GOVERNMENT OF PUERTO RICO
PUBLIC SERVICE REGULATORY BOARD
PUERTO RICO ENERGY BUREAU

IN RE: REVIEW OF THE PUERTO RICO ELECTRIC POWER AUTHORITY´S 10-YEAR INFRASTRUCTURE PLAN – DECEMBER 2020	**CASE NO**.: NEPR-MI-2021-0002 **SUBJECT**: Motion to Submit Generation Projects Initial SOWs

MOTION TO SUBMIT GENERATION PROJECTS INITIAL SOWS

COMES NOW the Puerto Rico Electric Power Authority (PREPA), through its counsel of record, and respectfully submits and requests as follows:

1. On March 26, 2021, the Puerto Rico Energy Bureau of the Public Service Regulatory Board (the "Energy Bureau" or "Bureau") entered a Resolution and Order (the "March 26 Order") by which it ordered PREPA, among other things, to:

> submit to the Energy Bureau each new capital investment project. For projects to be funded with the [Federal Emergency Management Administration "FEMA"] fund and/or any other federal funds, PREPA shall submit the specific projects to the Energy Bureau at least thirty (30) calendar days prior to its submittal to the [Central Office for Recovery, Reconstruction and Resiliency "COR3"], FEMA and/or any other federal agency.

March 26 Order at pp. 18-19, ¶ 10.

2. PREPA has prepared initial scopes of work (SOW) for several generation projects. In compliance with the March 26 Order, PREPA herein presents the initial SOWs for said projects.

a. **Reservoir dredging projects**. Exhibit A. The purpose of this set of ten (10) projects is to restore the water storage capacity of the reservoirs by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoirs. The objective is to restore the facilities to pre-disaster function and to approved codes/standards. The reservoirs that will be

repaired are: Dos Bocas, Garzas, Guajataca, Guayabal, Guayo, Guerrero, Guineo, Loco, Lucchetti, and Matrullas. Although construction for many of these reservoir projects is planned for execution in the mid and long-terms of the 10-Year Plan (i.e., 2024 and beyond), they are being submitted here as a group so bathymetric surveys can begin across all ten (10) reservoirs. Results of the bathymetric surveys are critical to inform the scope, approach, and subsequent preliminary Architecture and Engineering (A/E) design phase for each reservoir project. During the preliminary A/E design phase, PREPA will develop and propose 406 Hazard Mitigation Grant Program (HMGP) proposals consistent with the damages. These proposals will be documented with FEMA Benefit-Cost Analysis (BCA). Further, PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for these projects.

b. **Dam Safety Early Warning System**. Exhibit B. The purpose of the Dam Safety Early Warning System Project is to install an island-wide early warning system for thirty-seven (37) dams administered by PREPA. The Project will be used to provide public notifications during extreme floods when controlled flood releases could result in major flooding, or when seismic activity causes structural damage to dams that could result in a dam break incident and uncontrolled release of reservoir water. Instrumentation installed as part of the Project can also be used to detect developing failure modes during normal operations. The objective is to restore the pre-disaster function of the facility and incorporate improvements. This project is being funded through a FEMA 404 project funding source for HMGP.

c. **Guajataca Dams Permanent Repairs**. Exhibit C. The purpose of this project is to increase the Guajataca Dam spillway capacity, stabilize the earth embankment and abutment landslide while providing seismic resilience to the dam, resulting in a reduction of the dam's operational risks to below the United States Army Corps of Engineers tolerable risk safety guidelines. The scope of work will consist of construction works to provide a new stabilization berm, repair of the outlet works improving hydraulic efficiency by installing new gates at the intake tower, enlarge existing water control gates, replacing and realigning the outlet works conduits and construction of a new emergency spillway. All work will be designed in accordance with locally adopted codes and standards and/or FEMA-approved industry standards. The objective of this project is to restore the facilities to pre-disaster function and to approved codes/standards. During the Preliminary A/E Design phase, PREPA will develop and propose 406 Hazard Mitigation Grant Program (HMGP) proposals consistent with the damages. These proposals will be documented with FEMA Benefit-Cost Analysis (BCA). Further, PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for these projects.

d. **Palo Seco Demin Water Tank 4**. Exhibit D. The operation of the mega gen gas turbines is required as subsequent repairs to other generating units are not all completed and the other units are still off-line. In addition, these mega gen units will be utilized as a temporary power source to bypass the needs of certain transmission lines and/or generation power plants. This is required to maintain electrical service to customers while eligible work is performed on the transmission

lines, generation plants, and other PREPA infrastructure. To meet the environmental permitting of the units and allow for the operation of the mega gen gas turbines, demineralized ("demin") water is required to be supplied to the units. Currently, the Palo Seco site is providing a mixture of condensate and demin water to the mega gen gas turbines. This project is to replace the existing tank 4 with a clean demin water tank to supply demin water to the mega gen gas turbines. The scope will include the necessary piping changes to provide the mega gen gas turbines with demin water. The objective of this project is to provide the demin water required to operate the mega gen units within environmental permitting requirements.

e. **Patillas Dam – Seismic Retrofit Project.** Exhibit E. PREPA evaluated several alternatives to mitigate adverse effects of excessive deformations and a potential dam breach caused by strong seismic events. Some of these alternatives are as follows: (1) resume normal operation without implementing any risk reduction measures; (2) construct a new dam and remove or decommission the old one; (3) lower the operational level of the reservoir pool level permanently to a point of reducing risk to acceptable levels, which would result in inadequate water supply during drought periods; and (4) investigate all engineering components of the dam, develop plans and specifications to design a permanent risk reduction dam modification, which would allow water levels to return to normal operating levels. After discussing the benefits and disadvantages of the above-listed alternatives, PREPA decided to investigate all engineering components of the dam. This will result in development of design plans and specifications to construct a permanent

risk reduction dam modification. PREPA has initiated studies and plans to develop conceptual designs for a seismic retrofit design to improve the seismic stability of the embankment dam. PREPA is currently developing preliminary designs for options 2 and 4, whereby more accurate cost estimates can be determined for each option. The two options intended are (1) modifying the existing dam by placing a substantial amount of structural fill material on both upstream and downstream slopes of the earthen embankment to stabilize the dam, or (2) constructing a new dam downstream of the existing one using roller compacted concrete techniques, will be further evaluated by performing a detailed risk analysis and a benefit/cost analysis to determine the best, most cost effective method of reducing the seismic risks associated with Patillas Dam. This project is being funded through a FEMA 404 project funding source for HMGP.

3. The above-listed projects are aligned with the operative Integrated Resource Plan and Modified Action Plan approved by PREB on August 24, 2021.[1]

WHEREFORE, PREPA respectfully requests the Energy Bureau to approve the above-listed projects.

RESPECTFULLY SUBMITTED.

In San Juan Puerto Rico, 20th day of August 2021.

[1] Final Resolution and Order on the Puerto Rico Electric Power Authority's Integrated Resource Plan entered on August 24, 2020 in case no. CEPR-AP-2018-0001, *In Re: Review of the Puerto Rico Electric Power Authority Integrated Resource Plan*.

s/ Maralíz Vázquez-Marrero
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s/ Katiuska Bolaños-Lugo
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CERTIFICATE OF SERVICE

It is hereby certified that I have filed the foregoing with the Clerk of the Energy Bureau using the electronic filing system using https://radicacion.energia.pr.gov/login and also, that I have served a copy on LUMA Energy, LLC and LUMA Energy ServCo, LLC through their counsel of record at laura.rozas@us.dlapiper.com and margarita.mercado@us.dlapiper.com.

