City of St. Pete Beach 2012 Stormwater Master Plan Update

St. Pete Beach
The Sunset Capital of Florida

CPWG
CRIBB PHILBECK WEAVER GROUP

1.0 INTRODUCTION

The City of St. Pete Beach (City) is a barrier island community located just off the Pinellas County mainland of Saint Petersburg bordered on the west south by the Gulf of Mexico, on the east by Boca Ciega Bay and on the north by Treasure Island (Figure 1-1). The City has a permanent population of about 10,000 and a large influx of seasonal visitors.

The City began to formally address stormwater management in 1993 when a Master Drainage Plan was prepared. The Plan focused on evaluation of drainage infrastructure facilities in 25 separate drainage basins throughout the City that were identified by city personnel. A drainage level of service was established for each basin so that the City could prioritize and construct affordable improvements as part of the Capital Improvements Program (CIP).

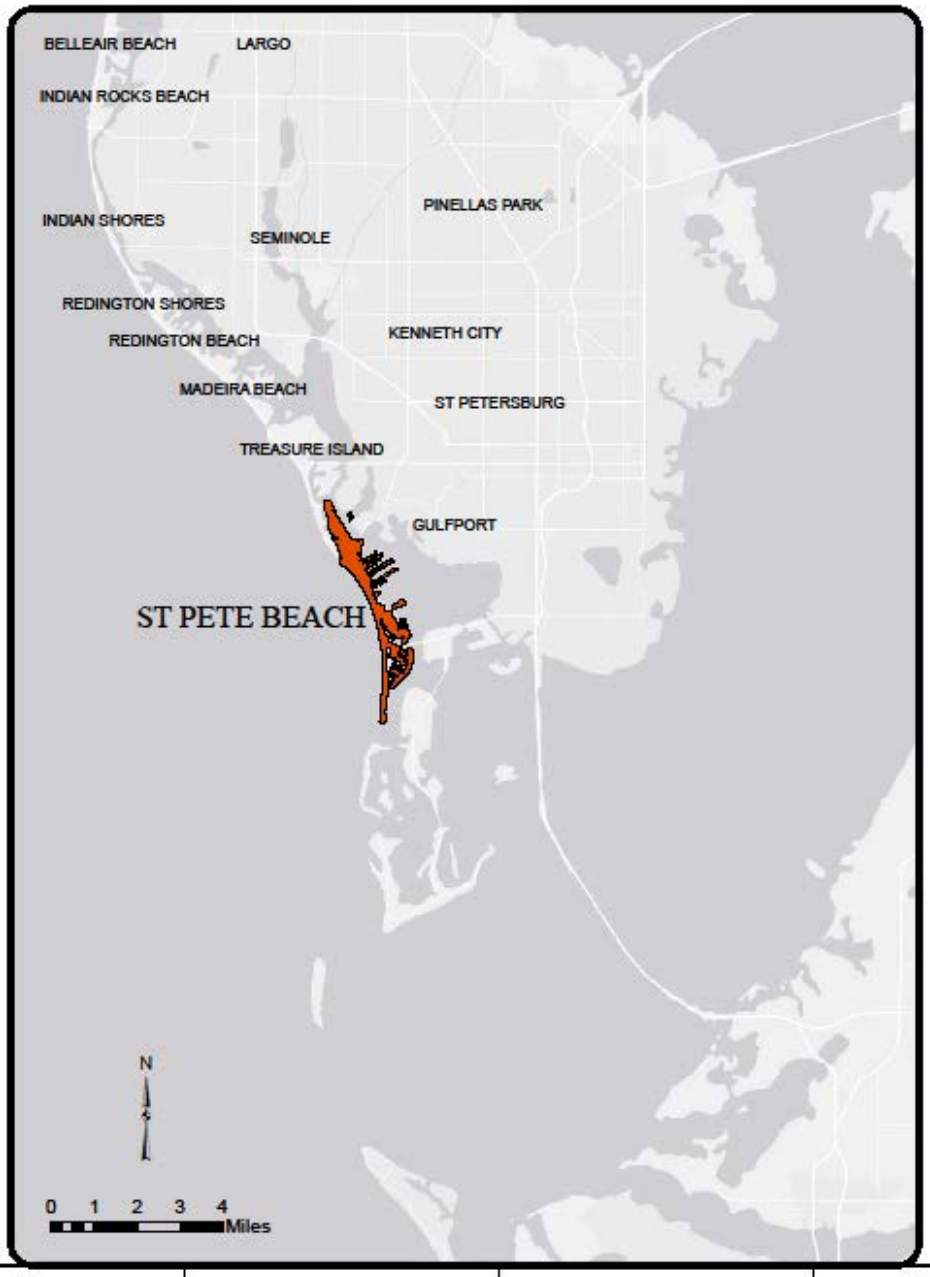
Twenty years have passed since the Master Drainage Plan was prepared and the City recognized the need to perform an update. The City selected CPWG to review and update the City's 1993 Master Drainage Plan and prepare a document summarizing findings and recommendations.

1.1 Purpose and Scope

The primary focus of this Stormwater Master Plan is to update the City's 1993 Plan, update the City's GIS stormwater database, prepare recommendations for improvements to reduce flooding in certain drainage basins within the City, and prepare a budget for recommended improvement projects for the City to use for long range planning. During this master planning process, an in-depth look at the hydrology and hydraulics of 25 drainage basins within the City was performed identifying areas with extensive flooding problems and the causes of those problems. Additionally, water quality issues associated with NPDES and TMDL regulations were reviewed.

1.2 Data Collection and Evaluation

Data was collected from a number of sources and reviewed to develop a comprehensive Stormwater Master Plan for the City. Data collection was focused on identifying and



CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST . PETE BEACH LOCATION MAP	FIGURE 1-1

quantifying hydraulic elements within 25 primary drainage basins previously identified by the City (Figure 1-2). Existing reports and plans were obtained, reviewed and categorized from the following sources:

- Stormwater infrastructure data from St. Pete Beach Public Services
- As-built plans from St. Pete Beach Community Development
- Stormwater management plans from Southwest Florida Water Management District
- Stormwater infrastructure as-built plans from Florida Department of Transportation
- Topographic information from United States Geological Survey
- NPDES and TMDL information from the Florida Department of Environmental Protection
- Stormwater Outfall Mapping and Condition Documentation from St. Pete Beach Public Services
- City Stormwater GIS data
- City flooding data from St. Pete Beach Public Services

In additional to the review of existing records and plans, field reconnaissance was performed for each drainage basin to verify existing conditions.

1.3 Field Reconnaissance

Field reconnaissance was performed to investigate and inventory each drainage structure within the 25 primary drainage basins. Field notes were taken to document the location, type, size, length and, number of structures (culverts, detention ponds control weirs, drop structures, manholes and ditches, etc.). Photographs were taken of each drainage structure to document the condition of the structure at the time of the field investigation. Photographs are attached to the City's GIS database.

