APPENDIX D

Proposed Mitigation Plan

Environmental Assessment
Rio Culebrinas, Puerto Rico Study

US Army Corps of Engineers
JACKSONVILLE DISTRICT

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Rio Culebrinas, Puerto Rico Study

PROPOSED MITIGATION PLAN
OCTOBER 2019

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1 INTRODUCTION

The U.S. Army Corps of Engineers, Jacksonville District (Corps) prepared the Rio Culebrinas Aguadilla-Aguada, Puerto Rico Section 205 Continuing Authorities Program (CAP) Flood Damage Reduction project Detailed Project Report Addendum (DPR) in 2015. The DPR determined that the selected project alternative results in the loss of approximately 10 acres of wetlands within the levee right of way.

A 404(b)(1) Guidelines Evaluation (included as Appendix C of the Final EA) was completed, and the Corps intends to complete mitigation for unavoidable impacts to wetlands. This proposed mitigation plan further expands upon the conceptual mitigation plan that was proposed in the 2015 DPR.

Projects requiring mitigation will submit a mitigation plan, which will ensure that habitat types are mitigated to not less than in-kind condition, to the extent possible. As per Section 2036(a) of the Water Resources Development Act of 2007, the plan includes:

1. A description of the project and its background, purpose, and need;
2. The need for mitigation;
3. A description of the physical action to be undertaken to achieve the mitigation objectives within the watershed;
4. Types and amount of restoration activities to be conducted including a monitoring plan;
5. Ecological success criteria;
6. The functions and values that will result from the mitigation plan.

2 PROJECT INFORMATION

Project Description

The Rio Culebrinas is approximately 43.94 kilometers (km) (27.3 miles) long and originates in the western part of the central mountain range of Puerto Rico, approximately 130 km (80.8 miles) west of the city of San Juan (*see* **Figure 1**). The Rio Culebrinas flows in a westerly direction through the areas of San Sebastian, Moca, Aguadilla, and Aguada where the river discharges into the Aguadilla Bay in the Mona Passage on the northwestern coast of Puerto Rico. Tributaries of the Rio Culebrinas include the Caño Madre Vieja, Rio Guatemala, Rio Caño, Rio Sonador, and Quebrada Grande. The Caño Madre Vieja, a 2.09 km (1.3 miles) long tributary of Rio Culebrinas, is an old river outlet that flows across the project area and discharges into the Aguadilla Bay. This small intermittent stream is the political boundary dividing the municipalities of Aguadilla and Aguada.

The Corps proposes to construct two segments of earthen levees, a short cutoff channel, drainage structures, interior drainage channels, and three paved road ramps across the levees to reduce flood damage to the southwest portion of Aguadilla and the community of Espinar in Aguada, Puerto Rico (*see* **Figure 2** and **Figure 3**). The non-Federal sponsor (NFS) is the Municipality of Aguadilla.

Figure 1. Rio Culebrinas, Puerto Rico Study project location map.
(SOURCE: Corps 2019)

