Executive Summary
Carraízo Reservoir Dredging Environmental Assessment

INTRODUCTION

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

The Stafford Act authorizes FEMA to provide funding to eligible grant applicants for activities with the purpose of reducing or eliminating risks to life and property from hazards and their effects. The 2018 Bipartisan Budget Act authorizes FEMA to provide assistance to restore disaster damaged facilities or systems that provide the specifically identified critical services to an industry standard without regard to pre-disaster condition (FEMA 2018). Section 406 of the Stafford Act describes critical services as power, water, sewer, wastewater treatment, communications, education, and emergency medical care.

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

PURPOSE AND NEED

The Carraízo Reservoir is a major component of the Puerto Rico Aqueducts and Sewer Authority (PRASA) municipal water treatment, transmission, and distribution system and meets the definition of a critical service. The purpose of the project is to recover the water storage capacity of the Carraízo Reservoir which is the only water source for PRASA's Sergio Cuevas Water Filtration Plant (SCWFP).

The need for the project is to support the long-term ability of PRASA to provide a steady, reliable source of potable water for the SCWFP service area which includes a population of approximately 491,663 individuals within the municipalities of San Juan, Carolina, Canóvanas, Trujillo Alto, Gurabo, Loíza, and Juncos. The reservoir supplies approximately 90 MGD (million gallons per day)

of water to the SCWFP. Water from the reservoir also supports the major economic drivers of San Juan and adjacent municipalities including manufacturing, finance, and tourism. The excess sediment deposited during Hurricane María significantly reduced the reservoir's storage capacity.

PROJECT BACKGROUND

The Carraízo Dam forms a reservoir known as Carraízo Reservoir or Lago Loíza, north of the confluence of Río Gurabo and Río Grande de Loíza in the municipality of Trujillo Alto. The Carraízo Dam, owned and operated by PRASA, was built in 1953 to supply water for the SCWFP service area.

Sedimentation at Carraízo Reservoir has been an ongoing challenge that affects the Carraízo Reservoir's storage capacity. To address the issue of sedimentation, in 1992, a Preliminary EIS (PEIS) was prepared to study alternatives to recover the water storage capacity. Due to concerns expressed by several agencies on the method of sediment disposal, the PEIS was put on hold until additional information and studies could be conducted.

The need for dredging rose again in June 1994 due to low reservoir levels associated with a drought event. A Supplemental EIS was completed in 1995 which reevaluated the need to dredge the reservoir. In 1996, the U.S. Army Corps of Engineers (USACE) issued a 20-year permit to dredge the Carraízo Reservoir to recover its water storage capacity. The permit allowed the dredging of approximately 6.11 million cubic meters (Mm^3) (8 million cubic yards [Mcy]) of sediment. For the 1996 dredging project, three new disposal dikes and a staging area with a temporary dock were constructed. Hydraulic dredging was performed using a floating sediment pipeline in the reservoir and inland aboveground pipelines to pump sediment into the new disposal dikes. Once the sediment settled, the decanted water was released back into the reservoir. Prior to dredging, the reservoir's water storage capacity was 13.26 Mm^3 (17.3 Mcy) and after dredging the reservoir's storage capacity was 19.35 Mm^3 (25.3 Mcy).

In 2019 PRASA commissioned a study to determine the amount of sediment delivered into the reservoir due to Hurricane María and the current storage capacity of the reservoir. The study determined that as of 2019, the reservoir's capacity was approximately 15.06 Mm^3 (19.7 Mcy). This corresponds to 56% of the 1953 original reservoir storage capacity of 26.8 Mm^3 (35 Mcy). Based on the loss of storage capacity, PRASA determined the continuous capacity loss of the reservoir, if left unattended, would result in future service interruptions even under normal non-drought weather conditions.

This EA evaluates the impacts of conducting another dredging project to recover the storage capacity of the reservoir utilizing the same staging area, disposal dikes, and a similar pipeline alignment used during the 1996-1998 dredging project. For this EA, studies were performed to characterize the sediments to be dredged as well as document the existing conditions of the disposal dikes, pipeline alignment, and surrounding project area. Sediment samples were collected and analyzed to identify the potential presence of contaminants that could be subject to dispersion if the sediments were disturbed or resuspended during dredging activities. The sediment characterization determined the sediment in the Carraízo Reservoir is non-hazardous, within sampled depths.

DESCRIPTION OF ALTERNATIVES

Five alternatives that fulfill the purpose and need were evaluated for this project, including a No Action Alternative.