In San Juan Puerto Rico on this 20th day of August 2021.

s/ Katiuska Bolaños-Lugo
Katiuska Bolaños-Lugo

EXHIBIT A

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Dos Bocas Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245458
PREPA 10-Year Plan Project Number:	06-03-245458-00014
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Dos Bocas Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245458-00014

Federal Information

(provided by FEMA)

Damage Number	245458
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Dos Bocas Reservoir		18.335653, -66.667038

2.2. Facilities Description

The **Dos Bocas Reservoir** is impounded by **Dos Bocas Dam**, a concrete gravity dam used to collect and store water for potable water and hydro-electric generation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Dos Bocas Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$58.25** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Dos Bocas Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Dos Bocas Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$6.55**
Final Design and Engineering (including 30%)	**$8.74**
Construction	**$49.51**
Total Project Estimated Cost	**$58.25**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Dos Bocas Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Dos Bocas Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Garzas Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245459
PREPA 10-Year Plan Project Number:	06-03-245459-00037
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Garzas Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245459-00037

Federal Information

(provided by FEMA)

Damage Number	245459
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Garzas Reservoir		18.137436, -66.741034

2.2. Facilities Description

The **Garzas Reservoir** is impounded by **Garzas Dam**, an earthen dam used to collect and store water for hydro-electric generation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Garzas Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$1.53** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Garzas Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

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Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Garzas Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Garzas Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Guajataca Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	0
PREPA 10-Year Plan Project Number:	06-03-000000-00010
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 1 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Guajataca Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-000000-00010

Federal Information

(provided by FEMA)

Damage Number	0
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location
Guajataca Reservoir		18.397585, -66.923715

2.2. Facilities Description

The **Guajataca Reservoir** is impounded by Guajataca Dam, an earthen dam used to collect and store water for irrigation and potable water purposes. The reservoir has a normal surface area of 1.6 square miles (4.1 square kilometers), its length is 2.5 miles (4.0 kilometers), its maximum width is 1 mile (1.6 kilometers), and its maximum discharge is 28,954 cubic feet (819.9 cubic meters) per second. Its normal storage capacity is 30,055 acre feet (37 million cubic metres), and its drainage basin is 31 square miles (80 km).

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Guajataca Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$18.99** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Guajataca Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.
2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.
3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.
4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	Guajataca Reservoir - Dredging ($M)
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$2.14**
Final Design and Engineering (including 30%)	**$2.85**
Construction	**$16.14**
Total Project Estimated Cost	**$18.99**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Guajataca Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Guajataca Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Guayabal Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245463
PREPA 10-Year Plan Project Number:	06-03-245463-00029
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Guayabal Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245463-00029

Federal Information

(provided by FEMA)

Damage Number	245463
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Guayabal Reservoir		18.086964, -66.504139

2.2. Facilities Description

The **Guayabal Reservoir** is impounded by **Guayabal Dam**, a concrete Ambursen dam used to collect and store water for irrigation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Guayabal Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$7.75** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Guayabal Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Guayabal Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$0.87**
Final Design and Engineering (including 30%)	**$1.16**
Construction	**$6.58**
Total Project Estimated Cost	**$7.75**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Guayabal Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Guayabal Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Guayo Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245466
PREPA 10-Year Plan Project Number:	06-06-245466-00051
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Guayo Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-06-245466-00051

Federal Information

(provided by FEMA)

Damage Number	245466
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Guayo Reservoir		18.210609, -66.834724

2.2. Facilities Description

The **Guayo Reservoir** is impounded by **Guayo Dam**, a concrete gravity dam used to collect and store water for irrigation, potable water and hydro-electric generation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Guayo Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$21.01** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Guayo Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Guayo Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$2.36**
Final Design and Engineering (including 30%)	**$3.15**
Construction	**$17.86**
Total Project Estimated Cost	**$21.01**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Guayo Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Guayo Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Guerrero Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245467
PREPA 10-Year Plan Project Number:	06-03-245467-00011
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Guerrero Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245467-00011

Federal Information

(provided by FEMA)

Damage Number	245467
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Guerrero Reservoir		18.474186, -67.067653

2.2. Facilities Description

The **Guerrero Reservoir** is impounded by **Guerrero Dam**, an earthen dam used to collect and store water for irrigation and potable water purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Guerrero Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$0.019** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Guerrero Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

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The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Guerrero Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$0.002**
Final Design and Engineering (including 30%)	**$0.003**
Construction	**$0.016**
Total Project Estimated Cost	**$0.019**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Guerrero Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Guineo Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245468
PREPA 10-Year Plan Project Number:	06-03-245468-00027
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Guineo Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245468-00027

Federal Information

(provided by FEMA)

Damage Number	245468
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Guineo Reservoir		18.159558, -66.526433

2.2. Facilities Description

The **Guineo Reservoir** is impounded by **Guineo Dam**, an earthen dam used to collect and store water for irrigation, potable water and hydro-electric generation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Guineo Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$1.25** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Guineo Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Guineo Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$0.14**
Final Design and Engineering (including 30%)	**$0.19**
Construction	**$1.06**
Total Project Estimated Cost	**$1.25**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Guineo Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Guineo Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Loco Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245470
PREPA 10-Year Plan Project Number:	06-03-245470-00053
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Loco Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245470-00053

Federal Information

(provided by FEMA)

Damage Number	245470
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Loco Reservoir		18.042459, -66.887670

2.2. Facilities Description

The **Loco Reservoir** is impounded by **Loco Dam**, a concrete gravity dam used to collect and store water for irrigation and potable water purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Loco Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$2.73** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Loco Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Lco Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$0.31**
Final Design and Engineering (including 30%)	**$0.41**
Construction	**$2.32**
Total Project Estimated Cost	**$2.73**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Loco Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Loco Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Lucchetti Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245473
PREPA 10-Year Plan Project Number:	06-03-245473-00052
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Lucchetti Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245473-00052

Federal Information

(provided by FEMA)

Damage Number	245473
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Lucchetti Reservoir		18.091852, -66.864446

2.2. Facilities Description

The **Lucchetti Reservoir** is impounded by **Lucchetti Dam**, a concrete gravity dam used to collect and store water for irrigation, potable water and hydro-electric generation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Lucchetti Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$35.81** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Lucchetti Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

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survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Lucchetti Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$4.03**
Final Design and Engineering (including 30%)	**$5.37**
Construction	**$30.44**
Total Project Estimated Cost	**$35.81**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Lucchetti Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Antonio Lucchetti Dam

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Matrullas Reservoir – Dredging

(Dams/Hydro)

Damage Inventory Number:	245475
PREPA 10-Year Plan Project Number:	06-03-245475-00028
FEMA Project Number:	To be determined

Revision Number: FINAL, Rev 0 Revision Date: JUNE 04, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Matrullas Reservoir – Dredging (Dams/Hydro)
PREPA Project Number	06-03-245475-00028

Federal Information

(provided by FEMA)

Damage Number	245475
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	FEMA Project Number	GPS Location (of dam)
Matrullas Reservoir		18.210465, -66.480215

2.2. Facilities Description

The **Matrullas Reservoir** is impounded by **Matrullas Dam**, an earthen dam used to collect and store water for irrigation, potable water and hydro-electric generation purposes.