Drainage patterns within each drainage basin were observed during the field reconnaissance to evaluate the presumed direction of surface water flow. Aerial photographs, topographic

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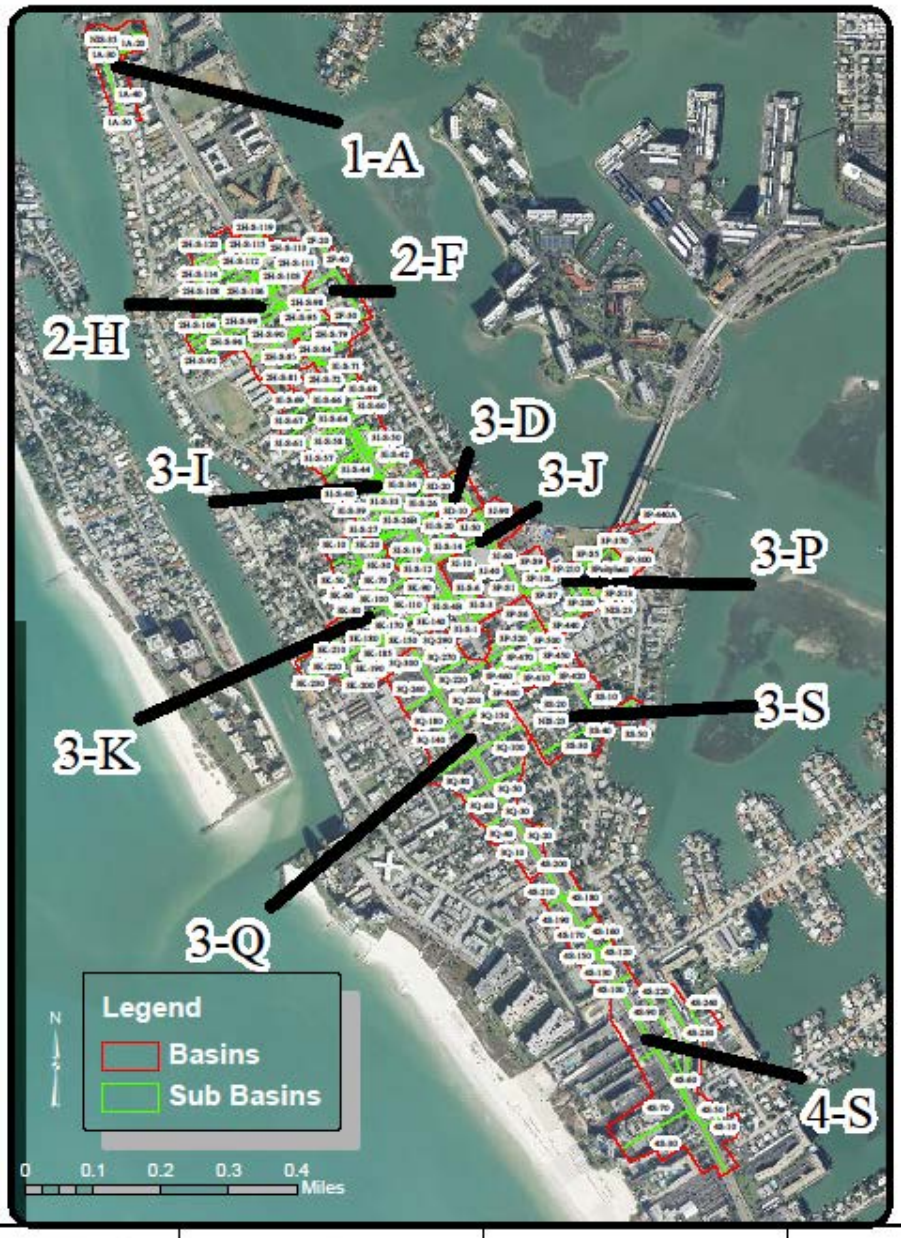
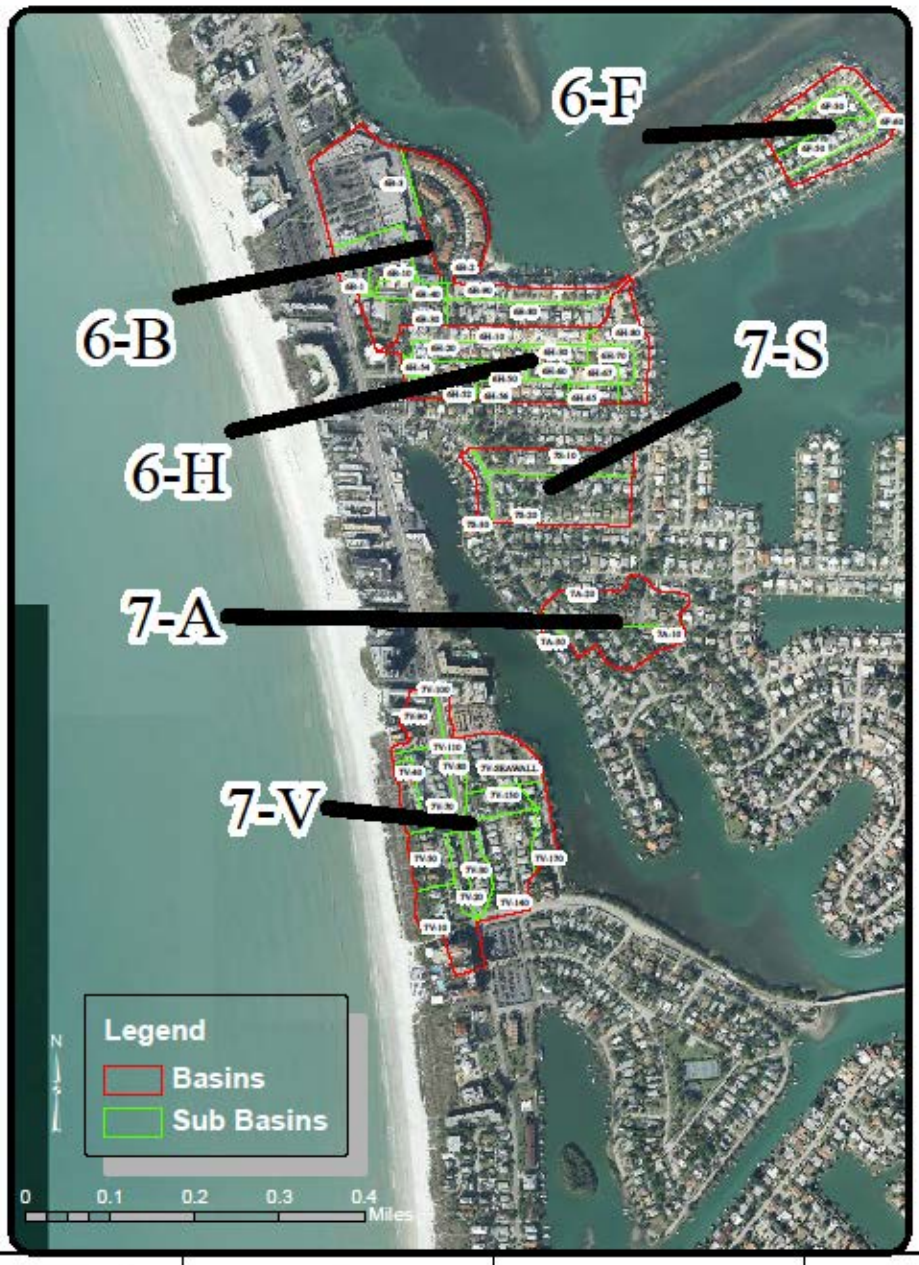
elevations and observed field conditions were used to divide the 25 primary drainage basins into sub-basin drainage areas directly connected to one hydraulic structure. Sub-basin divides around each drainage structure better represent actual conditions during computer modeling to provide detailed analysis of the height and length of flooding. Location of sub-basin boundaries is shown in Figure 1-3. The name, area and number of sub-basins for each of the 25 primary drainage basins are presented in Table 1-1.