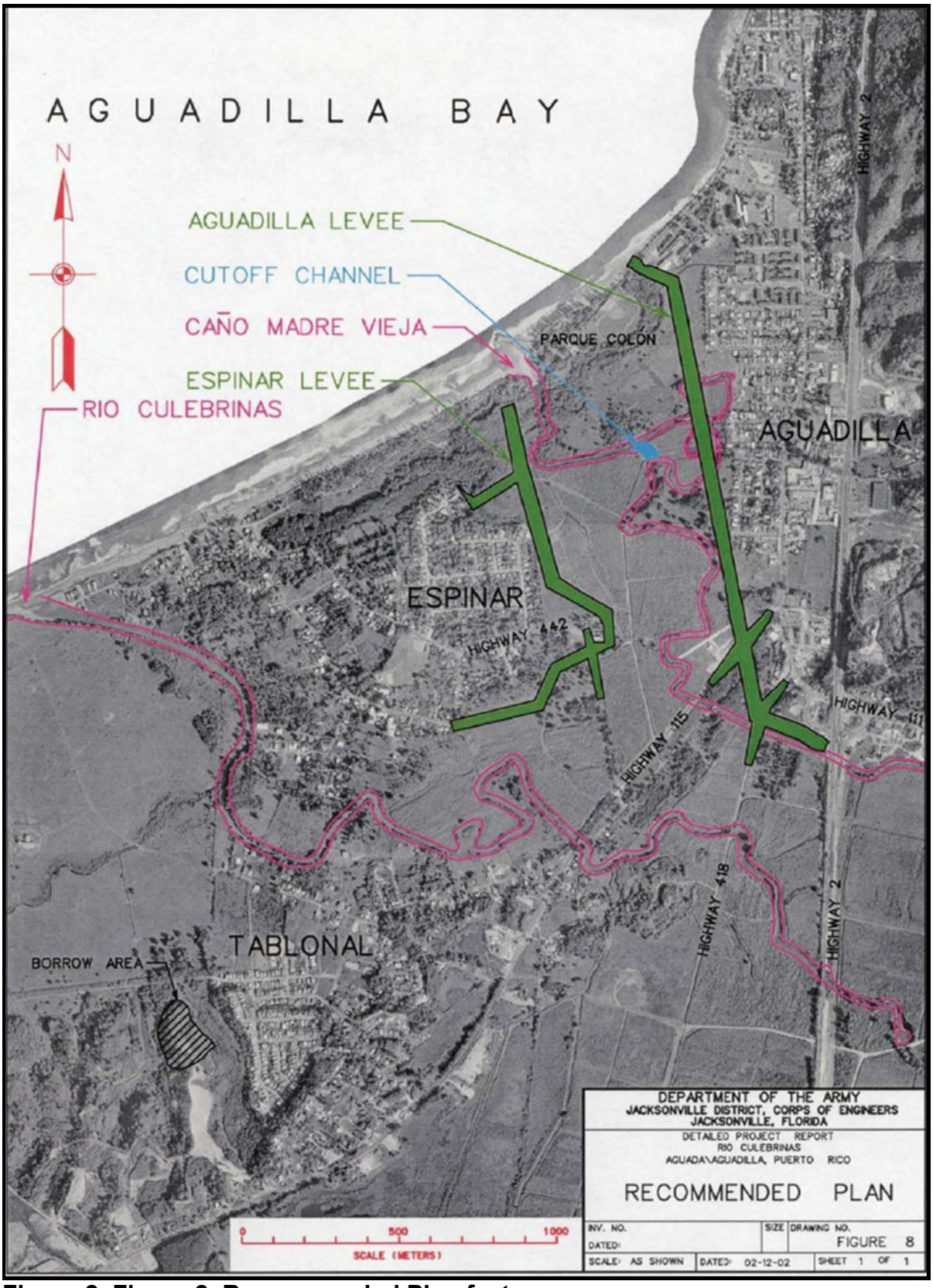

Figure 2. Figure 2. Recommended Plan features.
(SOURCE: Corps 2019)

