the mountainous areas, ridge tops reach altitudes of 700 m (or 2,297 ft) with a maximum altitude of 1,338 m (or 4,390 ft) found at Cerro de Punta north of Ponce. Within the mountainous areas, hillsides are steep with about 50 percent of the land having slopes greater than 45 percent. The predominant

physiographic feature characterizing the western two-thirds of the northern coast is karst terrain, which extends inland as much as 20 km (or 12.4 mi) (Gómez-Gómez 2014).

There are 77,323 total hectares (161,069 acres) of designated Prime Farmland (9%) in the Commonwealth as well as 98,803 hectares (244,147 acres) of Farmland of Statewide Importance (11%). There is an additional 6 percent that are “conditional” soils that are of statewide importance or prime farmland if irrigated, reclaimed from excess salts, or drained. (Gould 2017; NRCS 2011). **Figure 2 in Appendix A** shows classified areas as farmland throughout the Commonwealth.

There has been an overall gradual loss of prime farmlands in Puerto Rico. According to the Economic Research Service of the US Department of Agriculture (USDA) and the USDA 2012 Agricultural Census, there are 584,988 cuerdas or 568,096 acres (229,900 hectares) of farmland (a gradual loss of approximately 5 percent since 2007) and 13,159 farms in Puerto Rico (loss of approximately 16 percent since 2007). Prime farmland appears throughout the Commonwealth (USDA 2014). Approximately 53,300 acres (21,569 hectares) of prime farmland changed use to urban or rural development between 1982 and 1997 (USDA 2017).

The Puerto Rico Seismic Network (PRSN), as part of the Geology Department of University of Puerto Rico, Mayaguez campus, works to detect, process and investigate seismic activity (earthquakes and tsunamis) in the Caribbean. They report the results for public safety, education, engineering, and scientific study purposes for Puerto Rico (PRSN 2019).

During 2018, PRSN recorded 3,974 seismic events in the Puerto Rico and Virgin Island area. This is up from the 3,129 events in 2017, but approximately the same as in 2016 (3,947 events). Of the reported earthquakes, 29 were strong enough to be noticeable by people in the responsible area. The depths of the earthquakes varied from two km to 185 km. Their magnitudes ranged from 0.63 local magnitude ( $M_L$ ) to 4.67  $M_L$ . (PRSN 2019).

### **5.1.2 Potential Impacts and Proposed Mitigation**

If a project were to have a potential to impact geology, it would be a substantially larger-scale project that may likely require a supplemental EA or an EIS.

#### **Alternative 1: No Action**

In the No Action alternative, permanent repairs or upgrades, and temporary, emergency measures would remain the status quo. Under the No Action alternative there is no federal action and restoration of utilities would rely on local funding to address the projects purpose and need. Alternative 1 has potential leave some communities experiencing a reduction in their level of service. Erosion and sedimentation may increase if utilities receive further damage from remaining unrepaired. The No Action Alternative would likely have negligible to minor impacts on soils and geology and no impacts to seismicity or prime or important farmland.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Under this alternative, the existing utilities replacements would be substantially within the existing footprint. Existing utilities updated to current codes and standards and installed under the appropriate permits and will follow best management practices (BMPs). Section 6 of this PEA

displays a complete list of the conditions associated with this PEA. Utilities could have their elevations raised, to comply with floodplain regulations and flood avoidance during the construction process. FEMA anticipates that for utility upgrades the utility footprint will remain largely within the previous ROW.

In some cases, the additional width of infrastructure elements or changes in the elevation of utilities may require small portions of new ROW. There may be soil disturbance and changes to topography; however, FEMA expects Alternative 2 could have short term minor impact on geology and soils. This alternative would likely have negligible to minor impacts on prime or important farmland or seismicity.

### **Alternative 3: Realignment or Relocation of Utilities**

During construction, previously undisturbed soils excavated or compacted will occur as a result of Alternative 3 (e.g. trenching for new underground lines; digging for new poles, telecommunication towers, or wind turbines; or prepping land for placement of new facilities). Engineering designs should entail bioengineering whenever possible. Additionally, stabilization projects should use BMPs to increase the amount of vegetation and soil stabilization in the long term.

There will be soil disturbance and there could be long term minor changes to topography. If realignment in potential farmland is involved FEMA may consult with USDA NRCS to avoid, minimize, or mitigate the impacts. Alternative 3 would have a minor impact on geology and soils, negligible to minor impacts on prime or important farmland, and no impacts on seismicity.

### **Alternative 4: Combination**

The potential impacts of Alternative 4 would be similar to the impacts identified in Alternatives 2 and 3.

## **5.2 AIR QUALITY**

The Clean Air Act (CAA) of 1970 (42 USC 7401–7661 [2009]) is a comprehensive federal law that regulates air emissions from area, stationary, and mobile sources. The act authorized the US Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment. The NAAQS include standards for six criteria air pollutants: lead, nitrogen dioxide, ozone, carbon monoxide, sulfur dioxide, and particulate matter (including both particulate matter less than 10 micrometers in diameter [PM<sub>10</sub>], and fine particulate matter less than 2.5 micrometers in diameter [PM<sub>2.5</sub>]). Areas where the monitored concentration of a criteria pollutant exceeds the applicable NAAQS designation as being in nonattainment of the standards. Maintenance areas are those geographic areas that had a history of nonattainment; however, the areas are now consistently meeting the NAAQS. Maintenance areas have been re-designated by USEPA from "nonattainment" to "attainment with a maintenance plan," or designated by the Environmental Quality Commission. The classification of attainment areas is when the monitored concentration of criteria pollutants is below the standard.

Federally funded actions in nonattainment and maintenance areas are subject to USEPA conformity regulations (40 CFR Parts 51 and 93), which ensure that emissions of air pollutants from planned federally funded activities would not affect the state's ability to meet the NAAQS.

Section 176(c) of the CAA requires that federally funded projects conform to the purpose of the State Implementation Plan (SIP), meaning that federally funded activities would not cause any violations of the NAAQS, increase the frequency or severity of NAAQS violations, or delay timely attainment of the NAAQS or any interim milestone.

The 1990 Amendments to the CAA require that Federal agency activities conform to the State Implementation Plan (SIP) with respect to achieving and maintaining attainment of National Ambient Air Quality Standards (NAAQS) and to addressing air quality impacts. The USEPA General Conformity Rule requires that a conformity analysis be performed, which demonstrates that a proposed action does not: 1) cause or contribute to any violation of any NAAQS in the area; 2) interfere with provisions in the SIP for maintenance or attainment of any NAAQS; 3) increase the frequency or severity of any existing violation of any NAAQS; or 4) delay timely attainment of any NAAQS, any interim emission reduction goals, or other milestones included in the SIP.

The conformity requirements of the CAA and its regulations limit the ability of federal agencies to assist, fund, permit, and approve projects that do not conform to the applicable SIP. When subject to this regulation, the federal agency is responsible for demonstrating conformity for its proposed action. Conformity determinations for federal actions other than those related to transportation plans, programs, and projects, funded, or approved under title 23 USC or the Federal Transit Act (49 USC 1601 et seq.) must be according to the federal general conformity regulations (40 CFR 93 Subpart B). Exemptions for certain actions and activities from general conformity review include:

- Stationary source emissions regulated under major or minor New Source Review (air permitting) programs,
- Alteration and additions of existing structures as specifically required by new or existing applicable environmental legislation,
- Actions where the emissions are not reasonably foreseeable,
- Actions defined by the federal agency or by the state as “presumed to conform”, and
- Activities with total direct or indirect emissions (not including stationary source emissions regulated under New Source Review programs) below *de minimis* levels. Emissions from construction activities are subject to air conformity review, unless they fall below the applicable *de minimis* levels.

## **Construction Equipment**

The use of nonroad engines in an extremely wide range of applications will involve great differences in operating characteristics, engine technology, and market dynamics. USEPA has adopted emission standards for all types of nonroad engines, equipment, and vehicles. These standards apply separately to aircraft, heavy equipment, locomotives, marine, recreational vehicles, portable generators, and small equipment and tools.

The USEPA has adopted a comprehensive national program to reduce emissions from nonroad diesel engines by integrating engine and fuel controls as a system to gain the greatest emission reductions.

## Heavy Equipment

CFR Title 40, Part 89 contains USEPA emission standards for nonroad diesel engines (heavy equipment). Heavy equipment includes excavators and other construction equipment, farm tractors and other agricultural equipment, forklifts, airport ground service equipment, and utility equipment such as generators, pumps, and compressors (USEPA 2004). USEPA has adopted multiple tiers (Tier 1, Tier 2, Tier 3, and Tier 4) of emission standards. The Tier 1, Tier 2, Tier 3, and Tier 4 standards require compliance with progressively more stringent emission standards. In 2004, the USEPA published the final rule (40 CFR Parts 9, 69, et al.) introducing Tier 4 emission standards, which were phased-in over the period of 2008-2015.

To meet the Tier 4 emission standards, engine manufacturers produce new engines with advanced emission control technologies. Sulfur can cause damage to the emission control devices; therefore, the USEPA also adopted requirements for in-use diesel fuel to decrease sulfur levels by more than 99 percent. The resulting Ultra Low Sulfur Diesel Fuel has a maximum sulfur concentration of 15 parts per million (USEPA 2004).

### 5.2.1 Existing Conditions

The CAA's criteria pollutants include Carbon Monoxide, Lead, Nitrogen Oxides, Ozone, Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) and Sulfur Dioxide. As of March 21, 2019, the USEPA's Green Book for nonattainment lists Puerto Rico for of two criteria pollutants in the areas listed below on the island and maintenance for another pollutant. **Figure 3** in **Appendix A** illustrates the conditions for Puerto Rico's air quality. **Table 3** and **Figure 3** in **Appendix A** depict Puerto Rico's current nonattainment and maintenance areas for certain municipalities and criteria pollutants (USEPA 2019a).

**Table 3: Current Nonattainment and Maintenance Areas**

Municipality	Criteria Pollutants
Arecibo	Lead (2008)
Bayamon	Sulfur Dioxide (2010)
Cataño	Sulfur Dioxide (2010)
Guaynabo	Sulfur Dioxide (2010)
Guaynabo	PM <sub>10</sub> (1987) - Moderate Maintenance (since 2010)
Salinas	Sulfur Dioxide (2010)
San Juan	Sulfur Dioxide (2010)
Toa Baja	Sulfur Dioxide (2010)

Source: USEPA 2019a

On November 12, 2008, the USEPA revised the Lead NAAQS, lowering the level from 1.5 micrograms per cubic meter (µg/m<sup>3</sup>) to 0.15 µg/m<sup>3</sup> calculated over a three-month rolling average. The USEPA established the 2008 Lead NAAQS based on significant evidence and numerous health studies demonstrating that serious health effects are associated with exposures to lead emissions. If temporary and/or new power generation equipment is necessary, it will need to

conform to the requirements of the CAA, any associated amendments, as well as requirements stipulated in the SIP.

On August 14, 2017, the USEPA approved Puerto Rico's revised SIP dated August 30, 2016. The purpose of the revision was to address attainment issues associated with the 2008 Lead NAAQS for the Arecibo Lead nonattainment area. The Arecibo nonattainment Area is comprised of a portion of Arecibo Municipality in Puerto Rico with a 4-kilometer radius surrounding. The Battery Recycling Company, Inc. Puerto Rico initially submitted the revised SIP for the Arecibo area on January 30, 2015. On February 29, 2016, the USEPA indicated the potential disapproval of the SIP dated January 30, 2015. The PREQB rescinded the January 30, 2015 submittal and replaced it with the August 30, 2016 Lead SIP submittal for the Arecibo area (USEPA 2017).

## **5.2.2 Potential Impacts and proposed Mitigation**

### **Alternative 1: No Action**

In the No Action alternative, FEMA will not fund permanent projects, potentially leaving communities with unreliable electricity, communications, water and sewer services, and vulnerable to future storm events. There is the potential for residents and commercial entities to rely on outdated generators that could impact the concentrations of localized criteria pollutants. The usage of any remaining temporary power generators from emergency response efforts following the hurricane may not be replaced which may cause. Possible increase in overall vehicle emissions may occur if detour routes around downed utilities are extensive or if response causes traffic delays. Those areas without access may experience a reduction in localized vehicle emissions; while other areas may experience increased air pollution, due to increased congestion, increased vehicle wait times, and construction efforts related to the relocation of disaster-affected communities. Therefore, this alternative should have negligible to minor impacts to the current air quality.

### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Based on the size and duration of construction projects or utility operation, an air quality permit from the PREQB may necessary. During construction there may be short-term increases in mobile and construction equipment exhaust emissions; however, FEMA assumes the impacts from modern well-maintained equipment would be minor. Equipment will comply with Tier 4 USEPA standards for off road diesel. Engines and generators should run on low-sulfur diesel. The equipment emissions would be below de minimis levels.

During construction activities on utility infrastructure, there would likely be some short-term increase in fugitive dust and vehicular emissions ( $PM_{10}$  and  $PM_{2.5}$ ); however, mitigation measures such as dust suppression techniques and employee transportation plans can limit negative impacts. Impacts from fugitive dust and vehicular emissions will be short-term and negligible. Control techniques for fugitive dust sources generally involve watering, chemical stabilization, or reduction of surface wind speed with windbreaks or source enclosures.

As part of Alternative 2, long-term impacts to air quality would not occur. The replacement of back-up power generation equipment with more modern equipment may prove to be a beneficial impact on air quality as emissions from their operations decrease.



As a result of the short-term construction activities associated with Alternative 2, an increase in negligible emissions would occur for any pollutant. Alternative 2 would not cause a NAAQS exceedance and would not trigger major source permitting. With regards to the areas currently listed as nonattainment or under maintenance, the effects evaluation concludes the following:

- Alternative 2 will have no impact on lead attainment for the Arecibo area because all fuels should be unleaded, and no measurable amount of lead emissions will occur.
- Alternative 2 will have a negligible impact on PM<sub>10</sub> attainment for the municipality of Guaynabo. This determination is based on the US's adoption of Tier 4 emission standards that reduce the amount of particulate matter emitted from exhaust and the implementation of fugitive dust control measures.
- Alternative 2 will have negligible impact on SO<sub>x</sub> for the municipalities of Bayamon, Catão, Guaynabo, Salinas, San Juan, and Toa Baja due to the adoption of Tier 4 emission standards for nonroad diesel engines.

The activities that Alternative 2 includes may have a beneficial impact on air quality and energy efficiency by updating existing utilities to current codes and standards. The USDOE through the Building Energy Codes Program, requires the establishment of mandatory energy efficiency requirements for federal, commercial, and residential buildings. Federal law also requires the USDOE to publish new energy efficiency standards for the installation of new energy and heating, ventilation, and air conditioning (HVAC) systems in existing facilities. By operating at a greater efficiency, it is possible that updated utilities would produce fewer emissions (USDOE 2020a).

By meeting current codes and standards, Alternative 2 activities would be in alignment with the Commonwealth's 2019 Energy Public Policy Act. The 2019 Act updates and unifies policy initiatives stated from several Acts regarding Puerto Rico's energy policy. The 2019 Act establishes the Puerto Rican energy public policy and guiding principles for the electric grid based on efficiency, formulates energy policy, and establishes goals and objectives for becoming more energy efficient and independent (PREPA 2019).

### **Alternative 3: Realignment or Relocation of Utilities**

When considering most of the utilities, the impacts to air quality from this Alternative would be similar to those described for Alternative 2. However, if utility retrofits to accommodate greater capacity will be necessary, construction time may increase which would increase short-term minor emissions, though these impacts are not to exceed NAAQS levels. Any exceedances of NAAQS standards may require a tiered EA or stand-alone EA. Therefore, air emissions from equipment and impacts from fugitive dust would be short-term and minor. If a project involves the permanent installation of a generator, the facility may require additional permitting from PREQB and would require additional studies, which may require a tiered EA or stand-alone EA if emissions may exceed NAAQS levels. FEMA anticipates impacts to air quality to be comparable to Alternative 2 with no adverse long-term effects to air quality.

Alternative 3 may have a beneficial impact on air quality and energy efficiency long-term by installing new industrial equipment that meets the USDOE's Office of Energy Efficiency and Renewable Energy standards. The Office of Energy Efficiency and Renewable Energy sets energy

efficiency standards for new industrial products such as distribution transformers, pumps, boilers, and electric motors. By operating at a greater efficiency, it is possible that updated utilities would produce fewer emissions (USDOE 2020b).

By installing industrial equipment that meets current efficiency standards, Alternative 3 activities would be in alignment with the Commonwealth's 2019 Energy Public Policy Act. The 2019 Act updates and unifies policy initiatives stated from several Acts regarding Puerto Rico's energy policy. The 2019 Act establishes the Puerto Rican energy public policy and guiding principles for the electric grid based on efficiency, formulates energy policy, and establishes goals and objectives for becoming more energy efficient and independent (PREPA 2019).

#### **Alternative 4: Combination**

Generally, the impacts to air quality from this alternative would be similar to those described for Alternatives 2 and 3 with air quality impacts being minor and short-term for the replacement and relocation project sites.

### **5.3 WATER QUALITY/WATER RESOURCES**

Congress enacted the Federal Water Pollution Control Act in 1948 and later reorganized and expanded in 1972 and became known as the Clean Water Act (CWA) in 1977. The CWA regulates discharge of pollutants into water with sections falling under the jurisdiction of the US Army Corps of Engineers (USACE) and the USEPA.

Section 404 of the CWA establishes the USACE permit requirements for discharging dredged or fill materials into Waters of the United States and traditional navigable waterways. USACE regulation of construction activities in or near any navigable water of the United States is authorized under Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 USC § 401 et seq.).

Section 401 of the CWA requires that an Applicant for a federal license or permit provide a certification that any discharges from the facility will comply with the act, including state-established water quality standard requirements. Under the NPDES, the USEPA regulates both point and non-point pollutant sources, including stormwater and stormwater runoff for projects with ground disturbance of more than one acre. The NPDES permit requires that a Stormwater Pollution Prevention Plan (SWPPP) be prepared. The NPDES Permit Program authorizes the issuance of individual or general permits to control municipal and industrial point source discharges, including those from wastewater and stormwater.

The Sole Source Aquifer (SSA) program is established under Section 1424(e) of the Safe Drinking Water Act (SDWA) of 1974 (Public Law 93–523). The SDWA authorizes USEPA to designate an aquifer for special protection under the SSA program if the aquifer is the sole or principal drinking water resource for an area and if its contamination would create a significant hazard to public health. The definition of a designated SSA is one supplying 50 percent or more of the drinking water for a particular area. No commitment for federal financial assistance may proceed for any project that USEPA determines may contaminate a sole source aquifer such that it creates a significant hazard to public health.

The Wild and Scenic River designation preserves selected rivers or river sections in their natural, free-flowing condition. To be eligible for designation, rivers must possess outstandingly remarkable scenic recreational or other natural values. Wild and Scenic River designation also requires Congressional action that mandates river segments be managed to protect and enhance the values which makes them eligible for designation. The segments must be free of impoundments and are accessible only by trail. Regulations require that riparian zone maintenance is in an essentially primitive condition (free of structures and modifications of the waterway, such as riprapping and channelization) and maintain current water quality. Scenic segments also remain free of impoundments, have largely primitive riparian zones, and are accessible only at certain points by roads (NPS 2018). For waterbodies designated as wild and scenic rivers, the following prohibitions or management activities apply to the river and surrounding wilderness corridor for up to ¼ of a mile (or 0.4 km) from each of the rivers' banks:

- No road construction or other development
- No motorized or mechanized (e.g. bicycle) use
- No timber harvesting
- No water development
- No treatment vs. control (manipulative) research
- No mineral activity
- Recreation management for low use, primitive experiences
- Primitive standards for trail construction

### **5.3.1 Existing Conditions**

There are numerous rivers and streams on Puerto Rico's main island. Puerto Rico has a total of 5,385 mi of rivers, streams, and creeks (USDI-NPS, 2019). None of the rivers are navigable by large vessels. Only twenty of these rivers have a permanent minimum water flow of at least 0.28 cubic meters per second (9.88 ft<sup>3</sup>/sec) and are relatively important to the island's fishery. Major river systems are the Río Grande de Loíza (64 km [39.8 mi]), Bayamón (41 km [25.5 mi]), La Plata (73 km [45.4 mi]), Arecibo (64 km [39.7 mi]), Culebrinas (40 km [24.8 mi]), and Añasco (65 km [40.4 mi]).

Puerto Rico has considerable variability in water resources due to geology, hydrology, and topography (**Figure 4 in Appendix A**). Of a total area of 8,927 sq. km, approximately 3,500 sq. km underlain by groundwater hydrogeologic units classified as intergranular or fissured. These hydrogeologic units form the principal aquifer systems throughout Puerto Rico and the outlying islands. The United States Geological Survey (USGS) subdivides the major watersheds of Puerto Rico into 24 subsets at the Hydraulic Unit Code level 10 for major watersheds. There is one unit for each for the islands of Culebra, Vieques, and Mona, respectively.

There are reservoirs but no freshwater inland lakes. Fifty-five rivers discharge directly into the sea. Puerto Rico maintains 36 reservoirs that are between 6 and 390 hectares (PRDNER 2017). In 2010,

surface water accounts for 83% of the total public water withdrawals and groundwater provides the remaining 17% for a total use of 733.16 million gallons/day (Mgal/d) (USGS 2010; Molina-Rivera 2014). The reservoirs provide potable water, irrigation, electrical power, and flood control. Problems with freshwater ecosystems are a major environmental issue in Puerto Rico. Water pollution, siltation of reservoirs, and excessive withdrawals of fresh water from rivers are associated with the past human population growth of the Island. Unauthorized wetland filling is also a substantial and continuing problem.

Surface water accounts for about 90 percent of public supplies but only about 20 percent of industry. Agriculture uses about equal amounts of ground water and surface water. Of the average daily (d) 11,600 million gallons (Mgal) (or 43,911 mega liters [ML]) of precipitation, losses by evapotranspiration are about 7,240 Mgal/d (27,406 ML/d); about 3,620 Mgal/d (13,703 ML/d) by streamflow to the sea; (McCoy 1978).

- The population served by public-supply water facilities operated by the Puerto Rico Aqueduct and Sewer Authority (PRASA) estimated to be 96 percent of the total resident population for Puerto Rico in 2010 (approximately 3,586,000 residents) (USGS 2014).
- During 2010, public-supply water withdrawals from surface-water and groundwater sources constituted the major freshwater use category and estimated at 677 million gallons per day (Mgal/d) (2,562.7 ML/d).
- Non-PRASA public-supply water withdrawals estimated at 7.1 Mgal/d (26.9 ML/d) to serve a population of approximately 102 thousand residents.
- Public-supply domestic water use in Puerto Rico estimated at 206 Mgal/d (780 ML/d), with about 30 percent of the total PRASA deliveries from surface-water and groundwater sources.
- Water withdrawals by domestic self-supplied users estimated at 2.41 Mgal/d (9.12 ML/d) by a population of about 38 thousand people.
- Groundwater withdrawals by industrial users estimated at 4.30 Mgal/d (16.3 ML/d).
- Crop-irrigation withdrawals from surface-water and groundwater sources estimated at 38.2 Mgal/d (145 ML/d), of which 15.7 Mgal/d (59.4 ML/d) of surface water were in areas supplied by the public irrigation systems operated by the Puerto Rico Electric Power Authority.
- Groundwater withdrawals from Puerto Rico's major aquifers for irrigation purposes were about 22 Mgal/d (83.3 ML/d).
- Micro-irrigation was the predominant irrigation method (32,500 acres) (13,152.3 hectares) to supply artificially the water requirements of 40,200 cultivated acres (16,268 hectares).
- Freshwater use at thermoelectric power plants consisted of 1.77 Mgal/d (6.7 ML/d) delivered from the PRASA to the plants located in Cataño and San Juan and 1.15 Mgal/d (4.35 ML/d) from local aquifers at the Guayanilla and Salinas power plants.

- The nine active hydroelectric power plants located throughout Puerto Rico had an instream freshwater use of 556 Mgal/d (2105 MI/d), and
- In 2010, Puerto Rico had four thermoelectric power plants that used large amounts of saline (seawater) for cooling. The instream saline withdrawals totaled 2,262 Mgal/d (8,562.6 MI/d) (Molina-Rivera 2010).

According to the USEPA's Map of SSA Locations, there are no SSA within the Commonwealth (USEPA 2019b). However, if the potable water pipeline constructed in 1978 from the Puerto Rican mainland to the islands of Vieques and Culebra becomes compromised, Vieques would revert to withdrawing from one of their two wells on the island for drinking water supply. There could be a potential that one of these could become a sole source aquifer (USGS 2014).

Rainfall averages about 11,600 million gallons of water per day (McCoy 1978). The mountainous interior receives the most rainfall and the southwest coast the least. The south coast is the most stressed area in terms of water deficiency. Changes in water use and the importation of water are alternatives for increasing supplies to meet future demands. Generally, the chemical composition of nearly all surface waters in Puerto Rico is about the same. The waters are predominantly of the calcium bicarbonate type. However, characteristic differences occur locally, especially in dissolved solids concentrations and in concentrations of specific constituents.

The designation of Wild/Scenic Rivers in Puerto Rico was a significant milestone for the program as they remain the only tropical rivers in the National Wild and Scenic River System. The designated rivers are Río Mameyes, Río de la Mina, and a section of the Río Icacos. (**Figure 5 in Appendix A**). The area of the Río Mameyes, from the Forest boundary mile west of the Road 988 bridge (Puente Roto) to its headwaters in the Ba de Oro Research National Area's total length is 4.5 miles with 2.1 miles classified as wild, 1.4 miles as scenic, and 1.0 mile as recreational (National Wild and Scenic Rivers System 2002a). The Río de la Mina is designated as scenic from its confluence with the Río Mameyes to its headwaters located east of PR-191, with a total length of 2.1 miles (3.37 km) (National Wild and Scenic Rivers System 2002b). The section of the Río Icacos designated as scenic extends from its confluence with the Río Cubuy, to its headwaters approximately ½ miles south of the PR Highway 191 gate, with total length 2.9 miles (4.66 km) (National Wild and Scenic Rivers System 2002c).

The detailed management requirements for Puerto Rico's designated Wild and Scenic Rivers is in the El Yunque National Forest Wild and Scenic Rivers Comprehensive Management Plan (USDA Forest Service 2010). Although the El Yunque National Forest contains designated wild and scenic rivers, there is no federally designated wilderness in the surrounding forest.

The Commonwealth controls water quality through the Puerto Rico Water Quality Standards Regulation, administered by the PREQB. Regulations and an anti-degradation policy are in place to protect coastal, surface, and ground waters.

Based on the November 2018 USEPA 303(d) list of impaired waters, there are 666 instances of pollutants causing designation of water impairment though the island including surface water, groundwater, and reservoirs (USEPA 2018). The impairments constitute 12,090 river miles of impairment (with overlapping contaminants) in rivers, streams, and creeks alone. In 2018 the primary sources of pollutants reported are sewage discharges (274), urban runoff/stormwater

(153), confined animal feeding operations (121), sewer overflows/system failures (103), industrial point sources (80), agricultural (57), and landfills (47). Copper leaching has already impaired over 1,000 miles of streams and rivers; 6,111 acres of reservoirs, lagoons, and bays; and around 250 miles of coastal shoreline (USEPA 2018b). Water resources impacts continue throughout the Commonwealth at this time due to broken pipes, groundwater contamination, and erosion into stream systems associated with exposed and sloughing soil.

Puerto Rico maintains expansive marine resources including coral reefs and rock reef communities. Activities covered by this PEA will not occur on or around coral reefs and rock reefs within the waters of Puerto Rico. As stated in previous sections actions affecting marine ecosystems are beyond the scope of this PEA.

### **Consent Decree**

The USEPA and the Commonwealth have entered into a number of consent decrees that involve violations of the CWA. A consent decree involving the USEPA is an agreement that seeks to enforce the rules and regulations that Congress has delegated to the Agency. A consent decree is a formal agreement made on the record that ends a dispute without any of the parties having to admit guilt or liability. A consent decree associated with water quality enforces policies under the CWA. If the defendant does not hold up their end of the bargain as agreed to do in the decree, then the USEPA can take them to court on the charge of contempt.

An example of such an agreement with the Commonwealth is the 1995 consent decree between the USEPA and PRASA. The 1995 consent decree includes the operation, management, repair, and maintenance of PRASA's aqueduct, sewer, and customer services system. In 1998, the USEPA and PRASA amended the consent decree to allow PRASA to delegate operations to private operators.

Within the 1995 consent decree, the USEPA alleged that PRASA discharged pollutants in violation Section 301(a) of the CWA, Section 33 U.S.C §1311(a) and violated certain terms and conditions of NPDES permits issued by the USEPA to PRASA for their waste water treatment plants (WWTP) pursuant to Section 402 of the CWA 33 USC § 1342. The terms of the 1995 consent decree apply to all pump stations appurtenant to PRASA's WWTPs (USEPA 2019d).

It is the policy of FEMA's Public Assistance program to limit funding to damages caused by the disaster. Public Assistance would determine the applicability of funding projects that an existing consent decree would otherwise cover on a case-by-case basis.

### **5.3.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide funding for utilities projects, potentially leaving communities with unreliable electricity, communications, water and sewer services, and vulnerable to future storm events. An example of increasing the vulnerability is when a water control structure is not cleaned properly, repaired, and upgraded, as water quality would suffer or when potable water lines are damaged and not repaired leaving communities without clean drinking water. Lack of funding may increase erosion and sedimentation if utilities are damaged

further from disrepair. Damaged utility infrastructure may cause increased pollution into waters from problems such as sewage-runoff mixing or copper leaching from old and broken pipes. Damages may constitute a flow impediment, potentially causing significant impacts to stream and floodplain hydraulics and function. The damages could also impact and limit water flow in pipes needed for fire suppression, agriculture, and overall health and cleanliness. Therefore, the No Action alternative could have moderate adverse impacts on water resources.

### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Activities associated with utility repair, replacement and upgrades, including installing temporary access routes that allow heavy equipment to reach utilities, could involve embankment work and slope stabilization. BMPs will prevent fill material and other landscape modifications from impacting existing waters near or within project boundaries. The discharge of fill material into surface water may temporarily alter surface water quality including, but not limited to, temperature, dissolved oxygen, or turbidity. This could result in adverse minor short-term impacts to water quality. Fill placement could permanently alter the physical environment where placed. Section 6 of this document require erosion and sedimentation control techniques projects to reduce the potential for impacts to water resources during and after construction.

The design of some utility features may require a hydrologic analysis to determine the magnitude and frequency of flows and to properly size drainage facilities. During construction, the Applicant will mitigate impacts by applying BMPs to prevent sediment and fill material from entering the water. Projects larger than one acre would require a General Construction Permit under the NPDES program. A condition of the General Construction Permit is the preparation of a SWPPP that includes the implementation of construction BMPs. Some projects may require a Section 404 or other permit from the USACE and a Section 401 Water Quality Certification permit from PREQB. Compensatory mitigation may offset adverse impacts to wetlands. The Applicant and their contractor are responsible for complying with any conditions outlined within these federal permits. Verification of compliance occurs through a construction monitoring program that covers each phase of the project. The permitting agencies confirm compliance as part of their permit closeout procedures under the CWA.

