
APPENDIX A2 – 404(B)(1) ANALYSIS & COMPLIANCE

for

**RIO GUAYANILLA, GUAYANILLA, PR
2018 SUPPLEMENTAL APPROPRIATIONS
FLOOD RISK MANAGEMENT STUDY**



March 2020



**US Army Corps
of Engineers®**
Chicago District

Rio Guayanilla, Guayanilla, PR
Flood Risk Management Study

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1.0 404(b)(1) Analysis

The purpose of this document is to comply with Section 404(b)(1) of the Clean Water Act of 1972 pertaining to guidelines for placement of dredged or fill material into the waters of the United States. This analysis is limited to features of the Recommended Plan as identified in the Rio Guayanilla, Guayanilla, PR Flood Risk Management Feasibility Report and Integrated Environmental Assessment (Feasibility Report) issued by the U.S. Army Corps of Engineers, Chicago District.

1.1 I. Project Description

1.1.1 a. Location

The Rio Guayanilla watershed is located within the Municipality of Guayanilla on the southwestern coast of Puerto Rico. The watershed is bordered on the west by the Rio Yauco, on the east by the Rio Tallaboa, on the northwest by the Rio Grande de Añasco, on the northeast by the upper Rio Grande de Arecibo, and on the south by the Caribbean Sea.

The Rio Guayanilla originates at a point near the central mountain range at an elevation of about 1,000 meters (3,280 feet) above mean sea level. The Rio Guayanilla flows in a southerly direction through steep slopes in the upper part of the watershed producing fast runoff velocities and allowing minimal infiltration. The total length of the river channel is approximately 23 kilometers (13.9 miles). The total drainage area of the Rio Guayanilla watershed is approximately 96 square kilometers (37 square miles) (Figure 1). There is potential for the river system to the east, the Rio Macaná, to overflow into the Rio Guayanilla's lower basin during floods in that watershed. The focused study area includes the whole floodplain of the lower Rio Guayanilla, where the Town of Guayanilla is located, portions of the mountains to the west, and to a lesser degree, the marine/estuarine coastline (Figure 2).

The proposed Project features that involve fill materials within the ordinary high water mark are located along the Rio Guayanilla just downstream of PR-2. Additionally, proposed Project features that involve discharge of fill material in wetlands are located near the El Faro neighborhood.

Rio Guayanilla, Guayanilla, PR
Flood Risk Management Study



Figure 1: Guayanilla River Watershed

Rio Guayanilla, Guayanilla, PR
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Figure 2: Focused Study Area with Guayanilla River Watershed and USGS Gaging Station

1.1.2 b. General Description

The Corps has prepared the Feasibility Report to present the results of its studies to address flooding problems in Guayanilla, Puerto Rico area. The Feasibility Report analyzed several possible alternatives that could potentially achieve the original purpose and needs identified in the feasibility study. Screening criteria, including natural resource effects, are described in greater detail in the Feasibility Report at Section 3.4.4. The alternatives are described in more detail in the Focused Array of Alternatives section (Section 3.5) of the Feasibility Report.

Subject to approval and funding, the Corps will construct the Recommended Plan with the goal of reducing flood risk to the town of Guayanilla. For purposes of this Section 404(b)(1) evaluation, a summary description of the Project is provided below as it pertains to potential fill activities. A general description for the Recommended Plan is included in the Description of Recommended Plan section of the Feasibility Report.

Description of NED Plan Alternative #1 Features Applicable to Section 404

Removal of Impediments to Flow – Removal of impediments to flow is a nonstructural maintenance measure that involves the removal of vegetation, sediment, and debris that can accumulate in the channel and interfere with the conveyance of flood flows. Removing impediments to flow would be implemented on a priority-basis at the 3 bridge crossings on the natural channel of the Rio Guayanilla. Typically, materials of fluvial of stone and large woody debris would need to be removed to maintain a) existing flows without implementation of structural measures or b) the bank full flows required to keep the Rio Guayanilla riverine ecosystem intact should a structural measure be implemented.

This component would not cumulatively have long term adverse effects. No mitigation is recommended.

Description of NED Plan Alternatives #3 Features Applicable to Section 404

Cross-Channel Diversion Structures & Channel Improvements – This alternative would construct an engineered diversion channel at the end of the montane unit and beginning of the coastal plain unit of the Rio Guayanilla, approximately at PR-2. Concrete and riprap diversion structures with low flow culverts would be set in place across the river channel to split flows, sending all flood waters to the diversion channel, but keeping almost bank-full flows to maintain the ephemeral riverine ecology of the Rio Guayanilla. The diversion structures design includes conservation measures for riverine connectivity for sediment transport and fish passage. Channel improvement upstream of the diversion structures include clearing foreign and natural debris and accumulated sediment.

This alternative would affect approximately 3-acres of ephemeral riverine rock bottom stream, including about 0.075-acres of permanent impact by placing the concrete diversion structures across the river channel and about 2.925-acres of temporary impact where the river channel morphology would be extended into the constructed stilling basin via shaping of the channel banks to facilitate the transition of flow from the channel to the basin. The stilling basin would be sculpted to a wide, rocky pool setting (Figure 4) that would emulate rocky channel conditions upstream. In addition, about 12-acres of the riverine habitat would be temporarily effected by the channel improvements activity, but would recover after several floods as geomorphic processes will be maintained. This alternative includes conservation measures for riverine communities, which further lessens the magnitude of change. It was determined that no compensatory mitigation under Section 404 of the Clean Water Act (40 C.F.R. § 230.93) would be required for the loss of less than one tenth (0.1) of an acre of ephemeral riverine habitat.

El Faro Setback Levee - Interior Mangrove Swamp Community – The initially proposed iteration of this alternative would potentially impart adverse effects to 240 acres of interior mangrove basin and fringe swamp. The initial proposed alternative would have a levee/berm that extended all the way to the river mouth and ocean. This would effectively cut off a freshwater and sediment from flushing through the greater mangrove system, which is a required supply for mangrove to exist and sustain. Avoidance and minimization planning by the USACE, USFWS and NOAA reduced these significant effects to less than significant by applying a conservation measure and compensatory mitigation. The conservation measure includes truncating the levee/berm short of the greater 240 acres of interior basin mangrove to allow river floods into the system; however, this would require a small set-back levee at El Faro to protect citizens and structures from these same floods. This levee component would need to be placed in the interior mangrove basin itself, as there were no other available options. This would effectively impact/fill 5.8 acres of interior basin mangrove wetland.

It was determined that compensatory mitigation (40 C.F.R. § 230.93) would be implemented for the loss of 5.8 acres of perennial estuarine interior basin mangrove wetland/habitat and associated fauna as described for Clean Water Act compliance in this 404(b)(1) Analysis (*Appendix A2*) and USFWS DCAR (*Appendix A4*). The effects under NEPA are considered to be lowered to less than Significant by the application of the conservation measure and compensatory mitigation as described in *Appendix A3 Mitigation, Monitoring and Adaptive Management Plan*.

1.1.3 c. Authority & Purpose

The study authority is the Water Resources Development Act of 1986 (P.L. 99-662), Sec 722.

SEC. 722. Guayanilla River Basin, Puerto Rico.

(a) The Secretary shall conduct a feasibility study on providing flood protection in the Guayanilla River Basin, Puerto Rico.

