

Programmatic Environmental Assessment
School Infrastructure Recovery and Resiliency
Puerto Rico
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TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
LIST OF ACRONYMS	iv
1.0 INTRODUCTION	1
2.0 PURPOSE AND NEED.....	2
3.0 PROJECT BACKGROUND	2
4.0 ALTERNATIVES.....	5
4.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE	5
4.2 ALTERNATIVE 2: REPAIR OF SCHOOLS WITH ADDED RESILIENCY MEASURES	6
4.3 ALTERNATIVE 3: RELOCATION OF SCHOOLS	8
4.4 ALTERNATIVE 4: A COMBINATION OF ALTERNATIVES 2 AND 3.....	11
5.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS	12
5.1 GEOLOGY, TOPOGRAPHY, AND SOILS	13
5.1.1 <i>Existing Conditions</i>	14
5.1.2 <i>Potential Impacts and Proposed Mitigation</i>	15
5.2 AIR QUALITY	17
5.2.1 <i>Existing Conditions</i>	18
5.2.2 <i>Potential Impacts and Proposed Mitigation</i>	19
5.3 WATER QUALITY.....	21
5.3.1 <i>Existing Conditions</i>	21
5.3.2 <i>Potential Impacts and Proposed Mitigation</i>	22
5.4 WETLANDS	23
5.4.1 <i>Existing Conditions</i>	24
5.4.2 <i>Potential Impacts and Proposed Mitigation</i>	25
5.5 FLOODPLAINS	27
5.5.1 <i>Existing Conditions</i>	28
5.5.2 <i>Potential Impacts and Proposed Mitigation</i>	28
5.6 COASTAL RESOURCES.....	31
5.6.1 <i>Existing Conditions</i>	32
5.6.2 <i>Potential Impacts and Proposed Mitigation</i>	33
5.7 THREATENED AND ENDANGERED SPECIES.....	36
5.7.1 <i>Existing Conditions</i>	36
5.7.2 <i>Potential Impacts and Proposed Mitigation</i>	37
5.8 CULTURAL RESOURCES	39
5.8.1 <i>Standing Structures</i>	40
5.8.1.1 <i>Existing Conditions</i>	40
5.8.1.2 <i>Potential Impacts and Proposed Mitigation</i>	41
5.8.2 <i>Archaeological Resources</i>	43
5.8.2.1 <i>Existing Conditions</i>	43

5.8.2.2 Potential Impacts and Proposed Mitigation.....	45
5.9 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE	46
5.9.1 Existing Conditions	47
5.9.2 Potential Impacts and Proposed Mitigation.....	49
5.10 LAND USE AND PLANNING	53
5.10.1 Existing Conditions	53
5.10.2 Potential Impacts and Proposed Mitigation.....	54
5.11 NOISE	55
5.11.1 Existing Conditions	55
5.11.2 Potential Impacts and Proposed Mitigation.....	56
5.12 TRANSPORTATION	58
5.12.1 Existing Conditions	58
5.12.2 Potential Impacts and Proposed Mitigation.....	59
5.13 PUBLIC SERVICES AND UTILITIES	60
5.13.1 Existing Conditions	60
5.13.2 Potential Impacts and Proposed Mitigation.....	61
5.14 HAZARDOUS MATERIALS	62
5.14.1 Existing Conditions	63
5.14.2 Potential Impacts and Proposed Mitigation.....	64
5.15 CUMULATIVE IMPACTS	66
5.15.1 On-going Federal Actions.....	67
5.15.2 Summary of Cumulative Impacts	67
6.0 PERMITS AND REQUIREMENTS	69
7.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT	71
8.0 LIST OF PREPARERS.....	73
9.0 SUMMARY OF IMPACTS	74
10.0 REFERENCES	76
APPENDIX A.....	83
APPENDIX B	89
APPENDIX C	106
APPENDIX D	113
APPENDIX E	115

LIST OF FIGURES

Figure 1: Location Map	90
Figure 2: U.S. Census Bureau – Urban Areas	91
Figure 3: Farmland Protection Policy Act	92
Figure 4: Illustration of Regional Fault Lines and Geophysical Formations	93

Figure 5: Clean Air Act: Nonattainment and Maintenance Areas in Puerto Rico	94
Figure 6: U.S. Fish and Wildlife National Wetlands Inventory	95
Figure 7: Advisory Base Flood Elevations	96
Figure 8: Coastal Zone Management Act	97
Figure 9: Coastal Barrier Resource System	98
Figure 10: Endangered Species Act: Designated Critical Habitat	99
Figure 11: Schools 50 Years of Age or Older	100
Figure 12: National Historic Preservation Act: Individually Listed Sites and Historic Districts	101
Figure 13: U.S. Census Bureau: Percentage of the Population Living in Poverty and Percentage of the Population Under 18 Years	102
Figure 14: U.S. Census Bureau: Municipalities with High Percentage of Minority Populations	103
Figure 15: Comprehensive Environmental Response, Compensation, and Liability Act: National Priorities List Map	104
Figure 16: Ongoing Federal Actions in Puerto Rico	105

LIST OF TABLES

Table 1: Impact Significance and Context Evaluation Criteria for Potential Impacts	12
Table 2: NEPA Time Scale	12
Table 3: Eliminated Resource Topics	13
Table 4: Current Nonattainment and Maintenance Areas	18
Table 5: PRDNER/PREQB Classification Zone and Sound Emission Levels Per Zone (dBA)	56
Table 6: Active NPL Sites in Puerto Rico	64

LIST OF ACRONYMS

ABFE	Advisory Base Flood Elevation
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
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COR3	Central Office of Recovery, Reconstruction, and Resiliency
CSP	Consolidated State Plan
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	Decibels (weighted)
DCH	Designated Critical Habitat
EA	Environmental Assessment
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESSA	Every Student Succeeds Act
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
H&H	Hydrologic and Hydraulic
HUD	Housing and Urban Development
Km	Kilometers
MOT	Maintenance of Traffic
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NOAA	National Oceanic Atmospheric Association
NO _x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
O ₃	Ozone
OPA	Otherwise Protected Areas

OSHA	Occupational Safety and Health Administration
PEA	Programmatic Environmental Assessment
PM _{2.5}	Particulate Matter less than 2.5 micrometers
PM ₁₀	Particulate Matter less than 10 micrometers
PNP	Private non-profit
PRASA	Puerto Rico Aqueduct and Sewer Authority
PRCZMP	Puerto Rico Coastal Zone Management Program
PRDE	Puerto Rico Department of Education
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
PreK-12	Pre-Kindergarten through 12 th Grade Schools
PRPB	Puerto Rico Planning Board
RCRA	Resource Conservation and Recovery Act
RHA	Rivers and Harbors Act
ROW	Right of Way
SHPO	State Historic Preservation Office
SOW	Scopes of work
SO _x	Sulfur oxides
SWPPP	Stormwater Pollution Prevention Plan
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WOTUS	Waters of the United States

1.0 INTRODUCTION

The mission of the Federal Emergency Management Agency (FEMA) is to help people before, during, and after disasters. Since 2017, the President signed multiple disaster declarations for Puerto Rico in response to various disaster events. These disaster events included Hurricane Irma and Hurricane Maria, both of which affected Puerto Rico in September 2017, and the increased seismic activity Puerto Rico experienced between 2019 and 2020. These disasters caused varying degrees of damage to schools across Puerto Rico.

The declarations 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 (Stafford Act), *as amended*, (42 U.S.C. §§ 5121-5207); the Sandy Recovery Improvement Act of 2013; and the Bipartisan Budget Act of 2018 (Pub. L. 115-123). The Puerto Rico Central Office of Recovery, Reconstruction and Resiliency (COR3) is the recipient for FEMA grants, and multiple entities within Puerto Rico may be subrecipient 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 NEPA (40 Code of Federal Regulations [CFR] Parts 1500 to 1508). Recent changes to the President's Council on Environmental Quality (CEQ) regulations implementing NEPA became effective on September 14, 2020 (85 Fed. R. 43304-76 (July 16, 2020)). As stated in 40 CFR § 1506.13, the new regulations apply to any NEPA process begun after September 14, 2020. This PEA substantively commenced prior to that date; therefore, this PEA conforms to the CEQ NEPA implementing regulations that were in place prior to September 14, 2020, and procedures adopted pursuant to Department of Homeland Security Directive 023-01, Rev. 01, and FEMA Directive 108-1. In accordance with above referenced regulations, directive, and instruction, FEMA evaluates and considers the environmental consequences of major federal actions it funds or undertakes.

This PEA considers the potential environmental impacts of potential project alternatives, including a no action alternative, to repair or relocate schools in Puerto Rico, and to determine whether to revise the PEA (take no action), prepare a Finding of No Significant Impact (FONSI), or initiate an Environmental Impact Statement (EIS).

If a proposed project meets the scope, impacts, and mitigation described in this PEA, FEMA will then conduct any remaining project-specific reviews and consultations with federal regulatory partners. The subrecipient for such proposals will conduct consultation and permitting with municipal and Puerto Rican agencies prior to construction. Projects that exceed the thresholds or have impacts greater than considered in this PEA may result in a project-specific tiered environmental assessment (EA) or stand-alone project-specific EA. Appendix A presents conditions under which FEMA may tier an EA from this PEA. Project proposals that FEMA determines cannot meet a FONSI will require an EIS, or FEMA may choose to not fund such a project.

2.0 PURPOSE AND NEED

Wind, rain, and floodwater from hurricanes Irma and Maria caused widespread damage to schools throughout Puerto Rico. Subsequent increases in seismic activity further exacerbated the physical condition of Puerto Rico's Pre-Kindergarten through 12th grade schools (PreK-12). The purpose of the programmatic actions considered herein is to restore the capacity of Puerto Rico's PreK-12 schools to meet the post-disaster needs of the subrecipients and increase the resiliency of their facilities in response to future disaster events. Under the Stafford Act, FEMA is authorized to provide grant funding to eligible subrecipients for cost-effective actions with the purpose of reducing or eliminating risks to life, property, and the environment. FEMA's programs of Public Assistance Alternate Procedures, Sections 404 and 406 Hazard Mitigation under the Stafford Act, and the Bipartisan Budget Act of 2018, each encourage flexibility in disaster recovery.

Following hurricanes Maria and Irma in 2017 and the earthquake events of 2019 and 2020, over 1,000 schools reported damages to their facilities. As a result, some schools were forced to close and have not yet reopened. The need for action is to equitably re-establish and restore disaster-impacted schools to current codes and standards, reopen facilities closed as a result of disaster events, and provide hazard mitigation to increase resiliency in response to future disaster events. In doing so, schools will be able to serve as resilient functional community centers during times of crisis as well as be able to resume in-person learning sooner, following disaster events. If, instead of implementing one of the alternatives covered under this PEA for a disaster-impacted school, a new action is proposed, then it would undergo a separate NEPA evaluation.

3.0 PROJECT BACKGROUND

Following hurricanes Maria and Irma and earthquake events for Puerto Rico, FEMA prepared this PEA to address affected PreK-12 schools. Puerto Rico is situated within a Caribbean archipelago composed of four main islands and has a total area of approximately 13,791 square kilometers (km²) (5,325 square miles [mi²]), including 4,707 km² (1,817 mi²) of territorial waters (Figure 1 in Appendix B; USCB 2011). The main island of Puerto Rico is 180 km (110 mi) east-west by 65 km (40 mi) north-south (Yuan, et al 2017) and has an area of 8,713 km² (3,364 mi²) (Gomez-Gomez et al. 2014). The other two permanently populated islands, Vieques and Culebra, have an area of 132 km² (51 mi²) and 30 km² (12 mi²), respectively, while Mona Island has an area of 54 km² (21 mi²) (Gomez-Gomez et al. 2014).

Puerto Rico is mountainous with extensive coastal areas in the north and south. The main mountain range is called "La Cordillera Central." Puerto Rico is comprised of the following 78 municipalities, each with a mayor and municipal legislature:

Adjuntas, Aguada, Aguadilla, Aguas Buenas, Aibonito, Añasco, 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, Orocovis, Patillas, Peñuelas, 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.

Since the early 1900, Puerto Rico's population has more than tripled. However, between 2010 and 2019, the population of Puerto Rico declined by 14.3% (USCB 2021a). As of July 1, 2019, the U.S. Census Bureau (USCB) estimated that the number of people living in Puerto Rico is 3,193,694 (USCB 2021a). This equates to 1,088 people per square mile. Based on USCB data, this suggests that Puerto Rico is one of the most densely populated states or territories per capita within the United States.

Puerto Rico divides the school system into pre-kindergarten schools, kindergarten through 12th grade high school, and higher education colleges and universities. The individual schools may be part of the preK-12 public schools, private non-profit (PNP), and Montessori style preK-12 schools, PNP colleges and universities, or part of the public University of Puerto Rico system. Religious organizations staff and administer many of the PNP schools. This PEA covers PreK-12 public and PNP schools.

The Puerto Rico Department of Education (PRDE) and the Puerto Rico Education Council oversee PreK-12 public education within Puerto Rico. PRDE manages all public elementary and secondary schools; while the Puerto Rico Education Council oversees all academic standards and issues licenses to operate public schools and institutions within Puerto Rico. To manage Puerto Rico's public-school system more effectively, PRDE has established seven education regions: *Arecibo, Bayamon, Caguas, Humacao, Mayaguez, Ponce, and San Juan*. Public school facilities within Puerto Rico are owned by either the Puerto Rico Buildings Authority or the Puerto Rico Department of Transportation and Public Works (PRDTOP). The Puerto Rico Buildings Authority is the legal custodian of all government owned real estate within Puerto Rico. In addition to public schools, there are a number of private schools operating within Puerto Rico. Private schools consist of both religious and non-religious institutions with the Catholic school system representing the most prominent non-public school system in Puerto Rico. Catholic PreK-12 schools in Puerto Rico fall under the management of the Superintendent of Catholic Schools for Puerto Rico. PRDE currently manages 1,109 schools while there are approximately 123 PNP preK-12 schools, for a total of 1,232 preK-12 schools in Puerto Rico (FEMA 2021a).

Between 2006 and 2018, the number of open schools declined by about 56%. Of the closings, 65% were in rural areas and 35% were in urban areas (Hinojosa et al. 2019). Following Hurricane Maria, impacts to schools were widespread. PRDE closed all schools during the disaster except those utilized as shelters. One month after Hurricane Maria's landfall, PRDE had only reopened 9% of their schools for in-person learning. By early December 2017, 90%, of PRDE's schools had reopened for classroom learning. Since Hurricane Maria, PRDE has classified 38 schools as irreparably damaged (FEMA 2018). Following the increase in seismic activity between December 2019 and January 2020, Puerto Rico closed many of its schools due to earthquake and aftershock related damage. The earthquakes caused damages which were primarily confined to the southwestern portion of the main island (Press Democrat 2020).

Since Hurricane Maria, Puerto Rico has experienced a decrease in the amount of money spent on schools as well as decreased student enrollment. Puerto Rico's decrease in education expenditures was greater proportionally than their decrease in enrollment, resulting in a 12.8% decrease in the amount of money Puerto Rico spends per public school pupil between 2017 and 2018 (NCES 2020).

In December 2015, the Every Student Succeeds Act (ESSA) replaced the No Child Left Behind Act as federal education law and reauthorized the 50-year-old Elementary and Secondary Education Act. The new law had a clear goal of ensuring that the public education system prepares every child to graduate from high school, ready to thrive in college and their careers. The ESSA includes provisions that promote equitable access to educational opportunities. These provisions include holding all students to high academic standards and ensuring that the public education system takes meaningful action to improve the lowest-performing schools and schools with underperforming student groups.

On January 17, 2018, the Governor of Puerto Rico and Puerto Rico's Secretary of Education approved the Puerto Rico Consolidated State Plan (CSP) prepared by PRDE. The CSP is a requirement of the 2015 ESSA and applies only to public schools, and not to PNPs. According to the CSP, Puerto Rico indicated school consolidation is necessary to reorganize and improve Puerto Rico's school system. Public outreach under the CSP occurred between 2016 and 2017 and involved consultation with educators, parent organizations, and elected officials. During PRDE's stakeholder engagement, student attendance rates, school climate, violent incident records, parent involvement, teacher preparation, and teacher attendance rates were identified as top priorities for addressing Puerto Rico's lagging public education system (PRDE 2018).

As part of PRDE's comprehensive restructuring outlined in the approved CSP, the agency's school improvement efforts under the 2015 ESSA were based on the following recommendations:

- Close low-performing schools; and
- Consolidate schools by sending students to higher-performing schools, schools with the capacity to achieve positive outcomes, and schools that have sufficient enrollment to support cost-effective implementation of new academic programs (PRDE 2018).

Following the signing of the CSP in 2018, PRDE reduced the number of schools that would be open for the 2018-2019 school year from 1,109 to approximately 844. All 1,232 PRDE and PNP-managed PreK-12 schools in Puerto Rico are covered by this PEA, regardless of whether they were closed due to disaster damage or for other reasons.

As of the preparation of this PEA, PRDE may develop a Community Engagement Plan regarding the improvement of schools in Puerto Rico. Part of this plan is to develop a Master Plan to provide a framework for decision making regarding the prioritization school repair and improvement. If this Master Plan is developed, it should include a community outreach process that involves reaching out to communities, educators, and students to learn their needs and concerns regarding school facilities and the future of education in Puerto Rico. The information gathered during the community outreach should be used as a first step in developing the process to repair and improve

schools. Once more information is available, PRDE will conduct additional community outreach to obtain feedback on this process.

4.0 ALTERNATIVES

FEMA's intent in developing the following Alternatives is to satisfy the purpose and need for broad categories of actions for which FEMA anticipates receiving project proposals. The Alternatives will assist the recipient and subrecipients in addressing schools impacted by hurricanes Irma and Maria, as well as the subsequent seismic activity. Within this PEA, "schools" are comprised of the buildings, roads, walkways, athletic facilities, landscaping, playgrounds, and all other infrastructure that together make up a school campus.

Implementation of action alternatives will support federally funded projects and mitigate future impacts from flooding, wind, and seismic events by increasing the resiliency of schools. The alternatives presented include a no action alternative, otherwise known as the "Future without Federal Protection Condition," and three action alternatives. The action alternatives presented in this section are inclusive of all portions of project development, including planning and design, engineering, repair, demolition, construction, and regulatory compliance.

For actions at existing facilities, FEMA is considering expansion of location, capacity, and density up to 20%, aligning with Department of Housing and Urban Development (HUD) standards in 24 CFR Parts 50 and 58. FEMA is considering ground disturbance up to five acres in urban areas and up to two acres in rural areas. The five-acre threshold aligns with categorical exclusions of other agencies, determining that, in the absence of extraordinary circumstances, do not have a significant impact to the human environment by themselves. FEMA is selecting a more conservative two-acre threshold to minimize impacts to undisturbed areas and for scale of actions that may warrant a closer look. These thresholds are inclusive of ground disturbing activity, such as establishing staging areas, temporary construction activities, site access, and site construction.

The USCB defines "urban areas" as a densely developed territory, that encompasses residential, commercial, and other non-residential urban land uses. Figure 2 of Appendix B illustrates urban areas across Puerto Rico. The following are definitions the USCB uses to determine if an area is urban or rural:

- Urbanized Areas include densely populated areas of 50,000 or more people,
- Urban Clusters are any incorporated place or census place that includes between 2,500 and less than 50,000 people, and
- Rural Areas are locations where any population, housing, and territory do not occur within an urban area (USCB 2010).

4.1 Alternative 1: No Action Alternative

Under the no action alternative, FEMA will not provide grant funding for permanent work including reconstruction, relocation, and/or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates these projects may go unfunded or

deferred indefinitely. Under the no action alternative, the governments of Puerto Rico and their respective agencies will be responsible for funding any necessary school repairs and hazard mitigation efforts. Any schools with temporary, emergency measures in place following disaster events are likely to remain in their current physical condition. During the 2020-2021 school year, PRDE opened 844 of their 1,109 schools. The remaining schools are vacant because of consolidation and/or damages. Under the no action alternative, schools damaged and not in use will remain a hazard to their community or unable to fulfill their intended use until subrecipients are able to identify funding solutions.

4.2 Alternative 2: Repair of Schools with added Resiliency Measures

The activities satisfied by Alternative 2 would involve repairing schools to their pre-disaster function, as well as, improving their resiliency in response to future disaster events. Schools, under Alternative 2, will remain in their same location; however, this Alternative allows for expansion of schools up to 20%, except for those in the floodway or coastal high-hazard area. Expansion of schools is not allowed in the floodway or coastal high-hazard area.

This alternative includes demolition and rebuilding of schools on the same property, except when the site is in the coastal high-hazard area or the floodway. Title 44 CFR § 9.11(d)(1) prohibits FEMA from rebuilding a school in the floodway or coastal high-hazard area.

Under this alternative, the subrecipient could repair schools that have minor damages and are within the 100-year floodplain. However, the subrecipient could be required to relocate schools that have substantial damages and are within the 100-year floodplain, unless no practicable alternate location exists. This also applies to schools within the 500-year floodplain if the school meets the definition of a critical action, such as those serving as emergency shelters. Relocation of schools is discussed further under the impact analysis for Alternative 3.

Common Actions: The following are common actions that may be associated with repair of schools with added resiliency measures.

- Mobilization of construction equipment and materials to project sites, establishment of staging areas, demolition of existing structures, performance of concrete and asphalt work, and post-construction site restoration.
- The upgrade of school facilities to the current building codes and standards which provide minimum requirements to safeguard public health, as well as the safety and general welfare of building occupants.
- Compliance with the Americans with Disabilities Act.
- Engineering design services, such as Hydrologic and Hydraulic (H&H) studies, seismicity surveys, geotechnical subsurface explorations, topographical surveys, life-cycle cost analyses, energy efficiency studies, and feasibility analyses.

- Site work may include surface grading, conduit replacements, trenching, concrete applications, cutting and resurfacing of pavement or curb and gutter, and hardware placement.

Construction or Installation of Additional Facilities: This may include construction of additional classrooms, administrative offices, or operational infrastructure. In addition to facilities constructed in-place, Alternative 2 includes the installation of prefabricated modular classrooms or offices. Associated actions will include the installation of all mechanical, electrical, and plumbing necessary to operate a modern school.

Upgrade of Utilities and Stormwater Management Systems: Principal activities will involve replacing or hardening existing utility networks. Alternative 2 actions will likely involve tying into existing offsite networks operated by municipal and Puerto Rico-wide providers. Under this PEA, utility networks include telecommunication systems, power, backup power, potable and wastewater systems, stormwater management systems, and heating, ventilation, and air conditioning systems. Upgrades to telecommunication networks, potable water, wastewater, and stormwater systems could 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. New stormwater systems will include conduits, water overflow ponds, trenches, and gutters, manholes, grates, and appurtenances.

Installation of Microgrids: Alternative 2 includes microgrid installation to provide more resilient, continuous power for schools when the larger power grid is unavailable. This would reduce learning disruptions from extended power outages. Microgrid systems may include installation of solar panels, wind turbines, or other renewable energy sources and can provide grid resilience, mitigate disturbances caused by natural disasters, and allow for faster system response and recovery. Microgrid systems could include solar panels, battery storage, feeder automation control systems, load control equipment, and other renewable energy sources. The subrecipient would protect any batteries, inverters, and associated equipment for microgrid systems from impact from flooding appropriate to the site.

Elevation of Schools: Alternative 2 actions involve the elevation of facilities and associated infrastructure above the current Base Flood Elevation (BFE) when no practicable alternate location exists outside of the floodplain. Examples of operational infrastructure include buildings, backup power equipment, elevators, and utilities. For Scopes of Work (SOW) involving elevating school facilities, subrecipients may need to install new foundations or structural pilings. Projects involving elevating school facilities may include the following activities:

- Elevating school facilities may include the elevation of slab-on-grade buildings. The subrecipient's engineer will be responsible for inspecting the structural integrity of all buildings to determine whether the slab is sufficient to support the elevated structure without the continuous support of the underlying soil.

- The separation of frame, masonry veneer, and masonry buildings and facilities from their foundations; and use of heavy equipment and hydraulic jacks for the purpose of elevating facilities to their required height above the BFE.
- The installation of a temporary support system that will hold a structure in place while the subrecipient's contractor installs a new or extended foundation below. The new support system may consist of continuous walls or separate piers, posts, columns, or piles.
- Additional actions under this category may include removing a roof and raising a building's operational space, either by extending the walls of the building and raising the floor or by abandoning the lower level and moving the operational space to an existing or newly constructed upper floor.

Non-residential wind retrofit of School Facilities: For wind retrofit projects satisfied by Alternative 2, each SOW must include retrofit measures to address roof retrofits, openings protection, and load path improvements. Additional SOW under this class of actions will involve mitigating constructed steel frames, concrete, and reinforced masonry construction.

Earthquake retrofit of Schools Facilities: Actions under Alternative 2 may include the application of structural supports to existing school facilities. Some common retrofitting improvements may include foundation stabilization, foundation anchoring, continuous load path integration, and improvements to structural systems.

Installation of Flood Protection Measures: Actions under Alternative 2 may include flood mitigation measures such as the installation of floodwalls, floodproofing, and temporary barriers. The subrecipient's engineer will be responsible for the design of flood protection measures and coordinate with the Puerto Rico Planning Board (PRPB) to ensure compliance with National Flood Insurance Program (NFIP). The installation of perimeter flood walls may be comprised of either wire mesh-lined flood barriers or concrete walls. Typical construction activities associated with flood protection measures will include excavation, foundation preparation, access road installation, and site boundary establishment.

Installation of Safe Room or Tsunami Refuge: Actions under Alternative 2 may include constructing a safe room or hardening of existing facilities in whole or in part following FEMA design guidance. Actions may also include the construction of tsunami refuge to serve as a safe haven until the most imminent danger has passed. Construction of either would include any associated utility connections for emergency and redundant power, communications, water, wastewater, and any other essential support for the use of the safe room or refuge for the intended populations.

4.3 Alternative 3: Relocation of Schools

Alternative 3 allows for moving the function of a school to a new property which could include consolidation of one or more schools into an existing one, physical relocation of a whole facility to a new site, or selection of a new site for new construction. Consolidation of schools to an existing site is subject to the 20% expansion of the existing location, capacity, or density. Relocation of school functions could be to an existing school or to an existing developed site not currently used

as a school and would include associated build-out of the site. Construction of new schools at a new location would be subject to the acreage limits based on rural and urban area. Construction of a new school within the floodway or coastal high-hazard area is not allowed under this alternative. Relocation of a school into the floodplain would only occur if there were no practicable location that met the needs of the community.

Common Actions: The following are common actions that may be associated with either the relocation of school operations to an existing facility, relocation of an existing structure, or new school construction:

- Engineering design services, such as H&H studies, seismicity surveys, geotechnical subsurface explorations, topographical surveys, life-cycle cost analyses, energy efficiency studies, and feasibility analyses.
- Mobilization of construction equipment and materials to project sites, establish staging areas, conduct demolition of existing structures, perform concrete and asphalt work, and post-construction site restoration.
- Site work may include surface grading, excavation, conduit replacements, trenching, concrete applications, cutting and resurfacing of pavement or curb and gutter, and hardware placement.
- Alternative 3 actions may require the acquisition of land or structures for the relocation of an entire school or a component of a school facility. Any acquisition of land will adhere to federal, territorial, and local regulations for the acquisition of lands.
- Under Alternative 3, subrecipients that choose to abandon a facility must render the original site safe and secure to ensure that it does not present a threat to public health and safety. Such activities could include, but are not limited to, fencing, boarding windows and doors, securing utilities, providing adequate ventilation, removing potential hazards to public health, structural stabilization, and maintenance and monitoring plans. Any future use or transfer of property must adhere to applicable federal, Puerto Rico, and local regulations.
- Actions associated with the demolition of facilities will likely involve the removal of aboveground structures, removal of associated facilities, filling in of basements, removal or capping of utilities and septic tanks, and removal and disposal of asbestos or similar hazardous building materials. Demolition activities under Alternative 3 will likely include the use of heavy machinery for construction and demolition activities.
- Construction and demolition debris generated by Alternative 3 actions will be disposed of at Puerto Rico Department of Natural and Environmental Resources (PRDNER)/Puerto Rico Environmental Quality Board (PREQB) permitted disposal staging areas, landfills, and associated recycling facilities.

Relocation to an Existing Facility: The following activities are associated with the relocation of school operations to an existing school or an existing non-school site:

- **Upgrade of Utilities and Stormwater Management Systems:** These activities would be the same as Alternative 2.
- **Installation of Microgrids:** These activities would be the same as Alternative 2.
- **Expansion of Existing Facilities for School Relocation:** Alternative 3 allows for the expansion of existing facilities. This may include construction of additional classrooms or administrative offices as well as, support infrastructure for schools. Alternative 3 actions include both facilities constructed in-place as well as, prefabricated modular classrooms or offices. Construction activities will likely require minor to moderate excavations, installation of temporary and permanent access roads, and placement of concrete footers and pads or fill material. Associated actions will include the installation of mechanical, electrical, and plumbing infrastructure needed to ensure that schools meet current building codes and standards.
- **Installation of Flood Protection Measures:** These activities would be the same as Alternative 2.
- **Installation of Safe Room or Tsunami Refuge:** These activities would be the same as Alternative 2.

Physical Relocation of an Existing Structure: This option involves heavy equipment to move existing structures to a new site. Other than transportation of the structure, these actions will be the same as elevation of structures under Alternative 2. The subrecipient's engineer will design a new foundation sufficient to support the structure to be relocated and will coordinate with all local requirements for use of oversize vehicles. The following activities are associated with relocating structures to a new site:

- **Upgrade of Utilities and Stormwater Management Systems:** Activities will be the same as relocation to an existing school facility.
- **Expansion of Existing Facilities:** Activities will be the same as relocation to an existing school site with associated build-out of the facility to serve school functions.
- **Installation of Flood Protection Measures:** Activities will be the same as relocation to an existing school facility.
- **Installation of Safe Room or Tsunami Refuge:** These activities would be the same as Alternative 2.

New School Construction: Under Alternative 3 the subrecipient, may construct schools at a new, previously unused site that meets current building codes and standards. New school construction may include both facilities constructed in-place, as well as the installation of prefabricated modular classrooms or offices. The new school construction may also include safe rooms or tsunami refuge. The following activities are associated with constructing new schools.

- To confirm the applicability of a new location, this action alternative will include all necessary architectural and engineering design studies needed to ensure that a new school

building is resilient to future disaster events. Such studies may include H&H studies, seismicity surveys, geotechnical subsurface explorations, topographical surveys, life-cycle costs analyses, energy efficiency studies, and feasibility analyses.

- Associated actions will include the construction of all surface and subsurface elements necessary to operate and manage a modern school. FEMA anticipates that new construction will involve the installation of all mechanical, electrical, and plumbing systems. Associated actions will likely include backup power generation, construction of parking structures, and connections to adjacent roadways.
- Similar to relocation of operations, facility relocation and new facility construction might include SOW that include land acquisition and the abandonment, stabilization, or demolition of existing damaged buildings.