Table 1-1: Basin Summary

Basin Name	Area (Acres)	Percent (%)
1-A	4.85	1.68%
2-F	5.13	1.78%
2-H	23.92	8.30%
3-D	2.69	0.93%
3-I	28.34	9.84%
3-J	5.7	1.98%
3-K	17.24	5.99%
3-P	20.28	7.04%
3-Q	25.48	8.85%
3-S	9.86	3.42%
4-S	27.76	9.64%
6-B	12.28	4.26%
6-F	8.39	2.91%
6-H	17.4	6.04%
7-A	8.18	2.84%
7-S	10.63	3.69%
7-V	25.72	8.93%
8-P	5.55	1.93%
9-C	4.65	1.61%
9-D	4.47	1.55%
9-F	5.62	1.95%
9-O	3.55	1.23%
10-A	3.23	1.12%
10-B	4.07	1.41%
10-K	3.04	1.06%
Total	**288.03**	**100.00%**



CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH SUB BASIN MAP 1	FIGURE 1-3A



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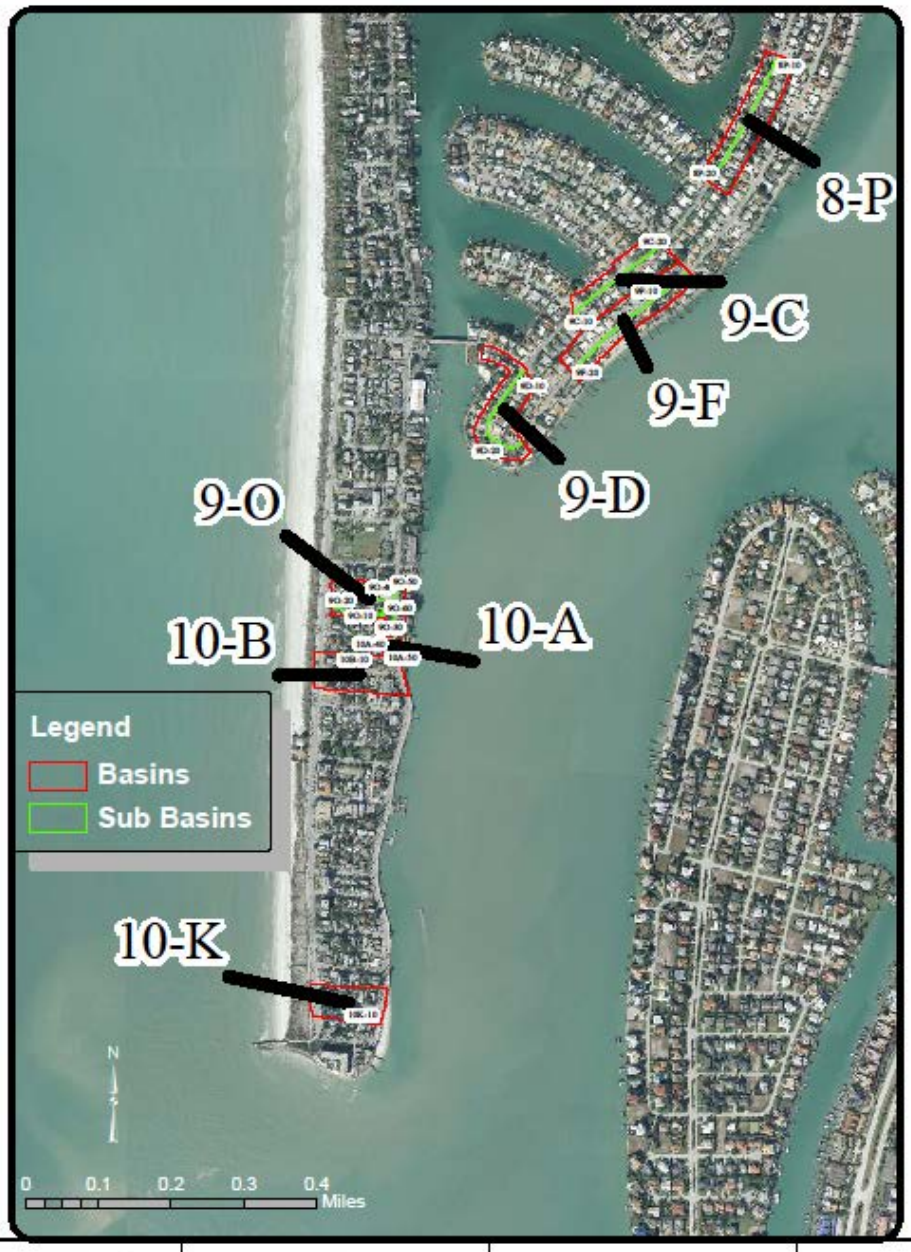

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1.4 Soil Data

Soil data was obtained from the Southwest Florida Water Management District GIS library for the St. Pete Beach city limits. The data is based on the US Department of Agriculture, Natural Resources Conservation Service (NRCS), Soil Survey of Pinellas County.

Soil characteristics have a major influence on hydrology due to their effects on infiltration rates and water storage capacities. Soils are classified by the NRCS according to hydrologic soil groups and generally fall into four categories designated A, B, C, and D.

- Hydrologic Group A soils are well–drained sands typical found in upland areas and have high infiltration rates and low runoff potential when wet.
- Hydrologic Group B soils are moderately well soils that have moderate infiltration rates when wet.
- Hydrologic Group C soils consist of soils that are of moderate to fine texture or may have a layer that impedes the downward transmission of water. The infiltration rates of Hydrologic Group C soils are typically slow when wet.
- Hydrologic Group D soils are found primarily in wetlands and have very slow infiltration rates when wet. These soils typically have high clay content, a shallow impervious layer, or a high water table.
- Hydrologic Group B/D soils are a dual classification and are typically Group D soils that are drained and effectively improved to Group B soils. This soil group is typically counted with Group B soils.