On 20 September 2017, Hurricane Maria made landfall as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rainfall in excess of 24 inches. The heavy rains caused significant storm water discharge through the **Matrullas Reservoir** system leaving behind significant amounts of new sediment resulting in the loss of water storage capacity necessary to maintain adequate water supplies for the region's irrigation and potable water requirements. FEMA has tentatively approved **$3.08** million (see FEMA Attachment 7 document) to remove and dispose of sediment material to restore, at least in part, water storage capacity to near pre-storm conditions.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to restore the water storage capacity of the **Matrullas Reservoir** by removing and disposing of sediment material from critical operational zones within the active water storage regions of the reservoir. Before volumes of sediment and locations requiring dredging can be determined, the current sub-surface conditions and contours of the reservoir must be mapped using bathymetry.

Bathymetric studies involve the measurement of ocean or lake depth through depth soundings. The data used to make bathymetric maps typically comes from an echo-sounder (sonar) mounted beneath or over the side of a boat, "pinging" a beam of sound downward at the seafloor/lake-floor or from remote sensing LIDAR or LADAR systems. Bathymetry studies serve to provide information on the current status of a reservoir depth and contours of the lake bottom.

Based on the proposed bathymetric studies, a plan for sediment removal will be developed. Sediment removal may be performed by mechanical methods (excavator, dragline, clamshell, etc.) or by hydraulic dredging (pipelines with suction, cutter-head, dustpan, etc.) as determined by the successful contractor(s). All work shall compliant local Codes and Environmental Law.

The scope of work for this project consists of the following four (4) phases:

1) Preliminary Engineering Phase: Review available drawings and other records to determine optimal locations where bathymetric surveys should be performed. Prepare an RFP (which will likely be coordinated with surveys of other PREPA reservoirs) to acquire bathymetric

survey services to survey selected areas of the reservoir, especially inlet and outlet structures, water discharge channels and optimal water storage zones. The RFP could also include optional pricing to collect survey data for other areas of the reservoir, up to and including the entire reservoir, which could be used as a baseline for future sedimentation studies. In some cases, integration of both bathymetric and aerial survey data may be recommended.

2) Field Data Collection Phase: Bid and award one or more contracts to perform bathymetric surveys of selected zones within the reservoir, up to and including the entire reservoir (if selected). For improved efficiency, this work may be performed with similar surveys (within one contract) of other reservoirs within PREPA's system. Field data collected will be processed to generate maps and/or drawings that depict subsurface contours of current sedimentation. Sediment sampling and environmental testing may also be included in this phase.

3) Final Design Phase: Evaluate maps and drawings developed during Phase 2 and determine what areas of the reservoir require dredging to restore optimal operation of the reservoir. This work will include identification of appropriate disposal sites, required environmental permitting, and preparation of an RFP for awarding dredging contracts.

4) Construction Phase: Bid and award construction contracts to one or more qualified contractors to perform dredging and disposal operations as determined in phase 3.

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **July 1, 2023** and construction completed on or before **September 1, 2026**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	**Matrullas Reservoir - Dredging ($M)**
Preliminary Engineering to Design (30%); (includes bathymetric survey services)	**$0.35**
Final Design and Engineering (including 30%)	**$0.46**
Construction	**$2.62**
Total Project Estimated Cost	**$3.08**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photo of **Matrullas Dam and Reservoir**.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Matrullas Dam

EXHIBIT B

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Dam Safety
Early Warning System (EWS)

(Water Assets - Dams)

Damage Inventory Numbers:	245470
PREPA 10-Year Plan Project Numbers:	06-03-245470-00054
FEMA Project Numbers:	To be determined

Revision Number: FINAL, Rev 0 **Revision Date: June 28, 2021**

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Early Warning System (EWS) Project *(FEMA 404 Funded)*
PREPA Project Number	

Federal Information

(provided by FEMA)

Damage Number	245470
Damaged Inventory/Asset Category	Hydro, Dams, Irrigatiom, Reservoir and Water Conveyances
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	Damage Number	GPS Location of Dams
Dam Safety Early Warning System (EWS)	245470	See Attachment A

Note: *GPS coordinates are required for all facilities.*

2.2. Facilities Description

The purpose of the **Dam Safety Early Warning System Project** is to install an island-wide early warning system for thirty-seven (37) dams administered by PREPA. The Project will be used to provide public notifications during extreme floods when controlled flood releases could result in major flooding, or when seismic activity causes structural damage to dams that could result in a dam break incident and uncontrolled release of reservoir water. Instrumentation installed as part of the Project can also be used to detect developing failure modes during normal operations.

The prime focus of PREPA's dam safety program is the protection of people and properties from the hazards of dam failures caused by normal operations or by floods and earthquakes. A dam safety Early Warning System is an automated data-acquisition system equipped to transmit and process data, and should include early warning notification features and be programmed to operate without the need for human intervention. It may incorporate a variety of sensors, including reservoir and tail water level monitoring, stream gauges, weather measurements, and other geotechnical instrumentation. The detection of abnormal, hazardous, and/or threatening conditions is the first step in issuing a timely and effective warning.

A dam designed for probable maximum floods based on the estimated probable maximum precipitation and maximum credible earthquakes, as determined by current practices, does not necessarily provide absolute assurance that the dam is safe for every possible flood or earthquake. The dam may fail for other than extreme loads, such as by internal erosion, excessive pore pressure within the dam, or some element of the dam deteriorating over time.

Extreme floods and earthquakes are random events that could occur at any time during the lifespan of a dam. A dam failure can be sudden and devastating. The Project will help guard people and property from the hazards of dam failures caused by normal operations or by floods and earthquakes by providing a warning that such an event is occurring or is imminent.

Puerto Rico's high and intermediate hazard dams have Emergency Action Plans (EAP) to help minimize loss of life in the event of a dam failure. However, EAPs need a trigger to put them in motion. The earlier an imminent dam failure can be detected, the sooner the EAP can be activated and the more effective it will be. An effective EAP will save lives with just minutes of warning.

2.3. Scope of Work Description (e.g., Plan for Repair)

The conceptual early warning system development goals include the following steps:

1. Evaluate existing and develop supplemental dam safety surveillance and monitoring instrumentation plans to facilitate timely notifications when initiation of potential failure modes has been detected.

2. Develop conceptual system architecture for automatic data acquisition, data reduction, presentation, evaluation, interpretation, and verification using currently available technology.
3. Establish action states for sensor threshold levels and limit levels requiring action the dam owner, including automatic activation of warning systems and notifications to emergency responders and the public.
4. Evaluate existing island-wide communications systems and develop conceptual enhancements to strengthen and improve early warning capability.
5. Develop preliminary benefit/cost estimates for each site.

This preliminary engineering phase of the Project will develop the basic system architecture, preliminary design plans and specifications, design alternatives/options for sites, environmental data collection, line item budgets, and a budget narrative.

Each early warning system will monitor the risk of a dam rupture or other failure, and:

1. Alert dam operations and control personnel through existing and new enterprise asset management tools, as well as via SMS (text) and email.
2. Notify first responders via SMS and email.
3. Sound a warning signal to vulnerable areas downstream within an hour of an emergency (or immediately if disaster is imminent).
4. Notify public present in vulnerable areas via SMS alerts.