(b) Not later than two years after the date of the enactment of this Act, the Secretary shall submit to Congress a report on the results of such study together with such recommendations as the Secretary determines to be appropriate.

The purpose of flood risk evaluation includes identifying the measures necessary to reduce the consequences of flooding, such as those measures that reduce: risks to life safety, damages to residential and commercial structures and public infrastructure, and lost economic output due to recovery efforts.

1.1.4 d. General Description of Fill Material

1) General Characteristics of Material

Concrete – General types of concrete following ASTM requirements per feature. Limestone, gravel, sand, lime, water.

Steel / Concrete Culverts – Between 1 and 5 steel culverts, or concrete box culverts, would be embedded into the diversion structures, occupying the same geospatial foot print/cubic yards of fill of the Concrete fill material. These culverts comprise the conservation measure for fish passage, habitat and stream hydrology conservation measures. The culverts would be 1) strategically placed/embedded into the bed of the stream to ensure connectivity and benthic habitat, and 2) strategically sized to allow bank-full flows and sediment transport.

Karstic Limestone – Riprap and levee material needed for the project would be quarried and sized according to requirements per feature; generally angular stones, but could be block shaped for some applications.

Clay – Earthen material needed for El Faro Levee.

2) Quantity of Material

Concrete – Diversion Structure with Fish Passage Culverts: 735 cubic yards

Karstic Limestone – Stilling Basin Riprap: 6,325 cubic yards; El Faro Levee 1,000 cubic yards

Clay – El Faro Levee 28,000 cubic yards

3) Source of Material

Concrete – There are two options for acquiring concrete; 1) sourced from a licensed commercial vendor; 2) make concrete on site with quarried limestone, sands and gravels from onsite. Concrete would be made to meet environmental and commercial standards and statues.

Embedded Steel Culverts – Purchased from licensed vendor.

Karstic Limestone – Would be quarried by contractor from abandoned quarry site described in the main report.

Clay – Would be purchased from licensed vendor.

1.1.5 e. Description of Proposed Discharge Site

See Figure 4; See Appendix F – Civil Engineering for feasibility level plan sheets.