Alternatives Considered in Detail:

- Alternative 1: No Action Alternative
- Alternative 2: Dredging to Remove 2 Mm^3 (2.6 Mcy) Preferred Alternative
- Alternative 3: Dredging to Remove 6 Mm^3 (7.8 Mcy).

Alternatives Dismissed From Further Consideration:

- Alternative 4: Raise Height of the Dam
- Alternative 5: Construction of New Desalination Plant

Alternative 1: No Action Alternative

Under the No Action Alternative, FEMA would not provide grant funding for dredging activities to remove the accumulated sediments resulting from Hurricane María. Under the No Action Alternative, the government of Puerto Rico and PRASA would be responsible for funding any dredging. Due to budgetary constraints within Puerto Rico, FEMA anticipates this project may go unfunded or deferred indefinitely. With the No Action alternative, PRASA would not be able to provide a steady, reliable source of potable water for the SCWFP service area.

Alternative 2: Dredging to Remove 2 Mm^3 of Sediment (Preferred Alternative)

Alternative 2 would hydraulically dredge the Carraízo Reservoir to remove 2 Mm^3 (2.6 Mcy) of sediment. For Alternative 2 sediment from the reservoir would be removed over two years and would increase the water storage capacity of the reservoir from approximately 15.06 Mm^3 (19.7 Mcy) to approximately 17.02 Mm^3 (22.3 Mcy). Dredged sediment transfer would be through a pipeline up to 0.6-meter(m) (24-inches) in diameter and up to 17 kilometers (km) (10.9 miles [mi]) long, with approximately 10 km (6.2 mi) of pipeline sections along the reservoir (open water) and approximately 7 km (4.3 mi) of inland aboveground pipeline, generally following the same alignment as the pipeline used during the previous dredging event. The sediment slurry would be transferred to the three existing disposal dikes (A, B and C) with a combined disposal capacity of approximately 2.6 Mm^3 (3.4 Mcy). After sediment settling, the decanted water would be released back into the reservoir through weir outlets. The dredged sediments would remain in the disposal dikes, where vegetation would be allowed to naturally recover.

Installation of the sediment pipeline would include both floating platforms/rafts and aboveground pipelines with booster pumps for sediment slurry transfer to the existing disposal dikes. The floating platforms in the reservoir would support booster pumps. Installation and operation of the inland sediment pipelines would require a 12-m-wide (39.3-foot [ft]) pipeline easement along approximately 7 km (4.3 mi) of open non-developed and agricultural lands. To secure the pipeline

and limit ground disturbance, installation of the inland pipeline would include non-invasive temporary weighted anchors. The weighted anchors would include large concrete blocks placed on the ground on either side of the pipeline. A metal bracket would be attached to the concrete blocks and would fit over the top of the pipeline. The booster pumps placed at intervals along the alignment would be mounted on skids and would sit on the ground. For primary or secondary road crossings, the pipeline would go through existing culverts under roads and bridges. For the dirt roads pipeline crossings, the pipeline would cross aboveground.

Site preparation/construction phase actions include:

- Implementation of sediment and erosion control measures at the dredging, staging area, and disposal dikes.
- Protection of the archaeological site identified at staging area.
- Equipment mobilization and installation of temporary office trailers at staging area.
- Rehabilitation (including clearing and grubbing, incidental tree removal, refurbishing access roads) of the staging area and disposal dikes A, B and C, and along the pipeline alignment as needed.
- Construction of a temporary dock abutting the staging area to allow hydraulic dredge equipment and support vessels operations. The new temporary dock would be in a location similar to the dock location used for the previous dredging event.
- Demolition and reconstruction of existing weir outlets at the disposal dikes for the discharge of decanted water.
- Activities would take place from 7 a.m. to 10 p.m., 5 days a week.

Dredging operation phase actions include:

- Delimit by buoys or other means that facilitates its visual identification, the submerged residential structure, and a 10-m (32.8-ft) buffer zone around it to be avoided/protected by the dredging crew.
- Fueling of the hydraulic dredge barge and support vessels.
- Installation of the sediment pipeline along an alignment that would be similar to the previous dredging project.
- Installation of conventional equipment and dewatering geotextile tubes for sediment management within disposal dikes.
- Dredging activities would occur up to 24-hours a day, 7 days a week.
- Pumping dredged material from the reservoir to the sediment disposal dikes. This operation would occur up to 24-hours a day, 7 days a week.