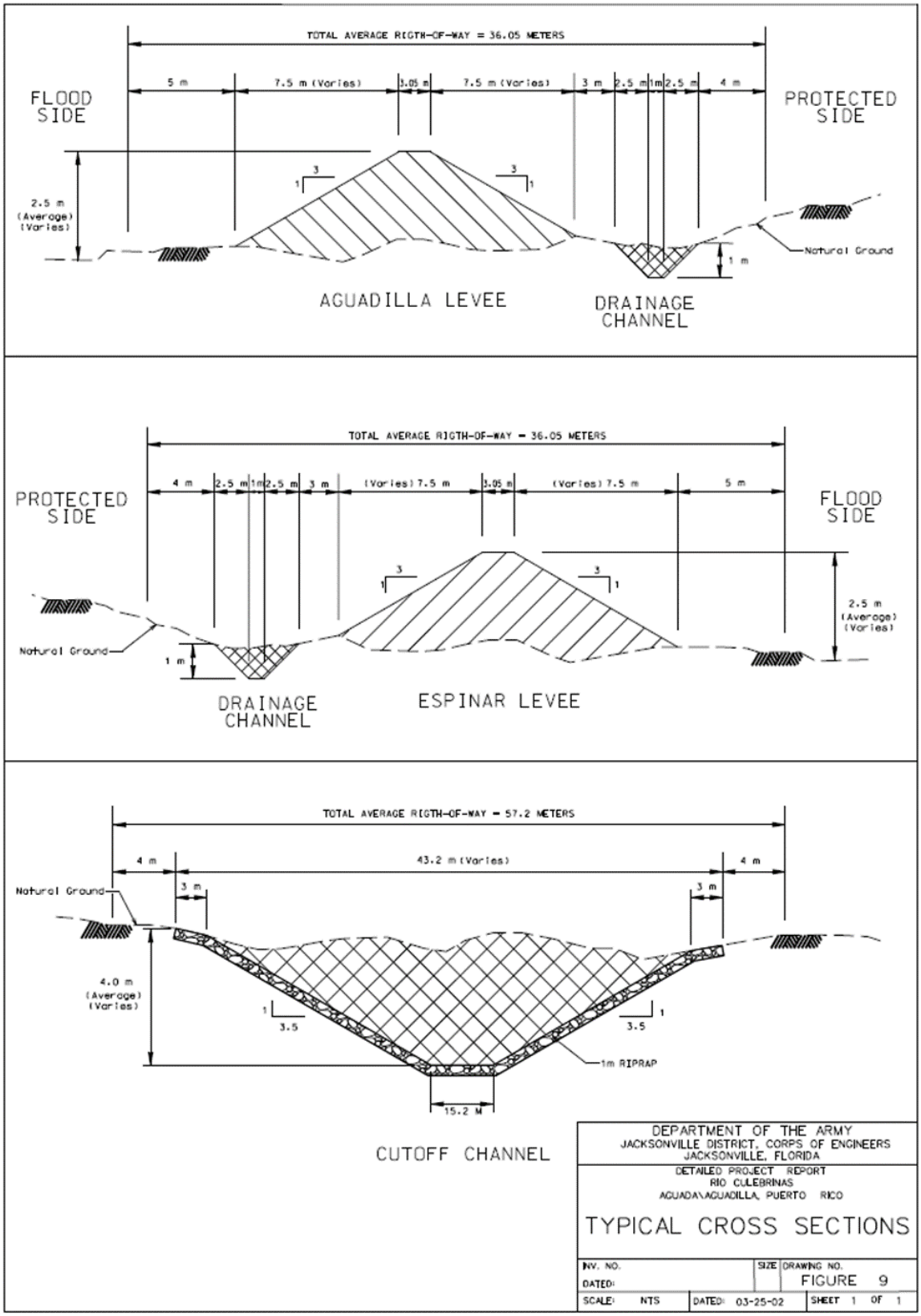

Figure 3. Recommended Plan cross sections.
(SOURCE: Corps 2019)

Project Background

The Rio Culebrinas project was initially authorized under the Continuing Authorities Program (CAP), Section 205 of the Flood Control Act of 1948, Public Law 80-858, as amended. Completion of all components of the approved plan are necessary to achieve full project benefits. No portion of the project has been constructed since the project's initial approval. The project cost exceeded the capacity of the statutory CAP budget limits. The project is now being planned under the authority of Section 204 of the Flood Control Act of 1970, Public Law 91-611, authorizing the Secretary of the Army, acting through the Chief of Engineers, to prepare plans for the development, utilization and conservation of water and related land resources of drainage basins and coastal areas in the Commonwealth of Puerto Rico.

Title IV, Division B of the Bipartisan Budget Act of 2018, Public Law 115-123, enacted February 9, 2018 ("BBA 2018"), authorizes the Corps to conduct the Study at full Federal expense to the extent that appropriations provided under 2018 BBA are available and used for such purpose. A more detailed discussion on the project authority can be found in the 2019 Rio Culebrinas, Puerto Rico Study conversion report, which is included in Appendix E of the project's 2019 Environmental Assessment (EA).