This alternative would have a negligible long-term impact on groundwater recharge and water quality through the transmission of sediment, debris, oils, and hazardous substances into surface waters due to the type and size of the projects covered by this PEA. Local and federal Agency requirements would mitigate potential impacts to water resources by requiring BMPs to reduce transport of sediment, debris, oils, concrete waste, and hazardous substances into water resources, including wetlands or waterways.

### **Alternative 3: Realignment or Relocation of Utilities**

The process of relocating utilities within a new or expanded ROW would have similar impacts and mitigation measures as those described for Alternative 2; however, the process of expanding a ROW and the removal and disposal of out-of-service utilities would increase the footprint of construction activities. As a result, this alternative may have a negligible to minor direct or indirect on impact water resources, including wetlands and waterways; but would have mitigation through Section 401 and Section 404 permitting. Damages may constitute a flow impediment, potentially

causing moderate adverse impacts to stream and floodplain hydraulics and function. Therefore, the removal of out-of-service utilities would prevent the potential of their future degradation and water quality contamination. Any relocation of a utility in El Yunque National Forest or a Wild and Scenic River would require an additional analysis under NEPA beyond this PEA. Such an analysis would involve the USDA's Forest Service cooperation.

#### **Alternative 4: Combination**

This alternative would generate impacts similar to those described for Alternative 2 and 3.

### **5.4 WETLANDS**

Wetlands are areas saturated or inundated by surface or ground water with a frequency enough to support, or that under normal hydrological conditions does or would support, a prevalence of vegetation or aquatic life typically adapted for these soil conditions. Examples of wetlands include swamps, marshes, estuaries, bogs, beaches, wet meadows, sloughs, mud flats, among others. Wetlands are important because they protect and improve water quality, provide fish and wildlife habitats, provide economic, and social benefits, store floodwaters, and maintain surface water and groundwater flow during dry periods. EO 11990 Wetlands Management requires Federal agencies to avoid funding activities that directly or indirectly support occupancy, modification, or development of wetlands, whenever there are practicable alternatives. FEMA uses the 8-Step Decision-Making Process (8-Step Process) to evaluate potential effects on, and mitigate impacts to, wetlands in compliance with EO 11990. The U.S. Fish and Wildlife Service (USFWS) and the Puerto Rico Department of Natural and Environmental Resources (PRDNER) administer and regulate wetlands in Puerto Rico.

The USACE, through its permit program, regulates the discharge of dredged or fill material into waters of the United States (WOTUS), including wetlands, pursuant to § 404 of the CWA. In addition, the USEPA has regulatory oversight of the USACE permit program, allowing the agency under Section 404C to veto USACE-issued permits where there are unacceptable environmental impacts. 33 C.F.R. Section 328.3 defines WOTUS and includes a broad scope of surface waters.

#### **5.4.1 Existing Conditions**

Puerto Rico's wetlands are diverse, consisting of coastal and inland forested and herbaceous communities. The Commonwealth currently maintains 16,556 acres or 6,700 hectares of mangroves and 741 acres or 300 hectares of bloodwood swamps also known as *Pterocarpus* forests (PRDNER 2017).

Wetlands in Puerto Rico occur on each of the Commonwealth's islands as well as in the mountainous regions and along the coasts. The presence of lacustrine and riverine classified wetlands is minimal in both abundance and acreage. These wetlands are confined to the shallow areas of deep-water reservoirs and along the banks of streams and rivers. The most common types of wetlands in the Commonwealth are palustrine or estuarine. Freshwater wetlands (palustrine) are located on the island's northern coast. The most common estuarine wetlands are the mangrove wetlands along Puerto Rico's coastline. Between 70 percent and 90 percent of marine life with commercial or recreational value uses mangroves for at least part of their respective life cycles. In addition to the mangrove swamps, salt flats (also estuarine wetlands) are common along Puerto



Rico's south coastline. Estuarine wetlands are habitats not covered under this PEA. Puerto Rico has lost approximately half of its naturally occurring wetlands since settlement; historically due to agricultural development, and more recently due to population growth and tourism (Adams et al 1996).

Degradation or destruction of wetlands can occur by activities such as drainage, dredging, filling, sedimentation, and oil spills. Wetlands in Puerto Rico have been heavily degraded and destroyed from dredging, filling, draining, eutrophication, and the use of agricultural fertilizers and pesticides (Miller 2009). Other stressors to Puerto Rico's coastal wetlands include: sea level rise; hurricanes and storms; erosion and stream channelization; for road construction and development; effluent and runoff; mining of gravel, limestone, sand, and other materials (Miller 2009). The CWA requires avoiding impacts to wetlands through a sliding scale by avoidance, then minimization, or finally mitigation.

#### **5.4.2 Potential Impacts and Proposed Mitigation**

##### **Alternative 1: No Action**

In the No Action alternative, there is no permanent repair of utilities with FEMA funds, this may potentially leave communities without electricity, communications, water and sewer services, and vulnerable to future storm events. In the No Action alternative, there is no impact to wetlands by projects funded by FEMA. However, erosion and sedimentation may increase if additional damage occurs from utilities left unrepaired. Damaged utility infrastructure may cause increased pollution into waters and wetlands from problems such as sewage-runoff mixing or copper leaching. Therefore, the No Action alternative could have moderate adverse impacts on water resources. Damages may constitute a flow impediment, potentially causing impacts to stream and floodplain hydraulics and function. Federal and local coordination and permitting will be required should local entities, such as the Commonwealth, utility companies, or municipalities, fund projects that impact jurisdictional wetlands.

##### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Activities associated with utility repair, replacement and upgrades, including installing temporary access routes that allow heavy equipment to reach utilities, could involve embankment work and slope stabilization. Erosion and sedimentation control techniques would reduce the potential for impacts to wetlands and water resources during and after construction.

The design of some utility features may require a hydrologic analysis to determine the magnitude and frequency of flows and to properly size drainage facilities. During construction, agencies would mitigate impacts by requiring projects to apply BMPs to prevent sediment and fill material from entering the water. Projects larger than one acre must obtain a Construction General Permit from the USEPA which requires the development and implementation of a SWPPP and construction BMPs. Projects may require a Section 404(d) or other permit from the USACE and a Section 401 Water Quality Certification permit from PREQB. Compensatory mitigation could offset adverse impacts to wetlands. The Applicant and Subapplicant are responsible for complying with any conditions outlined within these federal permits.

FEMA anticipates short-term and long-term negligible to minor direct and indirect impacts on wetlands, streams, and other WOTUS through the runoff of sediment, debris, oils, and other hazardous materials. Projects that may impact WOTUS would require permitting under Section 404(d) and Section 401 of the CWA. Such permits would seek to minimize or avoid impacts to WOTUS through project revisions and compensatory mitigation. Additionally, FEMA would mitigate potential impacts to wetland resources by requiring BMPs to reduce transport of sediment, debris, oils, concrete waste, and hazardous substances into wetlands or waterways. As a result of staying within the existing ROW, the intent of this alternative is that activities would not impact wetlands; however, certain sites could result in some fill placed within the wetland boundaries during construction. Where individual projects may impact wetlands, streams, or WOTUS, FEMA would consider further tiered review.

### **Alternative 3: Realignment or Relocation of Utilities**

The process of relocating utilities within a new or expanded ROW would have the same impacts and mitigation measures as those described for Alternative 2; however, the process of expanding a ROW and the removal and disposal of out-of-service utilities would increase the footprint of construction activities. This alternative includes embankment and in-water work that may impact wetlands. This alternative may have minor short-term direct or indirect impacts on wetlands; however, Section 401 and Section 404 would require permitting to offset impacts.

### **Alternative 4: Combination**

This alternative would generate the same impacts as those described for Alternative 2 and 3.

## **5.5 FLOODPLAIN**

Executive Order 11988, Floodplain Management was issued in 1977 to eliminate the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative for locating a project outside of the floodplain. EO 11988 applies to federally-funded projects and directs agencies to consider alternatives to siting projects within a floodplain. EO 11988 requires that a Federal agency avoid direct or indirect support of development within the floodplain whenever there is a practicable alternative. Where there are no practicable alternatives, FEMA is required to use minimization standards to reduce impacts to the floodplain and impacts from the floodplain to the facility. Such standards include elevating facilities or equipment above the BFE, or floodproofing, among others. FEMA uses Flood Insurance Rate Maps (FIRM) to identify the floodplains for the National Flood Insurance Program (NFIP). FEMA evaluates actions within the 100-year floodplain, also known as the BFE (or 500 for critical action facilities), using the 8-Step Process. FEMA's regulations on conducting the 8-Step Process are contained in 44 CFR Part 9.

EO 11988 prohibits FEMA from funding new construction in Coastal High Hazard Area "V-Zones" that is not functionally dependent on water or facilitates open space use. FEMA would consider new construction and expansion in the V-zone or in the base-flood elevation where there is a potential to increase flood levels on a case-by-case basis, in order to determine whether this PEA applies.

### **5.5.1 Existing Conditions**

Following Hurricanes Irma and Maria, floodplain FIRM maps for the Commonwealth were re-evaluated and re-mapped based on high-water-marks during the storms. FEMA compared the effective flood hazard data and the advisory 1 percent seamless flood hazard data to analyze the changes in flood hazard zones. The differences identified between the effective and advisory flood zone information resulted in about 30 zone change (e.g. AE to A, VE to AE, A to X, etc.) combinations. In addition to reclassification of some flood zones, there was also a total increase to the 1% floodplain areas (STARRII 2018).

Under requirements established in 44 CFR Section 60.3, participating communities will require permits for all development, including temporary and new development, in the Special Flood Hazard Area. Any new construction and substantial improvements in the V Zones require structure elevation on pilings, posts, piers, or columns so that the bottom of the lowest horizontal structural member of the lowest floor (including pilings or columns), to or above the BFE. This protects new, substantially improved or substantially damaged buildings from damage by the base flood. The Flood Zone Map for Puerto Rico is found as **Figure 6 of Appendix A**. FEMA will evaluate structures on a project by project basis using the FIRM panels and the 8-Step Process, as applicable.

### **5.5.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. An example of increasing the vulnerability would be if a stormwater control structure is not cleaned out properly, repaired, and upgraded. Erosion and sedimentation may increase if unrepaired utilities suffer further damage. Damaged utility infrastructure may cause increased pollution into the floodplains from problems such as sewage-runoff mixing or copper leaching into the floodplain. Damages may constitute a flow impediment, potentially causing moderate adverse impacts to stream and floodplain hydraulics and function.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Because some utilities are location-dependent and potentially located within a floodplain, the scope of work of this alternative may have impacts to floodplains. Construction of utilities may result in alteration of the course or magnitude of floodwater. Utility repair and changes within floodplains may also have minor impact. If proposed changes to utility infrastructure to impact the floodplain/floodway, FEMA will apply the 8-Step Process to assess potential impacts and practicable alternatives. Projects may require a hydrology and hydraulics report to evaluate changes to stream hydraulics in detail and compliance with local ordinance.

Construction activities associated with utility replacement, including installing temporary access routes that allow heavy equipment to reach utilities, could involve embankment work and slope stabilization.

This alternative would have short-term negligible impact on floodplains and floodways due to the actions covered by this PEA, mitigation measures, and compliance with local and federal permit requirements. As a result of staying within the existing ROW, the intent of this alternative is that it will have no effects to negligible long-term impacts; however, certain sites could result in additional impervious surfaces that could have indirect long-term, but minor impacts on floodplains and floodways. FEMA will evaluate projects in the V-zone or that have the potential to increase flood elevations on a case-by-case basis to determine whether this PEA applies.

### **Alternative 3: Realignment or Relocation of Utilities**

The process of relocating utilities within a new or expanded ROW would have similar impacts and mitigation measures as those described for Alternative 2; however, the process of expanding a ROW and the removal and disposal of out of service utilities would increase the footprint of construction activities. As a result, floodplains may have short-term and long-term minor impacts due to this alternative; if there is not another alternative that would lie outside of the floodplain for the placement of the utilities. Additionally, if the increase in footprint results in added impervious area or trenching for new placement of underground utilities, the nearby floodplains could also have long-term minor impacts. Further evaluation on a project by project basis using the FIRM panels and the 8-Step Process, as applicable. The design of some utility features may require a hydrologic analysis to determine the magnitude and frequency of flows and to properly size drainage facilities. As a condition of construction, federal regulatory agencies would mitigate impacts by requiring the Applicant and Subapplicant projects to apply BMPs to prevent sediment and fill material from entering waters, floodplains, and floodways. Some projects may require preparation of a SWPPP that include the deployment of BMPs. FEMA will evaluate projects in the V-zone or that have the potential to increase flood elevations on a case-by-case basis to determine whether this PEA applies.

### **Alternative 4: Combination**

This alternative would generate impacts like those described for Alternative 2 and 3.

## **5.6 COASTAL RESOURCES**

The National Oceanic and Atmospheric Administration (NOAA), an agency within United States Department of Commerce's Office of Ocean for Coastal Management, administers the Coastal Zone Management Act (CZMA). Recognizing the national interest in managing coastal zone resources, the CZMA encourages states and U.S. territories along the oceans, Gulf of Mexico, and Great Lakes to proactively manage natural resources, balancing resource protection with economic, recreational, and cultural needs. The CZMA established a voluntary program for states and territories to develop and implement their own unique coastal management programs that describe coastal zone boundaries, uses and resources that are subject to management, legal authorities, and enforceable policies. The CZMA encourages states and territories to self-assess coastal resources by aligning management plans with Section 309 of the CZMA, to assess coastal hazards and resources management issues throughout the nation (NOAA 2014) in coastal areas of national importance.

Coastal resources protected under the CZMA include barrier islands, intertidal shoreline, beaches, salt marshes, fresh and saltwater wetlands, aquatic habitat, and any culturally significant or historic resources occurring in those areas, such as shipwrecks and archeological sites. Pursuant to Federal Consistency Regulations at 15 C.F.R. § 930, FEMA and the Puerto Rico Planning Board (PRPB) signed a Federal Consistency Certificate for Category C through G work dated October 3, 2018 (Resolution JP-2018-324). The CZMA resolution is found in **Appendix D**.

The Coastal Barrier Resources Act (CBRA) of 1982 created designated areas under the jurisdiction of the USFWS that are ineligible for both direct and indirect federal expenditures. This act, amended by the CBRA of 1990, which added a new category of coastal barriers called Otherwise Protected Areas (OPA). The Act protects sensitive and vulnerable barrier islands found along the U.S. Atlantic, Gulf, and Great Lakes coastlines; to minimize loss of human life; and to minimize wasteful expenditure of Federal revenues on coastal barriers that are affected by natural disasters repeatedly. In a federally-declared disaster area with CBRS System Units, federal assistance is allowed for most emergency actions that are essential for saving lives, protecting property, and protecting public health and safety, if those actions are consistent with the purposes of CBRA. Actions that are permissible are in System Units limited to those necessary to alleviate the emergency, such as removal of debris from public property; emergency restoration of essential community services such as electricity, water or sewer; provision of emergency shelter; and relocating individuals out of danger. In OPAs, the only prohibition is on provision of federal flood insurance. In September 2018, USFWS released a new Coastal Barrier Resources System (CBRS) data set which contains the flood insurance prohibition date for each area within the CBRS and the System Unit establishment date for each area within a System Unit under the NFIP (USFWS 2019).

Projects receiving federal assistance must follow the procedures outlined in 15 CFR 930.90 – 930.101 for federal coastal zone consistency determinations. To guide development and resource management within the Commonwealth's coastal area, the Commonwealth identified and promulgated substantive policies. The PRDNER serves as the lead agency and is responsible for managing the maritime zone, coastal waters, and submerged lands. The PRPB serves as the primary agency for managing coastal development.

### **5.6.1 Existing Conditions**

The Federal Consistency provision, contained in Section 307 of the CZMA, allows affected states to review Federal activities to ensure that they are consistent with the state's coastal zone management program. This provision also applies to non-Federal programs and activities that use Federal funding or that require Federal authorization. Approved in 1978, the Puerto Rico Coastal Zone Management Plan (PRCZMP) provides guidance in management of the coastal zone. The PRCZMP defines the coastal zone as the strip of land extending 1,000 meters landward from the coastline, as well as additional distances necessary to include key natural systems such as rivers streams, wetlands, or other areas influenced by the tide. The coastal zone also includes territorial waters and submerged oceanic or marine land up to nine nautical miles from shore (NOAA 2015 and NOAA 2012). Required by Section 307(c) of the CZMA, any federal activity that directly or indirectly affects any land or water use or natural resource of the coastal zone must be consistent with the PRCZMP to the maximum extent possible. FEMA must evaluate projects falling within designated coastal zones to ensure they are consistent with the CZMA Plan.

The main island of Puerto Rico is approximately 100 miles long by 30 miles wide, with approximately 310 miles of coastline. If you combine the coastline of the main island with the coastlines of the Commonwealth's other islands and cays, Puerto Rico coastline is in excess of 600 miles long (PRDNER 2010). Using the definition within the CZMA, NOAA estimates the total Coastline of the Commonwealth to be closer to 700 miles long. Additionally, NOAA estimates the size of the Commonwealth's shallow coral reef ecosystem to be 5,000 square kilometers (NOAA 2018). In addition to the habitats listed and defined by the CZMA, other habitats that occur in the coastal zone and marine corridors of the Commonwealth include coastal forests and mangroves, karst ecosystems and sea-caves, bioluminescent lagoons, and seagrass beds. There are 8,431 hectares classified as coastal barriers, located primarily in the south and northeast portions of the Commonwealth. There are 70 CBRS units: 41 federally protected CBRS units and an additional 29 OPA (**Figure 7 in Appendix A**).

Under the direction of Section 306(c) and Section 309 of the CZMA, the Commonwealth has a Coastal and Estuarine Land Conservation Plan that inventories existing conservation programs and lists areas of ecological significance and national importance. Areas of ecological significance include: undeveloped and undisturbed stretches of shoreline; coastal wetlands; coastal dry forests; old growth forests; lands that provide connectivity to existing protected areas; lands that provide a buffer to encroachment on core habitats; marine reserves; lands in which the preservation is important to the cultural heritage of the islands; and lands that support low-impact, non-consumptive recreational activities. Puerto Rico's Conservation Plans list several other partnership conservation programs consistent with federal priorities (PRDNER 2005 2010). Critical Wildlife Areas and Important Bird Areas as defined by PRDNER occur along the coast, along with additional six wildlife refuges defined by USFWS Coastal Program and NOAA Habitat Blueprint Focus Areas

### **5.6.2 Potential Impacts and Proposed Mitigation**

Actions that conflict with the Federal Consistency Resolution Certificate signed by FEMA and Puerto Rico Planning Board, dated October 3, 2018 would be beyond the scope of this PEA. This PEA's geographic thresholds would ensure that there are no adverse direct impacts to resources covered under CBRA.

#### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. As such, there would be no direct impacts to coastal areas, however with no mitigation measures or permanent repairs, FEMA anticipates further deterioration under this alternative. Deteriorating infrastructure could contribute additional debris during storm events which could lead to minor negative impacts to coastal areas.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Since the footprint should stay relatively the same under this Alternative, FEMA anticipates short-term and long-term negligible to minor adverse impacts to the CZMA. Such impacts would be associated with upgrading systems that require additional acreage beyond what these systems

currently occupy. The installation of upgraded pumps and generators within the CZMA would minimally reduce the available area within the CZMA; however, the actions would be in alignment with the October 3, 2018 Federal Consistency Resolution Certificate.

Due to this PEA's geographical constraints, there will be no direct impacts from Alternative 2 activities to resources covered under CBRA. For projects that have the potential to indirectly impact OPAs and CBRS units, FEMA will review each project location on a case-by-case basis to determine eligibility. In accordance with USFWS guidelines, FEMA would consult with USFWS for activities that have the potential to affect CBRS units.

### **Alternative 3: Realignment or Relocation of Utilities**

Under this alternative, some adverse minor short-term and long-term impacts would occur within the CZMA. Coordination with PRDNER and PRPB will occur prior to any work and limit impacts to the extent possible. Due to this PEA's geographical constraints, there will be no direct impacts from Alternative 3 activities to resources covered under CBRA. For projects that have the potential to indirectly impact OPAs and CBRS units, FEMA will review each project location on a case-by-case basis to determine eligibility. In accordance with USFWS guidelines, FEMA would consult with USFWS for activities that have the potential to affect CBRS units.

### **Alternative 4: Combination of Alternatives**

The potential CZMA and CBRA impacts of Alternative 4 activities and consultation requirements would be similar to those identified for Alternatives 2 and 3.

## **5.7 VEGETATION**

Biological resources include native or naturalized plants and animals and their habitats (e.g. wetlands, forests, and grasslands). This PEA does not cover adverse impacts to species or habitats of concern over relatively large areas, or if disturbances cause reductions in population size or distribution. FEMA used potential physical impacts such as habitat loss, noise, and impacts to water quality to assess the effects of the Action Alternatives on biological resources.

An invasive organism is a species that grows or spreads aggressively in its new environment and causes environmental and/or economic harm. EO 13112, Invasive Species, enacted February 3, 1999, was issued to prevent the introduction of invasive plant and animal species, providing resources for their control, and diminishing their main economic and ecological impact. Invasive species prefer disturbed habitats and generally possess high dispersal abilities, enabling them to out-compete native species.

### **5.7.1 Existing Conditions**

Puerto Rico is comprised of two major eco-regions within the Savanna Division of the Humid Tropical Ecoregion Domain: M412 Forest Steppe Mountains and 411 Open Woodlands, Shrubs, and Savannas (Bailey & Cushwa 1981). Puerto Rico maintains six climatic life zones: subtropical dry forest, subtropical moist forest, subtropical wet forest, subtropical rain forest, lower montane wet forest, and lower montane rain forest.

Within the Commonwealth, there are 3,500 vascular plant species. These species include flowering plants, gymnosperms, ferns, and allies. As of 2017, local reports indicate that over 1,000 non-native plants exist in Puerto Rico. Invasive and exotic plants represent about a third of total plant diversity on the islands. The non-native flora in Puerto Rico is diverse and includes a wide range of taxonomic groups (PRDNER 2017). Their presence has resulted in detrimental effects, including extinctions of native species

### **5.7.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

In the No Action alternative, FEMA would not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. The No Action Alternative would have no direct impact on the existing vegetation from construction disturbance. However, without continued human use or landscape maintenance, some locations may become overgrown and provide additional habitat for fauna in the area. Conversely, if areas remain unmaintained, the No Action alternative could potentially result in negligible to minor long-term adverse impacts in those areas. This would result in the introduction and colonization of invasive plant species, which out-compete native species in disturbed type habitats.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

This alternative would likely result in short-term negligible impacts to terrestrial vegetation during construction activities. However, the mitigation of impacts would occur through permit requirements and BMPs. During the construction phase, to control the spread of invasive species, all vehicles (i.e. heavy equipment, construction and personal vehicles) will be free of dirt and debris before entering and exiting the project areas. The re-vegetation of project sites will occur in accordance with the applicable permits, SWPPP, and federal and local guidance. Thorough project identification, impact assessment, and review will occur as appropriate. FEMA anticipates no long-term negative impacts; however, any impacts to vegetation would be beneficial in the long-term as native species become established upon implementation of an approved SWPPP.

#### **Alternative 3: Realignment or Relocation of Utilities**

FEMA anticipates this alternative to have effects similar to those discussed under Alternative 2. However, this alternative could consist of performing work by constructing new utilities due to relocation, which would result in short-term and long-term minor impacts to vegetation. Building new utilities will often have greater impacts than working on existing utilities, particularly involving new ground disturbance in previously undisturbed areas. There will be impacts to vegetation along utility corridors during construction; however, the area would either revegetate on its own or be re-vegetated in accordance with the applicable permits and SWPPP. Relocation of utilities and corresponding ROWs into previously undeveloped areas may cause impacts to additional acreage of vegetation. If FEMA determines that biological impacts are greater than what this PEA includes, FEMA will review those projects on a case-by-case basis to determine appropriate level of NEPA analysis.



## **Alternative 4: Combination**

This alternative consists of performing work on existing utilities and constructing new utilities. Building new utilities will often have greater impacts than working on existing utilities, because of the potential for increased ground disturbance in previously undisturbed areas. Alternative 4 will have effects similar to those discussed under Alternatives 2 and 3.

## **5.8 WILDLIFE AND FISH**

Biological resources include native or naturalized plants and animals and their habitats (e.g. wetlands, forests, and grasslands). Adverse effects to biological resources, including fish and wildlife are significant if impacts to species or habitats of concern are over relatively large areas, or if disturbances cause reductions in population size or distribution. FEMA evaluates the proposed alternatives to assess potential impacts to biological resources resulting from potential physical impacts such as habitat loss, noise, and impacts to water quality. There are several federal acts that express the will of Congress to protect the quality of the aquatic environment as it affects the conservation, improvement and enjoyment of fish and wildlife resources.

The Migratory Bird Treaty Act (MBTA) of 1918 provides a program for the conservation of migratory birds that fly through lands of the United States. The lead Federal agency for implementing the MBTA is the USFWS. The law requires Federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any migratory birds or result in the destruction or adverse modification of designated critical habitat of such species. The law makes it illegal for anyone to “take,” possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or their parts, feathers, nests, or eggs. “Take” is defined as “to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities.”

In the Commonwealth there are laws which place both state and federally protected wildlife and plants into the jurisdiction of PRDNER. As discussed above, the New Wildlife Law of Puerto Rico declares all plants and wildlife as property of the commonwealth. Additionally, Regulation No. 6765 and Regulation No. 6766 of the Commonwealth provides the legal basis for the Department of Natural and Environmental Resources to manage biological resources, including hunting activities and invasive species.

### **5.8.1 Existing Conditions**

Puerto Rico hosts about 5,847 native species of fish, mammals, birds, reptiles, insects, and amphibians (PRDNER 2017). Of the 5,847 wildlife species, there are seven native freshwater fish, 15 terrestrial and marine mammals, 190 birds, 51 reptiles, and 18 amphibians (PRDNER 2005). The Draft Comprehensive Wildlife Plan revisions of 2017 shows some slightly different data, stating there are 15 mammals, nine native freshwater fish, 190 birds, 54 reptiles, 19 amphibians, and 5,573 insects; however, the plan is not yet final (PRDNER 2017).

Puerto Rico hosts more than 45 exotic bird and more than 35 are either well-established or have small breeding populations. Although 27 native species are known from Puerto Rico, two are extinct: The White-necked Crow *Corvus leucognaphalus* and the Hispaniolan Parakeet *Aratinga chloroptera*. According to the Puerto Rico Ornithological Society there are 20 Important Bird

Areas on the islands (Mendez 2008). The primary concerns for avian species on the archipelago are the rapid development of habitat to urbanized areas. The conservation priorities are for the acquisition of protected areas that provide for those necessary habitats that are rapidly disappearing and are under represented on the islands (USFWS 2015).

### **5.8.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

Under the No Action alternative, FEMA would not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. While it is unlikely the Commonwealth and its partners would be able to finance widespread utility projects, there is no way to be certain that for the projects they do fund that they would comply with all applicable local and federal laws and regulations. Under the No Action Alternative, FEMA anticipates that the effect locally and regionally on wildlife and fish would be adverse and negligible to minor for both the short-term and long-term. The most likely adverse and beneficial impacts would be associated with neglect. Unstable or deteriorating infrastructure would pose both short-term and long-term adverse impacts to wildlife and fish through direct impacts from the collapse of structures and electrocution or indirect impacts resulting from erosion, stormwater runoff, and pollution. Conversely, without continued human use or landscape maintenance, some locations may become overgrown. If an area becomes overgrown, there is the potential for it to provide a beneficial habitat feature for wildlife.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

This alternative consists of performing work on utilities in existing alignments; however, utility projects included under Alternative 2 may occur in, on, or over land, streams, and reservoirs. The work on embankments and in-water work could impact wildlife and fish. This alternative would likely result in adverse short-term negligible to minor impacts to the habitat during construction activities. The implementation of the BMPs included in Section 6 would limit indirect impacts to fish and wildlife habitat. The requirements and implementation of NPDES permitting and SWPPP maintenance will limit degradation of water quality from runoff and sedimentation.

#### **Alternative 3: Realignment or Relocation of Utilities**

This alternative includes constructing new utilities in areas both previously disturbed and undisturbed. Building new utilities often causes greater impacts than working on existing utilities, particularly in undisturbed areas. The realignment or relocation of utilities and corresponding ROWs on undisturbed lands could result in removal of wildlife habitat. FEMA will review projects on a case-by-case basis to identify impacts to wildlife and fish. If necessary, consultation with the USFWS as well as other regulatory would occur as needed.

This alternative would likely result in adverse short-term negligible to minor impacts to the habitat during construction activities. The implementation of the BMPs included in Section 6 would limit indirect impacts to fish and wildlife habitat. The NPDES permitting process and implementation of a SWPPP would limit the degradation of water quality from runoff and contain loose sediment to the vicinity of the construction area. As some actions would result in the permanent conversion

of land, this alternative would likely result in adverse long-term negligible to minor impacts to wildlife and fish habitat following the construction of utility projects.

#### Alternative 4: Combination

Alternative 4 will have effects similar to those discussed under Alternatives 2 and 3.

### 5.9 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) of 1973 provides a program for the conservation of threatened and endangered (T&E) plants and animals and their habitats. The lead Federal agencies for implementing ESA are the USFWS and the NOAA NMFS. The law requires Federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The law also prohibits any action that causes a “taking” of any listed species of endangered fish or wildlife.

Protected and sensitive biological resources include federally listed endangered or threatened, proposed, and candidate species designated by the USFWS and NMFS. Sensitive habitats include those areas designated by the USFWS as critical habitat protected by the ESA and sensitive ecological areas as designated by Commonwealth or federal rulings. Designated Critical Habitat (DCH) is a term defined and used in the ESA that outlines specific geographic areas that contain features essential to the conservation of an endangered or threatened species and that may require special management and protection. Critical habitat may also include areas that are unoccupied by the species but are necessary for its recovery. Sensitive habitats also include wetlands, plant communities that are unusual or of limited distribution, and important seasonal-use areas for wildlife (e.g. migration routes, breeding areas, crucial summer and winter habitats).

Section 7(a)(2) of the ESA requires the lead federal agency to consult with either the FWS or the NMFS, depending which agency has jurisdiction over the federally-listed species in question, when a federally-funded project either may have the potential to adversely affect a listed species, or a federal action occurs within or may have the potential to impact DCH. Additionally, Section 7, requires that federal agencies ensure that any activities they authorize, funded, or carried out are not likely to destroy or adversely modify the DCH of a listed species.

#### 5.9.1 Existing Conditions

**Table 4** presents the federally listed threatened and endangered terrestrial species managed by USFWS for the Commonwealth. Appendix E contains habitat characteristics for the species presented in **Table 4**.