1) Location

Rio Guayanilla, Guayanilla, PR
Flood Risk Management Study

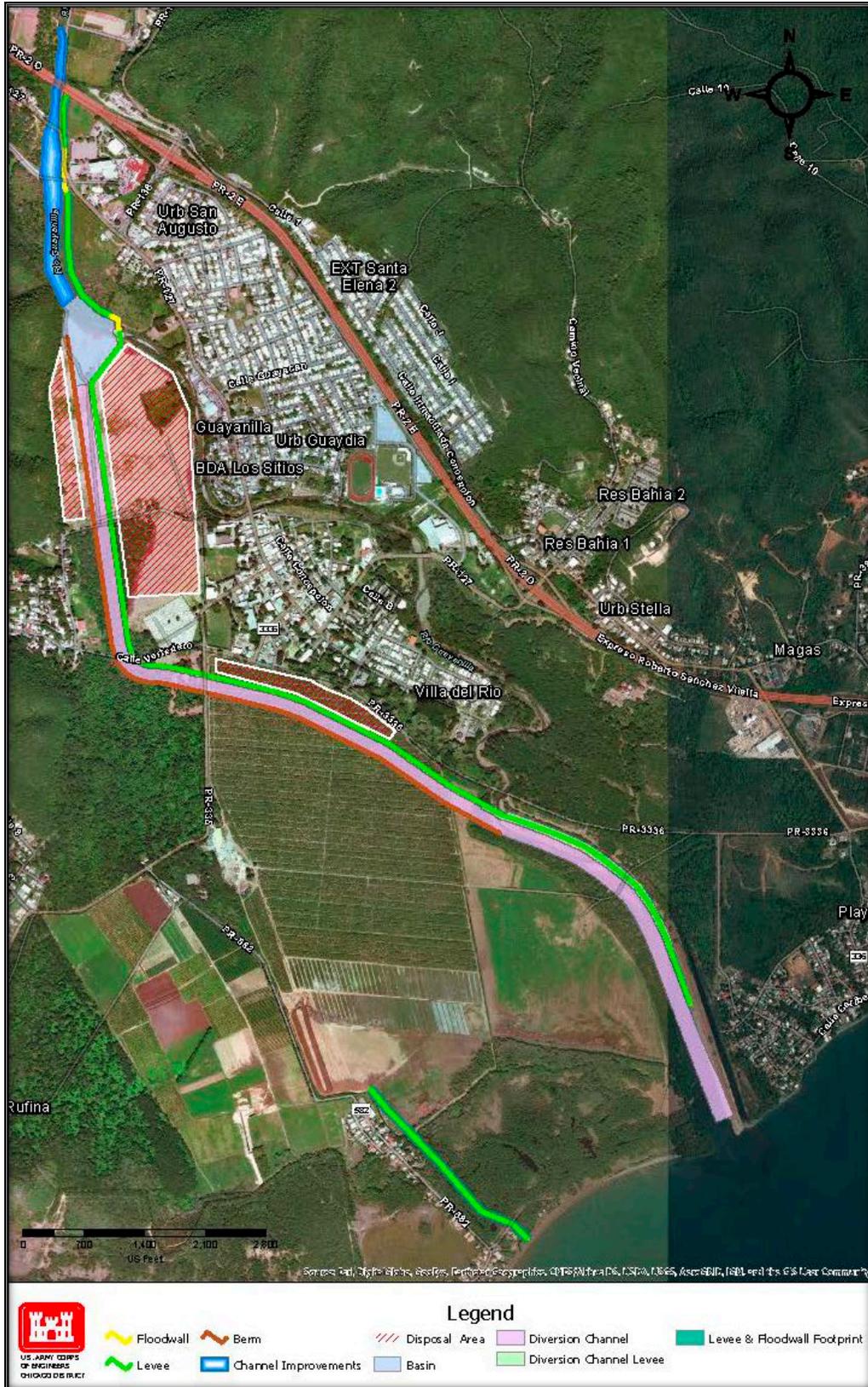


Figure 3: Alt#3 Diversion Channel South w/ Single Line Protection - Detailed

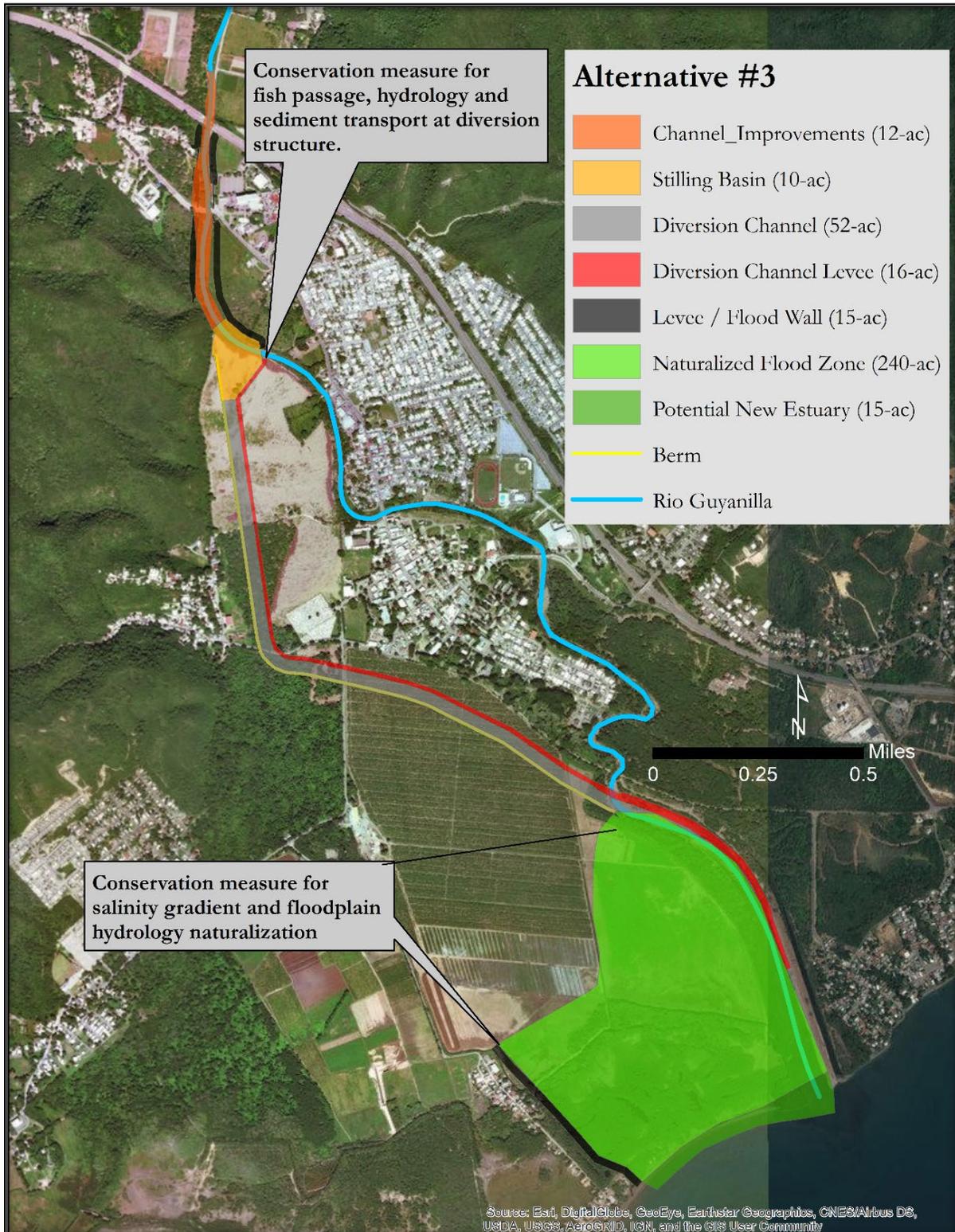


Figure 4: Areas of Effected Riverine Channel & Areas of Floodplain Hydrology Improvement

2) Size, Type, and Habitat

Riverine – Ephemeral – Rock Bottom Stream: The Rio Guayanilla is a freshwater, ephemeral river that typically runs dry for up to seven months a year and provides aquatic habitat for ephemeral aquatic insects, amphidromous fishes, freshwater shrimp and other plants and animals that are adapted to long periods of no water and short bursts of intense flooding.

About 12-acres of this habitat type would be temporarily affected by the channel improvements activity (Figure 4). Channel morphology, vegetation and large woody debris would be temporarily affected by clearing out the whole channel. This condition is only temporary since recovery would occur after several floods of higher magnitude 25-year occurrence or larger. Due to the amount of alluvial cobble and gravel being transported through the system, bottom geomorphology would be naturalized, forming point bars, riffles, pools, etc. This area would need to be kept free of large woody debris and other debris types after each flood as an operations and maintenance measure.

Implementation of the Diversion Structures and Stilling Basin would affect approximately change three (3) acres of this habitat type (7 of the 10 acres of Stilling Basin is considered upland) (Figure 5). Just less than 0.075-acres (3,240 ft²) of permanent change by placing the concrete Diversion Structures across the river channel and about 2.925-acres of temporary change to river channel morphology to facilitate overflow from the channel to the stilling basin that will be constructed as a wide, rocky pool.

Estuarine – Perennial – Interior Mangrove Swamp: Approximately 240-acres of mangrove swamp and abandoned sugar cane fields (Cañaveral) would receive riverine flood pulses that provide natural processes of freshwater inundation, flushing of built up salts from tidal action and providing riverine inputs of sediment and [allocthonous](#) material.

This basin type mangrove system utilizes hydrology from extreme high tides, coastal flooding and river flooding. Freshwater input provided by the agricultural drainage canals and overbank flooding by the Rio Guayanilla help maintain salinity levels. The mangrove stand to the north of Playa is mostly dominated by Black Mangrove (*Avicennia nitida*), although White Mangrove (*Laguncularia racemosa*) and Red Mangrove (*Rhizophora mangle*) are present. All trees are of small size and show evidence of frequent cutting (probably used for posts). Other species found in contact with the mangrove include Majaguilla (*Thespesia populnea*), Escambron (*Clerodendrum aculeatum*), and few Almond and Bayahonda trees. The exotic vine Canario Morado Falso (*Cryptostegia grandiflora*) has invaded this mangrove stand. The mangrove floor is covered by Snake Grass (*Bacopa monnieri*) and Marsh Fern (*Acrostichum daneifolium*). A small salt flat is also part of the system. A more detailed description of the affected environment is in the Feasibility Report at Section 2.6, Biological Resources.

The El Faro levee component would need be placed in the interior mangrove basin itself, as there were no other available options. This would effectively impact/fill 5.8 acres of interior basin mangrove wetland (Figure 6). It was determined that compensatory mitigation (40 C.F.R. § 230.93) would be implemented for the loss of 5.8 acres of perennial estuarine interior basin mangrove.