- On-going maintenance activities for dredging equipment, booster pumps, pipelines, etc., as needed during the dredging period.

Demobilization phase actions include:

- Demobilization of dredging equipment and structures from staging area, disposal dikes, and sediment pipeline. To be completed within four months after dredging operations end.
- Removal of temporary dock, to be completed within four months after dredging operations end.
- Removal of sediment and erosion control measures at the dredging, staging area, disposal dikes, and along the pipeline route within four months after dredging operations end.

Alternative 3: Dredging to Remove 6 Mm^3 of Sediment

The proposed dredging method and components for Alternative 3 would be similar to Alternative 2, with a variation on the total sediment volume to be removed (6 Mm^3) (7.8 Mcy) and dredging period (20 years). For Alternative 3, sediment dredged from the reservoir would increase the water storage capacity of the reservoir at the end of 20 years from approximately 15.06 Mm^3 (19.7 Mcy) to approximately 15.26 Mm^3 (19.96 Mcy).

The three existing disposal dikes presently have an estimated combined capacity of 2.6 Mm^3 (3.4 Mcy). To achieve the 6 Mm^3 (7.8 Mcy) dredged sediment volume, Alternative 3 would require the annual removal of 300,000 m^3 (392,385 cy) of de-watered sediments from disposal dike A, once the three disposal dikes' storage capacity is reached. Sediment dredging, dewatering, sorting and transportation off-site would continue exclusively at disposal dike A, beginning approximately during year 7 or 8 after initiating dredging activities, and continuing until year 20. Dredging operations at disposal dikes B and C would stop and equipment demobilized.

The dry sediments would be utilized beneficially as construction materials (sand and gravel portions) and fill material for various uses. Markets for this material on the island include the following:

- Construction material. The sand and gravel portions would be sold in bulk to wholesale and retail marketers, such as permitted hardware stores and quarries.
- Fill material. There are multiple uses for dredged material, since chemical test results indicate these sediments are non-hazardous. Some fill material uses:
    - Landfill daily cover. Landfills are required to daily cover the working cells to prevent vermin and disease vectors from reaching deposited municipal solid waste.
    - Landfill Closures. Closure requirements require substantial amounts of sediment to cap the landfill.
    - Other fill material uses. Dredged material can be used beneficially for upland habitat restoration, recontouring shallow water habitat, filling dead-end basins, and restoring bird habitat in uplands.

- Topsoil. Fill material would be mixed with compost to make a fertile topsoil.

Activities associated with Alternative 3 that would be different or in addition to the activities for Alternative 2 include:

Dredging operation phase:

- Continue dredging and de-watering sediments with the use of geotubes at disposal dike A, and the release of decanted water back into the reservoir.

Sediment processing and transportation phase:

- Construction equipment mobilization and installation at disposal dike A for sorting and loading the dry sediments into dump trucks for transportation off-site, once disposal dikes B and C have reached their respective capacity.

- Sediment sorting and processing within the disposal dike A footprint and would entail the use of construction equipment such as excavators, skid-steer loaders, bulldozers, mechanical cascade sifters, and dump trucks.

- Sorting, processing, and transportation off-site annually of approximately 300,000 m^3 (392,385 cy) of dry sediment material from disposal dike A to different markets in Puerto Rico.

- Off-site sediment transportation would require approximately 77 truckloads, with a capacity of 15 m^3 (19 cy) per day, 5 days per week, on a yearly basis between 7:00 a.m. and 10:00 p.m.

- The roads employed for transportation of materials off-site would be PR-9189 for 1.4 km (0.9 mi), to PR-189 for 0.4 km (0.25 mi), to PR-30 for 9 km (5.6 mi), and thereon to different markets in Puerto Rico.

Demobilization phase:

- Removal of sediment pipelines, pipeline fasteners, booster pumps, and erosion control measures at disposal dikes B and C once their capacity is reached.

- Demobilization of dredging equipment and structures from staging area, disposal dike A and its sediment pipeline, removal of temporary dock, and removal of sediment and erosion control measures at the dredging, staging area and disposal dike A during year 20.

Alternatives Considered and Dismissed

Alternative 4: Raise Height of the Dam

Alternative 4 would raise the dam structure to increase the reservoir's water storage capacity. This alternative was evaluated in the 1992 PEIS, which proposed raising the level of the dam to increase the water level and storage capacity of the reservoir by 3.5 m (11.5 ft). Raising the water elevation of the reservoir would raise the elevations of the flood zone for the adjacent Caguas and Gurabo

areas. Higher elevation in the reservoir would cause a greater risk of flooding for these communities. The conditions and potential impacts evaluated as part of the 1992 PEIS have not changed, therefore, this alternative was discarded due to the high risk of causing increased flood problems.