**Table 4: Terrestrial-based Federally ESA Listed Threatened & Endangered Species**

Common Name	Scientific Name	Federal Status*	Critical Habitat
<b>Birds</b>			
Elfin-woods warbler	<i>Setophaga angelae</i>	T	Proposed
Piping plover	<i>Charadrius melodus</i>	E, T**	No
Puerto Rican broad-winged hawk	<i>Buteo platypterus brunescens</i>	E	No
Puerto Rican nightjar	<i>Caprimulgus noctitherus</i>	E	No

Common Name	Scientific Name	Federal Status*	Critical Habitat
Puerto Rican parrot	<i>Amazona vittata</i>	E	No
Puerto Rican plain Pigeon	<i>Columba inornata wetmorei</i>	E	No
Puerto Rican sharp-shinned hawk	<i>Accipiter striatus venator</i>	E	No
Roseate Tern	<i>Sterna dougallii dougallii</i>	T	No
Rufa Red Knot	<i>Calidris canutus rufa</i>	T	No
Yellow-shouldered blackbird	<i>Agelaius xanthomus</i>	E	Yes
<b>Amphibians</b>			
Golden coqui	<i>Eleutherodactylus jasperii</i>	T	Yes
Guajon	<i>Eleutherodactylus cooki</i>	T	Yes
Llanero Coqui	<i>Eleutherodactylus juanariveroi</i>	E	Yes
Puerto Rican crested toad	<i>Peltophryne lemur</i>	T	No
<b>Reptile</b>			
Culebra Island giant anole	<i>Anolis roosevelti</i>	E	Yes
Mona boa	<i>Epicrates monensis monensis</i>	T	Yes
Mona ground Iguana	<i>Cyclura stejnegeri</i>	T	Yes
Monito gecko	<i>Sphaerodactylus micropithecus</i>	E	Yes
Puerto Rican boa	<i>Epicrates inornatus</i>	E	No
Virgin Islands tree boa	<i>Epicrates monensis granti</i>	E	No
<b>Plants</b>			
Arana	<i>Schoepfia arenaria</i>	T	No
Bariaco	<i>Trichilia triacantha</i>	E	No
Cana Gorda Girdlepod	<i>Mitracarpus polycladus</i>	E	No
Capa rosa	<i>Callicarpa ampla</i>	E	No
Cerro de Punta Jayuya	<i>Elaphoglossum serpens</i>	E	No
Chase's Threeawn	<i>Aristida chaseae</i>	E	No
Chupacallos	<i>Pleodendron macranthum</i>	E	No
Cobana negra	<i>Stahlia monosperma</i>	T	No
Cook's holly	<i>Ilex cookii</i>	E	No
Cordillera Maiden Fern	<i>Thelypteris inabonensis</i>	E	No
El Yunque Colorado	<i>Ternstroemia subsessilis</i>	E	No
Elfin tree fern	<i>Cyathea dryopteroides</i>	E	No
Erubia	<i>Solanum drymophilum</i>	E	No
Heller's Cieneguillo	<i>Daphnopsis hellerana</i>	E	No
Higo Chumbo-Prickly Pear	<i>Harrisia portoricensis</i>	T	No
Higuero de sierra	<i>Crescentia portoricensis</i>	E	No
Jamaican Broom	<i>Chamaecrista glandulosa</i> var. <i>mirabilis</i>	E	No
Luquillo Mtn babyboot	<i>Lepanthes eltoroensis</i>	E	No
Mata Buey-Beautiful goetzea	<i>Goetzea elegans</i>	E	No
Maxwell's Girdlepod	<i>Mitracarpus maxwelliae</i>	E	No
Monte Guilarte Hollyfern	<i>Polystichum calderonense</i>	E	No
No common name	<i>Varronia rupicola</i>	T	Yes
No common name	<i>Cranichis ricartii</i>	E	No
No common name	<i>Gonocalyx concolor</i>	E	Yes
No common name	<i>Leptocereus grantianus</i>	E	No

Common Name	Scientific Name	Federal Status*	Critical Habitat
No common name	<i>Myrcia paganii</i>	E	No
No common name	<i>Thelypteris verecunda</i>	E	No
No common name	<i>Vernonia proctorii</i>	E	No
Palma de manaca	<i>Calyptronoma rivalis</i>	T	No
Palo colorado	<i>Ternstroemia luquillensis</i>	E	No
Palo de jazmin	<i>Styrax portoricensis</i>	E	No
Palo de nigua	<i>Cornutia obovata</i>	E	No
Palo de ramon	<i>Banara vanderbiltii</i>	E	No
Palo de rosa	<i>Ottoschulzia rhodoxylon</i>	E	No
Pelos del diablo	<i>Aristida portoricensis</i>	E	No
Proctor's Staggerbush	<i>Lyonia truncata</i> var. <i>proctorii</i>	E	No
Puerto Rico Halberd Fern	<i>Tectaria estremerana</i>	E	No
Puerto Rico Maiden Fern	<i>Thelypteris yaucoensis</i>	E	No
Puerto Rico Maidenhair	<i>Adiantum vivesii</i>	E	No
Puerto Rico Manjack	<i>Cordia bellonis</i>	E	No
Sintenis' Holly	<i>Ilex sintenisii</i>	E	No
St. Thomas prickly-ash	<i>Zanthoxylum thomasianum</i>	E	No
Thomas' Lidflower	<i>Calyptanthus thomasiana</i>	E	No
Tropical Lilythorn	<i>Catesbaea melanocarpa</i>	E	Only VI
Turtlefat	<i>Auerodendron pauciflorum</i>	E	No
Uvillo-Luquillo Mtn Stopper	<i>Eugenia haematocarpa</i>	E	No
Vahl's boxwood	<i>Buxus vahlii</i>	E	No
West Indian Walnut-Nogal	<i>Juglans jamaicensis</i>	E	No
Wheeler's peperomia	<i>Peperomia wheeleri</i>	E	No
Woodbury's Stopper	<i>Eugenia woodburyana</i>	E	No
Yerba Maricao de Cueva	<i>Gesneria pauciflora</i>	T	No

E = federally listed endangered species located in the Commonwealth of Puerto Rico

T = federally listed threatened species located in the Commonwealth of Puerto Rico

Source: United States Fish and Wildlife Service Sources: <https://www.fws.gov/southeast/puerto-rico/> and <https://ecos.fws.gov/ecp0/reports/species-listed-by-state-report?state=PR>

\*\*Piping plover is endangered in Cabo Rojo National Wildlife Refuge, and threatened in the rest of PR

Currently there is one candidate species located within the Commonwealth, the Puerto Rico harlequin butterfly (*Atlantea tulita*) (USFWS ECOS 2018b). Petitioned species include Mona skink (*Spondylurus monae*), Puerto Rican skink (*S. nitidus*), and Culebra skink (*S. culebrae*) (USFWS pers. comm. 2019a).

## Designated Critical Habitat

According to the USFWS, eleven of the federally listed T&E species managed by the service have designated critical habitat in Puerto Rico. In addition to those above species designated critical habitats, *Gonocalyx concolor* and *Varronia rupicola* also have critical habitat and the Elfin-woods

Warbler has proposed critical habitat even though these species are unlisted in Puerto Rico (**Figure 8 in Appendix A**). The following is a list of terrestrial species that have designated critical habitat:

*Culebra Island Giant Anole, Golden Coqui, Goncalyx concolor, Puerto Rican Rock Frog, Hawksbill Sea Turtle, Mona Boa, Llanero Coqui, Mona Ground Iguana, Monito Gecko, Varronia rupicola, and Yellow-shouldered Black Bird (USFWS IPaC 2018).*

NMFS has designated additional DCH for species; however, due to the location of the critical habitat being located either in the Atlantic Ocean or Caribbean Sea, it will not be discussed further.

### **5.9.2 Potential Impacts and Proposed Mitigation**

Existing programmatic consultations may cover projects accomplished by FEMA for this disaster, such as consultation on the Puerto Rican Boa Commonwealth-wide. FEMA will initiate consultation for any project not covered by an existing consultation and apply appropriate conservation measures resulting from consultation. The project REC must document all consultations and results prior to construction commencement. FEMA will evaluate any project that potentially adversely affects federally listed species or their DCH for tiered or SEA, on a case-by-case basis.

#### **Alternative 1: No Action**

Under the No Action alternative, FEMA would not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. While it is unlikely the Commonwealth and its partners would be able to finance widespread utility projects, there is no way to be certain that for the projects they do fund that they would comply with all applicable local and federal laws and regulations. Under the No Action Alternative, FEMA anticipates that the effect locally and regionally on federally listed T&E species would be adverse and negligible to minor for both the short-term and long-term.

The most likely adverse and beneficial impacts to T&E species from the No Action Alternative would be associated with neglect. Unstable or deteriorating infrastructure would pose both short-term and long-term adverse impacts to T&E species through direct impacts from the collapse of structures and electrocution or indirect impacts resulting from erosion, stormwater runoff, and pollution. Conversely, without continued human use or landscape maintenance, some locations may become overgrown. If an area becomes overgrown there is the potential for it to provide a beneficial habitat feature for T&E species.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

The actions under this alternative may affect sensitive biological resources. However, at the programmatic level; the expectation is that landscaped or managed vegetation would occur within the disturbed footprint of many project areas. The potential impacts to T&E species are likely to result from construction activities. Alternative 2's actions consist of performing work on utilities within existing alignments. Embankment work and temporary in-water work that affects land, streams, and reservoirs may occur. FEMA will review projects based on available information for the potential occurrence of T&E species and DCH in the area.

FEMA will consult with USFWS on individual projects as necessary for compliance with ESA. The consultation process would identify any project conditions necessary to minimize impacts to T&E Species and DCH. The Applicant would be responsible for complying with all conditions issued by the USFWS as well as, the implementation of BMPs presented in Section 6. Additionally, the NPDES permitting program and implementation of a SWPPP would limit impacts to water quality from runoff and sedimentation.

Based on this PEA's project thresholds, federal consultations, conservation measures, and NPDES permitting requirements, Alternative 2 may have an adverse negligible to minor short-term and long-term impact on the federally-listed endangered, threatened, and proposed or candidate species. If through the consultation process, the USFWS determines that a project has the potential to have an adverse effect on T&E species, the project would be beyond the scope of this PEA and require FEMA to perform an additional NEPA analysis.

### **Alternative 3: Realignment or Relocation of Utilities**

This alternative includes constructing new utilities in areas both previously disturbed and undisturbed. Building new utilities often causes greater impacts than working on existing utilities, particularly in undisturbed areas. The construction phase, permanent conversion of land, and operations of new systems would constitute short-term and long-term adverse impacts. The realignment or relocation of utilities and corresponding ROWs on undisturbed lands could result in removal of plant and animal habitat.

FEMA would review projects on a case-by-case basis to identify potential impacts to federally listed T&E Species and DCH. If necessary, consultation with the USFWS as well as other regulatory agencies would occur as needed. The Applicant would be responsible for complying with all conditions issued by the USFWS and the implementation of BMPs presented in Section 6. Additionally, the NPDES permitting program and implementation of a SWPPP would limit impacts to water quality from runoff and sedimentation.

Based on this PEA's project thresholds, federal consultations, conservation measures, and NPDES permitting requirements, Alternative 3 may have an adverse negligible to minor short-term and long-term impact on the federally-listed endangered, threatened, and proposed or candidate species and their DCH. If through the consultation process, the USFWS determines that a project has the potential to have an adverse effect on T&E species, the project would be beyond the scope of this PEA and require FEMA to perform an additional NEPA analysis.

### **Alternative 4: Combination**

Alternative 4 will have effects similar to those discussed under Alternatives 2 and 3.

## **5.10 CULTURAL RESOURCES**

Cultural resources (aka historic and archaeological resources) are subject to review under Federal and State laws and regulations. The National Historic Preservation Act (NHPA) passed in 1966, established State Historic Preservation Offices (SHPO) and the National Register of Historic Places (NRHP).

The NRHP is the United States' official list of significant historic properties and is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect historic and archeological resources. The Secretary of the Interior administers the NRHP through the National Park Service (NPS). Historic properties include districts, buildings, structures, objects, landscapes, archaeological sites, traditional cultural properties, and other resources that are significant in American history, architecture, archeology, engineering, and culture. To be eligible for listing, a property must meet eligibility criteria delineated by the Secretary of the Interior and retain enough integrity to convey its significance to American culture. The 36 CFR Part 60 contains eligibility criteria for listing a property on the NRHP.

Section 106 of the NHPA, as amended, and implemented by 36 CFR Part 800 requires Federal agencies to consider the effects of their actions on historic properties and provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on federal projects that have an effect on historic properties. This action must take place prior to the expenditure of federal funds. Pursuant to 36 CFR 800.4(a)(1), the definition of the Area of Potential Effects (APE) is the geographic area(s) within which the undertaking may directly or indirectly affect cultural resources.

Once identified, resources are assessed against significance criteria and only historic properties determined to be eligible for listing on the NRHP are covered under the NHPA.

FEMA evaluates impacts to cultural resources prior to project actions for both Historic Standing Structures (above ground resources) and Archaeology (on and below ground resources) within the APE.

## **5.10.1 Historic (Standing) Structures**

### **5.10.1.1 Existing Conditions – Historic Standing Structures**

Throughout four centuries, Spanish colonists established many buildings and structures (i.e. Catholic Churches, civic and military structures) throughout the island. Many remain standing and listed on the NRHP. Across Puerto Rico there are over 350 properties listed on the NRHP, 18 historic districts, and 6 National Historic Landmarks (NHL), altogether over 200 resources are within the register (**Figure 9** in **Appendix A**) (NPS NRHP 2019). Also, there are twelve Historic Zones declared by the PRPB and overseen by the Institute of Puerto Rican Culture.

Urban development, coastline, and mountains dominate Puerto Rico's overall viewshed. The Cordillera Central (Central Mountain Range) spans the island from east to west and separates the more arid south from the more tropical north. At its highest point (Cerro De Punta), the mountains reach 4,390 ft above mean sea level. Ruta Panorámica is a 165 mile stretch of highway running roughly east-west through the Central Mountain Range, connecting ridgelines, towns, and natural reserves. Other visual resources include elements incorporated into other sections of this PEA, including vast cultural and historic resources dating from pre-colonial Taíno carvings, Spanish Colonial forts, and historic districts.

Hurricane Maria damaged the Commonwealth's infrastructure causing negative impacts to many of the territory's historic structures. Recovery efforts that will repair and harden many of these historic properties are ongoing.



### **5.10.1.2 Potential Impacts and Proposed Mitigation to Historic (Standing) Structures**

Analysis of potential impacts to historic resources considers both direct and indirect impacts. Descriptions of what constitute direct and indirect impacts are as follows:

- Direct impacts may occur by physically altering, damaging, or destroying all or part of a resource or introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting. Once identification of the proposed action locations occurs, assessment of the project specific impacts can begin.
- Indirect impacts may occur associated with altering the characteristics of the surrounding environment that contribute to resource significance. Neglect of the resource to the extent that it causes deterioration or destruction of the resource can be an indirect impact as well.

Following the establishment of potential impacts or effects, is the identification of specific cultural and historic resources affected and the nature of potential impacts. Indirect impacts primarily result from such effects as project-induced population increases in areas served by utilities and development of new housing and commercial areas, access roads, services, and other associated development. Construction, and other activities associated with utilities and the communities they serve, can adversely affect historic resources. If a proposed action may adversely affect historic resources, consultation with the SHPO and other consulting parties can help identify ways to avoid or minimize impacts. If adverse effects are unavoidable, then agencies must resolve the adverse effects through a Memorandum of Agreement, or the Abbreviated Consultation Process as outlined in the FEMA Section 106 Programmatic Agreement. Additionally, FEMA or another Federal Agency may develop a Project Specific Programmatic Agreement to outline a review process, including a process for evaluating historic properties, avoidance and proposed mitigation.

#### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. The No Action Alternative does not include construction, and thus no new impacts to historic resources would occur as a result of federal funding. Though, existing historic structures may experience degradation due to inability to access the site for repairs and maintenance and could have a long-term negligible to minor impacts.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

This alternative has the potential to affect historic resources. Extant infrastructure of cultural significance or archeological resources may be present within the project area. Physical alternations of the site may also affect cultural resources. FEMA Historic Preservation staff will determine if a project scope of work has the potential to affect the resource or meets Allowances outlined in the Second Amendment Programmatic Agreement with the Puerto Rico SHPO executed on November 13, 2019 (FEMA-Puerto Rico SHPO Programmatic Agreement for Section 106 Review, May 2016, Amended April 2018 and known collectively as the Programmatic Agreement. If the scope meets the Allowances, the FEMA will determine if the project is within compliance with Section 106 of NHPA and the review process will be complete. If the proposed scope of work does not fall within an allowance, the Agency will follow the standard Section 106

review process and initiate consultation with the SHPO and any appropriate consulting parties. This alternative could consist of construction of new viewshed elements in NRHP districts or properties, removal of historic utility structures (e.g. substations, water pumps or treatment plants), and would require consultation with SHPO prior to their removal. Through consultation and mitigation, this alternative will have a negligible to moderate impact on historic structures.

### **Alternative 3: Realignment or Relocation of Utilities**

This alternative will have effects similar to those discussed under Alternative 2. However, this alternative could consist of the removal of historic utility structures for realignment or relocation and would require consultation with SHPO prior to their removal. Through consultation and mitigation, this alternative may have a negligible to moderate impact on historic structures. Additionally, realignment or relocation of overhead utilities, such as powerlines, poles, and communication towers may impact viewshed of a historic property or historic district and require coordination with SHPO before their placement.

### **Alternative 4: Combination**

Impacts are similar to those listed under Alternatives 2 and 3.

## **5.10.2 Archaeological Resources**

### **5.10.2.1 Existing Conditions**

Puerto Rico has a rich cultural history. The indigenous Taino people first encountered Western explorers at the end of the 15<sup>th</sup> Century when Christopher Columbus' second voyage brought him to the island known to the locals as Boriken (Borinquen). The Taino trace their roots to the Arawak tribes in the Orinoco delta in Venezuela. Around 400 years Before the Common Era (BCE), they began migrating across the Antilles and established communities with the original inhabitants across the northern Caribbean. At the time of Western contact, the Taino were in conflict with the Carib Indians who had settled the Lesser Antilles as early as 1,300 BCE.

Spanish settlers found a well-developed, primarily agrarian society that had developed a sophisticated pharmacopeia from native flora, created pottery with fine detail, cotton weavings and wood, and shell and stone carvings. Inter-marriage with Spanish settlers and African slaves brought to the island, and the diseases they brought, coupled with an early 16<sup>th</sup> century uprising reduced the native Taino population to near zero by the middle of the century.

### ***Prehistoric Archaeological Resources***

Puerto Rico has approximately 6,000 years of human history encompassing indigenous, colonial, and contemporary occupations covering a chronological range from 3500 BCE to 1500 Common Era (CE). There are approximately 2,500 archaeological sites reported for Puerto Rico in the SHPO and the Institute for Puerto Rican Culture, with similar settlement patterns characteristic of Caribbean geography and defined by the geographical areas where they are located. Typical areas of ancient human settlements are similar to the currently inhabited areas. These include: coastal areas, interior valleys in mountain regions, and flood river valleys.

Distinct types of archaeological sites are located within these principal geographical areas. The most predominant are: shell middens, stone workshops, villages/stone delimited plazas, caves and rock petroglyphs near rivers.

Over the last four decades the implementation of NHPA and Section 106 compliance review has resulted in the identification, evaluation and documentation of numerous significant archaeological resources because of the construction of new utility systems throughout the island. Any repair, replacement or relocation of utilities should take into consideration the potential impact to archaeological resources.

### ***Historic Archaeological Resources***

Puerto Rican history did not end with the arrival of the Spanish conquistadors. This stage was one of the rich developments with contributions from many ethnic groups including: European, indigenous, African, Arab, Chinese. Between the 16<sup>th</sup> and 19<sup>th</sup> centuries, Puerto Rican culture, through a slow process of development, acquired its current characteristics. These groups constructed some of the social, political, and economic institutions, and the buildings that served as their headquarters. Among these infrastructures are lighthouses, roads, bridges, and buildings (i.e. hospitals and schools). While some of the structures still stand, there is still the need for identification and recording of many of the associated archaeological deposits of these institutions.

In 1898 after the Spanish-American War and the arrival of the U.S. government, there were new developments in Puerto Rico's political and economic structures. Among the most notable are the sugar mills, such as the Guanica Central. Many infrastructure works constructed were irrigation canals, roads, bridges, and public buildings. Many of them are under current conservation measures and are part of Puerto Rican historical heritage.

Among the actions for permanent projects that could potentially increase impact rates for archaeological sites and other historical properties are the construction of staging areas, new access roads, and new ROWs. In general, depending on the type of site, they can have an extension area that varies from hundreds of meters to several kilometers. FEMA has a Programmatic Agreement with the Puerto Rico SHPO executed November 13, 2019. These documents and any subsequent future amendments will aid in fulfilling FEMA's responsibilities for Section 106 under NHPA. However, the current version only applies to work limited to the footprint and the ROW but not the staging areas or new access roads. The 2019 2<sup>nd</sup> Amendment Programmatic Agreement established a distance of 200 meters (650 ft) to be maintained as a buffer zone between any ground disturbance activity and registered historical properties.

### **5.10.2.2 Potential Impacts and Proposed Mitigation, Archaeological Resources**

#### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future flood events. The No Action Alternative does not include ground disturbance and thus no new impacts to archeological resources would occur.

## **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

This alternative has the potential to affect archeological resources. Archeological resources may be present within the project area. Destruction or alteration of any site, structure, or object of prehistoric or paleontological importance may occur during construction. Physical alternations of the site may also affect cultural resources. FEMA Historic Preservation staff will determine if a project scope of work meets outlined Programmatic Allowances from the applicable Programmatic Agreement with the Puerto Rico SHPO or requires standard 106 review and consultation. If the scope of work meets an applicable allowance under the Second Amendment Programmatic Agreement, FEMA will determine that the project is within compliance with Section 106 of NHPA and the review process will be complete. If the proposed scope of work does not fall within the allowances, a FEMA representative will make an effect determination and initiate consultation with the SHPO following the standard Section 106 review process. SHPO consultation may require additional archaeological surveys of ground disturbing activities. This alternative has the potential to affect archeological resources; however, they would be negligible to minor impacts with SHPO consultation.

## **Alternative 3: Realignment or Relocation of Utilities**

Utility relocation could result in new ground disturbance. While new ground disturbance has the potential to affect archaeological resources, methods of avoidance, mitigation, or documentation are similar to those used for projects described listed under Alternative 2. This alternative has the potential to affect archeological resources; however, they would be negligible to minor impacts with SHPO consultation.

## **Alternative 4: Combination**

Impacts are similar to those listed under Alternatives 2 and 3.

## **5.11 ENVIRONMENTAL JUSTICE**

Executive Order 12898, Federal Actions to Address Environmental Justice (EJ) in Minority Populations and Low-Income Populations, requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. Similarly, NEPA ensures that environmental decisions do not have a disproportionate burden on minority communities or low-income groups.

FEMA uses demographics data to analyze trends associated with this PEA's Action Alternatives to identify potentially disproportionate impacts on minority and low-income populations. On a project level, FEMA would evaluate scopes of work on a case-by-case basis to ensure compliance with EO 12898. Data collection comes from previously published documents issued by Federal and Commonwealth agencies and from state and national databases .

The CEQ guidance states that “minority populations should be identified” where either: a) the minority population of the affected area exceeds 50 percent; or b) the population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis” (CEQ 1997).

### 5.11.1 Existing Conditions

This section incorporates a review of the Commonwealth's population dynamics and communities of concern in evaluating areas that may be environmental justice communities. The data sets presented herein are the most current demographics published for Puerto Rico; however, they may not accurately depict the Commonwealth's post Hurricane Maria economic status and population trends. The following summary details an overview of past losses, potential losses, and some of the most vulnerable jurisdictions.

#### Population Data

To ensure compliance with EO 12898, a key question is if a proposed action has the potential to disproportionately affect a low income or minority community and if so, has that population had considerable input in the development of alternatives. Unlike its treatment of poverty, the Census Bureau does not provide an official definition of low income. The USEPA's June 2016 Technical Guidance for Assessing Environmental Justice in Regulatory Analysis suggests that if income levels don't accurately predict risk factors associated with low-income populations due to localized existing conditions, low-income can more broadly be characterized by criteria other than just those that fall below the poverty threshold (e.g. to include families whose income is above the poverty threshold but still below the average household income for the United States). Educational attainment, baseline health status, and health insurance coverage may also be useful to identify low income communities (USEPA 2016).

With regards to determining a disproportionate adverse impact, some communities such as Puerto Rico will have a higher percentage of minority and/or low-income members than populations on mainland USA. Provided these differences have a regular, or uniform, distribution, they generally would not indicate a potential for a disproportionate adverse impact (USEPA 2016).

The 2010 U.S. census data provides the most complete data set of Puerto Rico's population. In 2020, the U.S. Census Bureau will be performing a constitutionally mandated update. The 2020 Census will be the first post-Hurricane Maria accounting of the Commonwealth's population. The 2010 Census revealed a decrease in the population living in the Commonwealth of 2.2 percent for the period between 2000 and 2010 (U.S. Census Bureau 2017). The five most populous municipalities within Puerto Rico and their populations are as follows:

- San Juan, 381,931;
- Bayamón, 185,996;
- Carolina, 157,832;
- Ponce, 132,502; and
- Caguas, 82,243

San Juan's population decreased by 9.5 percent from the 2000 Census. With regards to other major municipalities, Bayamón decreased by 8.6 percent, Carolina decreased by 6.1 percent, Ponce decreased by 14.5 percent, and Caguas decreased by 7.3 percent (U.S. Census Bureau 2011).

According to the U.S. Census Bureau's fact sheet for the Commonwealth, as of July 1, 2017 (prior to Hurricane Maria) the Commonwealth's population was 3,337,177. The Census Bureau attributed the loss of population in Puerto Rico to emigration. The population data published by the Census Bureau Estimates from last decade used both a residual method and the American Community Survey/Puerto Rico Community Survey to measure international migration for Puerto Rico. Population estimates from the Census Bureau had projected a decline of 0.34 percent from 2000 to 2010; however, as noted above the population of Puerto Rico decrease by approximately 2.2 percent. The Commonwealth's Department of Labor and Human Resources Bureau of Labor Statistics (PR-DLHRBLS) in 2017 stated that according to the U.S. Census Bureau, Population Division, the population of Puerto Rico continued its downward trend losing 6.6 percent of its population between 2010 and 2015. The decrease in the estimated population from 2010 to 2015 shows a reduction of 247,345 persons (PR-DLHRBLS 2017). A possible explanation for the decrease in population and increased emigration from the Commonwealth is the rise in unemployment. According to Census Bureau data the unemployment rate in Puerto Rico increased by 17.3 percent between 2007 and 2011.

The racial makeup of the Commonwealth based on the 2010 census is 98.9 percent Hispanic or Latino. Within the category of Hispanic or Latino, the population was 69.4 percent white, 9.1 percent was black, 7.5 percent were two or more races, 0.3 percent were American Indian or Alaska Native, and 0.3 percent were Asian (U.S. Census Bureau 2017).

## **Education**

Based on the most recent Census Data developed by the USDA, the trend in Puerto Rico over the last 50 years is towards higher levels of education (**Figures 10 and 11**, both in **Appendix A**). However, the percentage of the overall population with a college degree by 2016 was 24.6 percent, while 26.1 percent do not have a high school diploma or equivalent (U.S. Census Bureau 2017). By 2017, just one year later, the education levels improved slightly with 24.9 percent completing college and 25.3 percent still without a high school diploma (USDA 2019).

## **Income Levels**

According to Census Bureau data, the median household income for the Commonwealth of Puerto Rico between 2012 and 2016 was \$19,606. Commonwealth wide, 43.5 percent households are below the poverty level (U.S. Census Bureau 2017). In 2017, the poverty rate for the Commonwealth was 44.4 percent (USDA 2019).

The Puerto Rico Department of Labor Research and Statistics pre-Hurricane Maria expectation was that the highest occupational increases in the Commonwealth between 2014 and 2024 would be in the health care sector and the largest decrease in employment would be in the construction sector. Prior to Hurricane Maria, the anticipated main job losses within the construction sector were paving, surfacing, and associated activities. The most recent data from the U.S. Bureau of Labor Statistics indicates that the 2018 average hourly wage for Puerto Rico was \$14.16 (U.S. Bureau of Labor Statistics 2018).

## **Communities of Concern**

The terms “EJ [EJ] Area” or “EJ Community” describe a community that satisfies the intent of EO 12898. Another term that is used in describing an applicable EJ community for analysis purposes is “Community of Concern (COC). Potential COC’s are any EJ community that may become overburdened by an action alternative. For Puerto Rico, a COC can be indistinguishable from the surrounding community using minority status as the key demographic in the EJ analysis since the island is predominately Hispanic (Region 2 EPA 2000). As such other variables may be appropriate to considered when analyzing environmental justice. For instance, air quality, commercial and industrial facilities, and land use may be appropriate when analyzing EJ for Puerto Rico (Region 2 EPA 2000).

The percentage of households below the poverty level do not vary between Municipalities or towns a great deal island wide. There are however, small variations in racial makeup, income levels, and poverty rates that differ slightly between regions and Municipalities within Puerto Rico. For example, the southeast Municipalities near Arroyo and Yabucoa generally have a higher percentage of black Hispanic population than many other Municipalities. Population densities and per capita income are much higher in the San Juan-Bayamon-Guaynabo-Carolina and Caguas regions than the rest of the island (USEPA NEPAassist 2019c).

### **5.11.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

Under the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Additionally, EO 12898 would not apply to locally-funded projects.

The No Action Alternative may cause adverse impacts to the socioeconomics of a community if the Applicant is unable to repair, upgrade, or make utilities more resilient to future storm events. For instance, the No Action Alternative could result in a reduction in public services such as power, water, or communications access for emergency, police, and fire services. The No Action Alternative could impact localized employment rates for industries that are dependent on utilities to provide reliable service. However, data does not exist to support a claim that the existing level of utility service is causing widespread losses of employment and reduced access to health services. The No Action Alternative would continue the same level of service and resiliency for EJ communities. This could have both an adverse short and long-term less than major impact for those communities affected.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

FEMA anticipates jobs related to the recovery are likely to be available for all education and skill levels. The increase in construction jobs would be short-term in nature and upon completion of the recovery projects, conditions would likely return to a pre-disaster state. As such, FEMA anticipates an increase in construction jobs from the post Hurricane Maria recovery would likely have a less than major beneficial impact on Puerto Rico’s economy.

By meeting current codes and standards, activities covered under Alternative 2 would result in utility networks that are more resilient. At the programmatic level, Alternative 2 actions could occur at any applicable location throughout the Commonwealth. As such, all demographics within Puerto Rico could benefit from the actions undertaken by this Alternative. The benefit of improving resiliency would be long-term and depending on existing conditions could have a range of beneficial impacts from minor to moderate.

Short-term negligible to minor adverse impacts to effected populations may occur during construction due to service interruption, road detours, and building construction. The Applicant will be responsible for managing the inconveniences and disruptions of service through the implementation of maintenance of traffic (MOT) and public notifications. At the programmatic level, short-term minor adverse impacts could occur at any applicable location within the Commonwealth. Due to the geographical extent of the disaster and potential for projects to occur anywhere within Puerto Rico, Alternative 2 would not disproportionately single out low income or minority populations for adverse impacts from the construction of proposed actions. The Applicant would be responsible for identifying applicable projects and determining the best method of minimizing impacts to local populations.

### **Alternative 3: Realignment or Relocation of Alternatives**

Generally, the impacts to socioeconomics and environmental justice from this alternative would be similar to those described for Alternative 2. The Applicant would be responsible for identifying applicable projects and determining the best method of minimizing impacts to local populations. FEMA would review projects on a case by case basis to confirm that Applicant has included mitigative measures in their scopes of work.