The dam performance monitoring and early warning system should be based on current best practices in dam safety. This includes potential failure modes analysis and risk informed decision making for each dam and for each loading condition. A determination must be made of what can and should be monitored, what data thresholds and limit levels should result in actions to verify and evaluate impending or actual dam failures, and when warnings should be initiated to provide reliable early warning to downstream stakeholders and emergency responders.

Each dam may have existing manual, semi-automatic, or automatic data acquisition instrumentation for dam safety monitoring dam performance. The Consultant must review the current instrumentation types and arrays to determine if these can be incorporated into the proposed early warning system or if supplemental instrumentation is required as part of the early warning system.

Development of the final design package, including detailed plans, specifications, permits and submittal of a **Detailed SOW to CORE3** and **FEMA** will be completed on or before January 01, 2024 and construction is expected to be completed on or before December 31, 2026.

2.4. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Improved Project

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

2.5. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 3. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

3.1. Codes, Specifications, and Standards

Yes If yes, describe how incorporated below.
Approved codes and standards will be incorporated into the SOW and final plans and specifications.

3.2. Industry Standards

Yes If yes, describe how incorporated below.
Appropriate industry standards will be identified during the preliminary engineering phase and incorporated into the final scope of work document, design plans, and project specifications.

Section 4. Cost Estimates

Cost estimates to complete the work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. This estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost. These costs were developed from the Detailed Damaged Descriptions provided for each damage number. If further repairs and/or improvement are needed beyond the scope and/or quantities defined within these reports the costs will subject to change.

4.1. Dam Safety Early Warning System (EWS) Project

Early Warning System (245470)

Cost Type	Amount ($M)
Preliminary Engineering to Design (30%)	$10.0
Final Design and Engineering (including 30%)	$30.0
Construction	$70.0
Total Project Estimated Cost	$100.0

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 5. 406 Hazard Mitigation Proposal

5.1. 406 Mitigation Opportunity Scope of Work

Since this project is being funded through a FEMA 404 project funding source for Hazard Mitigation Grant Program (HMGP), FEMA 406 Hazard Mitigation does not apply.

Section 6. EHP Requirements

EHP considerations (complete EHP scoping document and checklist) will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities.

Section 7. Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

Section 8. PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 9. Attachments

9.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

9.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

9.3. Location Maps and Site Pictures

See Attached:

Attachment A: EWS Dams - GPS Location Coordinates
Attachment B: EWS Dams - Location Map

9.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

EXHIBIT C

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

PROJECT SCOPE OF WORK WITH COST ESTIMATES

Submittal to COR3 and FEMA

Guajataca Dam – Permanent Repairs

(Dams/Hydro)

Damage Inventory Number:	245460
PREPA 10-Year Plan Project Number:	06-01-245460-00001
FEMA Project Number:	To be determined

Revision Number: Draft – 3, For Review

Revision Date: May 18, 2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Guajataca Dam – Permanent Repairs (Dams/Hydro)
PREPA Project Number	To Be Determined

Federal Information

(provided by FEMA)

Damage Number	245460 (06-01-245460-00001)
Damaged Inventory/Asset Category	Island Wide Dams and Hydroelectric Power Plants
FEMA Project Number *(formerly Project Worksheet)*	To Be Determined
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	Number	GPS Location
Guajataca Dam		18.397585, -66.923715

2.2. Facilities Description

The Guajataca Dam is an earthen dam used to collect and store water for irrigation and potable water purposes. The reservoir has a normal surface area of 1.6 square miles (4.1 square kilometers), its length is 2.5 miles (4.0 kilometers), its maximum width is 1 mile (1.6 kilometers), and its maximum discharge is 28,954 cubic feet (819.9 cubic meters) per second. Its normal storage capacity is 30,055 acre feet (37 million cubic metres), and its drainage basin is 31 square miles (80 km).

Hurricane Maria made landfall on 20 September 2017 as a Category 4 storm near Yabucoa, Puerto Rico with sustained winds of 155 mph and rains in excess of 24 inches. The heavy rains caused significant storm water discharge through the Guajataca Dam service spillway, a spillway that allows for emergency discharges, causing failure of the spillway structure at its outfall. The damage to the spillway involved severe erosion and collapse of the concrete lining with progressive erosion moving toward the crest of the spillway. The erosion also destroyed the water supply line that crossed beneath the spillway channel and severely damaged the dam outlet works.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The purpose of this project is to increase the Guajataca Dam spillway capacity, stabilize the earth embankment and abutment landslide while providing seismic resilience to the dam, resulting in a reduction of the dam's operational risks to below the United States Army Corps of Engineers tolerable risk safety guidelines.

The scope of work will consist of construction works to provide a new stabilization berm, repair of the outlet works improving hydraulic efficiency by installing new gates at the intake tower, enlarge existing water control gates, replacing and realigning the outlet works conduits and construction of a new emergency spillway. All work will be designed in accordance with locally adopted codes and standards and/or FEMA-approved industry standards.

The proposed work is expected to be completed in the following three phases:

1) **Studies and Risk Assessment** – Includes site specific studies and collection of supplemental data which will be evaluated to gain a clear understanding of existing conditions of the Guajataca Dam to assess risks and determine construction measures necessary to permanently repair the dam. The studies may include, but are not limited to, the following:
    a. Subsurface exploration and laboratory testing

b. Site specific seismology analysis
c. Static and dynamic analysis
d. Seepage analysis
e. Develop Probable Maximum Precipitation (PMP) and Probable Maximum Flood (PMF) estimates
f. Structural analysis of intake tower and outlet works
g. Wind and wave analysis
h. Baseline historic property inventory
i. Baseline natural resource assessment
j. Full quantitative risk analysis
k. Dam safety modification study

2) **Design** – Includes design of the repairs required to meet dam safety criteria consistent with USACE design methodologies as described in the current version of ER 1110-2-1156: Engineering & Design, Safety of Dams – Policy & Procedures. This engineering regulation utilizes risk analysis procedures to determine the level of repair necessary to reduce the overall risk of unsatisfactory performance of the dam to a tolerable level. Planned design activities will likely include development of plans and specifications for the following tasks:
    a. Dam instrumentation
    b. New or replacement highway bridge
    c. New spillway and outlet works
    d. Seismic and landslide mitigation
    e. Dam embankment rehabilitation
    f. Value engineering studies
    g. Cultural resource evaluation and coordination
    h. Environmental compliance
    i. Coordination of design reviews and permit applications

3) **Implementation** – Construction of the dam's recommended improvements will be performed under the oversight and supervision of the USACE in the following two service classifications:
    a. Construction Services, including contract acquisition, contract administration, engineering during construction, contract closeout and as-built documentation
    b. Construction Contract, including all labor, equipment and material necessary to construct a new spillway capable of passing the Probable Maximum Flood (PMF), stabilization of the historic landslide, stabilization for earthquake loading of the dam and its appurtenant structures, replacement of the Highway 476 bridge, construction of a new PR-119 bridge, and improvements to the intake tower and outlet works

Development of the final design package, including detailed plans, specifications and permits is anticipated to be completed on or before **January 1, 2025** and construction completed on or before **9/1/2030**.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes. If yes, describe how incorporated below.
Yes, applicable codes and standards will be identified and incorporated into the plans and specifications.