4.4 Alternative 4: A Combination of Alternatives 2 and 3

FEMA prefers Alternative 4 to best fulfill the purpose and need of this PEA. This Alternative is inclusive of SOW presented for Alternatives 2 through 3 allowing the subrecipient the ability to select actions that are applicable to addressing the wide range of school facilities within Puerto Rico. Additionally, it provides the subrecipients the greatest flexibility in how they increase the resiliency of Puerto Rico's Prek-12 schools.

5.0 AFFECTED ENVIRONMENT AND POTENTIAL IMPACTS

This section discusses the potential environmental impacts and proposed mitigation measures associated with the no action alternative and the action alternatives. In accordance with NEPA, the affected environment includes the physical, biological, cultural, and human use settings in which the proposed activities will occur. This PEA presents a qualitative evaluation of potential impacts to the affected environment. The qualitative evaluation relies upon a scale that describes the intensity and duration of a potential impact. Table 1 presents the impact scale FEMA used to describe the anticipated intensity of an impact, while Table 2 describes the duration of the impact.

Whether it is the no action alternative or the action alternatives, the potential impacts resulting from FEMA's decision to either fund or not fund a project may impact a resource in either a beneficial or adverse way. Additionally, impacts to a resource may be direct, indirect, or cumulative.

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

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

Direct impacts occur at the same time and place as project construction, such as vegetation removal, vehicle emissions, and erosion control. Indirect impacts occur at a later time or place than the project construction such as the accumulation of sediments downstream or increased traffic on alternate roads. Cumulative impacts occur when impacts from the proposed action area added to the impacts of other past, present, or reasonably foreseeable future actions.

Table 2: NEPA Time Scale

Terminology	Definition
Temporary	Impacts and recovery occurring only during the construction period.
Short-Term	Impacts and recovery occurring during a limited, predictable amount of time up to three years.
Long-Term	Impacts and recovery occurring over time longer than three years but into the reasonably foreseeable future.

Section 9.0 presents the Summary of Impacts Table for the Alternatives analysis. FEMA is omitting the following environmental resource topics from further evaluation under this PEA because they do not apply to the projects or locations considered in this NEPA document.

Table 3: Eliminated Resource Topics

Topic	Reason
Safe Drinking Water Act of 1974	According to the EPA's Map of Sole Source Aquifer Locations, there are no such aquifers within Puerto Rico.
Wild and Scenic River System	Within Puerto Rico, the three rivers that have received the Wild and Scenic River designation are primarily confined to El Yunque National Forest. If a project has the potential to impact a Wild and Scenic River designated river, it will be evaluated on a case-by-case basis.
Bald and Golden Eagles	Bald and Golden Eagles are not found in Puerto Rico.
Fish and Wildlife Coordination Act (FWCA)	The FWCA does not apply for grant funding projects or other activities that receive financial assistance from a federal agency.
Essential Fish Habitat	This PEA does not evaluate Essential Fish Habitat. The Magnuson-Stevens Act defines Essential Fish Habitat as those waters and substrate necessary for fish to spawn, breed, feed, or grow to maturity. This PEA covers only land-based and non-marine or non-Essential Fish Habitat water projects.
Vegetation	Vegetation is discussed in several sections of this PEA, including soils, water quality, and threatened and endangered species. Therefore, a section specific to vegetation is not included in this PEA.

5.1 Geology, Topography, and Soils

Geologic and topographic characteristics such as shallow bedrock, steep slopes, or excessive erodibility can affect the engineering design, method of construction, potential environmental impacts of a project, and type of impact minimization measures that will 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.

The Farmland Protection Policy Act (FPPA) of 1981 (7 U.S.C. § 4201 *et seq.*) protects designated 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, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland is either used for the growth of food or fiber crops, or it 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 food and fiber crops, such as citrus, tree nuts, olives, fruits, and vegetables. The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Web Soil Survey is useful in determining 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, and other land types that are available for

conversion to lands for potential agriculture purposes. The FPPA does not apply to land that is already designated by the USCB as urban area.

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. Executive Order 12699 requires that any permanent structures rebuilt after a disaster and using federal funds through the Stafford Act abide by the EO's provisions.

5.1.1 Existing Conditions

Geology and Topography

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 (985 feet). Throughout most of the mountainous areas, ridge tops reach altitudes of 701 meters (2,300 feet) with a maximum altitude of 1,338 meters (4,390 feet) found at Cerro de Punta north of Ponce. Within the mountainous areas, hillsides are steep with about 50% of the land having slopes greater than 45%. The predominant physiographic feature characterizing the western two-thirds of the northern coast is karst terrain (Gómez-Gómez et al. 2014).

Farmland Protection Policy Act

Puerto Rico has experienced a gradual loss of prime farmland has experienced a gradual loss of prime farmland as 42% of urban areas constructed between 1977 and 1994 were on potential agricultural farmland (Gould et al. 2017). However, prime farmland still exists throughout Puerto Rico. Within Puerto Rico, there are approximately 191,070 acres of designated Prime Farmland and approximately 244,150 acres of Farmland of Statewide Importance. Potential designated farmland “if irrigated,” encompass almost 25% of the landmass (Gould et al. 2017). Figure 3 of Appendix B presents an illustration of the expanse of Prime Farmland across Puerto Rico. According to the USDA 2017 Agricultural Census, there are 487,775 acres of farmland and 8,230 farms in Puerto Rico. In 2012, there were 584,988 acres of farm and 13,159 farms (USDA 2020). This constitutes a 16.6% loss of farmland and a loss of approximately 37% of farms since 2012. There are 53 schools within areas of prime farmland or farmland of state importance in Puerto Rico (FEMA 2021a). These schools are exempt from the FPPA analysis because they are in areas that are already developed, irreversibly converted, or designated an urban area by the USCB.

Seismic Activity

According to the U.S. Geological Survey (USGS), the Puerto Rico Trench and Bunce Fault are located approximately 161 km (100 miles) to the north of the island, and the Muertos Trough is located 80 km (50 miles) to the south of the main island. There are numerous subsurface faults that intersect Puerto Rico. Some notable faults include the great northern Puerto Rico fault zone, the

great southern Puerto Rico fault zone, the Cerro Goden Fault, and the South Lajas Fault (USGS 2006). Figure 4 of Appendix B presents an illustration of the regional fault lines in relationship to Puerto Rico. Earthquakes have historically caused land slumps and slides in the mountainous areas of Puerto Rico (Larsen and Torres-Sanchez 1998).

Recent earthquake activity occurring between December 2019 and January 2020 included a magnitude 6.4 earthquake, followed by numerous aftershocks measuring up to a 5.9 magnitude. This seismic activity caused extensive damage on the south side of the main island of Puerto Rico near the North Boquerón Bay-Punta Montalva fault zones (Lopez et al. 2020). The earthquakes associated with recent events damaged and destroyed buildings, structures, and landmarks. Additionally, the earthquakes directly resulted in the death of one person and indirectly to the death of others. The increased seismic activity forced many people to evacuate their homes into temporary shelters due to the ongoing aftershocks and potential for future collapse of weakened structures (Lopez, et al 2020).

5.1.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. Further deterioration of schools could lead to negligible to minor short-term and long-term impacts on geology and soils from continued erosion. If Puerto Rico is not able to repair damaged schools, future disaster events may cause substrate to further erode. Funding from other federal sources may assist in minimizing adverse impacts to geologic and soil resources by supporting school repair projects. Under Alternative 1, FEMA anticipates no impacts to seismicity or soils protected under the FPPA.

Alternative 2: Repair of Schools with added Resiliency Measures

FEMA anticipates that Alternative 2 actions would likely have no impacts on prime or unique farmland, as the land has already been developed. FEMA anticipates that site excavation activities and support pile installation would result in temporary minor adverse impacts to geologic resources associated with the driving of piles into bedrock and the resulting vibrations. Following site stabilization, FEMA does not anticipate long-term adverse impacts to geologic resources from the post-construction phase of Alternative 2 actions.

Adverse short-term minor impacts to soil resources would occur during the construction phase of Alternative 2 actions from the use of heavy equipment and soil excavation around existing school sites. Short-term impacts would occur from the loss of topsoil, erosion, and fugitive dust. The use of heavy equipment can lead to soil compaction that can cause adverse long-term negligible to minor impacts to soil resources. FEMA anticipates that in most cases, Alternative 2 actions would impact soils that have previously experienced some level of compaction due to prior development. Soil compaction can reduce precipitation infiltration rates and make the re-establishment of

vegetation more difficult. FEMA anticipates no impact to soils subject to the FPPA, as the sites of existing schools are already developed.

The repair and hazard mitigation of existing school facilities would occur in accordance with the applicable Puerto Rico building codes and standards. The Puerto Rico building codes and standards were prepared in alignment with International Building Codes published by the International Code Council. Compliance with applicable building standards would minimize impacts associated with seismically induced geohazards. Compliance with current codes and standards with relation to seismic hazards would result in a minor long-term beneficial direct impact from the reduction of damaged buildings and personnel injuries, increased lives saved, and shorter timeframe to restart school operations. FEMA anticipates Puerto Rico will derive a negligible to minor beneficial long-term impact from the improved structural integrity and resiliency of schools that meet current codes and standards including design specifications for earthquake resiliency.

Alternative 3: Relocation of Schools

FEMA anticipates that Alternative 3 actions would have adverse moderate long-term impacts on prime or unique farmland if new facilities are constructed in non-urban areas with classified soils present. In these cases, FEMA would consult with the NRCS to determine the level of impact and possible mitigation measures. FEMA anticipates that site excavation activities and support pile installation would result in temporary minor adverse impacts to geologic resources associated with the driving of piles into bedrock and the resulting vibrations. Following site stabilization, FEMA does not anticipate long-term adverse impacts to geologic resources from the post-construction phase of Alternative 3 actions. FEMA anticipates adverse temporary minor impacts to soil resources would occur during the construction phase of Alternative 3 actions. Temporary impacts would occur from the loss of topsoil, erosion, and fugitive dust. The use of heavy equipment can lead to soil compaction that can cause adverse long-term minor impacts to soil resources. Soil compaction can reduce precipitation infiltration rates and make the re-establishment of vegetation more difficult. For projects that involve construction on previously disturbed lands, similar impacts to soil may occur during a project's construction phase; however, adverse long-term impacts would likely not exceed pre-construction conditions.

The construction of new schools would be in accordance with the applicable Puerto Rico building codes and standards. Compliance with applicable building standards would minimize impacts associated with seismically induced geohazards. Compliance with current codes and standards with relation to seismic hazards would result in a minor long-term beneficial direct impact from the reduction of damaged buildings and personnel injuries, increased lives saved, and shorter timeframe to restart school operations. FEMA anticipates Puerto Rico would derive a beneficial long-term negligible to minor impact from the improve structural integrity and resiliency of school facilities that meet current codes and standards. The Puerto Rico building codes and standards provide design specifications for earthquake resiliency.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to the FPPA, geology, soils, and geologic hazards would be similar to Alternatives 2 and 3 for the Alternative's construction and post-construction phases.

5.2 Air Quality

The Clean Air Act (CAA) of 1970 (42 U.S.C. § 7401 et seq.), including its 1977 and 1990 amendments, is the federal law that regulates air emissions from stationary and mobile sources. This law tasks the U.S. Environmental Protection Agency (EPA) among its other responsibilities, with establishing primary and secondary air quality standards. Primary air quality standards protect the public's health, including the health of sensitive populations, such as people with asthma, children, and older adults. Secondary air quality standards protect the public's welfare by promoting ecosystem health, preventing decreased visibility, and reducing damage to crops and buildings. The EPA has set National Ambient Air Quality Standards (NAAQS) for the following six criteria pollutants: carbon monoxide (CO), lead, nitrogen oxides (NO_x), ozone (O₃), particulate matter (less than 10 micrometers [PM₁₀] and less than 2.5 micrometers [PM_{2.5}]), and sulfur dioxide.

Federal agencies must make conformity determinations for federal actions other than those related to transportation plans and programs in accordance with the federal general conformity regulations (40 CFR Part 93, subpart B). In accordance with the General Conformity regulations, the subrecipient is subject to its requirements for projects located in nonattainment and maintenance areas. Furthermore, the subrecipients would be responsible for conducting a General Conformity Applicability Analysis for applicable projects in those areas. In addition, the following is a list of actions that are exempt from the general conformity review:

- Stationary source emissions regulated under major or minor New Source Review 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, and
- Activities with total direct or indirect emissions below *de minimis* levels, not including stationary source emissions regulated under New Source Review programs.

United States 40 CFR Part 89 contains EPA emission standards for heavy equipment nonroad diesel engines. This includes farm tractors and other agricultural equipment, forklifts, and utility equipment such as generators, pumps, and compressors.

In administering the CAA, EPA has adopted multiple tiers of emission standards. The implementation of Tier 1, Tier 2, Tier 3, and Tier 4 standards progressively required compliance with more stringent emission standards. In 2004, EPA published the final rule (40 CFR Parts 9, 69, et al.) introducing Tier 4 emission standards, which were phased-in from 2008-2015. To meet the Tier 4 emission standards, engine manufacturers began producing engines with advanced emission control technologies. The EPA has also adopted requirements for in-use diesel fuel to

decrease sulfur levels by more than 99%. The resulting Ultra Low Sulfur Diesel Fuel has a maximum sulfur concentration of 15 parts per million (EPA 2004).

The CAA and corresponding EPA regulations prohibited gasoline containing lead or lead additives as a motor vehicle fuel after December 31, 1995 (40 CFR Part 80). Diesel fuel, primarily used in most construction equipment, does not include lead or a lead additive. At the national level, major sources of lead in air come from ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other sources of lead are waste incinerators, utilities, and lead-acid battery manufacturers.

5.2.1 Existing Conditions

The PRDNER/PREQB monitors, manages, and regulates air quality standards using its approved State Implementation Plan. Activities that generate emissions or air pollutants must comply with Regulation for the Control of Atmospheric Pollution and Regulation with a General Permit from PRDNER/PREQB. Sensitive receptor locations include schools, hospitals, convalescent homes, day care centers, and other locations where children, chronically ill individuals, or other sensitive persons exist. Sensitive receptors could also be present in communities with environmental justice (EJ) concerns which are typically in areas of increased air pollution (EPA 2021a). Effects of air pollution on communities with EJ concerns associated with the Proposed Action are presented in Section 5.10, Socioeconomics and Environmental Justice. Potential impacts from construction activities at any project site could increase air emissions. As of June 30, 2021, EPA's Green Book under the CAA classified seven of Puerto Rico's municipalities as nonattainment or in maintenance. There are 123 schools within nonattainment areas and 14 within maintenance areas in Puerto Rico (Figure 5 of Appendix B; FEMA 2021a). Table 4 presents the municipalities and criteria pollutants that EPA lists as current nonattainment and maintenance areas for Puerto Rico (EPA 2021b).

Table 4: 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 ₁₀ (1987) - Moderate Maintenance (since 2010)
Salinas	Sulfur Dioxide (2010)
San Juan	Sulfur Dioxide (2010)
Toa Baja	Sulfur Dioxide (2010)

Source: EPA 2021b

On November 13, 2018, the EPA approved Puerto Rico's revised State Implementation Plan dated November 29, 2018, effective December 31, 2018. The purpose of the revision was to address the interstate transport of air pollution that may interfere with attainment and maintenance of NAAQS. In this action, the approval is pertaining to the 1997 and 2008 ozone, 1997 and 2006 fine particulate matter (PM_{2.5}), and 2008 lead NAAQS (EPA 2018).

5.2.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico FEMA anticipates that the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. FEMA anticipates that the no action alternative would have no direct adverse short-term or long-term impact on air quality. Further deterioration of schools could lead to school closures requiring students to travel to other schools which would more than likely be further away than the base school. This would result in indirect minor long-term adverse impacts to air quality from the increased air emissions from cars traveling further.

Alternative 2: Repair of Schools with added Resiliency Measures

Under Alternative 2, FEMA anticipates that construction activities would result in an adverse minor temporary impact to air quality. Emissions from construction vehicles, generators, and equipment could temporarily increase the levels of criteria pollutants (CO, NO_x, O₃, sulfur oxides (SO_x), PM₁₀) and non-criteria pollutants such as volatile organic compounds. The EPA mandates the use of Tier 4 rated equipment and ultra-low sulfur fuel which minimize air quality impacts from the combustion of diesel fuel. FEMA anticipates the implementation of best management practices (BMPs) listed in Section 6.0 by the subrecipient would minimize adverse impacts to sensitive receptors from construction related emissions. Such BMPs and conservation measures include monitoring air quality during construction, proper vehicle maintenance, fugitive dust suppression, and minimizing vehicle idling time.

With regards to the areas currently listed as nonattainment or under maintenance, the effects evaluation for Alternative 2 concluded the following:

- Alternative 2 would have no impact on lead attainment for Arecibo because regulations require that all fuels are unleaded. As a result, the proposed activities would cause no measurable increase in lead emissions.
- Alternative 2 would have a negligible impact on PM₁₀ attainment for Guaynabo. This determination is based on EPA's adoption of Tier 4 emission standards that reduce the amount of particulate matter emitted from exhaust as well as, this PEA's requirement that the subrecipient implement fugitive dust control measures for all applicable projects.
- Alternative 2 would have a negligible impact on SO_x for Bayamón, Cataño, Guaynabo, Salinas, San Juan, and Toa Baja due to the adoption of Tier 4 emission standards for nonroad diesel engines.

FEMA anticipates that Alternative 2 actions would have no long-term adverse impacts on air quality because although the subrecipient may replace existing permanent sources with new equipment, they would not install additional permanent sources of emissions. Installation of a microgrid system would provide emergency power to schools from renewable energy sources

without an increase in emissions. This would result in a long-term minor beneficial direct impact to air quality.

If microgrids are not installed at a school, the subrecipient could install generators under this alternative to provide emergency power when needed; however, the schools would not use generators when normal electrical services are available. This would result in a temporary minor adverse direct impact to air quality from an increase in air pollutants from the burning of fossil fuels when the generators are in use.

FEMA anticipates Alternative 2 actions would have a beneficial negligible to minor long-term impact on air quality and energy efficiency by updating existing schools and associated structures to current codes and standards.

Alternative 3: Relocation of Schools

Under Alternative 3, the subrecipient may either construct a new school or relocate an existing school. FEMA anticipates that Alternative 3 construction activities would result in an adverse minor temporary impact to air quality. An adverse minor temporary impact to air quality would occur from the use of heavy equipment and clearing and grubbing of developed and undeveloped project sites.

Emissions from construction vehicles, generators, and equipment would temporarily increase the levels of criteria pollutants (CO, NO_x, O₃, SO_x, PM₁₀) and non-criteria pollutants such as volatile organic compounds. The mandatory use of Tier 4 rated equipment and ultra-low sulfur fuel would minimize air quality impacts from the combustion of diesel fuel. Additionally, the subrecipient would be responsible for implementing construction BMPs that include proper vehicle maintenance and minimizing vehicle idling time. These BMPs are effective measures in reducing construction generated emissions.

For both disturbed and undisturbed urban and rural project sites, temporary ground disturbing activities and driving over unpaved surfaces would likely generate PM_{2.5} and PM₁₀ emissions in the form of fugitive dust. Control techniques for fugitive dust sources generally involve watering, chemical stabilization, and the reduction of surface wind speeds using windbreaks or source enclosures. With implementation of these control measures, Alternative 3 would have an adverse temporary minor impact on air quality. Following site stabilization, FEMA anticipates that no adverse long-term indirect impacts to air quality from particulate matter would occur as a result of Alternative 3 actions.

Under Alternative 3, privately-owned vehicles and school buses may need to travel longer distances to get students and faculty to the new school locations in some areas. Therefore, FEMA anticipates that Alternative 3 would have minor long-term adverse indirect impacts to air quality from an increase in air emissions from vehicles traveling longer distances.

Alternative 3 would have similar long-term beneficial and adverse direct impacts to air quality from the use of microgrids or generators as described under Alternative 2. Under Alternative 3, impacts to quality and nonattainment and maintenance areas and to long-term impacts would be similar to Alternative 2.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to air quality and nonattainment and maintenance areas would be similar to Alternative 2 and 3 for the Alternative's construction and post-construction phases.

5.3 Water Quality

Congress enacted the Federal Water Pollution Control Act in 1948 and later reorganized and expanded the Act in 1972, and it 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 U.S. Army Corps of Engineers (USACE) and EPA.

Section 401 of the CWA requires that a recipient for a federal license or permit provide a certification that any discharges from the facility would comply with the act, including state-established water quality standard requirements.

Section 402 of the CWA established the National Pollutant Discharge Elimination System (NPDES) program which enables EPA to regulate both point and non-point pollutant sources, including stormwater and stormwater runoff. Under the NPDES program, EPA regulates projects with ground disturbance of equal to or greater than one acre. The NPDES permit requires the preparation of a Stormwater Pollution Prevention Plan (SWPPP) for each project that qualifies under the program. 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 EPA maintains the responsibility for administering the NPDES permit program for Puerto Rico.

Section 404(d) of the CWA establishes the USACE permit requirements for discharging dredged or fill materials into Waters of the United States (WOTUS) and traditional navigable waterways. The USACE regulates construction activities in or near any navigable WOTUS under the authority of Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C. § 401 et seq.). Section 10 of the RHA defines navigable waters as "those waters that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce" (33 CFR § 329.4) (USACE 1986). Through its administration of the RHA, the USACE implements a permit program that evaluates impacts to navigable waters and their navigable capacity.

5.3.1 Existing Conditions

The PRDNER/PREQB takes an active role in water quality-based permitting through the CWA Section 401 certification process. The EPA reviews applications for completeness and requests Puerto Rico's certification prior to development of a draft permit. PRDNER/PREQB permitting includes water quality-based effluent limits and special conditions in the water quality certificates (EPA 2005). An anti-degradation policy is in place and regulations are in place to protect coastal, surface, and ground waters. The PRDNER/PREQB issues local Water Quality Certification under the authority of the Puerto Rico Water Quality Standards Regulation.

The December 2020 EPA list of impaired waters under Section 303(d) of the CWA indicates 856 instances where pollutants are causing the impairment of surface water, groundwater, and reservoirs within Puerto Rico. In 2020, the primary sources of pollutants reported were sewage discharges, urban runoff/stormwater, confined animal feeding operations, sewer overflows/system failures, industrial point sources, agricultural, and landfills (EPA 2020).

Puerto Rico has considerable variability in water resources due to geology, hydrology, and topography. Puerto Rico has over 50 rivers with a total of 8,666 km (5,385 miles) of rivers and creeks (National Park Service 2020). Rainfall averages about 11,600 million gallons of water per day (McCoy 1978). The mountainous interior receives the most rainfall and the southwest coast receives the least. The south coast is the most stressed area in terms of water deficiency (Gómez-Gómez and Heisel 1980).

5.3.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. Further deterioration of schools could lead to negligible to minor short-term and long-term adverse impacts to water quality from deteriorating infrastructure. Potential sources of contamination at schools include wastewater, laboratory chemicals, and oils and greases. If pipes and containment structures are allowed to further deteriorate, potential adverse impacts to water quality could occur.

Alternative 2: Repair of Schools with added Resiliency Measures

Under Alternative 2, construction related sources of contaminants include petroleum hydrocarbons from leaking equipment, excavated non-stabilized soil, contaminated groundwater, and runoff from construction materials. Additionally, school related contaminants include wastewater, laboratory chemicals, and oils and greases. Surface waters can become contaminated as uncontrolled pollutants migrate through groundwater or across the land surface.

FEMA anticipates an adverse short-term minor impact to water quality as contaminants associated with the construction phase of Alternative 2 actions have the potential to escape project sites. For actions equal to or greater than one acre, the subrecipient will prepare a SWPPP and obtain applicable NPDES permits. The subrecipient will be responsible for implementing soil and erosion control BMPs and to follow all applicable permit conditions.

FEMA anticipates that Alternative 2 would have negligible long-term adverse impacts on water quality related to the repair and operation of schools. Negligible impacts may occur from runoff due to an increased amount of impervious surface at expanded sites. FEMA anticipates a beneficial long-term minor impact to water quality would occur as the subrecipient upgrades school infrastructure to meet current Puerto Rico codes and standards.

Alternative 3: Relocation of Schools

Construction related sources of contaminants may include petroleum hydrocarbons from leaking heavy equipment, excavated non-stabilized soil, contaminated groundwater, and runoff from construction materials. Additionally, school related contaminants include wastewater, laboratory chemicals, and oils and greases.

FEMA anticipates an adverse short-term minor impact to water quality as contaminants associated with the construction phase of Alternative 3 actions have the potential to escape project sites. For actions equal to or greater than one acre, the subrecipient will prepare a SWPPP and obtain applicable NPDES permits. The subrecipient will be responsible for implementing soil and erosion control BMPs and to follow all applicable permit conditions. FEMA anticipates Alternative 3 actions would have a negligible to minor adverse long-term impact on water quality related to the relocation of school operations or new school construction. The potential for an increase in impervious surfaces in previously undeveloped areas would contribute to future sources of stormwater runoff. FEMA anticipates that this PEA's thresholds for project size and capacity would limit long-term adverse impacts from stormwater runoff. Additionally, site stabilization practices as required by the subrecipient's NPDES construction permit would limit the potential for adverse long-term impacts to water quality from erosion and sedimentation.

For projects where the subrecipient chooses to demolish the school buildings, FEMA anticipates negligible to minor long-term benefits with replanting native vegetation and improving ground water recharge. All debris will be disposed properly at appropriately licensed facilities. Where the subrecipient chooses to abandon the buildings, the site must be stabilized so that it does not deteriorate. FEMA anticipates no additional long-term impacts once the site is secure, existing impervious surfaces would remain.

For projects that involve the installation of new utilities, current codes and standards for sewage disposal requires that all new or upgraded school facilities comply with Puerto Rico's design requirements for the treatment and disposal of non-hazardous waste. FEMA anticipates a beneficial minor long-term impact to water quality would occur as upgraded school infrastructure assists in preventing water quality impacts from unregulated discharges.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to water quality would be similar to those impacts described for Alternatives 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 do 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 societal benefits, store floodwaters, and maintain surface water and groundwater flow during dry periods. Executive Order 11990, *Protection of Wetlands* 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 at 44 CFR § 9.6 to evaluate potential effects on, and mitigate impacts to, wetlands in compliance with EO 11990. The USACE, through its permit program, regulates the discharge of dredged or fill material into WOTUS, including wetlands, pursuant to Section 404 of the CWA. In addition, EPA 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.

5.4.1 Existing Conditions

Wetlands in Puerto Rico occur on each of Puerto Rico's islands and are located in both the mountainous regions and along the coastlines. The presence of lacustrine and riverine classified wetlands is minimal in both abundance and acreage. Lacustrine and riverine wetlands occur along shallow areas of deep-water reservoirs and along the banks of streams and rivers. The most common types of wetlands in Puerto Rico are palustrine or estuarine. Freshwater wetlands (palustrine) are primarily located on the main island's northern coast. The most common estuarine wetlands are the mangrove wetlands along Puerto Rico's coastline (Adams and Hefner 1996). Between 70% and 90% of marine life with commercial or recreational value use 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 (Adams and Hefner 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 and Lugo 2009). Stressors to Puerto Rico's coastal wetlands include sea level rise, hurricanes and storms, erosion, and stream channelization, road construction and development, effluent and runoff, mining of gravel, limestone, sand, and other materials (Miller and Lugo 2009).

FEMA uses the United States Fish & Wildlife Service (USFWS) National Wetlands Inventory, state-specific mapping tools and on-site surveys to identify wetlands. Figure 6 of Appendix B presents the USFWS mapped wetlands within Puerto Rico. Wetlands within Puerto Rico span a vast range of types, from interior montane wetlands of the rain forest to intertidal mangrove swamps along the coast. Wetlands are a natural resource with incredible intrinsic as well as economic value, providing wildlife habitat, plant diversity, and the water supply for many urban areas. Historically, Puerto Rico dredged and filled wetlands for the purpose of agriculture, drinking water, and flood control. More recently, urban expansion, transportation, and tourist facilities have impacted Puerto Rico's wetlands.

Approximately 16 schools out of 1,232 PRDE and PNP schools are situated within the boundary of a wetland mapped by the USFWS (FEMA 2021a):

- Estuarine and marine wetland – 1 school
- Freshwater emergent wetland – 10 schools

- Freshwater forested/shrub wetland – 4 schools
- Riverine wetland – 1 school

This information is based upon the best available data and the USFWS National Wetlands Inventory maps.

5.4.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. Further deterioration of schools could lead to unregulated releases of contaminants and contaminated stormwater runoff from schools as containment structures and stormwater management systems deteriorate. FEMA anticipates the no action alternative would have a long-term negligible to minor adverse impact on wetland resources.

Alternative 2: Repair of Schools with added Resiliency Measures

The repair and hazard mitigation of schools would occur within their same location. As such, FEMA anticipates no direct impacts to wetland resources from Alternative 2 actions. However, FEMA anticipates indirect adverse negligible to minor short-term impacts to wetland resources during the construction phase of Alternative 2 actions. The subrecipient would implement construction BMPs appropriate to the site to minimize these indirect impacts. FEMA will evaluate Alternative 2 actions through the 8-Step Decision Making Process as the subrecipient submits location-specific projects for funding. This process includes an alternatives analysis and minimization considerations to reduce or avoid impacts to wetland ecosystems.

If a project includes expansion that would be in, under, or over WOTUS, Section 404(d) of the CWA and Section 10 of RHA may require permits from the USACE. For compliance with this PEA, impacts to wetlands would need to fall within the thresholds of a USACE Nationwide Permit and meet the conditions of that permit including implementing required mitigation. The USACE Nationwide Permits authorize activities that have minimal individual and cumulative adverse effects on the aquatic environment. These permits issued under the CWA limit the size of wetland impacts and include conditions that limit adverse impacts to wetland ecosystems. In addition, this alternative only allows for school expansion up to 20%. FEMA anticipates that these limits, conditions, and USACE's compensatory mitigation requirements for impacts to wetlands would limit unavoidable adverse long-term impacts to wetland ecosystems in Puerto Rico.

FEMA anticipates that Alternative 2 actions could have indirect adverse negligible to minor long-term impacts on wetland quality and function of nearby wetlands from stormwater runoff related to increases in impervious area. Requirements for site stabilization after construction is complete would reduce the potential for eroding or loose soils to impact adjacent wetlands. FEMA anticipates that wetland resources in Puerto Rico would receive a long-term beneficial minor

impact from repairing schools with materials that meet Puerto Rico's current building codes and standards. FEMA anticipates new or upgraded infrastructure would reduce the potential for accidental releases of contaminants to wetland resources. The Puerto Rico building codes and standards for sewage disposal require that all existing buildings modified or upgraded comply with Puerto Rico's most recent design requirements for the treatment and disposal of non-hazardous waste.