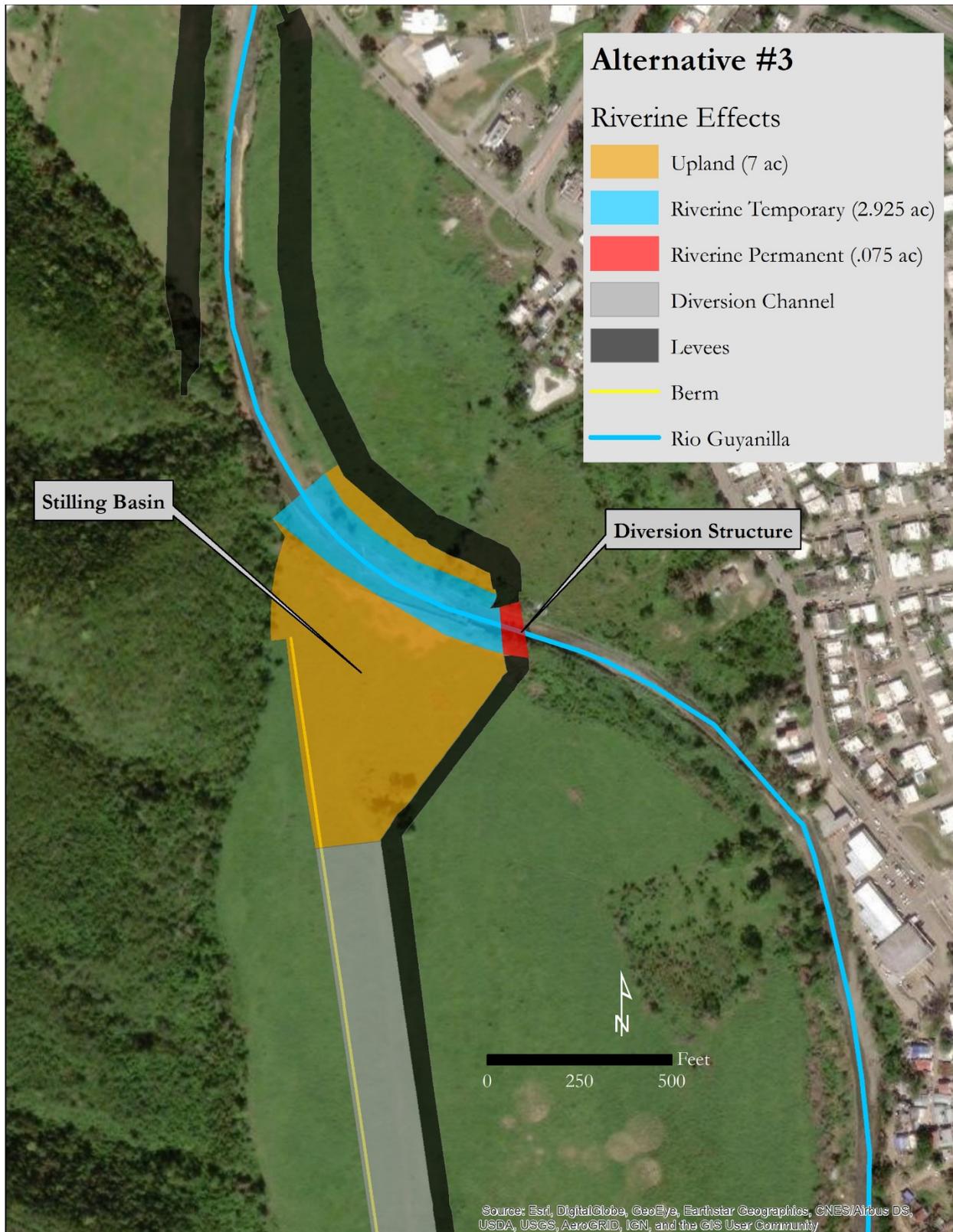


Figure 5: Riverine 404 Effects from Stilling Basin and Diversion Structures.

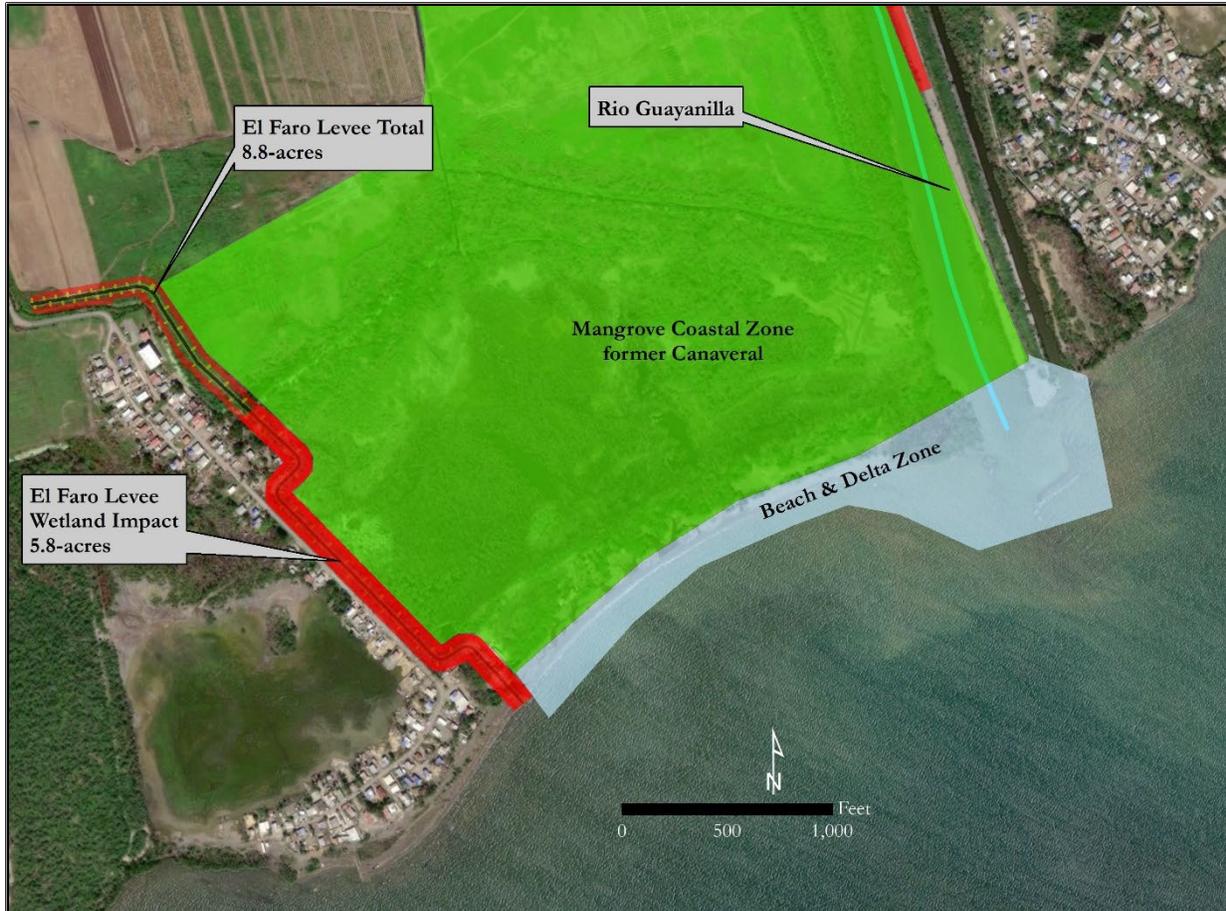


Figure 6: El Faro Levee Footprint & Mangrove Coastal Zone

3) Timing and Duration of Discharge

All work applicable to Section 404 is proposed to be primarily constructed during the dry season, or roughly between December and August; or about 8 months from start of work including bad weather days

1.1.6 f. Description of Placement Method

All identified materials and features would be placed with large machinery such as bull dozers, dump trucks, backhoes, cranes, excavators, skid-steers, sheet-pile drivers, etc. Heavy construction work would primarily be accomplished during the dry season, avoiding the need for machinery environmentally approved for aqueous or subaqueous work. Should large machinery be necessitated to work in aqueous or subaqueous conditions, it would be required for machinery to be in environmental compliance for this type of work.

1.2 II. Factual Determinations

1.2.1 a. Physical Substrate Determinations

1) Substrate Elevation and Slope

Rio Guayanilla – The substrates and slopes (geomorphology) of the natural river channel are that of a medium gradient, alluvial plain stream fed by waters and sediment from steep montane slopes. Substrates in order of frequency are: medium to large sized cobble, small cobble, gravels, sands, large erratic boulders, and very little to no silt.

Mangrove Swamp – The geomorphology of the mangrove swamp is flat to slightly sloped towards the ocean.

2) Sediment Type

Rio Guayanilla – Alternative #1 would remove a negligible amount of rock sediment in the Rio Guayanilla comparatively to the sediment budget of the river at bridge crossings and potentially other constrictions in the river channel. Removal would occur once during construction and periodically throughout the project life cycle of the alternative.

