



**US Army Corps  
of Engineers**  
Jacksonville District

**FINAL**

**Compensatory Wetland Mitigation Plan**  
Improvements for Shore Protection  
Highway 187 at Piñones,  
Loíza, Puerto Rico

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## TABLE OF CONTENTS

<b>1.0</b>	<b>PROJECT DESCRIPTION</b> .....	1
<b>2.0</b>	<b>USE OF MITIGATION BANK</b> .....	1
<b>3.0</b>	<b>PROPOSED COMPENSATORY MITIGATION PLAN</b> .....	1
	3.1 Purpose and Goal .....	1
	3.2 Mitigation Site Selection, Ownership, and Coordination.....	2
	3.3 Mitigation Site General Conditions .....	2
	3.4 Mitigation Site Protection and Long-term Management.....	7
	3.5 Mitigation Work Plan .....	7
	3.6 Maintenance and Monitoring .....	11
	3.6.1 Maintenance.....	11
	3.6.2 Monitoring.....	11
<b>4.0</b>	<b>CRITERIA FOR ECOLOGICAL SUCCESS AND PERFORMANCE STANDARD</b> .....	12
<b>5.0</b>	<b>CONTINGENCY PLAN</b> .....	12
<b>6.0</b>	<b>ANNUAL CONSULTATION WITH FEDERAL/COMMONWEALTH AGENCIES</b> .....	13
<b>7.0</b>	<b>REFERENCES</b> .....	14

## LIST OF FIGURES

<b>Figure 1</b>	- Site Location “El Terraplén” .....	3
<b>Figure 2</b>	- Proposed Mitigation Site Location.....	4
<b>Figure 3</b>	- Mitigation Site Soil Map .....	5
<b>Figure 4</b>	- Mitigation Site Landscape.....	6
<b>Figure 5</b>	- Mitigation Site Limits, Edge of Mangroves, and Topographic Survey .....	9
<b>Figure 6</b>	- Designated Area for Placement/Storage of Excavated Suitable Material and Chip/Mulch .....	10

# FINAL

## COMPENSATORY WETLAND MITIGATION PLAN

Improvements for Shore Protection  
Highway 187 at Piñones, Loíza, Puerto Rico

### 1.0 PROJECT DESCRIPTION

The Jacksonville District, U.S. Army Corps of Engineers (USACE) has prepared this mitigation plan (MP) to compensate for wetland impacts associated with the Highway 187 Shore Protection Project in Piñones, Loíza, Puerto Rico, as authorized by Section 103 of the Rivers and Harbors Act of 1962. It complies with the requirements of Section 2036 of the Water Resources Development Act of 2007 (WRDA 2007) and follows the guidance on mitigation from the Council on Environmental Quality (January 2011).

The Highway 187 Shore Protection Project was conducted in cooperation between USACE, the Department of Natural and Environmental Resources (DNER) and the Puerto Rico Highway and Transportation Authority (PRHTA). The project consisted of the construction of flood protection improvements to sections of Highway 187 by means of an on-shore breakwater, by raising segments of the highway to 10 feet NGVD and by armoring its ocean side with stone revetment. As a result of project construction, it was estimated that approximately 3.95 acres of mangroves (estuarine) wetlands were impacted. This impact was anticipated, assessed and publicly coordinated via an Environmental Assessment and Finding of No Significant Impact (EA/FONSI), in March 1997. The mitigation plan calls for restoration/creation of 4.75 acres of mangrove wetlands, as per the commitment reached during the project planning process.

### 2.0 USE OF MITIGATION BANK

A search of mitigation bank service areas was conducted and there are no mitigation banks in Puerto Rico. Therefore, the use of a mitigation bank was discarded for this project.

### 3.0 PROPOSED COMPENSATORY MITIGATION PLAN

#### 3.1 Purpose and Goal

- a) Purpose: Restore/create 4.75 acres of mangrove wetlands to compensate for unavoidable impacts to wetland areas resulting from the Highway 187 Shore Protection Project.
- b) Goal: The long-term goal of the MP is to provide a self-sustaining high quality mangrove habitat to increase the overall health of the ecosystem and to provide biological functions lost as a result of the authorized wetland impacts.