Soils within city limits fall within three of the four hydrologic soil groups with 90% of the City consisting of Hydrologic Group A and B soils. A summary of the hydrologic soil group information for soils found within city limits are presented in Table 1-2. The distribution of soils throughout the city based on named soil groups is illustrated on attached Figure 1-4A. The distribution of soils throughout the city based on hydrologic soil groups is illustrated on attached Figure 1-4B.

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CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH HYDROLOGIC SOIL GROUP NAME	FIGURE 1-4B

Table 1-2: Soil Name

Soil Name	Hydrologic Group	Area (Acres)	Percent (%)
Beaches	A	100	7.60%
Palm Beach fine sand, 0 to 8 percent slopes	A	490	37.08%
	Subtotal A	**590**	**44.68%**
Matlacha and St. Augustine soils and Urban land	B	557	42.13%
Urban land	B	68	5.17%
	Subtotal B	**625**	**47.30%**
Waters of the Gulf of Mexico	D	106	8.02%
Total		**1321**	**100.00%**

1.5 Land Use Data

Land use data for the City of St. Pete Beach was obtained from the Southwest Florida Water Management District GIS library and is based on the Florida Land Use, Cover and Forms Classification System (FLUCFCS) developed by the Department of Transportation. Land Use refers to the type of ground cover that stormwater flows over. Paved surfaces and roofs (impervious surfaces) generate more runoff than grassed areas (pervious surfaces) because they allow less infiltration of water into the ground.

Land uses within city limits are classified into 10 general categories as summarized in Table 1-3. The predominant land uses within the city limits are grouped into High Density Residential (69.0 percent) and Commercial (23.2 percent). The distribution of land use throughout the Study Area is illustrated on attached Figure 1-5.

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Table 1-3: Land Use

Land Use Description	Area (Acres)	Percent (%)
Bays And Estuaries	14	1.05%
Commercial And Services	306	23.15%
Institutional	18	1.34%
Major Bodies Of Water	0	0.00%
Recreational	40	3.04%
Residential, High Density (Six Or More Dwelling Units Per Acre)	912	69.02%
Shrub And Brushland	26	1.93%
Transportation	1	0.08%
Utilities	4	0.29%
Wetland Hardwood Forests	1	0.10%
Total	**1321**	**100.00%**

1.6 Drainage Basin Characterization

A total of 25 primary drainage basins were evaluated as part of the Stormwater Master Plan. The area of the 25 basins is 288 acres, approximately 22 percent of the land area of the City. The topography of the City ranges from sea level to 11 feet with the highest elevations at the 3 bridges that provide access to the City (11 feet at the Pinellas Bayway, 8 feet at Blind Pass and 9+ feet at the Corey Causeway). The elevation within the basins is at or below 5.0 feet, mean sea level. The City is entirely sourrounded by water and is completely located within the 100-year flood zone.

Each of the 25 primary drainage basins have separate outfalls. The basins are designated as FDOT or local drainage, depenging on the main road within the basin generating the stormwater runoff. Stormwater collection structures (detention ponds, curb inlets and grated inlets) are connected by culverts that discharge to Boca Ciega Bay, Blind Pass (intercoastal

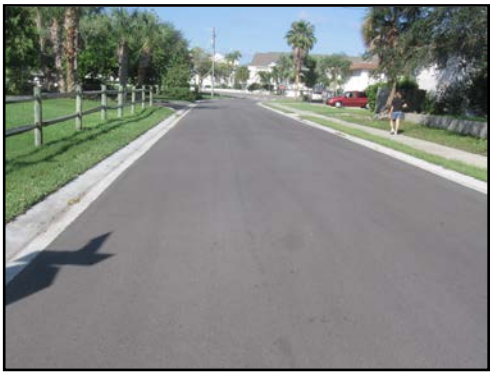
waterway), McPherson Bayou and Little McPherson Bayou. All water bodies are connected to the Gulf of Mexico.

Drainage within the City is divided into 3 sections: north, middle and south. Drainage north of 75th Avenue to Blind Pass Bridge is defined as the north drainage section of the City. Drainage between 75th Avenue and the Pinellas Bayway is defined as the middle drainage section of the City. Drainage south of the Pinellas Bayway is defined as the south drainage section of the City. Basins in the north drainage section outfall to Blind Pass or Boca Ciega Bay. Basins in the middle drainage section outfall to Boca Ciega Bay or McPherson Bayou. Basins in the south drainage section outfall to Boca Ciega Bay or Little McPherson Bayou.

A brief description of the existing conditions observed in the 25 primary drainage basins studied for the Stormwater Master Plan are described below.

1.6.1 Basin 1A

Basin 1A is located in the northern drainage section of the City near the intersection of 93rd Avenue and Blind Pass Road. The basin consists of a city park (Blind Pass Park), residential lots and paved roadways. The drainage basin covers 3.2 acres (1.12 percent of the total area for the 25 drainage basins evaluated during this Master Plan).



Runoff from the parking area for the city park is collected and treated in a small detention pond. Overflow from the detention pond control structure discharges to the 93rd Avenue drainage system. Stormwater runoff along 93rd Avenue is collected by several drop structures and conveyed westward through culverts from Blind Pass Road to discharge into the Blind Pass (Intracoastal Waterway).

1.6.2 Basin 2F

Basin 2F is located in the northern drainage section of the City near the intersection of 85th Avenue and Blind Pass Road. Portions of Blind Pass Road (FDOT maintained road) historically discharged to Boca Ciega Bay down 85th Avenue. However, when Blind Pass Road was widened, the FDOT outfall pipe was plugged. The basin currently provides drainage for local runoff only. The basin consists of a closed school, residential lots and paved roadways. The drainage basin covers 5.13 acres (1.78 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

Runoff from the southern portion of the school yard flows toward 85th Avenue and is captured by drop structures located on the road. Stormwater runoff along 85th Avenue is collected by several drop structures and conveyed eastward through culverts from near Blind Pass Road to discharge into the Boca Ciega Bay.

1.6.3 Basin 2H

Basin 2H is located in the northern drainage section of the City along Blind Pass Road (FDOT maintained road) between 82nd Avenue and just north of 87th Avenue. This portion of Blind Pass Road historically discharged to Boca Ciega Bay down 82nd Avenue. When Blind Pass Road was widened, the FDOT constructed a new outfall pipe down 83rd Avenue into Boca Ciega Bay. The basin land use includes commercial property and paved roadway. The drainage basin covers 23.92 acres (8.30 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

Stormwater runoff along Blind Pass Road is collected by curb inlets and several behind sidewalk drop structures. Drainage is conveyed north and south through culverts 83rd

Avenue to discharge down into Boca Ciega Bay. The FDOT outfall is located under Homer Still Park, one of the City's pocket parks along the Bay.