Rio Guayanilla – Alternative #3 would remove a small portion of rock sediment and contour the affected area with the same rock sediment in order to place the diversion structure and connector channel to the Phase I project. Removal of sediment would occur once during construction and periodically throughout the project life cycle of the diversion structure in order to maintain functionality and effectiveness.

Mangrove Swamp – Alternative #3 El Faro Component would fill over fluvial and marine deposits of silt, clay and sand. Substrates also consist of organic much and detritus from mangrove and other plant inputs.

3) Fill Material Movement

Fill material (riprap and concrete) are not expected to move except for minor settling movements.

4) Physical Effects on Benthos

Rio Guayanilla – Effects to benthos are not expected, as the majority, if not all of, work would occur during the dry season in materials that are naturally subjected to continual movement by river flows.

Mangrove Swamp – Effects to benthos are expected. Those benthic invertebrates that do not move or exhibit low vagility would be covered by the levee.

5) Effects Determination

Rio Guayanilla Diversion Structures: The nature of effects are permanently covering up by the concrete diversion structures; this is the highest degree of impact, because the substrates are basically removed. Cumulatively, this will have no effect on the Rio Guayanilla system because sediment transport and substrate sorting would remain intact.

It was determined that no compensatory mitigation under Section 404 of the Clean Water Act (40 C.F.R. § 230.93) would be implemented required for the permanent loss of 0.075 acres of ephemeral riverine habitat.

Mangrove Swamp El Faro Levee: The nature of effects are permanently covering up by the El Faro Levee structure; this is the highest degree of impact because the substrates are basically removed. Cumulatively, this will have no effect on the greater mangrove wetland system because removed mangrove does not provide functional properties to sustain adjacent substrate conditions.

6) Actions Taken to Minimize Impacts

Conservation Measure for Riverine Flows & Sediment Transport: Implementing Alternative #3 would cause an interruption in connectivity for sediment transport and river flows by having a diversion structure placed across the channel just downstream of PR-2. To render this effect to a minor effect, there would be conservation measures applied to the structure. A set of culverts would be sized and placed as part of the diversion structure. These culverts would allow for sediment transport and near bank-full flows to continue downstream to the ocean; while maintaining effectiveness in transferring all out-of-bank flood stages to the constructed diversion channel. This would preserve the quality of substrates and substrate sorting in the Rio Guayanilla.

Compensatory Mitigation for Mangrove Swamp: It was determined that compensatory mitigation (40 C.F.R. § 230.93) would be implemented for the loss of 5.8 acres of perennial estuarine interior basin mangrove wetland/habitat and associated fauna as described for Clean Water Act compliance in this 404(b)(1) Analysis (*Appendix A2*) and USFWS DCAR (*Appendix A4*). The effects under NEPA are considered to be lowered to less than Significant by the application of the conservation measure and compensatory mitigation as described in *Appendix A3 Mitigation, Monitoring and Adaptive Management Plan*.

1.2.2 b. Water Circulation, Fluctuation, and Salinity Determinations

1) Water

(a) Salinity – No effects to salinity within the Rio Guayanilla and nearshore Guayanilla Bay are anticipated as flow volumes or chemistries are not being changed. Salinity within the interior basin mangrove swamp would be naturalized by allowing floodwaters from the Rio Guayanilla to periodically flush excess salts built up from tidal action. The project will change the timing of flood flows, which will facilitate the flush of salinity from the interior mangrove swamp over time.

(b) Water Chemistry – Effects to water chemistries of the Rio Guayanilla and Guayanilla Bay are not anticipated from any of the proposed alternatives.

(c) Clarity – No effects are expected.

(d) Color – No effects are expected.

(e) Odor – No effects are expected.

(f) Taste – No effects are expected.

(g) Dissolver Gas Levels – No effects are expected.

(h) Nutrients – No effects are expected.

(i) Eutrophication – No effects are expected.

(j) Other – NA

2) Current Patterns and Circulation

See Section 2.3 and 5.3 of the main report for description of Water Resources.

(a) Current Patterns and Flow

Rio Guayanilla – Flows, and patterns resulting from flows over the natural geomorphology, large woody debris, boulders, and manmade structures within the Rio Guayanilla are expected to stay in the existing conditions, as near bank-full flows would be maintained.

Rio Guayanilla / Guayanilla Bay Discharge Point – Flow patterns would be moderately changed to allow a more natural discharge point than the existing Phase I condition. Instead of rebuilding/maintaining the “chute” created at the mouth of the Rio Guayanilla, levees will be truncated well before the ocean to allow flows to spread out, flush and deposit sediments to build coastal wetland hydrogeomorphic delta and estuarine features.

Mangrove Swamp – Flow patterns and currents would be excluded from the new levee footprint at El Faro.

(b) Velocity

Rio Guayanilla – Velocities within the Rio Guayanilla are expected to remain in the existing condition, as near bank-full flows would be maintained.

Rio Guayanilla / Guayanilla Bay Discharge Point – Velocities at the discharge point to the ocean would be naturalized and reduced for reasons previously noted.

(c) Stratification – NA

(d) Hydrologic Regime – A new hydrologic regime would be established for all floods greater than the bank-full width flows, or roughly the 2-year flood interval. All flood stages over this level would be redirected and confined in an engineered diversion channel. Lands affected by the new hydrologic regime are urban and agricultural, and therefore changes to native plant communities are not expected. The hydrologic regime would be naturalized from the existing condition at the river mouth by allowing flood flows to spread out by truncating and setting back confining topography and berms to the west.

3) Normal Water Level Fluctuations

Rio Guayanilla – Water fluctuations for the 2-year flood and below would remain in the existing condition; all other flood events of greater magnitude would be transferred to the diversion channel.

Rio Guayanilla / Guayanilla Bay Discharge Point – No effects are anticipated due to the ocean controlling water level fluctuations in the nearshore and to a certain degree up the Rio Guayanilla river mouth and channel.

Mangrove Swamp – Surface waters and fluctuations would no longer be present within the 5.8 acre footprint of the new levee at El Faro.

4) Salinity Gradients

Salinity gradients of the Rio Guayanilla freshwater riverine system and Guayanilla Bay marine system are not anticipated to be adversely affected by the implementation of the recommended plan. Beneficial changes to the river mouth delta, interior mangrove basin to the immediate west, and floodway hydraquent soils salinity are anticipated based on conservation measures of naturalizing the river mouth discharge. Changes in flood flows will result from project implementation. Changes in the timing of flood flows will facilitate a return of the natural flushing processes that were altered by past projects. Consequently, the accumulation of excessive salts from past modifications will change due to the freshwater flooding of the greater mangrove coastal zone over time.

5) Actions that will be Taken to Minimize Impacts

Conservation Measure for Riverine Flows & Sediment Transport: Implementing Alternative #3 would cause an interruption in connectivity for sediment transport and river flows by having a diversion structure placed across the channel just downstream of PR-2. To render this effect to a minor effect, there would be conservation measures applied to the structure. A set of culverts would be sized and placed as part of the diversion structure. These culverts would allow for sediment transport and near bank-full flows to continue downstream to the ocean; while maintaining effectiveness in transferring all out-of-bank flood stages to the constructed diversion channel. This would preserve the quality of substrates and substrate sorting in the Rio Guayanilla.