### 3.2 Mitigation Site Selection, Ownership, and Coordination

In order to compensate the wetland impacts associated with the Highway 187 Shore Protection Project, the USACE prepared and circulated a conceptual compensatory mitigation plan, in 2006. The mitigation plan called for the on-site restoration/creation of 4.75 acres of mangrove wetlands in the area known as “El Terraplén”, as per the commitment reached during the project planning process. The proposed mitigation site was located at the western end of the constructed project to the south, and to the north of the Piñones State Forest. The area is currently being used as a parking lot by commercial kiosk and beach users (**Figure 1**). The effects this could have on the mitigation ecological success have been discussed with the resource agencies. As a result, during a meeting held on September 13, 2012, between USACE, DNER, PRHTA and the Fish and Wildlife Service (FWS) personnel, it was recommended to identify additional potential areas for the mitigation project within the Piñones State Forest.

On November 29, 2012, USACE, FWS and DNER personnel met to discuss possible site locations. During the meeting, a suitable previously disturbed upland site for the mitigation project was identified and visited. The site is located next to the Piñones State Forest facilities and it is bordered by existing mangrove wetlands (**Figures 1 and 2**). In a letter dated December 6, 2012, FWS recommended to proceed with the use of this site for mitigation and survey the area for an accurate acreage, in coordination with DNER. In order to proceed with the mitigation plan development and to survey the area, on April 17, 2013, DNER concurred and authorized the use of this site. It was surveyed and the needed 4.75 acres are currently available for the mitigation project.

### 3.3 Mitigation Site General Conditions

The Piñones State Forest is located on the northeastern coast of Puerto Rico in the municipality of Loíza and is managed and operated by DNER. It is a significant natural resource and the most extensive mangrove forest in Puerto Rico. It consists of approximately 1,560 acres (DNER, 2008). This protected area is bound by the Boca de Cangrejos Estuary and Torrecilla Lagoon in the west, the islet of Juan Pérez in the east, the Atlantic Ocean in the north, and the Cangrejo Abajo and Cerámica communities in the south (NOAA, 2009). The forest provides commercial fish nursery, organic matter export and wildlife (bird) habitat benefits for a great diversity of native and migratory species. It is considered a primary coastal wildlife area. As an urban forest, it also provides significant fishery and outdoor recreation benefits to residents of San Juan and Carolina (Cardona and Rivera 1988; USACE, 1997).

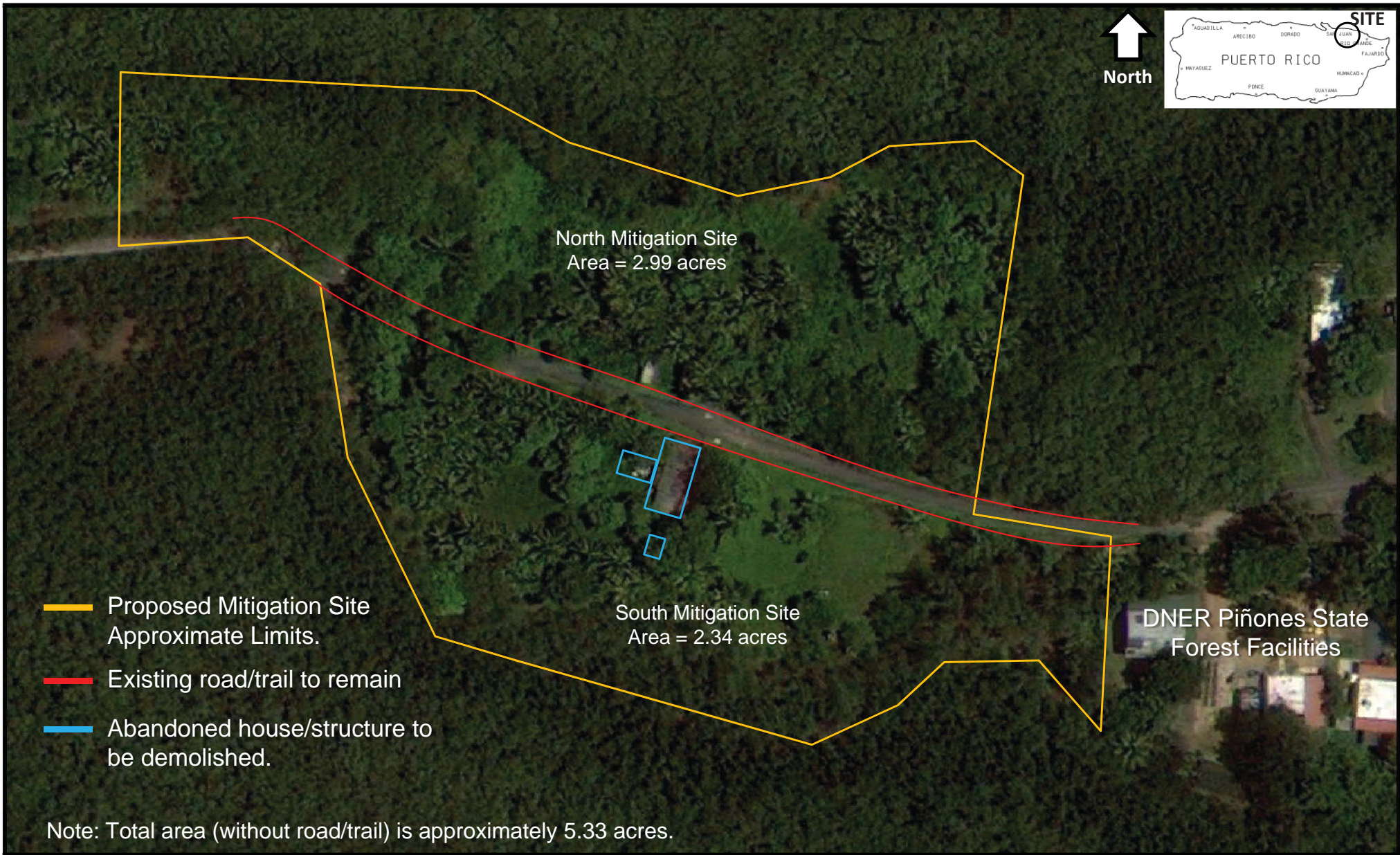
- a) Location: The proposed mitigation site is an upland parcel located next (west) to the Piñones State Forest facilities (**Figures 1 and 2**).
- b) Soils: There are two different soils found within the mitigation site. They are Corcega sandy loam (Cs) and Tidal swamp (Ts). The site is dominated by Cs (**Figure 3**). Both are described as frequently flooded.