The Applicant may abandon utilities in place if they pose no risk to the surrounding population or environment. The Applicant would be responsible for recording any abandoned utilities with the appropriate agencies and utility locators.

### **Alternative 4: Combination**

Generally, the impacts to socioeconomics and environmental justice from this alternative would be similar to those described for Alternatives 2 and 3.

## **5.12 LAND USE AND PLANNING**

Comprehensive land use plans determine land use within the vicinity of urban and rural areas. These plans specify the types of present and future land use. In most cases, the development of comprehensive plans through a public participation process as approved by publicly-elected officials will capture local values and attitudes of planning and future development. Zoning ordinances and land use regulations vary throughout Puerto Rico.

### **5.12.1 Existing Conditions**

**Figure 12** in **Appendix A** illustrates Puerto Rico's current land cover estimates based on the Multi-Resolution Land Characteristics (MRLC) Consortium 2001 National Land Cover Database. The



values were derived by the MRLC through remote sensing and the application of an algorithm (MRLC 2018). **Table 5** displays the land cover in Puerto Rico.

**Table 5: Land Cover of Puerto Rico**

<b>NLCD2001 Land Cover Class for Puerto Rico</b>	<b>Percentage</b>
11. Open Water	21.56
12. Perennial Ice Snow	0.00
21. Low Intensity Residential	2.21
22. High Intensity Residential	5.45
23. Developed, Medium Intensity	3.38
24. Developed High Intensity	0.52
31. Bare Rock/Sand/Clay	0.49
41. Deciduous Forest	0.00
42. Evergreen Forest	35.86
43. Mixed Forest	0.00
52. Shrub/Scrub	2.14
71. Grasslands/Herbaceous	22.37
81. Pasture/Hay	2.09
82. Row Crops	1.75
90. Woody Wetlands	0.93
95. Emergent Herbaceous Wetlands	1.25
<b>Total</b>	<b>100.00%</b>

A detailed description of all NLCD2001 land cover class proportions across Puerto Rico. Note: this table is for illustrative purposes only, NLCD2001 has the most recent data file with complete detailed land cover analysis.

## **5.12.2 Potential Impacts and Proposed Mitigation**

### **Alternative 1: No Action**

Under the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Under the No Action alternative there is no federal action and restoration of utilities would rely on local funding. Due to the emergency actions funded by FEMA, widespread disruptions in service from Maria-damaged utilities does not currently exist. FEMA anticipates that the No Action Alternative would have either no impact or an adverse negligible short-term and long-term impact on land use within the Commonwealth as residents adjust to existing conditions.

### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Under this alternative, the replacement of existing utilities would be in-kind although with minor upgrades being possible. The use of current codes and standards would make utilities inherently more resilient. The construction process may include raising the elevation of existing utilities or placing utilities underground. During construction, temporary staging areas and access roads would have a short-term minor impact on land use. The utility footprint itself will remain largely within the previous ROW therefore no substantial changes in land use would occur. Some projects however may require small portions of new ROW due to upgrades. This may lead to adverse negligible to minor long-term changes in land use. If the footprint extends outside of the existing ROW into public or private lands, it may require a new or revised easement. For all ROW acquisitions, the Applicant will comply fully with federal and Commonwealth requirements where applicable.

### **Alternative 3: Realignment or Relocation of Utilities**

Alternative 3 entails the realignment or relocation of utilities. If it is unsafe for the Applicant to rebuild a utility that services an area, Alternative 3 allows local governments to buy out some parcels of private property. The Applicant may have to obtain a new or revised easement if project footprints extend outside of an existing ROW. For all ROW acquisitions, the Applicant would comply fully with all federal and Commonwealth requirements.

FEMA anticipates Alternative 3 would have an adverse short-term minor impact on land use from the installation of new utilities. The construction of Alternative 3 actions may include impacts to land use from the excavation and compaction of soil resources. Alternative 3 actions may also include the clearing of vegetation from within an existing or new utility corridor. The Applicant would be responsible for implementing site stabilization and revegetation measures in accordance with their NPDES permits and SWPPP. Additionally, the Applicant would be responsible for deploying the mitigation measures presented in Section 6 to minimize impacts to existing land uses.

The utility operators will manage deed and ROW restrictions to limit impacts to the infrastructure from other actions that could result in disruptions in service. The occupation of new ROWs and project areas would cause an adverse long-term minor impact to land use as restrictions on future development would likely exist.

FEMA anticipates that the removal of utilities would cause an adverse negligible to minor long-term impact on the former locations of relocated utilities. For locations where the Applicant plans on abandoning utilities or management issues remain, the resulting parcel may require land use restrictions that prevent future development. In some cases, the action would essentially revert the land to previous uses or the Applicant may be able to reuse the parcels for other industrial purposes. In both cases, the Commonwealth could derive a negligible long-term benefit from the actions.

### **Alternative 4: Combination**

The potential impacts of Alternative 4 would be similar to the impacts identified in Alternatives 2 and 3.

## **5.13 NOISE**

Noise is defined as unwanted or unwelcome sound and measured in decibels (dBA) on the A-weighted scale (i.e. the scale most similar to the range of sounds that the human ear can hear). Noise that occurs during the night (10 p.m. to 7 a.m.) is more disturbing than those that occur during normal waking hours (7 a.m. to 10 p.m.). The Noise Control Act of 1972 required the USEPA to create a set of noise criteria. In response, the USEPA published *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* in 1974 which explains the impact of noise on humans. The USEPA report found that keeping the maximum 24-hour Ldn value below 70 dBA protects the majority of people from hearing loss. The Quiet Communities Act of 1978 enabled the development of state and local noise control programs, to provide an adequate Federal noise control research program. According to

published lists of noise sources, sound levels, and their effects, sound causes pain starting at approximately 120 to 125 dBA (depending on the individual) and can cause immediate irreparable damage at 140 dBA. Occupational Health and Safety Administration (OSHA) has adopted a standard of 140 dBA for maximum impulse noise exposure.

The HUD noise standards (24 CFR Part 51, Subpart B) indicate that for proposed new construction in high noise areas, the project must incorporate noise mitigation features. The “Normally Unacceptable” noise zone includes community noise levels from greater than 65 dBA to 75 dBA.

The Day Night Average Sound Level (DNL or Ldn) is an average measure of sound. The DNL descriptor, accepted by federal agencies, is a standard for estimating sound impacts and establishing guidelines for compatible land uses. The federal government regulates sound by the Noise Control Act of 1972, which charges the USEPA with preparing guidelines for acceptable ambient noise levels. USEPA guidelines, and those of many other federal agencies, state that outdoor sound levels in excess of 55 dBA DNL are “normally unacceptable” for noise-sensitive land uses including residences, schools, or hospitals (USEPA 1974). The Noise Control Act, however, only charges implementation of noise standards to those federal agencies that operate noise-producing facilities or equipment.

Sound Pressure Level (SPL) measures sound in decibels (dB or dBA) with the threshold of human hearing equaling 0 dBA. The SPL increases logarithmically, so that when the intensity of a sound is increased by a factor of 10, its SPL rises by 10 dB, while a 100-fold increase in the intensity of a sound increases the SPL by 20 dB. Equivalent noise level (Leq) is the average of sound energy over time, so that one sound occurring for 2 minutes would have the same Leq of a sound twice as loud occurring for 1 minute. Ldn, based on Leq, measures average sound impacts for the purpose of guidance for compatible land use. This method weighs the impact of sound perceived at night against the impact of the same sound heard during the day by adding 10 dBA to all noise levels measured between 10:00 pm and 7:00 am. For instance, the sound of a car on a rural highway may have an SPL of 50 dBA when *measured* from the front porch of a house. If measured at night, the 24-hour Ldn would include a value of 60 dBA.

Leq and Ldn are useful measures when used to determine levels of constant or regular sounds (such as road traffic or noise from a ventilation system). However, neither represents the sound level as perceived during discrete events, such as fire sirens and other impulse noises. They are averages that express the equivalent SPL over a given time. Because the decibel scale is logarithmic, louder sounds (higher SPL) would carry more weight; however, loud infrequent noises (such as fire sirens) with short durations would not significantly increase Leq or Ldn over the course of a day.

### **5.13.1 Existing Conditions**

The PREQB regulates noise pollution in Puerto Rico in accordance with the Noise Pollution Control Regulation of 2011. The regulation has established the threshold for industrial levels at 75 dB.

Existing noise levels would vary by each site location and depend on the sound level and the observer’s distance from the source. Noise events in the project vicinity may be associated with

climatic conditions; transportation noise; local environment; and “life sounds” (e.g. communication, children playing). For those sites located along roadways, there would be existing traffic noise from roadway vehicles. Other potential sources of noise near the site locations prior to construction and repair activities may include transportation sources such as aircraft, machinery and industrial plant equipment, water channels, humans, and animals.

### **5.13.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and more vulnerable to future storm events. Temporary emergency repairs and protective measures would remain in place and would only be sufficient until the next storm event. Noise levels would remain similar to those prior to the event. Although, some traffic reroutes from other hurricane-affected areas, like closed roads and bridges, may impact localized noise levels; however, these would be short-term negligible to minor effects.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

The restoration of utilities would carry similar noise levels to pre-disaster levels. FEMA anticipates that noise from construction activities will have short-term minor effects. The Applicant will manage noise impacts by complying with local noise ordinances, using well maintain equipment, and limiting work to daytime hours. During construction periods, transportation noise on temporary detour routes may increase under this alternative due to increasing traffic on alternate roadways as traffic is re-routed into low traffic areas. FEMA anticipates no long-term noise effects.

#### **Alternative 3: Realignment or Relocation of Utilities**

FEMA anticipates short-term minor impacts associated with utility abandonment or removal. Noise from new construction activities, such as pile/post driving, directional drilling, and construction vehicles (e.g. cement mixing trucks), may have short term minor adverse effects on the workers and persons who live nearby. Noise from construction will comply with PREQB standards. Appropriate BMPs will be similar to those in Alternative 2 to aid in minimizing noise from construction activities. FEMA anticipates no long-term noise effects.

#### **Alternative 4: Combination**

The noise impacts from this alternative would be like those described for Alternatives 2 and 3 with impacts from noise being minor and short-term impacts during construction activities, affecting both the replacement and relocation project sites. FEMA anticipates no long-term noise effects.

### **5.14 TRANSPORTATION**

The Commonwealth’s Department of Transportation and Public Works (PRDTOP) governs transportation facilities. The PRDTOP is comprised of the Puerto Rico Highway and Transportation Authority (PRHTA), the Puerto Rico Port Authority, the Maritime Transport Authority (MTA), and the Metropolitan Bus Authority (MBA). PRHTA is the government-owned corporation of Puerto Rico charged with constructing, operating, and maintaining roads, bridges,

avenues, highways, tunnels, public parking, tolls, and other transit facilities in Puerto Rico. Additionally, the Authority provides an integrated transportation system to Puerto Rico and its people and has jurisdictional and maintenance responsibilities for highways and bridges within the Commonwealth.

#### **5.14.1 Existing Conditions**

Many linear utilities follow existing roadways; therefore, during construction there could be temporary road closures, traffic pattern changes, and re-routing of public transportation. Puerto Rico has over 2 million automobiles, trucks, and buses constituting one of the highest vehicle densities per capita in the world (Miller 2009). Based on 2007 data published by the FHWA, there are 2,531,199 registered motor vehicles and 115,865 registered motor cycles in the Commonwealth (FHWA 2011). Puerto Ricans are heavily dependent on their transportation system with the average worker commute time of 29.2 minutes, and 90.5% of the workforce travels to work via car, truck or van. Mobility in regional areas is critical for social, recreational and economic activities. Commuting is a part of daily life and truck transportation plays a vital role in Puerto Rico's economy. Although the presence of railway is minimal on the island and used primarily for the transportation of sugar cane. Per USDOT statistics, the Puerto Rico road system is a total of 18,359 miles (FHWA 2017). Puerto Rico has 35,048 total lane miles (or 56,404 km) of roadway of which 6,322 lane miles (or 10,174 km) are in rural areas. The roadways in rural areas include unimproved roads. FHWA assumed that unimproved roadways constitute two lanes in their calculations (FHWA 2013). FHWA lists 2,325 bridges of which 444 are in good condition, 1,608 are in fair condition, and 273 are in poor condition (FHWA 2018). Maintenance and reconstruction of roads and highways must be to the most current standards required by PRDTOP, or as a minimum the "General Design Criteria" for roads and highways (PRDTOP 1979), or the "Minimum Standards for Rural Municipal Roads" (PR FEMA 1992).

#### **5.14.2 Potential Impacts and Proposed Mitigation**

##### **Alternative 1: No Action**

In the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Without permanent repairs, FEMA anticipates that further deterioration of utilities, including pipes under roadways, will lead to minor long-term impacts as additional temporary repairs occur.

##### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

FEMA anticipates short-term minor impacts to transportation facilities during the implementation of Alternative 2 actions. Specifically, this would occur in areas where utilities are within or intersect transportation ROWs. Impacts may include temporary road closures, detours, and lane restrictions. The Applicant would minimize impacts by using MOT activities. The DTOP Design Manual (aka the Work Zone Safety and Mobility Policy) requires contractors working in Puerto Rico to implement MOT plans and conduct public notifications. Following repair, replacement, and/or upgrades to utilities, FEMA anticipates that there would be no long-term adverse impacts to transportation infrastructure. A beneficial impact would result from utilities being more resilient and less likely to cause disruptions to the Commonwealth's transportation network.

### **Alternative 3: Realignment or Relocation of Utilities**

FEMA expects negligible to minor long-term adverse impacts to transportation facilities following the relocation or realignment of utilities. The impacts would be associated with future repairs in areas where utilities previously didn't intersect the Commonwealth's transportation network. Adverse short-term minor impacts may occur during construction. The use of MOT by the Applicant, coordination between the Applicant and managers of the Commonwealth's transportation network, and public notifications would minimize adverse impacts to a level of less than major. A beneficial impact would result from utilities being more resilient and less likely to cause disruptions to the Commonwealth's transportation network.

### **Alternative 4: Combination**

Generally, the impacts to transportation facilities from this alternative would be similar to those described for Alternatives 2 and 3.

## **5.15 PUBLIC SERVICES AND UTILITIES**

This section evaluates the potential impacts of the Action Alternatives on public utilities. A public utility is an organization that maintains the infrastructure for a public service. The interruption of public utilities can cause public health concerns. A reduction in the reliability of public utility services affects all areas of daily life.

The classification of utilities for this PEA includes: water storage facilities, treatment plants, and delivery systems, supplemental power generation, transmission, and distribution facilities, including, but not limited to, wind turbines, generators, substations and power lines, natural gas transmission and distribution facilities, sewage collection systems and treatment plants, landfills, and communication systems.

### **5.15.1 Existing Conditions**

The power grid alone includes six fossil fuel and seven hydroelectric generation sites, owned and operated by the PREPA, as well as privately owned generation facilities consisting of two cogeneration plants, two windfarms, and five solar farms. The electric grid includes 2,478 miles of transmission lines, 31,485 miles of overhead and underground distribution lines across the service territory, and 334 substations and transmission centers. Approximately 6% of the distribution lines are underground (Build Back Better 2017).

Approximately 69% of PREPA's 5,839 megawatt (MW) generating capacity is from petroleum. Four central locations generate the majority of electricity: Costa Sur Power Plant, Complejo Aguirre, San Juan, and Palo Seco.

Puerto Rico receives natural gas imported primarily from Trinidad and Tobago, as liquified natural gas (LNG) through the Penuelas terminal and regasification facility at Guayanilla Bay on the southwestern coast. This facility supplies the adjacent 507-megawatt EcoElectrica electricity generating plant. The facility also receives LNG at the terminal as standardized cryogenic containers to supply fuel to some industrial customers.

PRASA owns and operates the island-wide public water and wastewater systems and has five operational regions: Metro, North, South, East, and West. PRASA has more than 20,000 miles of water and wastewater pipelines and operates 51 wastewater treatment plants that treat 206 million gallons per day of sewage and reported 126 water treatment facilities that treat approximately 500 million gallons per day (PRASA 2019 and PRASA 2013).

USEPA in its 2015 settlement with PRASA requires numerous upgrades in the system to bring the system into compliance with the CWA. PRASA estimated at that time the costs would be up to \$1.5 billion (USEPA, 2015). These are long-standing infrastructure issues that USEPA and PRASA have been coordinating on as they relate to water quality and potential human health. Communications within the Commonwealth entails multiple resources, such as, cellular towers and provider networks, fiber optic lines, radio and associated broadcast towers, microwave antennas standard radio towers, land mobile radio (LMR) radio systems, 2-way radio radios, pagers, and Satellite phones (Cornell 2019).

Wireless priority service (WPS) cellular phone providers include: AT&T, Mobility, Sprint/Nextel (CDMA), Sprint/Nextel (iDEN), T-Mobile, and Verizon Wireless, and Claro. Cellular antennas are commercial wireless structures that send and receive signals connecting mobile devices within the carrier's designated coverage area to the public switched network. A Federal Communication Commission (FCC) database of cellular towers of greater than 200 ft in height indicates there are 88 total identified cell tower locations (51 towers are AT&T and 37 towers are other carriers) (Cornell 2019).

There are approximately 238 broadcast antennas in the Commonwealth-wide. Broadcast antennas comprise of AM, FM, TV Digital, and TV NTSC. Additionally, there are approximately 6,141 microwave towers (Cornell 2019). Microwave towers transmit video, audio, or data between two locations.

### **5.15.2 Potential Impacts and Proposed Mitigation**

Public services and utility infrastructure likely exist across all developed portions of the Commonwealth and would be in the vicinity of some, if not all, project sites. The locations of public services and utilities would be determined at each project site in order to assess individual and cumulative impacts. FEMA would document the absence or presence of public services and utilities, as well as, potential impacts within the project REC.

This PEA assesses the potential adverse and beneficial impacts of the Action Alternatives on utilities and infrastructure. This PEA does not include actions that have the potential to cause long-term effects that adversely affect human health and the environment. This PEA does not include actions that would cause long term disruptions to infrastructure networks that residents of the Commonwealth depend on for their existence. If projects exceed the capacity of the existing utility system, such that it requires a significant expansion of infrastructure, they would be beyond the scope of this PEA and require FEMA to perform an additional NEPA analysis.

Although FEMA funded activities under the Action Alternatives would substantially help the utilities within the Commonwealth bring their infrastructure up to current codes and standards, issues of concern do exist. For projects covered under this PEA, the main issues of concern would

be associated with the disruption of service during the construction phase, increased demand for utility capacity, and comparable increases in capacity from implementing the proposed Alternatives.

### **Alternative 1: No Action**

Under the No Action alternative, FEMA does not provide grant funding for utility projects, therefore potentially leaving communities with unreliable services and vulnerable to future storm events. FEMA anticipates that the emergency repairs made following Hurricane Maria will not serve as long-term solutions to the Commonwealth's aging infrastructure. The lack of reliability could prove to be a long-term adverse impact on those communities and populations that rely on public services and utilities for their existence.

### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

During the construction phase of Alternative 2 actions, projects could cause adverse negligible to minor short-term impacts to Puerto Rico's social infrastructure. Social infrastructure includes facilities and institutions such as emergency services, schools, and hospitals. The Applicant would be responsible for coordinating with local communities and institutions regarding any possible delays or interruptions in utility service. Furthermore, the Applicant would be responsible for coordinating with service providers and construction managers to minimize impacts to public services and the communities they support. An adverse short-term minor impact to public services located within the project area could occur as a result of temporary road closures. The deployment of MOT by the Applicant's engineers and contractors would reduce or eliminate potential impacts due to road closures.

FEMA anticipates that Alternative 2 would have no adverse long-term impacts to public services and utilities as well as, the communities they support. This alternative would have long-term beneficial impacts, such as making the utilities more reliable and hardened against future disasters. By bringing utilities up to current codes and standards, energy demands on the existing system would not increase. For most utilities, United States Congress has legislated mandatory increases in energy efficiency for the development of current codes and standards (USDOE 2020). As such, FEMA anticipates that the Commonwealth would experience a long-term negligible beneficial impact by improving the energy efficiency of their utility networks.

### **Alternative 3: Realignment or Relocation of Utilities**

The impacts from this alternative would be similar to those described for Alternative 2. However, projects that involve the realignment and relocation of utilities are more likely to intersect existing utility and transportation networks. During the construction phase, short-term impacts to social infrastructure, utility service providers, and the communities they support could occur. The Applicant would be responsible for coordinating with local communities and institutions regarding any possible delays or interruptions in service. Furthermore, the Applicant would be responsible for coordinating with service providers and construction managers to minimize impacts to public services and their communities. FEMA anticipates that the existing utilities will remain in operation until the realigned or relocated utility is ready for service. This would mitigate



disruptions in public services and utilities. Due to limiting capacity to pre-Hurricane Maria levels, there would be no additional long-term energy demands on the Commonwealth's utility networks.

FEMA expects that the Commonwealth would derive long-term beneficial impacts from Alternative 3. The United States Congress has legislated mandatory increases in energy efficiency for the development of current codes and standards (USDOE 2020). As such, the Applicant would be able to conserve energy as they provide the same level of service to their communities. The realignment and relocation of utilities to less disaster-prone areas would inherently make the Commonwealth's utility networks more resilient. A more resilient network of public services and utilities would in turn benefit the health and safety of the communities they support.

#### **Alternative 4: Combination**

The impacts to utilities from this alternative would be similar to those described for Alternatives 2 and 3.

### **5.16 PUBLIC HEALTH AND SAFETY**

A considerable number of health and safety laws and regulations exist for a wide variety of activities. An exhaustive review of these various rules is beyond the scope of this PEA. With regards to worker safety, the U.S. Congress enacted the Occupational Safety and Health Act of 1970, 29 USC § 651 et seq. (OSHA) to assure safe and healthful working conditions for working men and women.

#### **5.16.1 Existing Conditions**

Safety considerations can arise in many stages of the NEPA process. Public health and safety can include everything from the safety and security of food supplies to the safe use of drug and medical devices. Utility projects in particular have the potential to affect our safety and security as our protective and health services rely on a vast network of utilities to function in a fast and efficient method.

Within the Commonwealth, the primary protective and health services include fire protection, law enforcement, and medical emergency services. The follow describes the primary authorities tasked with ensuring public health and safety within the Commonwealth:

- The Puerto Rico Firefighters Corps (*Cuerpo de Bomberos de Puerto Rico*) is a Commonwealth-wide fire department with over 91 fire stations. There are six (6) operational zones located in Aguadilla, Arecibo, Carolina, Caguas, Ponce and San Juan. There are eleven (11) districts located in: San Juan, Bayamón, Carolina, Rio Piedras, Caguas, Humacao, Ponce, Guayama, Aguadilla and Arecibo. The Puerto Rico Firefighters Corps' Special Operations Division is a separate division that performs functions such as search and rescue operations in conjunction with the emergency medical services (*Cuerpo de Bomberos de Puerto Rico* 2020).
- Within the Commonwealth, the municipal police forces, the Special Investigation Bureau, and the Department of Justice make up the local law enforcement apparatus. In all, approximately 17,000 officers service 78 municipalities. Local police departments provide

law enforcement and emergency services for each community and the surrounding areas. Hurricane Maria has had an adverse effect on many of Commonwealth's police officers, some of which have chosen to quit Puerto Rico's law enforcement establishment.

- The United States Coast Guard (USCG) is the Federal agency operating in Puerto Rico responsible for maritime safety and security, protection of natural resources, homeland security, and national defense. Sector San Juan of the USCG serves all of Puerto Rico
- The Puerto Rico Medical Emergency Corps is the agency of the executive branch of the government of Puerto Rico that responds to all medical emergencies within the jurisdiction of Puerto Rico. The Puerto Rico Department of Health manages the Puerto Rico Medical Emergency Corps. Additionally, the Puerto Rico Medical Emergency Corps is a component of the Puerto Rico's Emergency Operations Center (Departamento de Salud Gobierno de Puerto Rico 2020).
- Throughout the mainland of Puerto Rico, there are 68 hospitals (Puerto Rico Hospital Association 2019) and 30 clinics, all of which have re-opened since Hurricane Maria (Kaiser Family Foundation 2018). Prior to Hurricane Maria, the island of Vieques was served by one hospital and one clinic. Roughly 500-700 physicians and surgeons have left the island since Hurricane Maria (Lliveras 2018). There is no available data on how many medical professionals have since returned to the Commonwealth.

## **5.16.2 Potential Impacts and Proposed Mitigation**

### **Alternative 1: No Action**

Under the No Action alternative, FEMA does not fund utility projects potentially leaving communities with unreliable utility services and be more vulnerable to future storm events. FEMA anticipates that the existing level of utility service is sufficient to maintain the Commonwealth's public health and safety. However, emergency measures funded by FEMA following Hurricane Maria may not be sufficient to prevent localized future power outages, water shortages, unsanitary conditions, or disruptions in communications. Each of which could adversely affect the administration of emergency medical personnel, police, and fire protective services. FEMA anticipates that the No Action Alternative has the potential to cause short-term and long-term less than major adverse impacts to public health and safety.

### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Pre-construction meetings and equipment trainings for workers would minimize the risk of employment related injuries from construction phase activities. The potential adverse impact to worker safety would be short-term and minor. The use of qualified personnel trained in the operation of their equipment as well as, the implementation of OSHA safety measures would minimize risk to human health and safety. The Applicant would be responsible for posting the appropriate signage and placement of construction barriers to alert the public of potential hazards and prevent unauthorized access to project sites.

Under Alternative 2, the Applicant would use current codes and standards for permanent utility projects. During the construction phase, utility interruption and delays in fire, emergency, and law

enforcement services could occur; however, the disruptions in service from upgrading utilities would cause only short-term negligible to minor adverse impacts. This Alternative includes activities that may require the re-routing of traffic. Road detours could adversely impact emergency services depending on how far traffic is to be re-routed. The Applicant can minimize disruptions through MOT, coordinating with service providers, and public notifications.

FEMA anticipates that results of Alternative 2 actions would cause no adverse long-term impacts to the administration of public health and safety services. The Commonwealth's residents may experience a long-term benefit to their health and safety from the application of more resilient utilities. Police and fire protective services would be able to consistently respond to emergencies in a timely manner. Patients would arrive at medical facilities in time for life saving measures. Additionally, medical personnel and medical devices would be able to function without concern of possible disruptions in utility service. By repairing and upgrading unstable utilities, Alternative 2 actions would reduce or eliminate the risk of electrocutions or the occurrence of similar types of catastrophic events. Based on the current status of Puerto Rico's utility networks, this would result in a long-term benefit to the health and safety of Puerto Rico's communities.

### **Alternative 3: Realignment or Relocation of Utilities**

Pre-construction meetings and equipment trainings for workers would minimize the risk of employment related injuries from construction phase activities. The potential adverse impact to worker safety would be short-term and minor. The use of qualified personnel trained in the operation of their equipment as well as, the implementation of OSHA safety measures would minimize risk to human health and safety. The Applicant would be responsible for posting the appropriate signage and placement of construction barriers to alert the public of potential hazards and prevent unauthorized access to project sites.

Alternative 3 would have no long-term adverse impacts to public health or safety. The Applicant would use current codes and standards for the development and installation of utilities that can handle the network's pre-disaster capacity and be more resilient to future storm events. Similar to Alternative 2, fire, emergency, and law enforcement services could experience interruptions in service. Utility interruptions during the relocation process could cause short-term negligible to minor adverse impacts as road closures occur and the Applicant's contractor relocates various power and communications networks. The Applicant would be responsible for minimizing disruptions of service through the implementation of MOT, coordinating with utility service providers, and public notifications. The delays may be a bit longer than Alternative 2, as relocations may take longer than replacement in some cases.

The affected populations are likely to experience a long-term beneficial impact to their public health and safety from the application of more resilient utilities. Police and fire protective services would be able to consistently respond to emergencies in a timely manner. Patients would arrive at medical facilities in time for life saving measures. Additionally, medical personnel and medical devices would be able to work without concern of possible disruptions in services. An additional long-term benefit to public health and safety would occur from realigning or relocating utilities to less disaster-prone areas. By removing utilities from areas where accidents have the potential to occur, the public would inherently be safer.

#### **Alternative 4: Combination**

Generally, the impacts to public health and safety from this alternative would be like those described for Alternatives 2 and 3.

#### **5.17 HAZARDOUS MATERIALS**

Hazardous materials and/or wastes constitutes any solid, liquid, contained gaseous or semisolid waste, or any combination of materials and/or wastes that pose a substantial present or potential hazard to human health and the environment. Hazardous materials constitute a type of substance demonstrating either flammable, corrosive, reactive, or toxic characteristics that may pose a substantial existing or potential hazard to human health and the environment. Federal and State environmental, safety occupational, and transportation laws and regulations extensively regulate the handling and use of hazardous materials. Examples of common hazardous materials include asbestos, lead, petroleum products (e.g. gasoline, heating oil, etc), paints, toxic (e.g. pesticides, herbicides, Polychlorinated biphenyls , etc.) or highly reactive chemicals (e.g. explosives, etc.). Improper management or disposal of hazardous materials and/or wastes can lead to pollution or contamination of groundwater, surface water, soil, and/or the air.

Regulatory agencies enforce laws governing hazardous materials and wastes to ensure the protection of the environment and human health through the establishment of management systems. The systems track information regarding the makeup of the hazardous material or the identification, use, storage, treatment, transportation, and disposal of the hazardous waste. The regulations manage hazardous materials and wastes from cradle to grave. The laws and regulations governing hazardous materials and wastes provide a framework for adequate investigation and cleanup of sites already contaminated by the release of hazardous materials and wastes.

#### **Safety and Occupational Health**

Safety and occupational health issues include exposure to natural hazards; one-time and long-term exposure to asbestos, lead, radiation, chemicals, and other hazardous materials; and injuries or deaths resulting from a one-time accident. Existing utilities could cause safety and occupational health concerns for workers as well as, residents and pedestrians during or as a result of project implementation.

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 USC § 9601 *et seq.*) Resource Conservation and Recovery Act (RCRA), Subtitle D are the primary Federal laws for the management and disposal of hazardous substances. The USEPA regulates the management of non-hazardous solid waste according to the RCRA. Under RCRA, the USEPA is also in charge of regulating the handling and disposal of hazardous wastes.

Previous land use at the project sites and/or their location relative to known hazardous waste sites can be an indicator of whether hazardous materials are likely to be present. Project specialists from FEMA would review online databases that provide information about specific known contaminated locations to determine if a project area is located within proximity to a known source of contamination. Additionally, facilities constructed prior to the ban on lead-based paint and asbestos in 1978 or with materials manufactured prior to 1978 have the potential to contain lead-

based paint or asbestos. Some countries after 1978 continued to manufacture materials that contained lead-based paint or asbestos. Exposure to these materials could impact the health of persons working on the project site and in the surrounding area.

Lead exposure can result from contact with lead-based paint chips, contact with or inhalation of paint dust, or inhalation of lead vapors from torch-cutting operations. Lead exposure can adversely affect the human nervous system. Exposure to lead based paint is especially dangerous to small children. OSHA considers all painted surfaces in which lead is detectable as a potential occupational health hazard. Asbestos exposure can result from the inhalation of dust from a multitude of construction materials or household products.