Alternative 3: Relocation of Schools

Projects under Alternative 3 could have both direct and indirect impacts to wetland resources. For projects that have the potential to adversely impact wetland resources, FEMA will evaluate location-specific proposals through the 8-Step Decision Making Process. This process includes an alternatives analysis and minimization considerations to reduce or avoid impacts to wetland ecosystems. FEMA anticipates that this PEA's threshold limits will assist in minimizing adverse direct impacts to wetland resources to negligible to minor levels.

If a project has an activity in, under, or over WOTUS, Section 404(d) of the CWA and Section 10 of RHA may require permits from the USACE. For compliance with this PEA, impacts to wetlands would need to fall within the thresholds of a USACE Nationwide Permit and meet the conditions of that permit including implementing required mitigation. The USACE Nationwide Permits authorize activities that have minimal individual and cumulative adverse effects on the aquatic environment. These permits issued under the CWA limit the size of wetland impacts and include conditions that limit adverse impacts to wetland ecosystems. FEMA anticipates that these limits, conditions, and USACE's compensatory mitigation requirements for impacts to wetlands would limit unavoidable adverse long-term impacts to wetland ecosystems in Puerto Rico.

FEMA anticipates the relocation or construction of schools or school facilities would result in indirect short-term negligible to minor impacts to wetland resources from erosion and stormwater runoff. The subrecipient is responsible for obtaining applicable NPDES permits and developing a SWPPP for all projects equal to or greater than one acre in size and to implement appropriate BMPs and follow applicable grant conditions.

FEMA anticipates that Alternative 3 actions would result in negligible to minor long-term indirect impacts to wetland resources. Under Alternative 3, the potential exists for an increase in human activity in areas where none or limited activity previously occurred. Long-term indirect impacts would be associated with new schools or larger schools that have more students and require more faculty and staff. Long-term adverse indirect impacts would be associated with the creation of more impervious surface that would reduce the ability of soils to attenuate stormwater runoff.

FEMA anticipates that wetland resources in Puerto Rico would receive a beneficial minor impact from the installation of new utilities that meet Puerto Rico's current building codes and standards. FEMA anticipates new or upgraded infrastructure would reduce the potential for accidental releases of contaminants to wetland resources.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to wetlands and required mitigation measures would be similar to Alternatives 2 and 3 for the Alternative's construction and post-construction phases.

5.5 Floodplains

Executive Order 11988, *Floodplain Management* was issued in 1977 to eliminate the long-term 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. Executive Order 11988 applies to federally funded projects and directs agencies to consider alternatives to siting projects within a floodplain. 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 a facility.

FEMA uses Flood Insurance Rate Maps to identify the floodplains for the NFIP and the 8-Step Decision Making Process found at 44 CFR § 9.6 for floodplain evaluation. The 100-year floodplain is the area that is subject to a one percent or greater chance of flooding in any given year, whereas, the 500-year floodplain is the area that is subject to a 0.2 percent or greater chance of flooding in any given year. A floodway is the portion of the floodplain, which is effective in carrying flow, within which this carrying capacity must be preserved, and where the flood hazard is generally highest, for example, where water depths and velocities are the greatest. It is that area which provides for the discharge of the base flood so the cumulative increase in water surface elevation is no more than one foot. The term Special Flood Hazard Area includes the 100-year floodplain, floodway, and coastal high hazard areas.

Following some large disaster declarations, FEMA performs assessments to determine whether the 1% annual chance flood event, depicted on effective Flood Insurance Rate Maps, adequately reflects the current flood hazard. This assessment determines the need to produce Advisory Base Flood Elevation (ABFE) maps and is the most recent tool to support communities to recover and become more resilient to future storms. FEMA defines a critical action as an action for which even a slight chance of flooding is too great under 44 CFR § 9.4. The minimum floodplain of concern for critical actions is the 500-year floodplain. Under this PEA, schools may be considered to perform critical actions when they also serve as shelters or serve populations that would be challenging to evacuate.

Federal regulation 44 CFR § 9.11(d)(1) prohibits FEMA from funding new construction or substantial improvements in floodways or new construction in Coastal High Hazard Areas "V-Zones" which are not functionally dependent on water or facilitate open space use. To determine whether this PEA applies, FEMA will consider new construction and limited expansion in floodways or the V-zone where there is a potential to increase flood levels using the 8-Step Decision Making Process. Projects that would increase flood levels would not fall under this PEA; however, FEMA could prepare a tiered EA from this PEA for those projects. The subrecipient will be responsible for coordinating with the PRPB to ensure compliance with NFIP.

5.5.1 Existing Conditions

FEMA evaluates actions within the 100-year floodplain, or 500-year floodplain for critical actions, using the 8-Step Process found at 44 CFR § 9.6. All 78 municipalities in Puerto Rico participate in the NFIP. The NFIP separates the 78 municipalities into five NFIP communities. Of the 78 municipalities in Puerto Rico, one NFIP community contains 74 municipalities while the remaining four municipalities are independent NFIP communities (FEMA 2021b). Under requirements established in 44 CFR § 60.3, participating communities will require permits for all development, including temporary development, in the Special Flood Hazard Area (SFHA). FEMA, in conjunction with the PRPB, created ABFE maps which the PRPB adopted in March 2018. These maps show the BFE after hurricanes Irma and Maria. Figure 7 of Appendix B presents the ABFE across Puerto Rico. According to a HUD assessment, close to 1.3 million people live near coastal areas and approximately 320,000 Puerto Ricans live in flood-prone zones (HUD 2018). The Puerto Rico Coastal Zone Management Program (PRCZMP) policies discourage land development and construction of properties in urban areas that are in flood zones or prone to floods.

Approximately 92 schools out of 1,232, or 7.5%, schools are situated within special flood hazard areas (SFHA) and the 500-year floodplain (FEMA 2021a):

- Floodways – 14 schools
- AE Zone – 30 schools
- Coastal A Zone – 1 school
- 500-year Floodplain – 47 schools

5.5.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. FEMA anticipates that if Puerto Rico does not perform the necessary repairs to Pre-K-12 schools that are deteriorating and are within a SFHA, or-500-year floodplain for critical actions, the structures and supporting landscapes may further deteriorate causing adverse impacts to floodplains. In these cases, adverse impacts to floodplain hydraulics and hydrology would likely cause long-term damage to the surrounding community as the ability of floodplain resources to attenuate storm events decreases. Schools that are within flood hazard areas would continue to be susceptible to damage from flooding which could eventually lead to a school being unusable. FEMA anticipates that the no action alternative would result in an adverse moderate long-term indirect impact to floodplains. FEMA anticipates that impacts are limited because only 7.5% of schools across Puerto Rico are within the SFHA or 500-year floodplain.

Alternative 2: Repair of Schools with added Resiliency Measures

This alternative does not allow for the expansion of schools within the floodway or coastal high-hazard area. The repair and hazard mitigation of schools may involve the demolition and construction of structures within the SFHA or 500-year floodplain. FEMA would use the 8-Step Decision Making Process to review all projects within these areas. This process includes an alternatives analysis and minimization considerations to limit impacts to floodplains. In accordance with 44 CFR § 9.11(d)(4), projects located in the SFHA where no regulatory floodway has been designated must not result in an increase in the water surface elevation of more than one foot in the base floodplain at any point within the community.

The construction phase of Alternative 2 actions would require the mobilization and use of heavy equipment, ground disturbing activities, placement of fill material, installation of staging areas and other impervious surfaces, and landscape grading within designated floodplains. The presence of additional equipment and loose building materials within a floodplain could present a hazard to a surrounding community should a flood occur during construction. FEMA anticipates the regular disposal of construction and demolition debris at an appropriately licensed facility would limit adverse impacts to floodplains by keeping these materials out of the floodplain. Alternative 2 actions would result in temporary minor adverse impacts to floodplains during demolition and construction activities. These impacts would be minor because only 7.5% of existing schools in Puerto Rico are located within SFHA or 500-year floodplain.

Any additional impervious surface within the floodplain can have an adverse impact on the movement of floodwaters and floodwater attenuation; however, by constraining expansion to the approximate area of a school's pre-disaster location, impacts on floodplain hydrology are not likely to exceed the level of minor.

Alternative 2 would involve constructing resiliency measures in schools within the flood hazard zone. These measures could include elevating schools above the ABFE, retrofitting schools to be safer during high winds and earthquakes, and other flood protection measures. Construction of safe rooms and tsunami refuges in schools would provide safe havens for communities during major storms. This would result in long-term minor to major direct beneficial impacts to schools within the flood hazard zones. This would also result in long-term minor to major beneficial impacts to the occupants of the schools and to communities during future disasters. FEMA anticipates that Puerto Rico would receive long-term minor to major beneficial impacts to its 100-year and 500-year floodplains from Alternative 2 actions as the resiliency of schools to flooding increases.

Alternative 3: Relocation of Schools

Under Alternative 3, construction of a new school within the floodway or coastal high-hazard area would not occur. Relocation of a school into a SFHA or 500-year floodplain would only occur if there were no practicable alternative that met the needs of the community. The subrecipient may propose new school construction at an on-site location or at a new site. FEMA would use the 8-Step Decision Making Process to review all projects which includes an alternatives analysis to limit impacts to floodplains. The 8-Step Decision Making Process would take into consideration

temporary impacts that diversion of flow would cause on floodplains during the construction and demolition phases of Alternative 3 actions.

As the subrecipient relocates, abandons, or demolishes schools, the construction phase of Alternative 3 actions would require the mobilization and use of heavy equipment, ground disturbing activities, demolition of structures, placement of fill material, and landscaping within a designated floodplain. The presence of additional equipment and loose building materials within a floodplain can present a hazard to a surrounding community during flood events. As such, FEMA anticipates Alternative 3 would result in minor to moderate temporary indirect adverse impacts to floodplain resources.

Abandonment of schools in a SFHA would retain an impediment to flooding events, which would leave the facility at risk to further damage. Measures to render the abandoned facility safe and secure would need to account for and minimize flood risk. This would result in minor to moderate long-term indirect adverse impacts to floodplain resources. Demolition of schools would remove impediments to flooding events and may restore the natural floodplain values of slowing and absorbing waters. This would result in long-term indirect minor to moderate beneficial impacts to floodplain resources.

New school construction would not occur within a regulatory floodway or coastal high-hazard area. New school construction would not occur within a 100-year or 500-year floodplain unless there is no practicable alternative to locating the school within the floodplain and the subrecipient implements the appropriate flood protection measures following the 8-Step Decision Making Process. Therefore, FEMA anticipates that Alternative 3 would have negligible long-term direct impacts to floodplains.

Construction of safe rooms and tsunami refuges in schools would provide safe havens for communities during major storms. This would result in long-term minor to major beneficial impacts to communities during future disasters.

For all applicable projects, the subrecipient would be responsible for complying with the permits and requirements listed in Section 6.0. FEMA anticipates that the requirements, which include the disposal of construction and demolition debris at an appropriately licensed facility, would limit adverse impacts to floodplains. Additionally, Section 6.0 requires that the subrecipient obtain required permits and approvals from Puerto Rico and local agencies. New structures would not be placed within the floodway or the coastal-high hazard area. FEMA anticipates that additional consultation with PRPB on modifications to structures within the floodplain would limit adverse impacts to floodplain resources. FEMA anticipates Alternative 3 would result in long-term moderate adverse direct impact to floodplain resources if construction occurs within a SFHA, or the 500-year floodplain for critical actions.

FEMA anticipates this PEA's requirements that the subrecipient render abandoned structures safe and secure would limit long-term adverse impacts to floodplain resources from Alternative 3 actions to a level of negligible. FEMA anticipates that SOWs involving demolition of existing structures located in designated floodplains would result in a beneficial negligible to minor long-term impact to the 100-year and 500-year floodplains. The beneficial impact would occur as a

result of improving floodplain capacity and function by removing impediments to natural floodplain hydraulics and hydrology.

Alternative 4: A Combination of Alternatives 2 and 3

This alternative would generate impacts similar to those described for Alternatives 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). The CZMA encourages coastal states and U.S. territories and states bordering the Great Lakes to proactively manage natural resources by balancing resource protection with economic, recreational, and cultural needs. The CZMA established a voluntary program for states and U.S. territories to develop and implement their own unique coastal management programs that describe coastal zone boundaries, uses, and resources subject to management, legal authorities, and enforceable policies. 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. Projects receiving federal assistance must follow the procedures outlined in 15 CFR §§ 930.90 – 930.101 for federal coastal zone consistency determinations.

The Coastal Barrier Resources Act (CBRA) of 1982 created designated areas administered by the USFWS that restricts direct and indirect federal expenditures. The intent of CBRA is to minimize loss of human life and wasteful federal expenditures on coastal barriers that natural disasters repeatedly impact. The CBRA authorizes the establishment of Coastal Barrier Resources System (CBRS) Units which consist of undeveloped coastal barriers and other areas located on the coasts of the United States. The CBRA of 1990, as amended, added a new category of coastal barriers called Otherwise Protected Areas (OPA). According to the CBRA of 1990, an OPA is “an undeveloped coastal barrier within the boundaries of an area established under Federal, State, or local law, or held by a qualified organization, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes.”

The USFWS maintains a series of maps entitled “John H. Chafee Coastal Barrier Resources System” which present the locations of CBRS Units. If CBRS Units occur within a federally declared disaster area, CBRA allows federal assistance for most emergency actions that are essential for saving lives, protecting property, and protecting public health and safety so long as the actions are consistent with the intent of the regulation. In OPAs, the only prohibition is with regards to the issuance of federal flood insurance. In September 2018, USFWS released a new 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).

5.6.1 Existing Conditions

The islands of Puerto Rico which include Puerto Rico, Vieques, Culebra, Mona, Monito, Desecheo, Caja de Muerto, and several cays and small recreational islands, have a total of over 966 km (600 miles) of coastline and over 5,000 km (3,106 miles) of shallow coral reef ecosystems. Figure 8 of Appendix B presents the coastal zone around Puerto Rico. The main island of Puerto Rico is 180 km (110 mi) east-west by 65 km (40 mi) north-south (Yuan et al. 2017), with approximately 500 km (310 miles) of coastline. The remaining islands that comprise Puerto Rico combine for approximately another 482 km (300 miles) of coastline (PRDNER 2010). Habitats that occur within Puerto Rico's coastal zone and marine corridors include coastal forests, wetlands and mangroves, karst ecosystems and sea-caves, bioluminescent lagoons, shallow and deep coral reefs, grouper spawning grounds, nesting beaches for sea turtles, and seagrass beds (NOAA 2017).

PRDNER and the PRPB are responsible for compliance, planning, and permitting in Puerto Rico's coastal zone. In addition, each municipality in Puerto Rico prepares their own land use plan for approval by the PRPB. PRDNER regulates and grants the use of resources within the CZMA. Figure 9 of Appendix B presents the CBRS units and OPA map for Puerto Rico. PRPB issues permits and federal consistency certifications in coordination with a lead federal agency and in accordance with the PRCZMP. The PRCZMP of 1978 incorporated the Objectives and Public Policies of Puerto Rico's Land Use Plan (OPP-PRLUP) of 1977 and with that action established a uniform public policy framework for the management of all natural resources, including those located in the coastal zone. Pursuant to Federal Consistency Regulations in 15 CFR Part 930, FEMA and the PRPB signed a Federal Consistency Certificate (Resolution) dated October 3, 2018, which approves approval for the activities described in Category C through G of FEMA's PA Program for damages from Hurricane Irma and Hurricane Maria (Resolution JP-2018-324). The Resolution is set for a five-year term. If the Resolution expires and it does not get renewed, FEMA would review the SOW for actions within the CZMA to determine the need for consultation with PRPB as required under the PRCZMP. Appendix C includes the Resolution. The Resolution includes works described in the action alternatives, specifically, the repair, demolition, and relocation of buildings. There are 153 preK-12 schools, approximately 12%, within the CZMA in Puerto Rico (FEMA 2021a).

The 2009 PRCZMP incorporates substantive issues relevant to the adequate management of coastal resources including sustainable development, the watershed as a planning unit, and non-point sources of pollution as a critical issue. The main goal of the PRCZMP is to promote awareness of coastal hazards, climate variability and change. The OPP-PRLUP established general goals regarding land use and public policy goals and objectives regarding urban, industrial, and agricultural development; tourism; natural risks; infrastructure; and natural, environmental, and cultural resources. Several of these policies discourage land development and construction of properties in urban areas that are in flood zones, prone to floods, contain natural or archeological resources, are susceptible to significant erosion and landslides, or are environmentally critical. FEMA requires the subrecipient comply with current land use plans and the PRCZMP goals and principles during project development.

Within Puerto Rico there are a total of 70 CBRA System Units. The CBRA system units in Puerto Rico are comprised of 41 CBRS units and 29 OPAs. The combined area of resources covered

under CBRA in Puerto Rico total 50,652 acres. Of the 50,652 acres, aquatic habitats comprise 45,713 acres of the total resources projected under CBRA in Puerto Rico. Figure 9 indicates that most of the coastal resources protected under CBRA within Puerto Rico are in the south and northeast. Based on the Public Assistance data, there are no schools in Puerto Rico within CBRA System units or OPAs (FEMA 2021a).

With limited exceptions, projects within CBRS System Units are ineligible for direct or indirect Federal funds that might support or promote coastal development, thereby discouraging development in coastal areas. Federal assistance may occur in a federally declared disaster area within CBRS System Units 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. One of the exceptions to CBRA allows for Federal funds to be used in areas developed prior to the nomination of the zone into CBRS. For projects within CBRS System Units, FEMA, with support from the subrecipient, would evaluate the limitations and exceptions outlined in § 206.344 and § 206.345 and consult with USFWS to ensure concurrence.

In addition, Section 6 of CBRA permits federal expenditures and financial assistance within System Units of the CBRS after consultation with the Service for the following three activities:

- The maintenance, replacement, reconstruction, or repair, but not the expansion, of publicly owned or publicly operated roads, structures, or facilities that are essential links in a larger network or system.
- Military activities essential to national security.
- The construction, operation, maintenance, and rehabilitation of USCG facilities and access thereto.

5.6.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. Further deterioration of schools could lead to adverse short-term and long-term negligible to minor indirect and direct impacts to areas protected under the CZMA. These impacts would be associated with continued site erosion and deterioration of structures within the coastal zone. In addition, the PRCZMP discourages construction or development in the coastal flood zones that are not providing flood control measures. Leaving damaged or deteriorating schools within the coastal flood zone could be inconsistent with the PRCZMP, resulting in long-term minor to moderate adverse indirect impacts to coastal zone resources. There are no schools within the CBRA System units, so the no action alternative would not impact CBRA System units.

Alternative 2: Repair of Schools with added Resiliency Measures

Based upon the best available data, there are no schools within CBRs System Units; therefore, there would be no impacts to the CBRs System from Alternative 2.

Under Alternative 2, the repair of schools could occur in areas protected under the CZMA because 153 of 1,232 schools are within the CZMA. FEMA anticipates that the expansion of schools or increases in student populations may lead to negligible to minor long-term adverse indirect impacts to areas protected under the CZMA. The adverse indirect impact would be associated with increasing human activity within coastal area. FEMA would review SOW for schools damaged by seismic activities to determine the need for consultation with PRPB as required under the PRCZMP. Under Alternative 2, the potential for a reduction in available space within the coastal zone would occur if the subrecipient expands the size of existing school facilities within the coastal management zone. Limiting expansion to 20% and ground disturbance up to 2-acres in rural areas and 5-acres in urban areas would limit the impacts to the coastal zone. Projects covered under this PEA that are within the coastal zone would need to be approved by the PRPB as consistent with the PRCZMP. Repair of schools that are within the CZMA to include resiliency measures would protect against future storms and would therefore be consistent with the goals of the PRCZMP. FEMA anticipates that Alternative 2 projects would lead to a long-term negligible to minor adverse direct impact to areas protected under the CZMA.

Under Alternative 2, construction phase activities would require work that has the potential to cause an adverse temporary negligible to minor indirect impact to CZMA protected areas from erosion and sedimentation. For all applicable projects, the subrecipient would be responsible implementing the conservation BMPs presented in Section 6.0. These BMPs include erosion and sediment control measures that are effective in preventing the offsite movement of sediment.

Construction of safe rooms and tsunami refuges in schools would provide safe havens for communities within coastal area during major storms. This would result in long-term minor to major beneficial impacts to communities during future disasters. FEMA anticipates that a beneficial minor to major long-term impact would occur from repairing structures within the coastal zone so that they are more resilient to future disasters and are less likely to cause adverse impacts to coastal resources from disaster events.

Alternative 3: Relocation of Schools

Based upon the best available data, there are no schools within CBRs System Units or OPAs and FEMA rules do not allow for the funding of new construction within CBRs System units (FEMA 2021a). Therefore, there would be no new impacts to the CBRs System from Alternative 3.

For SOW that include demolition, the action would likely result in short-term negligible to minor adverse direct impacts to areas protected under the CZMA. The adverse impacts would be associated with the short-term mobilization and staging of heavy equipment, personnel, and demolition debris within these protected areas. The CZMP discourages demolition in historic areas. Therefore, demolition of structures within historic areas would result in long-term minor to

moderate adverse direct impacts to areas within the coastal zone. Impacts to historic areas are described in detail in the Cultural Resources section of this PEA.

Under Alternative 3, construction phase activities would require work that has the potential to cause adverse short-term negligible to minor indirect impacts to areas protected under the CZMA from erosion and sedimentation. Under Alternative 3, the post-construction phase could cause adverse short-term negligible to minor indirect impacts to areas protected under the CZMA from erosion and sedimentation. Site stabilization requirements as directed by the subrecipient's NPDES permit would limit short-term adverse impacts and eliminate the long-term impacts to areas protected under the CZMA.

Under Alternative 3, the subrecipient could relocate schools into the coastal zone, outside of the coastal zone, or within the coastal zone. In these cases, there would either be adverse impacts, beneficial impacts, or no change from the increase or decrease in human activity within the coastal zone. As described under Alternative 2, PRPB would need to approve projects covered under this PEA that are within the coastal zone as consistent with the PRCZMP goals and policies. Therefore, this PEA does not include projects that are not consistent with the PRCZMP goals and policies.

Abandonment of schools in the coastal zone would retain facilities that may be susceptible to coastal erosion which would leave the facility at risk to further damage. Measures to render the facility safe and secure would need to account for and minimize this risk. This would result in a long-term indirect adverse impact to coastal resources. Demolition of schools that were in the coastal zone would remove impediments to coastal areas and may restore the natural coastal values. This would result in a long-term indirect beneficial minor to moderate impact to coastal areas.

Relocation of schools to an existing site is subject to the 20% expansion of the existing location, capacity, or density. Construction of new schools at a new location would be subject to the acreage limits of 5 acres in urban areas and 2 acres in rural areas. FEMA anticipates that adherence to these thresholds and to the requirements of the PRCZMP, which discourages construction or development within urban areas within the coastal zone, would limit adverse impacts to areas protected under the CZMA by constraining the size and characteristics of Alternative 3 actions. Therefore, long-term impacts to the coastal zone from Alternative 3 actions would not be major.

Construction of safe rooms and tsunami refuges in schools would provide safe havens for communities within coastal area during major storms. This would result in long-term minor to major beneficial impacts to communities during future disasters. FEMA anticipates that a beneficial minor to major long-term impact would also occur to areas protected under the CZMA as the subrecipient constructs more resilient schools. For SOW that involve demolition of structures inside the coastal zone, an additional long-term benefit to areas protected under the CZMA would occur as the amount open space increases.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to the resources and areas protected under the CZMA and CBRA would be similar to Alternatives 2 and 3 for the Alternative's construction and post-construction phases.

5.7 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 (16 U.S.C. §§ 1531-1543) provides policy and authority for the conservation of threatened and endangered plants and animals and their habitats. The USFWS is the lead federal agency responsible for implementing the ESA. 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 (DCH) of such species. The law also prohibits any action that causes an unauthorized "taking" of any ESA listed species.

The ESA prohibits the taking of listed species unless specifically authorized by permit from the USFWS. "Take" is defined in 16 U.S.C. Part 1532 (19) as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." The law's definition of "Harm" includes significant habitat modification or degradation that results in death or injury to ESA-listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3).

Section 7(a)(2) of the ESA requires the lead federal agency to consult with the USFWS when a federally funded project either may have the potential to adversely affect an ESA-listed species, or a federal action occurs within or may have the potential to impact DCH. Section 7 of the ESA requires that federal agencies must ensure that any activities they authorize, fund, or carry out are not likely to destroy or adversely modify an ESA-listed species DCH.

5.7.1 Existing Conditions

FEMA uses the USFWS Information, Planning, and Conservation system and natural heritage data to identify the potential presence of ESA-listed species. The USFWS determines the likelihood of a species occurrence through an evaluation of their habitat requirements, its documented range, and comparing those parameters with existing site conditions. Appendix D presents the terrestrial ESA-listed species within Puerto Rico. Appendix E contains habitat characteristics for the species presented in Appendix D. After review of the project area and the potential habitats present, FEMA will make a determination in consultation with USFWS based on site conditions and project proposals.

There are 13 listed DCHs in Puerto Rico; Figure 10 of Appendix B presents the DCH across Puerto Rico. There are 11 schools within DCHs in Puerto Rico and they are all within the DCH for the yellow-shouldered blackbird (*Agelaius xanthomus*, FEMA 2021a). The following is a list of species that have land based DCH within Puerto Rico (USFWS 2014, 50 CFR Part 17 Vol. 84, No. 192, 50 CFR Part 17 Vol. 85, No. 126, 50 CFR Part 17 Vol. 86, No. 114):

- Plants:

- *Gonocalyx concolor* (no common name),
- Puerto Rico manjack (*Varronia rupicola*),
- Amphibians:
 - Golden coqui (*Eleutherodactylus jasper*),
 - Guajón coqui (*Eleutherodactylus cooki*),
 - Llanero coqui (*Eleutherodactylus juanariveroi*),
- Reptiles:
 - Green sea turtle (*Chelonia mydas*),
 - Hawksbill sea turtle (*Eretmochelys imbricata*),
 - Culebra Island giant anole (*Anolis roosevelti*),
 - Mona boa (*Epicrates monensis monensis*),
 - Mona ground iguana (*Cyclura stejnegeri*),
- Birds:
 - Elfin-woods warbler (*Setophaga angelae*),
 - Yellow-shouldered blackbird (*Agelaius xanthomus*)

5.7.2 Potential Impacts and Proposed Mitigation

Any projects that may affect ESA-listed species may require consultation with the USFWS and possible conservation measures. FEMA will document the results of ESA consultations in a project specific review. If the project specific review indicates that take of an ESA listed species is possible, FEMA would work with the subrecipient to alter the project to avoid the take or would prepare a Biological Assessment and submit to USFWS for a Biological Opinion.

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. Further deterioration of schools could lead to long-term minor indirect adverse impacts to ESA-listed species. Some species, such as the Puerto Rican boa, could take up residence inside buildings or elsewhere on the school grounds.

Alternative 2: Repair of Schools with added Resiliency Measures

Under Alternative 2, the subrecipient would repair schools in the same location with up to 20% expansion. The activities would likely take place in previously developed and maintained areas but could include ground disturbing activities in previously undisturbed areas. Construction activities would include increased noise and heavy equipment traffic. For any project that has the potential to adversely impact ESA-listed species, FEMA would consult with the USFWS on affects determinations, recommended BMPs, and conservation measures. These conservation measures could include requiring the subrecipient to conduct pre-construction field surveys and pre-construction worker training. FEMA anticipates these conservation measures would be effective in limiting potential adverse impacts to ESA-listed species. Therefore, Alternative 2 would result in long-term adverse negligible indirect impacts to ESA listed species.

Due to ongoing school operations and landscape maintenance, FEMA does not expect adverse direct impacts to ESA listed plants from Alternative 2 actions. However, since some schools have existing biological and conservation programs in which USFWS and PRDNER have donated ESA-listed plants and trees to schools. For any project that has the potential to adversely impact ESA-listed species FEMA would consult with USFWS and PRDNER on affects determinations and recommended BMPs and conservation measures. FEMA anticipates that the resulting conservation measures would be effective in limiting potential adverse impacts to ESA-listed species. Furthermore, the mobility of most ESA-listed wildlife species and the deterrent of on-going human activity at sites would contribute to minimizing adverse impacts. Therefore, Alternative 2 would results in long-term adverse negligible direct impacts to ESA-listed species.

Based on the locations of projects satisfied by Alternative 2 and the limits on expansion, FEMA anticipates no adverse impacts to DCHs from repairing schools. If ground disturbance, clearing of vegetation, and demolition of structures has the potential to disturb DCH, FEMA would consult with the USFWS on necessary conservation measures and BMPs. FEMA anticipates conservation measures and BMPs would be effective in minimizing potential adverse impacts to DCH.

Alternative 3: Relocation of Schools

Under Alternative 3, the relocation of schools or school operations and new school construction may require constructing temporary staging areas, access roads, as well as vegetative clearing and grubbing new project sites. Projects may occur in either rural or urban areas as well as, on developed or undeveloped lots. Based on the potential location of Alternative 3 actions, FEMA anticipates ESA listed species may be present during the construction and post-construction phases of school recovery projects.

For any project that has the potential to adversely impact ESA listed species, FEMA would consult with the USFWS on affects determinations, recommended BMPs, and conservation measures. These conservation measures could include requiring the subrecipient to conduct field pre-construction surveys and pre-construction worker training. FEMA anticipates these conservation measures would be effective in minimizing potential adverse impacts to ESA listed species to no or negligible impact. Additionally, FEMA anticipates that this PEA's acreage and expansion thresholds would limit adverse impacts to ESA-listed plant species by limiting the amount of direct land disturbance allowed for Alternative 3 satisfied projects.

FEMA anticipates that temporary adverse negligible to direct impacts to ESA-listed animal species and long-term adverse negligible direct impacts to ESA-listed plant species might occur during clearing and grubbing, the removal and replacement of existing structures, and the mobilization and demobilization of personnel and equipment. FEMA anticipates that ESA-listed wildlife would likely avoid construction areas once activities have begun. The mobility of birds should minimize impacts to ESA-listed avian species. FEMA anticipates implementation of conservation measures in consultation with the USFWS and existing agreements would further minimize impacts to ESA-listed species.

For any project that results in a “*may affect*” determination for any listed species, FEMA anticipates that the Section 7 ESA consultation process would prevent or minimize adverse impacts

to ESA-listed species and DCH. Additionally, the necessity that PreK-12 schools are located near population centers as well as, this PEA's acreage thresholds, would assist limit the likelihood of adverse impacts to DCH from Alternative 3 actions.

Temporary adverse negligible indirect adverse impacts to ESA-listed species may occur as a result of additional erosion and sedimentation during the construction phase of Alternative 3 actions. For SOW satisfied under Alternative 3, the subrecipient would be responsible for implementing applicable BMPs and conservation measures listed in Section 6.0 of this PEA. For instance, silt fencing and construction barriers would limit off-site impacts by confining construction activities to the permissible acreage allowed under this PEA.