**Figure 1: Site Location "El Terraplén"**

Imagery Source: Google Earth

**Compensatory Wetland Mitigation Plan  
Improvements for Shore Protection , Highway 187  
Piñones, Loíza, Puerto Rico**



**Figure 2: Proposed Mitigation Site Location**

Imagery Source: Google Earth

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 Improvements for Shore Protection , Highway 187  
 Piñones, Loíza, Puerto Rico**



**Figure 3: Mitigation Site Soil Map**

Source: NRCS Web Soil Survey  
<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

**Compensatory Wetland Mitigation Plan  
 Improvements for Shore Protection , Highway 187  
 Piñones, Loíza, Puerto Rico**



- c) Vegetation: The site is bordered by mangroves and the landscape is dominated by a mix of coastal trees such as coconut palm (*Cocos nucifera*), tropical almond (*Terminalia catappa*), Australian pine (*Casuarina equisetifolia*), and mango (*Mangifera indica*) trees (**Figure 4**). Several Ceiba (*Ceiba pentandra*) trees were observed within the site and they will be marked and protected as part of the mitigation project.



**Figure 4. Mitigation site landscape.**

- d) Hydrology: The mangrove forest that bordered the proposed mitigation site is subject to tidal flooding (or is inundated by daily high tides). The proposed mitigation site is adjacent to the Piñones Lagoon (east), La Torrecilla Lagoon to the west and the Atlantic Ocean to the north.
- e) Threatened and Endangered Species: According to the 2011 FWS Caribbean Endangered Species Map, the following species have the potential to occur in the municipality of Loíza: Loggerhead (*Caretta caretta*), Green (*Chelonia mydas*), Leatherback (*Dermochelys coriacea*) and Hawksbill (*Eretmochelys imbricata*) sea turtles, Antillean Manatee (*Trichechus manatus manatus*), *Schoepfia arenaria* (plant), and *Ternstroemia subsessilis* (plant). None of these species are known to occur in the proposed mitigation site. This information has been



verified with DNER. In addition, in accordance with the *2007 FWS Critical Habitat Designations for Puerto Rico and the U.S. Virgin Island*, there are no designated critical habitats within or adjacent the project site. Therefore, the proposed project is not likely to adversely affect any listed species and/or designated critical habitats. Consultation with FWS and the National Marine Fisheries Service under Section 7 of the Endangered Species Act was completed on September 9, 2013 and September 18, 2013, respectively.