The power generation and transmission industries have widely deployed polychlorinated biphenyls (PCBs) as dielectric and coolant fluids and in heat transfer fluids. Because of their longevity, PCBs are still widely in use, even though their manufacture has declined drastically since the 1960s. The United States banned PCB production in 1978 because of their environmental toxicity and classification as persistent organic pollutants.

These industries also use diesel fuel for powering equipment. The potential for diesel power containment vessels to release increases during a disaster. Proper secondary containment is necessary to prevent releases to the environment.

Water and wastewater industries typically use various chemicals for treatment. Some of these chemicals may be hazardous materials and if released during a disaster would have the potential to adversely affect human health and the environment. Releases into the environment may also occur from pipe breaks of sewage water which may contaminate and impact local waterways with harmful bacteria. These bacteria can get into waterways and affect species in aqueous environments as well as have the potential to affect human health of those utilizing that resource.

Releases of contaminants from utility facilities may occur during a disaster from both flooding and wind-driven activities. Flooding of facilities can overcome secondary containment barriers releasing those stored chemicals. Wind-driven elements of a disaster have the potential to impact facilities by compromising the integrity of chemical storage areas by impacting the storage area directly.

USEPA RCRA Info online database is a national program management and inventory system of hazardous waste handlers. The activities of hazardous waste generators, transporters, treaters, storages and disposers must provide documentation to state environmental agencies. In turn, these agencies, pass on the information to regional and national USEPA offices. The RCRA Info database identifies location data for specific hazardous waste handlers and information on treatment, storage, and disposal facilities regarding permitting and closure status, compliance with federal and state regulations, and cleanup activities. In addition to a Non-Generator, there are three types of hazardous waste generators:

- Conditionally exempt small quantity generators (CESQGs) generate less than 100 kilograms (kg) of hazardous waste per month or less than 1 kg of acutely hazardous waste per month.

- Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.
- Large quantity generators (LQGs) generate more than 1,000 kg of hazardous waste per month or more than 1 kg of acutely hazardous waste per month.

The USEPA National Priority List (NPL) is the list of sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants.

### 5.17.1 Existing Conditions

The PREQB has licensed several distinct types of landfills and disposal facilities. The classes of waste permitted for handling and disposal include municipal solid waste, some special waste, land clearing debris, construction and demolition debris, industrial waste, and commercial waste. The types of facilities include municipal landfills as well as, gas recovery facilities. Federal and State regulations require proper handling and disposal of the debris produced by the Proposed Action.

The RCRA online database lists 1,552 active generator sites throughout the Commonwealth (USEPA 2019e).

Currently, there are 19 actively managed sites under the Superfund Alternative (SA) approach. In addition to the 19 active sites, the USEPA has obtained closure on at least six former NPL sites. The 19 active NPL sites in Puerto Rico include the following:

***Vieques:** Atlantic Fleet Weapons Training Area; **Cabo Rojo:** Cabo Rojo Ground Water Contamination; **Cabo Rojo:** Cidra Ground Water Contamination; **Corozal:** Corozal Well; **Dorado:** Dorado Ground Water Contamination; **Jobos:** Fibers Public Supply Wells; **Caguas:** Hormigas Ground Water Plume; **Juncos:** Juncos Landfill; **Maunabo:** Maunabo Area Ground Water Contamination; **Utua:** Papelera Puertorriquena, Inc.; **Arecibo:** Pesticide Warehouse I; **Manati:** Pesticide Warehouse III; **Penuelas:** PROTECO; **San German:** San German Ground Water Contamination; **Candelaria Ward:** Scorpio Recycling, Inc.; **Bo. Cambalache:** The Battery Recycling Company; **Barceloneta:** Upjohn Facility; **Vega Alta:** Vega Alta Public Supply Wells; **Rio Abajo Ward:** Vega Baja Solid Waste Disposal (USEPA 2019f).*

In 1988, the USEPA issued regulations requiring certain companies to report the asbestos used in their products. Products containing asbestos (e.g. insulation for pipes, walls, ceiling tiles, and floor tiles) can may be present anywhere in the Commonwealth. The naked eye cannot see asbestos fibers and, when inhaled, can cause asbestosis which can progress to cancer, disability, and death. Damaged or isolated utilities create public safety issues during and following disaster events. Utility structures constructed prior to 1978 or with materials manufactured prior to 1978 have the potential to contain lead-based paint or asbestos.

Since the 1990s, PREPA and PRASA have been in the process of removing PCB-laden transformers; however, some transformers may remain. It is anticipated that there may be transformers containing PCB-laden oil at non-PREPA and non-PRASA facilities. Exposure can result from fallen or damaged transformers that leak. Ballasts from fluorescent lights manufactured

prior to 1978 may contain PCBs as well. Exposure can result from leaking or damaged ballasts by direct contact or through drinking/eating water containing PCBs.

### **5.17.2 Potential Impacts and Proposed Mitigation**

#### **Alternative 1: No Action**

Under the No Action alternative, FEMA would not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Without permanent repairs, infrastructure may further deteriorate and result in the unregulated releases of contaminants into the environment. The No Action Alternative has the potential to adversely impact Puerto Rico. Although the CWA requires most licensed handlers of hazardous waste material to maintain a spill prevention and countermeasures plan (SPCC), uncontrolled discharges continue to occur. As such, FEMA anticipates adverse impacts in both the short and long-term to a level of less than major under the No Action Alternative.

The potential for utilities to deteriorate and release unregulated discharges exists for most utility service providers. Power generation, power transmission and distribution, cell towers, and WWTPs typically store or transport hazardous materials or wastes that could be detrimental to the environment and public health. For instance, the release of untreated waste from broken pipes can affect human health by temporarily contaminating local drink water supplies and recreational waters. The potential for aboveground and underground storage tanks to release has been well documented. Prior to recent regulations requiring secondary containment, on-site storage tanks were typically of single wall construction which lacks the ability to withstand corrosive forces and are susceptible to accidents. A similar situation exists with PCB use. While PCBs are capable of withstanding degradation, the equipment that relied on them are prone to deterioration and again susceptible to accidents.

#### **Alternative 2: Repair, Replacement, and Upgrade of Utilities**

Under Alternative 2, construction activities may temporarily use, encounter, or generate hazardous materials and wastes. Alternative 2 would use current codes and standards to implement proposed actions. Current codes and standards rely on materials that are more durable and safer for the environment than their predecessors. If contractors encounter contaminated soil or groundwater during construction, the Applicant must stop work. The contractor must contact PREQB and other regulators in accordance with applicable permits. The Applicant will be responsible for adhering to PREQB guidance before resuming work. For circumstances where the CWA requires the implementation of an SPCC, the plan would limit impacts of hazardous materials to the immediate area of the release.

The Applicant will ensure that on-site personnel follow applicable OSHA regulations for the abatement of asbestos and handling of lead-based paint. The Applicant will be responsible for ensuring their contractors use the appropriate level of personal protective equipment (PPE). The Applicant will ensure that on-site personnel will receive appropriate job specific safety training in accordance with OSHA regulations. The Applicant is responsible for the proper removal and disposal of all solid or hazardous wastes generated from project activities. The applicant will install construction barriers around active sites to prevent unauthorized personnel from gaining access.

FEMA anticipates that the use of new materials that are up to current codes and standards, properly trained and equipped personnel, PREQB licensed disposal facilities, and development of an SPCC would minimize both adverse short-term and long-term impacts to human health and the environment to a level of less than major. A short and long-term beneficial impact to the environment and human health would come from the removal of old equipment that could potentially release hazardous materials. If the Applicant encounters soil and water contaminated medium, an additional beneficial impact would come from the treatment and removal of the contaminated material from the environment.

### **Alternative 3: Realignment or Relocation of Utilities**

During the construction and operational phases of Alternative 3 actions, the Applicant may require the use of hazardous materials or generate hazardous wastes. Alternative 3 actions will involve use of materials that meet current codes and standards. Materials that meet current codes and standards are typically more durable and less harmful to the environment than their predecessors.

The abandonment or removal of existing utilities can result in the generation of hazardous wastes. The Applicant will be responsible for disposing of all hazardous waste at PREQB licensed facilities. Per PREQB guidance, the Applicant will only be able to dispose of hazardous materials at facilities licensed to receive such classes of waste. The handling of materials with painted surfaces containing lead, materials containing asbestos, or other hazardous substances, must follow USEPA and PREQB regulations. These regulations provide appropriate asbestos abatement procedures and would minimize the potential for an unregulated release of asbestos. The Applicant will be responsible for ensuring that construction workers are wearing the appropriate level of PPE and receive proper training.

Similar to Alternative 2, if contractors encounter contaminated soil or groundwater during construction, the Applicant must stop work. The contractor must contact PREQB and other regulators in accordance with applicable permits. The Applicant will be responsible for following PREQB guidance before resuming work. The Applicant is responsible for the removal and disposal of all solid or hazardous wastes generated by project activities. The Applicant will install construction barriers around active sites to prevent unauthorized personnel from gaining access.

FEMA anticipates that the use of new materials that are up to current codes and standards, properly trained and equipped personnel, PREQB licensed disposal facilities, and development of an SPCC Plan would minimize both adverse short-term and long-term impacts to human health and the environment to a level of less than major. A short and long-term beneficial impact to the environment and human health would come from the removal of old equipment that could potentially release hazardous materials. If the Applicant encounters soil and water contamination, an additional beneficial impact would come from the treatment and removal of contaminated materials from the environment.

### **Alternative 4: Combination**

Generally, the impacts to from hazardous materials and waste from this alternative would be like those described for Alternatives 2 and 3.



## **5.18 CUMULATIVE IMPACTS**

In accordance with NEPA, this PEA considers the overall cumulative impact of the Action Alternatives. The evaluation of cumulative impacts requires an assessment of the effects of the Action Alternatives and similar actions on the Commonwealth's vulnerable natural and socioeconomic resources. The statutory basis for considering cumulative impacts for federal actions under NEPA is in Title 42 USC 4321 et seq. In addition to NEPA, the CWA, CAA, Section 106 of the NHPA, and Section 7 of the ESA individually require an evaluation of cumulative effects for resources covered under their authorities.

According to CEQ regulations, cumulative impacts represent the "impact on the environment which results from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what federal agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively consequential actions taking place over a period" (40 CFR 1508.7). When combined with other actions affecting utilities and similar resources, the activities covered by this PEA could lead to cumulative impacts. The scale of those impacts would depend on the number of projects implemented, the size of the projects, and locality and proximity of the projects.

### **5.18.1 Summary of Cumulative Impacts**

FEMA identified few permanent utility-related projects in progress or substantially planned by Federal agencies as of the time of writing this PEA. During and shortly after the storm event there were many disaster emergency response projects covering the entire Commonwealth. The federal response to Hurricane Maria included large scale debris removal, transportation structure stabilization or replacement, and all types of utility infrastructure emergency repair or replacement. The federal agency response was unprecedented in scope with over 19,000 federal employees from 80 federal agencies deploying to the Commonwealth and U.S. Virgin Islands.

All the 2,478 miles of transmission lines and remaining electrical grid infrastructure required survey and repair and 25 percent of all the structures were damaged and temporarily rebuilt. Forty out of 114 water treatment plants were out of service as were 22 of the 51 wastewater treatment plants. Eighty percent of the above ground fiber optic lines were damaged and 95 percent of the cellular communication towers were out of service (COR3 2018). Federal agencies have funded emergency repairs and stabilization for all of these facilities over the last two years

FEMA has accomplished much of their post-disaster work through mission assignments and funding of various federal agencies such as the USACE. The USACE was responsible for the issuance of an unprecedented number of contracts for emergency response construction. The USACE's emergency projects affected all aspects of commerce and life within the Commonwealth. For example, the USACE installed over 2,300 electric emergency generators in Puerto Rico as part of their recovery efforts (GAO 2018).

The Puerto Rico Recovery Plan (COR3 2018) states the rebuilding of utilities would cost approximately \$2 billion for communications, \$17.5 billion for potable water, wastewater and stormwater systems, and \$18 billion for the electrical grid. The plan states that there are 17 federal agencies it expects to receive funding from for its energy and communications systems. The

sources of funding referenced in the plan include FEMA, Community Development Block Grant-Disaster Recovery through HUD, United States Department of Health and Human Services, United States Department of Homeland Security, U.S. Department of Commerce, USDOE, United States Department of Labor, United States Department of Education, USEPA, United States Department of Defense, USDOT, FCC, NOAA, National Science Foundation, USDA, and the United States Department of Veterans Affairs. The Sub-Applicants receiving federal funding to complete a majority of the utility projects would likely be PREPA for actions involving energy generation, transmission and distribution and PRASA for all things water. It remains unclear what entities will be associated with the implementation of projects involving the Commonwealth's communications networks.

After the initial emergency response, FEMA began reviewing grant applications for the completion of permanent work projects. For grant applications that FEMA approves, the federal government transfer funds to COR3 who is responsible for overseeing the administration of the projects on behalf of the Commonwealth of Puerto Rico. In addition to funding provided by FEMA in response to the disaster, various federal agencies continue to finance projects that fall under their Congressionally approved authorities. For instance, FHWA continues to support the Commonwealth's transportation sector by funding bridge or road repairs while, the USEPA is actively restructuring loans and issuing grants to improve drinking water and wastewater systems. As part of the USEPA's program, the USEPA announced in August 2019 that it was restructuring more than 200 delinquent loans it had issued to PRASA. The delinquent loans totaled approximately \$571 million. The loans have been in delinquency since 2016. The USEPA's decision to restructure the delinquent loans clears the way for PRASA to begin receiving new federal funding. It is PRASA's intent to use federal grant funding to begin financing drinking water permanent repair infrastructure projects throughout the Commonwealth (USEPA 2019g).

For larger permanent work projects that involve multiple agencies, FEMA anticipates that it will serve as the lead funding source and that other agencies will be responsible for administering the projects. The Guajataca Dam site is potential a prime example of how this arrangement would work. While FEMA is the likely source of funding for large permanent work projects involving the Guajataca Dam, the USACE would be responsible for scoping and contracting engineering and construction services. As joint projects become more clearly defined, FEMA as the likely lead agency would be responsible for evaluating cumulative impacts on a case-by-case basis. Under this scenario, FEMA would evaluate cumulative impacts in the preparation of a separate NEPA document. Project-specific cumulative impact analyses can be more meaningful than a single programmatic analysis due to range of actions evaluated programmatically. If the magnitude of impacts is greater than those described in this PEA or require additional mitigation measures beyond those listed in Section 6, a tiered NEPA document or supplemental NEPA document would be prepared.

FEMA expects the Action Alternatives in this PEA would not result in major cumulative impacts since FEMA is funding actions that involve the repair, replacement, or rehabilitation of projects that are similar in function, size, and locality to the existing systems. Therefore, most cumulative impacts from the initial installation and temporary restoration of the projects on the human environment have already occurred prior to and after Hurricane Maria. FEMA anticipates that the extended grant approval process for projects covered under this PEA or tiered from the PEA would further minimize cumulative impacts to Commonwealth's environmental and social resources. The

process of implementing projects over an extended time period would likely ensure that no one resource is overburdening at any given time by the implementation of federally financed utility projects.

- For circumstances where multiple utility projects are under construction within the same watershed and at the same time, a cumulative impact to resources such as vegetation, water quality, and soil could occur. Although adverse, FEMA anticipates that cumulative impacts from the utility projects covered under this PEA would be short-term and less than major. The conservation measures and BMPs presented in Section 6 will help minimize cumulative impacts to environmental and socioeconomic resources by maintaining compliance with applicable permit conditions.
- The combined effects of concurrent construction projects could have a short-term less than major cumulative effect on traffic delays and congestion, noise, and social services. The Commonwealth and Subapplicant will be responsible for coordinating project coordination and project schedule with their public utility departments and environmental permitting agencies.

## 6.0 PERMITS AND REQUIREMENTS

The Applicant or Subapplicant is responsible for obtaining all applicable Federal, State, and local permits and other authorizations for project implementation prior to construction and adherence to all permit conditions. Any substantive change to the approved scope of work will require re-evaluations by FEMA for compliance with NEPA, and other laws and EOs. The Applicant or Subapplicant must also adhere to the following conditions during project implementations and consider the below conservation recommendations. Failure to comply with grant conditions may jeopardize Federal funds:

1. **The Applicant or Subapplicant:** Must comply with all applicable environmental and historic preservation laws. Federal funding is contingent upon acquiring all necessary Federal, State and Local permits. Noncompliance with this requirement may jeopardize the receipt of federal funds.
2. **Stormwater and Soils:** Under the USEPA NPDES, any project disturbing more than one acre requires a USEPA Construction General Permit, an NPDES Permit, and a SWPPP. The permits and plan require BMPs which serve to protect soils, in addition to stormwater. Applicant and Subapplicant are required to: manage any piles of soil or debris, minimize steep slope disturbance, preserve native topsoil unless infeasible; and minimize soil compaction and erosion (USEPA 2018).
3. **Erosion and Sediment Control:** Each project will implement the BMPs and guidelines recommended in the Puerto Rico Erosion and Sediment Control Handbook for Developing Areas (PREQB-PR & USDA-NRCS). All necessary permits such as NPDES must be obtained and required plans (i.e. SWPPP) implemented.
4. **Endangered Species Act:** All projects will comply with and implement the ESA conditions found in any FEMA programmatic consultation that applies, or those conditions from a project-specific consultation. Any actions that may adversely affect federally listed species or designated critical habitat. Impacts not resolved through consultation, will require individual NEPA compliance.
5. **Work Affecting Water:** Any work that may affect waters of the United States will be consulted on with the USACE. The Applicant is responsible for obtaining appropriate permits prior to the beginning of work, and implementing all requirements of the permits, including pre-construction notification.
6. **Floodplain:** For FEMA funded projects that are within or may affect a floodplain, FEMA will apply the 8-Step Decision-Making Process. FEMA will assess short- and long-term effects to floodplains and apply applicable avoidance, minimization, and mitigation measures to limit impacts to less than major. FEMA will consider projects in the V-Zone, those with potential major or greater impacts, or those with the potential to increase flood elevations on a case-by-case basis for whether this PEA applies, or to prepare a tiered EA or SEA. Projects must also comply with Commonwealth floodplain and flood risk regulations.

7. **Wetlands:** For FEMA funded projects that are within or may affect a wetland, FEMA will apply the 8-Step Decision-Making Process. FEMA will assess short- and long-term effects to wetlands and apply applicable avoidance, minimization, and mitigation measures to limit impacts to less than major.
8. **Historic Preservation/Archaeological Resources:** For FEMA-funded projects, FEMA will review for any historic/archaeological resources on or eligible for the National Register of Historic Places. If there is potential to affect historic/archaeological resources, the stipulations from the FEMA/SHPO Puerto Rico 2<sup>nd</sup> Amendment Programmatic Agreement of November 13, 2019 and any subsequent future amendments between the SHPO and FEMA will be applied. If applicable stipulations cannot be applied, then consultation with SHPO must occur and any recommendations implemented.
  - a. The Applicant is responsible for any applicable coordination with the Puerto Rico Institute of Culture (ICP) for compliance with Commonwealth historic preservation and archaeological requirements.
9. **Discovery of Cultural Resources:** If any cultural materials or human remains are discovered during construction, the contractor must halt work immediately and contact FEMA. FEMA staff meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983) will evaluate the discovery in coordination with SHPO.
10. **Construction Material and Debris:** Any materials deposited in eroded embankments must be removed before start of work. The Applicant is responsible for ensuring that final disposal of bituminous and any non-recyclable debris materials resulting from the restoration and demolition activities must take place at a properly PREQB permitted landfill. If necessary, waste characterization may be required for certain waste types (i.e. oil, asbestos, lead-based paint, etc.) and properly disposed. The Applicant is responsible for obtaining any permits associated with transportation and handling of construction debris.
11. **Solid and Hazardous Waste:** The Applicant will handle, manage, and dispose of all solid and hazardous waste in accordance with requirements of local, state, and federal laws, regulations, and ordinances. In addition, the Applicant will ensure that all debris is separated and disposed of in a manner consistent with the PREQB guidelines at a permitted site or landfill.
12. **Clean Air Act:** The Applicant is responsible for complying with applicable EPA and PREQB requirements for low sulfur fuels and fugitive dust suppression.
13. **Asbestos and Lead:** The Applicant is responsible for determining the presence of asbestos or lead containing materials and obtaining applicable permits before beginning work. Applicant will identify, handle, transport, and dispose of hazardous materials and/or toxic waste in accordance with PREQB requirements including.

14. **Electric Generators:** The Applicant is responsible for complying with applicable EPA and DRNE/PREQB of Puerto Rico requirements and permits for installation and operation of electric generators.
15. **Tree Cutting:** The Applicant is responsible for complying with applicable DRNE/PREQB of Puerto Rico requirements for planting, pruning, and trimming.
16. **Commonwealth Permitting:** The Applicant is responsible for contacting the Puerto Rico Permit Management Office (OGPe) for any required permits prior to starting work.
17. **Invasive Species:** The Applicant is responsible for restoring disturbed soils with planting native, non-invasive species. Construction equipment should be power-washed prior to initial transport to the construction site and prior to changing locations to prevent spread of noxious weeds.

## 7.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

This Utilities PEA is available for agency and public review and comment for a period of 15 days. The public information process will include a public notice with information about the proposed action in these three newspapers: *El Vocero*, *Primer Hora*, and *El Nuevo Dia*, with targeted outreach to environmental justice populations through notices to community organizations. A Spanish translation of the PEA Executive Summary and Public Notice will also be posted. The PEA is available for download at <https://www.fema.gov/media-library>. The website link for the PEA will also be posted on the FEMA Puerto Rico Facebook, Inc. page <https://www.facebook.com/FEMAPuertoRico/>

A hard copy of the PEA will be available for review at the following locations:

*<name and address of where EA will be posted>*

Interested parties may request an electronic copy of the PEA by emailing FEMA at [FEMA-EHP-DR4339@FEMA.DHS.GOV](mailto:FEMA-EHP-DR4339@FEMA.DHS.GOV). This PEA reflects the evaluation and assessment of the federal government, the decision maker for the federal action; however, FEMA will take into consideration any substantive comments received during the public review period to inform the final decision regarding grant approval and project implementation. The public is invited to submit written comments by emailing [FEMA-EHP-DR4339@FEMA.DHS.GOV](mailto:FEMA-EHP-DR4339@FEMA.DHS.GOV) or via mail to:

Federal Emergency Management Agency Region II – DR-4339-PR  
Puerto Rico Joint Recovery Office  
50 State Road 165  
Guaynabo, PR 00968  
Attn: Puerto Rico Utilities PEA Public Comments

If FEMA receives no substantive comments from the public and/or agency reviewers, FEMA will adopt the PEA as final and will issue a FONSI. If FEMA receives substantive comments, it will evaluate and address comments as part of the FONSI documentation or in a Final PEA.

## **8.0 LIST OF PREPARERS**

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## **APPENDIX A**

### **FIGURES (MAPS)**

## Puerto Rico: Island Overview

Incident Complex - Puerto Rico

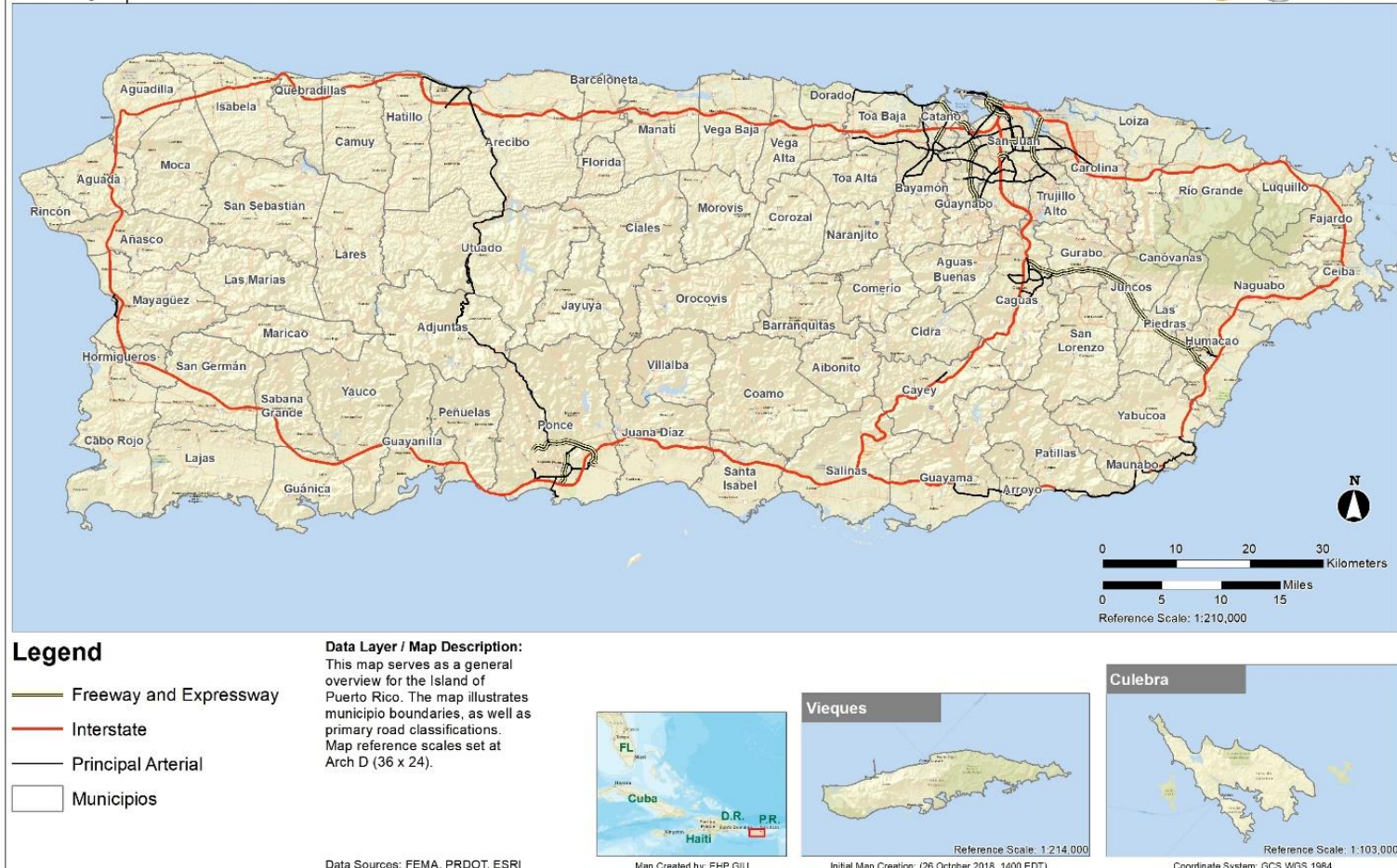


Figure 1: Puerto Rico Commonwealth Map

## Farmland Classification

Incident Complex - Puerto Rico



### Legend

- Prime farmland
- Farmland of statewide importance
- Farmland of statewide importance, if irrigated
- Prime farmland if drained
- Prime farmland if irrigated
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Municipios

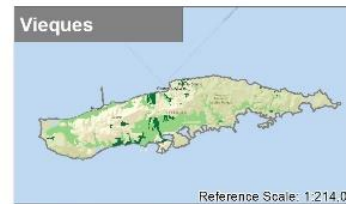
### Data Layer / Map Description:

This map displays areas of both prime and potential areas of prime farmlands of Puerto Rico.  
Map reference scales set at Arch D (36 x 24).