During the post-construction phase of Alternative 3 actions, FEMA anticipates there would be a long-term adverse negligible to minor direct impact to terrestrial ESA listed species. Potential adverse impacts to ESA listed species would be associated with the presence of new infrastructure, increases in human activity, and abandoned structures.

For projects that involve the abandonment of existing structures, this PEA requires that the subrecipient render abandoned structures safe and secure. This requirement would limit the likelihood that the buildings become potential nesting for ESA-listed species. ESA-listed species that take up residence in an abandoned building would need to be removed if the building is reopened. This could result in a take under the ESA triggering a higher level of consultation with the USFWS. Rendering the building safe and secure would minimize the chance of this happening.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to ESA-listed species would be similar to Alternative 2 and 3 for the Alternative's construction and post-construction phases.

5.8 Cultural Resources

Cultural resources, including historic and archaeological resources, are subject to review under federal and Puerto Rico laws and regulations. The National Historic Preservation Act (NHPA), passed in 1966, as amended, established State Historic Preservation Offices (SHPOs), the National Register of Historic Places (NRHP), and the National Historic Landmarks program. The NRHP and NHL are 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 archaeological resources. The Secretary of the Interior administers these programs through the National Park Service.

Historic properties include districts, buildings, structures, objects, and sites that are significant in American history, architecture, archaeology, engineering, and culture. The NHPA only applies to cultural resources, including archaeological resources, determined to be eligible for listing in the NRHP. To be eligible for listing as a historic property, a property must meet eligibility criteria defined by the Secretary of the Interior and must retain sufficient integrity to convey its historic significance. Detailed eligibility criteria for listing a property on the NRHP is in 36 CFR Part 60.

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. It provides the Advisory Council on Historic Preservation and interested parties an opportunity to comment. This process must take place prior to the expenditure of federal funds. Federal regulation 36 CFR §800.4(a)(1) defines the Area of Potential Effects (APE) as the geographic area(s) within which the undertaking (action) may directly or indirectly affect historic properties. If historic properties are present, FEMA would evaluate potential impacts to historic properties prior to implementing actions for both standing structures and archaeology within the APE.

5.8.1 Standing Structures

5.8.1.1 Existing Conditions

Throughout four centuries, Spanish colonists, together with the local population, established many buildings and structures throughout the islands. Types of structures built by Spanish colonists include Catholic churches, civic buildings, and military installations. Many remain standing and are listed in the NRHP. In Puerto Rico, there are over 350 individually listed properties and 18 historic districts listed in the NRHP and six National Historic Landmarks. Altogether, there are over 2,000 historic properties included in the NRHP (Resetar, 2020). Separately, the Institute of Puerto Rican Culture oversees 12 historic districts.

In addition to Spanish architecture, Puerto Rico has many historically significant cultural resources reflecting modern influences. After World War II and until the early 1970s, Puerto Rico received an infusion of funding to transform the island from an agrarian-based society to an urban-based one which was planned to be a premier example of democracy in the Caribbean basin. Puerto Rico constructed new public buildings, including schools, using concrete, steel and glass, bright colors, and geometric shapes. These more recent properties, including many schools, may be potentially eligible for listing in the NRHP (Rigau 2018). Approximately 718 of the 1,109 PRDE schools are 50 years of age or older (FEMA 2021a). Of the 123 PNP schools, 75 are 50 years of age or older (FEMA 2021a). Figure 11 of Appendix B presents the schools that are 50 years of age or older (FEMA 2021a). FEMA consulted with SHPO on the potential eligibility of many of these schools and SHPO concurred that almost half are potentially eligible for listing in the NRHP. Currently eighteen schools are listed in the NRHP and five are located within historic districts; however, this number could increase as more sites are listed in the future. Figure 12 of Appendix B presents the 18 schools that are listed in the NRHP and the 5 schools that are within Historic Districts as of 2021 (FEMA 2021a).

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 1,338 meters (4,390 ft) above mean sea level. Ruta Panorámica is a 266 km (165-mi) stretch of highway running roughly east to 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 pre-colonial Taíno carvings, Spanish Colonial forts, and historic districts.

Hurricanes Irma and Maria and the recent increase in seismicity damaged Puerto Rico's infrastructure causing negative impacts to many historic structures. Recovery efforts to repair and harden many of these historic properties are ongoing.

5.8.1.2 Potential Impacts and Proposed Mitigation

Analysis of potential impacts to cultural and 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 the proposed action locations are identified, the locations of direct impacts can be assessed.
- Indirect impacts may occur by altering the characteristics of the surrounding environment that contribute to the resource's significance as well as neglect of the resource causing deterioration or complete destruction.

Pursuant to 36 CFR §800.14(b), FEMA, in consultation with SHPO and other consulting parties, developed a programmatic agreement that provides a strategy for achieving and expediting compliance with Section 106 of the NHPA. This includes exemptions from Section 106 review of certain activities having limited or no effect on historic properties; identification and evaluation of historic properties; and methods of resolving adverse effects. The Programmatic Agreement was executed on May 6, 2016, and was subsequently amended on May 31, 2018, November 13, 2019, and April 11, 2022. FEMA anticipates that this PEA would be used for several years as Puerto Rico's recovery progresses. New methods to streamline the Section 106 review process or the addition of new allowances for hazard mitigation measures could be developed. This could result in the development of new programmatic agreements or additional amendments to the current Programmatic Agreement. FEMA would use all these tools to meet compliance requirements under Section 106 of the National Historic Preservation Act.

For this project, alternatives could include repair, expansion, abandonment, demolition, and/or installation of new resiliency technologies that could alter or impact NRHP-listed or eligible historic properties. To determine the effect(s) and opportunities to avoid or minimize any adverse effects, FEMA would follow the standard project review as outlined in Stipulation II.C of the amended Programmatic Agreement. FEMA would analyze the SOW to determine if the proposed actions are covered under the programmatic allowances outlined in the amended Programmatic Agreement. If the SOW meets the programmatic allowances, the project would be compliant with Section 106 and the review process would be complete.

If the proposed SOW does not fall within the allowances, FEMA would initiate consultation with SHPO. If FEMA finds, and SHPO concurs that the proposed action would have an adverse effect on a historic property, FEMA will work with SHPO, the recipient, subrecipient, and other identified consulting parties to avoid or minimize the adverse effect. If the adverse effect is unavoidable, FEMA would follow the process set forth in Stipulation II.C.6 of the amended Programmatic Agreement. FEMA would memorialize the outcome of this consultation using either the Abbreviated Consultation Process or through development of a Memorandum of Agreement

(MOA). FEMA may elect to develop a Project-Specific Programmatic Agreement that would provide a specialized Section 106 compliance strategy designed to meet the particular compliance needs of those projects.

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, and/or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates these projects may go unfunded or would be deferred indefinitely. Impacts to historic properties due to unfunded or deferred funding could result in long-term negligible to moderate adverse impacts to the resource. FEMA anticipates that without routine maintenance, historic properties would deteriorate over time. The no action alternative would have long-term negligible to major impacts.

Alternative 2: Repair of Schools with added Resiliency Measures

Alternative 2 could affect historic properties. Repair of historic schools would include repairs, expansion, demolition and/or added resiliency measures to damaged facilities. Repair could also include upgrades to school facilities due to codes and standards. For Alternative 2, historic school facilities would remain in their same location; however, this alternative allows for expansion of schools up to 20% of the capacity, function, and density. Demolition could include removal of a severely damaged facility and construction of a new school in the same location. Expansion could include construction of additional classrooms, administrative offices, or operational infrastructure with associated ground disturbance for staging areas and mechanical, electrical, and plumbing installation. Resiliency measures could include elevation, retrofitting, and/or installation of renewable energy systems needed for the school to join a local microgrid.

Construction activities that include operation of heavy equipment, particularly pile drivers and other impact devices create vibrations that travel across the surface or into the ground. These vibrations could cause structural damage to historic properties. Structural damage is often determined by the level and duration of vibration, underlying geology and soils, and materials used to construct the buildings.

For repair, expansion, demolition, or installation of new resiliency technologies that could alter or impact NRHP-listed or eligible school facilities under Alternative 2, FEMA would follow the standard review process as outlined in Stipulation II.C of the amended Programmatic Agreement and as previously described.

Alternative 2 would have short-term negligible to major impacts on historic properties and long-term moderate to major impacts. Treatment measures would reduce the major impact to moderate and moderate to minor.

Alternative 3: Relocation of Schools

Alternative 3 could include the relocation of a school to a new site which could affect historic properties. Relocation of a NRHP-listed or eligible historic school could impact the historical significance and integrity of the building. Relocation of a school into a historic district could

impact the historical significance and integrity of the district. Relocating a school could include the abandonment and/or demolition of a historic property. If a NRHP-listed or eligible historic school facility is abandoned, it must be rendered safe and secure to ensure that it does not present a threat to public health and safety. If a NRHP-listed or eligible historic school is to be demolished, it would be considered an adverse effect. This alternative could include hazard mitigation measures such as the installation of renewable energy systems needed for the school to join a local microgrid.

For the relocation, demolition, abandonment and/or installation of new resiliency technologies that could alter or impact NRHP-listed or eligible school facilities under Alternative 3, FEMA would follow the standard review process as outlined in Stipulation II.C of the amended Programmatic Agreement and as previously described. For the demolition of a historic school, appropriate treatment measures found in Appendix F of the amended Programmatic Agreement or treatment measures identified during the consultation process would resolve the adverse effect.

Alternative 3 would have short-term negligible to major impacts on historic properties and long-term moderate to major impacts. Treatment measures would reduce major impacts to moderate and moderate to minor.

Alternative 4: Combination of Alternatives 2 and 3

Impacts to historic schools under Alternative 4 would be similar to Alternatives 2 and 3 for the Alternative's construction and post-construction phases. Review, evaluation of potential impacts, and compliance with Section 106 of NHPA for Alternative 4 would be similar to Alternatives 2 and 3.

Under Alternative 4, impacts to historic properties would be short-term negligible to major and long-term impacts would be negligible to major depending on the combination. Demolition of a historic property would be a major impact but could be reduced from major to moderate with treatment measures.

5.8.2 Archaeological Resources

Archaeological resources can be found on land and in water and are protected by national and state laws and regulations. In addition to the NHPA, laws specifically protecting archaeological sites include the Antiquities Act of 1906 as amended, the Archeological and Historic Preservation Act of 1974, as amended, and the Archaeological Resources Protection Act of 1979, as amended.

5.8.2.1 Existing Conditions

The indigenous Taino people first encountered Western explorers at the end of the 15th 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. Circa 400 Before the Common Era (BCE), they began migrating across the Antilles and established communities with the original inhabitants across the northern Caribbean (Curet 2003). At the time of Western contact, the Tainos were in conflict with the Carib Indians who had settled the Lesser Antilles as early as 1,300 BCE (Barnes 1993). Archaeological evidence indicates there was a Pan-Caribbean trade network among indigenous populations that extended into Central

and South America (Crock 1989). Spanish settlers found a well-developed, primarily agrarian society that had developed a complex economic and political organization. They created pharmacopeia from native flora, created pottery with fine detail, cotton weavings and wood, and shell and stone carvings. Multiple factors, such as the establishment of a forced labor regime, the displacement and run away of large populations to other islands, as well as diseases caused by the European colonizers, caused an accelerated decline of the indigenous population by the middle of the 16th century (Curet 2003). This decline led to the introduction of enslaved Africans to continue with economic production based on gold mining and agricultural production units characterized by cattle ranches and haciendas.

Prehistoric Archaeological Resources

Puerto Rico has approximately 6,000 years of human history encompassing indigenous, colonial, and contemporary occupants covering a chronological range from 3500 BCE to the present. There are approximately 2,500 archaeological sites reported for Puerto Rico in the SHPO and the Institute of Puerto Rican Culture archives, with similar settlement patterns characteristic of Caribbean geography. Typical areas where ancient human settlements were located are very similar to the currently inhabited areas of Puerto Rico including coastal areas, interior valleys in mountain regions, and flood river valleys.

Different types of archaeological sites located within these principal geographical areas include but are not limited to shell middens, stone workshops, villages, villages with central plazas or stone delimited batey, and caves and rock petroglyphs near rivers (Rodriguez Ramos 2008).

Over the last four decades, the implementation of NHPA and Section 106 compliance review resulted in the identification, evaluation, and documentation of numerous significant archaeological resources throughout Puerto Rico. Any repair, replacement, or relocation of schools 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. Between the 16th and 19th centuries, Puerto Rican culture, through a slow process of development, acquired its current characteristics. This period was one of rich developments with contributions from many groups including indigenous people and enslaved Africans, and French, English, Dutch, Danish, German, Sardinian, Swedish, Haitian, and Chinese immigrants (Tomas 1831; Llanes Santos 2009). As Puerto Rican culture developed, they constructed schools, universities, and other educational institutions to help facilitate their growing education system. While some of the structures still stand, historical records do not include many of the associated archaeological deposits.

In 1898 following the Spanish-American War and the arrival of the U.S. government, there were new developments in Puerto Rico's political and economic structures. These included the construction of large industrial sugar mills, such as the Guánica Central; infrastructure works such as irrigation canal systems, roads, bridges; and new public and private buildings and institutions (Burrows 2014). Many of them are under current conservation measures and are part of Puerto Rican cultural heritage.

Activities for schools which have ground disturbance include the construction of staging areas, access roads, and new ground excavation. In general, archaeological sites can vary in size from between a few meters to several kilometers. The practice of providing a 200-m (650-ft) buffer zone around NRHP-listed or eligible archaeological resources helps reduce potential impacts. Review of the SOW, evaluation of potential impacts, conducting additional surveys (if needed), and compliance with Section 106 of NHPA for archaeological resources would be the same standard review process described for historic properties. Consultation with SHPO may result in the need to conduct additional archaeological surveys of the APE before FEMA could make a final determination of effect. Unavoidable destruction of an archaeological resource would be an adverse effect.

Analysis of potential impacts to archaeological resources considers both direct and indirect impacts. Direct and indirect impacts to archaeological sites would be the same as those described for other historic properties.

FEMA reviewed current information on PRDE and PNP schools and identified 362 PRDE schools and 74 PNP schools that lie within the 200-m (approximately 656-ft) buffer zone around NRHP-listed or eligible archaeological resources.

5.8.2.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates these projects may go unfunded or deferred indefinitely. The no action alternative does not include ground disturbance and thus no new impacts to archaeological resources would occur.

Alternative 2: Repair of Schools with added Resiliency Measures

Repair, expansion, or demolition of schools could impact archaeological resources. Destruction or alteration of archaeological sites could occur during construction and/or demolition activities, which frequently includes ground disturbance and the use of heavy equipment. The creation of access roads, staging areas, removal of existing structures, and the installation of new or modification of existing utilities could impact archaeological resources. Archaeological resources could be present within project areas that could have been impacted during previous construction activities.

Review of the SOW, evaluation of potential impacts, and compliance with Section 106 of NHPA for Alternative 2 for archaeological resources would be the same standard review process described for historic properties. If it is determined the action would have an adverse effect, FEMA will follow the same process previously described for historic properties. Consultation with SHPO may result in the need to conduct additional archaeological surveys of the APE before FEMA could make a final determination of effect. The standard practice of providing a 200-m (650-ft) buffer zone around NRHP-listed or eligible archaeological sites helps reduce potential impacts. Unavoidable destruction of an archaeological resource would be an adverse effect.

FEMA anticipates that ground disturbance on the existing site and with the limited expansion considered for Alternative 2 would limit short- and long-term impacts to negligible to minor.

Alternative 3: Relocation of Schools

For Alternative 3, archaeological resources could be present within proposed project areas and could be affected by relocation of schools or new school construction at a new site previously disturbed by construction. The creation of access roads, staging areas, removal of existing structures, and the installation of new or modification of existing utilities could impact archaeological resources. This alternative could include hazard mitigation measures such as the installation of renewable energy systems needed for the school to join a local microgrid. Relocation of a school to a new location could result in the demolition of the existing structure, potentially impacting archaeological resources. New construction in an undisturbed area is not covered under this alternative.

Review of the SOW, analysis of potential impacts, conducting additional surveys (if needed), and compliance with Section 106 of NHPA for Alternative 3 for archaeological resources would be the same standard review process described for historic properties and for Alternative 2. If it is determined the action would have an adverse effect, FEMA will follow the same process previously described for historic properties and Alternative 2.

Alternative 3 would have short-term negligible to major impacts on archaeological resources and long-term minor to major impacts. Treatment measures would reduce major impacts to moderate and moderate to minor.

Alternative 4: A Combination of Alternatives 2 and 3

Under Alternative 4, impacts to archaeological resources would be similar to Alternatives 2 and 3 for the Alternative's construction and post-construction phases. Review, evaluation of potential impacts, conducting additional studies (if needed), and compliance with Section 106 of NHPA for Alternative 4 would be similar to Alternatives 2 and 3. If it is determined the action would have an adverse effect, FEMA will follow the same process previously described for historic properties and Alternatives 2 and 3.

Under Alternative 4, impacts to archaeological resources would be short-term negligible to minor and long-term impacts would be negligible to moderate depending on the combination. Treatment measures would reduce the major impact to moderate and moderate to minor.

5.9 Socioeconomics and 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 these types of populations, to the greatest extent practicable and permitted by law.

The CEQ guidance states that "minority populations should be identified" where either: a) the minority population of the affected area exceeds 50%; 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).

FEMA uses demographics data to analyze trends to identify potentially disproportionate impacts on minority and low-income populations from the action alternatives. FEMA would evaluate each SOW on a case-by-case basis to ensure compliance with EO 12898. Data used in FEMA’s analysis comes from documents published by relevant federal and Puerto Rico agencies. The accuracy of the annual estimates is subject to the precision and relevance of the data used to compile the results.

5.9.1 Existing Conditions

Executive Order 12898 requires agencies to consider the potential of the federal action to disproportionately affect a low income or minority community. Unlike its treatment of poverty, the USCB does not provide an official definition of low income. The EPA’s June 2016 *Technical Guidance for Assessing Environmental Justice in Regulatory Analysis* suggests several methods for characterizing risk factors associated with low-income populations including income levels, educational attainment, baseline health status, and health insurance coverage. With regards to determining a disproportionate adverse impact, Puerto Rico has a higher percentage of minority and/or low-income residents than typical of the continental United States. Provided these differences have a regular, or uniform, distribution, they generally will not indicate a potential for a disproportionate adverse impact (EPA 2016).

Communities with EJ concerns are those made up of minority, low-income, and indigenous and tribal populations. In determining whether the project is within a community with EJ concerns in accordance with EO 12898, the subrecipient would engage with members of the community, engage with knowledgeable EPA staff, conduct historic or analytic research, and use EPA’s EJSCREEN tool. In addition to people of color, low-income, and indigenous people, people under the age of 18 could have a potential overburden from the proposed action. Figure 12 in Appendix B shows those municipalities which have high levels of the population living in poverty and high levels of the population under 18. These 16 municipalities are mostly concentrated within the central third of Puerto Rico. There are variations in racial makeup, income levels, and poverty rates that differ slightly between regions and municipalities within Puerto Rico. The municipalities of Las Piedras, Yabucoa, Patillas, and Maunabo have a higher percentage of black Hispanic population than the other municipalities. Figure 13 in Appendix B shows those municipalities which have higher percentage of minority populations than the rest of Puerto Rico. Population densities and per capita income are much higher in the San Juan-Bayamon-Guaynabo-Carolina, Trujillo Alto, and Caguas areas than the rest of Puerto Rico (EPA 2022a). The high rates of poverty within Puerto Rico have not affected its residents’ level of education. Puerto Rico has a high literacy rate of 92% (United Nations Educational, Scientific and Cultural Organization 2017) and 76.5% of the population graduates from high school or higher education (USCB 2021a).

Population and Student Decline

Between 2010 and 2020, Puerto Rico’s population decreased by 11.8%, or 439,915 people, from 3,725,789 to 3,263,584 (USCB 2022). According to U.S. Bureau of Labor Statistics, unemployment in Puerto Rico decreased from 16.2% in 2011 to 7.5% in 2021 (U.S. Bureau of

Labor Statistics 2022). The trend in Puerto Rico over the last 50 years is towards higher levels of education. However, as of 2019, just 25.9% of Puerto Rico's residents over the age of 25 had obtained a bachelor's degree (USCB 2022).

According to the National Center for Education Statistics, enrollment in Puerto Rico's primary and secondary schools declined from 365,181 students in fiscal year 2016 (school year 2015-2016) to 346,096 students in fiscal year 2018, a decline of approximately 16% (NCES 2018, NCES 2020a, NCES 2020b). Puerto Rico's per pupil expenditures for public schools went from \$7,887 in 2016 to \$6,889 in 2018. This amounts to a decrease of 12.8% in student funding per pupil. According to PRDE, enrollment declined from 307,282 in the 2019 school year to 292,518 in the 2021 school year and per pupil expenditures decreased from \$7,642 in the 2019 school year to \$7,233 per pupil in the 2021 school year, a decrease of 5.4 percent (PRDE 2022). Puerto Rico funds its public-school system equally based on student population.

Minority, Income, and Poverty

The 2019 USCB QuickFacts indicates the racial makeup of Puerto Rico is 98.7% Hispanic or Latino. The Census of Population and Housing allows respondents identifying as Hispanic to select additional races. Within the category of Hispanic, the population was self-identified as 65.9% white, 11.7% black, 0.2% were American Indian or Alaska Native, and 0.2% Asian. The remaining percentage of Hispanic respondents did not select a second race (USCB 2021a).

Puerto Rico's median household income between 2015 and 2019 was \$20,539 and the per capita income is \$12,914. Approximately 43.5% of Puerto Ricans live in poverty (USCB 2021a), with high rates of poverty among those younger than 18 (57%) and those older than 65 (40%) (USCB 2021b). While all areas of Puerto Rico have residents experiencing poverty, USCB data indicates that the highest levels of poverty typically occur in Puerto Rico's mountainous and rural communities. Approximately 94% of Puerto Rican's live in urban areas (USCB 2021c).

Public School Policy

PRDE states in the CSP that they will ensure equal access and participation to all persons in the public school system regardless of their race, color, ethnicity, religion, national origin, age, citizenship status, disability, gender or sexual orientation in its education programs, services, and/or activities. Furthermore, PRDE states that it will fully enforce all federal and state laws and regulations designed to ensure equitable access to all program beneficiaries and to overcome barriers to equitable participation. (PRDE 2018).

PRDE implements several programs that seek to address low-income and minority populations both in urban and rural communities. The programs range from incentivizing teacher attendance and recruitment in low-income and minority neighborhoods to PRDE's program that identifies underserved schools within rural communities. For example, PRDE uses the Rural Education Achievement Program grants issued by the U.S. Department of Education to assist rural districts improve their instruction and academic achievement (PRDE 2018).

Community Outreach Plan

During development of the Master Plan, PRDE conducted outreach meetings in approximately 35 communities and schools across Puerto Rico. During these focus groups, communities had the opportunity to express their concerns about the condition of school facilities, programs or facilities that may be needed, among other topics specific to each school. PRDE will continue to conduct community outreach while developing their plan to repair and improve schools.

5.9.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA will not provide grant funding for permanent work including reconstruction, relocation, and/or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repairs or relocation of damaged schools. Further deterioration of schools could lead to reduced school capacity or permanent school closures for minority populations and low-income communities because of disaster events. FEMA anticipates that the no action alternative could result in adverse minor short-term and long-term impacts to low-income and minority communities. The loss of opportunity to repair or relocate facilities and services would leave students and faculty exposed to potential indoor environmental hazards such as lead and asbestos from damaged facilities. Continuing existing services in damaged or inadequate facilities may put further strain on school budgets which would likely compromise services in disadvantaged communities. Adverse impacts would occur if the damaged schools are not able to provide the same level of education and non-education services to their communities as prior to the disaster. As schools close because of disrepair, students would need to travel to other schools which would more than likely be further away than the base school. Increased air emissions from cars and buses that need to travel further would cause indirect minor long-term adverse impacts to communities with EJ concerns. Funding from other federal sources could assist in minimizing the impact of the no action alternative to low-income and minority communities.

Alternative 2: Repair of Schools with added Resiliency Measures

FEMA anticipates that school repair projects would be based on the needs of the schools and their students as well as, be in alignment with the administration of the school system. PRDE's policies under the CSP should address potential inequities between urban and rural students within the public school system. FEMA, in coordination with the subrecipient, would notify communities with EJ concerns prior to conducting repairs in schools to encourage public participation. Through this process, FEMA, the public, and the subrecipient would identify and minimize potential impacts specific to the community. For example, construction vehicle traffic along the local roads could be routed to avoid school bus routes or restricted to times when schools are not in session or to avoid peak commute times. This would reduce traffic and noise in the local community.

FEMA anticipates the implementation of Alternative 2 actions would result in temporary, minor, adverse, indirect impacts to communities surrounding schools from increased noise, air emissions, and traffic, and from conflicts with construction and class schedules and school operations. These

impacts would occur in all communities in which schools need repairs, including low-income and minority communities. Construction activities would increase noise and air emissions from heavy equipment in communities around the schools. Many communities with EJ concerns already occur in areas with poor air quality (EPA 2021a). By working with the local communities through the public participation process and following the BMPs listed in Section 6.0, the subrecipient could minimize impacts to sensitive receptors. Such BMPs and conservation measures include monitoring air quality during construction, proper vehicle maintenance, fugitive dust suppression, and minimizing vehicle idling time.

As a result of the temporary repairs that were made following the recent disaster events, FEMA anticipates that, the subrecipient would be able to schedule Alternative 2 construction activities around openings in the school calendar that would allow for in-person learning to continue. However, there would likely be some construction that would interfere with in-person learning. In these instances, the subrecipient would be responsible for communicating with the municipalities regarding the construction schedule and preparing a plan to minimize the disruption to educational time in schools.

Schools in Puerto Rico can also serve as emergency shelters, voting centers, public health centers, and areas of information sharing and neighborhood cohesion (Centro para la Reconstrucción del Hábitat 2020). During the construction phase of Alternative 2 actions, it is possible that a school may not be able to perform these non-educational related services. FEMA will, with support from COR3 and the subrecipient, conduct public outreach, prepare a public engagement plan, schedule construction activities, manage disruptions to the flow of traffic into and out of schools through the implementation of maintenance of traffic (MOT) plan, and manage public notifications of changes in traffic patterns. FEMA anticipates that the upgrades and expansion of existing schools would not result in a long-term adverse impact the surrounding community's ability to use the facilities for non-education related services.

FEMA anticipates that Alternative 2 actions would not diminish the quality of education that students in low-income and minority communities receive from their schools. PRDE states in the CSP that they would ensure equal access and participation to all persons regardless of their race, color, ethnicity, religion, national origin, age, citizenship status, disability, gender or sexual orientation in its education programs, services, and/or activities. As noted in PRDE's CSP, Puerto Rico has proposed monitoring as a means of ensuring that the expected improvements in public school education occurs.

FEMA anticipates that Alternative 2 actions of repairing schools to their pre-disaster condition, improving their resilience to future disasters, and construction of saferooms and tsunami refuges would result in direct long-term minor to moderate beneficial impacts to low-income and minority communities.

Alternative 3: Relocation of Schools

Under Alternative 3 FEMA would direct public engagement with assistance from COR3 and the subrecipient. PRDE would inform the public regarding the identification and selection of disaster damaged schools that PRDE recommends be moved or closed according to Puerto Rico law and

EO 12898, which requires engaging with stakeholders. As needed, FEMA would, with assistance from COR3 and the subrecipient, prepare public engagement plans, as specified in Section 6.0, that meet the requirements of EO 12898 and Puerto Rico law. The plans would consider various public involvement strategies depending on the specific circumstances of the communities and other stakeholders to be impacted by closures or relocations of schools. FEMA, with assistance from COR3, would lead the PRDE in preparation and implementation of public engagement plans. The subrecipient would be responsible for determining school assignments and student transportation. PRDE's policies address potential inequities between urban and rural students and low-income and minority communities.

School closures would have a range of impacts within communities with EJ concern depending on whether closed schools are abandoned or demolished and whether the new school location is close to or further away from the target population. FEMA anticipates abandoning schools could result in a long-term adverse minor indirect impact to low-income and minority communities. The adverse impact would result from potential blight from leaving an empty unused building in the community. Vacant buildings tend to jeopardize residents' safety and encourage blight and disinvestment by attracting crime and reducing surrounding property values (EPA 2013). FEMA anticipates that this PEA's requirement that the subrecipient render abandoned schools safe and secure would limit adverse impacts to the surrounding community.

FEMA anticipates demolition of damaged schools would result in temporary adverse minor direct impacts to communities with EJ concern from an increase in noise, traffic, and air emissions in areas likely already impacted by high levels of each. By working with the local communities through the public participation process and following the BMPs listed in Section 6.0, the subrecipient would minimize impacts to sensitive receptors. Long-term adverse minor indirect impacts could occur if vacant properties where schools once stood remain empty and lead to issues with blight.

Construction of new facilities would have impacts to communities with EJ concern similar to those described in Alternative 2; however, because the construction would be of a new facility, construction would last longer and encompass a larger area.

Relocation of schools to existing or new facilities within an area served by the same target population as the original schools would result in fewer adverse impacts because students travel time to the school would likely be similar. Relocation of schools to adjacent communities could result in extended travel times which could constitute a moderate adverse long-term direct impact to communities with EJ concern. People living in communities with EJ concerns may not have the same level of access to private vehicles as people in other communities. Reliance on the public transportation system and school bus transportation may lead to potential reductions in the participation in extracurricular activities as well as school attendance and tardiness. FEMA anticipates that PRDE's school transportation program, Asegura La Transportación, would limit the impacts of extended travel times to students and parents. The program assists parents in identifying the best option for transporting their child to school.

Schools in Puerto Rico can also serve as emergency shelters, voting centers, public health centers, and areas of information sharing and neighborhood cohesion (Centro para la Reconstrucción del

Hábitat 2020). During the construction phase of Alternative 2 actions, it is possible that a school may not be able to perform these non-educational related services. The subrecipient will be responsible for the scheduling of construction activities, managing disruptions to the flow of traffic into and out of schools through the implementation of a MOT plan, and public notifications. FEMA anticipates that the upgrades and expansion of existing schools would not result in a long-term adverse impact the surrounding community's ability to use the facilities for non-education related services.

The closure of schools that also serve as emergency shelters, voting centers, public health centers, and areas of information sharing, and neighborhood cohesion would adversely impact low-income and minority communities as schools often serve multiple roles for their neighborhoods. If schools remain safe to keep open while the subrecipient opens new schools, there would be no impact to low-income and minority populations. If the subrecipient relocates closed schools within the same area or close by, these services would again be available at the new school once operational. In this case there would be an indirect temporary minor adverse impact to the low-income and minority populations while the new school is being prepared. If the subrecipient cannot relocate closed schools within the same area or close by, there would be an indirect long-term minor to moderate adverse impact to low-income and minority populations from a lack of available non-educational services.