- f) Cultural Resources: A cultural resources reconnaissance survey of the proposed mitigation site was conducted in June 2013. The Institute of Puerto Rican Culture (IPRC) and the State Historic Preservation Office (SHPO) were visited for information concerning previous investigations at the project area. Coordination with SHPO will be on going until the completion of the project. An archaeological monitor meeting the Secretary of the Interior standards shall be present for all earthmoving (e.g. clearing and grubbing) activities. In addition, the archeological monitoring will be conducted in accordance with the USACE archeological monitoring plan dated August 21, 2013, with concurrence by SHPO on September 23, 2013.

### **3.4 Mitigation Site Protection and Long-term Management**

The mitigation site is located within the Piñones State Forest limits, which is managed and operated by DNER. The forest is protected under the Forest Act of Puerto Rico (Law 133 of July 1<sup>st</sup>, 1975) and it was designated as a Natural Reserve on September 20, 1979. This will assure the conservation, management and protection of the mitigation site after project completion.

### **3.5 Mitigation Work Plan**

The MP proposes 4.75 acres of mangrove habitat restoration/creation at the proposed mitigation site. This area would tie into existing mangrove habitat bordering the site. Existing elevations within the restoration/creation areas are higher than the adjacent mangrove communities. Wetland restoration/creation would occur by demolishing the existing abandoned house/structure and shaping and grading these lands to provide the proper elevations for successful development of mangroves. Varying ground contours will allow a mixed growth of black (*Avicennia germinans*) and white (*Laguncularia racemosa*) mangroves. Existing elevations within the adjacent mangrove stand are serving as the best elevation guide.

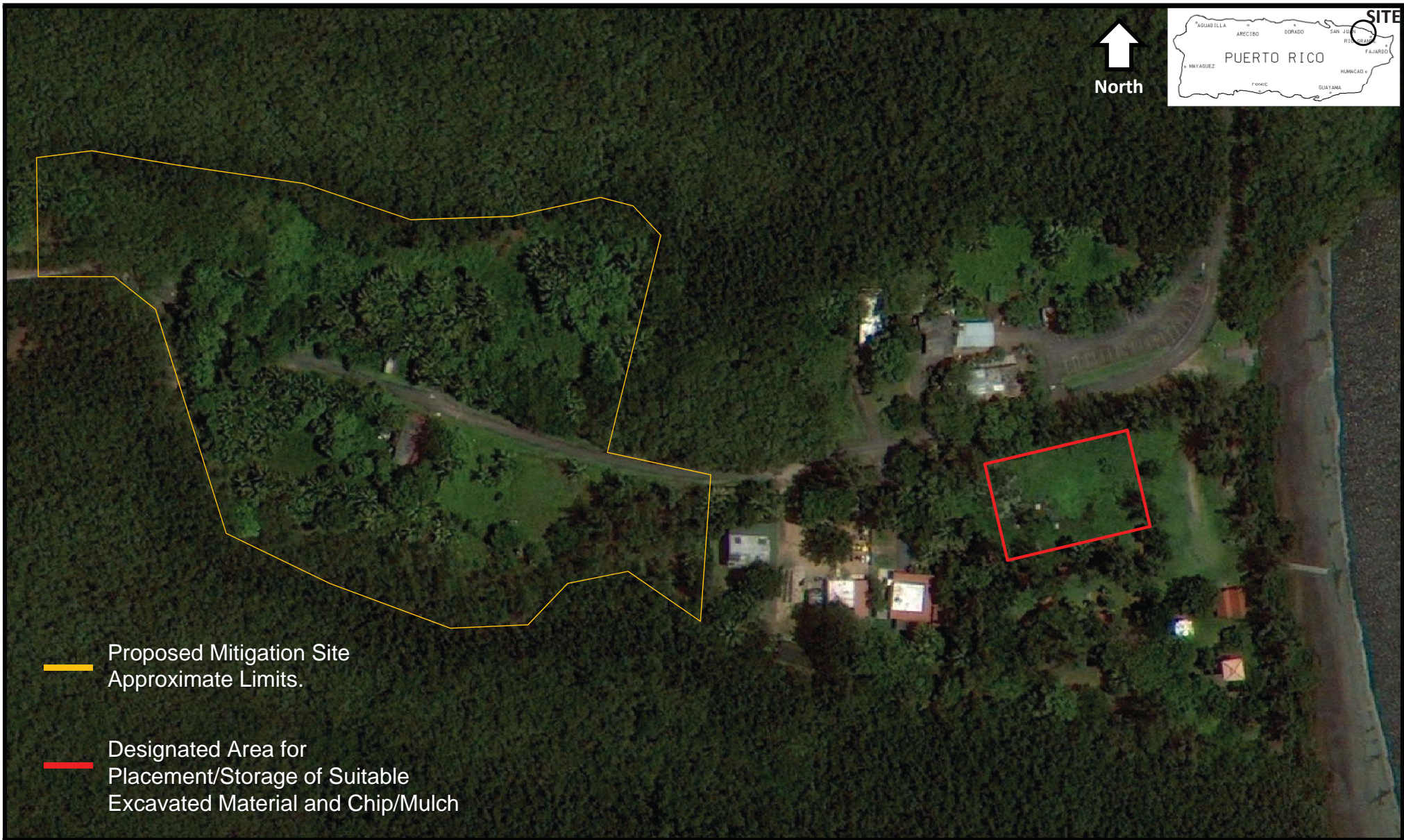
The proposed mitigation has four (4) main components:

