Table 3-27. Study Area 5A Cost Opinion – with Pump Station

Construction Subtotal (with Pump Station)		$10,133,796
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,520,069
Contractor Profit	10%	$1,013,380
Engineering/Design	22%	$2,229,435
Contingency/Market Volatility	25%	$3,166,811
Total Including Contingencies		$18,063,492

3.2.9 Study Area 6A, Southern Bahama Village

Study Area 6A lies in the southwest corner of the island, just before the Naval Air Station. The study area focuses on flooding at the Frederick Douglass Gym, at the intersection of Emma and Olivia Streets, and at Nelson English Park, on the corner of Thomas and Catherine Streets. This study area represents all drainage infrastructure south of Geraldine Street and west of Thomas Street. Much of the area is low lying near the coast, with a majority of the existing infrastructure at an elevation of 4 feet NAVD 88 or less. There are currently no pump stations in the area, but there is a good-sized outfall flowing southeast on Fort Street out to the ocean. The system lacks connectivity to this outfall, resulting in sheet flow channelization in the streets and sustained flooding at the intersections. The system is overwhelmed and cannot direct flow from this area fast enough. However, near Nelson English Park, the streets are low (less than elevation 2 feet NAVD 88) and there is a sanitary pump station (Pump Station A) that has to be considered.

The proposed solution for this area includes adding connectivity to the intersection of Emma Street and Olivia Street, adding redundancy on Fort Street and Amelia Street, and installing two pump stations. In addition, a check valve backflow preventer is recommended at the outfall to reduce tidal influences at the existing outfall. Conceptual conveyance pipe sizing and routing based on current tidal boundary conditions is included on Figure 3-10. Proposed flood stage results are included in Table 3-28.

The proposed improvements for the preferred alternative include the following:

- Install proposed 330 LF of 36-inch-diameter RCP along Olivia Street from Emma Street to Fort Street.
- Install proposed 1,030 LF of 48-inch-diameter RCP along Fort Street from Olivia Street to Amelia Street, paralleling the existing 24-inch-diameter RCP.
- Install proposed 470 LF of 24-inch-diameter RCP along Thomas Street from Catherine Street to Amelia Street and continuing west along Amelia Street from Thomas Street to Howe Street, paralleling the existing 12-inch-diameter RCP.
- Install proposed 615 LF of 36-inch-diameter RCP along Amelia Street from Howe Street to Fort Street, paralleling the existing 24-inch-diameter and 36-inch-diameter RCP.
- Remove and replace 550 LF of 48-inch-diameter RCP from Fort Street to the outfall with 72--inch -diameter RCP.
- Install a tidal check valve at the existing outfall location. The City was already planning to do this.

- Construct proposed 50-cfs peak-flow stormwater pump station located in the parking lot at the Frederick Douglass Gym on the corner of Fort Street and Olivia Street; proposed vault extending to elevation -10 feet NAVD 88.
- Construct proposed 18.5-cfs peak-flow stormwater pump station located in the parking lot at the Nelson English Park; proposed vault extending to elevation -10 feet NAVD 88.

Figure 3-10 shows the proposed improvements for Study Area 6A.

Figure 3-10. Proposed Improvements in Study Area 6A

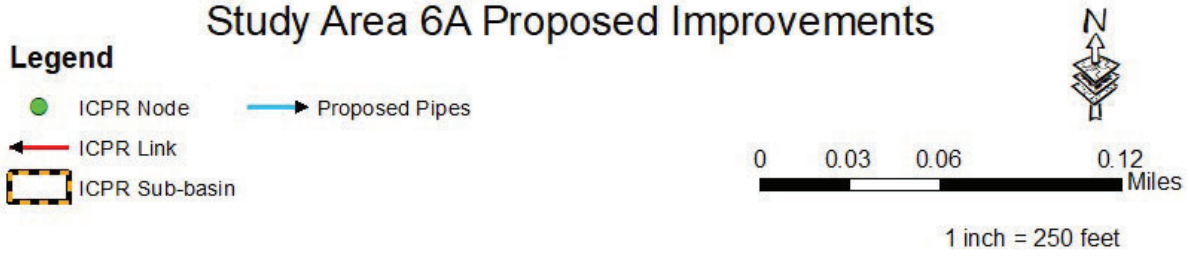

Table 3-28 presents a summary of the simulation results for the 10-year, 24-hour storm with upgrades provided at Study Area 6A.

Table 3-28. Summary of Study Area 6A Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes

Study Area Subbasins	10-Year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-foot Tide	Proposed Solution, 1-foot Tide (no pump)	Existing Conditions, 2.7-foot Tide	Proposed Solution, 2.7-foot Tide (w/pump)
Fort Street at Truman Avenue (N635)	3.01	3.77	2.17	3.96	3.76
Emma Street at Olivia Street (N642)	3.53	3.88	3.16	4.15	3.32
Fort Street at Olivia Street (N600)	2.82	2.77	1.86	3.29	2.84
Emma Street at Amelia Street (N605)	2.02	2.99	2.71	3.34	3.03
Howe Street at Amelia Street (N615)	2.00	2.95	2.60	3.33	2.97

Review of Table 3-28 shows the solution with or without a pump station will provide flood reduction at both target areas, especially at Emma and Olivia Streets. By adding pump stations at two locations in the system, with the 2.7-foot NAVD 88 tidal boundary conditions, the flood conditions will be significantly reduced. Results with the pump for the 2.7-foot tide solidify long-term benefits when SLR continues. The proposed backflow preventer on the outfalls also will reduce negative impacts of SLR.

Class 4 cost opinions were developed for the preferred solution both with and without pumps. Table 3-29 identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while Table 3-30 identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 3-29. Study Area 6A Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$2,648,279
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$397,242
Contractor Profit	10%	$264,828
Engineering/Design	22%	$582,621
Contingency/Market Volatility	25%	$827,587
Total Including Contingencies		$4,720,557

Table 3-30. Study Area 6A Cost Opinion – with Pump Station

Construction Subtotal (with Pump Station)		$ 11,831,346
Markups		
Contractors Overhead, General Conditions, Temp Facilities	15%	$1,774,702
Contractor Profit	10%	$1,183,135
Engineering/Design	22%	$2,602,896
Contingency/Market Volatility	25%	$3,697,296
Total Including Contingencies		$21,089,374

3.3 Regional/Resiliency Solutions for Flood Relief versus 2.7-foot Tidal Boundary Conditions

In addition to looking at the potential projects in the neighborhoods identified as problem areas, this SWMP also considered a broader review for potential, large-scale, regional strategies that address the future conditions with SLR up to 2.7 feet NAVD 88. The timing of the projections will vary, so the need is not urgent. However, at some point in the future, the ocean levels will reach these high 2.7 feet levels more frequently. This section discusses how bigger infrastructure projects could be formulated to provide resilient solutions for the island.

3.3.1 Master Planned Regional Pump Station Locations

Analysis of the study areas identified that when a future tidal boundary condition of 2.7 feet was inserted into the model, the flood-reduction benefits of isolated regional pump locations were diminished as the neighboring low-lying areas take advantage of the reduced flood stage and quickly drain into the improved area.