1.6.4 Basin 3D

Basin 3D is located in the northern drainage section of the City near the intersection of 78th Avenue and Blind Pass Road. Portions of Blind Pass Road (FDOT maintained road) historically discharged to Boca Ciega Bay down 78th Avenue. However, when Blind Pass Road was widened, the FDOT outfall pipe was plugged. The basin currently provides drainage for local runoff only. The basin consists primarily of residential lots, apartment buildings and paved roadway. The drainage basin covers 2.69 acres (0.93 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

Runoff from the lots adjacent to 78th Avenue flow toward the road and is captured by drop structures at the intersection of 78th Avenue and Boca Ciega Avenue. Stormwater runoff is conveyed eastward to discharge into the Boca Ciega Bay.

1.6.5 Basin 3I

Basin 3I is located in the northern drainage section of the City along Blind Pass Road (FDOT maintained road) between 75th Avenue and 81st Avenue. This portion of Blind Pass Road historically discharged to Boca Ciega Bay down 78th Avenue. When Blind Pass Road was widened, the FDOT constructed a new outfall pipe down 80th Avenue into Boca Ciega Bay. The basin land use consists primarily of commercial property, apartment buildings and paved roadway. The drainage basin covers 28.34 acres (9.84 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

Stormwater runoff along Blind Pass Road is collected by curb inlets and several behind sidewalk drop structures and is discharged to a detention pond located on the west side of Blind Pass Road and south of 80th Avenue. Overflow from the detention pond is conveyed eastward through culverts down 80th Avenue to discharge into Boca Ciega Bay.

1.6.6 Basin 3J

Basin 3J is located in the northern drainage section of the City near the intersection of 77th Avenue and Blind Pass Road. The basin consists of a commercial grocery store, residential lots, apartment buildings and paved roadways. The drainage basin covers 5.7 acres (1.98 percent of the total area for the 25 drainage basins evaluated during this Master Plan.

Runoff from the parking area of the commercial grocery store is collected and treated in a small detention pond. Overflow from the detention pond control structure discharges to the 77th Avenue drainage system. Stormwater runoff along 77th Avenue is collected by several drop structures and conveyed eastward under the parking lot of the City's community building to discharge into Boca Ciega Bay.

1.6.7 Basin 3K

Basin 3K is located in the northern drainage section of the City west of Blind Pass Road between 79th Avenue and 75th Avenue. Historically, drainage from 80th Avenue flowed south along Gulf Boulevard and was collected in the Basin 3K drainage system, but a speed bump installed on 79th Avenue has isolated the drainage between 80th Avenue and 79th Avenue, causing localized flooding. The basin consists of a commercial property, residential lots and paved roadways. The drainage basin covers 17.24 acres (5.99 percent of the total area for the 25 drainage basins evaluated during this Master Plan).

Runoff from a commercial bank located on 76th Avenue is collected and treated in a small detention pond. Overflow from the detention pond control structure discharges to the 76th Avenue drainage system. Stormwater runoff along Gulf Boulevard is collected by several drop structures and discharged into the culverts along 76th Avenue. Stormwater runoff along 76th Avenue is collected by several drop structures and conveyed westward under a City pocket park (Stan Cidlowski Sr. Park) to discharge into the Blind Pass (intracoastal waterway) which connects to the Gulf of Mexico.

1.6.8 Basin 3P

Basin 3P is located in the middle drainage section of the City along 75th Avenue (FDOT maintained Avenue). Outfall for this drainage system was historically discharged to Boca Ciega Bay north of the bridge. However, when the bridge and 75th Avenue was widened, a second, larger outfall pipe was installed. Plans for the widened road are not currently available to determine if the original outfall pipe was plugged or is still functioning. Near the time of construction of the new community building, pool and park, a CDS unit was installed to treat the stormwater before discharge to the Bay. The CDS unit is located in the city park near the Corey Causeway Bridge. During construction of the new police station near the City pool, a detention pond was constructed with a diversion weir in the control structure. Two new curb inlets were installed on 75th Avenue and outfall is through the diversion weir into the Bay.

The basin consists primarily of commercial property and paved roadway. The drainage basin covers 20.28 acres (7.04 percent of the total area of the 25 drainage basins evaluated during this Master Plan). The majority of runoff from 75th Avenue is collected by curb inlets and drop structures and discharged westward into Boca Ciega Bay.

1.6.9 Basin 3Q

Basin 3Q is located in the middle drainage section of the City along Gulf Boulevard (FDOT maintained road) between 75th Avenue and 68th Avenue. Runoff is collected through curb inlets along this portion of Gulf Boulevard and discharges westward down 73rd Avenue to Blind Pass (intracoastal waterway). The basin land use includes multi-family apartments, commercial property and paved roadway. The drainage basin covers 25.48 acres (8.85 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.10 Basin 3S

Basin 3S is located in the middle drainage section of the City near the intersection of 71st Avenue and Boca Ciega Avenue. This basin provides drainage for City road runoff only. The basin consists primarily of residential lots and paved roadway. The drainage basin covers 9.68 acres (3.42 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

Runoff from the lots adjacent to Boca Ciega Avenue between 73rd Avenue and 71st Avenue flow south and is captured by drop structures at the intersection of 71st Avenue and Boca Ciega Avenue. Stormwater runoff is conveyed south through two connected outfall structures into the Boca Ciega Bay.

1.6.11 Basin 4S

Basin 4S is located in the middle drainage section of the City near the intersection of Gulf Winds Drive and 2nd Street, just east of Gulf Boulevard (FDOT

maintained road). Runoff along Gulf Boulevard between 67th Avenue and 58th Avenue are collected by curb inlets and discharged to Boca Ciega Bay through an outfall pipe at 2nd Street and Gulf Winds Drive. The basin consists primarily of commercial property and paved roadway. The drainage basin covers 27.76 acres (9.64 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.12 Basin 6B

Basin 6B is located in the middle drainage section of the City along 46th Avenue east of Gulf Boulevard. The drainage basin collects runoff from commercial property, residential lots and paved roadways. The drainage basin covers 12.28 acres (4.26 percent of the total area for the 25 drainage basins evaluated during this Master Plan).

Runoff from a portion of a commercial srip mall located north of 46th Avenue is collected and treated in a small detention pond. Overflow from the detention pond control structure discharges to the 46th Avenue drainage system. Stormwater runoff along 46th Avenue is collected by grate inlets and conveyed eastward to Boca Ciega Bay.