With support from FEMA and COR3, the subrecipient will conduct public outreach, prepare a public engagement plan, schedule construction activities, manage disruptions to the flow of traffic into and out of schools through the implementation of a MOT plan, and manage public notifications of changes in traffic patterns. Because the subrecipient would work with local community leaders to communicate plans ahead of time and to try to devise options for these other services, FEMA anticipates indirect impacts to the low-income and minority populations would be temporary minor to moderate.

FEMA anticipates that although Alternative 3 actions could also have adverse impacts to communities with EJ concern, the relocation of schools to new facilities or facilities without storm damage and the addition of resiliency measures would constitute a long-term minor to moderate beneficial indirect impact to low-income and minority communities. Installation of microgrids in schools in communities with EJ concern would provide grid resilience, mitigate disturbances caused by natural disasters, and allow for faster system response and recovery. It would allow for schools to remain open even when other parts of the community may remain without power or potable water.

FEMA anticipates construction job related benefits would be similar to those described under Alternative 2 but could last longer depending on the duration of construction activities.

Alternative 4: A Combination of Alternatives 2 and 3

Impacts to Puerto Rico's low-income and minority communities from Alternative 4 actions would be similar to those of Alternative 2 and 3 for the construction and post-construction phases.

5.10 Land Use and Planning

5.10.1 Existing Conditions

Within Puerto Rico, comprehensive land use plans guide land use within the vicinity of urban and rural areas and determine what types of development can occur within a specified area. The PRPB regulates overall land-use planning within Puerto Rico; however, municipalities may adopt their own comprehensive plans or zoning ordinances. The most recently published land use strategy for Puerto Rico was for the years 2011 through 2018. Each land use plan presents land use descriptions and maps that delineate urban and residential zones and the appropriate activities for those respective localities.

Developed areas occur throughout the main island of Puerto Rico, including large clusters within the coastal plains and valleys, and linear developments along highways and roads. The U.S. Forest Service indicated three different land use types including urban (16%), densely populated rural (36%), and sparsely populated rural (48%) land development within Puerto Rico (Martinuzzi et al. 2007). Approximately 11% of Puerto Rico is comprised of urban/built-up surfaces in both low-density and sparsely populated neighborhoods; however, half of the urban development occurs outside urban centers.

A high degree of urban sprawl is present on 40% of the island. Undeveloped areas within Puerto Rico include areas with steep slopes, under current agricultural production, or maintain substantial wetland ecosystems. According to the 2010 U.S. Census, 93.7% of Puerto Ricans live in urban areas with only 6.2% living in rural areas. The total percent of land mass characterized as urban according to the 2010 U.S. Census is 47.17% (USCB 2010).

Section 8302 of the ESSA requires the Secretary of Education to establish procedures and criteria under which, after consultation with the Governor, a state educational agency may submit a CSP. The Puerto Rico CSP's goal is to improve student education and experience. PRDE's school improvement plan includes efforts to close low-performing schools and consolidate schools by sending students to other, higher-performing schools, schools with the capacity to achieve positive outcomes, and schools that have sufficient enrollment to support cost-effective implementation of new academic programs.

Under Puerto Rico Law Title 23 § 206 and § 206a, PRPB shall consult with Secretary of Education and the Police Corps of Puerto Rico on identifying suitable locations for schools. It is Puerto Rico's policy to provide the most effective protection and security to students and teachers and create a healthy environment for the schools and their surrounding communities. This law prohibits the location of new schools in places where the existing nature of the zone, as well as the activities, businesses, land use, traffic conditions and other characteristics of the area are incompatible with the characteristics of a school zone and the necessary environment for educational pursuits.

5.10.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. Further deterioration of schools could lead to no adverse impact on land use plans or land use planning. However, the no action alternative would result in damaged or possibly abandoned buildings remaining in the community resulting in blight. This would result in a long-term moderate adverse indirect impact.

Alternative 2: Restoration of Schools with added Resiliency Measures

Alternative 2 actions would adhere to local building and planning codes and ordinances. Current zoning ordinances would continue to restrict incompatible development around existing schools. Existing school zones should remain largely unchanged as a result of Alternative 2 actions. FEMA anticipates Alternative 2 would result in no adverse short-term and long-term impact to land use plans or planning as a result of actions satisfied by Alternative 2.

FEMA anticipates that this PEA's limits of disturbance and expansion thresholds would minimize adverse impacts to the surrounding communities from increases in student, faculty, and staff populations to a level of minor. Slight increases in school populations may require adjustments to existing traffic patterns into and out of schools. Compliance with PRDTOP's guidelines for a MOT plan would limit adverse impacts to surrounding communities from increased traffic volumes.

Local planning agencies would need to update emergency plans and evacuation routes in communities where the subrecipient constructs saferooms or tsunami refuges in conjunction with school renovation projects. FEMA and the subrecipient would provide the local communities with site-specific information, such as space and occupancy availability, for each saferoom and tsunami refuge for the evacuation plans. Construction of saferooms and tsunami refuges would result in a long-term moderate beneficial impact to community planning because local planners could incorporate them into their evacuation planning and routes.

Alternative 3: Relocation of Schools

FEMA anticipates that detours and access restrictions during the construction phase of Alternative 3 actions would result in negligible to minor temporary adverse impacts to land use within the surrounding communities. The subrecipient would be responsible for implementing applicable BMPs listed in Section 6.0. BMPs include a MOT plan in accordance with PRDTOP guidance as well as notifying local businesses and community organizations about proposed construction activities and schedules.

PRPB and local land use plans encourage concentration of development in urban areas and preservation of agricultural land. FEMA anticipates that the continued implementation of PRPB and local land use plans would limit adverse short-term and long-term impacts to land use within Puerto Rico. The subrecipient would follow Puerto Rico regulations for the siting of new schools

consistent with local planning and zoning. FEMA anticipates that this PEA's limits on expansion and new construction would minimize impacts to local priorities set through planning and zoning to negligible to minor levels.

Local planning agencies would need to update emergency plans and evacuation routes in communities where the subrecipient constructs saferooms or tsunami refuges in conjunction with school relocation projects. FEMA and the subrecipient would provide the local communities with site-specific information, such as space and occupancy availability, for each saferoom and tsunami refuge for the evacuation plans. Construction of saferooms and tsunami refuges would result in a long-term moderate beneficial impact to community planning because local planners could incorporate them into their evacuation planning and routes.

Alternative 4: Preferred Alternative

Impacts to the Puerto Rico's land use and land use planning would be similar to those of Alternatives 2 and 3 for Alternative 4's construction and post-construction phases.

5.11 Noise

The EPA defines noise as unwanted or unwelcome sound and measured in decibels (dBA) on the A-weighted scale. For example, the dBA is the scale most similar to the range of sounds that the human ear can hear. Noise occurring between 10 p.m. and 7 a.m. is more disturbing than those sounds that occur during normal waking hours between 7 a.m. and 10 p.m. The Noise Control Act of 1972 required the EPA to create a set of noise criteria. In response, EPA 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 EPA report found that keeping the maximum 24-hour exposure level below 70 dBA as the level of environmental noise which will prevent any measurable hearing loss over a lifetime (EPA 1974).

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 and can cause immediate irreparable damage at 140 dBA. The Occupational Health and Safety Administration (OSHA) adopted a standard of 140 dBA for maximum impulse noise exposure. OSHA requires that construction workers with exposure to noise pollution wear appropriate hearing protection. Similarly, HUD noise standards, 24 CFR § 51 Subpart B, indicate that for proposed new construction in high noise areas, the project must incorporate noise mitigation features.

Within Puerto Rico, the PRDNER/PREQB regulates noise in accordance with the Noise Pollution Control Regulation of 2011. The regulation established the threshold for school areas at 55 dBA (PREQB 2011).

5.11.1 Existing Conditions

Several factors affect the human ear's perception of sound. These include the actual level of sound or noise, frequencies involved, period of exposure to the noise, changes, or fluctuations in the noise

levels during exposure, and meteorological conditions such as wind speed, direction, inversions, and humidity.

An important way of predicting a human reaction to a new noise environment is the way it compares to the existing environment to which a person has adapted: the so called “ambient noise” level. In general, the more a new noise exceeds the previously existing ambient noise level, the less acceptable the new noise will be by those hearing it. Existing noise levels will vary by each site location and depend on the sound level and the observer’s distance from the source. Noise events near a school site may be associated with climatic conditions; transportation noise; local environment; and “life sounds” (e.g., communication, children playing). For those school sites located along roadways, there will be existing traffic noise from roadway vehicles. Other potential sources of noise near existing school sites may include humans and animals.

The subrecipient must comply with PRDNER/PREQB noise ordinance standards which include compliance with construction timeframes occurring between normal waking hours and using properly maintained equipment. Existing noise levels will vary by each site location and depend on the sound level and the observer’s distance from the source. Schools are included in Zone 4, Tranquility. Table 5 displays the PRDNER/PREQB noise abatement criteria. Noise receiving areas in the below table pertain to either daytime or nighttime applications (PREQB 2011).

Table 5: PRDNER/PREQB Classification Zone and Sound Emission Levels Per Zone (dBA)

Issuing Source	Zone 1 Day	Zone 1 Night	Zone 2 Day	Zone 2 Night	Zone 3 Day	Zone 3 Night	Zone 4 Day	Zone 4 Night
Zone 1 (Residential)	60	50	65	55	70	60	55	50
Zone 2 (Commercial)	65	50	70	60	75	65	55	50
Zone 3 (Industrial)	65	50	70	65	75	75	55	50
Zone 4 (Tranquility)	65	50	70	65	75	75	55	50

5.11.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA will not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates these projects may go unfunded or deferred indefinitely. The No Action would not impact existing noise conditions as daily operations would remain unchanged.

Alternative 2: Repair of Schools with added Resiliency Measures

Noise from construction activities have the potential to impact students, faculty, staff, construction workers, and the neighboring community. FEMA anticipates noise from construction of a new school would have a temporary minor to moderate adverse direct impact on local populations

depending upon the phase of construction activities. Construction activities would likely include heavy equipment which would generate vibrations and in-ground noise during the construction phase. Pile driving, which can be very disruptive because of noise, could be required during construction and would lead to moderate disruptions to the nearby population. The subrecipient would be responsible for planning construction schedules around school activities. This could include scheduling pile driving activities outside of school hours. This could in turn result in longer construction durations. Additionally, FEMA anticipates that OSHA regulations which require employers to provide workers with the appropriate level of protective equipment would minimize adverse impacts to construction worker hearing. Finally, FEMA anticipates that PRDNER/PREQB noise ordinances that limit construction activities to waking hours would limit adverse impacts to surrounding neighborhoods.

FEMA anticipates that following the completion of Alternative 2 actions, noise levels would return to pre-construction levels. If repaired schools are expanded to allow for higher capacity, there would likely be additional noise from more personal vehicles and buses as well as noise from students and staff. This would generally occur when school begins and ends each day. Therefore, FEMA anticipates that Alternative 2 would have negligible to minor long-term adverse direct impacts on local populations from additional noise.

Alternative 3: Relocation of Schools

Under Alternative 3, the subrecipient would construct a new school or relocate school activities to another existing facility. Construction of a new school would have similar impacts to those described under Alternative 2; however, they would occur over a longer time. FEMA anticipates that noise from construction activities would result in short-term minor to moderate adverse direct impacts to the surrounding communities.

FEMA anticipates that new schools would result in a minor to moderate long-term direct adverse impacts to the surrounding community from the additional noise. School generated noises are likely to occur at various times throughout the school day and school year. FEMA anticipates that a school's typical operational requirements would limit noise impacts to only certain times of the day and prevent noise impacts from occurring during non-waking hours. Relocating a school function to an existing facility would result in similar long-term impacts as introducing a new school to a neighborhood. If other activities remain ongoing at the existing facility, then school related noise would be additive. If the facility was vacant before the subrecipient relocated the school function, then the school related noise would be new to the surrounding population and could be disruptive.

Buildings under this PEA that are proposed for abandonment by the subrecipient PEA must be rendered safe and secure. For communities around abandoned schools, FEMA anticipates that this PEA's requirements that the subrecipient render buildings safe and secure would limit long-term noise impacts from former school sites.

Alternative 4: A Combination of Alternatives 2 and 3

FEMA anticipates that noise impacts from Alternative 4 would be similar to those described for Alternatives 2 and 3.

5.12 Transportation

The PRDTOP is responsible for managing both maritime and non-maritime transportation facilities in Puerto Rico. The PRDTOP is comprised of four agencies: the Puerto Rico Highway and Transportation Authority, the Puerto Rico Port Authority, the Maritime Transport Authority, and the Metropolitan Bus Authority. The Highway and Transportation Authority is a government-owned corporation responsible for constructing, operating, and maintaining roads, bridges, avenues, highways, tunnels, public parking, tolls, and other transit facilities.

Students in Puerto Rico travel to school using various means of transportation based on available resources. Traffic control plans manage the movement of students and traffic into and around school zones. In Puerto Rico, private entities own and operate school buses. PRDE awards contracts to school bus operators for the purpose of transporting students to public schools.

5.12.1 Existing Conditions

PRDE's student busing system serves much of Puerto Rico; however, some students must rely upon other means of transportation such as public buses, private transportation, walking, or riding their bikes to get to school. Although PRDE's busing system does not serve all homes or localities throughout Puerto Rico, PRDE does ensure that all students with special needs are served by buses that can accommodate their requirements. PRDE maintains a program devoted to assisting parents with identifying the best options for routinely transporting their children to school.

Puerto Ricans are heavily dependent on their transportation system with the average worker commute time of 29.1 minutes; however, approximately 3.8% of Puerto Ricans have commutes up to 90 minutes (Data USA 2022). Approximately 90.5% of the workforce travels to work via car, truck, or van. Puerto Rico has approximately 2.8 million registered vehicles and 2.1 million licensed drivers (American Society of Civil Engineers 2019).

The system includes roads operated under the National Highway System, state highways, and municipalities. The National Highway System in Puerto Rico consists of approximately 1,257 km (781 miles) of roadways while, Puerto Rico maintained roadways make up approximately 8,172 km (5,078 miles) of the road network. Municipalities within Puerto Rico own and operate the remaining 20,372 km (13,280 miles) of roadways (American Society of Civil Engineers 2019). The exact number of paved and unpaved road miles varies slightly based on the data's source and road surface definition used by the reference's preparer.

5.12.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA will not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates these projects may go unfunded or deferred indefinitely. FEMA anticipates no adverse impacts to Puerto Rico's transportation system or school zone traffic control plans from the no action alternative. The existing procedures for transporting students to schools would remain unchanged as a result of the no action alternative.

Alternative 2: Repair of Schools with added Resiliency Measures

Under Alternative 2, this PEA would allow the subrecipient to repair schools damaged by disaster events and implement resiliency measures. During construction activities, FEMA anticipates that temporary minor adverse direct impacts to existing traffic patterns would occur as the subrecipient mobilizes and demobilizes heavy equipment and materials to and from school construction sites. The subrecipients will be responsible for implementing a MOT plan per the Work Zone Safety and Mobility Policy presented in the PRDTOP Design Manual, thereby minimizing impacts to the local transportation systems. The design manual requires contractors working in Puerto Rico to implement MOT plans and conduct public notifications prior to project implementation.

FEMA anticipates that the potential expansion of school populations under Alternative 2 would require additional PRDE provided transportation for students attending schools with increases in student capacity. FEMA anticipates that an increase in school populations would result in a minor long-term adverse direct impact to school traffic control plans as additional cars and buses would be entering and exiting school zones. FEMA anticipates this PEA's expansion and project size thresholds would limit increases in traffic volumes related to school population because traffic generated is directly related to the size of the school. Larger schools generate more traffic. This PEA's thresholds on expansion and increases in capacity would assist in minimizing adverse long-term impacts to existing transportation systems and plans to a minor level.

Alternative 3: Relocation of Schools

FEMA anticipates the implementation of Alternative 3 actions would result in temporary, short-term, and long-term minor adverse direct impacts to Puerto Rico's transportation system. Construction related traffic would occur during at the old school during abandonment or demolition activities and at the new sites during expansion or new construction. The temporary and short-term impacts would likely be from localized construction related traffic delays as a result of using roadways to mobilize construction equipment and materials as well as, the off-site disposal of construction and demolition debris.

Under Alternative 3, the subrecipient will be responsible for consulting and notifying impacted populations and businesses of temporary changes in traffic patterns. For projects that involve adjacent streets, the subrecipient will be responsible for implementing a PRDTOP compliant MOT plan. For project's involving utilities in transportation ROWs, the subrecipient will be responsible for complying with PRDTOP's codes and standards for traffic management and roadway design.

FEMA anticipates that PRDTOP's codes and standards for school zones and roadway design would limit long-term adverse impacts from Alternative 3 actions.

Alternative 3 actions may require modifications to an existing roadway system as the subrecipient connects driveways and parking lots to existing surface streets. For project's involving connecting driveways and parking lots to Puerto Rico operated roadways, the subrecipient will be responsible for complying with PRDTOP's codes and standards for traffic management. FEMA anticipates that PRDTOP's codes and standards for traffic management and roadway design would limit long-term adverse impacts from Alternative 3.

FEMA anticipates relocated or new schools under Alternative 3 would require the rerouting of student transportation. FEMA anticipates that Alternative 3 would result in a minor long-term direct adverse impact to the Puerto Rico's roadway system as localized traffic volumes increase and the subrecipient implements new school zone traffic control plans. The further schools are relocated from the original location, the longer travel routes would be, and the more impacts there would be on local traffic.

Relocation of schools would increase traffic related impacts at the new school locations, both for new construction and for consolidation of schools. There would changes in the levels of traffic trips during the start and end of school days. There could also be changes in speed limits around the schools. FEMA anticipates a decrease in traffic at the closed schools.

FEMA anticipates in areas surrounding abandoned schools, a beneficial negligible impact to Puerto Rico's transportation system would occur as the subrecipient removes school zone traffic control requirements.

Alternative 4: A Combination of Alternatives 2 and 3

FEMA anticipates that impacts to Puerto Rico's transportation system from Alternative 4 actions would be similar to those described for Alternatives 2 and 3.

5.13 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 of a public service, such as electricity, potable water, wastewater, and communication networks. The interruption of public utilities can cause public health and safety concerns. A reduction in the reliability of public services affects all areas of daily life.

5.13.1 Existing Conditions

Utility companies distribute and transmit utilities mostly through overhead lines and underground conduits often within existing transportation ROWs. The Puerto Rico Electric and Power Authority (PREPA) owns and operates the majority of the Puerto Rico's electrical power generation and distribution facilities; however, some limited private ownership is also present. On June 1, 2021, PREPA entered into an operations and maintenance agreement with LUMA Energy, LLC. PREPA still operates the power generation facilities, while LUMA Energy operates and maintains the

transmission lines, overhead and underground distribution lines, substations, and transmission centers across the service area. The Puerto Rico Aqueduct and Sewer Authority (PRASA) owns and operates the majority of Puerto Rico's public water and wastewater systems. Not-for profit organizations operate those water and wastewater systems, not operated by PRASA.

In 2019, ten schools in the mountainous region of Puerto Rico installed microgrids to provide power to the schools during grid outages. The microgrids included installation of sufficient battery and solar capacity to back up school libraries, administrative offices, kitchens, and critical water pumps. These microgrids will help to ensure future disasters do not disrupt learning (RMI 2021).

5.13.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for school projects. Due to budgetary constraints within Puerto Rico, school projects may either be deferred or indefinitely delayed. FEMA anticipates the temporary emergency repairs made to Puerto Rico's schools following recent disasters would not serve as long-term solutions. FEMA anticipates that as schools deteriorate, their internal utility networks may become more susceptible to temporary and prolonged outages. FEMA anticipates the no action alternative will result in a long-term minor adverse indirect impact to public service providers and utilities.

Alternative 2: Repair of Schools with added Resiliency Measures

Under Alternative 2, this PEA allows for expansion of schools up to 20% of their pre-disaster location, capacity, and density. FEMA anticipates that temporary minor direct adverse impacts to public services and utilities would occur during the construction phase of Alternative 2 actions. The adverse impacts would occur from disruptions in service as the subrecipient ties upgraded utilities into existing transmission and distribution networks. In accordance with OSHA requirements and the BMPs listed in Section 6.0, the subrecipient would be responsible for locating utilities prior to the start of ground disturbing activities. This would limit adverse impacts to the surrounding communities from Alternative 2 actions by reducing the likelihood of unannounced outages.

FEMA anticipates this PEA's constraints on increases in capacity and obtaining appropriate permits would minimize adverse long-term impacts to public service and utility providers to a level of minor. Puerto Rico's Building Codes and Standards were prepared in accordance with the International Codes Council standards. The American Society of Heating and Air-Conditioning Engineers and the International Codes Council in cooperation with the U.S. Department of Energy develop codes and standards that incorporate materials and technologies in both designs and construction that encourage energy conservation and resiliency. Project SOWs that include installation of microgrids would lessen demand and provide greater resiliency to power generation. This would result in a long-term, direct beneficial impact to utilities. As such, FEMA anticipates Alternative 2 actions would provide a beneficial long-term minor indirect impact to Puerto Rico's

public service providers as upgraded utilities and schools become more resilient in response to future disasters and more energy efficient.

Alternative 3: Relocation of Schools

Under Alternative 3, the subrecipient would relocate existing schools or construct new schools. Construction of a new school would have similar impacts to those described under Alternative 2 from disruptions to utilities as the subrecipient ties upgraded utilities into existing transmission and distribution networks. These impacts would occur over a longer time period than those for Alternative 2 if a new school facility is constructed. In accordance with OSHA requirements and the BMPs listed in Section 6.0, the subrecipient will be responsible for locating utilities prior to the start of ground disturbing activities. This would limit adverse impacts to the surrounding communities from Alternative 3 actions by reducing the likelihood of unannounced outages. Therefore, FEMA anticipates that temporary to short-term minor to moderate adverse impacts to public services and utilities would occur during the construction phase of Alternative 3.

FEMA anticipates this PEA's constraints on increases in capacity would limit long-term adverse impacts to public service providers and utilities. For instance, if students are relocated to new schools, the utility capacity previously designated for their former school would then be available and no substantial increase in utility capacity would be necessary.

Puerto Rico's Building Codes and Standards were prepared in accordance with the International Codes Council standards. The American Society of Heating and Air-Conditioning Engineers and the International Codes Council in cooperation with the U.S. Department of Energy develop codes and standards that incorporate materials and technologies in both designs and construction that encourage energy conservation and resiliency. Project SOW that includes installation of microgrids would result in a long-term, direct beneficial impact to utilities by lessening demand and provide greater resiliency to power generation. As such, FEMA anticipates Alternative 3 actions would provide a beneficial long-term indirect impact to Puerto Rico's public service providers as upgraded utilities at schools would be more resilient in response to future disasters and more energy efficient.

Alternative 4: A Combination of Alternatives 2 and 3

Impacts to public services and utility networks under Alternative 4 would be similar to those described for Alternatives 2 and 3 for construction and post-construction activities.

5.14 Hazardous Materials

Hazardous materials, hazardous wastes, and hazardous substances include any solid, liquid, contained gaseous or semisolid waste, or any combination of materials, substances, or wastes that pose a threat to human health and the environment. Federal, state, and local environmental, safety occupational, and transportation laws and regulations extensively regulate the management and use of hazardous materials. Examples of hazardous materials include asbestos, lead, petroleum products, paints, polychlorinated biphenyls, and toxic or highly reactive chemicals. Improper management or disposal of hazardous materials and/or wastes can lead to pollution or contamination of surface water, soil, groundwater, and/or the air. Types of hazardous materials

that demonstrate either flammable, corrosive, reactive, or toxic characteristics may pose a substantial existing or potential hazard to human health and the environment if not properly managed and disposed.

Numerous agencies enforce laws governing hazardous materials and hazardous wastes to ensure protection of the environment and human health through the establishment of information management tracking systems. The tracking information may include the identification, use, storage, treatment, transportation, and disposal of hazardous materials and substances for cradle-to-grave management. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 U.S.C. § 9601 *et seq.*), *as amended*, commonly referred to as Superfund, provides a federal program to clean up uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment within the U.S. and its Territories. Under Superfund, EPA manages the National Priority List (NPL) which ranks sites based on a Hazard Ranking System.

The Resource Conservation and Recovery Act (RCRA) gives EPA authority for the management and disposal of hazardous waste from “cradle-to-grave.” This includes the generation, transport, treatment, storage, and disposal of hazardous waste by providing regulation, guidance, and policies ensuring safe management, cleanup, and disposal of solid hazardous waste. The EPA delegates the primary responsibility of implementing the RCRA hazardous waste program to states and territories.

In Puerto Rico, the PRDNER/PREQB implements the RCRA hazardous waste program and licenses hazardous waste landfills on Puerto Rico to properly dispose of hazardous waste on the island. The PRDNER/PREQB has 18 licensed and permitted landfills and disposal facilities in Puerto Rico. 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 and gas recovery facilities. Federal and state regulations require proper handling and disposal of the debris produced by any proposed action.

OSHA assures safe and healthful working conditions for on-site personnel inclusive of the appropriate level of personal protective equipment and receive appropriate job specific safety training in accordance with OSHA regulations. On-site personnel will follow applicable OSHA regulations for the abatement of asbestos and handling of lead-based paint.

5.14.1 Existing Conditions

Knowledge of prior land use at project sites and/or their location relative to known hazardous waste sites may be an indicator of whether hazardous materials are likely to be present. Water, soil, sediment, and groundwater may contain hazardous wastes and chemicals from prior usage or potential illegal dumping at the site, or from offsite migration. The potential for exposure to hazardous materials during construction activities increases with the exposure of subsurface materials.

Exposure to silica from the breaking of building materials into fine particles during demolition or similar activities can release fine particles into the air. Long-term exposure to these fine particles can lead to lung infections and lung cancer. OSHA requires that contractors use BMPs to minimize fugitive dust particulates while working with concrete.

The EPA RCRA Info online database is a national program management and inventory system of hazardous waste handlers. As of February 24, 2022, the RCRA online database lists 1,619 active generator sites throughout Puerto Rico (EPA 2022b). As of February 24, 2022, EPA has historically managed 25 NPL and Superfund Alternative Approach Sites in Puerto Rico (EPA 2022b). Since the inception of the program, EPA has obtained closure on seven former NPL sites within Puerto Rico (EPA 2022c, 2022d). Table 6 presents the 18 active NPL sites and Figure 14 of Appendix B presents the NPL sites across Puerto Rico.

Table 6: Active NPL Sites in Puerto Rico

Location	Active NPL Site
Vieques	Atlantic Fleet Weapons Training Area
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
Candeleria Ward	Scorpio Recycling, Inc.
Barrio Cambalache	The Battery Recycling Company
Barceloneta	Upjohn Facility
Vega Alta	Vega Alta Public Supply Wells
Rio Abajo Ward	Vega Baja Solid Waste Disposal

Source: EPA, 2022c and 2022d

5.14.2 Potential Impacts and Proposed Mitigation

Alternative 1: No Action

Under the no action alternative, FEMA would not provide grant funding for permanent work including reconstruction, relocation, or hazard mitigation of schools in Puerto Rico. Due to budgetary constraints within Puerto Rico, FEMA anticipates the subrecipient would delay or indefinitely defer repair or relocation of damaged schools. FEMA anticipates the no action alternative has the potential to cause a negligible to minor adverse short-term and long-term indirect impact to local school populations from the potential exposure or release of hazardous materials. The impact would be associated with exposure to deteriorating building materials and chemicals commonly used at schools.

Alternative 2: Repair of Schools with added Resiliency Measures

Under Alternative 2, FEMA would fund projects that involve the repair of schools with added resiliency measures. During construction activities, workers may temporarily use or encounter hazardous materials and generate hazardous wastes including used oil, asbestos, and lead based paint. FEMA anticipates that Alternative 2 actions would result in short-term and long-term minor adverse direct impacts due to the generation of hazardous wastes. Based on the location criteria for Alternative 2 actions, FEMA does not anticipate encountering contamination associated with NPL sites.

The subrecipient would ensure that on-site personnel follow applicable OSHA regulations for training, handling, management, and disposal of hazardous materials. As noted in Section 6.0, the subrecipient would be responsible for complying with federal and Puerto Rico laws and regulations for the management and disposal of hazardous materials and wastes. Assessment and testing for the presence of asbestos and lead-based paint must occur prior to the demolition of building materials. The excavation of soils and sediment can expose workers to contaminated surface water, groundwater, soils, and sediment during the construction process. The subrecipient will be responsible for ensuring their contractors use the appropriate level of personal protective equipment. The subrecipient will install construction barriers around active sites to prevent unauthorized personnel from gaining access. The subrecipient will be responsible for performing all demolition and excavation activities in accordance with federal, state, and local laws and regulations regarding the handling and disposal of hazardous materials. Appropriate signage and construction barriers will be in place prior to construction to alert the public of project activities and risks.

Current codes and standards specify materials that are more reliable, durable, and safer for the environment than their predecessors. During construction phase of Alternative 2 actions, excavations could encounter contaminated soil, groundwater, and sediment. If contaminated medium is encountered during construction, the subrecipient would stop work and contact PRDNER/PREQB and other regulators in accordance with applicable permits and adhere to regulator guidance prior to resuming work. For circumstances where the CWA requires the implementation of a spill prevention control and countermeasures plan, the plan would assist in preventing impacts of hazardous materials to the immediate area of the release.

FEMA anticipates that Alternative 2 actions would result in beneficial short-term and long-term minor indirect impacts to students from the removal and disposal of hazardous wastes including asbestos and lead. If the subrecipient encounters and removes a contaminated medium, its remediation would serve as an additional long-term benefit to the school population. The removal of hazardous wastes would follow the applicable federal and local laws.

Upgrade of school chemistry laboratories, upgrades to current codes and standards, and the use of energy-efficient lightbulbs and equipment would result in long-term beneficial minor impacts. Repairing and renovating schools would not change the amount of hazardous waste generated during normal school activities; however, the handling of such wastes might improve.

FEMA anticipates that the use of new materials that are up to current codes and standards, properly trained and equipped personnel, PRDNER/PREQB licensed disposal facilities, and development of a spill prevention control and countermeasures plan would minimize short-term and long-term adverse impacts to human health and the environment to a level of minor. A minor long-term beneficial impact to the environment and human health would come from the removal of deteriorating building materials and removal and treatment of contaminated soil and groundwater.

Alternative 3: Relocation of Schools

FEMA anticipates Alternative 3 would have potential impacts to public health and the environment from use of hazardous materials or generation of hazardous wastes; however, proposed mitigation would be similar to that of Alternative 2 for the construction and post-construction phases. For SOW involving the abandonment of existing school buildings, this PEA's requirements that all abandoned structures be rendered safe and secure would prevent the release of hazardous substances potentially impacting human health and the environment resulting in minor short-term and long-term adverse direct impacts.