Project Purpose and Need

The purpose of the Rio Culebrinas project is to reduce flood damages to the southwest portion of Aguadilla and the community of Espinar in Aguada, Puerto Rico. Although flooding in the Rio Culebrinas basin can occur at any time during the year, it is most frequent during the period of May through December. The large rainfall-driven peak discharges in the basin are generally associated with hurricanes, tropical depressions and tropical waves passing over or near Puerto Rico. Due to the steep slopes in the upper basin, flash floods from intense thunderstorms are a common event affecting this area and can occur anytime during the year. During the flood season, floodwaters overtopping the Rio Culebrinas and Caño Madre Vieja pose potential dangers to surrounding residents, inundate all major highways and roads in the Rio Culebrinas floodplain, and are a source of frequent flood damage to properties. Effects from Hurricane Maria, which hit the island in September 2017, prompted the Corps to include the project for consideration for funding under the BBA. (Effects from the storm are discussed more in the project's 2019 EA section 3.5 "Hurricane Maria Storm Effects".)

3 PROPOSED MITIGATION PLAN

Need for Mitigation

The 2004 Recommended Plan did not include mitigation. However, due to the increases in the width of the levee cross-sections and the need for additional lands, the 2004 project was reviewed for its potential environmental impacts with respect to adjacent wetlands. It was determined that the new levee design would impact wetlands (estimated at 10.25 acres) and that a mitigation plan would be implemented.

Proposed Mitigation Plan

The 2015 DPR proposed a conceptual mitigation plan to create approximately 11-12 acres of wetlands. A functional analysis of the impacted wetlands was not able to be completed due to several factors, which a survey during PED should be able to address. While the majority of the wetlands being impacted are expected to be low quality (as they are former sugar cane fields), the assumption was made that the land was at 90% functionality. In addition, it was assumed that any time losses between impact and mitigation completion are minimal, due to the mitigation being completed before the project is completed and the quick growth of vegetation in the area. It was also assumed that the mitigation lands would have at least 85% functionality. Thus the proposed 11-12 acres of mitigation would be sufficient to cover the estimated 10.25 acres of impact. Mitigation goals include:

(1) Achieving wetland hydrologic conditions (flooding or saturation of the soil for sufficient duration and frequency);
(2) Excavating material suitable for levee construction to the extent practicable;
(3) Minimizing the amount of surplus or unusable excavated material needing disposal;
(4) Minimizing impacts (to residential, commercial, recreational, and cultural interests).

This 2019 proposed mitigation plan builds upon the 2015 conceptual mitigation plan to ensure the recommended project will not have more than negligible adverse impacts on ecological resources. Mitigation includes the removal of invasive species and planting of native freshwater and tidal vegetation. Mitigation also includes excavation in existing wetlands to ensure hydrologic connection to created wetlands. Exact details on the species to be planted and final mitigation sites and excavation locations will be determined during the project's Preconstruction Engineering Design (PED) phase using updated survey data for hydrologic connections. **Figure 4** and **Figure 5** show the approximate overlay of the project footprint that would affect wetlands as well as nearby areas identified during the 2015 DPR that may be available for use as mitigation and/or excavation sites.