1.6.13 Basin 6F

Basin 6F is located in the middle drainage section of the City at the eastern end of Boca Ciega Isle Drive. Runoff along Boca Ciega Isle Drive is collected by grate inlets and discharged to Boca Ciega Bay through an outfall pipe at the eastern end of the road. The basin consists primarily of residential property and paved roadway. The drainage basin covers 8.39 acres (2.91 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.14 Basin 6H

Basin 6H is located in the middle drainage section of the City along 45th Avenue east of Gulf Boulevard. Runoff from Lido Drive is collected by grate inlets and conveyed to the drainage system on 45th Avenue. Drainage on 45th Avenue is collected by grate inlets and discharged eastward to Boca Ciega Bay through an outfall pipe at the eastern end of the road. The basin consists primarily of residential property and paved roadway. The drainage basin covers 17.40 acres (6.04 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.15 Basin 7A

Basin 7A is located in the middle drainage section of the City along 40th Avenue and Belle Vista Drive. Runoff from 40th Avenue just west of Poinsettia Drive sheet flows west to the intersection of 40th Avenue and Belle Vista Drive. Runoff is collected by grate inlets at the intersection and discharged westward to McPherson Bayou through an outfall pipe at the end of the 40th Avenue. The basin consists primarily of residential property and paved roadway. The drainage basin covers 8.18 acres (2.84 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.16 Basin 7S

Basin 7S is located in the middle drainage section of the City along 43rd Avenue and Belle Vista Drive. Runoff from 43rd Avenue just west of Poinsettia Drive sheet flows west to the intersection of 43rd Avenue and Belle Vista Drive. Runoff is collected

by grate inlets at the intersection and discharged westward to McPherson Bayou through an outfall pipe at the end of the 43rd Avenue. The basin consists primarily of residential property and paved roadway. The drainage basin covers 10.63 acres (3.69 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.17 Basin 7V

Basin 7V is located in the south drainage section of the City along Gulf Boulevard (FDOT maintained road) between just north of 27th Avenue and 35th Avenue (Pinellas Bayway). Runoff is collected through curb inlets along this portion of Gulf Boulevard and discharged eastward down 36th Avenue to Boca Ciega Bay. Additionally, local drainage at the intersection of 36th Avenue and Casablanca Avenue is captured in grate inlets at the intersection and discharged to the FDOT drainage system. The basin land use includes commercial property, residential property and paved roadway. The drainage basin covers 25.72 acres (8.93 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.18 Basin 8P

Basin 8P is located in the south drainage section of the City along Vista Del Mar Boulevard between Hermostia Drive and Lee Place. Runoff from Vista Del Mar Boulevard sheet flows to the middle of the basin where runoff is collected by grate inlets and discharged westward to Little McPherson Bayou through an outfall pipe located between two residential lots. The basin consists primarily of residential property and paved roadway. The drainage basin covers 5.55 acres (1.93 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.19 Basin 9C

Basin 9C is located in the south drainage section of the City along Vista Del Mar Boulevard between Mar Street and South Tessier Drive. Runoff from Vista Del Mar Boulevard sheet flows to the middle of the basin where runoff is collected by grate inlets and discharged westward to Little McPherson Bayou through an outfall pipe located between two residential lots. The basin consists primarily of residential property and paved roadway. The drainage basin covers 4.65 acres (1.61 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.20 Basin 9D

Basin 9D is located in the south drainage section of the City at the southern end of Vista Del Mar Boulevard, south of 21st Avenue. Runoff from Vista Del Mar Boulevard sheet flows to the south end of the road where runoff is collected by grate inlets and discharged south to Boca Ciega Bay through an outfall pipe located between two residential lots. The basin consists primarily of residential property and paved roadway. The drainage basin covers 4.47 acres (1.55 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.21 Basin 9F

Basin 9F is located in the south drainage section of the City along Vina Del Mar Boulevard between 21st Avenue and Tessier Drive. Runoff from Vina Del Mar Boulevard sheet flows to the middle of the basin where runoff is collected by grate inlets and discharged eastward to Boca Ciega Bay through an outfall pipe located between two residential lots.

The basin consists primarily of residential property and paved roadway. The drainage basin covers 5.62 acres (1.95 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.22 Basin 9O

Basin 9O is located in the south drainage section of the City along 14th Avenue at the intersection with Pass-A-Grille Way. Runoff from 14th Avenue sheet flows eastward, collected by grate inlets at the intersection with Pass-A-Grille Way and discharged to Boca Ciega Bay through an outfall pipe located under Pass-A-Grille Way. The basin consists primarily of residential property and paved roadway. The drainage basin covers 3.55 acres (1.23 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.23 Basin 10A

Basin 10A is located in the south drainage section of the City along 13th Avenue at the intersection with Pass-A-Grille Way. Runoff from 13th Avenue sheet flows eastward, collected by grate inlets at the intersection with Pass-A-Grille Way and discharged to Boca Ciega Bay through an outfall pipe located Pass-A-Grille Way and under Ercius Park. The basin consists primarily of residential property and paved roadway. The drainage basin covers 3.23 acres (1.12 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.24 Basin 10B

Basin 10B is located in the south drainage section of the City along 12th Avenue at the intersection with Pass-A-Grille Way. Runoff from 12th Avenue sheet flows westward, collected by grate inlets at the intersection with Pass-A-Grille Way and discharged to Boca

Ciega Bay through an outfall pipe located under Pass-A-Grille Way. The basin consists primarily of residential property, multi-family apartments and paved roadway. The drainage basin covers 4.07 acres (1.41 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.6.25 Basin 10K

Basin 10K is located in the south drainage section of the City along 2nd Avenue at the intersection with Pass-A-Grille Way. Runoff from 2nd Avenue sheet flows westward, collected by grate inlets at the intersection with Pass-A-Grille Way and discharged to Boca Ciega Bay through an outfall pipe located under Pass-A-Grille Way. The basin consists primarily of residential property, multi-family apartments and paved roadway. The drainage basin covers 3.04 acres (1.06 percent of the total area of the 25 drainage basins evaluated during this Master Plan).

1.7 Pollutant Load Analyses

The Florida Department of Environmental Protection (FDEP) has not established Boca Ciega Bay as impaired for pollutants. However, analysis for nutrient loading (phosphorus and nitrogen) was perfomed based on land use and soils data for the City. The FDEP has concerns that the amount of stormwater that is currently discharged to the Bay may have a negative effect on the sea grass community in the Bay. At this time, there are no limits on stormwater discharge to the Bay.

1.8 Water Quantity Evaluations (Modeling)

The Advance Interconnected Channel and Pond Routing Model (adICPR Version 2.02) was used to perform water quantity analyses for the 25 primary drainage basins within the City of St. Pete Beach. This simulation effort included identifying structures, locating and quantifying storage areas, delineating basins, computing hydrologic parameters for the model

(curve numbers and times of concentration), investigating the appropriate peaking factor and trouble-shooting the model. Once the model was stabilized, the primary system within the watershed was modeled using the existing land use condition for the 10-year/24-hour; 25-year/24-hour; and 100-year/24-hour storm events. The methodology used to model the drainage basins is presented in Section 2 of this report.

2.0 METHODOLOGY

The procedures, computer methods and assumptions utilized to assess the existing condition of 25 primary drainage basins in the City of St. Pete Beach are discussed below. Existing condition information will be use to quantify the improvements resulting from proposed modifications.

2.1 Stormwater Model Framework

The stormwater analysis model is comprised of two separate components utilizing individual methodologies and computer programs. These two modules consist of identifying water quantity or flooding problems and water quality or pollution-related problems. A brief description of the water quantity and quality models is presented below.