Data Sources: FEMA, ESRI



Map Created by: EHP GIU



Reference Scale: 1:214,000  
Initial Map Creation: (09 November 2018, 0800 EDT)



Reference Scale: 1:103,000  
Coordinate System: GCS WGS 1984

Figure 2: Farmland Classification in Puerto Rico



# Clean Air Act

Incident Complex - Puerto Rico

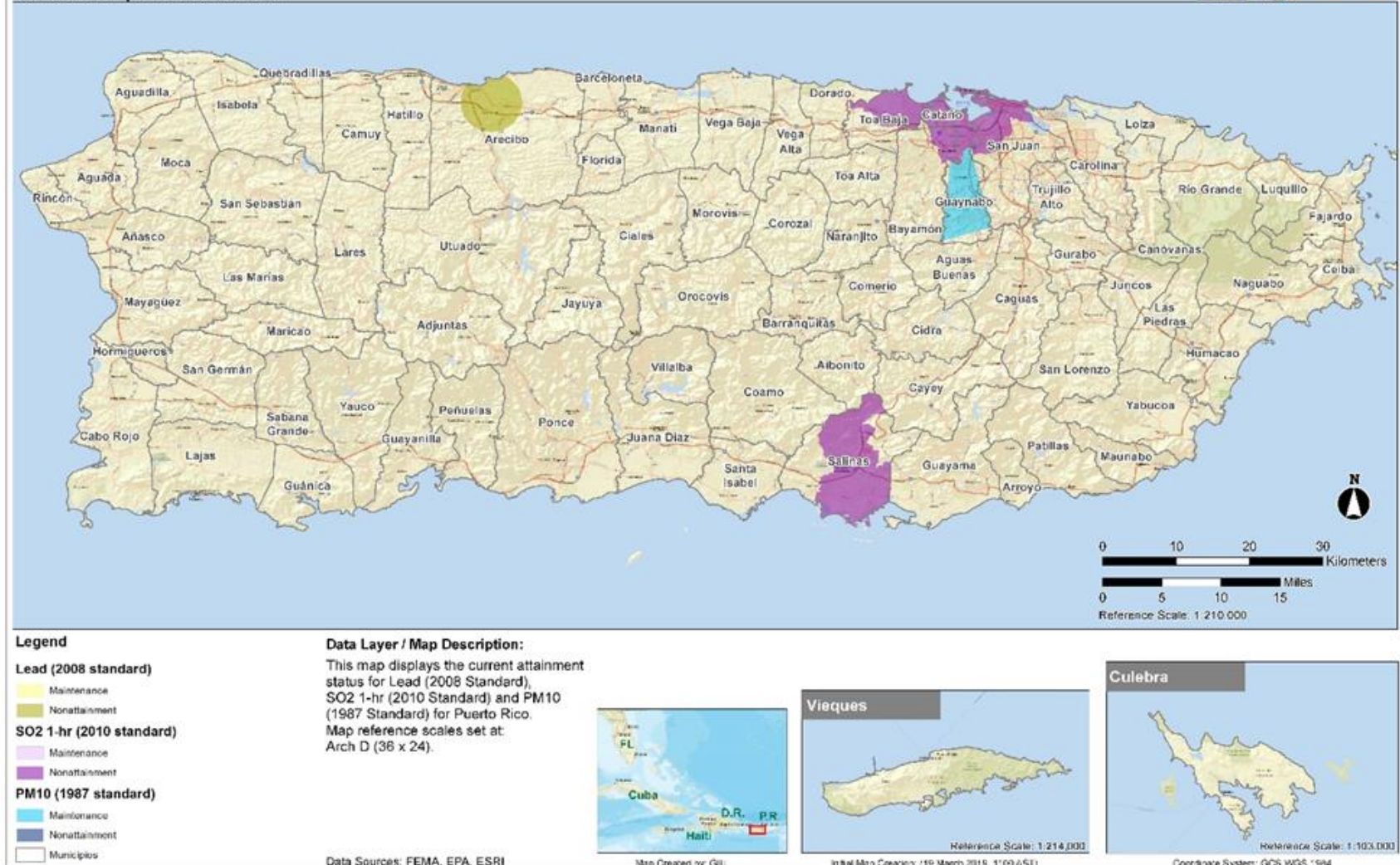


Figure 3: Clean Air Act Attainment and Non-Attainment Areas in Puerto Rico

# Water Resources

FEMA-4339-DR-PR

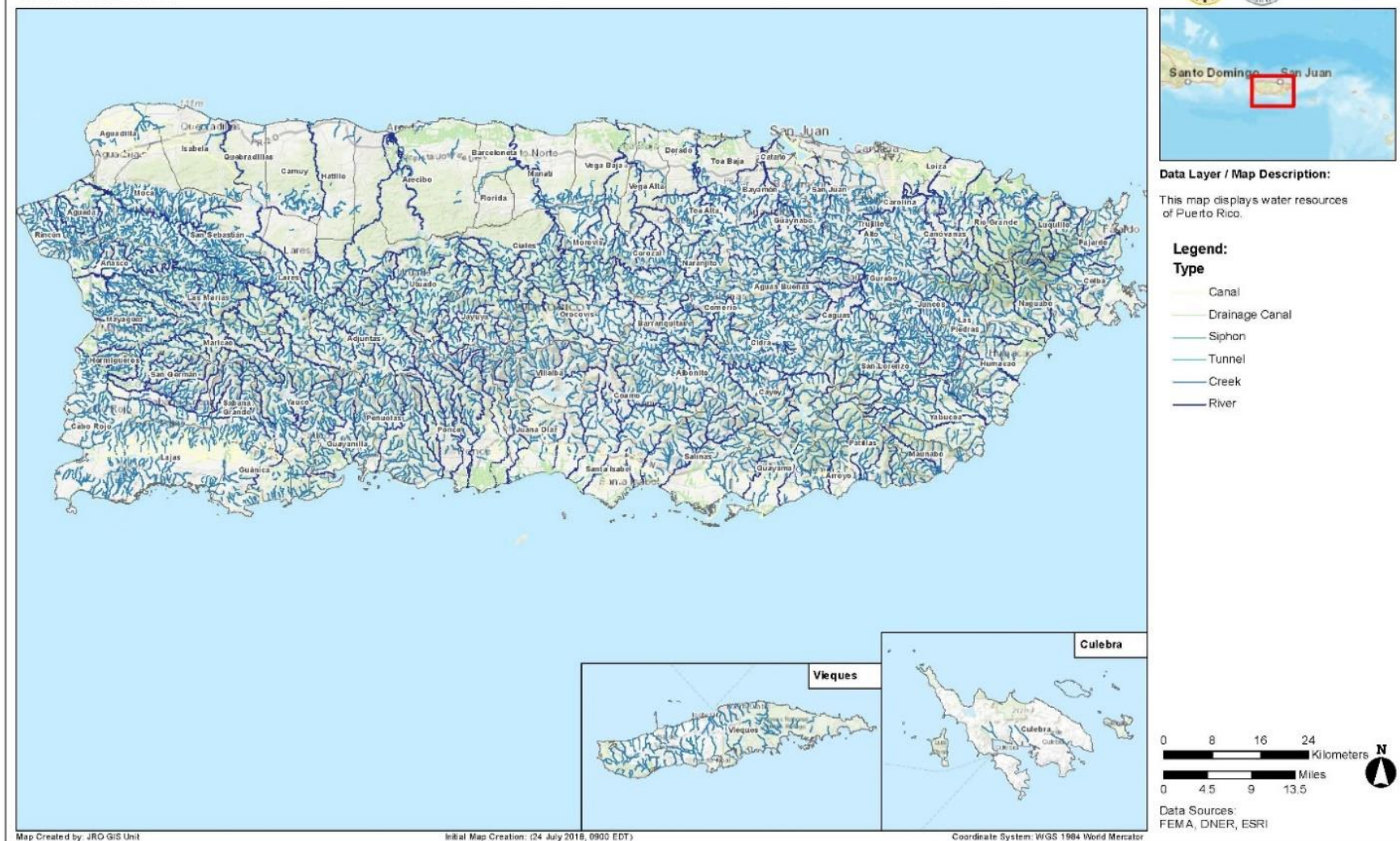
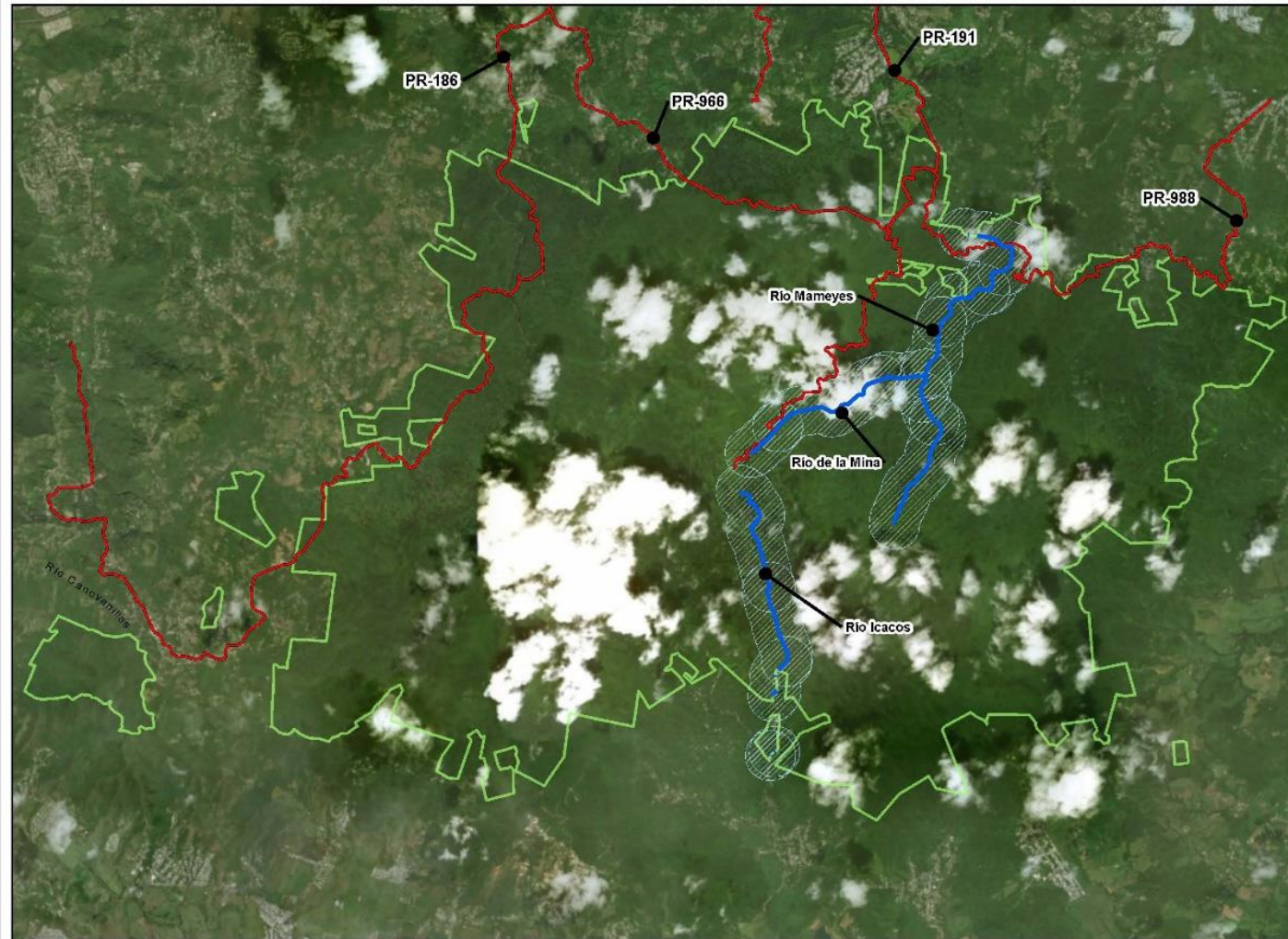


Figure 4: Water Resources Map of Puerto Rico



# Caribbean National Forest, Wild and Scenic Rivers

FEMA-4339-DR-PR



**Data Layer / Map Description:**  
This map displays the Caribbean National Forest, Wild and Scenic Rivers.

## Legend:

- Rivers
- Main Roads
- 0.25 Mile Buffer
- Caribbean National Forest



**Data Sources:**  
FEMA, DNER, ESRI

Map Created by: JRO GIS Unit

Initial Map Creation: (25 July 2018, 1600 EDT)

Coordinate System: WGS 1984 World Mercator

**Figure 5: Caribbean National Forest, Wild and Scenic Rivers Map**



# Advisory Base Flood Elevations (ABFEs) as of Dec 26th, 2018

Incident Complex - Puerto Rico

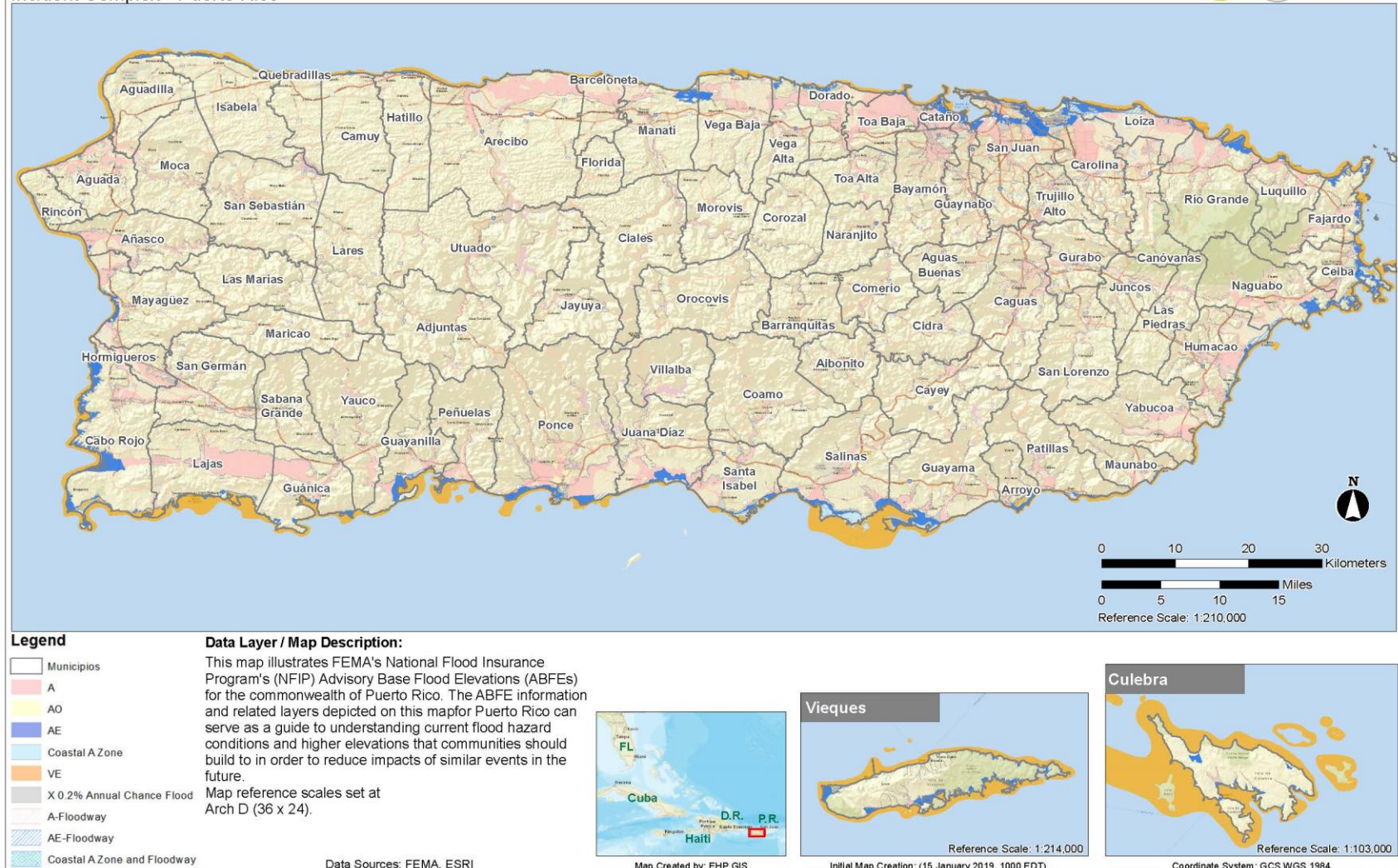
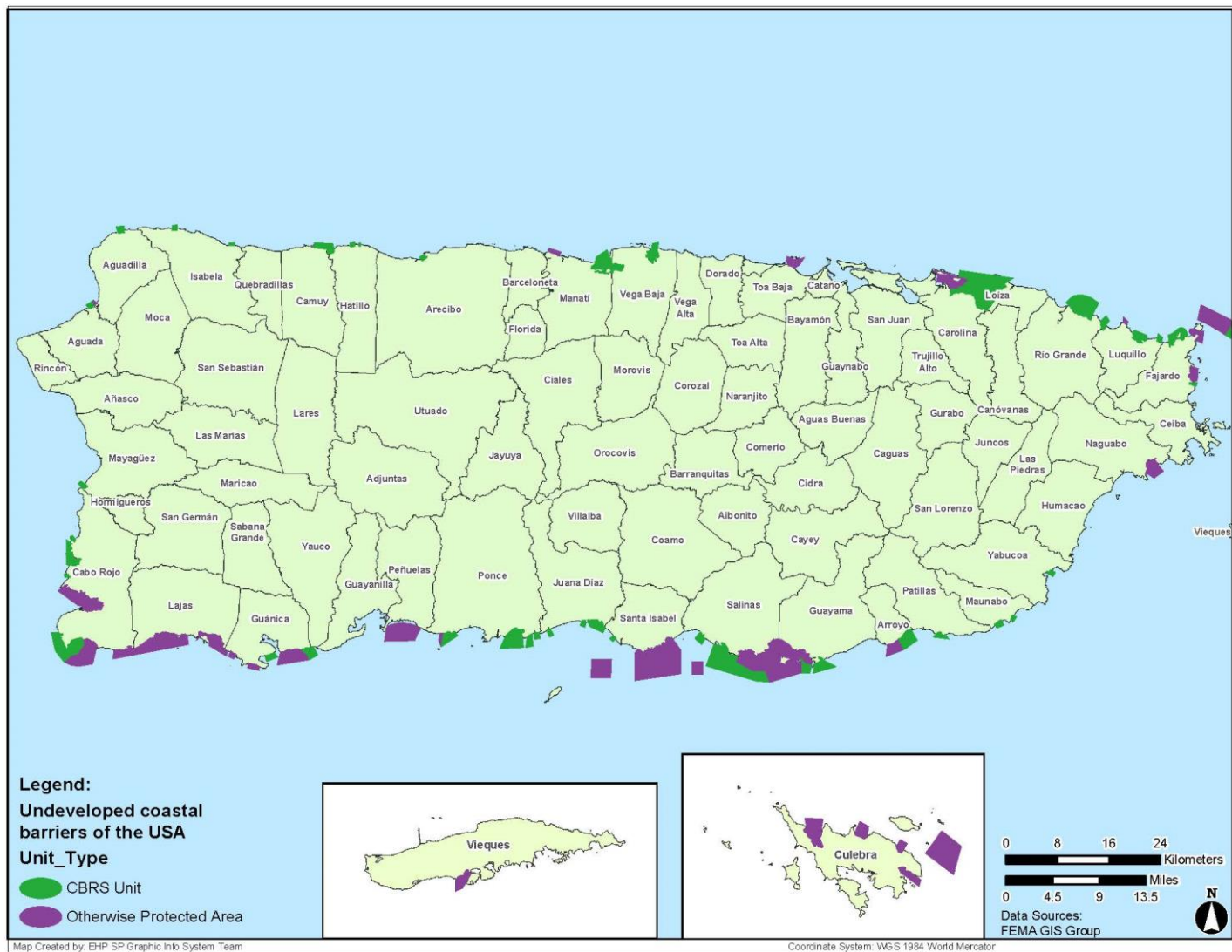
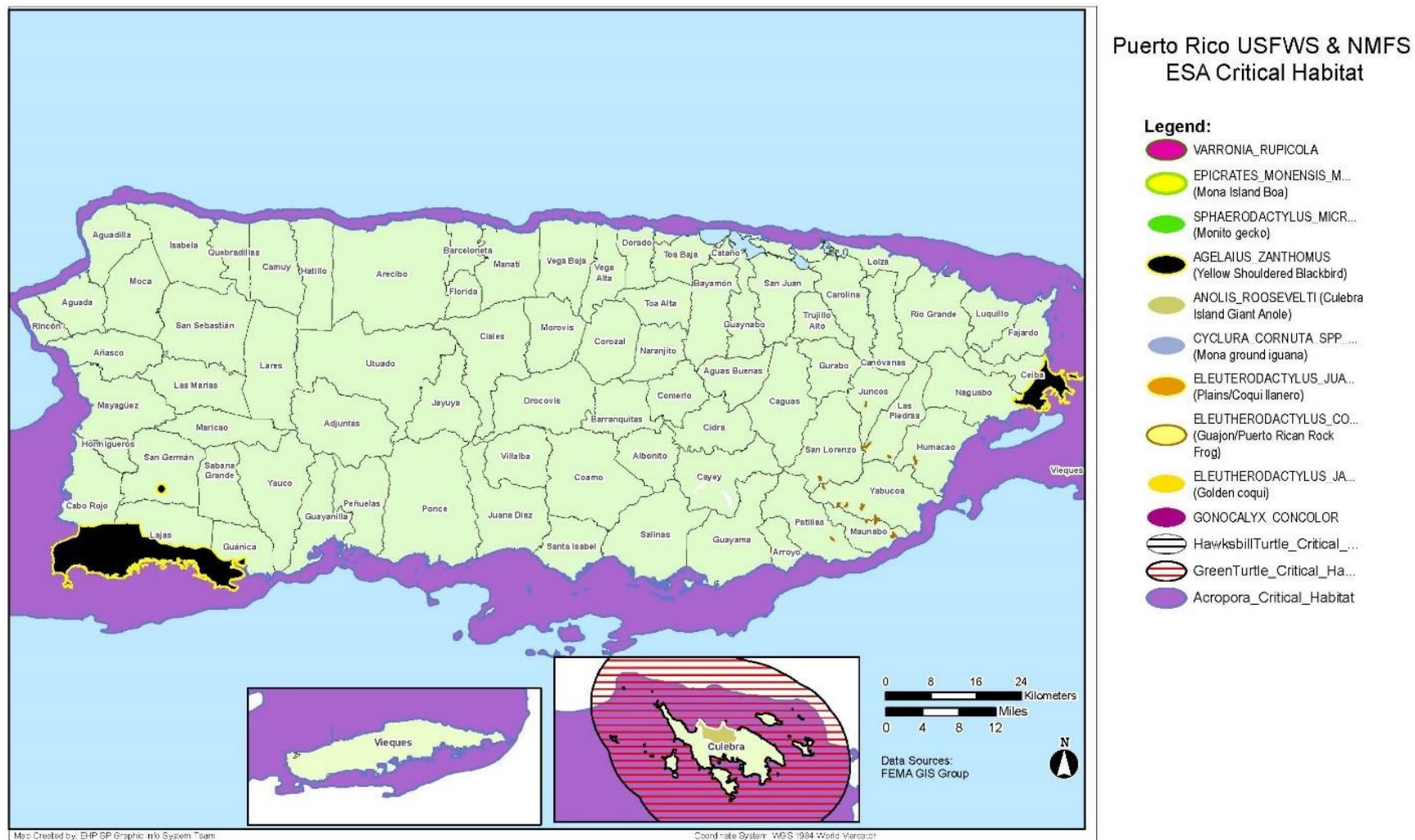


Figure 6: Flood Zone Map of Puerto Rico



**Figure 7: Undeveloped Coastal Barriers Map**



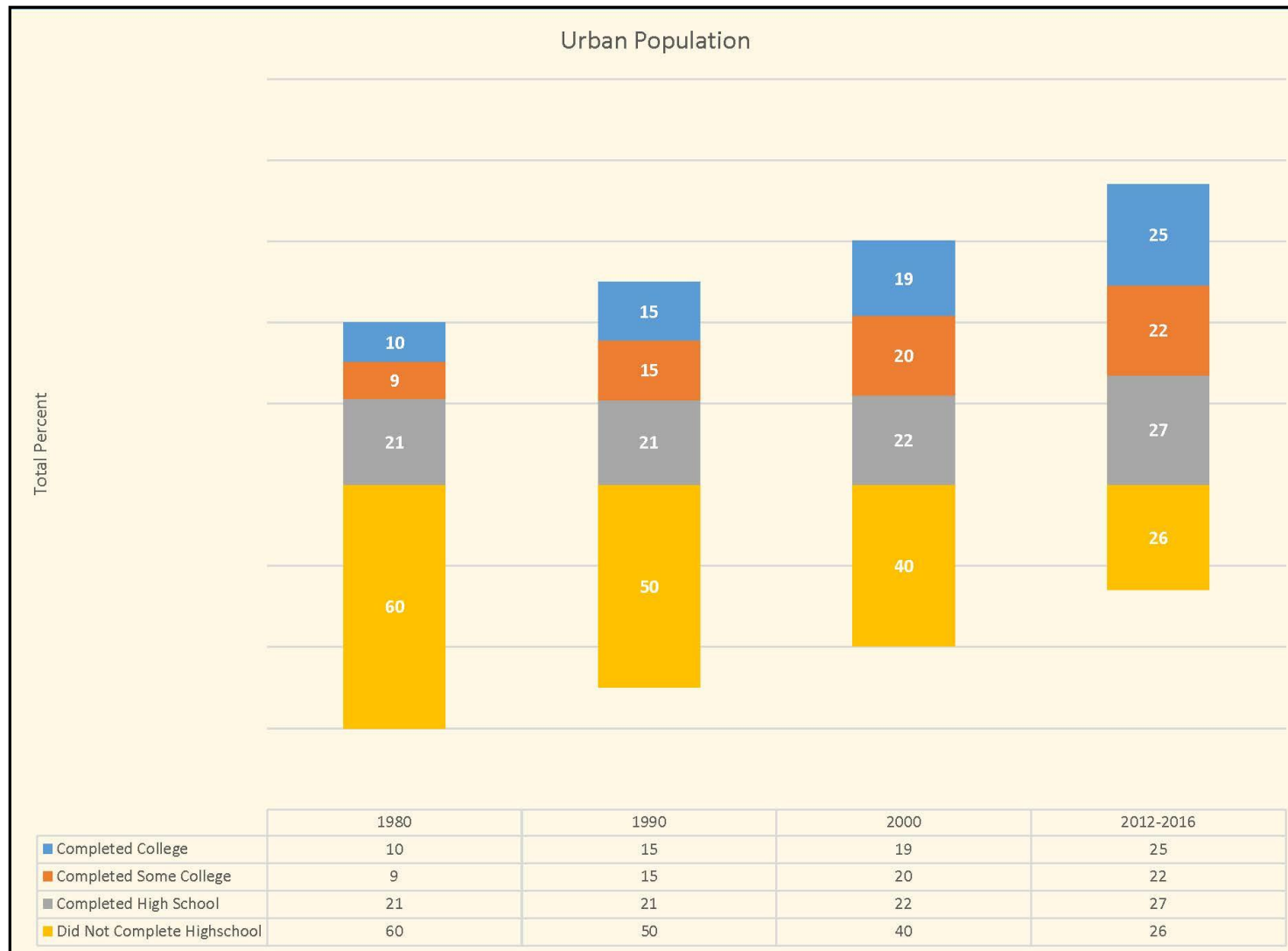


**Figure 8: Critical Habitat Map of Puerto Rico**



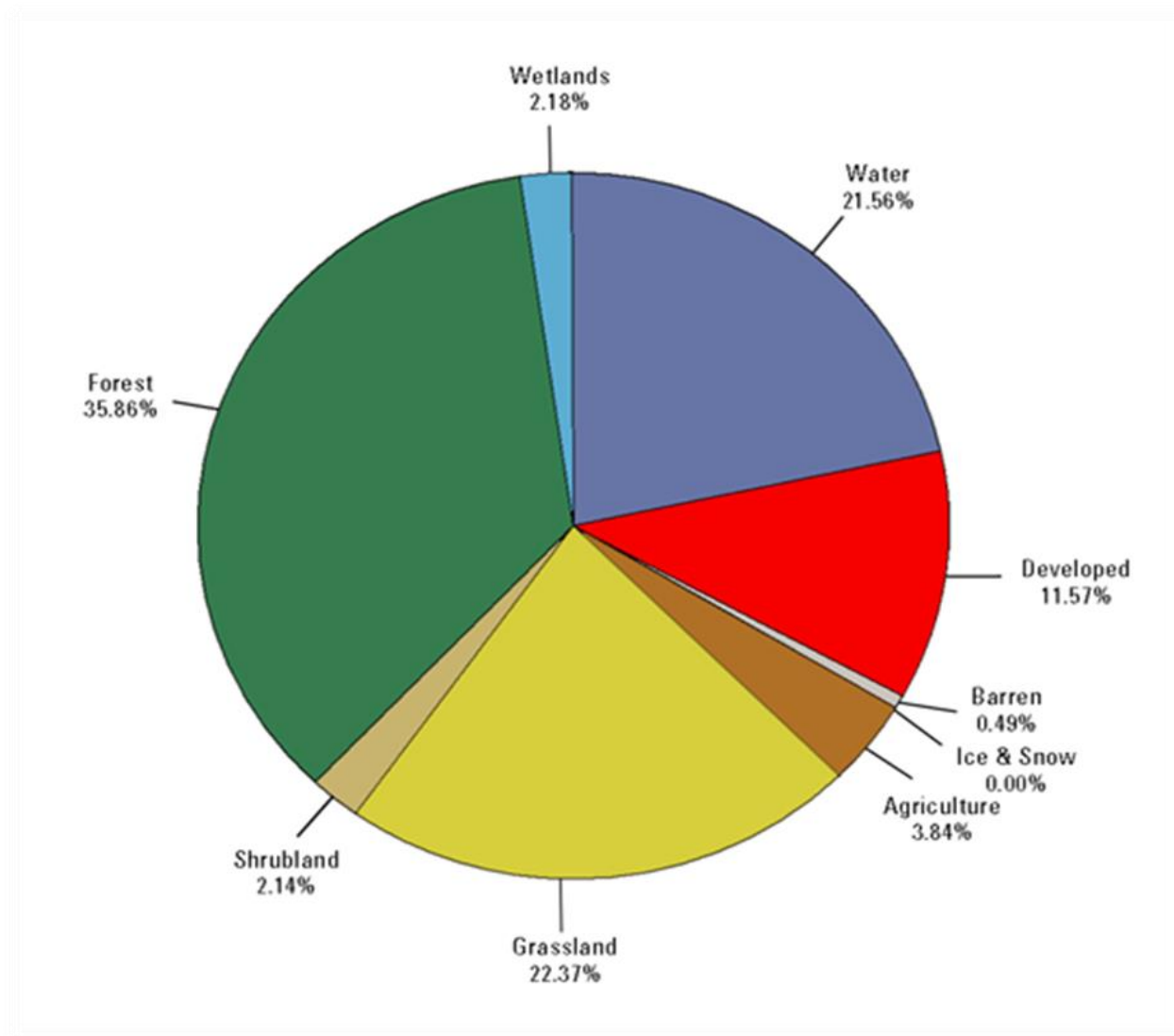


**Figure 10: Rural Education Persons 25 Years and Older**



**Figure 11: Urban Population and Education Attainment of Persons 25 and Older**

Source: USDA Economic Research Service: <https://data.ers.usda.gov/reports.aspx?StateFIPS=72&StateName=Puerto%20Rico&ID=17854>