4.2. Industry Standards

Yes. If yes, describe how incorporated below.
Yes, applicable industry standards will be identified and incorporated into the plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the planned work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	Guajataca Dam - Permanent Repairs ($M)
Architectural & Engineering to Design (30%)	**$16.00**
Final Design and Engineering (including 30%)	**$41.00**
Construction	**$525.00**
Total Project Estimated Cost	**$566.00**

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities

Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 8. Attachments

8.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

8.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

8.3. Location Maps and Site Pictures

See attachments for maps and aerial photos of Guajataca Dam.

8.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Guajataca Dam

EXHIBIT D

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

PROJECT SCOPE OF WORK WITH COST ESTIMATES

Submittal to COR3 and FEMA

Palo Seco Demin Water Tank 4 (Generation)

<Insert Project Number Here>

3/11/2021

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Palo Seco Demin Water Tank 4
PREPA Project Number	

Federal Information

(provided by FEMA)

Damage Number	206253
Damaged Inventory/Asset Category	Island Wide Generation Plants
FEMA Project Number *(formerly Project Worksheet)*	
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	Number	GPS Start	GPS End
Palo Seco Power Plant		18.45469, -66.14791	

2.2. Facilities Description

The Palo Seco Power Plant is located in the Municipality of Catano and consists of six simple cycle gas turbines (126MW) and four steam turbines (602MW) with a total capacity of 728MW. After Hurricane Maria, three Mega Gen Pratt-Whitney Gas Turbines were brought on site to provide emergency generation.

Section 3. Scope of Work

3.1. Scope of Work Description (e.g., Plan for Repair)

The operation of the mega gen gas turbines is required as subsequent repairs to other generating units are not all completed and still off-line. In addition, these units will be utilized as a temporary power source to bypass the needs of certain transmission lines and/or generation power plants. This is required to maintain electrical service to customers while eligible work is performed on the transmission lines, generation plants, and other PREPA infrastructure.

To meet the environmental permitting of the units and allow for the operation of the mega gen gas turbines, demin water is required to be supplied to the units. Currently, the Palo Seco site is providing a mixture of condensate and demin water to the mega gen gas turbines. This project is to replace the existing tank 4 with a clean demin water tank to supply demin water to the mega gen gas turbines. The scope will include the necessary piping changes to provide the mega gen gas turbines with demin water.

The final SOW (plans and specifications) will be completed by 9/30/2021 and construction will be completed by 6/30/2022.

A. Scope of work:

Work shall include engineering, design, all labor, materials, equipment, tools, supervision, and services for the design and build of the New Demineralized Water Tank #4 at the Palo Seco Steam Plant. The scope includes the following:

a) Design and Build of a New Tank – design and build of a new 172,730 gallons (nominal capacity) steel demi water tank with the following dimensions; (Diameter=35 ft. Height=24 ft.). The new tank shall be fitted with a spiral stairway, self-supported umbrella roof, top platform (10 ft. x 6 ft.), top catwalk to access adjacent tank roof, level indication, level transmitter, grounding, tank identification, etc. Tank design shall be based on the latest revision of API-650 code. A complete internal and external coating system shall be applied as per specifications. Contractor shall be responsible for all required rigging, safety, environmental permits and the appropriate store of the coatings, grit blast material, and equipment. The works shall include:

a. Perform all tasks, documentation requirements, and pay all fees regarding the approval of the OGPe's "Permiso Único Incidental Operacional (Permiso General Consolidado)".

b. The Environmental Document ("Exclusión Categórica") shall be PREPA's responsibility.

c. PREPA shall execute any soil studies and provide the following technical data for the design of the tank:

    i. Soil Bearing Capacity.

    ii. Site Seismic Classification

d. Design and construction of a tank with the following dimensions; D=35 ft. H=24 ft. with a nominal capacity of 172,730 gallons. The latest edition of API-650 code for the tank design must be implemented. The design shall be performed and stamped by a Professional Engineer.

e. The corrosion allowance shall be 1/16".

f. Anchors design calculation shall be performed in accordance to API-650 latest edition and using a Seismic Use Group II (SUG II), Importance factor (I) of 1.25.

g. Fluid considered for the design shall have a pH range of 5.5 to 8.5

h. Spiral type stairway shall be 36" wide with a 10' x 6' top platform. Also a catwalk shall be fabricated to allow access to the adjacent tank roof. Construction shall be in hot dipped galvanized steel.

i. Every attachment or support connected to the tank shell shall be dressed with a reinforcing plate.

j. Wind velocities for the design shall be in accordance with the Puerto Rico Building Code specific for the site (maps), but never less than 179 mph for ultimate.

k. Contractor shall follow API-650 (and reference codes) for the tank, ASME B31.3 for piping, AISC for pipe supports structural steel and IBC for foundations.

l. Installation of new illumination system including wiring, conduit, poles and luminaires.

m. Provide tank grounding and shall be connected to the existing power plant grounding mat.

n. One (1) 6" Ø (minimum) overflow pipe shall be included, fabricated with stainless steel schedule 10S and shall be fitted with a water seal formed with a candy cane shape (2-90° elbows) at the bottom position. The arrangement shall be prepared with a ½" stainless steel ball valve that shall be fed from the new Demineralized (Demi) Water Pumps Suction Header passing nearby.

o. Provide One (1) 24" Ø roof manhole, two (2) 2" Ø roof flanged nozzles shall be installed at the north location for recirculation and return demi water piping and one (1) 4" Ø roof flange nozzle (radar level gauge).

p. Provide a non-contacting radar for tank liquid level measurement. The signal output shall be 4-20 mA with digital signal base on HART protocol. Housing material shall be aluminum, ½"-14 NPT conduit connection, stainless steel 316L cone antenna with PTFE seal, 4" Ø stainless steel raised face flange (ASME B16.5 Class 150) process connection, calibration data certificate, instrument accuracy of +/- 0.08" and frequency modulated continuous wave measurement principle..

q. Provide one (1) 10" Ø (minimum) roof vent fitted with an air filter shall be installed. The filter shall be an element type. The filter housing shall have a 10" 150# ANSI flanged connection, stainless steel 304 safety screen, cap design cover, 5-10 microns low pressure drop filter element and 3,000 cfm capacity.

r. Provide two (2) 30" Ø shell manholes, one (1) 2" Ø low type reinforced flanged connection with isolation 150# gate valve and blind flange (future pressure sensor for tank water level), one (1) 6" Ø low type reinforced flanged connection with isolation 150# gate valve and blind flange (drain), one (1) 8" Ø low type reinforced flanged connection (Inlet), one (1) 6" Ø low type reinforced flanged connection (Outlet).

s. Provide an external liquid level indicator (float and tape type) with an integral electronic transmitter for tank level measuring.

t. Perform, as per API-650 a hydrostatic testing on the new tank.

u. Perform interior and exterior surface preparation and coating application on the tank. Perform all quality control testing on the coating application.

b) Modification to the Demineralized (demi) Water Pipe Headers – a modification to the existing demi water pipe headers, equalization headers and the demi water pumps recirculation and Mega Gens Generators demi water return piping. The works shall include:

a. Removal of the existing 65 ft Demi Water Header #1 (8" Ø), the existing Demi Water Header #2 (8" Ø), a 60 ft piping segment of the existing Equalization Header (4" Ø) and a 70 ft piping segment of the existing demi water transfer pumps suction header (6" Ø).

b. Existing valves V1 and V2 shall be removed from Demineralized Water Tanks #1 & #2 and reused for the New Equalization Header Double Check Valve Arrangement. Existing valves V3 and V4 shall be relocated to these locations and shall be fitted with stainless steel 316 blinded flanges and double isolation flange kits. Two separate 8 hours windows will be available for the removal and installations of these valves.