Conservation Measure for Freshwater Mangrove Inputs: Modifications to proposed Alternatives #3 during the plan formulation phase were made to help flush accumulating salinity in the near shore mangrove and estuary coastal soils. This modification consisted of truncating the confining topography / berms to the west about 4,500 feet from the ocean, and building a small levee along the town of El Faro; this is basically a “set-back” to allow for flooding and ecosystem functions to occur, while lowering flood risks.

1.2.3 c. Suspended Particulate/Turbidity Determinations

1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Fill Site

Rio Guayanilla – Suspended particulates and turbidity issues are not anticipated. The Rio Guayanilla parent materials are primarily rock, gravels and sands, with low presences of clays and silts. In addition, primarily all of the work, especially that applicable to Section 404, would be accomplished during the dry season when the river channel is dry. There would be no change to the wash load of the river, the magnitude of floods and nature of the catchment create and extremely turbid situation when the river floods. Species are adapted to and require this. Construction activities in the dry are deemed negligible comparatively to the natural condition.

Mangrove Swamp – The El Faro levee would be constructed primarily of clay. BMPs and construction methodologies dealing with clay material and particles would be prevented from eroding into the adjacent beach, mangrove or tributary ditches. There would be no change to the sediment load of the river entering into the interior mangrove basin, the magnitude of floods and nature of the catchment create an extremely turbid situation when the river floods. Species are adapted to this. Construction activities in the dry are deemed negligible comparatively to the natural condition.

2) Effects on Chemical and Physical Properties of the Water Column

- (a) Light Penetration – No effects are expected.
- (b) Dissolved Oxygen – No effects are expected.
- (c) Toxic Metals and Organics – No effects are expected.
- (d) Pathogens – No effects are expected. Pathogens gathered during floods may go down as all waters would be diverted through a clean channel, as opposed to flowing over and through a city and agricultural landscape and all associated chemicals and foreign debris.
- (e) Aesthetics – No effects are expected
- (f) Other – NA

3) Effects on Biota

- (a) Primary Production, Photosynthesis – No effects are anticipated.
- (b) Suspension/Filter Feeders – No effects are anticipated.
- (c) Sight Feeders – No effects are anticipated.

4) Actions Taken to Minimize Impacts

Best Management Practices – Soil erosion and sediment control measures will be incorporated into the alternative during design phase and will comply with commonwealth and federal environmental requirements. The minimum measures required at the project site may include:

- Conducting most of the construction during the dry season
- Dust abatement
- Installation of silt fences around graded slopes and stockpile areas near water bodies
- Stabilizing construction entrances to limit soil disturbance at the ingress/egress from the site
- Installing erosion blanket over erodible finished grades where applicable
- Etc.

1.2.4 d. Contaminant Determinations

The proposed fill material would not introduce any new contaminants into the Rio Guayanilla, Guayanilla Bay, mangrove swamp, or release any significant amounts of existing contaminants (if any are present) through bottom disturbance in the construction zone. All materials would be purchased from a licensed vendor or from the project's on-site quarry. Specifications for material require them to be clean and inert.

1.2.5 e. Aquatic Ecosystem and Organism Determinations

1) Effects on Plankton

The nature, degree and placement methods of fill would not impart effects to the greater planktonic community of the river channel or the mangrove swamp.

2) Effects on Benthos

Rio Guayanilla – Effects to benthos are not expected, as the majority, if not all of, work would occur during the dry season in materials that are naturally subjected to continual movement by river flows.

Mangrove Swamp – Effects to benthos are expected. Those benthic invertebrates that do not move or exhibit low vagility would be covered by the levee.

3) Effects on Nekton

Rio Guayanilla – Effects to nekton are not expected, as the majority, if not all of, work would occur during the dry season in materials that are naturally subjected to continual movement by river flows.

Mangrove Swamp – Effects to nekton are expected via habitat removal. Those animals that do not move or exhibit low vagility would be covered by the levee.

4) Effects on Aquatic Food Web

Effects not expected. Food web interactions may improve at the river mouth delta and estuary zone.

5) Effects on Special Aquatic Sites

a) Sanctuaries and Refuges – Effects not expected. These natural areas are not present within affected area.

b) Wetlands – The study team, inclusive of the USFWS Caribbean Office, used the following five steps to determine that compensatory mitigation is required to prevent or compensate for interior mangrove swamp loss:

a) Avoiding the impact altogether by not taking a certain action or part of an action

Large scale impacts were avoided by not placing a confining berm or levee on the west side of the Río Guayanilla from the southern end of town to the confluence with Guayanilla Bay (Figure 5). This initial measure would have cut off approximately 240-acres of interior basin mangrove swamp and other degraded and abandoned old fields that could be restored ecologically.

b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation

Hydrologic and geotechnical analyses of the El Faro area were utilized to minimize the footprint of the levee and set the alignment as close as possible to the existing road. Absence of these analyses would have incurred contingencies that would require a taller, wider and longer levee.

c) Rectifying the impact by repairing, rehabilitating or restoring the affected environment

Consequently, the flooding regime of the affected environment is natural and cannot be repaired, rehabilitated or restored, which requires some type of flood risk reduction measure at El Faro to reduce the risk of incurring flood damages and effects.

d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action

The levee construction activities require complete removal of the existing secondary growth Black Mangrove swamp community at the site in order to be functional, so the impact associated with this portion of the project footprint will never be reduced or eliminated over time, nor would the natural flooding regime.

e) Compensating for the impact by replacing or providing substitute resources or environments. "Replacing" means the replacement of fish and wildlife resources in-kind

Based on coordination and conservation planning conducted with the USFWS, the secondary growth condition of the Black Mangrove swamp, the avoidance of impacting 240-acres and the minimization of the El Faro levee size the target for 1:1 in-kind mitigation would be 5.8-acres of Black Mangrove swamp within the project footprint (Appendix A3).

f) "Substitute" means the replacement of fish and wildlife resources out-of-kind. Substitute resources, on balance, shall be at least equal in value and significance as the resources lost.

Not considered.

b) .

- c) Mud Flats – Effect to saline mudflats are not expected; the existence of mud flats could increase based on reducing the hydraulic forces at the mouth of the river due to the conservation measures for keeping flows through the interior mangrove basin.
- d) Vegetated Shallows – Effects to vegetated shallows are not expected, but could improve due proposed discharge configuration as a conservation measure.
- e) Marine Reefs – Effects to salt water reefs are not expected. The reefs just outside Guayanilla Bay are not considered within the affected area.
- f) Riffle & Pool Complexes – Effects to riffle / pool complexes in the natural channel of the Rio Guayanilla are not expected. Debris clearing at bridge crossing would not disturb riffle or pool structures.

6) Threatened and Endangered Species

Federal or state threatened and endangered species were not identified within those areas applicable to Section 404. ESA Section 7 consultation with the USFWS is concluded for subtropical, dry forest habitats; see Appendix A4.

7) Other Wildlife

No wildlife effects are anticipated. For a description of the affected biological resources, see Section 2.6 of the Feasibility Report. Section 5.6 of the Feasibility Report discusses effects to biological resources from the Recommended Plan.