**Figure 12: Land Cover of Puerto Rico**

APPENDIX B

SUMMARY OF POTENTIAL IMPACTS

Resource Area of Evaluation	Alternative 1: No Action	Alternative 2: Repair, Replacement, and Upgrade	Alternative 3: Realignment or Relocation	Alternative 4: Combination
Geology, Topography, and Soils	Alternative 1 has potential to permanently leave utility service absent in certain areas or leave some communities experiencing a reduction in their level of service. It could also lead to vegetation reclaiming ROW and degradation of public and private properties. Additionally, erosion and sedimentation may increase if utilities damage remains unrepaired. The No Action Alternative would likely have negligible to minor impacts on soils and geology and no impacts to seismicity or prime or important farmland.	During construction, Alternative 2 will have short-term minor impacts to soils. Alternative 2 has the potential to impact small portions of new ROW, so there may be minor impacts to soils and geology. No impacts to seismicity, and negligible to minor impacts for prime or important farmland.	During construction, Alternative 3 soils will result in soil excavation and compaction when placing new linear utilities (trenching) and utility structures (digging). Area clearing for vegetation and underlying soil removal will and will eventually stabilize; however, this process will alter soils in the immediate construction zone. FEMA anticipates minor changes to topography, minor impacts on geology and soils, negligible to minor impacts impact on prime farmland or important farmland, and no impact on seismicity.	Similar to Alternatives 2 and 3, as it is a combination
Air Quality	Under Alternative 1, there is the potential for residents and commercial entities to rely on outdated generators that could impact the concentrations of criteria pollutants. Possible increase in overall vehicle emissions may occur if detour routes (around downed utilities) are longer than the reroutes they replaced. Those areas without access may experience a reduction in localized vehicle emissions; while other areas may experience increased air pollution, due to increased congestion, increased vehicle wait times, and construction efforts related to the relocation of disaster-affected communities. Therefore, this alternative may have negligible to minor impacts to air quality.	During construction there may be adverse short-term minor impacts from exhaust emissions originating from mobile and construction equipment. Impacts from fugitive dust and vehicular emissions will be short-term and negligible. The implementation of construction BMPs will limit impacts to air quality. As part of Alternative 2, long-term adverse impacts to air quality may be negligible to minor. With regards to the areas currently listed as nonattainment or under maintenance, negligible to minor long-term impacts may occur. Alternative 2 activities may include beneficial impacts on air quality and energy efficiency by updating existing utilities to current codes and standards. Although new emergency generators would serve as a long-term source of emissions, new replacement emergency generators produce fewer emissions than their predecessors.	Similar to Alternative 2.	Similar to Alternatives 2 and 3, as it is a combination
Water Quality/Water Resources	No work would occur in water, thus there would be no direct impact to water due to project work. Erosion and sedimentation into downstream waters may increase if utilities damage remains unrepaired. Damaged utility infrastructure may cause increased pollution into waters from problems such as sewage-runoff mixing or copper leaching from old and broken pipes and may cause a flow impediment, potentially causing major impacts to streams and other waters. The damages could also impact and limit water flow in pipes needed for fire suppression, agriculture, and overall health and cleanliness. Therefore, the No Action alternative could have moderate adverse impacts on water resources.	The discharge of fill material into surface waters may temporarily alter surface water quality including, but not limited to, temperature, dissolved oxygen, or turbidity. This could result in adverse negligible to minor short-term impacts to water quality. This alternative would have a negligible long-term impact on groundwater recharge and water quality through the transmission of sediment, debris, oils, and hazardous substances into surface waters due to the type and size of the projects covered by this PEA. Local and federal Agency requirements would mitigate potential impacts to water resources by requiring BMPs to reduce transport of sediment, debris, oils, concrete waste, and hazardous substances into water resources, including wetlands or waterways.	The process of relocating utilities within a new or expanded ROW would have similar impacts and mitigation measures as those described for Alternative 2; however, the process of expanding a ROW and the removal and disposal of out-of-service utilities would increase the footprint of construction activities. As a result, this alternative may have a negligible to minor direct or indirect on impact water resources, including wetlands and waterways; but would have mitigation through Section 401 and Section 404 permitting.	Similar to Alternatives 2 and 3, as it is a combination
Wetlands	No work would occur in wetlands, thus there would be no direct impact to wetlands due to project work; however, there may be indirect impacts. Erosion and sedimentation into waters and wetlands may increase if utilities damage remains unrepaired. Damaged utility infrastructure may cause increased pollution into wetlands from problems such as sewage-runoff mixing or copper leaching from old and broken pipes and may cause a flow impediment, potentially causing major impacts to streams and other wetlands. Therefore, the No Action alternative could have moderate adverse impacts on water resources.	During construction, agencies would mitigate impacts by requiring projects to apply BMPs to prevent sediment and fill material from entering the water. Compensatory mitigation would offset adverse impacts to wetlands. FEMA anticipates short-term and long-term negligible to minor direct and indirect impacts on wetlands, streams, and other WOTUS. The impacts would originate from the runoff of sediment, debris, oils, and other hazardous materials from construction sites. FEMA would mitigate potential impacts to wetland resources by requiring construction BMPs.	Similar to Alternative 2, impacts from additional ROWs would be long-term, based on expanded footprint from ROW expansion or realignment. Removal of out-of-services utilities would decrease overall impacts. Additionally, for utilities along the edge of waterways, embankment and in-water work may occur during construction. This alternative may have minor short-term direct or indirect impacts on wetlands.	Similar to Alternatives 2 and 3, as it is a combination
Floodplain	Damaged utility infrastructure may cause increased pollution and may constitute a flow impediment, potentially causing moderate adverse impacts to floodplain hydraulics and function.	This alternative would have short-term negligible impacts on floodplains and floodways, especially for those utilities that are located within floodplains and are location-dependent. As a result of staying within the existing ROW, the intent of this alternative is that it will have negligible	This alternative would generate impacts similar to those described for Alternative 2 and additional areas of floodplain outside original ROW’s through the construction of a realigned or relocated utility and could have short-term and long-term minor impacts on nearby floodplains.	Similar to Alternatives 2 and



		long-term impacts; however, certain project areas could result in additional impervious surfaces that could have indirect long-term but minor impacts on floodplains and floodways.		3, as it is a combination
Coastal Resources	In the No Action alternative, there would be no impacts to CZMA and CBRA areas.	Since the footprint should stay relatively the same under this Alternative, FEMA anticipates short-term and long-term negligible to minor adverse impacts to the CZMA. Such impacts would be associated with upgrading systems that require additional acreage beyond what these systems currently occupy. The installation of upgraded pumps and generators within the CZMA would minimally reduce the available area within the CZMA; however, the actions would be in alignment with the October 3, 2018 Federal Consistency Resolution Certificate. Due to this PEA's geographical constraints, there will be no direct impacts from Alternative 2 activities to resources covered under CBRA. For projects that have the potential to indirectly impact OPAs and CBRS units, FEMA will review each project location on a case-by-case basis to determine eligibility. In accordance with USFWS guidelines, FEMA would consult with USFWS for activities that have the potential to affect CBRS units.	Under this alternative, some adverse minor short-term and long-term impacts would occur within the CZMA. Coordination with PRDNER and PRPB will occur prior to any work and limit impacts to the extent possible. Due to this PEA's geographical constraints, there will be no direct impacts from Alternative 3 activities to resources covered under CBRA. For projects that have the potential to indirectly impact OPAs and CBRS units, FEMA will review each project location on a case-by-case basis to determine eligibility. In accordance with USFWS guidelines, FEMA would consult with USFWS for activities that have the potential to affect CBRS units.	Similar to Alternatives 2 and 3, as it is a combination
Vegetation	The No Action Alternative would have no direct impacts on the existing vegetation from construction disturbance. Without continued human use or landscape maintenance, some locations may become overgrown and provide additional habitat for fauna in the area. Conversely, the No Action alternative could potentially result in long-term negative impacts in the area resulting from the introduction and colonization of invasive plant species, which compete with native species in disturbed type habitats, if the areas are unmaintained.	This alternative would likely result in short-term negligible impacts to terrestrial vegetation during construction activities. However, the mitigation of impacts would occur through permit requirements and BMPs. During the construction phase, to control the spread of invasive species, all vehicles (i.e. heavy equipment, construction and personal vehicles) will be free of dirt and debris before entering and exiting the project areas. The re-vegetation of project sites will occur in accordance with the applicable permits, SWPPP, and federal and local guidance. Thorough project identification, impact assessment, and review will occur as appropriate. FEMA anticipates no long-term negative impacts; however, any impacts to vegetation would be beneficial in the long-term as native species become established upon implementation of an approved SWPPP.	FEMA anticipates this alternative to have effects similar to those discussed under Alternative 2. However, the additional new area needed for the realignment or relocation of utilities may result in short-term and long-term minor impacts to vegetation.	Similar to Alternatives 2 and 3, as it is a combination
Wildlife and Fish	Under the No Action alternative, FEMA would not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Under the No Action Alternative, FEMA anticipates that the effect locally and regionally on wildlife and fish would be adverse and negligible to minor for both the short-term and long-term. The most likely adverse and beneficial impacts would be associated with neglect. Unstable or deteriorating infrastructure would pose both short-term and long-term adverse impacts to wildlife and fish through direct impacts from the collapse of structures and electrocution or indirect impacts resulting from erosion, stormwater runoff, and pollution. Conversely, without continued human use or landscape maintenance, some locations may become overgrown. If an area becomes overgrown there is the potential for it to provide a beneficial habitat feature for wildlife.	This alternative would likely result in adverse short-term negligible to minor impacts to wildlife habitat during construction activities. The implementation of the BMPs included in Section 6 would limit indirect impacts to fish and wildlife habitat. The degradation of water quality from runoff and sedimentation would be limited to the vicinity of construction activities and controlled through NPDES permitting and SWPPP maintenance.	This alternative includes constructing new utilities in areas both previously disturbed and undisturbed. Building new utilities often causes greater impacts than working on existing utilities, particularly in undisturbed areas. The realignment or relocation of utilities and corresponding ROWs on undisturbed lands could result in removal of wildlife habitat. This alternative would likely result in adverse short-term negligible to minor impacts to the habitat during construction activities. As some actions would result in the permanent conversion of land, this alternative would likely result in adverse long-term negligible to minor impacts to wildlife and fish habitat following the construction of utility projects.	Similar to Alternatives 2 and 3, as it is a combination
Threatened and Endangered Species	Under the No Action alternative, FEMA would not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Under the No Action Alternative, FEMA anticipates that the effect locally and regionally on federally listed threatened and endangered species would be adverse and negligible to minor for both the short-term and long-term. The most likely adverse and beneficial impacts to threatened and endangered species from the No Action Alternative would be associated with neglect. Unstable or deteriorating infrastructure would pose both short-term and long-term adverse impacts to T&E species through direct impacts from the collapse of structures and electrocution or indirect impacts resulting from erosion, stormwater runoff, and pollution. Conversely, without continued human use or landscape maintenance, some locations	Potential impacts to T&E species are likely to result from construction activities. Alternative 2's actions consist of performing work on utilities within existing alignments. Embankment work and temporary in-water work that affects land, streams, and reservoirs may occur. FEMA will review projects based on available information for the potential occurrence of T&E species and DCH in the area. FEMA will consult with USFWS on individual projects as necessary for compliance with ESA. The consultation process would identify any project conditions necessary to minimize impacts to T&E Species and DCH. Based on this PEA's project thresholds, federal consultations, conservation measures, and NPDES permitting requirements, Alternative 2 may have an adverse negligible to minor short-term and long-term impact on the federally-listed endangered, threatened, and proposed or candidate species.	Based on this PEA's project thresholds, federal consultations, conservation measures, and NPDES permitting requirements, Alternative 3 may have an adverse negligible to minor short-term and long-term impact on the federally-listed endangered, threatened, and proposed or candidate species and their DCH. If through the consultation process, the USFWS determines that a project has the potential to have an adverse effect on T&E species, the project would be beyond the scope of this PEA and require FEMA to perform an additional NEPA analysis.	Similar to Alternatives 2 and 3, as it is a combination

	may become overgrown. If an area becomes overgrown there is the potential for it to provide a beneficial habitat feature for T&E species.			
Cultural Resources: Historic (Standing) Structures	The No Action Alternative does not include construction, and thus no new impacts to historic resources would occur as a result of federal funding. Though, existing historic structures may experience degradation due to inability to access the site for repairs and maintenance and could have a long-term negligible to minor impact.	This alternative has the potential to affect historic or cultural resources. This alternative could consist of alteration or removal (for replacement) of historic utility structures and would require SHPO consultation (through the 2018 Programmatic Agreement) prior to their alteration or removal. Even through consultation and mitigation, this alternative may have a negligible to moderate impact on historic structures.	This alternative could consist of the removal or movement of historic utility structures for realignment or relocation; however, similar to Alternative 2, this alternative FEMA expects projects to have similar effects and through SHPO consultation and mitigation, this alternative may have a negligible to moderate impact on historic structures. Additionally, realignment or relocation of overhead utilities may impact viewshed and require coordination with SHPO before their removal or placement. Even through consultation and mitigation, this alternative may have a negligible to moderate impact on the viewshed	Similar to alternative 2 and 3, as it is a combination
Cultural Resources: Archeological Resources	The No Action Alternative does not include ground disturbance, and thus no new impacts to archeological resources would occur.	This alternative has the potential to affect archeological resources; however, they would be negligible to minor impacts with SHPO consultation. If SHPO agreement allowances apply, FEMA will determine if a project is compliant with Section 106 of NHPA and the review process will be complete. If the proposed scope of work does not fall within an allowance, FEMA will determine the effect and initiate consultation with the SHPO. Consultation requirements may include Archaeological surveys of ground disturbing activities.	Utility relocation may result in new ground disturbance. While new ground disturbance has the potential to affect archaeological resources, ways to manage impacts are similar to those used for projects described listed under Alternative 2. This alternative has the potential to affect archeological resources; however, they would be negligible to minor impacts with SHPO consultation.	Similar to Alternatives 2 and 3, as it is a combination
Environmental Justice	The No Action Alternative has the potential to cause adverse impacts to socioeconomics of a community if utilities are not repaired, upgraded, or made more resilient to future storm events. For instance, the No Action Alternative could result in a reduction in public services such as power, water, or communications access for emergency, police, and fire services. The No Action Alternative could impact localized employment rates for industries that are dependent on utilities to provide reliable service. However, at the data does not exist to support a claim that the existing level of utility service is causing widespread losses of employment and reduced access to health services. The No Action Alternative would continue the same level of service and resiliency for EJ communities. This could have both an adverse short and long-term less than major impact for those communities affected.	Jobs related to the recovery are likely to be available for all education and skill levels. The increase in construction jobs would be short-term in nature and upon completion of the recovery projects, conditions would likely return to a pre-disaster state. As such, FEMA anticipates an increase in construction jobs from the post Hurricane Maria recovery would likely have a less than major beneficial impact on Puerto Rico’s economy. By meeting current codes and standards, activities covered under Alternative 2 would result in utility networks that are more resilient. At the programmatic level, Alternative 2 actions could occur at any applicable location throughout the Commonwealth. As such, all demographics within Puerto Rico could benefit from the actions undertaken by this Alternative. The benefit of improving resiliency would be long-term and depending on existing conditions could have a range of beneficial impacts from minor to moderate. Short-term negligible to minor adverse impacts to effected populations may occur during construction due to service interruption, road detours, and building construction. At the programmatic level, short-term minor adverse impacts could occur at any applicable location within the Commonwealth.	Generally, the impacts to socioeconomics and environmental justice from this alternative would be similar to those described for Alternative 2.	Similar to Alternatives 2 and 3, as it is a combination
Land Use and Planning	FEMA anticipates that the No Action Alternative would have either no impact or an adverse negligible short-term and long-term impact on land use within the Commonwealth as residents adjust to existing conditions.	During construction, temporary staging areas and access roads would have a short-term minor adverse impact on land use. The utility footprint itself will remain largely within the previous ROW therefore no substantial changes in land use would occur. Some projects however may require small portions of new ROW due to upgrades. This may lead to adverse negligible to minor long-term changes in land use.	FEMA anticipates Alternative 3 would have an adverse short-term minor impact on land use from the installation of new utilities. Alternative 3 actions may include the clearing of vegetation from within an existing or new utility corridor. The operational phase of new utilities would prevent or limit future actions from occurring within new ROWs or project footprints. The occupation of new ROWs and project areas would cause an adverse long-term minor impact to land use as restrictions on future development would likely exist. FEMA anticipates that the removal of utilities would cause an adverse negligible to minor long-term impact on the former locations of relocated utilities. For locations where the Applicant plans on abandoning utilities or management issues remain, the resulting parcel may require land use restrictions that prevent future development. In some cases, the action would essentially revert the land to previous uses or the Applicant may be able to be reuse the parcels for other industrial purposes. In both cases, the Commonwealth could derive a negligible long-term benefit from the actions.	Similar to Alternatives 2 and 3, as it is a combination
Noise	Under this alternative, utilities would remain in damaged condition potentially leaving communities with unreliable services and more	Following utility restoration, noise levels will return to that of pre-disaster levels. Noise during construction activities may have short-term minor	Noise impacts from construction activities at the original location would be minor and short-term if utility abandonment or removal occurs. Noise from	Similar to Alternatives 2 and



	vulnerable to future storm events. Temporary emergency repairs and protective measures would remain in place and would only be sufficient until the next storm event. Noise levels would remain similar to those prior to the event.	effects on workers and persons living near the construction areas. The Applicant will manage noise impacts by complying with local noise ordinances, using well maintain equipment, and limiting work to daytime hours. Transportation noise along other roadway segments within the area may increase under this alternative due to increasing traffic on alternate roadways as traffic is re-routed into historically low traffic areas. Traffic during construction and the impacts would also be short-term and minor. FEMA anticipates no long-term noise effects.	construction activities at the new location, such as pile/post driving, directional drilling, and construction vehicles (i.e. cement mixing trucks), may have short-term, minor adverse impacts on the workers and persons who live nearby. Similar to Alternative 2, transportation noise along other roadway segments within the area may increase due to re-routed traffic patterns. FEMA anticipates no long-term noise effects.	3, as it is a combination
Transportation	Utility projects remain unfunded by FEMA and some projects that also affect transportation facilities, such as pipelines under roadways, may go unfunded or implemented.	FEMA anticipates short-term minor impacts to transportation facilities during the implementation of Alternative 2 actions. Specifically, this would occur in areas where utilities are within or intersect transportation ROWs. Impacts may include temporary road closures, detours, and lane restrictions. The Applicant would minimize impacts by using MOT activities. The DTOP Design Manual (aka the Work Zone Safety and Mobility Policy) requires contractors working in Puerto Rico to implement MOT plans and conduct public notifications. Following repair, replacement, and/or upgrades to utilities, FEMA anticipates that there would be no long-term adverse impacts to transportation infrastructure. A beneficial impact would result from utilities being more resilient and less likely to cause disruptions to the Commonwealth's transportation network.	FEMA expects negligible to minor long-term adverse impacts to transportation facilities following the relocation or realignment of utilities. Adverse short-term minor impacts may occur during construction. The use of MOT by the Applicant, coordination between the Applicant and managers of the Commonwealth's transportation network, and public notifications would minimize adverse impacts to a level of less than major. A beneficial impact would result from utilities being more resilient and less likely to cause disruptions to the Commonwealth's transportation network.	Similar to Alternatives 2 and 3, as it is a combination
Public Services and Utilities	Under the No Action alternative, FEMA does not provide grant funding for utility projects potentially leaving communities with unreliable services and vulnerable to future Storm events. FEMA anticipates that the emergency repairs made following Hurricane Maria will not serve as long-term solutions to the Commonwealth's aging infrastructure. The lack of reliability could prove to be a long-term adverse impact on those communities and populations that rely on public services and utilities for their existence.	During the construction phase of Alternative 2 actions, projects could cause adverse negligible to minor short-term impacts to Puerto Rico's social infrastructure. The Applicant would be responsible for coordinating with service providers and construction managers to minimize impacts to public services and the communities they support. An adverse short-term minor impact to public services located within the project area could occur as a result of temporary road closures. The deployment of MOT by the Applicant's engineers and contractors would reduce or eliminate potential impacts due to road closures. FEMA anticipates that Alternative 2 would have no adverse long-term impacts to public services and utilities as well as, the communities they support. This alternative would have long-term beneficial impacts and make the utilities more reliable and hardened against future disasters. By bringing utilities up to current codes and standards, energy demands on the existing system would not increase. FEMA anticipates that the Commonwealth would experience a long-term negligible beneficial impact by improving the energy efficiency of their utility networks.	During the construction phase, short-term impacts to social infrastructure, utility service providers, and the communities they support could occur. The Applicant would be responsible for coordinating with local communities and institutions regarding any possible delays or interruptions in service. FEMA anticipates that the existing utilities will remain in operation until the realigned or relocated utility is ready for service. Due to limiting capacity to pre-Hurricane Maria levels, there would be no additional long-term energy demands on the Commonwealth's utility networks. FEMA expects that the Commonwealth would derive long-term beneficial impacts from Alternative 3. The Applicant would be able to conserve energy as they provide the same level of service to their communities. The realignment and relocation of utilities to less disaster-prone areas would inherently make the Commonwealth's utility networks more resilient. A more resilient network of public services and utilities would in turn benefit the health and safety of the communities they support.	Similar to Alternatives 2 and 3, as it is a combination
Public Health and Safety	Under the No Action alternative, FEMA would not fund utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. FEMA anticipates that the existing level of utility service is sufficient to maintain the Commonwealth's public health and safety. However, emergency measures funded by FEMA following Hurricane Maria may not be sufficient to prevent localized future power outages, water shortages, unsanitary conditions, or disruptions in communications. Each of which could adversely affect the administration of emergency medical personnel, police, and fire protective services. FEMA anticipates that the No Action Alternative has the potential to cause short-term and long-term less than major adverse impacts to public health and safety.	Pre-construction meetings and equipment trainings for workers would minimize the risk of employment related injuries from construction phase activities. The potential adverse impact to worker safety would be short-term and minor. During the construction phase, utility interruption and delays in fire, emergency, and law enforcement services could occur; however, the disruptions in service from upgrading utilities would cause only short-term negligible to minor adverse impacts. Road detours could adversely impact emergency services depending on how far traffic has to be re-routed. FEMA anticipates that results of Alternative 2 actions would cause no adverse long-term impacts to the administration of public health and safety services. The Commonwealth's residents may experience a long-term benefit to their health and safety from the application of more resilient utilities.	The potential adverse impact to worker safety would be short-term and minor. The Applicant would be responsible for posting the appropriate signage and placement of construction barriers to alert the public of potential hazards and prevent unauthorized access to project sites. Alternative 3 would have no long-term adverse impacts to public health or safety. The Applicant would use current codes and standard to develop new utilities that can handle the network's pre-disaster capacity as well as, being more resilient to future storm events. Similar to Alternative 2, fire, emergency, and law enforcement services could experience interruptions in service. Utility interruptions during the relocation process could cause short-term negligible to minor adverse impacts as road closures occur and the Applicant's contractor relocates various power and communications networks. The affected populations are likely to experience a long-term beneficial impact to their public health and safety from the application of more resilient utilities.	Similar to Alternatives 2 and 3, as it is a combination

Hazardous Materials	<p>Under the No Action alternative, FEMA would not provide grant funding for permanent utility projects potentially leaving communities with unreliable services and vulnerable to future storm events. Without permanent repairs, infrastructure may further deteriorate and increase the potential for the unregulated releases of contaminants into the environment. Although the level would be less than major, the No Action Alternative has the potential to adversely impact human health and the environment of Puerto Rico.</p>	<p>The use of new materials that are up to current codes and standards, properly trained and equipped personnel, PREQB licensed disposal facilities, and development of an SPCC would minimize both adverse short-term and long-term impacts to human health and the environment to a level of less than major.</p> <p>A short and long-term beneficial impact to the environment and human health would come from the removal of old equipment that could potentially release hazardous materials. If the Applicant encounters soil and water contamination, an additional beneficial impact would come from the treatment and removal of contaminated substrates from the environment.</p>	<p>The abandonment or removal of existing utilities can result in the generation of hazardous wastes. The Applicant will be responsible for disposing of all hazardous waste at PREQB licensed facilities.</p> <p>The use of new materials that are up to current codes and standards, properly trained and equipped personnel, PREQB licensed disposal facilities, and development of an SPCC plan would minimize both adverse short-term and long-term impacts to human health and the environment to a level of less than major.</p> <p>A short and long-term beneficial impact to the environment and human health would come from the removal of old equipment that could potentially release hazardous materials. If the Applicant encounters soil and water contamination, an additional beneficial impact would come from the treatment and removal of contaminated materials from the environment.</p>	<p>Similar to Alternatives 2 and 3, as it is a combination</p>
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# APPENDIX C

## CZMA RESOLUTION (JP-2018-324)

Federal Consistency Certificate October 3, 2018

**GOVERNMENT OF PUERTO RICO  
PUERTO RICO PLANNING BOARD**

October 3, 2018

**RESOLUTION JP-2018-324**

Federal Consistency Certification with the Puerto Rico Coastal Zone Management Program  
FEMA Puerto Rico DR-4336-PR and DR-4339-PR Permanent Work:  
Federal Assistance for Permanent Work through the Public Assistance (PA) Program and  
Hazard Mitigation Grant Program (HMGP)

The damage caused by high winds, storm surge and flooding attributed to Hurricanes Irma and Maria had devastating effects on Puerto Rico's coastal areas that need to be addressed in an expeditious manner. While many of the most dire emergency needs have been met, the post-Irma and Maria recovery needs of the Commonwealth are on-going and will continue into the near future.

In its role conducting reviews pursuant to the authority of the Commonwealth under the Coastal Zone Management Act, the Puerto Rico Planning Board recognizes that these circumstances require expedited reviews. In order to achieve this, the Federal Emergency Management Agency (FEMA) in coordination with the Puerto Rico Planning Board agreed the following:

1. The financial assistance awards made by FEMA for responding to the Hurricanes Irma and Maria (Puerto Rico DR-4336-PR and DR-4339-PR) are consistent with the enforceable policies of the Puerto Rico Coastal Zone Management Program (PRZCMP), when the use of such funds is to finance:
  - a. Activities described under categories C through G according to the FEMA Public Assistance Program and Policy Guide (FP 104-009-2/April 2018). A summary table with these activities is provided in Appendix A.
  - b. Hazard mitigation projects and activities to be covered through the "Hazard Mitigation Grant Program" (HMGP) according to the "Hazard Mitigation Assistance Guidance of February 27, 2015". Hazard mitigation activities to be covered by this program are detailed in appendix A.
  - c. "Planning-Related Activities", "Technical Assistance" and "Management Cost" covered under the Hazard Mitigation Grant Program.
2. Financing the above mentioned projects and activities will not require further review pursuant to Subpart F of the Federal Consistency Regulations at 15 CFR Part 930, yet:
  - a. The granting of financial assistance under the programs at reference does not exclude or supersede the financed projects to comply with applicable federal and state permits or requirements.
  - b. Recipients and Subrecipients that receive FEMA assistance through these programs are not exempt to comply with Federal Consistency requirements (according to Subpart C of the 15 CFR Part 930) for certain projects and activities that may affect the Puerto Rico coastal resources.
  - c. This Certification does not exempt or supersede any of the activities mentioned in paragraph number one (1) from compliance with Federal Consistency requirements for "Federal Licenses or Permits" (according to Subpart D of the 15 CFR Part 930) that may be required for certain projects and activities under this agreement.



- d. Where "In-kind" repair or replacement is specified for a project, "In-kind" shall mean that it is either the same or a similar material, and the result shall match all physical and visual aspects. The in-kind repairs and replacements should be limited to pre-existing architectural features and physical components of buildings and structures that were in existence prior to the event but are not extant after the event.

After the evaluation of the type of activities to be granted, according to the above mentioned FEMA guides, the Puerto Rico Planning Board, in its meeting of October 3, 2018, determined the following:


"The Financial Assistance at reference is consistent with the Puerto Rico Coastal Zone Management Program; as long as each financed project complies with conditions under paragraph number two (2) of this resolution."

This Certification only applies to disasters DR-4336-PR and DR-4339-PR and will be in effect for a term of five years from the notification date of this resolution. The Certification at reference will be renewed or amended if necessary to extend its validity or address other matters. The Puerto Rico Planning Board agree to have an open line of communication with FEMA to resolve questions that may arise in executing the Federal Assistance grants under the programs at reference.

  
Maria del C. Gordillo Perez  
President

*Excused*  
Eileen Poueymirou Yunque  
Associate Member

  
Rebecca Rivera Torres  
Associate Member

  
Suheidy Barreto Soto  
Designated Associate Member

**Certify:** That this Resolution is copy of the agreement adopted by Puerto Rico Planning Board (PRPB) in its meeting of **October 3, 2018**. I expedite and notify this copy to the parties under my sign and official stamp of the Puerto Rico Planning Board stamp, for general use and knowledge.

In San Juan, Puerto Rico, today **10/5 OCT 2018**

  
Loida E. Soto Noguera  
Secretary



SUMMARY OF PUBLIC ASSISTANCE AND HAZARD MITIGATION ASSISTANCE COVERED UNDER THE GENERAL FEDERAL  
CONSISTENCY CERTIFICATION WITH THE PUERTO RICO COASTAL ZONE MANAGEMENT PROGRAM  
RESOLUTION JP-2018-324  
APPENDIX A

CATEGORY	PUBLIC ASSISTANCE (PA)		HAZARD MITIGATION GRANT PROGRAM (HMGP) ELIGIBLE ACTIVITIES
	TYPE OF PROJECT	ELIGIBLE WORK INCLUDING BUT NOT LIMITED TO:	
C- ROADS AND BRIDGES	1- Roads may be paved, gravel or dirt. Road components include but may not be limited to:	<ul style="list-style-type: none"> <li>• Surfaces</li> <li>• Bases</li> <li>• Shoulders</li> <li>• Ditches</li> <li>• Drainage Structures, such as culverts</li> <li>• Low Water Crossings</li> <li>• Associated facilities, such as lighting, sidewalks, guardrails and signs.</li> </ul>	Localized Flood Risk Reduction Projects
	2- Bridge components include, but may not be limited to:		Non-localized Flood Risk Reduction Projects
	• Decking		Infrastructure Retrofit
	• Guardrails		Soil Stabilization
	• Girders		Post-Disaster Code Enforcement
	• Pavement		Advance Assistance
	• Abutments		5% Percent Initiative Projects:
	• Piers		Miscellaneous/Other
	• Slope Protection		
	• Approaches		
	• Associated facilities, such as lighting, sidewalks and signs.		
	3- Maintenance: the incident may cause minor damage to roads that result in damage similar to that which may occur over time from other causes. Normal maintenance is not eligible.		



Reference: FEMA Public Assistance Program and Policy Guide (FP 104-009-2/April 2018) /Hazard Mitigation Assistance Guidance (February 27, 2015)



PUBLIC ASSISTANCE (PA)			HAZARD MITIGATION GRANT PROGRAM (HMGP) ELEGIBLE ACTIVITIES
CATEGORY	TYPE OF PROJECT	ELIGIBLE WORK INCLUDING BUT NOT LIMITED TO:	
D- WATER CONTROL FACILITIES	<p>Water Control facilities are does built for Channel alignment, recreation, navigation, land reclamation, irrigation, maintenance of fish and wildlife habitat, interior drainage, erosion prevention, flood control and storm water management. They include:</p> <ul style="list-style-type: none"> <li>• Dams and reservoirs</li> <li>• Levees and floodwalls</li> <li>• Lined and unlined engineered drainage channels</li> <li>• Canals</li> <li>• Aqueducts</li> <li>• Sediment and debris basins</li> <li>• Storm water retention and detention basins</li> <li>• Coastal shoreline protective devices</li> <li>• Irrigation facilities</li> <li>• Pumping facilities</li> <li>• Navigational waterways and shipping channels</li> </ul>	<p><b>1- Debris and silt removal required to restore capacity (engineered and maintained facilities only)</b></p> <ul style="list-style-type: none"> <li>• Eligible only if the Applicant provides documentation to establish the pre-disaster capacity of the facility and that the facility was actively used and maintained with a regular clearance schedule.</li> </ul> <p><b>2- Restoration: Permanent Repair or Replacement</b></p> <ul style="list-style-type: none"> <li>• PNP irrigation facilities are only eligible if they provide water for essential services of a governmental nature to the general public for fire suppression, generating and supplying electricity, and drinking water supply.</li> </ul>	Localized Flood Risk Reduction Projects
			Non-localized Flood Risk Reduction Projects
			Soil Stabilization
			Post-Disaster Code Enforcement
			5% Percent Initiative Projects
			Miscellaneous/Other



Reference: FEMA Public Assistance Program and Policy Guide (Fp 104-009-2/April 2018) /Hazard Mitigation Assistance Guidance (February 27, 2015)

PUBLIC ASSISTANCE (PA)		HAZARD MITIGATION GRANT PROGRAM (HMGP) ELIGIBLE ACTIVITIES
CATEGORY	TYPE OF PROJECT	
<b>E- BUILDINGS AND EQUIPMENT</b>	<p>Buildings including:</p> <ul style="list-style-type: none"> <li>All structural and non-structural components, including mechanical, electrical, and plumbing systems.</li> <li>Contents and equipment within the building</li> <li>Furnishings</li> </ul> <p>Equipment includes:</p> <ul style="list-style-type: none"> <li>Vehicles</li> <li>Construction equipment</li> </ul>	<p><b>ELIGIBLE WORK INCLUDING BUT NOT LIMITED TO:</b></p> <p><b>1- Restoration – Permanent repair or replacement</b></p> <ul style="list-style-type: none"> <li>Repair or replacement of buildings</li> <li>Repair or replacement of building components, vehicles or equipment with items similar in age, condition, and capacity.</li> <li>Replacement of destroyed contents with items similar in age, condition, and capacity.</li> <li>Recovering and stabilizing records.</li> <li>Stabilization of irreplaceable collections and individual objects is eligible.</li> <li>Re-shelving, cataloging, and other work incidental to the replacement of library books and publications.</li> </ul> <p><b>2- Demolition when replacing a facility including removal and disposal of associated debris.</b></p> <p><b>3- Extracting water and removing mud, silt, or debris from interior in conjunction with repairs.</b></p> <p><b>4- Mold remediation when conducted in conjunction with restoration of the facility</b></p> <ul style="list-style-type: none"> <li>Post remediation sampling to confirm remediation is complete.</li> </ul> <p><b>5- Post-earthquake inspection and evaluation of welded steel moment frames in buildings to determine the level of disaster-related damage requiring repair.</b></p>
		Property Acquisition and Structure Demolition
		Property Acquisition and Structure Relocation
		Structure Elevation
		Wind Retrofit Projects
		Soil Stabilization
		Mitigation Reconstruction
		Wildfire Mitigation
		Advance Assistance
		5% Percent Initiative Projects
		Miscellaneous/Other



Reference: FEMA Public Assistance Program and Policy Guide (FP 104-009-2/April 2018) /Hazard Mitigation Assistance Guidance (February 27, 2015)

PUBLIC ASSISTANCE (PA)			HAZARD MITIGATION GRANT PROGRAM (HMGP) ELIGIBLE ACTIVITIES
CATEGORY	TYPE OF PROJECT	ELIGIBLE WORK INCLUDING BUT NOT LIMITED TO:	
F- UTILITIES	<ul style="list-style-type: none"> <li>Water storage facilities, treatment plants, and delivery systems</li> </ul>	<b>Eligible restoration activities:</b> <ul style="list-style-type: none"> <li>Permanent repair or replacement of any component of system, including buildings, structures, or systems, even if not contiguous.</li> </ul>	Generators
	<ul style="list-style-type: none"> <li>Power generation, transmission, and distribution facilities, including, but not limited to, wind turbines, generators, substations, and power lines</li> </ul>	<ul style="list-style-type: none"> <li>Electrical conductor replacement subject to specific criteria.</li> </ul>	Infrastructure Retrofit
	<ul style="list-style-type: none"> <li>Natural gas transmission and distribution facilities</li> </ul>	<ul style="list-style-type: none"> <li>Inspection or assessment of damaged components of a system.</li> </ul>	Soil Stabilization
	<ul style="list-style-type: none"> <li>Sewage collection systems and treatment plants</li> </ul>	<ul style="list-style-type: none"> <li>Inspection or assessment of an inaccessible structure or component of a system may be eligible, but only when there is evidence of damage, such as when sunken ground appears above a water pipeline.</li> </ul>	Post-Disaster Code Enforcement
	<ul style="list-style-type: none"> <li>Communication systems</li> </ul>		Advance Assistance
			5% Percent Initiative Projects
			Miscellaneous/Other





CATEGORY	PUBLIC ASSISTANCE (PA)		HAZARD MITIGATION GRANT PROGRAM (HMGP) ELIGIBLE ACTIVITIES
	TYPE OF PROJECT	ELIGIBLE WORK INCLUDING BUT NOT LIMITED TO:	
G- PARKS, RECREATIONAL, OTHER	Eligible publicly owned facilities in this category include:	Restoration – Permanent repair or replacement.	Infrastructure Retrofit
	<ul style="list-style-type: none"> <li>• Mass transit facilities such as railways</li> <li>• Beaches</li> <li>• Parks</li> <li>• Playground equipment</li> <li>• Swimming pools</li> <li>• Bath houses</li> <li>• Tennis courts</li> <li>• Boat docks</li> <li>• Piers</li> <li>• Picnic tables</li> <li>• Golf courses</li> <li>• Ball fields</li> <li>• Fish hatcheries</li> <li>• Ports and harbors</li> </ul>	Restoration of engineered beaches is subject to specific eligibility criteria.	Soil Stabilization
			Post-Disaster Code Enforcement
			Advance Assistance
			5% Percent Initiative Projects
	Other facilities that do not fit in Categories C–F		Miscellaneous/Other



## APPENDIX D

### HABITAT CHARACTERISTICS OF ENDANGERED SPECIES ACT TERRESTRIAL SPECIES OF THE COMMONWEALTH OF PUERTO RICO

Federally-Listed Terrestrial-Based Threatened and Endangered Species: Habitat Characteristics.