c. Reutilize the existing Mega Generators Demi Water Transfer Pumps suction header piping (6" diameter stainless steel 316 sch.10) for the new suction header from the New Demi Water Tank #4. Contractor shall be responsible for the additional piping and fittings required for the new header. Bidders shall be responsible for the material take-off. Re-purpose piping shall be trimmed to remove at least 6" of length from existing welds. Existing fittings shall not be re-used.

d. The new Mega Generators Demi Water Transfer Pumps suction header shall be fabricated from the Demi Water Tank #4 as depicted in drawings. Contractor

shall be responsible for all construction drawings and fabrication including new pipe supports.

e. A new Double Check Valve Arrangement for the Equalization Header shall be fabricated and installed as per drawings. The material of the arrangement shall be stainless steel 316L. Note that valves V1 and V2 are existing to be re-used and valves V21, V22, V33, and drain valve will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe flanges at both sides. The arrangement shall be 6" diameter with a transition to the 4" diameter existing header.

f. Install at least 60 ft of new 6" diameter stainless steel 316 L Sch.10 pipe from V33 to V1, upstream section from the new suction header for the Mega Generators Demi Water Transfer Pumps. Contractor shall include all materials. Note that valve V1 is existing and V33 will be procured by PREPA.

g. A new Double Check Valve Arrangement for the Demi Water Header #1 shall be fabricated and installed as per drawings. The material of the arrangement shall be stainless steel 316L. Note that valves V23, V24, V25, V26, and drain valve will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe flanges at both sides. The arrangement shall be 8" diameter. The arrangement shall be fabricated/installed between the riser coming from the Demi Plant and the first header branch that feed Demi Tank #1.

h. The pipe segment from the Demi Water Tank #4 to the new Double Check Valve Arrangement for the Demi Water Header #1 shall be replaced with 8" diameter stainless steel 316L sch. 10 pipe. Note that valve V31 will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe, flanges, fittings, etc.

i. A new Double Check Valve Arrangement for the Demi Water Header #2 shall be fabricated and installed as per drawings. The material of the arrangement shall be stainless steel 316L. Note that valves V27, V28, V29, V30 and drain valve will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe flanges at both sides. The arrangement shall be 8" diameter. The arrangement shall be fabricated/installed adjacent to the existing isolation valve in the upstream position.

j. New cartridge filters (CF-1 & CF-2) arrangement shall be fabricated/installed as per drawings. The material of the arrangement shall be stainless steel 316L. Note that Cartridge Filter 1 & 2, valves V17, V18, V19, V20, indicators isolation valves, drain valves, vent valves, and differential pressure indicators will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe flanges, fittings, etc. This task shall be scheduled with priority.

k. New suction header for the Mega Generators Demi Water Transfer Pumps (6" diameter stainless steel 316 sch.10) as per drawings. As stated before, Contractor could reutilize the existing Mega Generators Demi Water Transfer Pumps suction header piping (6" diameter stainless steel 316 sch.10) for the new suction header from Demi Water Tank #4. Note that valve V32 will be procured by PREPA. Everything else shall be procured by the Contractor, including the

required pipe flanges, fittings, etc. Contractor shall also be responsible to wire and configure the new pressure transmitter into the existing pumps PLC control unit. The new configuration shall include alarms and pumps shut down based on the pressure drop across the cartridge filters. Contractor shall coordinate with the original PLC control designer (Engineered Parts and Services, Vega Alta, P.R.).

l. Mega Generators Demi Water Transfer Pumps discharge header modifications (4" diameter stainless steel 316 sch.10) as per drawings. Note that the pressure indicating transmitter and the pressure indicator shown on drawings in this line will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe flanges, fittings, etc. The Contractor shall also be responsible to wire and configure the new pressure transmitter into the existing pumps PLC control unit. The new configuration shall include alarms and pumps shut down based on the pressure drop across the cartridge filters. Contractor shall coordinate with the original PLC control designer (Engineered Parts and Services, Vega Alta, P.R.). This task shall be scheduled with priority.

m. New 2" diameter stainless steel 316 L sch.10 branch from the Mega Generators Demi Water Transfer Pumps recirculation line to the new 2" flanged Demi Water Tank #4 roof connection (included in the tank's scope). Note that valve V34 will be procured by PREPA. Everything else shall be procured by the Contractor, including the required pipe flanges, fittings, etc.

c) Contracts included on this Project:

a. Contract 89722 – Design and Construction of a New Demi Water Tank # 4 at a cost of $988,000. (Contractor – Alonso & Carus Iron Works, Inc.)

b. Contract 89705 – New Stainless Steel Piping and Fitting at the Palo Seco Steam Plant at a cost of $285,700.(Contractor – Enersys Engineering, Corp.)

c. Contract 89300 - Soil Study for the Demi Tank 4 at the Palo Seco Steam Plant at a cost of $7,585. (Contractor – Earth Engineers, Inc.)

d. Contract 89189 – Demin Water Supply Line Filters and Valves – Palo Seco Mega Gens at a cost of $151,915 (Contractor – Engineered Parts and Services).

d) Project Duration – The total time for the execution of the above mentioned contracts is 264 days, commencing on December 10, 2021 and finishing on August 31, 2021.

3.2. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Restores to Codes/Standards

See scope of work above.

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

3.3. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 4. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

4.1. Codes, Specifications, and Standards

Yes **If yes, describe how incorporated below.**
Applicable codes and standards will be identified and incorporated into the final SOW, plans and specifications.

4.2. Industry Standards

Yes If yes, describe how incorporated below.
Applicable industry standards will be identified and incorporated into the final SOW, plans and specifications.

Section 5. Cost Estimates

Cost estimates to complete the work have been generated at a class 5 level, which is between -50% and +100% of the final project cost. The estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost.

Cost Type	Amount ($M)
Architectural & Engineering to Design (30%)	0.46
Final Design and Engineering (Including 30%)	1.15
Construction	1.40
Total Project Estimated Cost	2.55

Section 6. 406 Hazard Mitigation Proposal

6.1. 406 Mitigation Opportunity Scope of Work

During the 30% design phase, PREPA will develop and propose 406 Hazard Mitigation proposals consistent with the damages. These proposals will be documented with BCAs.

6.2. 406 Mitigation Opportunity Cost Estimate

PREPA will provide cost information and BCAs for 406 Hazard Mitigation proposals submitted for this project.

Section 7. EHP Requirements

EHP considerations will be identified and evaluated during the 30% design phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents to be approved by FEMA prior to construction activities.

Section 8. Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

Section 9. PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 10. Attachments

10.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

10.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

10.3. Location Maps and Site Pictures

10.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Palo Seco Power Plant.pdf

EXHIBIT E

Government of Puerto Rico

Puerto Rico Electric Power Authority

DR-4339-PR Public Assistance

Initial SOW

PROJECT SCOPE OF WORK with COST ESTIMATES

Submittal to COR3 and FEMA

Patillas Dam – Seismic Retrofit Project

(Water Assets - Dams)

Damage Inventory Numbers:	TBD
PREPA 10-Year Plan Project Numbers:	TBD
FEMA Project Numbers:	TBD

Revision Number: FINAL, Rev 0 **Revision Date: June 28, 2021**

Introduction

The purpose of this document is to present and update a Project Scope of Work (SOW) with Cost Estimates to be submitted to COR3 and FEMA for projects under DR-4339-PR Public Assistance. The completed document will be reviewed by COR3 and FEMA to create and version a specific project worksheet and post fixed-cost estimates to repair, restore, or replace eligible facilities including Section 406 hazard mitigation for a specific project.

