

The Caño Martín Peña Ecosystem Restoration Project National Ecosystem Restoration Benefits Analysis

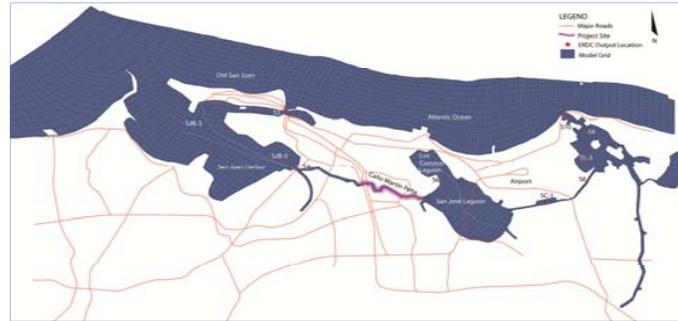


Donald R. Deis¹; David A. Tomasko¹; Jaime A. Pabon²; Katia R. Avilés-Vázquez³; Angeliz Encarnación Burgos³
¹Atkins North America; ²Atkins Caribe, San Juan, PR; ³Corporación del Proyecto ENLACE del Caño Martín Peña

Abstract

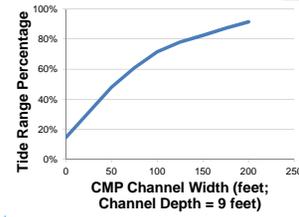
The Caño Martín Peña (CMP) Ecosystem Restoration Project (the ERP) consists of the dredging of approximately 2.2 miles of the eastern end of the CMP, starting from the San José Lagoon towards the west of the Luis Muñoz Rivera Avenue Bridge. The CMP represents a unique urban ecosystem restoration opportunity with potential for significantly enhancing the water quality and fish and wildlife habitat of the entire San Juan Bay Estuary (SJBE) system. Secondary benefits of this restoration project include flood control, community socio-economic development, land use planning integration, and quality of life benefits for local residents. The proposed channel restoration could also add to recreation, transportation, and tourism opportunities for the San Juan area once the channel's historic tidal connection and flushing conditions are reestablished. The actual condition of the CMP and surrounding areas, its ecological attributes and biological integrity are extremely degraded due to significant human encroachment, including human settlements, deposits of solid waste and demolition debris, and raw sewage discharges. Multiple ERP alternatives were evaluated for the CMP dredging configuration, including a 33 foot wide by three foot deep as an "existing condition"; 75, 100, 125, 150, 175, and 200 foot channel widths; and nine and fifteen foot depths. Models were developed using an existing hydrodynamic model, benthic index, and fish and fishery habitat to evaluate the benefits of the alternatives and configurations.

System Modeling



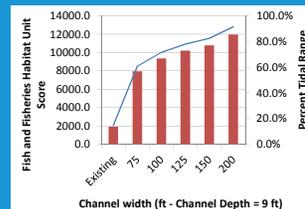
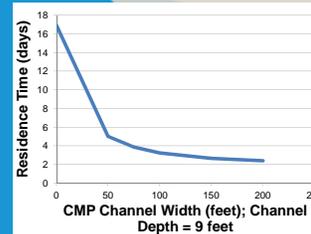
CH3D-WES Model Grid

- CH3D-WES Hydrodynamic Model is a three dimensional curvilinear finite difference model developed by the U.S. Army Engineer Waterways Experimental Station.
- CH3D-WES hydrodynamic model was chosen because it was used for a previous study of the San Juan Bay estuary and in particular, the original proposed dredging of the Caño Martín Peña
- Modeling results show that the Caño Martín Peña currently provides only a slight influx of tidal waters to the San José Lagoon.
- Should the Caño Martín Peña be opened up and friction reduced through the removal of material currently clogging the canal, there would be a dramatic increase in tidal amplitude in San José Lagoon.



Percentage similarity between tidal ranges in San Juan Bay and San José Lagoon as a function of channel width (feet) of the Caño Martín Peña.

Residence time in San José Lagoon as a function of dredged Caño Martín Peña width. Existing condition is portrayed as zero width (i.e. zero dredging).