Water Quantity Model

To analyze the impacts of flooding, a computer model of the City of St. Pete Beach was developed. The Advanced Interconnected Channel and Pond Routing (adICPR) Program, Version 3.10 Service Pack 8, was used to model the drainage basins. Seven individual design storms (rain events) were simulated as a part of this study. The model estimates the hydraulic responses to these storm events based on the hydraulic elements in the basin including ponds, tidal influences, depressions, storm pipe systems and roadway crossings. Stages and flows at various locations throughout the system can then be determined for each modeled design storm. Alterations to the stormwater system will be modeled showing the improved stages and flows in each drainage basin.

Water Quality Model

Pollutants carried in stormwater runoff tend to degrade the receiving downstream water bodies. A pollutant load model spreadsheet was developed to estimate the amount of harmful pollutants flowing to such water bodies on an annual basis. This model utilizes a computer spreadsheet which organizes important data such as land use class and loading rates within each primary drainage basin. The spreadsheet model represents typical pollutant loads for future planning purposes. Those drainage basins with high pollutant loads will be evaluated for water quality improvement projects.

2.2 Water Quantity Modeling

AdICPR was originally developed in 1982 by Advanced Engineering Technologies, Inc. AdICPR is capable of calculating urban stormwater runoff and its effects on open and closed stormwater management systems, interconnected lake, pipe and open channel systems. AdICPR simulates historical and design storm events based on rainfall amounts, meteorological conditions and basin characteristics.

AdICPR is divided into two distinct areas, hydrology and hydraulics. The hydrology sub-routine generates surface runoff based on rainfall hyetographs, antecedent conditions, land use, soil type, topography, and area which lead to the development of curve numbers and times of concentration. The hydraulic sub-routine performs sophisticated hydraulic routing, incorporating conveyance data and storage information.

2.2.1 Hydrologic Modeling

AdICPR's hydrologic sub-routine quantifies the amount of rainfall that becomes surface runoff during a simulated storm event. In order to perform these calculations, information on the following parameters must be collected and quantified:

- Contributing Area
- Land Cover
- Soil Type
- Land Slope
- Land Surface Roughness
- Peak Rate Factor
- Rainfall
- Curve Number
- Time of Concentration
- Directly Connected Impervious Area (DCIA)

2.2.2 Basin and Sub-Basin Delineations

The first step in developing a stormwater model is delineating the land areas which contribute runoff to that particular part of the conveyance system that is being studied. These contributing areas are called sub-basins or contributing areas. The structures within the system must also be considered including ponds, lakes, bridges, roadway culverts and open channels.

The Section-Township-Ranges covering the study area are listed in Table 2-1. This location information was used to obtain the correct aerial and LIDAR Maps. A listing of the Natural color imagery aerials, flown in 2009, that were used to perform the study and prepare graphics is presented in Table 2-2. The aerials were in MrSID format. Topographic information is necessary to determine stormwater runoff flow paths. The sources of topographical data that were used in the St. Pete Beach Master Plan were 2009 LIDAR points obtained from the Southwest Florida Water Management District. The LIDAR points were then converted into contour lines in GIS. A listing of the LIDRA panels reviewed is included in Table 2-3.

Table 2-1: Section-Township Range

Section	Township	Range
5	32	16
6	32	16
7	32	16
8	32	16
17	32	16
18	32	16
19	32	16
1	32	15
25	32	16
31	32	16
36	32	16
14	23S	28E
15	23S	28E
22	23S	28E
23	23S	28E

Table 2-2: Aerial Images

Aerial Panel Number
75082
75083
75084
75382
75383
75384
75683
75684
75685
75983
75984
75986
76284
76285
76286
76584
76585
76884
76885
77183
77185
77483
77484
77485

Table 2-3: Lidar Panels

Lidar Panel Number
75082
75083
75383
75384
75683
75684
75983
75985
76284
76285
76585
76886

The St. Pete Beach sub-basins were delineated utilizing both surface topography and stormwater inventories. Information was obtained from St. Pete Beach, Southwest Florida Water Management District, field observations and other pertinent sources specifying the location of pipes and outfalls and their connections within the drainage basins. The gathered information was field verified to ensure model accuracy. These facilities were then located on the topographic maps and basin boundaries were established. The study area included 25 major basins and is depicted in Figure 1-2:

- 1A – 93rd Avenue
- 2F – 85th Avenue and Boce Ciega Drive
- 2H – Blind Pass Road Outfall at 83rd Avenue
- 3D – 78th Avenue
- 3I – Blind Pass Road Outfall at 80th
- 3J – 77th Avenue and Boca Ciega Drive
- 3K – 76th Avenue and Gulf Boulevard
- 3P – Corey Causey / 75th Avenue
- 3Q – Gulf Boulevard and Coquina Way Outfall at 73rd Avenue
- 3S – 71st Avenue and Boca Ciega Drive
- 4S – Gulf Boulevard Outfall at 2nd Street E
- 6B – 46th Avenue
- 6F – Boca Ciega Isle Drive (East End)
- 6H – 45th Avenue and 2nd Street E
- 7A – 40th Avenue and Belle Vista Drive
- 7S – 43th Avenue and Belle Vista Drive
- 7V – Gulf Boulevard and 36th Avenue
- 8P – W Vina Del Mar Blvd between Lee Pl and Hermosita Dr
- 9C – W Vina Del Mar Blvd between Tessier Dr. and Mar St.
- 9D – E Vina Del Mar Blvd south of 21st Avenue
- 9F – E Vina Del Mar Blvd between 21st Ave and N Tessier Dr.
- 9O – Pass-a-Grill Way at 14th Avenue
- 10A – Pass-a-Grill Way between 12th Avenue and 12th Avenue
- 10B – Pass-a-Grill Way at 12th Avenue
- 10K – Pass-a-Grill Way at 2nd Avenue

In order to further develop the stormwater model to estimate flood stages and flow rates, the sub-basins were each subdivided into smaller individual contributing areas. Individual contributing areas were delineated by identifying runoff storage areas and the conduits that connect these storage areas. Contributing areas to each conduit were then identified using the same principles as the main sub-basin delineation.

2.2.3 Hydrologic Model Parameters

The curve number and time of concentration parameters are based on land use and soil type. Land use is used in the determination of percent of impervious cover, Manning's coefficient, and initial abstraction. Soil type aids in soil storage calculations. Land use within the drainage basins was obtained from the Southwest Florida Water Management District (SWFWMD) Geographic Information System and confirmed with the 2009 Aerial Photography and ground truthing. Land use data were obtained and simplified into 10 individual land uses based on similar hydrologic characteristics. These land use categories are bay and estuaries, commercial and services, institutional, water, recreational high density residential, rush, commercial, fallow, forested, golf courses, groves, high-density residential, shrud and brushland, transportation, utilities, and wetlands.

The soil types within the drainage basins were also obtained from SWFWMD Geographic Information System. The soil types are presented in Table 1-3.