Alternative 5: Construction of New Desalination Plant

Alternative 5 would involve the construction of a new reverse osmosis desalination plant to provide a new source of water for the SCWFP service area. This alternative would also include maintenance dredging Carraízo Reservoir in order for PRASA to produce approximately 6 MGD of drinking water. The desalination plant would require design of a new treatment plant, a new seawater pipeline inlet, and a new brine discharge outfall which would extend to the Atlantic Ocean. It is estimated it would take approximately three years for planning, permitting, design, and construction of a new desalination plant before starting operations to deliver drinking water. The desalination plant could be located within an urbanized area near the Atlantic Ocean or within the port of San Juan. Despite the construction of a treatment plant of this nature, the Carraízo Reservoir would still have to be dredged periodically to maintain storage capacity and safe yield, or the reverse osmosis plant would have to be upgraded every two years to increase the drinking water supply to compensate for the continued Carraízo Reservoir storage capacity loss. Due to projected high construction costs and the elevated energy costs associated with plant operation, including the potential environmental impacts linked to the development of this alternative, the 1992 PEIS determined this alternative was not feasible. Conditions have not changed, and this alternative was discarded due to projected high construction costs, potential environmental impacts, and elevated energy costs.

PERMITS AND CONDITIONS

The PRASA is responsible for obtaining applicable federal and Puerto Rico permits, including authorizations and environmental compliance for project implementation prior to construction, and adherence to permit conditions and regulatory requirements. Any substantive change to the approved scope of work will require re-evaluations by FEMA for compliance with NEPA and other laws and Executive Orders. The PRASA must also adhere to the following conditions during project implementation and consider the below conservation recommendations:

1. **PRASA:** Must comply with applicable environmental and historic preservation laws. Federal funding is contingent upon acquiring the necessary federal, Puerto Rico, and local permits. Noncompliance with this requirement may jeopardize the receipt of federal funds.

2. **Utility Clearance:** For ground disturbing activities, PRASA is responsible for locating utilities. The Occupational Safety and Health Administration 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.

3. **Stormwater and Soils:** A Construction National Pollutant Discharge Elimination System permit (NPDES) and a Stormwater Pollution Prevention Plan (SWPPP) will be prepared and implemented by PRASA. The agency will implement Best Management Practices (BMPs) to manage any piles of soil or debris, minimize steep slope disturbance, preserve native topsoil unless infeasible, and minimize soil compaction and erosion.

4. **Erosion and Sediment Control:** The BMPs and guidelines recommended in the Puerto Rico Erosion and Sediment Control Handbook for Developing Areas (Puerto Rico Department of Natural and Environment Resources (PRDNER) and U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) will be implemented by PRASA for the preferred alternative. The agency will be responsible for obtaining the necessary permits such as an NPDES permit and implementing the associated erosion and sediment control plans included as part of the Puerto Rico Planning Board (PRPB) Joint Regulation Single Incidental Operational Permit and SWPPP.

5. **Spill Prevention, Control and Countermeasure:** A Spill Prevention, Control, and Countermeasures (SPCC) Plan will be prepared by PRASA to establish procedures, methods, and equipment requirements to prevent fuel or lubricants from reaching navigable waters and adjoining shorelines, and to contain discharges of harmful substances.

6. **Endangered Species Act:** An Endangered Species Act Section 7 informal consultation letter was submitted to the U.S. Fish and Wildlife Service (USFWS) with the determination of impacts to listed federal threatened or endangered species. The USFWS, in a communication dated February 18, 2022, concurred with FEMA on a *May Affect but not likely to Adversely Affect* determination. Appendix J of the EA includes the USFWS concurrence letter, including conservation measures.

7. **Fish and Wildlife Coordination Act:** The USFWS, in the communication dated February 18, 2022 (See Appendix J in the EA), concurred with the conservation measures proposed by FEMA, and provided indications on species in which to concentrate efforts. The PRASA will comply with the conservation measures required by USFWS. The PRASA is responsible for coordinating with the Puerto Rico Department of Natural and Environmental Resources (PRDNER) to comply with Puerto Rico's requirements related to natural and environmental resources.