- 1) Existing topographic data suggests that mangroves bordering the mitigation site grow from an elevation of approximately 0.5 ft to 1.2+ ft (NAD 83FT(07) – PRVD02) (**Figure 5**). The MP proposes shaping the mangrove restoration/creation sites to 0.7 ft with a tolerance of 0.2 ft above or below the required elevation. The clearing, grubbing and shaping activities will avoid the

removal of existing mangroves within the mitigation areas, if present. Project implementation may require some mangrove pruning to allow equipment operation near existing vegetation. Care will be taken not to damage any existing mangroves or any other wetland vegetation to be kept adjacent or within the sites, when present.

- 2) Best management practices, such as erosion prevention and sediment control measures will be implemented during all earthmoving activities to prevent water quality impacts in Piñones and La Torrecilla Lagoons.
- 3) Prior to project implementation, salinity levels will be taken to determine salt content of the waters near the project area. Salinity levels may be periodically measured as part of the monitoring efforts.
- 4) Suitable excavated material (soil/sand) without debris (or solid waste) will be placed at the designated area for its beneficial use by DNER to restore erosion areas within the forest (**Figure 6**). All unsuitable material (e.g. slag, cinders, garbage and debris) will be disposed of off-site in an approved solid waste disposal facility.
- 5) Chipping/mulching of vegetative material: A portable grinder will be used to chip all vegetative material into 1 to 2 inch diameter sized chip/mulch. The resultant mulch will be left at the designated area for the use of DNER. There is a small stand of Australian pines within the proposed mitigation site. They will be cut, chipped and disposed of off-site in an approved facility.
- 6) The mitigation planting will consist of black and white mangroves. Spacing for black and white mangroves is 1.0 meter on center spacing (or approximately 4,000 per acre) in a staggered distribution. As an option, after planting is complete, seeds (propagules) can be broadcast-sown at 8,000 per acre. Black and white mangroves will be planted as seedlings or saplings having a minimum height of 12 inches. The Contractor conducting this work will be responsible for providing the required amount of seedlings/saplings (field collected and/or nursery grown) for this project. The seedlings/saplings could be collected from appropriate nearby sites, but must be coordinated with the USACE Environmental Branch point-of-contact (POC) and DNER staff. If required, the Contractor will be responsible for obtaining all necessary permits or authorizations for harvesting mangrove seedling/saplings from DNER. As an alternative, the Contractor may collect propagules as soon as the project is approved for implementation and propagate and maintain seedlings/saplings at appropriate facilities. If the required amount of seedlings/saplings is not available, the Contractor will have to coordinate with local nurseries to obtain them.





**Figure 6: Designated Area for Placement/Storage of  
 Excavated Suitable Material and Chip/Mulch**

Imagery Source: Google Earth

**Compensatory Wetland Mitigation Plan  
 Improvements for Shore Protection , Highway 187  
 Piñones, Loíza, Puerto Rico**

## 3.6 Maintenance and Monitoring Plan

### 3.6.1 Maintenance

Following of mangrove planting activities, a maintenance and nuisance/invasive species control program will be implemented to ensure a 80% survival of the installed plant material and to prevent colonization of nuisance/invasive species until the planted vegetation can compete and survive without further control. 'Nuisance/invasive species' refers to species not planted as part of the mitigation project, none-native (alien/exotic), and whose introduction can causes or is likely to cause detrimental effect to the mitigation sites or planted vegetation or the environment.