For SOW involving the relocation of schools to a new site, the subrecipient must conduct all-appropriate-inquiry investigation to determine if prior uses at the new site may present an environmental issue for the relocated school. If there is potential for environmental contamination at the new site from current or prior use, the subrecipient must furnish this information and coordinate with the community regarding cleanup of the contamination or choose another site that is not contaminated. If SOW includes consolidating schools into one facility, the subrecipient must conduct a similar investigation to determine potential for environmental contamination as it relates to use as a school. Siting of future schools would consider types of contaminants present, exposure pathways, and possible health effects to students, teachers, and staff before finalization. New schools would not be constructed on NPL sites. Alternative 3 would result in minor long-term direct beneficial impact to the environment and human health from the potential cleanup of contamination.

Relocating schools would not change the amount of hazardous waste generated during normal school activities; however, the handling of such wastes might improve.

Alternative 4: A Combination of Alternatives 2 and 3

Impacts to local school populations and the surrounding communities from the generation or discovery of hazardous materials under Alternative 4 would be similar to those described for Alternatives 2 and 3 for construction and post-construction activities.

5.15 Cumulative Impacts

In accordance with NEPA, this PEA considers the overall cumulative impacts of Alternative 4 and other actions that are related in terms of time or proximity. Cumulative impacts are incremental and when combined with past, present, and reasonably foreseeable actions can have individually minor but collectively significant actions over time.

In addition, the CWA, CAA, Section 106 of the NHPA, and Section 7 of the ESA require an evaluation of cumulative effects as the Alternatives apply to their respective resources.

5.15.1 On-going Federal Actions

The 2017 hurricanes and subsequent increases in seismic activity caused damages throughout Puerto Rico. Following these disasters, emergency teams put in place temporary repairs and since then federal, state, and local governments and private contractors have been conducting repairs within the Puerto Rico. Approximately ten federal agencies are completing projects across the island including repairs to buildings, utility infrastructure, transportation systems, and maritime facilities. For example, HUD issues funds through their Community Development Block Grant for Disaster Relief and Mitigation Programs. These funds are to implement projects which reduce further losses, mitigate disaster risks, and enhance or improve electrical power systems in Puerto Rico. In 2019, through private sector funding, ten schools in the mountainous region of Puerto Rico installed microgrids to provide power to the schools during grid outages. These energy projects contribute to overall fossil fuel emission reductions and air quality impacts. Figure 15 in Appendix B presents general areas of the ongoing federal actions in Puerto Rico.

5.15.2 Summary of Cumulative Impacts

Recently completed, ongoing, and planned projects would add impacts to the same resources as those covered under this PEA. In the short-term, adverse impacts from construction activities would include additional traffic and noise, increased air emissions, decreased water quality from increased erosion, decreases in available materials for rebuilding, increased production of hazardous wastes, reduced landfill space, increased local commerce, and increases in construction related jobs. In the long-term, projects could include adverse impacts to water, biological, air, and cultural resources as well as communities with EJ concerns; however, beneficial impacts to public services and utilities, land use, and water resources would occur.

FEMA anticipates action alternatives under this PEA would not result in major cumulative impacts when considered in combination with other recently completed, ongoing, and planned projects in Puerto Rico based upon the following. Projects under this PEA would include actions that involve repair, replacement, and relocation projects and their associated hazard mitigation measures that are similar in location, capacity, and density to the existing schools. FEMA anticipates the extended grant approval and impact review process for projects covered under this PEA or tiered from this PEA, would further minimize cumulative impacts to the environmental and socioeconomic resources and historic properties within the Puerto Rico. The process of implementing projects over an extended time would limit the overburdening of resources at any given time by the implementation of federally financed recovery projects.

- For circumstances where multiple projects are under construction within the same watershed and at the same time, a cumulative impact to resources such as geology, topography, soils, water quality, vegetation and wildlife could occur. Although adverse, FEMA anticipates that cumulative impacts from school recovery projects under this PEA would be short-term and negligible to moderate.

- Construction of multiple projects within the SFHA would result in an increase of new structures and impervious surfaces which could in turn result in an increase in upgradient flooding. However, EO 11988 directs federal agencies to avoid siting projects within a floodplain if there is a practicable alternative. If one is not available, then projects must minimize impacts and include resiliency measures to protect the structures within the floodplain. FEMA would not provide grant funding for new projects or project expansion within the floodway or the V-zone, so there would be no adverse cumulative impacts to those areas. Based on these minimization and protection requirements, the combined effects of concurrent construction projects would have long-term, minor adverse impacts on floodplains.
- The combined effects of concurrent construction projects would have a long-term adverse impact on air quality. Although each project would be temporary, the number of projects for completion would be continuous; therefore, the projects would result in long-term emissions of air pollutants, including fugitive dust, from construction equipment. The impacts are expected to be minor because these projects would be spread across the Puerto Rico and would occur over multiple years. There would be a long-term beneficial cumulative impact on air quality from the increased number of renewable energy projects and from the enhancement or improvement of electrical power systems across the Puerto Rico.
- The combined effects of concurrent construction projects would have a long-term beneficial impact on the resiliency of buildings and infrastructure across the Puerto Rico. Structures and infrastructure upgraded by the subrecipient would have additional resiliency measures and would better withstand future disasters.
- The combined effects of concurrent construction projects could have a long-term negligible to major adverse impact on historic properties, including archaeological resources. Concurrent construction project impacts would have no adverse effect to historic properties when repairs are carried out in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties 2017 (Secretary's Standards)* as outlined in the amended Programmatic Agreement. Demolition of historic properties would have a long-term major effect, reducing the number of historic properties representing the history and culture of the Puerto Rico. The amended Programmatic Agreement identifies particular mitigation measures to compensate for the demolition of historic properties. Documentation of the historic property before its demolition may reduce the impact to less than major. The BMP for known archaeological resources is avoidance. Avoidance would result in negligible impacts to archaeological resources. If archaeological resources cannot be avoided, the amended Programmatic Agreement outlines the process for data recovery and documentation. Data recovery of archaeological resources may reduce the impact to less than major, however data recovery by definition also adversely affects archaeological resources. For projects with no known archaeological resources, a survey of the project site prior to construction may be required to identify the likelihood of any potential resources and determine if additional studies are appropriate. In the event archaeological resources are discovered during construction, the discovery provisions in the amended Programmatic Agreement (Stipulation III.B) define the process to be followed. In order to prevent the

cumulative loss of Puerto Rico's historic school buildings due to demolition or the disposition as a result of relocation, FEMA will establish an internal process to track FEMA-funded projects for historic preK-12 public and PNP schools.

- The combined effects of concurrent construction projects could have long-term moderate cumulative impact on traffic delays and congestion, noise, and public services. The subrecipient will be responsible for coordinating project schedule with local agencies, public utility departments, and environmental permitting agencies.

The conservation measures and BMPs presented in Section 6.0 of this PEA would help minimize cumulative impacts to environmental and socioeconomic resources by maintaining compliance with applicable permit conditions.

6.0 PERMITS AND REQUIREMENTS

The subrecipient is responsible for obtaining all applicable federal, Puerto Rico, and local permits and other authorizations for project implementation prior to construction and must adhere to all permit conditions. Any substantive change to the approved SOW will require re-evaluation by FEMA for compliance with NEPA, the ESA, Section 106 of the NHPA, and other relevant laws and EOs. The subrecipient must also adhere to the following permit requirements during project implementation.

1. **Stormwater, Soils, and Erosion and Sediment Control:** Under EPA NPDES, any project disturbing equal to or greater than one acre in size requires an EPA Construction General Permit, an NPDES Permit, and a SWPPP. The permits and plan require BMPs which serve to protect soils, in addition to stormwater. The subrecipient is required to manage any piles of soil or debris, minimize steep slope disturbance, preserve native topsoil unless infeasible, and minimize soil compaction and erosion (EPA 2018). For each project, the subrecipient will implement the BMPs and guidelines recommended in the Puerto Rico Erosion and Sediment Control Handbook for Developing Areas (PREQB and USDA-NRCS 2005). The subrecipient will be responsible for obtaining all necessary permits such as an NPDES permit and implementing the associated erosion and sediment control plans (i.e., SWPPP).
2. **Clean Air Act:** The subrecipient is responsible for complying with all applicable EPA and PRDNER/PREQB requirements for fugitive dust suppression. The subrecipient will prepare a General Conformity applicability analysis for applicable projects satisfied by this PEA.
3. **Work Affecting Water:** For project that involves WOTUS, the subrecipient will be responsible for initiating the permitting process with the USACE and PRDNER. The subrecipient will be responsible for obtaining appropriate permits prior to the beginning of work, and implementing all requirements of the permits, including pre-construction notification. Staging areas and access roads must be located outside the jurisdictional boundaries of WOTUS.

4. **Floodplains:** For FEMA funded actions that may affect or are within a floodplain, under requirements established under 44 CFR § 60.3 and 44 CFR § 9.11, the subrecipient will ensure the project is in compliance with the local PRPB floodplain administrator and follow appropriate mitigation requirements for new construction or substantial improvement.
5. **Endangered Species Act:** Projects will comply with and implement the ESA conditions found in applicable FEMA programmatic consultations or those conditions from a project-specific consultation.
6. **Invasive Species:** EO 13112, *Invasive Species*, directs federal agencies to prevent the introduction of invasive species, providing resources for their control, and decreases the economic, ecological, and human health impacts caused by their presence. The subrecipient 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. **Historic Properties:** FEMA will review all SOWs to determine compliance with Section 106 of the NHPA. FEMA will follow the compliance process defined in the amended *Programmatic Agreement Among the Federal Emergency Management Agency, the Puerto Rico State Historic Preservation Officer, and the Puerto Rico Central Office for Recovery, Reconstruction and Resiliency* and any project-specific programmatic agreement that may be executed for the undertaking (action). The subrecipient will be responsible for coordination with the Puerto Rico Institute of Culture for compliance with historic preservation and archaeological requirements. In the event an unexpected discovery of archaeological materials or human remains or if it appears that the undertaking (action) has affected a previously unidentified historic property or a known property in an unanticipated manner, the subrecipient must stop work and contact FEMA. FEMA, in coordination with SHPO, will evaluate the discovery in accordance with any similar stipulation included in the amended programmatic agreement if one is executed for the undertaking (action).
8. **Communities with EJ Concerns:** In accordance with EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, the subrecipient will be responsible for engaging the public in local communities impacted by restoration or relocation of schools. The subrecipient will facilitate and encourage public participation in determining and minimizing potential impacts within communities with EJ concerns.
9. **Construction Material and Debris:** The subrecipient is responsible for obtaining any permits associated with the transportation and handling of construction material and debris. The subrecipient will identify, handle, transport, and dispose of hazardous materials and/or toxic waste in accordance with EPA and PRDNER/PREQB requirements. The subrecipient is responsible for determining the presence of asbestos or lead containing materials and obtaining applicable permits before beginning work. The subrecipient is responsible for ensuring that non-recyclable debris generated from restoration and demolition activities be deposited at a PRDNER/PREQB permitted landfill.

10. **Utility Clearance:** For all ground disturbing activities, the recipient is responsible for locating utilities. OSHA mandates that if a utility provider cannot respond to a request to locate underground utility installations or cannot establish the exact location of these installations, the contractor may proceed provided they use detection equipment or other acceptable means to locate utility installations.

11. **Tree Cutting:** The subrecipient is responsible for complying with applicable PRDNER /PREQB of Puerto Rico requirements for planting, pruning, and trimming.

7.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

This PEA is available for agency and public review and comment for a period of 30 calendar days. The public information process will include a public notice in both English and Spanish with information about the proposed action in the *Primer Hora* and *El Nuevo Dia* newspapers. Additionally, FEMA targeted outreach to PRDE's 7 local regions to request that each posts the public notice to their public facing website and posts a physical copy of the PEA in a public building. A Spanish translation of the PEA, Executive Summary, and Public Notice will also be posted on FEMA's and COR3's websites.

The draft PEA is available for download at the following websites:

- FEMA: <https://www.fema.gov/emergency-managers/practitioners/environmental-historic/nepa-repository>
- COR3: <https://recovery.pr/es/document-library>

The website link for the Draft EA will also be posted on the following Facebook page:

- FEMA: <https://www.facebook.com/FEMAPuertoRico/>

A hard copy of the PEA will be available for review at the following Department of Education Regional Offices:

- *Central Office, 150 Federico Costa Street, Urb. Tres Monjitas, Bo. Hato Rey, San Juan, PR 00917*
- *Arecibo Regional Office, Government Center, 372 Jose A Cedeño Ave., Ste. 210B, Arecibo, PR 00612*
- *Bayamon Regional Office, PR-2 Km 15.0, Bo. Hato Tejas 1, Bayamón, PR 00956*
- *Caguas Regional Office, Government Center, Doctor Goyco St., Acosta corner, Bo. Pueblo, Caguas, PR 00726*
- *Humacao Regional Office, Government Center, Tower 2, Nicanor Vazquez Torres Avenue, Humacao, PR 00791*

- *Mayaguez Regional Office, Government Center, 3rd Floor, Office 301, Mayagüez, PR 00681*
- *Ponce Regional Office, Government Center, 4820 Las Americas Avenue, Ponce, PR 00732-7477*
- *San Juan Regional Office, 602 Barbosa Ave., Guayama Street corner, Barreras Building, 3rd Floor, San Juan, PR 00917*

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

Municipalities

- *Municipality of Aibonito, Planning and Permits Office, Degetau St. Annex #56, Aibonito, PR*
- *Municipality of Caguas, William Miranda Marín City Hall, Environmental Affairs Office, Second floor, Padial St. Corner of Jose Mercado Ave., Caguas, PR*
- *Municipality of Carolina, Mayor's Office, Planning Department, 2nd Floor, Manuel Fernandez Juncos Ave., Carolina, PR*
- *Municipality of Luquillo, Mayor's Office, 14 de Julio St. #154, Luquillo, PR*
- *Municipality of Toa Baja, Department of Planning, Infrastructure and Economic Development, Llanero Sports Complex, José de Diego St., Levittown, Toa Baja, PR*
- *Municipality of Vieques, Mayor's Office, Lebrum St. #449, Vieques, PR*

State Agencies

- *Institute of Puerto Rican Culture (ICP) (Headquarters), Former Asilo de Beneficencia, 1st Floor, Beneficencia St. Corner of Dr. Francisco Rufino, San Juan, PR*
- *Institute of Puerto Rican Culture (ICP) at Mayaguez, Urrutia Residence, West #60 Ramos Antonini, St. Corner of Pilar Defilló, Mayaguez, PR*
- *Institute of Puerto Rican Culture (ICP) at Ponce, Puerto Rican Music Museum, Serrallés Residence #42, Isabel St. 50, Ponce, PR*

Interested parties may request an electronic copy of the PEA by emailing FEMA at 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 any decisions. The public is invited to submit written comments by emailing FEMA-EHP-DR4339@FEMA.DHS.GOV or via mail to:

U.S. Department of Homeland Security
Federal Emergency Management Agency Region 2

Puerto Rico Caribbean Area Office –Joint Recovery Office
50 State Road num. 165, Suite 3
Guaynabo, PR 00968-8024
Attn: Puerto Rico School Infrastructure 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 in the FONSI or, revise and issue a Final PEA for further comment.

8.0 LIST OF PREPARERS

FEMA Region 2

Puerto Rico Recovery Office Environmental Planning and Historic Preservation Environmental
Assessment Writing Team

9.0 SUMMARY OF IMPACTS

Resource Section	Alternative 1: No Action	Alternative 2: Restoration with Resiliency Measures	Alternative 3: Relocation of Facility Operations	Alternative 4: Combination
Section 5.1	Geology: Negligible to minor short-term and long-term impacts Soil Resources: Negligible to minor short-term and long-term impacts Seismicity: No impact FPPA: No impact	Geology: Temporary minor adverse impacts Soil Resources: Adverse short-term minor impacts; adverse long-term negligible to minor impacts Seismicity: No impact FPPA: No impact	Geology: Temporary minor adverse impact Soil Resources: Temporary and long-term minor adverse impact Seismicity: Beneficial long-term negligible adverse impacts FPPA: Long-term moderate adverse impact	Geology: Impacts similar to Alternatives 2 and 3 Soil Resources: Impacts similar to Alternatives 2 and 3 Seismicity: Impacts similar to Alternatives 2 and 3 FPPA: Impacts similar to Alternatives 2 and 3
Section 5.2	Air Quality: No direct impact; Minor indirect adverse long-term impact	Air Quality: Minor temporary adverse impact; No long-term adverse impact Beneficial Impact: Beneficial negligible to minor long-term	Air Quality: Minor adverse temporary and long-term impact; Beneficial Impact: Beneficial negligible to minor long-term	Air Quality: Impacts similar to Alternatives 2 and 3
Section 5.3	Water Quality/Water Resources: Negligible to minor short-term and long-term adverse impacts	Water Quality/Water Resources: Short-term minor and long-term negligible adverse impacts Beneficial Impact: Long-term minor beneficial	Water Quality/Water Resources: Short-term minor adverse impact; Long-term negligible to minor adverse impact Beneficial Impact: Long-term minor beneficial	Water Quality/Water Resources: Impacts similar to Alternatives 2 and 3
Section 5.4	Wetlands: Long-term negligible to minor adverse impact	Wetlands: Indirect adverse negligible to minor short-term and long-term impacts Beneficial Impact: Long-term minor beneficial	Wetlands: Indirect adverse negligible to minor short-term and long-term impacts Beneficial Impact: Long-term minor beneficial	Wetlands: Impacts similar to Alternatives 2 and 3
Section 5.5	Floodplains: Adverse moderate short-term and long-term direct impacts	Floodplains: Temporary minor indirect adverse impact; Long-term minor adverse direct impact Beneficial Impact: Beneficial negligible, minor, and moderate long-term	Floodplains: Temporary minor indirect adverse impact; Long-term minor adverse direct impact Beneficial Impact: Beneficial negligible, minor, and major long-term	Floodplains: Impacts similar to Alternatives 2 and 3
Section 5.6	Coastal Resources: No impacts to CBRA; Adverse short-term and long-term negligible to minor indirect and direct impacts to coastal zone	Coastal Resources: No impacts to CBRA; Long-term negligible to minor adverse direct impact; Adverse temporary negligible to minor indirect impact Beneficial Impact: Beneficial negligible to minor long-term	Coastal Resources: No impacts to CBRA; Long-term minor to moderate adverse direct impacts; Short-term and long-term negligible to minor adverse direct impacts; Adverse short-term negligible to minor indirect impact Beneficial Impact: Beneficial negligible, minor, and moderate long-term	Coastal Resources: Impacts similar to Alternatives 2 and 3
Section 5.7	Threatened and Endangered Species: Long-term adverse minor indirect impacts	Threatened and Endangered Species: Long-term adverse negligible direct and indirect impacts DCH: No adverse impacts	Threatened and Endangered Species: Temporary and long-term adverse negligible to minor direct and indirect impacts DCH: Adverse minor short-term or long-term impact	Threatened and Endangered Species: Impacts similar to Alternatives 2 and 3
Section 5.8.1	Cultural Resources (Historic Structures): Long-term negligible to major impacts	Cultural Resources (Historic Structures): Short-term negligible to major impacts and long-term moderate to major impacts. Treatment measures would reduce major impact to moderate and moderate to minor.	Cultural Resources (Historic Structures): Short-term negligible to major impacts and long-term minor to major impacts. Treatment measures would reduce major impact to moderate and moderate to minor.	Cultural Resources (Historic Structures): Short-term negligible to major impacts and long-term negligible to major adverse impacts. Treatment measures would reduce the major impact to moderate and moderate to minor.
Section 5.8.2	Cultural Resources (Archaeological): No impacts	Cultural Resources (Archaeological): Short- and long-term negligible to minor impacts.	Cultural Resources (Archaeological): Short- and long-term negligible to major impacts. Treatment measures would reduce the major impact to moderate and moderate to minor.	Cultural Resources (Archaeological): Short-term negligible to minor and long-term impacts negligible to major. Treatment measures would reduce the major impact to moderate.

Resource Section	Alternative 1: No Action	Alternative 2: Restoration with Resiliency Measures	Alternative 3: Relocation of Facility Operations	Alternative 4: Combination
Section 5.9	Socioeconomics and Environmental Justice: Indirect minor long-term adverse impact	Socioeconomics and Environmental Justice: Temporary adverse minor indirect impacts Beneficial Impact: Short-term beneficial negligible indirect impact; Long-term beneficial minor to moderate indirect impact	Socioeconomics and Environmental Justice: Temporary and long-term adverse minor to moderate direct and indirect impacts Beneficial Impact: Beneficial long-term minor to moderate indirect impact	Socioeconomics and Environmental Justice: Impacts similar to Alternatives 2 and 3
Section 5.10	Land Use and Planning: Long-term moderate adverse indirect impact	Land Use and Planning: No short-term or long-term adverse impact	Land Use and Planning: Temporary short-term, and long-term adverse negligible to minor impacts.	Land Use and Planning: Impacts similar to Alternatives 2 and 3
Section 5.11	Noise: No adverse impact	Noise: Temporary minor to moderate adverse direct impacts; negligible to minor direct adverse impacts	Noise: Temporary minor to moderate adverse direct impacts similar to but greater than Alternative 2; minor to moderate long-term adverse direct impacts,	Noise: Impacts similar to Alternatives 2 and 3
Section 5.12	Transportation: No adverse impact	Transportation: temporary minor adverse direct impacts; minor long-term adverse direct impact	Transportation: Temporary, short-term, and long-term minor adverse direct impacts	Transportation: Impacts similar to Alternatives 2 and 3
Section 5.13	Public Services and Utilities: Long-term minor adverse indirect impact	Public Services and Utilities: temporary minor direct adverse impacts Beneficial Impact: Long-term minor indirect from more resilient utilities	Public Services and Utilities: temporary to short-term minor to moderate adverse impacts Beneficial Impact: Long-term minor indirect from more resilient utilities	Public Services and Utilities: Impacts similar to Alternatives 2 and 3
Section 5.14	Hazardous Materials: Negligible to minor adverse short-term and long-term indirect	Hazardous Materials: Short-term and long-term minor adverse direct impacts Beneficial Impact: Short-term and long-term minor indirect impacts	Hazardous Materials: Minor short-term and long-term adverse direct impacts Beneficial Impact: Long-term minor direct impact	Hazardous Materials: Impacts similar to Alternatives 2 and 3

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APPENDIX A

Conditions for Tiering

Projects that exceed the thresholds of this PEA may result in the need for a project-specific tiered EA. These thresholds include:

- expansion of location, capacity, and density up to 20%, or
- ground disturbance up to five acres in urban areas, or
- ground disturbance up to two acres in rural areas.

In addition, projects that have impacts greater than considered in this PEA may result in the need for a project-specific tiered EA. The following table presents conditions under which FEMA may tier an EA from this PEA.

Area of Resource Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Geology, Topography, and Soils	<ul style="list-style-type: none">• The proposed action SOW would have no, negligible, or minor impacts to geology, topography, and soils; and• The proposed action leads to moderate impacts that are mitigated by regulatory permit conditions and resource agency consultations to reduce the impacts below the level of major; and• The proposed action is consistent with FPPA and NRCS policies.	<ul style="list-style-type: none">• The proposed action results in major impacts to geology, topography, or soils that cannot be mitigated; or• The proposed action includes work that exceeds the thresholds established in this PEA; or• FPPA consultation indicates the proposed action may cause major impacts to prime and unique farmland.

Area of Resource Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Air Quality	<ul style="list-style-type: none"> • Air level emissions for parameters identified under the NAAQS from the proposed action in nonattainment and maintenance areas would be below de minimis levels, and • Emissions in attainment areas would not cause air quality to elevate above attainment for any NAAQS criteria pollutant; and • Mitigation measures are used to reduce the level of impacts below the level of major; and • The proposed action would limit impacts to indoor air quality impacts to no, negligible, or minor through the implementation of building materials which are to current codes and standards. 	<ul style="list-style-type: none"> • The levels for NAAQS criteria pollutants from the proposed action would be greater than the established exceedance levels for nonattainment and maintenance areas; or • Emissions in attainment areas would cause an area to be out of attainment for any NAAQS criteria pollutant after a conformity determination; or • Impacts to indoor air quality attain the level of major following project completion.

Area of Resource Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Water Quality/Water Resources	<ul style="list-style-type: none"> • The proposed action SOW would have no, negligible, or minor impacts to water resources and would not negatively impact water quality standards or criteria. Minor localized alterations in water quality and hydrologic conditions relative to historical baseline may occur; and • The proposed action would result in moderate impacts that can be mitigated by regulatory permit conditions and resource agency consultations to reduce the impacts below the level of major; and • The proposed action would not require an individual permit from USACE; and • The proposed action complies with all permit conditions, notifications, and reporting requirements for applicable USACE-issued general permits; and • The proposed action, one acre or greater, requires and complies with a NPDES and SWPPP; and • The proposed action would not negatively impact nearby designated Wild and Scenic Rivers. 	<ul style="list-style-type: none"> • The proposed action SOW would cause or contribute to existing or new exceedances of water quality standards on either a short-term or prolonged basis that are not able to be mitigated under CWA permits; or • The proposed action requires an individual permit from USACE; or • The action negatively impacts nearby designated Wild and Scenic Rivers.
Wetlands	<ul style="list-style-type: none"> • The proposed action SOW is not located in or does not adversely impact wetlands following an 8-Step Decision Making Process; and • All federal and Puerto Rico permits that authorize actions involving wetlands would be obtained by the recipient; and • The recipient complies with all permit conditions including compensatory mitigation. 	<ul style="list-style-type: none"> • The proposed action is located in wetlands, and following an 8-Step Decision Making Process, would adversely impact wetlands that cannot be mitigated; or • The proposed action requires an individual permit from USACE because of impacts to a wetland; or • The proposed action would result in adverse impacts to the wetlands, conveyance, and duration that increase flood risk at locations upstream, downstream, or adjacent to the project site.

Area of Resource Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Floodplains	<ul style="list-style-type: none"> • The proposed action is not located in or does not adversely impact floodplains; and • The recipient has complied with conditions associated with all state, federal, and local permits, regulations, and authorizations, including CWA and state and local floodplain codes; and • The recipient conducted an H&H analysis to determine the proposed action would not increase levels, frequency or duration of floods and would not alter hydrological connectivity and function; and • The completed 8-Step Decision Making Process which determined the proposed action is the only practicable alternative with the least impact. 	<ul style="list-style-type: none"> • The individual 8-Step Decision Making Process depicts adverse impacts to the floodplain, including a decrease hydrological connectivity and function from action implementation; or • The proposed action would result in adverse impacts to the floodplain, including an increase in flood levels, significant changes to flood frequency, conveyance and duration that increase flood risk at locations upstream, downstream or adjacent to the project site.
Coastal Resources	<ul style="list-style-type: none"> • The proposed action in a coastal zone has received a CZMA Federal Consistency Certification from PRPB or has complied with permits issued, and the proposed action would have no, negligible or minor impacts to coastal resources; and • The proposed action is located within a CBRS and FEMA receives concurrence from USFWS that it qualifies as an exception under Section 6 of CBRA and is consistent with CBRA; and • The proposed action results in adverse impacts to coastal zones following mitigation by regulatory permit conditions and resource agency consultations to reduce the impacts below the level of major. 	<ul style="list-style-type: none"> • The proposed action is located within the CBRS and not exempt under CBRA; or • The proposed action is not covered by the CZMA Federal Consistency Certification from PRPB; or • The proposed action is located within a CBRS and USFWS does not concur that it qualifies as an exception under Section 3505.a.6 of the CBRA; or • The proposed action includes new construction within a V-Zone or Coastal High Hazard area.

Area of Resource Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Threatened and Endangered Species	<ul style="list-style-type: none"> • The proposed action would not adversely impact ESA listed species or DCH; and • The proposed action results in potential negligible or minor impacts with mitigation through resource agency consultations. FEMA makes a “May affect, but Not Likely to Adversely Affect” determination and USFWS concurs. 	<ul style="list-style-type: none"> • Any proposed actions, following consultation, that would create a level of impact beyond “not likely to adversely affect” ESA listed species or DCH; or • Any proposed action that results in the loss or adverse modification of DCH for an ESA listed species.
Cultural Resources (Structural and Archaeological)	<ul style="list-style-type: none"> • The proposed action impacts can be resolved through the compliance strategy laid out in the Programmatic Agreement, as amended, and project-specific programmatic agreement executed pursuant to Stipulation II.C.6.c of the amended Programmatic Agreement. In both cases, impacts may be resolved through application of programmatic allowances or consultation with SHPO, COR3, the subrecipient, and any other identified consulting parties. 	<ul style="list-style-type: none"> • FEMA makes an “Adverse Effect” determination in consultation with SHPO that cannot be resolved with the SHPO, COR3, the subrecipient, and other identified consulting parties through Stipulation II.C.6.a (Abbreviated Consultation Process) or Stipulation II.C.6.b (Memorandum of Agreement) of the amended Programmatic Agreement or through a Resolution of Adverse Effects process identified in a project-specific programmatic agreement. • Abandonment of a historic property may require a tiered EA analysis from this PEA if the structure cannot be rendered safe and secure.
Socioeconomic and Environmental Justice	<ul style="list-style-type: none"> • Impacts of the project actions would not disproportionately affect minority, low-income communities, or populations and communities relying on the facilities; and • Mitigation measures and project reviews would reduce the level of impacts to minor or lower. 	<ul style="list-style-type: none"> • There would be unmitigated disproportionately high and adverse, disproportionate, environmental and health impacts to low-income or minority populations.
Land Use and Planning	<ul style="list-style-type: none"> • Projects are in alignment with current comprehensive land use plans and implementation plans for school facility actions. 	<ul style="list-style-type: none"> • The proposed action would not be consistent with the surrounding land use and the local land use agency requires a special land use permit or waiver to facilitate project completion.

Area of Resource Evaluation	Action Covered by this PEA	Tiered Site-Specific Environmental Assessment Required
Noise	<ul style="list-style-type: none"> • Temporary construction related noise would not increase above established noise threshold levels following mitigation measures; and • Projects with mitigation measures would not adversely impact sensitive receptors; and • Projects with post-construction noise levels at or below baseline conditions. 	<ul style="list-style-type: none"> • Projects exceeding established noise threshold levels would require a noise permit from PRDNER/PREQB that allows for work to occur during non-waking hours; or • Projects that would result in post-construction noise impacts above baseline conditions; or • Projects that would adversely impact sensitive receptors and cannot be mitigated.
Transportation	<ul style="list-style-type: none"> • The proposed action would cause minor adverse impacts from construction-related delays, reroutes, congestion, transit and commuter times, vehicular traffic conditions, danger to pedestrians, and reductions in commerce; and • Following mitigation, actions would negligible or minor adverse impacts. 	<ul style="list-style-type: none"> • The proposed action may have a permanent adverse impact on vehicle traffic congestion, emergency routes, and commerce; or • A proposed action isolates a community, or portion of a community, through road closures on a short- or long-term basis.
Public Services and Utilities	<ul style="list-style-type: none"> • Projects not resulting in adverse impacts to sensitive receptors from a disruption in public services; and • Mitigation by the recipient to project actions including public services would limit impacts to a minor level. 	<ul style="list-style-type: none"> • The proposed action would require the relocation of utilities into environmentally sensitive areas where impacts cannot be mitigated below the level of major; or • Disruption in utility services that would adversely impact sensitive receptors that cannot be mitigated.
Hazardous Materials	<ul style="list-style-type: none"> • To keep impacts negligible or minor less than major, any hazardous materials exposed, generated, or used during construction would be handled and disposed of in accordance with applicable federal, state, and local regulations. 	<ul style="list-style-type: none"> • Projects within an area designated by EPA as a superfund site on the National Priorities List; or • Projects on a site with extensive and un-remediated contamination.