Puerto Rico Electric Power Authority (PREPA) is the agency that provides the electric service to the entire island of Puerto Rico. As such, the facilities, sites, and systems identified in this Scope of Work are eligible as critical services facilities as defined in the PAAP (Section 428) and BBA 2018 guidance documents. Additional details may be found in Sections 3 and 4, respectively.

This document will be updated with information developed during the initial design and engineering phase through the construction phase.

The sections included in this document are:

- *Project Information*
- *Facilities*
- *Scope of Work*
- *Codes and Standards*
- *Cost Estimate*
- *406 Hazard Mitigation Proposal*
- *Environmental and Historic Preservation (EHP) Requirements*
- *Program Manager Certification*
- *PREPA Project Sponsor Comments*
- *Attachments*

Document Revision History

Version	Date	Summary of Changes

Section 1. Project Information

General Information

Recipient	Central Office for Recovery, Reconstruction and Resiliency (COR3)
Sub-Recipient	Puerto Rico Electric Power Authority (PREPA)
Project Title	Patillas Dam – Seismic Retrofit Project *(FEMA 404 Funded)*
PREPA Project Number	

Federal Information

(provided by FEMA)

Damage Number	TBD
Damaged Inventory/Asset Category	Hydro, Dams, Irrigatiom, Reservoir and Water Conveyances
FEMA Project Number *(formerly Project Worksheet)*	TBD
Amendment Number	

Program Manager: ***<Name>***

<Insert title here>

PREPA Project Sponsor: ***<Name >***

<Insert title here>

Section 2. Facilities

2.1. Facilities List

Name	Damage Number	GPS Location of Dam
Patillas Dam – Seismic Retrofit Project	TBD	18.019128, -66021508

Note: *GPS coordinates are required for all facilities.*

2.2. Facilities Description

The **Patillas Dam** is an earthen embankment dam located at the confluence of the Rio Patillas and Rio Marin rivers in the south-eastern region of Puerto Rico. It was designed and constructed by the Puerto Rico Irrigation Service in 1914, and is now owned and operated by the Puerto Rico Electric Power Authority (PREPA). The Patillas dam and reservoir is part of the island's critical water resource infrastructure and provides water for power generation, agricultural irrigation and public water supply for 100,000 persons in the island's southeast sector.

Patillas Dam was constructed by hydraulic fill methods, which typically produces zones of low-density soils within the embankment. The low density of embankment and foundation soils has been confirmed by subsurface investigations. Therefore, Patillas Dam is susceptible to significant deformations caused by seismically induced ground motions.

There is a potential for very severe earthquakes in the Patillas Dam vicinity due to the proximity of several major geologic faults, including the Great Southern Puerto Rico Fault Zone and the Muertos Trough off the southern coast of Puerto Rico. The potential exists for earthquake ground motions in the vicinity of Patillas Dam to be large enough to induce soil liquefaction due to the low density of the embankment and foundation soils. This can result in a dam breach and catastrophic loss of stored water in the reservoir. Consequently, a voluntary temporary reservoir water surface elevation reduction has been implemented by PREPA to increase the factor of safety against liquefaction in the embankment dam. A seismic retrofit for the Patillas Dam will allow restoration of normal operating reservoir water surface elevations that are required to meet critical water resources for power, irrigation, and public water supply.

2.3. Scope of Work Description (e.g., Plan for Repair)

To mitigate adverse effects of excessive deformations and a potential dam breach induced by strong seismic events, alternatives have been evaluated by PREPA. Some of these alternatives are as follows:

1. Resume normal operation without implementing any risk reduction measures.
2. Construct a new dam and remove or decommission the old one.
3. Lower the operational level of the reservoir pool level permanently to a point of reducing risk to acceptable levels, which would result in inadequate water supply during drought periods.
4. Investigate all engineering components of the dam, develop plans and specifications to design a permanent risk reduction dam modification, which would allow water levels to return to normal operating levels.

After discussing the pros and cons of the above alternatives, PREPA decided to investigate all engineering components of the dam. This will result in development of design plans and specifications to construct a permanent risk reduction dam modification. PREPA has initiated studies and plans to develop conceptual designs for a seismic retrofit design to improve the seismic stability of the embankment dam.

PREPA is currently developing preliminary designs for options 2 and 4, whereby more accurate cost estimates can be determined for each option. The two options envisioned, 1) modifying the existing dam by placing a substantial amount of structural fill material on both upstream and downstream slopes of the earthen embankment to stabilize the dam, or 2) construct a new dam downstream of the existing one using roller compacted concrete (RCC) techniques, will be further evaluated by performing a detailed risk analysis and a benefit/cost analysis to determine the best, most cost effective method of reducing the seimic risks associated with Patillas Dam.

Development of the final design package, including detailed plans, specifications, permits and submittal of a **Detailed SOW to CORE3** and **FEMA** will be completed on or before January 01, 2024 and construction is expected to be completed on or before December 31, 2029.

2.4. Type of Project

Indicate whether the intended plan is a(n):

1. **Restoration to Codes/Standards**: Restores the facility(s) to pre-disaster function and to approved codes/standards
2. **Improved Project**: Restores the pre-disaster function of the facility(s) and incorporates improvements including any:
    a. Other improvements, not required by codes and standards
    b. Changes in facility size, capacity, dimension, or footprint
3. **Alternate Project:** Does not restore the pre-disaster function of the damaged facility(s)

Choose One (Restoration, Improved or Alternate) *If improved, provide the changes in facility size, capacity, dimension, or footprint. If alternate, provide rationale for recommendation.*
Improved Project

Note: *If 30% A&E work has not been completed, the type of work designation is considered initial and is based on currently available information. The type of work designation may be revised based on the results of the completed 30% A&E work.*

2.5. 30% Architectural and Engineering (A&E)

Is architectural and engineering funding required to help define the intended scope of work?

Yes

Section 3. Codes and Standards

Which of the following types of codes, specifications, and standards apply to the restoration, replacement, relocation, or alternate scope of work?

3.1. Codes, Specifications, and Standards

Yes	If yes, describe how incorporated below.
	Approved codes and standards will be incorporated into the SOW and final plans and specifications.

3.2. Industry Standards

Yes	If yes, describe how incorporated below.
	Appropriate industry standards will be identified during the preliminary engineering phase and incorporated into the final scope of work document, design plans, and project specifications.

Section 4. Cost Estimates

Cost estimates to complete the work have been generated at a Class 5 level, which is between -50% and +100% of the final project cost. This estimate includes materials, construction labor and equipment, engineering, permitting, management, and contingencies. For the engineering estimates provided, the 30% Engineering estimate is a subset of the Engineering Total, which is a subset of the Total Cost. These costs were developed from the Detailed Damaged Descriptions provided for each damage number. If further repairs and/or improvement are needed beyond the scope and/or quantities defined within these reports the costs will subject to change.