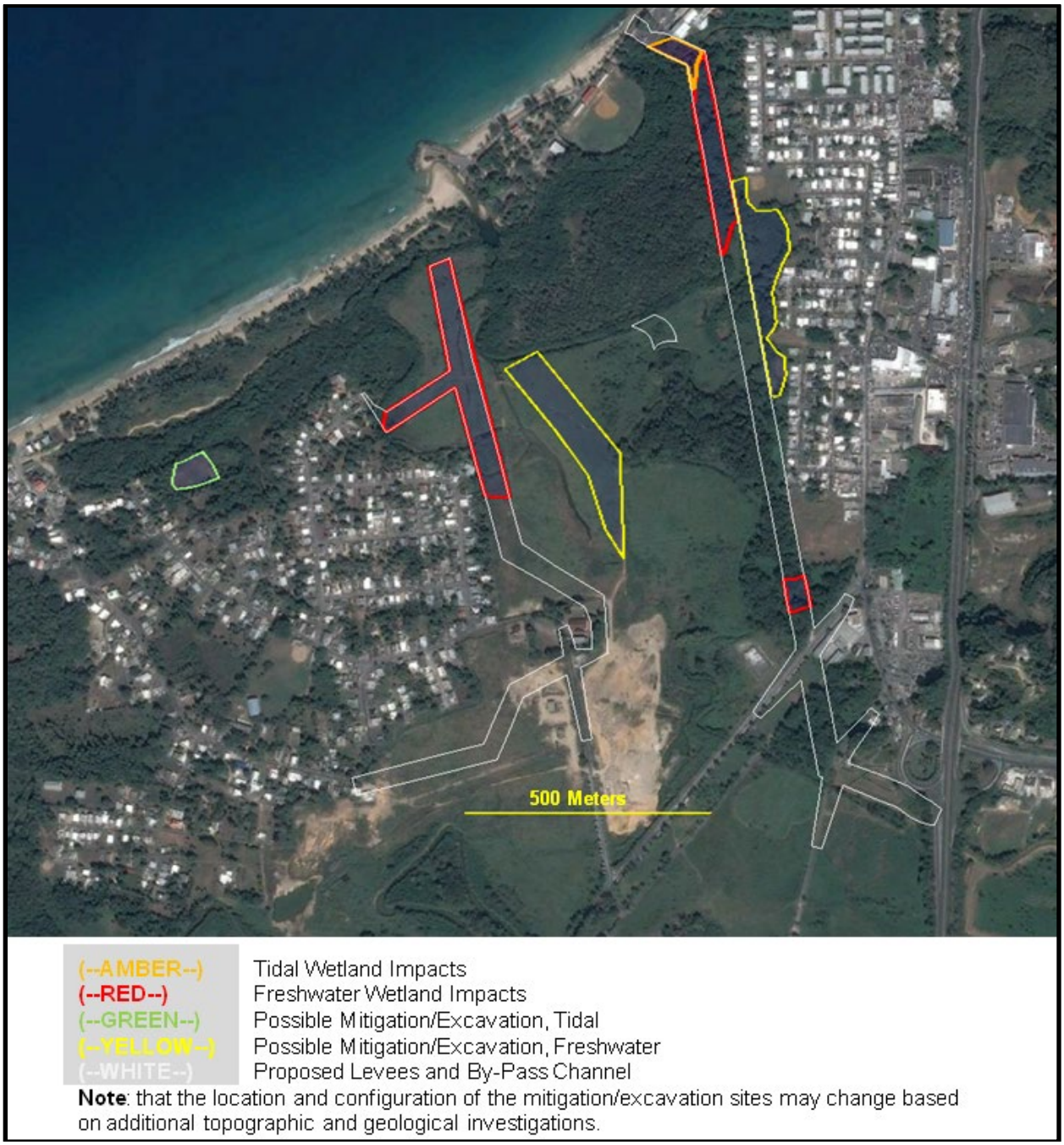

Figure 4. Location of wetlands affected by the proposed project (as described by the 2015 DPR).
(SOURCE: 2015 DPR)