8) Actions to Minimize Impacts

Conservation Measure for Riverine Flows & Sediment Transport: Implementing Alternative #3 would cause an interruption in connectivity for fishes, shrimps, sediment transport and river flows by having diversion structures placed across the channel just downstream of PR-2. To render this effect to a minor effect, there would be conservation measures applied to the structure. A set of culverts would be sized and

placed/embedded as part of the diversion structures. These culverts would allow for sediment transport and near bank-full flows to continue downstream to the ocean; while maintaining effectiveness in transferring all out-of-bank flood stages to the constructed diversion channel. This would preserve the quality of substrates and substrate sorting in the Rio Guayanilla.

As example, the suite of ephemeral fishes found within the Rio Guayanilla during the wet season would not be subsequently effected by this alternative. Cues (bank-full flows), connectivity (culvert passage) and habitat (sediment transport/substrates) would remain no less intact than the existing condition, especially for species in which physical fragmentation of the river in not an issue i.e. Sirajo Goby, Spinycheeked Smallscaled Sleeper, American Eel.

Conservation Measure for Freshwater Mangrove Inputs: Modifications to proposed Alternatives #3 during the plan formulation phase were made to help flush accumulating salinity in the near shore mangrove and estuary coastal soils. This modification consisted of truncating the confining topography / berms to the west about 4,500 feet from the ocean, and building a small levee along the town of El Faro; this is basically a “set-back” to allow for flooding and ecosystem functions to occur, while lowering flood risks.

Mangrove Swamp Mitigation: Based on coordination and conservation planning conducted with the USFWS, the secondary growth condition of the mangrove swamp, the avoidance of impacting 240-acres and the minimization of the El Faro levee size the target for 1:1 in-kind mitigation would be 5.8-acres of interior basin mangrove swamp within the project footprint (Figure 6). See *Appendix A3 Mitigation, Monitoring & Adaptive Management Plan*.



Figure 7: Recommended Mitigation Plan Alternative 1 Old Basin

1.2.6 f. Proposed Disposal/Discharge Site Determinations

1) Mixing Zone Determination

A mixing zone is not applicable to this project as no volume of water will serve as a zone of initial dilution in the immediate vicinity of the discharge point where water quality may not meet water quality standards. Aqueous or emulsified sediment/water discharges for this project are not anticipated.

2) Determination of Compliance with Applicable Water Quality Standards

The proposed activity would not cause significant or long-term degradation of water quality within the Rio Guayanilla, Guayanilla Bay, or 240 acre interior mangrove forest and would comply with all applicable water quality standards.

3) Potential Effects on Human use Characteristics

- (a) Municipal and Private Water Supply – No effects expected.
- (b) Recreational and Commercial Fisheries – No effects expected.
- (c) Water Related Recreation – No effects expected.

(d) Aesthetics – No effects expected.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves – NA

1.2.7 g. Determination of Cumulative Effects on the Aquatic Ecosystem

Based on recent natural and anthropogenic history and demographics of the study area, considering adjacent towns and municipalities as well it is not anticipated that non-federal, state or municipal projects would occur within the study that are of magnitude or spatial size to add cumulative effects to any of the proposed alternatives. The direct and indirect effects analysis took into consideration the past effects of the Phase I DNER flood project at the mouth of the Rio Guayanilla. Current actions under any of the alternatives coupled with described conservation measures and mitigation would not cumulatively increase adverse effects that had previously occurred, but in some instance would promote ecosystem recovery of the mouth, delta, mangrove coastal zone and the greater estuarine system.

It was determined that no compensatory mitigation under Section 404 of the Clean Water Act (40 C.F.R. § 230.93) would be implemented required for the loss of 0.075 acres of ephemeral riverine habitat.

The Recommend NED Plan component of the set-back El Faro levee would fill/impact about 5.8-acres of mangrove swamp. Based on the findings of this 404(b)(1) analysis, the target for 1:1 in-kind mitigation would be 5.8-acres of mangrove swamp within the project footprint.

1.2.8 h. Determination of Secondary Effects on the Aquatic Ecosystem

No significant secondary impacts on the Rio Guayanilla, Guayanilla Bay, or 240 acre interior mangrove forest ecosystems are expected as a result of the proposed alternatives.

1.3 III. Findings of Compliance or Non-Compliance with Restrictions on Discharge

a. No adaptation of the Section 404(b)(1) guidelines was made for this evaluation.

b. No practical alternatives are available that produce fewer adverse aquatic impacts than the proposed plan.

c. The proposed project would comply with applicable water quality standards.

d. The project is in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act; with the Endangered Species Act of 1973; with the National Historic Preservation Act of 1966; and with the Marine Protection, Research, and Sanctuaries Act of 1972.

e. The proposed fill activity would have no significant adverse impact on human health or welfare, including municipal and private water supplies, recreational and commercial fisheries, plankton, fish, shellfish, or wildlife communities (including community diversity, productivity, and stability), special aquatic sites, or recreational, aesthetic, and economic values.

f. Typical erosion control measures would be taken to minimize construction impacts other than selection of the least environmentally damaging construction alternative.

g. On the basis of the Guidelines, the proposed site for the discharge of fill material is specified as complying with the requirements of these guidelines with the inclusion of appropriate and practical conditions to minimize pollution or adverse impacts to the aquatic ecosystem.

2.0 Compliance with Applicable Laws, Statutes & Executive Orders

The alternatives presented in the Environmental Assessment are considered to be in compliance with the following legal components, as summarized in Table 28 of the Integrated Feasibility Report:

2.1.1 Clean Air Act

The Clean Air Act (42 U.S.C. § 7401) is a United States federal law designed to control air pollution on a national level.

2.1.2 Clean Water Act

CLEAN WATER ACT SECTION 404(B)(1) COMPLIANCE

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in **Appendix A** of the IFR/EA.

CLEAN WATER ACT SECTION 401 COMPLIANCE:

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the **Commonwealth of Puerto Rico** prior to construction. In a letter dated **TBD**, the **Environmental Quality Board, Commonwealth of Puerto Rico** stated that the recommended plan appears to meet the requirements of the water quality certification, pending confirmation based on information to be developed during the pre-construction engineering and design phase. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality.

2.1.3 Comprehensive Environmental Response, Compensation, & Liability Act

The Comprehensive Environmental Response, Compensation and Liability Act (known as Superfund) was passed to facilitate the cleanup of toxic waste sites. In 1986, the Act was amended by the Superfund Amendment and Reauthorization Act Title III (community right-to-know laws). Past and present owners of land contaminated with hazardous substances can be held liable for the entire cost of the cleanup, even if the material was dumped illegally when the property was under different ownership. HTRW materials may be present in the project vicinity. The NFS is responsible for providing all lands, easements, and rights-of-way required for the proposed project. If contaminants exist, these lands would be required to be cleaned up before project implementation. The proposed project would be in full compliance with this Act.

2.1.4 Federal Endangered Species Act of 1973, as Amended

Pursuant to the ESA, USFWS and NMFS have regulatory authority over federally-listed species. Under the ESA, a permit to “take” a listed species is required for any federal action that may harm a listed species. ESA, Section 7 prohibits federal agencies from authorizing, funding, or carrying out activities that are likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its critical habitat. By consulting with USFWS and NMFS before initiating projects, agencies review actions to determine if they could adversely affect listed species or their habitat and design their programs and projects to conserve listed and proposed species. USFWS and NMFS coordination with other federal

agencies is important to species conservation. USFWS is the administering agency for non-marine species. NMFS is the administering agency for marine species, including anadromous fish species.