APPENDIX B

Figures (Maps)

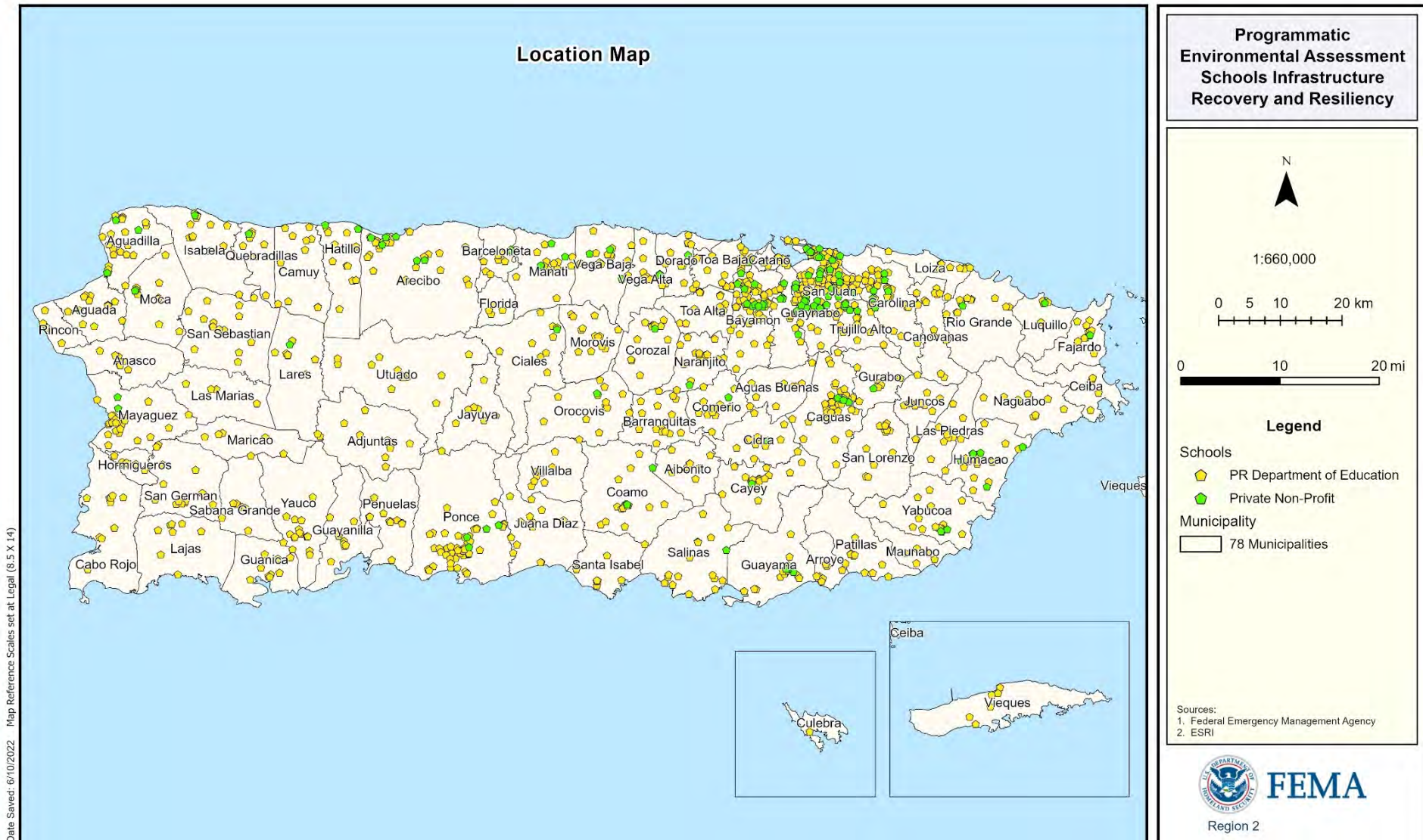


Figure 1: Location Map

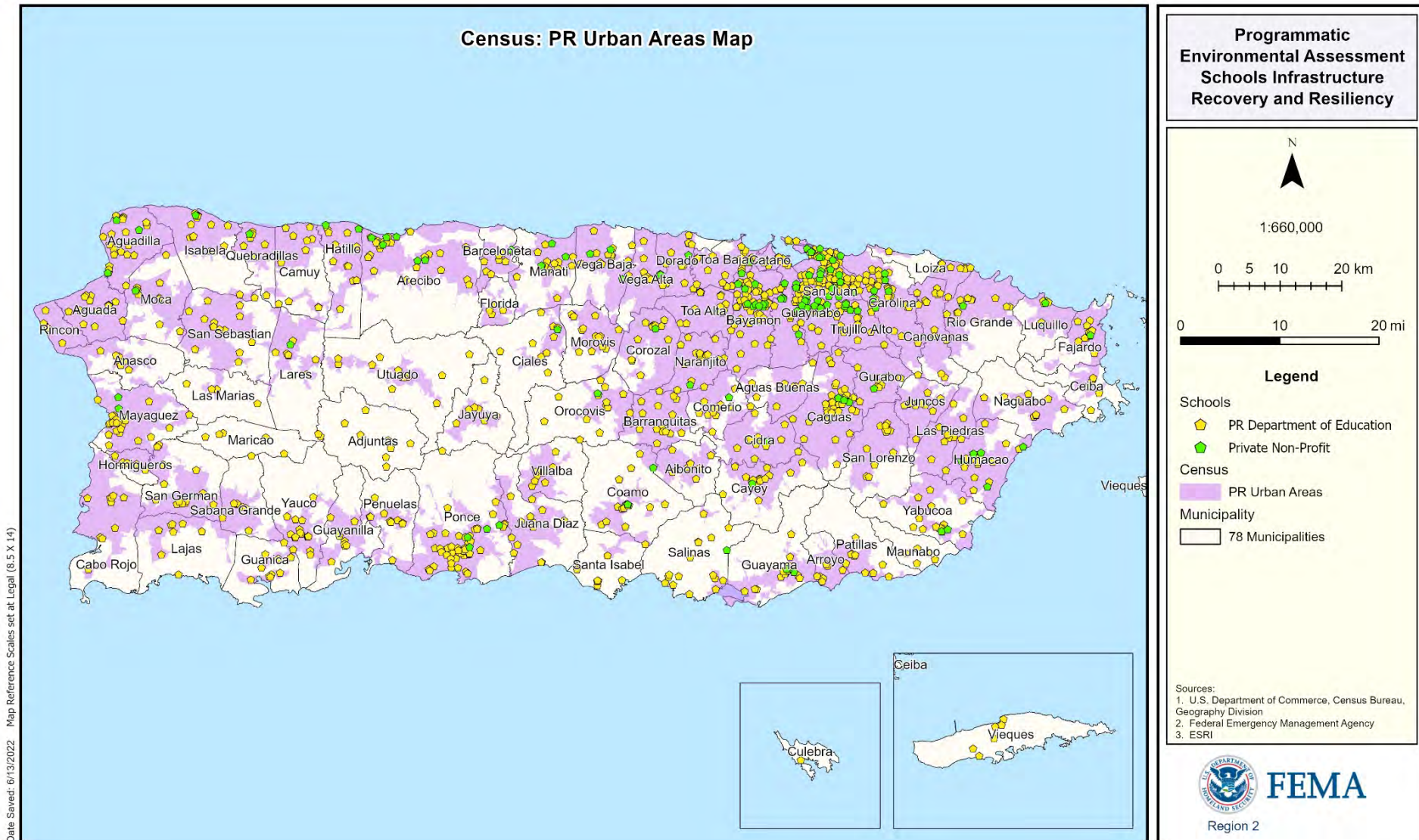


Figure 2: U.S. Census Bureau – Urban Areas

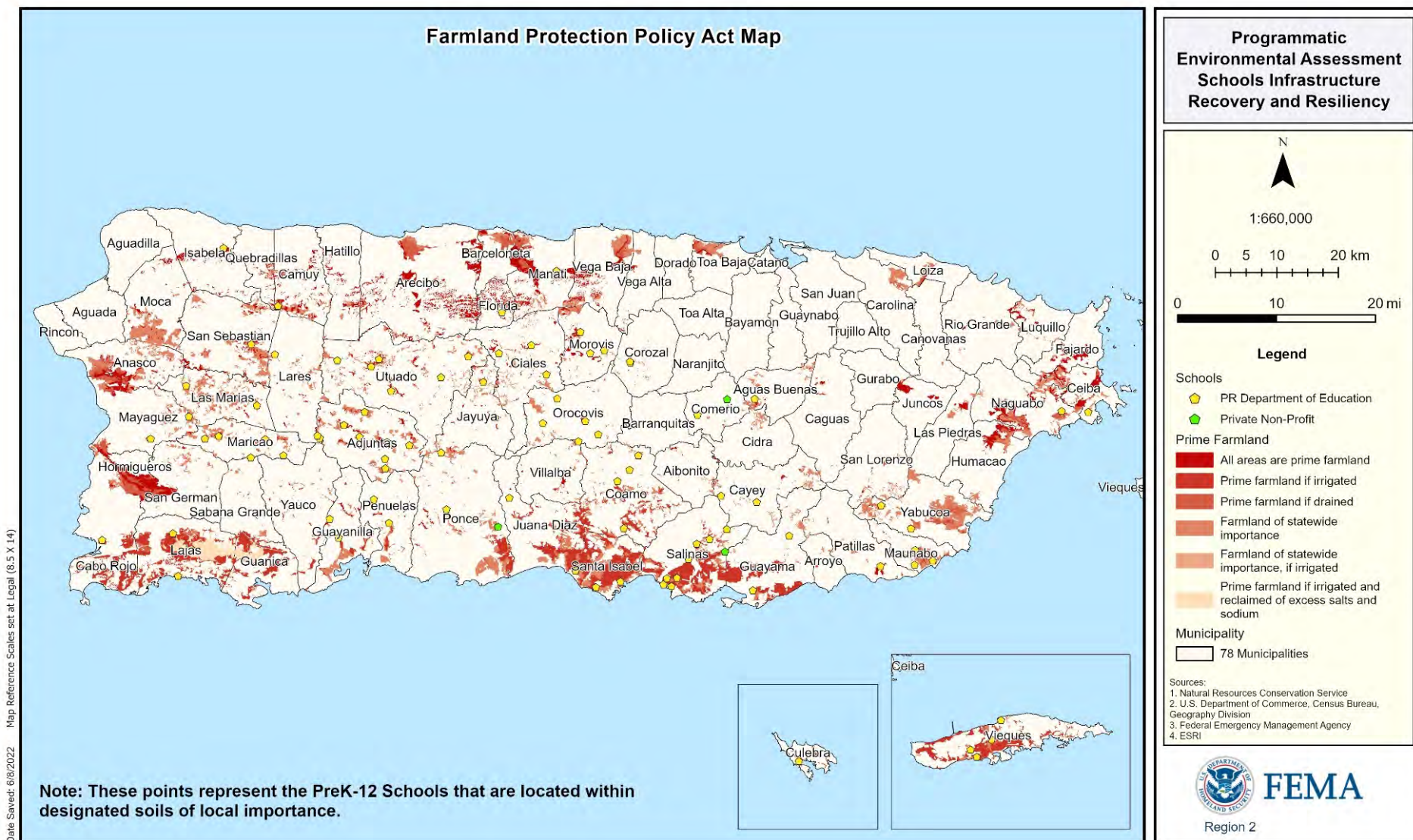


Figure 3: Farmland Protection Policy Act

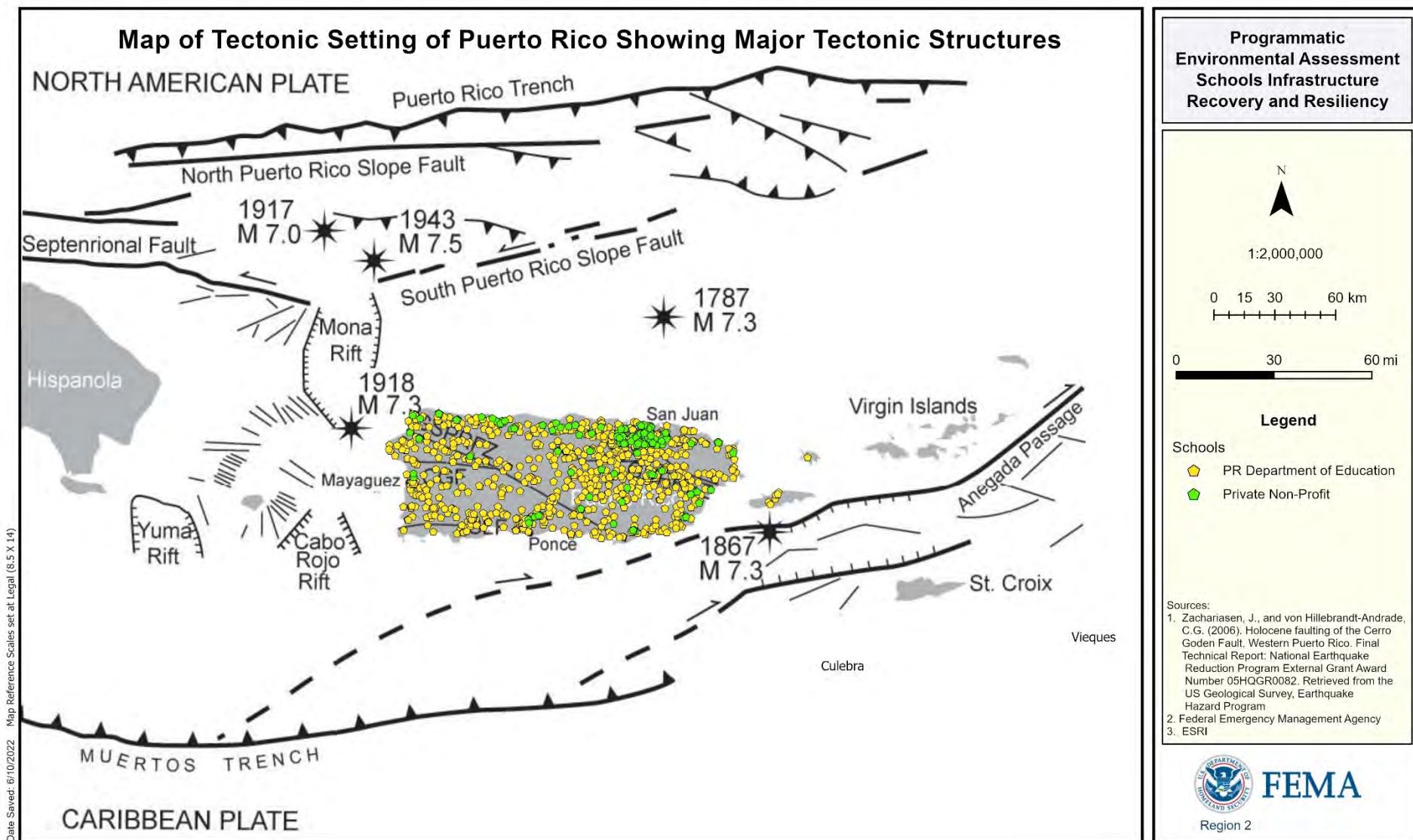


Figure 4: Illustration of Regional Fault Lines and Geophysical Formations

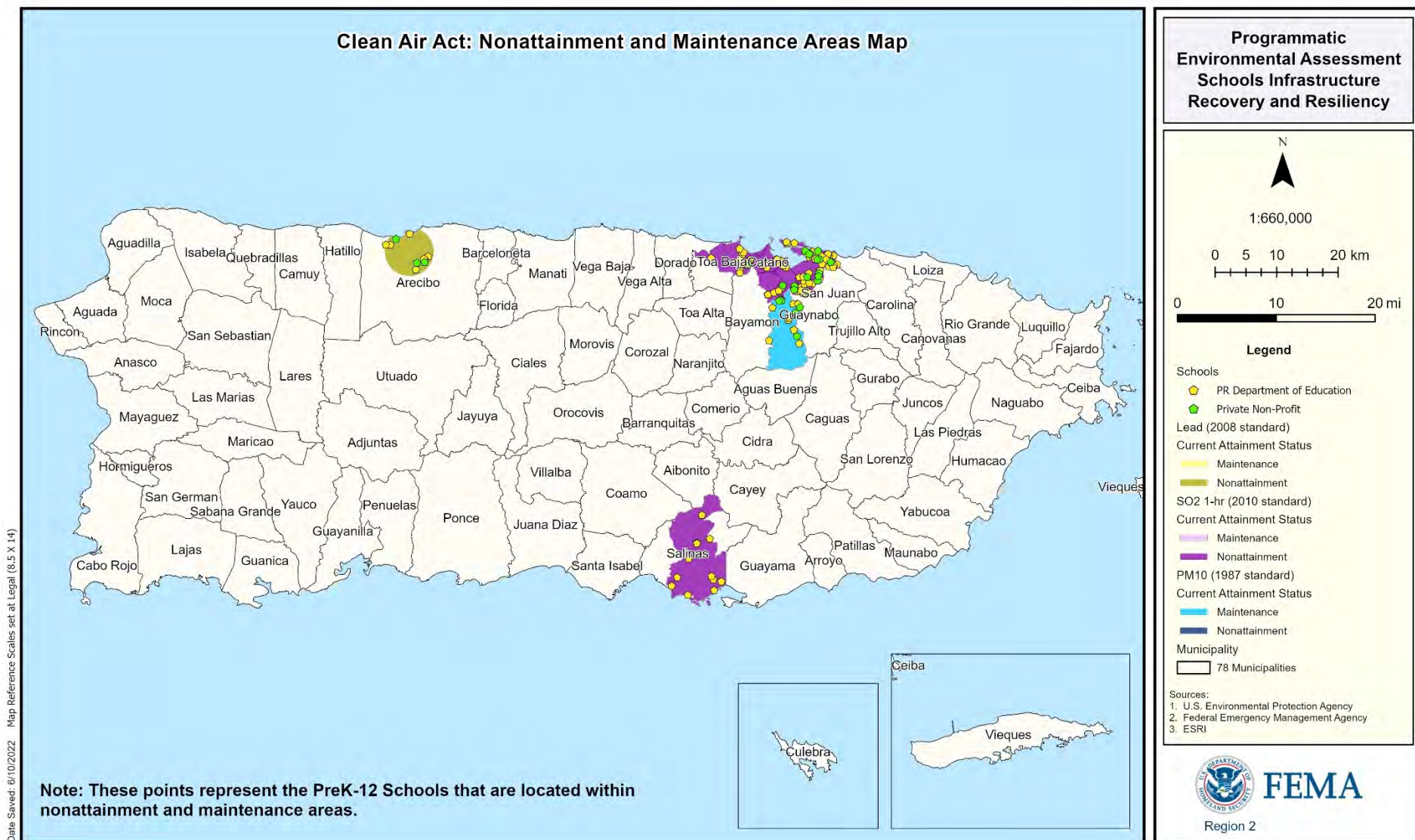


Figure 5: Clean Air Act: Nonattainment and Maintenance Areas in Puerto Rico

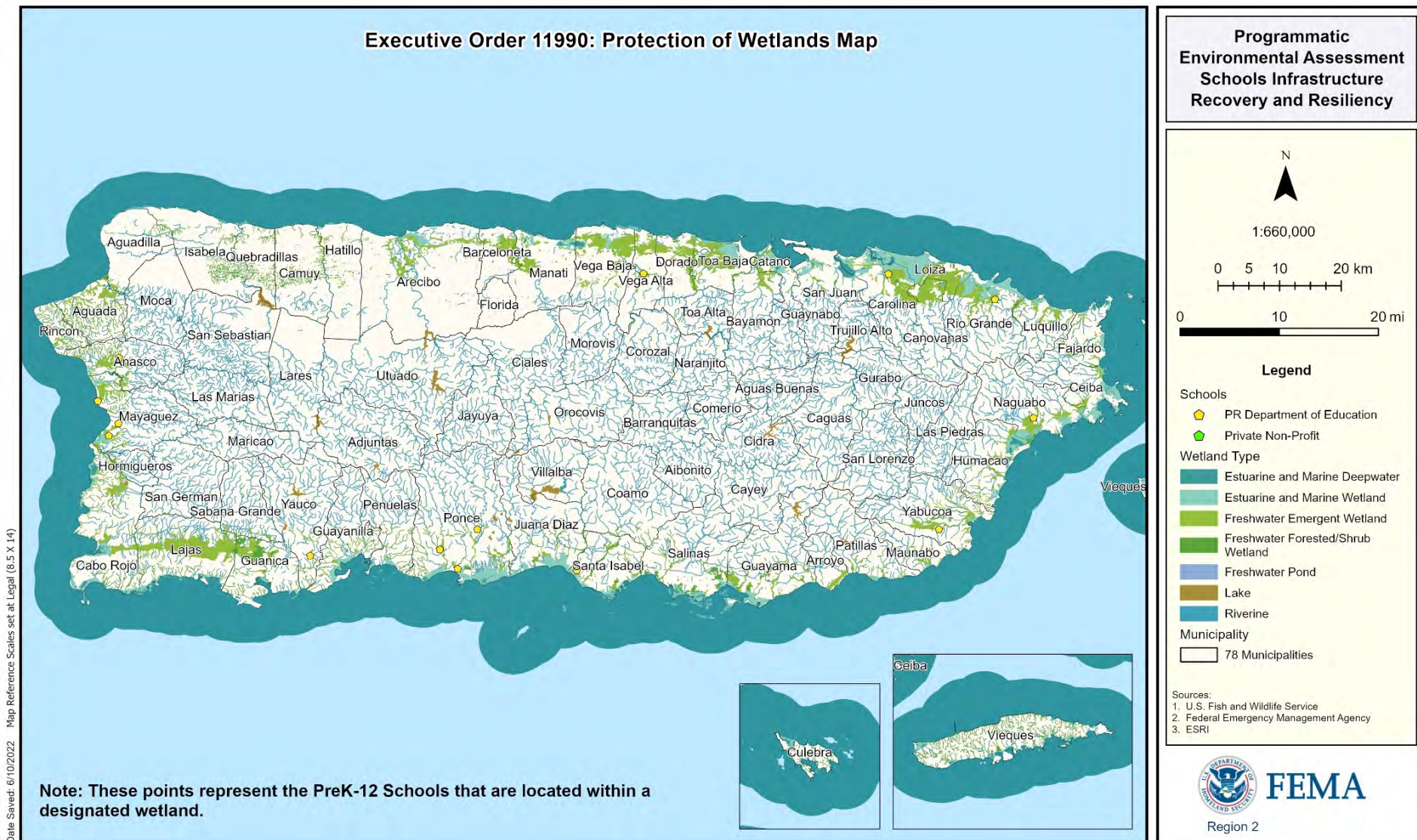


Figure 6: U.S. Fish and Wildlife National Wetlands Inventory



Figure 7: Advisory Base Flood Elevations

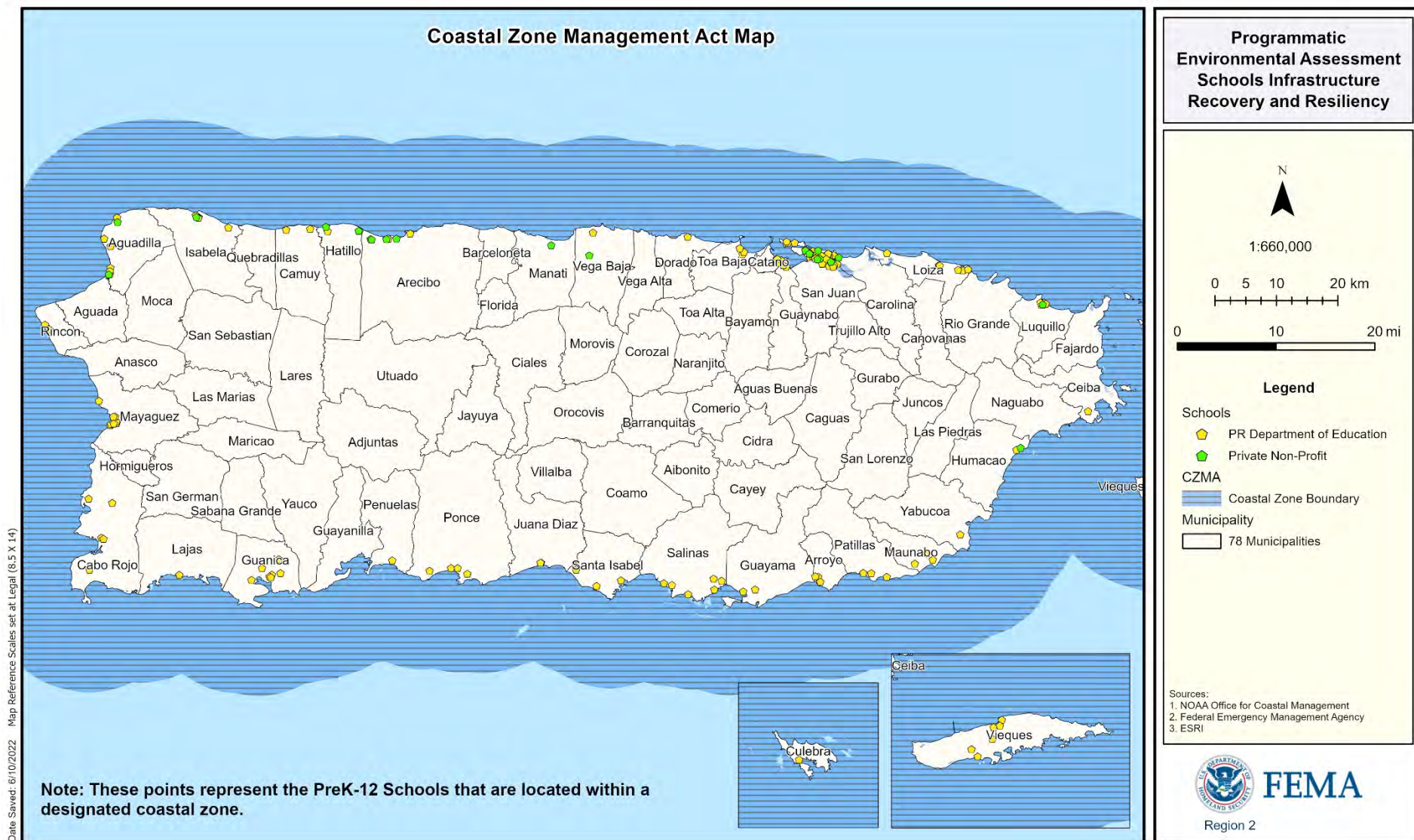


Figure 8: Coastal Zone Management Act

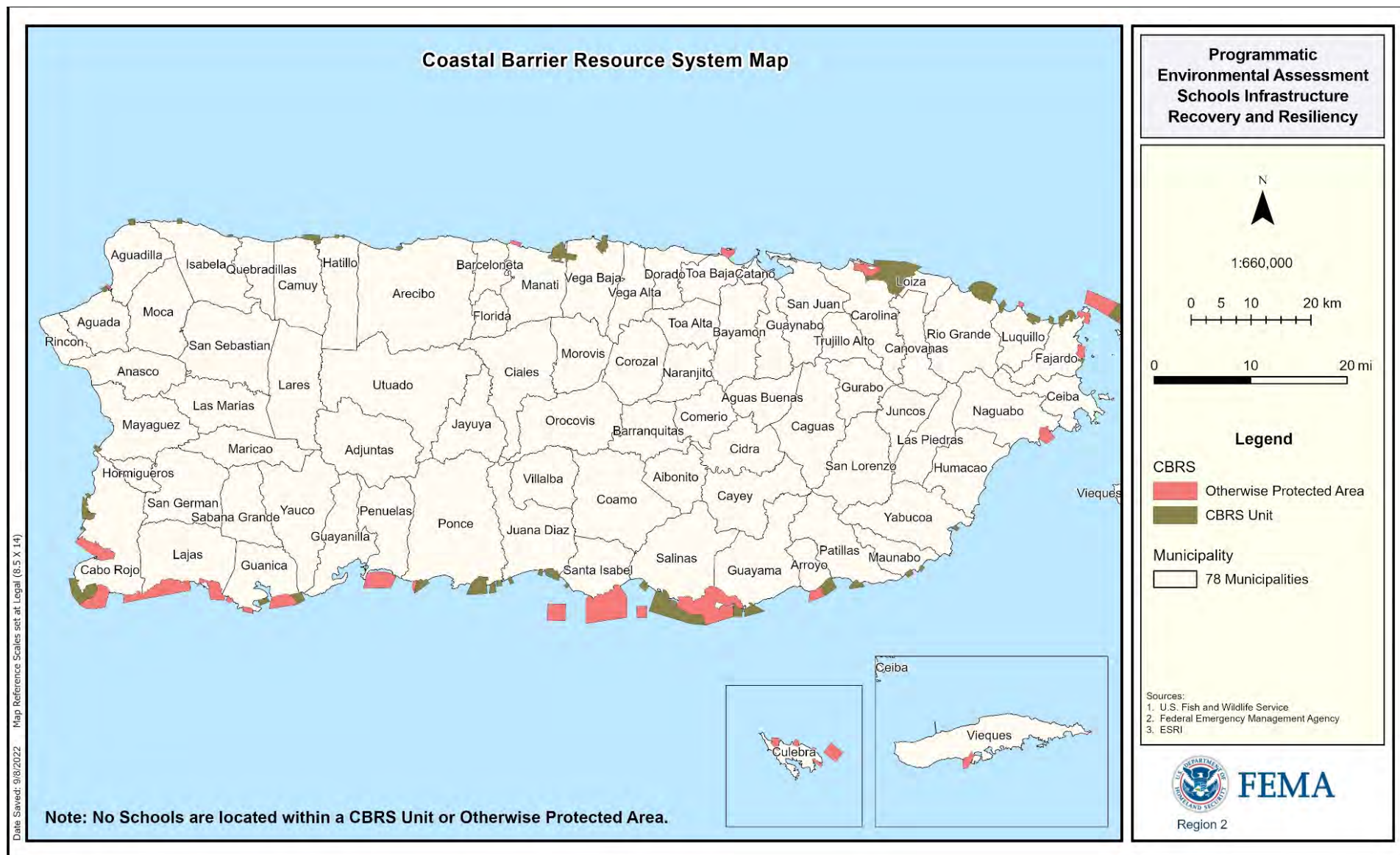


Figure 9: Coastal Barrier Resource System



Figure 10: Endangered Species Act: Designated Critical Habitat

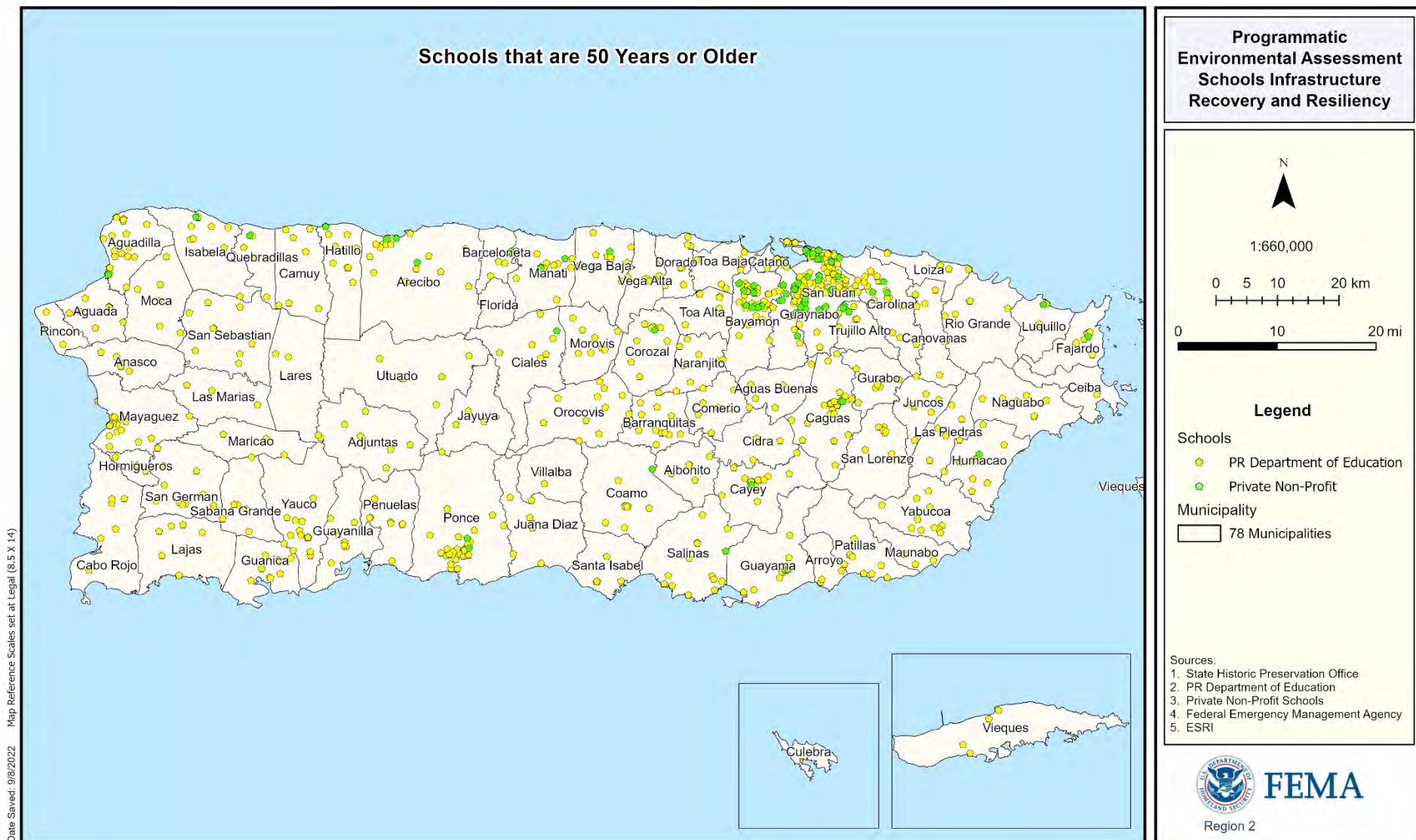


Figure 11: Schools 50 Years of Age or Older



Figure 12: National Historic Preservation Act: Individually Listed Sites and Historic Districts