Manual removal is the preferred method to control nuisance species. Nevertheless, if herbicides are necessary to control the growth of nuisance species, these must be applied by certified personnel in order to avoid damage to the planted vegetation. Also, the herbicides to be used will need to be approved by EPA. Some examples of nuisance or not desired species within the mitigation site are: Venezuelan grass (*Paspalum fasciculatum*), Cattail (*Typha domingensis*), Black mimosa (*Mimosa pigra*), Australian pine (*Casuarina equisetifolia*), and Brazilian pepper (*Schinus terebinthifolius*), among others. It should be noted that DNER has currently in place an Invasive Species Management and Control Plan for the Piñones State Forest.

Early implementation of the control program is essential for long-term success of the mitigation project. Site inspection and removal of unwanted species should be performed, at least, monthly for the first year and every six (6) month for five years.

### 3.6.2 Monitoring

Vegetation monitoring will be performed to document the establishment, conditions and cover of the planted species, and to document the presence and cover of unwanted, invasive species. Monitoring will occur at six (6) months and one (1) year after planting completion; thereafter monitoring inspections will occur once a year for five (5) years. Monitoring efforts will be conducted by DNER, in coordination with USACE personnel.

The vegetation monitoring should occur in at least, in two (2) locations (plot or transect) within the mitigation site. These locations will represent site conditions and should be representative areas of the mitigation planting sites. The dimensions of each plot should be at least five (5) meters by five (5) meters and each transect should be at least 50 meters long.

The following actions will be performed during monitoring:

- a) Monitoring data such as; estimated cover by species, estimate of survival of planting, average height of planted species, casual observations, survival rates, identification of nuisance/invasive species and salinity levels will be recorded on

a standardized form during monitoring events. In addition, monitoring may also detail observations regarding tidal flooding.

- b) Permanent monitoring and photographic stations/locations will be established at the mitigation site. The stations' location coordinates will be recorded. At least, four (4) photographs of the mitigation sites from each control points facing north, east, south and west will be provided.
- c) Monitoring and photographic stations' identification markers should be maintained for location reference during successive monitoring.
- d) A monitoring report will be prepared after each monitoring event. The monitoring reports may follow the format and content established in the USACE Regulatory Guidance Letter 08-03.

#### **4.0 CRITERIA FOR ECOLOGICAL SUCCESS AND PERFORMANCE STANDARD**

The following criteria for ecological success and performance standards will be used to determine the minimum level of success in reaching the goal of the mitigation project:

- a) Criteria for ecological success will be a minimum of 80% survival after two (2) years of initial planting. It could be also considered a 80% canopy or ground cover. Cover is defined as closure of the gaps between spreading branches of adjacent plants (if branch tips touch, canopy closure has occurred).
- b) As the site matures, the success of the mitigation project will be evaluated in terms of the percent of the total ground cover and the percent of survival (through planting and natural recruitment).
- c) The goal is to provide a self-sustaining high quality mangrove habitat to increase the overall health of the ecosystem and to provide biological functions lost as a result of the authorized wetland impacts.

#### **5.0 CONTINGENCY PLAN**

Contingencies means the actions that will be employed to correct deficiencies or failures found during the monitoring period and to achieve the specified ecological success criteria. In the event that monitoring or other site information indicates that the mitigation project do not achieve the requirements of this MP, the following actions will be taken:

- a) USACE, in consultation with DNER, and other appropriate agencies, will evaluate if the mitigation project is meeting the objectives as specified in this MP and assist in determining the appropriate measures to correct any deficiencies.

- b) Corrective measures will be designed and coordinated with resource agencies to provide ecological functions and values comparable to those specified in this MP.
- c) Criteria for ecological success and performance standards may be revised to reflect any changes in management strategy or objectives.

## **6.0 ANNUAL CONSULTATION WITH FEDERAL/COMMONWEALTH AGENCIES**

The following agencies will be consulted annually (or until ecological success has been achieved) for their views on the success of the mitigation, the likelihood of achieving the mitigation goal, the projected timeline for success, and any recommendations for improving the likelihood of success:

1. DNER, San Juan, PR
2. Environmental Quality Board, San Juan, PR
3. Planning Board, San Juan, PR
4. EPA Caribbean Environmental Protection Division, San Juan, PR
5. FWS Boquerón Field Office, PR
6. NMFS Boquerón Field Office, PR
7. NMFS Habitat Conservation Division, San Juan, PR
8. San Juan Bay Estuary Program, San Juan, PR

This Final MP will be made available to the Piñones community leaders through mail or by posting it at DNER Piñones State Forest facilities. It will be also available online at the USACE Jacksonville District website at: <http://www.saj.usace.army.mil/>

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