2.1.5 EO 11990, Protection of Wetlands

Executive Order 11990, signed May 24, 1977, directs all federal agencies to refrain from assisting in or giving financial support to projects that encroach on publicly or privately owned wetlands. It further requires that federal agencies support a policy to minimize the destruction, loss or degradation of wetlands. A project that encroaches on wetlands may not be undertaken unless the agency determines that: 1) there are no practicable alternatives to such construction, 2) the project includes all practicable measures to minimize harm to wetlands that would be affected, and 3) the effect would be minor.

2.1.6 EO 11988, Floodplain Management

EO 11988 requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modifications of floodplains and to avoid direct and indirect support of floodplain development where there is a practicable alternatives. In accomplishing this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities” for the following actions: 1) acquiring, managing, and disposing of federal lands and facilities, 2) providing federally-undertaken, financed, or assisted construction and improvements, and 3) conducting federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities.

2.1.7 EO 12898, Environmental Justice

EO 12898 requires that environmental analyses of proposed federal actions address any disproportionately high, adverse human health or environmental effects on minority or low-income communities. Federal agencies’ responsibility applies equally to Native American populations. Each federal agency must ensure that public documents, notices, and hearings are readily accessible.

2.1.8 EO 13045, Protection of Children from Environmental Health Risks and Safety Risks

EO 13045, signed April 21, 1997, directs federal agencies, to the extent permitted by law and as appropriate, to make identifying and assessing environmental health and safety risks that may disproportionately affect children a high priority and to ensure that policies, programs, activities and standards address disproportionate risks to children that result from environmental health or safety risks.

2.1.9 Fish and Wildlife Coordination Act of 1958, as Amended (16 U.S.C. 661, et seq.)

The FWCA of 1958 requires that all federal agencies consult with USFWS, NMFS, and the affected State wildlife agency for activities that affect, control, or modify surface waters, including wetlands and other waters. Under the FWCA, the USFWS, NMFS, and USACE have an extended responsibility for project review that encompasses concerns about plant and wildlife species that may not be addressed under NEPA and the federal ESA.

2.1.10 Magnuson-Stevens Fishery Conservation & Management Act (16 U.S.C. 1801, et seq.)

This Act establishes a management system for national marine and estuarine fishery resources. EFH is defined as “waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” It states that migratory routes to and from anadromous fish spawning grounds should also be considered EFH. The phrase “adversely affect” refers to any effects that reduce the quality or quantity of EFH. Federal activities that occur outside an EFH, but that may have an effect on EFH waters and substrate, must also be considered in the consultation process.

This Act requires federal agencies to consult with NMFS regarding all actions or proposed actions permitted, funded, or undertaken that may adversely affect EFH. In consulting, the action agency must provide a written assessment of the effects of their action on EFH to NMFS. If NMFS determines that a proposed federal or State activity would adversely affect EFH, then NMFS is obligated to provide EFH conservation recommendations to the action agency. The action agency must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed for avoiding, mitigating, or offsetting the impact of the activity on EFH. If the response is inconsistent with NMFS EFH conservation recommendations, the agency must explain its reasons for not following the recommendations.

2.1.11 Migratory Bird Treaty Act of 1918, as Amended (16 U.S.C. 703, et seq.)

This Act, as amended, implements treaties and conventions between the United States, Canada, Japan, Mexico, and Russia providing protection for migratory birds as defined in 16 U.S.C. 715j. It establishes hunting seasons and capture limits for game species and protects migratory birds, their occupied nests, and their eggs (16 U.S.C. 703, 50 C.F.R. 21, 50 C.F.R. 10). Permits from USFWS are required for both incidental and direct take.

2.1.12 National Historic Preservation Act of 1996, as Amended (54 U.S.C. 300101 et seq.)

The NHPA requires federal agencies to consider the effects of a proposed undertaking on properties determined to be eligible for, or included in, the NRHP. The goal of the NHPA is to have federal agencies act as responsible stewards of our national resources when their actions affect historic properties. Section 106 applies when two thresholds are met: (1) there is a federal or federally licensed action, including grants, licenses, and permits; and (2) that action has the potential to affect properties listed in or eligible for listing in the National Register of Historic Places. Section 106 requires each federal agency to identify and assess the effects of its actions on historic resources and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. The agency must consult with appropriate state and local officials, Native American tribes, applicants for federal assistance, and members of the public, and consider their views and concerns about historic preservation issues when making final project decisions. Effects are resolved by mutual agreement, usually among the affected state's State Historic Preservation Office/Tribal Historic Preservation Office (SHPO/THPO), the federal agency, and any other involved parties. The ACHP may choose to participate in controversial or precedent-setting situations.

2.1.13 Resource Conservation and Recovery Act (42 U.S.C. 6901, et seq.)

This Act enables EPA to administer a regulatory project that extends from the manufacture of hazardous materials to their disposal, thus regulating the generation, transportation, treatment, storage, and disposal

of hazardous waste at all facilities and sites in the U.S. The proposed project would comply with this Act when transporting or disposing of hazardous material found in the project area.

2.2 Additional Requirements

2.2.1 Section 401 Clean Water Act

Under the Puerto Rico Federal Relations Act, the statutory laws of the United States apply in Puerto Rico in the same force and effect as in the United States, unless expressly excluded by particular legislation. 48 U.S.C.A. Sec 734. In 1917, jurisdiction over all bodies of water including harbor areas, navigable streams and submerged lands in and around the Commonwealth were transferred to the government of Puerto Rico. 48 U.S.C.A. Sec 749. Federal Law, under Section 401 of the Clean Water Act (CWA) requires all government agencies whose proposed activity may result in the discharge of pollutants into waters of the United States to obtain a state water quality certification. Water quality certification is issued if the proposed agency activity meets the water quality standards developed by the State, in accordance with the CWA and in coordination with the EPA. In defining the term “State,” the CWA included the Commonwealth of Puerto Rico within its circumscription. 33 U.S.C. §1362(3).

The Environmental Quality Board (EQB) is designated as the agency responsible for developing Puerto Rico’s public policy to conserve, maintain and protect the use of waters in the island. Therefore, in conformance with Section 401 of the Clean Water Act, the U.S. Army Corps of Engineers must seek state water quality certification from the EQB for the discharge of dredged or fill material.

2.2.2 Coastal Zone Management

The 1972 U.S. Coastal Zone Management Act requires that all federal actions that may have reasonably foreseeable effects on the uses or resources of a state’s coastal zone be consistent with the enforceable policies of the state’s and U.S. territories coastal management program to the maximum extent practicable. On July 12, 1978 the Puerto Rico Coastal Zone Management Program (PRCZMP) was adopted with the purpose of promoting the protection, conservation and sustainable development of the islands coastal zone and natural resources. The Department of Natural and Environmental Resources (DNER) is the lead agency responsible for the implementation of the program, in close coordination with the Puerto Rico Planning Board (PRPB), which is the local governmental entity responsible for administering the federal consistency certification process in compliance with the PRCZMP.

Any federal action (activity, project or construction) carried out within the boundaries of Puerto Rico’s coastal zone or affecting the resources located therein must comply with the enforceable policies of the PRCZMP. These policies include compliance with all local laws and regulations pertaining to the use of land, water and natural resources such as those implemented by the Planning Board, Permits Management Office, Environmental Quality Board, Department of Natural and Environmental Resources, Department of Agriculture and the Institute of Puerto Rican Culture.