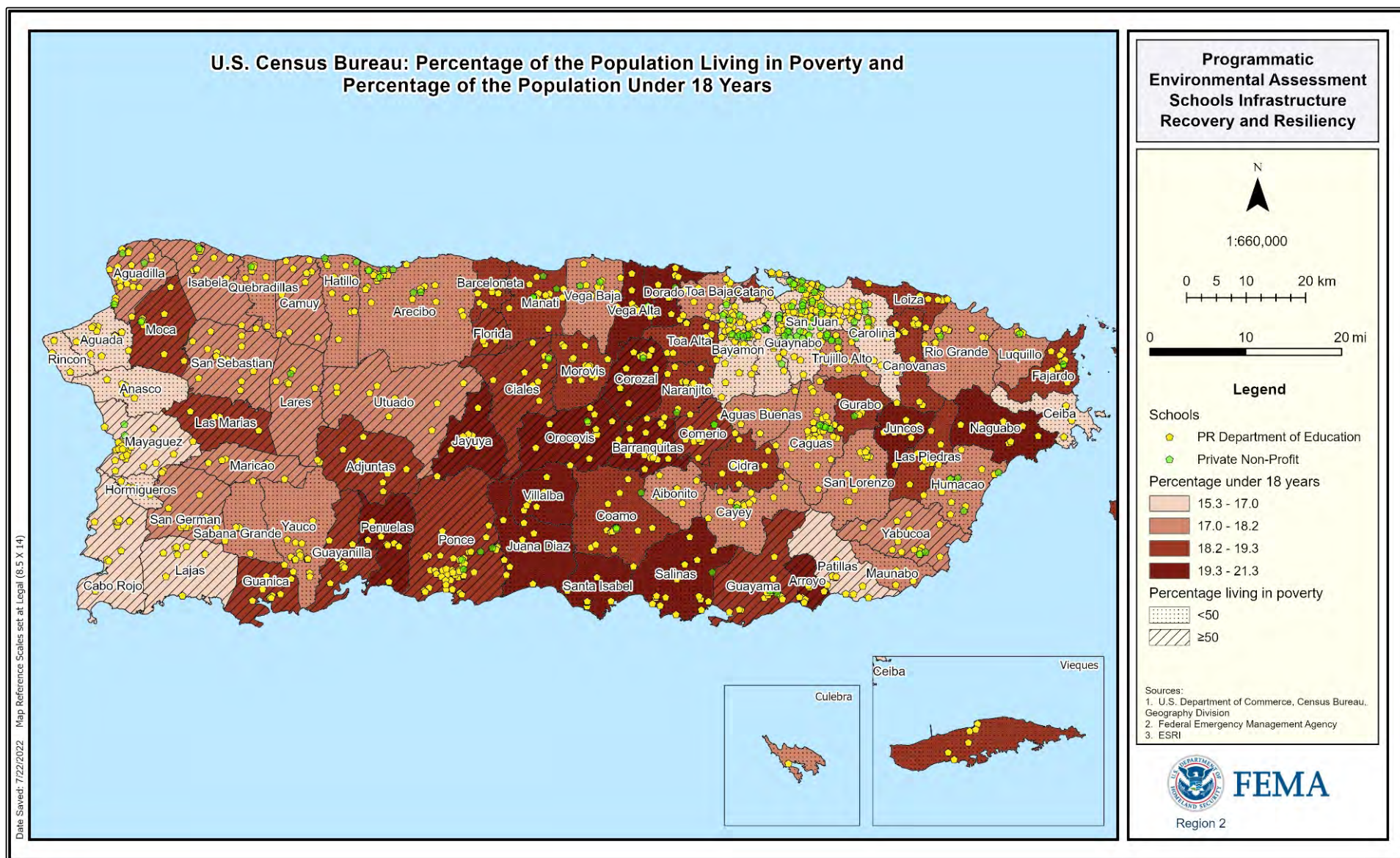


Figure 13: U.S. Census Bureau: Percentage of the Population Living in Poverty and Percentage of the Population Under 18 Years

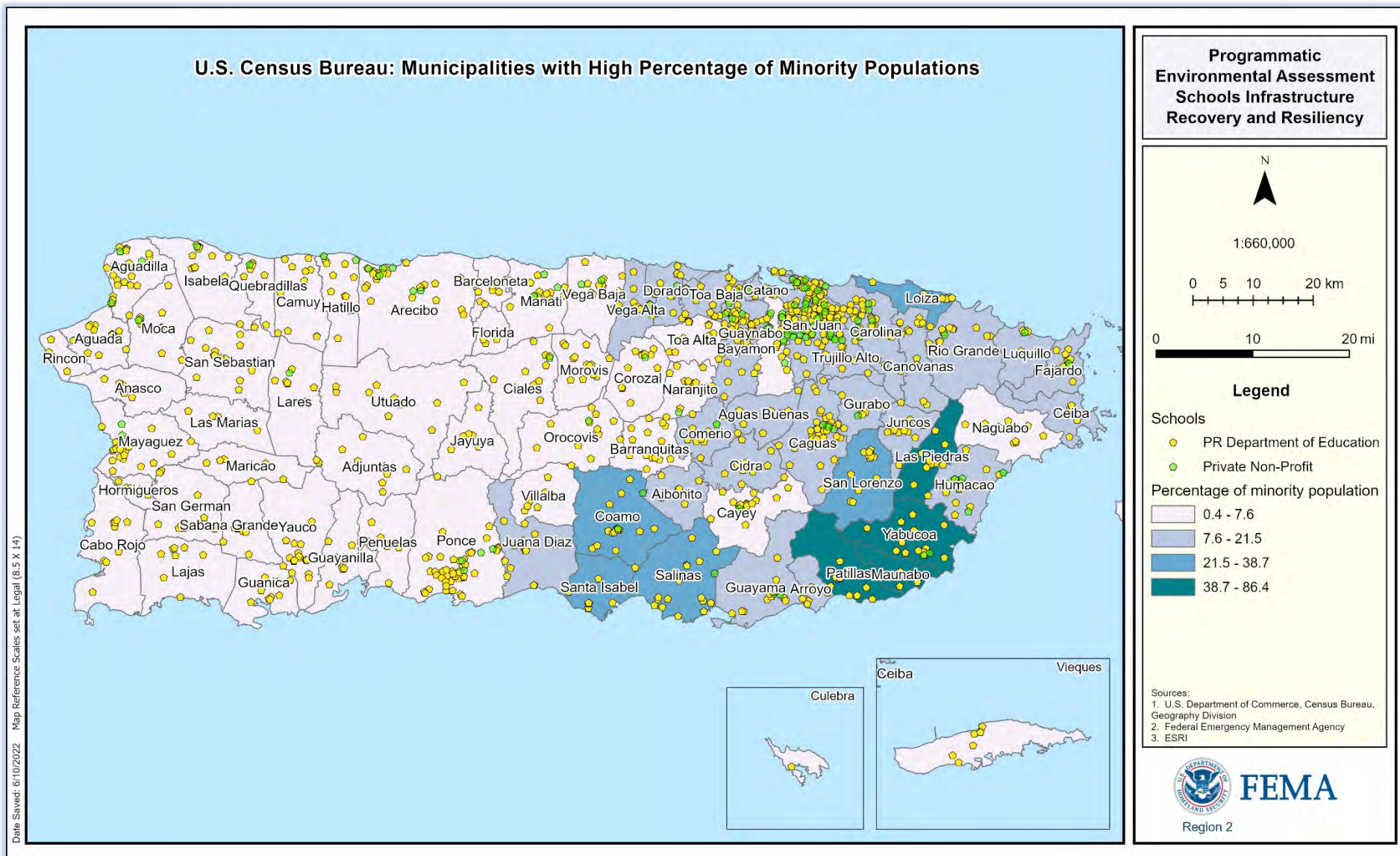


Figure 14: U.S. Census Bureau: Municipalities with High Percentage of Minority Populations

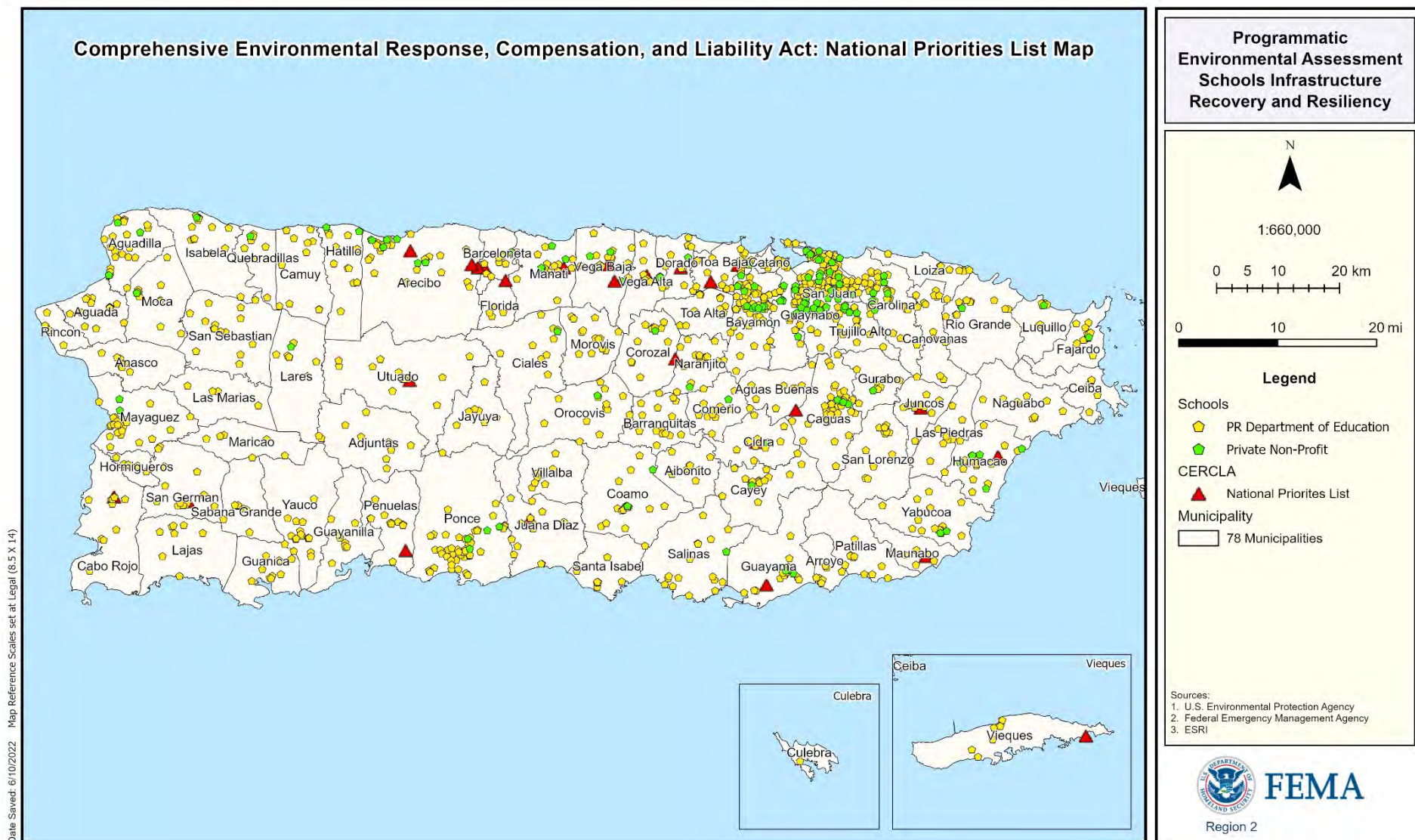


Figure 15: Comprehensive Environmental Response, Compensation, and Liability Act: National Priorities List Map



Figure 16: Ongoing Federal Actions in Puerto Rico

APPENDIX C

Federal Consistency Certificate October 3, 2018 (CZMA RESOLUTION (JP-2018-324))

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.



GOBIERNO DE PUERTO RICO
OFICINA DEL GOBERNADOR
JUNTA DE PLANIFICACIÓN

- 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 Pérez
President

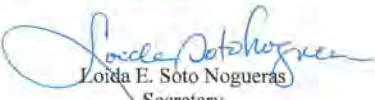
Excused
Eileen Poueymirou Yunque
Associate Member


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"> • Surfaces • Bases • Shoulders • Ditches • Drainage Structures, such as culverts • Low Water Crossings • Associated facilities, such as lighting, sidewalks, guardrails and signs. 2- Bridge components include, but may not be limited to: <ul style="list-style-type: none"> • Decking • Guardrails • Girders • Pavement • Abutments • Piers • 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.	Restoration: Permanent repair or replacement	Localized Flood Risk Reduction Projects
			Non-localized Flood Risk Reduction Projects
			Infrastructure Retrofit
			Soil Stabilization
			Post-Disaster Code Enforcement
			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) 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"> • Dams and reservoirs • Levees and floodwalls • Lined and unlined engineered drainage channels • Canals • Aqueducts • Sediment and debris basins • Storm water retention and detention basins • Coastal shoreline protective devices • Irrigation facilities • Pumping facilities • Navigational waterways and shipping channels 	<p>1- Debris and silt removal required to restore capacity (engineered and maintained facilities only)</p> <ul style="list-style-type: none"> • 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. <p>2- Restoration: Permanent Repair or Replacement</p> <ul style="list-style-type: none"> • 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. 	Localized Flood Risk Reduction Projects
			Non-localized Flood Risk Reduction Projects
			Soil Stabilization
			Post-Disaster Code Enforcement
			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:	
E- BUILDINGS AND EQUIPMENT	Buildings including: <ul style="list-style-type: none"> • All structural and non-structural components, including mechanical, electrical, and plumbing systems. • Contents and equipment within the building • Furnishings Equipment includes: <ul style="list-style-type: none"> • Vehicles • Construction equipment 	1- Restoration – Permanent repair or replacement <ul style="list-style-type: none"> • Repair or replacement of buildings • Repair or replacement of building components, vehicles or equipment with items similar in age, condition, and capacity. • Replacement of destroyed contents with items similar in age, condition, and capacity. • Recovering and stabilizing records. • Stabilization of irreplaceable collections and individual objects is eligible. • Re-shelving, cataloging, and other work incidental to the replacement of library books and publications. 	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
		2- Demolition when replacing a facility including removal and disposal of associated debris.	
		3- Extracting water and removing mud, silt, or debris from interior in conjunction with repairs.	
		4- Mold remediation when conducted in conjunction with restoration of the facility <ul style="list-style-type: none"> • Post remediation sampling to confirm remediation is complete. 	
		5- Post-earthquake inspection and evaluation of welded steel moment frames in buildings to determine the level of disaster-related damage requiring repair.	



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"> Water storage facilities, treatment plants, and delivery systems 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 Communication systems 	Eligible restoration activities: <ul style="list-style-type: none"> Permanent repair or replacement of any component of system, including buildings, structures, or systems, even if not contiguous. Electrical conductor replacement subject to specific criteria. Inspection or assessment of damaged components of a system. 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. 	Generators
			Infrastructure Retrofit
			Soil Stabilization
			Post-Disaster Code Enforcement
			Advance Assistance
			5% Percent Initiative Projects
			Miscellaneous/Other

PUBLIC ASSISTANCE (PA)			HAZARD MITIGATION GRANT PROGRAM (HMGP) ELIGIBLE ACTIVITIES
CATEGORY	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"> • Mass transit facilities such as railways • Beaches • Parks • Playground equipment • Swimming pools • Bath houses • Tennis courts • Boat docks • Piers • Picnic tables • Golf courses • Ball fields • Fish hatcheries • Ports and harbors 	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

Terrestrial Threatened and Endangered Species Listed in Puerto Rico

Common Name	Scientific Name	Federal Status*	Critical Habitat in PR
Birds			
Elfin-woods warbler	<i>Setophaga angelae</i>	T	Yes
Piping plover	<i>Charadrius melodus</i>	E, T**	No
Puerto Rican broad-winged hawk	<i>Buteo platypterus brunnescens</i>	E	No
Puerto Rican nightjar	<i>Caprimulgus noctitherus</i>	E	No
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
Yellow-shouldered blackbird	<i>Agelaius xanthomus</i>	E	Yes
Amphibians			
Golden coqui	<i>Eleutherodactylus jasperii</i>	T	Yes
Guajón	<i>Eleutherodactylus cooki</i>	T	Yes
Llanero coqui	<i>Eleutherodactylus juanariveroi</i>	E	Yes
Puerto Rican crested toad	<i>Peltophryne lemur</i>	T	No
Reptile			
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
Puerto Rican boa	<i>Epicrates inornatus</i>	E	No
Virgin Islands tree boa	<i>Chilabothrus granti</i>	E	No
Hawksbill sea turtle	<i>Eretmochelys imbricata</i>	E	No
Plants			
Arana	<i>Schoepfia arenaria</i>	T	No
Bariaco	<i>Trichilia triacantha</i>	E	No
Caña Gorda Girdlepod	<i>Mitracarpus polycladus</i>	E	No
Capá 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 helleriana</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
Mata Buey-Beautiful goetzea	<i>Goetzea elegans</i>	E	No

Common Name	Scientific Name	Federal Status*	Critical Habitat in PR
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
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
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 Puerto Rico

T = federally listed threatened species located in 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

APPENDIX E

Habitat Characteristics of Endangered Species Act Listed Terrestrial Species within Puerto Rico

<i>Common Name / Scientific Name</i>	<i>Habitat Characteristics</i>
Birds	
Elfin-woods warbler (<i>Setophaga angelae</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: https://www.fws.gov/program/endangered-species/species
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: https://www.fws.gov/midwest/Endangered/pipingplover/pipingpl.html
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). https://www.fws.gov/program/endangered-species/species
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: https://www.fws.gov/program/endangered-species/species
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: https://www.fws.gov/program/endangered-species/species
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. Source: https://www.fws.gov/program/endangered-species/species
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: https://www.fws.gov/program/endangered-species/species
Roseate Tern (<i>Sterna dougallii dougallii</i>)	In the Caribbean area, this bird selects sparsely vegetated, rocky offshore islands for nesting. Source: https://www.fws.gov/program/endangered-species/species
Yellow-shouldered blackbird (<i>Agelaius xanthomus</i>)	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 oxhorn bucida (<i>Bucida buceras</i>), among others. Source: https://www.fws.gov/program/endangered-species/species

Common Name / Scientific Name	Habitat Characteristics
Amphibians	
Golden coqui (<i>Eleutherodactylus jasper</i>)	All that is known about the golden coquí's habitat is that it lives in the bromeliads growing on trees, on the ground, and/or on vertical surfaces like cliff sides. Source: https://www.fws.gov/program/endangered-species/species
Guajon (<i>Eleutherodactylus cooki</i>)	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: https://www.fws.gov/program/endangered-species/species
Llanero Coqui (<i>Eleutherodactylus juanariveroi</i>)	The coquí llanero is only found in one freshwater wetland in Puerto Rico, and it reproduces on only one plant, the bulltongue arrowhead. Source: https://www.fws.gov/program/endangered-species/species
Puerto Rican crested toad (<i>Peltophryne lemur</i>)	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: https://www.fws.gov/program/endangered-species/species
Reptile	
Culebra Island giant anole (<i>Anolis roosevelti</i>)	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: https://www.fws.gov/program/endangered-species/species
Mona boa (<i>Epicrates monensis</i>)	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: https://www.fws.gov/program/endangered-species/species
Mona ground Iguana (<i>Cyclura stejnegeri</i>)	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: https://www.fws.gov/program/endangered-species/species
Puerto Rican boa (<i>Epicrates inornatus</i>)	Observed in every ecosystem in Puerto Rico, it is most commonly sighted in the karst areas in northern Puerto Rico. Source: https://ecos.fws.gov/ecp/species/6628
Virgin Islands tree boa (<i>Chilabothrus granti</i>)	Virgin Island boas usually live in forest or xerophytic (dry) scrubland, characterized by sharp inclines and rocky, poorly fertile soil. Source: https://www.fws.gov/species/virgin-island-tree-boa-epicrates-monensis-granti
Plants	
Arana (<i>Schoepfia arenaria</i>)	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: https://ecos.fws.gov/docs/recovery_plan/920110.pdf
Bariaco (<i>Trichilia triacantha</i>)	Native dry forest located in the Montes de Barinas, Sabana Grande, Guayanilla and Ponce-Peñuelas. Source: https://ecos.fws.gov/docs/recovery_plan/Trichilia%20triacantha_Final%20Draft%20Amendment.pdf
Caña Gorda Girdlepod (<i>Mitracarpus polycladus</i>)	Caña 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: https://ecos.fws.gov/docs/recovery_plan/981006a.pdf
Capa rosa (<i>Callicarpa ampla</i>)	Capa rosa is known from five localities in the palo Colorado forest type. Source: https://ecos.fws.gov/docs/recovery_plan/950731a.pdf

Common Name / Scientific Name	Habitat Characteristics
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: https://ecos.fws.gov/docs/recovery_plan/950117.pdf
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: https://ecos.fws.gov/docs/five_year_review/doc6034.pdf
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: https://ecos.fws.gov/docs/recovery_plan/980911a.pdf
Cobana negra (<i>Stahlia 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: https://ecos.fws.gov/docs/recovery_plan/961101a.pdf
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 1,200 to 1,300 meters (3,900 to 4,260 feet). Source: https://ecos.fws.gov/docs/recovery_plan/910131a.pdf
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 Inabon in Ponce and Cerro Rosa in the municipality of Ciales. Both areas are located within the Toro Negro Commonwealth Forest. https://ecos.fws.gov/docs/recovery_plan/950117.pdf
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: https://ecos.fws.gov/docs/recovery_plan/950731a.pdf
Elfin tree fern (<i>Cyathea dryopteroides</i>)	Restricted to dwarf or elfin forests found at elevations greater than 830 meters (2,723 feet) . Source: https://ecos.fws.gov/docs/recovery_plan/910131a.pdf
Erubia (<i>Solanum drymophilum</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 (984 to 2953 feet). Source: https://ecos.fws.gov/docs/recovery_plan/Solanum%20drymophilum%20RP.pdf
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 (328 to 1,148 feet). Source: https://ecos.fws.gov/docs/recovery_plan/920807b.pdf
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: https://ecos.fws.gov/docs/recovery_plan/961112c.pdf
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 (650 feet) in the Susua Forest to about 800 meters in Maricao. Source: https://ecos.fws.gov/docs/recovery_plan/910923.pdf
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: https://ecos.fws.gov/docs/recovery_plan/940512.pdf
Mata Buey-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: https://ecos.fws.gov/docs/recovery_plan/beautiful%20goetzea%20rp.pdf

Common Name / Scientific Name	Habitat Characteristics
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: https://ecos.fws.gov/docs/recovery_plan/981006a.pdf
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: https://ecos.fws.gov/docs/recovery_plan/950117.pdf
No common name (<i>Varronia rupicola</i>)	Solitary scattered; in areas with low shrubs. Source: https://collections.si.edu/search/record/edanmdm:nmnhbotany_13353942
No common name (<i>Cranichis ricartii</i>)	<i>Cranichis ricartii</i> has been found at only three locations in the Maricao Commonwealth Forest. Source: https://ecos.fws.gov/docs/recovery_plan/960715.pdf
No common name (<i>Gonocalyx concolor</i>)	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: 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/
No common name (<i>Leptocereus grantianus</i>)	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: https://ecos.fws.gov/docs/recovery_plan/950726.pdf
No common name (<i>Myrcia paganii</i>)	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: https://ecos.fws.gov/docs/recovery_plan/970929b.pdf
No common name (<i>Thelypteris verecunda</i>)	The fern is found at Charcas Ward in Quebradillas, Bayaney Ward in Hatillo, and Cidral Ward in the municipality of San Sebastian. Source: https://ecos.fws.gov/docs/recovery_plan/950117.pdf
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. https://ecos.fws.gov/docs/recovery_plan/A.chaseae_L.Truncata_V.proctorii_Recovery_Plan_Amendment_2.pdf and https://ecos.fws.gov/docs/recovery_plan/950731b.pdf
Palma de manaca (<i>Calyptronoma 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: https://ecos.fws.gov/docs/recovery_plan/Recovery%20plan%20for%20Calyptronoma%20rivalis.pdf
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. https://ecos.fws.gov/docs/recovery_plan/950731a.pdf
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. https://ecos.fws.gov/docs/recovery_plan/950731a.pdf
Palo de nigua (<i>Cornutia</i>)	The plant is known to occur in the central mountains of Puerto Rico and in the limestone hill region. Source: https://ecos.fws.gov/docs/recovery_plan/920807b.pdf

Common Name / Scientific Name	Habitat Characteristics
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: https://ecos.fws.gov/docs/recovery_plan/910315.pdf
Palo de rosa (<i>Ottoschulzia rhodoxylon</i>)	<i>Palo de rosa</i> 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: https://ecos.fws.gov/docs/recovery_plan/940920.pdf .
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: https://ecos.fws.gov/docs/recovery_plan/Recovery%20plan%20for%20Aristida%20portoricensis.pdf
Proctor's Staggerbush (<i>Lyonia truncata</i> var. <i>proctorii</i>)	<i>Proctor's Staggerbush</i> is known only from the summit of Cerro Mariquita in the Sierra Bermeja. Source: https://ecos.fws.gov/docs/recovery_plan/950731b.pdf
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: https://ecos.fws.gov/docs/recovery_plan/950117.pdf
Puerto Rico Maiden Fern (<i>Thelypteris yaucoensis</i>)	<i>Puerto Rico Maiden Fern</i> 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: https://ecos.fws.gov/docs/recovery_plan/950117.pdf
Puerto Rico Maidenhair (<i>Adiantum vivesii</i>)	<i>Puerto Rico Maidenhair</i> has been reported to occur at only one location in the limestone hills of northern Puerto Rico near Quebradillas. Source: https://ecos.fws.gov/docs/recovery_plan/950117.pdf
Puerto Rico Manjack (<i>Cordia bellonis</i>)	<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) 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: https://ecos.fws.gov/docs/recovery_plan/991001.pdf
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: https://ecos.fws.gov/docs/recovery_plan/950731a.pdf
St. Thomas prickly-ash (<i>Zanthoxylum thomasianum</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: https://ecos.fws.gov/docs/recovery_plan/st%20thomas%20prickly%20ash%20rp.pdf
Tropical Lilythorn (<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: https://ecos.fws.gov/docs/recovery_plan/050818.pdf
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: https://ecos.fws.gov/docs/recovery_plan/970929b.pdf

Common Name / Scientific Name	Habitat Characteristics
Uvillo-Luquillo Mtn Stopper (<i>Eugenia haematocarpa</i>)	All known localities of these endemic tree species occur within federal and Puerto Rican 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: https://ecos.fws.gov/docs/recovery_plan/980911a.pdf
Vahl's boxwood (<i>Buxus vahliei</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: https://ecos.fws.gov/docs/recovery_plan/vahls%20boxwood%20rp_1.pdf
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: https://ecos.fws.gov/docs/recovery_plan/991209A.pdf
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: https://ecos.fws.gov/docs/recovery_plan/901126.pdf
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: https://www.fws.gov/caribbean/PDF/Eugenia_woodburyana.pdf
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: https://ecos.fws.gov/docs/recovery_plan/981006b.pdf