4.1. Patillas Dam Seismic Retrofit Project

Patillas Dam (XXXXXX)

Cost Type	Amount ($M)
Preliminary Engineering to Design (30%)	$50.0
Final Design and Engineering (including 30%)	$150.0
Construction	$408.0
Total Project Estimated Cost	$558.0

Note: *If available, detailed engineering cost estimates will be included as an attachment.*

Section 5. 406 Hazard Mitigation Proposal

5.1. 406 Mitigation Opportunity Scope of Work

Since this project is being funded through a FEMA 404 project funding source for Hazard Mitigation Grant Program (HMGP), FEMA 406 Hazard Mitigation does not apply.

Section 6. EHP Requirements

EHP considerations (complete EHP scoping document and checklist) will be identified and evaluated during the preliminary engineering (30% design) phase and submitted to FEMA for review. Requirements will be incorporated into the final design and construction documents approved by FEMA prior to construction activities.

Section 7. Program Manager Lead Certification

Based on my knowledge and information available to date, I certify that the contents of this document accurately reflect the project scope of work and cost estimates.

_____	_____
Program Manager's Printed Name	Date
_____	_____
Title	Signature

Section 8. PREPA Project Sponsor Comments

Comments
<Insert any comments here>

_____	_____
PREPA Project Sponsor's Printed Name	Date
_____	_____
Title	Signature

Section 9. Attachments

9.1. Project Detailed Cost Estimates

<Insert project detailed cost estimates from A&E here (if available)>

9.2. Engineering Studies and Designs

<Insert engineering studies and designs (if available)>

9.3. Location Maps and Site Pictures

See Attached:

Attachment A: Patillas Dam – General Plan
Attachment B: Patillas Dam – Soil Boring Layout
Attachment C: Patillas Dam – Dam Failure Inundation Map

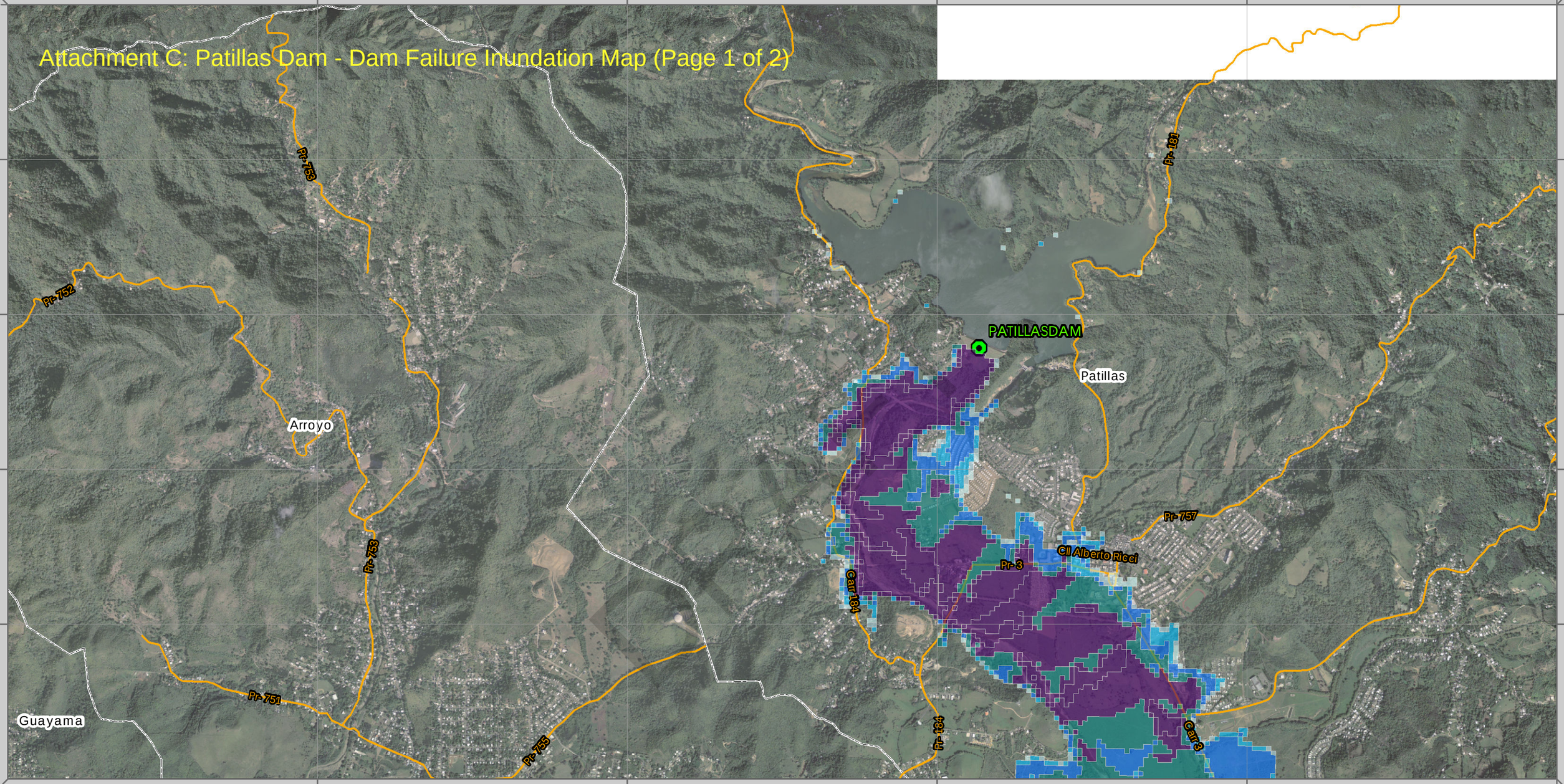
9.4. Other: (Please Describe)

<Insert other documents attached to this submittal>

Attachment A: Patillas Dam – General Plan

Attachment B: Patillas Dam showing exploratory soil boring locations during initial assessment of the dam's stability.

Attachment C: Patillas Dam - Dam Failure Inundation Map (Page 1 of 2)



Patillas Dam
Approximate Inundation Map
Rapid Breach Scenario

FEMA

STARR II Strategic Alliance for Risk Reduction

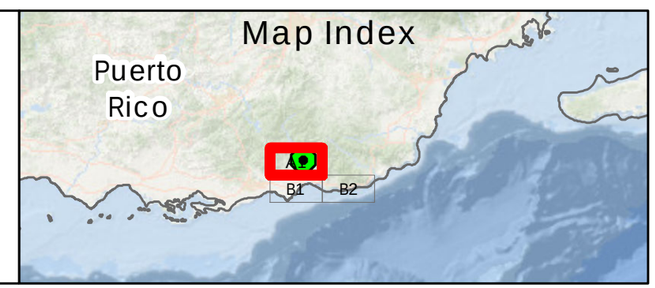
Legend

Inundation Area
- Above 1.0 Feet
- Above 2.0 Feet
- Above 3.0 Feet
- Above 6.0 Feet
- Above 12.0 Feet
- Above 18.0 Feet
- National Inventory of Dams
- Roads
- Municipality Boundary

0 5 10 20 Miles

N

Notes:
Year Constructed: 1976
Height: 127.00 ft
Peak Storage: 17,073 cu. ft



Attachment C: Patillas Dam - Dam Failure Inundation Map (Page 2 of 2)

Patillas Dam
Approximate Inundation Map
Rapid Breach Scenario

FEMA

STARR II Strategic Alliance for Risk Reduction

Legend

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Map Index