<i>Common Name / Scientific Name</i>	<i>Habitat Characteristics</i>
<b>Birds</b>	
Elfin-woods warbler ( <i>Setophaga angela</i> )	Elfin-woods warblers live in forests with high rainfall, high humidity, low insolation, low temperatures, and constant winds. As its name suggests, this warbler inhabits elfin or montane dwarf forest with dense stands of short, small diameter, twisted trees and shrubs, but it is not exclusive to those areas. This warbler can also live in montane wet forest, and ranges to lower-elevation wet forest. Source: <a href="https://www.fws.gov/southeast/wildlife/birds/elfin-woods-warbler/">https://www.fws.gov/southeast/wildlife/birds/elfin-woods-warbler/</a>
Piping plover ( <i>Charadrius melodus</i> )	Piping plovers use wide, flat, open, sandy beaches with very little grass or other vegetation. Nesting territories often include small creeks or wetlands. Source: <a href="https://www.fws.gov/midwest/Endangered/pipingplover/pipingpl.html">https://www.fws.gov/midwest/Endangered/pipingplover/pipingpl.html</a>
Puerto Rican broad-winged hawk ( <i>Buteo platypterus brunescens</i> )	This species occurs in elfin woodland, sierra palm, caimitillo-granadillo, and tabonuco forest types of the Carite Commonwealth Forest, Toro Negro Forest, Los Tres Picachos Forest and El Yunque National Forest, as well as within mature hardwood plantations, shade coffee plantations, and mature secondary forest of the north-central karst region of Puerto Rico within and adjacent to the Río Abajo Commonwealth Forest, and in the Río Encantado area (Florida - Ciales). <a href="https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-broad-winged-hawk-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-broad-winged-hawk-english.pdf</a>
Puerto Rican nightjar ( <i>Caprimulgus noctitherus</i> )	The tree species usually found in the Puerto Rican nightjar's habitat include the oxhorn tree ( <i>Bucida buceras</i> ), gumbo limbo ( <i>Bursera simaruba</i> ), birdcatcher trees ( <i>Pisonia albida</i> ), Caribbean princewood ( <i>Exostema caribaeum</i> ), and big-leaf mahogany ( <i>Swietenia mahagoni</i> ). Some of these trees shed their leaves during certain seasons, and the nightjar uses this leaf litter for nesting. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-nightjar-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-nightjar-english.pdf</a>
Puerto Rican parrot ( <i>Amazona vittata</i> )	The bird is found only in the Caribbean National Forest (known as "El Yunque") located in the northeastern part of the island. Source: <a href="https://nctc.fws.gov/Pubs4/PR_parrot.pdf">https://nctc.fws.gov/Pubs4/PR_parrot.pdf</a>
Puerto Rican plain Pigeon ( <i>Columba inornata wetmorei</i> )	It can thrive in different habitats, but usually behaves as a border species, nesting, foraging and sleeping in trees along the sides of roads, rivers and creeks. <a href="https://www.fws.gov/southeast/pdf/fact-sheet/plain-pigeon-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/plain-pigeon-english.pdf</a>
Puerto Rican sharp-shinned hawk ( <i>Accipiter striatus venator</i> )	The Puerto Rican sharp-shinned hawk is an endemic species in Puerto Rico, and it is usually found in forested areas associated with the life zones known as subtropical montane rain forests and moist subtropical forests (e.g. cloud forests, Sierran palm, caimitillo-granadillo and tabonuco [candlewood]). Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-sharp-shinned-hawk-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-sharp-shinned-hawk-english.pdf</a>
Roseate Tern ( <i>Sterna dougallii dougallii</i> )	In the Caribbean area, this bird selects sparsely vegetated, rocky offshore islands for nesting. Source: <a href="https://www.facebook.com/pg/USFWSCaribbean/notes/">https://www.facebook.com/pg/USFWSCaribbean/notes/</a>
Rufa Red Knot ( <i>Calidris canutus rufa</i> )	Habitats used by red knots in migration and wintering areas are generally coastal marine and estuarine habitats with large areas of exposed intertidal sediments. Source: <a href="https://www.fws.gov/verobeach/StatusoftheSpecies/20151104_SOS_RedKnot.pdf">https://www.fws.gov/verobeach/StatusoftheSpecies/20151104_SOS_RedKnot.pdf</a>

<b>Common Name / Scientific Name</b>	<b>Habitat Characteristics</b>
Yellow-shouldered blackbird (Agelaius xanthomus)	The YSBL primarily nests in black mangroves ( <i>Avicennia germinans</i> ) and coconut palms ( <i>Cocos nucifera</i> ). It also nests in: West Indian locust ( <i>Hymenaea courbaril</i> ), red mangroves ( <i>Rhizophora mangle</i> ), Puerto Rico royal palm ( <i>Roystonea borinquena</i> ), and oxborn bucida ( <i>Bucida buceras</i> ), among others. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/yellow-shouldered-blackbird-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/yellow-shouldered-blackbird-english.pdf</a>
<b>Amphibians</b>	
Golden coqui (Eleutherodactylus jasper)	All that is known about the golden coqui's habitat is that it lives in the bromeliads growing on trees, on the ground, and/or on vertical surfaces like cliff sides. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/coqui-dorado-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/coqui-dorado-english.pdf</a>
Guajon (Eleutherodactylus cooki)	The guajón is endemic to Puerto Rico and is restricted to the southeastern part of the island. presence of "guajonales" which are caves and grottoes made of plutonic, granitic or sedimentary rocks. Additionally, the species also lives in rocky stream banks covered with moss, ferns and other vegetation. Source: <a href="https://www.fws.gov/caribbean/PDF/GuajonFacts.pdf">https://www.fws.gov/caribbean/PDF/GuajonFacts.pdf</a>
Llanero Coqui (Eleutherodactylus juanariveroi)	The coquí llanero is only found in one freshwater wetland in Puerto Rico, and it reproduces on only one plant, the bulltongue arrowhead. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/coqui-llanero-spanish.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/coqui-llanero-spanish.pdf</a>
Puerto Rican crested toad (Peltophryne lemur)	The habitat in which the Puerto Rican crested toad is found is usually described as a coastal dry forest, although they can also be found in subtropical, humid forest habitats, mainly along the karst fringes along the north and south coasts of Puerto Rico. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-crested-toad-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/puerto-rican-crested-toad-english.pdf</a>
<b>Reptile</b>	
Culebra Island giant anole (Anolis roosevelti)	Not much is known about this anole's habits. The specimen collected in 1931 was found in a forested area comprised of ficus and gumbo-limbo trees ( <i>Bursera simaruba</i> ). Source: <a href="https://www.fws.gov/uploadedFiles/CulebraGiantAnole ENG fact sheet.pdf">https://www.fws.gov/uploadedFiles/CulebraGiantAnole ENG fact sheet.pdf</a>
Mona boa (Epicrates monensis monensis)	This species is unique to the Mona Island Nature Reserve of Puerto Rico; that is to say, it is a species endemic to Mona. The subtropical dry forest, coastal plains, and coastal shrubbery are the species' preferred habitat. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/mona-boas-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/mona-boas-english.pdf</a>
Mona ground Iguana (Cyclura stejnegeri)	The Mona ground iguana is an endemic species of the Mona Island Nature Reserve of Puerto Rico. This species' habitat is rocky and dry, where the predominant flora is subtropical. The iguana seeks shelter in caves and rocky crevices during the nighttime and the cooler hours of the day. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/mona-ground-iguana-english.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/mona-ground-iguana-english.pdf</a>
Monito gecko (Sphaerodactylus micropithecus)	This gecko is only found in Monito Island. The gecko can be found in leaf litter on the ground, and it hides in small crevasses and holes in Monito Island. Source: <a href="https://www.fws.gov/southeast/pdf/fact-sheet/monito-gecko.pdf">https://www.fws.gov/southeast/pdf/fact-sheet/monito-gecko.pdf</a>
Puerto Rican boa (Epicrates inornatus)	Observed in every ecosystem in Puerto Rico, it is most commonly sighted in the karst areas in northern Puerto Rico. Source: <a href="https://www.fws.gov/uploadedFiles/PuertoRicanBoa ENG fact sheet.pdf">https://www.fws.gov/uploadedFiles/PuertoRicanBoa ENG fact sheet.pdf</a>
Virgin Islands tree boa (Epicrates monensis granti)	Virgin Island boas usually live in forest or xerophytic (dry) scrubland, characterized by sharp inclines and rocky, poorly fertile soil. Source: <a href="https://www.fws.gov/uploadedFiles/VirginIslandsBoa ENG fact sheet.pdf">https://www.fws.gov/uploadedFiles/VirginIslandsBoa ENG fact sheet.pdf</a>
<b>Plants</b>	
Arana (Schoepfia arenaria)	This species is an evergreen shrub or small tree, occurs in low elevation evergreen and semi-evergreen forests of the limestone hills of northern Puerto Rico. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/920110.pdf">https://ecos.fws.gov/docs/recovery_plan/920110.pdf</a>

<b>Common Name / Scientific Name</b>	<b>Habitat Characteristics</b>
Bariaco ( <i>Trichilia triacantha</i> )	Native dry forest located in the Montes de Barinas, Sabana Grande, Guayanilla and Ponce-Peñuelas. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/Trichilia%20triacantha_Final%20Draft%20Amendment.pdf">https://ecos.fws.gov/docs/recovery_plan/Trichilia%20triacantha_Final%20Draft%20Amendment.pdf</a> .
Cana Gorda Girdlepod ( <i>Mitracarpus polycladus</i> )	Cana Gorda Girdlepod are found within the subtropical dry forest life zone, the driest life zone in Puerto Rico. The vegetation in this zone forms a complete ground cover and is deciduous on most soils. Leaves are succulent or coriaceous, and species with spines and thorns are common. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/981006a.pdf">https://ecos.fws.gov/docs/recovery_plan/981006a.pdf</a>
Capa rosa ( <i>Callicarpa ampla</i> )	Capa rosa is known from five localities in the palo Colorado forest type. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950731a.pdf">https://ecos.fws.gov/docs/recovery_plan/950731a.pdf</a>
Cerro de Punta Jayuya ( <i>Elaphoglossum serpens</i> )	<i>Elaphoglossum serpens</i> is found at a single site in the montane dwarf forest of the summit of Cerro Punta in the central mountains, municipality of Jayuya. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>
Chase's Threawn ( <i>Aristida chaseae</i> )	<i>Aristida chaseae</i> is known from the Cabo Rojo National Wildlife Refuge (CRNWR) and La Tinaja Farm which is part of the Cartagena Lagoon National Wildlife Refuge (CLNWR) and Cerro Mariquita area adjacent to the LTF in the Sierra Bermeja mountain range. Source: <a href="https://ecos.fws.gov/docs/five_year_review/doc6034.pdf">https://ecos.fws.gov/docs/five_year_review/doc6034.pdf</a>
Chupacallos ( <i>Pleodendron macranthum</i> )	<i>Pleodendron macranthum</i> is known to exist in the subtropical wet (tabonuco forest type) and the subtropical lower montane wet (palo colorado forest type) forest life zones. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/980911a.pdf">https://ecos.fws.gov/docs/recovery_plan/980911a.pdf</a>
Cobana negra ( <i>Stahliia monosperma</i> )	Grows in brackish, seasonally flooded wetlands in association with mangrove communities, although cultivated plants have been reported from inland areas such as the nursery at Cambalache State Forest in Puerto Rico. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/961101a.pdf">https://ecos.fws.gov/docs/recovery_plan/961101a.pdf</a>
Cook's holly ( <i>Ilex cookii</i> )	Restricted to the dwarf or elfin forests of the highest elevations in the central mountains of Puerto Rico. Elevations at all known sites ranges from 3,900 to 4,260 feet (1,200 to 1,300 meters). Source: <a href="https://ecos.fws.gov/docs/recovery_plan/910131a.pdf">https://ecos.fws.gov/docs/recovery_plan/910131a.pdf</a>
Cordillera Maiden Fern ( <i>Thelypteris inabonensis</i> )	<i>Thelypteris inabonensis</i> is only known from high elevation wet montane forest in two localities, the headwaters of the Rio Inabón in Ponce and Cerro Rosa in the municipality of Ciales. Both areas are located within the Toro Negro Commonwealth Forest. <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>
El Yunque Colorado ( <i>Ternstroemia subsessilis</i> )	The four known localities of <i>Ternstroemia subsessilis</i> are in the palo colorado forest. These species are extremely restricted in distribution and vulnerable to habitat destruction or modification by forest management practices and hurricanes. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950731a.pdf">https://ecos.fws.gov/docs/recovery_plan/950731a.pdf</a>
Elfin tree fern ( <i>Cyathea dryopteroides</i> )	Restricted to dwarf or elfin forests found at elevations greater than 830 meters. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/910131a.pdf">https://ecos.fws.gov/docs/recovery_plan/910131a.pdf</a>
Erubia ( <i>Solanum dryophilum</i> )	Found in evergreen forests of the subtropical wet forest life zone. It occurs on volcanic soils at elevations ranging from 300 to 900 meters. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/Solanum%20dryophilum%20RP.pdf">https://ecos.fws.gov/docs/recovery_plan/Solanum%20dryophilum%20RP.pdf</a>
Heller's Cieneguillo ( <i>Daphnopsis hellerana</i> )	All populations of <i>Daphnopsis hellerana</i> occur in the semi-evergreen and evergreen seasonal forests of the limestone hills of northern Puerto Rico at elevations which range from 100 to 350 meters. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/920807b.pdf">https://ecos.fws.gov/docs/recovery_plan/920807b.pdf</a> .
Higo Chumbo-Prickly Pear ( <i>Harrisia portoricensis</i> )	<i>Higo chumbo</i> is known from the several vegetation types on the island of Mona but is most frequently observed in the cactus forest. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/961112c.pdf">https://ecos.fws.gov/docs/recovery_plan/961112c.pdf</a>

<b>Common Name / Scientific Name</b>	<b>Habitat Characteristics</b>
Higuero de sierra ( <i>Crescentia portoricensis</i> )	Is known to occur only on serpentine soils in the western mountains of Puerto Rico. Elevations range from 200 meters in the Susua Forest to about 800 meters in Maricao. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/910923.pdf">https://ecos.fws.gov/docs/recovery_plan/910923.pdf</a>
Jamaican Broom ( <i>Chamaecrista glandulosa</i> var. <i>mirabilis</i> )	It is a small shrub endemic to the white silica sands of the northern coast of Puerto Rico at elevations near sea level. It is scattered along the southern shore of the Tortuguero Lagoon and is also found at one location in Dorado and one in Vega Alta. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/940512.pdf">https://ecos.fws.gov/docs/recovery_plan/940512.pdf</a>
Luquillo Mtn babyboot ( <i>Lepanthes eltoroensis</i> )	It is currently known from six discrete sites in the sierra palm, palo colorado, and dwarf forests of the Caribbean National Forest. <a href="https://ecos.fws.gov/docs/recovery_plan/960715.pdf">https://ecos.fws.gov/docs/recovery_plan/960715.pdf</a>
Beautiful goetzea ( <i>Goetzea elegans</i> )	It is endemic to the island of Puerto Rico that has historically been known to occur at several locations within the karst and foothills regions on the northern side of the islands. At present, the species appears to be confined to a single area in the northwest. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/beautiful%20goetzea%20rp.pdf">https://ecos.fws.gov/docs/recovery_plan/beautiful%20goetzea%20rp.pdf</a>
Maxwell's Girdlepod ( <i>Mitracarpus maxwelliae</i> )	All areas where these three species are located are found within the subtropical dry forest life zone, the driest life zone in Puerto Rico. The vegetation in this zone forms a complete ground cover and is deciduous on most soils. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/981006a.pdf">https://ecos.fws.gov/docs/recovery_plan/981006a.pdf</a>
Monte Guilarte Hollyfern ( <i>Polystichum calderonense</i> )	It is found in two locations: Monte Guilarte Commonwealth Forest in Adjuntas and Cerrote Penuelas in the municipality of Penuelas. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>
No common name (Varronia rupicola)	Solitary scattered; in areas with low shrubs. Source: <a href="https://collections.si.edu/search/record/edanmdm:nmnhbotany_13353942">https://collections.si.edu/search/record/edanmdm:nmnhbotany_13353942</a>
No common name (Cranichis ricartii)	<i>Cranichis ricartii</i> has been found at only three locations in the Maricao Commonwealth Forest. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/960715.pdf">https://ecos.fws.gov/docs/recovery_plan/960715.pdf</a>
No common name (Gonocalyx concolor)	The only known populations of <i>Gonocalyx concolor</i> are located within the Carite Commonwealth Forest, managed by the Puerto Rico Department of Natural and Environmental Resources. Source: <a href="https://www.fws.gov/southeast/news/2014/05/service-seeks-comments-on-draft-economic-analysis-re-opens-comment-period-on-proposal-to-designate-critical-habitat-for-three-caribbean-plants/">https://www.fws.gov/southeast/news/2014/05/service-seeks-comments-on-draft-economic-analysis-re-opens-comment-period-on-proposal-to-designate-critical-habitat-for-three-caribbean-plants/</a>
No common name (Leptocereus grantianus)	The one known population occurs in dry thickets along a rocky shoreline on the southwestern part of Culebra. The population is located only 8 to 10 meters from high tide. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950726.pdf">https://ecos.fws.gov/docs/recovery_plan/950726.pdf</a>
No common name (Myrcia paganii)	Only eight individuals of <i>M. Paganii</i> are currently known from three localities in the Biafara-Arrozal area to the south of Arecibo and in Quebradillas. Only 19 individuals of <i>A. pauciflorum</i> are known from four groups in the Coto Ward area of Isabela. Both species are found in the semi-evergreen and evergreen seasonal forests of the subtropical moist forest life zones. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/970929b.pdf">https://ecos.fws.gov/docs/recovery_plan/970929b.pdf</a>
No common name (Thelypteris verecunda)	The fern is found at Charcas Ward in Quebradillas, Bayaney Ward in Hatillo, and Cidral Ward in the municipality of San Sebastian. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>



<b>Common Name / Scientific Name</b>	<b>Habitat Characteristics</b>
No common name ( <i>Vernonia proctorii</i> )	Located with dry forest habitat within the range of Sierra Bermeja ( <i>V. proctorii</i> are known only from the summit of Cerro Mariquita in the Sierra Bermeja., this species occurs in a limited geographic area in southwestern Puerto Rico. <a href="https://ecos.fws.gov/docs/recovery_plan/A.chaseae_L.Truncata_V.proctorii_Recovery_Plan_A_mendment_2.pdf">https://ecos.fws.gov/docs/recovery_plan/A.chaseae_L.Truncata_V.proctorii_Recovery_Plan_A_mendment_2.pdf</a> and <a href="https://ecos.fws.gov/docs/recovery_plan/950731b.pdf">https://ecos.fws.gov/docs/recovery_plan/950731b.pdf</a>
Palma de manaca ( <i>Calyptronomia rivalis</i> )	An arborescent palm grows along streambanks in the semi-evergreen forests of the karst region of northwestern Puerto Rico. The three populations are known from San Sebastian, Caumy and Guajataca. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/Recovery%20plan%20for%20Calyptronomia%20rivalis.pdf">https://ecos.fws.gov/docs/recovery_plan/Recovery%20plan%20for%20Calyptronomia%20rivalis.pdf</a>
Palo colorado ( <i>Ternstroemia luquillensis</i> )	<i>Ternstroemia luquillensis</i> exist only in the Luquillo Mountains where it grows in three localities in the palo colorado forest and one locality in the dwarf forest. <a href="https://ecos.fws.gov/docs/recovery_plan/950731a.pdf">https://ecos.fws.gov/docs/recovery_plan/950731a.pdf</a>
Palo de jazmin ( <i>Syrax portoricensis</i> )	This species is endemic to Puerto Rico, where they exist only in the Luquillo Mountains. Its located in the palo colorado forest type. <a href="https://ecos.fws.gov/docs/recovery_plan/950731a.pdf">https://ecos.fws.gov/docs/recovery_plan/950731a.pdf</a>
Palo de nigua ( <i>Cornutia obovate</i> )	The plant is known to occur in the central mountains of Puerto Rico and in the limestone hill region. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/920807b.pdf">https://ecos.fws.gov/docs/recovery_plan/920807b.pdf</a>
Palo de ramon ( <i>Banara vanderbiltii</i> )	<i>Banara vanderbiltii</i> , a small evergreen tree, is found in the semi-evergreen forests of the subtropical moist forest life zone. Populations are found on limestone hills or mogotes (elevations 100 to 150 meters) and in the central mountains of volcanic origin (elevations greater than 800 meters). Source: <a href="https://ecos.fws.gov/docs/recovery_plan/910315.pdf">https://ecos.fws.gov/docs/recovery_plan/910315.pdf</a>
Palo de rosa ( <i>Ottoschulzia rhodoxylon</i> )	Palo de rosa is known from serpentine and limestone-derived soils in western Puerto Rico. In these areas, narrow moisture tolerance range has been identified. In Guánica, it is found in the more humid canyon bottoms, and in Quebradillas/Isabela it occurs on the drier upper slopes and summits. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/940920.pdf">https://ecos.fws.gov/docs/recovery_plan/940920.pdf</a> .
Pelos del diablo ( <i>Aristida portoricensis</i> )	<i>Pelos de diablo</i> is known only from serpentine slopes and red clay soils in southwestern Puerto Rico. Two populations are known: Cerro Las Mesas near Mayaguez and the Sierra Bermeja in the Cabo Rojo and Laja. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/Recovery%20plan%20for%20Aristida%20portoricensis.pdf">https://ecos.fws.gov/docs/recovery_plan/Recovery%20plan%20for%20Aristida%20portoricensis.pdf</a>
Proctor's Staggerbush ( <i>Lyonia truncata</i> var. <i>proctorii</i> )	Proctor's Staggerbush is known only from the summit of Cerro Mariquita in the Sierra Bermeja. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950731b.pdf">https://ecos.fws.gov/docs/recovery_plan/950731b.pdf</a>
Puerto Rico Halberd Fern ( <i>Tectaria estremarana</i> )	The Puerto Rico Halberd Fern has been reported to occur at only one location in the limestone hills of northern Puerto Rico near Arecibo. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>
Puerto Rico Maiden Fern ( <i>Thelypteris yaucoensis</i> )	Puerto Rico Maiden Fern is known from two localities in Yauco and one locality in Ciales and grows in humus on steep, shaded rocky banks, and ledges at high elevations. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>
Puerto Rico Maidenhair ( <i>Adiantum vivesii</i> )	Puerto Rico Maidenhair has been reported to occur at only one location in the limestone hills of northern Puerto Rico near Quebradillas. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950117.pdf">https://ecos.fws.gov/docs/recovery_plan/950117.pdf</a>
Puerto Rico Manjack	<i>Cordia bellonis</i> has been found at Maricao and Susua in serpentine soils, at road edges, river margins, and on steep slopes at an elevation between 230 to 250 meters (754 to 820 feet) (Susua)

<b>Common Name / Scientific Name</b>	<b>Habitat Characteristics</b>
( <i>Cordia allonisia</i> )	and 441 to 820 meters (1,447 to 2,690 feet) (Maricao). In the Rio Abajo Forest, the species was found either on sunny banks along dirt roads, growing in thickets of vegetation, or in open saddles between limestone hills. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/991001.pdf">https://ecos.fws.gov/docs/recovery_plan/991001.pdf</a>
Sintenis' Holly ( <i>Ilex sintenisii</i> )	Occur within the federally owned Caribbean National Forest, within the municipalities of Ceiba, Loiza, Naguabo, and Rio Grande. Sintenis' Holly are located within the dwarf forest type. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/950731a.pdf">https://ecos.fws.gov/docs/recovery_plan/950731a.pdf</a>
St. Thomas prickly-ash ( <i>Zanthoxylum thomsonianum</i> )	The species is known to occur in the southern foothills and south coastal uplands as well as, the limestone karst region of northwest Puerto Rico. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/st%20thomas%20prickly%20ash%20rp.pdf">https://ecos.fws.gov/docs/recovery_plan/st%20thomas%20prickly%20ash%20rp.pdf</a>
Thomas' Lidflower ( <i>Calyptanthus thomsonianus</i> )	On Vieques, the Puerto Rican population is found on US Navy property in moist deciduous forest at an elevation of 301 meters. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/970930a.pdf">https://ecos.fws.gov/docs/recovery_plan/970930a.pdf</a>
No common name ( <i>Catesbaea melanocarpa</i> )	<i>Catesbaea melanocarpa</i> occurs in the subtropical dry forest life zone, the driest life zone in Puerto Rico. The vegetation in this zone typically forms a nearly continuous single-layered canopy, with little ground cover, and it is deciduous on most soils. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/050818.pdf">https://ecos.fws.gov/docs/recovery_plan/050818.pdf</a>
Turtlefat ( <i>Auerodendron pauciflorum</i> )	Only 19 individuals of <i>A. pauciflorum</i> are known from four groups in the Coto Ward area of Isabela. Both species are found in the semi-evergreen and evergreen seasonal forests of the subtropical moist forest life zones. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/970929b.pdf">https://ecos.fws.gov/docs/recovery_plan/970929b.pdf</a>
Uvillo-Luquillo Mtn Stopper ( <i>Eugenia haematocarpa</i> )	All known localities of these endemic tree species occur within Federal and Commonwealth lands, except a small population located on private property adjacent to the Carite Commonwealth Forest. <i>Eugenia haematocarpa</i> is known to only exist in the subtropical lower montane wet (palo colorado forest type) forest life zone. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/980911a.pdf">https://ecos.fws.gov/docs/recovery_plan/980911a.pdf</a>
Vahl's boxwood ( <i>Buxus vahlii</i> )	Vahl's boxwood is an evergreen shrub or small tree endemic to the island of Puerto Rico, where it is known from only two locations within the karst region on the northern side of the island. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/vahls%20boxwood%20rp_1.pdf">https://ecos.fws.gov/docs/recovery_plan/vahls%20boxwood%20rp_1.pdf</a>
West Indian Walnut-Nogal ( <i>Juglans jamaicensis</i> )	In Puerto Rico, this species is known from only 14 individuals at one locality in the municipality of Adjuntas. The known locality is near the Monte Guilarte Commonwealth Forest. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/991209A.pdf">https://ecos.fws.gov/docs/recovery_plan/991209A.pdf</a>
Wheeler's peperomia ( <i>Peperomia wheeleri</i> )	Wheeler's peperomia is an herbaceous plant, occurs on large granodiorite boulders beneath the semi-evergreen seasonal forest of the Monte Resaca area of Culebra Island. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/901126.pdf">https://ecos.fws.gov/docs/recovery_plan/901126.pdf</a>
Woodbury's Stopper ( <i>Eugenia woodburyana</i> )	<i>Eugenia woodburyana</i> is endemic subtropical dry forest in the southwestern Puerto Rico. Currently, the population total consists of approximately about 150 individuals in various locations in Sierra Bermeja in the municipalities Cape Red and Lajas. Source: <a href="https://www.fws.gov/caribbean/PDF/Eugenia_woodburyana.pdf">https://www.fws.gov/caribbean/PDF/Eugenia_woodburyana.pdf</a>
Yerba Maricao de Cueva ( <i>Gesneria pauciflora</i> )	<i>Gesneria pauciflora</i> is known to occur only on serpentine derived substrates. At all known localities, the plants are associated with wet habitats, which are on steep rock faces with little or no soil formation. They are within the spray zone of waterfalls or near deep pools. Most are in shady situations where direct sun is not received. Most individuals are found within 1 meter of water and may actually be submerged for brief periods of time. Source: <a href="https://ecos.fws.gov/docs/recovery_plan/981006b.pdf">https://ecos.fws.gov/docs/recovery_plan/981006b.pdf</a>