8. **Work Affecting Water:** The PRASA is responsible for initiating the permitting process with USACE to obtain a Section 404 permit (discharge of dredged material into waters of the United States, which includes streams and wetlands). The agency is responsible for obtaining appropriate permits prior to the beginning of work and implementing permits requirements, including pre-construction notification. Section 401 of the Clean Water Act water quality certification will be issued by the PRDNER as part of the USACE Section 404 permitting process.

9. **Floodplain:** Sediment control BMPs will be implemented by PRASA. In addition, PRASA will comply with permit requirements to limit construction activities in floodplains.

10. **Wetlands:** The PRASA will use preventive measures and construction BMPs to minimize impacts to waters of the United States including wetlands that might be within the sediment pipeline alignment during the construction phase. The agency is responsible for initiating the permitting process with USACE in compliance with mentioned regulations.

11. **Historic Preservation/Archaeological Resources:** A consultation letter was submitted to the State Historic Preservation Office (SHPO) in compliance with Section 106 of the National

Historic Preservation Act, on which FEMA determined that the proposed activities will result in *No Adverse Effect to Historic Properties with Conditions*. A communication from SHPO dated December 30, 2021, stated that the office concurs with FEMA's determination (See Appendix K in the EA for correspondence). The PRASA will comply with the conditions required by SHPO. It will also be responsible for coordinating with the Institute of Puerto Rican Culture (ICP) to comply with Puerto Rico's historic preservation and archaeological requirements. If any cultural materials or human remains are discovered during construction or dredging operations, the contractor must halt work immediately and contact FEMA. The FEMA staff will evaluate the discovery in coordination with SHPO.

12. **Built Historic Heritage and Terrestrial Archaeology:** The PRASA consulted the ICP through an archaeological recommendation to obtain concurrence and recommendations on the proposed action. Appendix K of the EA includes the ICP communication and recommendations regarding the proposed action. The ICP letter includes conditions similar to those of the SHPO for identified resources and for disposal dike and staging site preparation and dredging activities.

13. **Construction Material and Debris:** The PRASA is responsible for obtaining required permits for the handling and transportation of construction material and debris. It will identify, handle, transport, and dispose of hazardous materials and/or toxic waste in accordance with U.S. Environmental Protection Agency (EPA) and PRDNER requirements, including the details associated with the proposed action construction materials and debris handling as part of the PRPB Joint Regulation, General Consolidated Permit of the Single Incidental Operational Permit. It is also responsible for ensuring that non-recyclable debris generated from project activities will be disposed at a PRDNER permitted landfill.

14. **Clean Air Act:** The PRASA is responsible for complying with applicable EPA and PRDNER requirements for fugitive dust suppression. Vehicular emission and airborne dust particulates resulting from construction activities and equipment operation shall be de minimis. An Operation Plan to implement emissions control measures would be included as part of the Single Incidental Operational Permit application, as required by the PRPB Joint Regulation.

15. **Atmospheric Pollution Control:** The PRASA will evaluate the proposed equipment associated to the proposed action to comply with Regulation 5300 and PRDNER requirements. A Puerto Rico General Consolidated Permit application will be prepared and submitted to the PRDNER for a permit for operation of emergency generators.

16. **Tree Cutting:** The PRASA is responsible for complying with the requirements of the PRPB Joint Regulation on the requirements to mitigate trees that are impacted by the proposed action. A tree inventory would be prepared by a Puerto Rico Department of Economic Development and Commerce Planting Authorized Inspector to identify trees within the proposed action areas, as part of the Single Incidental Operational Permit as required by the PRPB Joint Regulation. A permit will be required for tree cutting prior to beginning clearing and grubbing.

17. **Invasive Species Act**: The PRASA is responsible for restoring disturbed soils with planting native, non-invasive species once project activities are completed. 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.

18. **Compliance with State (Local) Permit Requirements:** The PRASA will submit to the Puerto Rico Department of Economic Development and Commerce and PRDNER the corresponding applications to obtain, if required, the following environmental protection permits and endorsements:

    a. Natural Habitat Categorization Certification – PRASA will submit to the PRDNER an application to request concurrence on the habitat classification for the proposed project.

    b. Infrastructure and Utilities Recommendations – The proposed action information is presented for consideration and comments for conformity with State Utility agencies for building requirements.

    c. Maintenance of Public Infrastructure Works Permit – Required for maintenance of public infrastructure facilities.

    d. Single Incidental Operational Permit – This permit includes the Incidental Activity Permit for Public Infrastructure Works, Trees Cutting and Pruning Authorization, and the General Consolidated Permit.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This EA evaluates the existing conditions and environmental consequences of implementing the No Action Alternative and the action Alternatives 2 and 3, as required by NEPA. Table 1 summarizes the impacts of the No Action Alternative, the Preferred Alternative, Alternative 2, and Alternative 3.