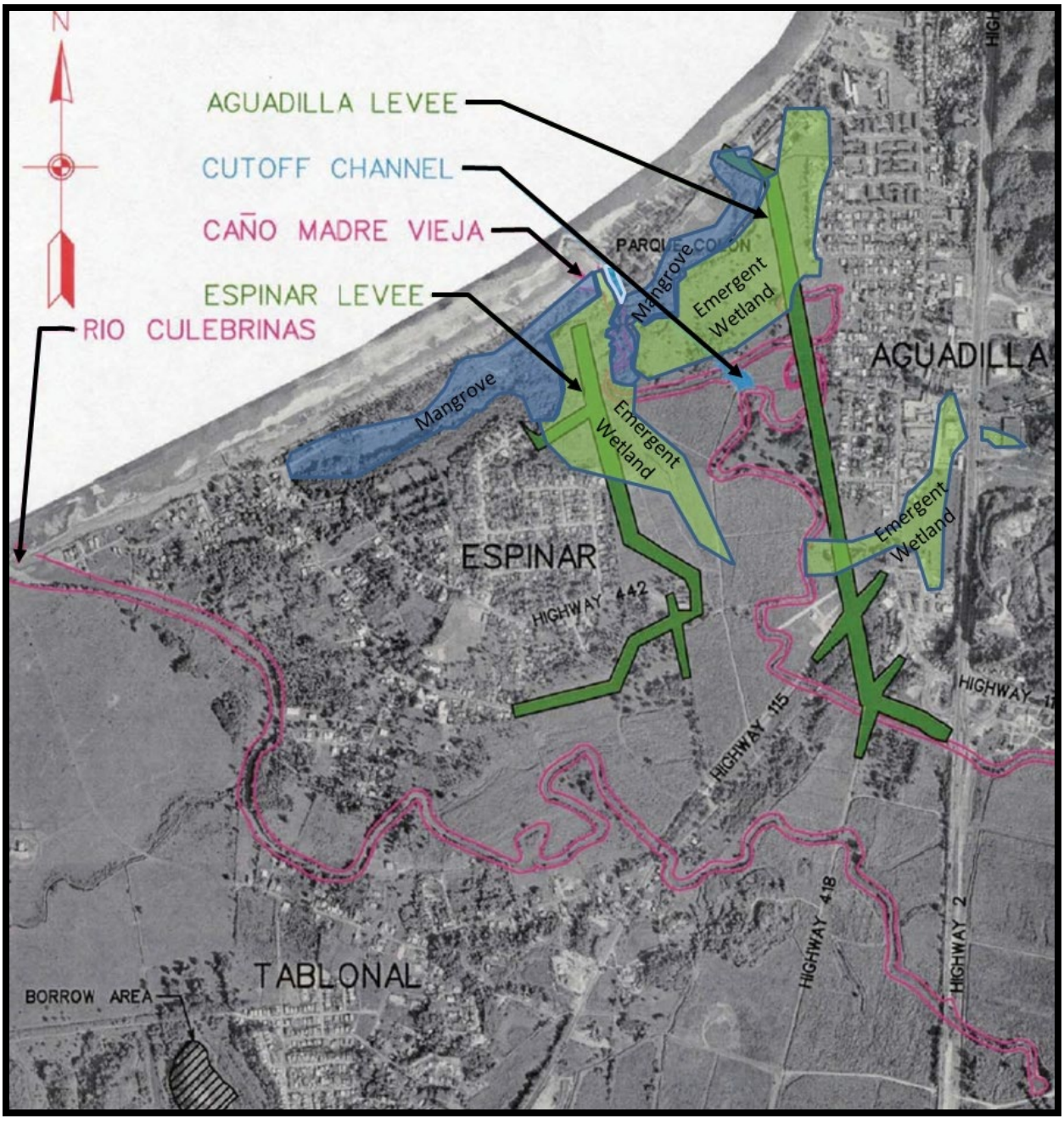

Figure 5. Location of proposed mitigation and/or /excavation sites identified during the 2015 project review.
(SOURCE: 2015 DPR)

The Corps will conduct a wetland habitat functional analysis during the project's PED phase to verify that the functional equivalent is still valid and ensure the appropriate performance measures are in place. Detailed calculations and exact acreages are not

expected to change by more than 50% from the project's conceptual mitigation plan proposed in the 2015 DPR, which provided a cost of $349,200.00 for 13.35[1] acres.

Monitoring and Adaptive Management

Monitoring and adaptive management address key uncertainties that relate to achieving restoration success and making adjustments to the project features, if determined to be necessary. Monitoring will be performed to assess the project's mitigation sites and determine the ecological success of the mitigation.

Mitigation in the form of excavation between existing wetlands to created wetlands to ensure hydrologic connection and will be monitored quantitatively if possible and qualitatively at a minimum. Qualitative observations of the wetland hydrology (hydrologic indicators, standing water and/or soil saturation), overall hydrologic assessment, description of dominant plant species, presence or absence of invasive nuisance and exotic vegetation, and observed wildlife utilization or indicators of wildlife (i.e. tracks, scat, etc.) will also be reported.