Fish and Fishery Habitat Units gained by opening the Caño Martín Peña and increasing the percent of tidal range similarity between San Juan Bay and San José Lagoon

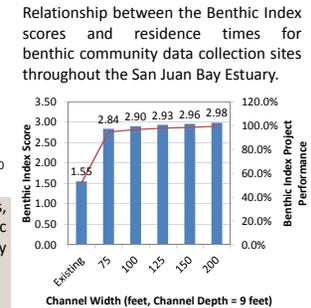
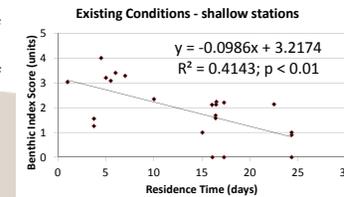
Ecological Performance Measures

Planning Objectives:

- ✓ Improve fish and fisheries populations in the San Juan Bay Estuary system by increasing connectivity and tidal access to estuarine areas;
 - ✓ Improve hydrology and reestablish soil elevations to allow for improvements in functional value of mangrove wetlands within the Caño Martín Peña ;
 - ✓ Improve human health conditions in neighborhoods adjacent to the Caño Martín Peña, San Jose and Los Corozos lagoons, and the Suárez Canal by improving water quality and limiting exposure pathways to contaminated waters in the Study Area; and
 - ✓ Restore benthic habitat by increasing dissolved oxygen in bottom waters and improving salinity regime to levels that support native estuarine benthic species.
- A conceptual Ecological Model was developed to understand the system and guide performance measure selection.

Benthic Index

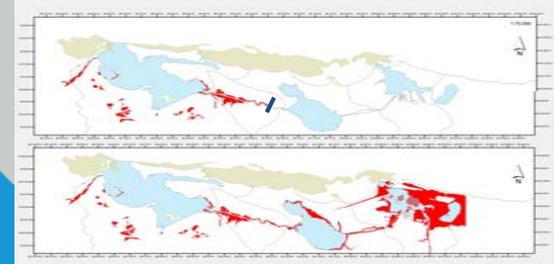
- Index developed for San Juan Bay estuary combining information on benthic community diversity; the presence or absence of pollution-tolerant benthic taxa; and the presence or absence of pollution-sensitive benthic taxa.
- Low Benthic Index scores in San José Lagoon that could not be explained by water depths alone.
- Distance from the Atlantic Ocean, an inverse proxy for the residence time, was a better predictor of benthic community health than water depth



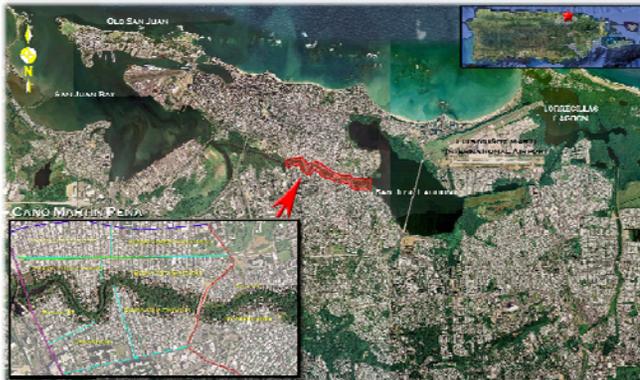
Relationship between the Benthic Index scores, project performance based on Benthic Index scores, and residence time achieved by Caño Martín Peña project channel widths.

Fish and Fishery Habitat

- A relationship was developed between the increased percentage similarity in tidal range east and west of the Caño Martín Peña with increased channel width from the hydrodynamic model and connectivity for fish and fishery habitat with the San Juan Bay Estuary system and offshore reefs



Map of mangrove habitat acreage (shown in red) within the San Juan Bay estuary system representing available mangrove habitats for fish within San Juan Bay proper under existing (top) and projected future conditions (bottom). Blue line shows approximate location of area where local residents currently cross the Caño Martín Peña on foot.



Caño Martín Peña and the San Juan Bay Estuary System



Caño Martín Peña, 1936 aerial



Trash and Debris in the Caño Martín Peña

Plan Design Enable