Table 1 Summary of Impacts

Resource Section	**Alternative 2 Impacts 2 Mm^3, 2-year duration**	**Alternative 3 Impacts 6 Mm^3, 20-year duration (0.3 Mm^3/year)**	**No Action Alternative Impacts**
Section 5.1 Geological, Topography, and Soils	Minor	Minor	No Impact
Section 5.2 Air Quality	Minor	Major	No Impact
Section 5.3 Water Resources/Water Quality	Minor Beneficial	Minor Beneficial	Negligible to Major
Section 5.4 Wetlands	Minor	Minor	No Impact
Section 5.5 Floodplain	Negligible	Negligible	No Impact
Section 5.6 Vegetation	Minor	Minor	No Impact
Section 5.7 Wildlife and Fish	Minor	Minor	Negligible

Resource Section	Alternative 2 Impacts 2 Mm^3, 2-year duration	Alternative 3 Impacts 6 Mm^3, 20-year duration (0.3 Mm^3/year)	No Action Alternative Impacts
Section 5.8 Threatened and Endangered Species	Minor	Minor	No Impact
Section 5.9 Cultural Resources	No Impact	No Impact	No Impact
Section 5.10 Socioeconomic and Environmental Justice	Minor Beneficial	Minor Beneficial	Moderate
Section 5.11 Land Use and Planning	Minor	Minor	No Impact
Section 5.12 Noise	Minor	Major	No Impact
Section 5.13 Transportation	Minor	Major	No Impact
Section 5.14 Public Services and Utilities	Minor Beneficial	Minor Beneficial	Major
Section 5.15 Public Health and Safety	Minor Beneficial	Minor Beneficial	Major
Section 5.16 Hazardous Materials	Negligible	Minor	No Impact

Specific plans and permits, such as the plans required by the Single Incidental Permit from of Puerto Rico Permit Management Office and the NPDES permit from the EPA will include project-specific requirements.

CUMULATIVE IMPACTS

Both Alternative 2 and Alternative 3 would meet PRASA's existing needs and could support new development. These alternatives would support PRASA's ability to provide a steady, reliable water source for the SCWFP service area, by increasing the water storage capacity of the Carraízo Reservoir.

Adverse impacts of the Preferred Alternative, Alternative 2, would be minor, direct, and short-term when combined with other past, on-going, or planned projects, since most of the federal funding actions involve the repair, replacement, or rehabilitation of projects that are similar in function, size, and locality to the existing systems. Therefore, most cumulative impacts from the initial installation and temporary restoration of the projects on the human environment have already occurred prior to and after Hurricane María. Dredging the Carraízo Reservoir would have beneficial, indirect long-term impacts to the SCWFP service area and Puerto Rico by increasing water storage capacity to approximately 17.02 Mm^3 (22.3 Mcy).

Based on the proposed activities for Alternative 2, the most relevant cumulative environmental impacts would be related to air quality, noise, and traffic increases. BMPs would be implemented by PRASA to avoid and minimize impacts to these resources in the project area. The PRASA would coordinate minimization measures as part of the environmental review process with PRDNER, USACE, Puerto Rico Department of Health, and the Puerto Rico Permit Management Office.

For Alternative 3, most impacts would be similar to those for Alternative 2, except that they would be long-term occurring over twenty years. However, Alternative 3 would result in major direct long-term adverse impacts to air quality, traffic, and noise in the municipality of Gurabo due to scope and duration of the proposed activities. Equipment and trucks operating for a twelve-year period would exceed regulatory standards for air quality and noise due to the proximity of residential areas. Increased truck traffic would also adversely impact communities along transportation routes.

Therefore, cumulative impacts from Alternative 3 and other past, on-going, or planned projects for traffic, air quality, and noise would be major. Cumulative impacts of Alternative 3 and other past, on-going, or planned projects would not be major for the other resources considered in this EA for the same reasons as those for Alternative 2. While dredging the Carraízo Reservoir would have beneficial, indirect long-term impacts to the SCWFP service area and Puerto Rico, the major direct long-term adverse impacts during dredging operations outweigh the benefits. Therefore, this alternative is not preferred.