Permanent monitoring and photographic stations will be established, identified, and maintained for location reference during monitoring. Location plots for monitoring will be selected to represent site conditions and representative areas of the mitigation planting sites. At least one transect will be established within each representative vegetative community. Each transect will be an appropriate length and will include at least four data collection stations, spaced at 50-100 foot-intervals. Each data collection station will be permanently marked in the field, preferably with PVC pipes anchored over a metal post. Vegetative coverage will be documented at each data collection station and for each stratum (tree, sapling, shrub, herb and woody vine, as defined in the wetland determination data form). Vegetative success criteria will be 80% survivorship of planted vegetation, commensurate percent cover compared to reference sites, and less than 5% exotic vegetation.

Monitoring would be conducted for 5 years following completion of mitigation and may be completed by the Corps or the non-federal sponsor. Monitoring reports will be prepared to document monitoring events and will include photographic documentation of the site, collected data, such as estimated coverage by species, estimated survival of planting, average height of planted species, as well as change analysis to document progress between monitoring events. If monitoring results show that the success criteria has not been met and there is a consistent reduction in or maintenance of mitigated acreage, adaptive management should be implemented.

Contingency Plan/Adaptive Management

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[1] The cost includes a total creation of approximately 13.35 acres of wetlands; however, 1-2 acres of excavation is proposed in areas where wetlands currently exist to ensure hydrologic connection. Therefore, the net creation would be approximately 11-12 acres of wetlands.

Implementation of adaptive management is informed by the mitigation's ecological success criteria and would be implemented if the mitigation site(s) do not meet the success criteria defined above. The primary objectives of this mitigation plan include creation of a hydrologic connection between existing wetlands and created wetlands and planting of native vegetation. The contingency strategies may include additional planting of native freshwater and/or tidal vegetation and/or adjustments to excavated areas to ensure hydrologic connection to created wetlands.

The adaptive management evaluation for addressing hydrologic connectivity will be a comparison of water level data in the created wetlands compared to the existing wetlands as well as monitoring establishment of native wetland vegetation. If hydrologic connectivity does not reach equilibrium between the wetland sites, additional excavation will be completed to increase hydrologic connection. In addition, if exotic vegetation exceeds 5% during the five year monitoring period, the exotic vegetation will be removed.

Coordination of Final Mitigation Plan

The final mitigation plan, including completion of a wetland habitat functional analysis, will be coordinated with the U.S. Fish and Wildlife Service (USFWS) as well as the Puerto Rico Department of Natural and Environmental Resources (DNER). The plan will be finalized by the Corps and provided to partner agencies for review and comment. In addition, if the final plan in acres or cost is greater than 10% more from the proposed plan, it will be coordinated through the USACE vertical chain. The final mitigation plan will be finalized during PED, when design is complete and when the project is reviewed on Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) characteristics.

Cost Estimate of Mitigation Plan

A rough breakdown of costs for the mitigation plan is below. It should be noted that cost for lands needed for mitigation are included in the total project cost as a single line item called "lands and damages."

Activity	**Estimated Cost**
Clearing & Grubbing	$86,000
Wetland Excavation	$1,730,000
Contingency (30%)	$545,000
Total Mitigation Cost Estimate with contingency	**$2,361,000**

4 REFERENCES

U.S. Army Corps of Engineers, Jacksonville District (Corps). 2019. Draft Continuing Authorities Program (CAP) Conversion Feasibility Report for Río Culebrinas, Puerto Rico Study. Jacksonville, Florida.

U.S. Army Corps of Engineers, Jacksonville District (Corps). 2019 Draft Environmental Assessment, Rio Culebrinas, Puerto Rico Study. Jacksonville, Florida.

U.S. Army Corps of Engineers, Jacksonville District (Corps). 2015. Rio Culebrinas Aguadilla-Aguada, Puerto Rico, Section 205 Continuing Authorities Program Flood Damage Reduction Project, Detailed Project Report Addendum. Jacksonville, Florida.