Only one value for curve number can be input for each contributing area, therefore, an average value must be calculated based on land use and soil type. These average values are weighted according to the areal extent of each type of soil or land use within the sub-basin. In other words, the land use map was electronically overlaid on the soils map and the area of the resulting polygons was calculated and labeled by the computer. The Geographic Information System was utilized to determine the amount of each type of land use or soil type within each sub-basin. Since the subsequent calculations that were utilized to determine an area weighted average parameter are repetitive, the Geographic Information System output was incorporated into a spreadsheet program. In other words, the spreadsheet sums each product of land use or soil type

area and its related curve number. An area weighted average is generated when this sum is divided by the contributing area.

Rainfall Intensities and Quantities

Rainfall data used in the St. Pete Beach primary drainage basin model were determined by specifying storm duration and storm depth, with depth predicated on recurrence interval. The following storm scenarios were analyzed in this study: 2-year/24-hour storm, mean annual storm/24-hours, 5-year/24-hour, 10-year/24-hour storm, 25-year/24-hour storm, 50-year, 24-hour and 100-year/24-hour. The rainfall depths and distributions were obtained from the SWFWMD. Rainfall quantities for the seven design storm events are shown in Table 2-4.

TABLE 2-4: Storm Event Rainfall Quantities

Storm Frequency (Years)	Storm Duration (Hours)	Storm Depth (Inches)
2	24	4.5
Mean Annual (2.3-Year)	24	4.8
5	24	5.0
10	24	7.5
25	24	9.0
50	24	10.0
100	24	11.0

In order to estimate the runoff that would be generated from each basin, some standard hydrologic parameters must be determined. These parameters define the average runoff characteristics found within each basin and are defined as basin area, time of concentration, and curve number.

Contributing Area

The location for each contributing area was delineated using LIDAR elevations and 0.3-foot contours developed using the LIDAR points.. The contributing areas were further refined by investigating construction plans, developments, etc. and modifying the areas accordingly.

Time of Concentration

The time of concentration is the length of time it takes a drop of water to flow from the most hydraulically distant point in the basin to the basin outfall without unreasonable delay. This parameter controls how far into the storm event it is until the entire basin is contributing runoff. Given the small size of the basins, high density of development and the large amount of directly connected impervious area the time of concentration for all basins was assumed to be 10 minutes.

The peak rate factor (K') is critical for the determination of peak discharge. The peak rate factor is used to represent the effect of drainage basins storage on hydrograph shape. The factor generally varies from 100 to 600. High values represent little or no storage with steep land slopes. Lower values are used for drainage basins with significant ponding effects due to very little or no slope and contain abundant surface storage. Four characteristics affect the choice of the peak rate factor: slope, drainage works, surface depressions and landscape. Steep slopes suggest a high factor, and conversely, gentle slopes suggested a low factor. Drainage works, such as ditches and piping systems, convey the water more quickly producing a higher peak discharge than in the undeveloped state. Therefore, where drainage works are present, a higher peak rate factor is recommended. Surface depressions will decrease peak discharge; as a result, a lower factor should be used in areas with significant depressional areas. The type of landscape also affects the factor. Forested areas will receive a lower factor than pasture land. A peak rate factor of 256 was used for the entire City of St. Pete Beach. This decision was based on the generally gentle slope of the area. The SWFWMD guidelines and specifications also recommend a peaking factor of 256 for this area. The Florida Modified rain distribution was used for the study.

Directly Connected Impervious Area (DCIA)

The DCIA is the impervious area within a basin that is hydraulically connected to the discharge point. For example, if a paved road in sub-division drains by way of curb and gutter into a storm sewer system, then the roadway would be considered DCIA. Furthermore, if the driveways and portions of the roofs drain directly into the roadways without passing over pervious areas, then they would also be considered part of the DCIA. However, if other portions of the roofs drain onto the lawn, then those portions would not be considered DCIA even though they are impervious. The DCIA is expressed as the percentage of the basin area. For example, if the area of a basin is 40 acres and the DCIA is set to 25, then 10 acres (i.e., 25% of the 40 acres) would be DCIA. The curve number method is used to calculate runoff for the remaining 30 acres (non-DCIA) in this example.

For the City of St. Pete Beach, DCIA was assumed to be the roadway areas. The driveway and roof tops were assumed to be non-directly connected impervious area and incorporated in the overall curve number calculation.

Curve Number

The curve number is an indication of the type of soil, land cover and impervious area present within the basin. It commonly ranges from 30 to 98 with 30 representing unpaved, highly infiltrative areas and 98 representing highly developed, impervious areas. The NRCS has developed the following guidelines for estimating the curve number for a particular site based on the existing soil conditions and land use.

The antecedent moisture condition is an index of the runoff potential in the five-day period preceding a storm occurrence. AMC II represents the average condition on which the curve numbers shown in Table 2-5 are based. An AMC I condition represents a condition in which the runoff potential is low and is normally characterized as no rain having occurred during the preceding five-day period, producing dry moisture-absorbent soils. AMC III represents a high potential for runoff. A storm event has probably just occurred, and the soil is already saturated, causing more rainfall to be converted to runoff. Table 2-5 is a representation of how the existing

antecedent moisture condition may affect the curve number and, therefore, the potential runoff from a basin.

Table 2-5: Curve Number - Antecedent Moisture Condition

AMC I	AMC II	AMC III
4	10	22
9	20	37
15	30	50
22	40	60
31	50	70
40	60	78
51	70	85
63	80	91
78	90	96
100	100	100

AMC = Antecedent Moisture Condition
National Engineering Handbook 4, March 1985
U.S. Department of Commerce

The average condition (AMC II) was used during the development of this model. AMC II is the industry standard in the Florida, and no information exists to suggest that any other condition would be used in this area. Furthermore, AMC II produces an accurate model that can easily be compared with other studies.

The initial abstraction, "I_a", is a variable which is directly related to both the curve number and the antecedent moisture condition. Initial abstraction is a percentage of the maximum potential storage available for a given soil complex. This maximum potential storage, designated S, is provided by interception, infiltration, and depressional storage. The initial abstraction is that percentage of the total storage which must be filled by rainfall before any runoff from the basin occurs. Storage, S, is related to the curve number by:

$$CN = \frac{1{,}000}{S + 10}$$

Through experimentation, the SCS has determined that the initial abstraction is 20% of the maximum storage potential as shown in the following empirical relationship:

$$I_a = 0.2\ S$$

This means that 20% of the total potential soil storage will be utilized before any runoff from the basin occurs but this, too, can vary depending on conditions within the basin. For example, as the moisture content in the soil decreases, the potential for infiltration increases. This means that the percentage of the initial abstraction will increase above the estimated 20%, and the estimated runoff will be less than anticipated. The reverse will be true for those areas with a high existing moisture condition.

The ability of the soil to infiltrate, store and transmit moisture is related to its hydrologic soil classification. These classifications were developed by the SCS as an indication of the soil's drainage ability. The classifications are described as follows:

Group A: Soils having a high infiltration rate (low runoff potential) even when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands. These soils have a high rate of water transmission.

Group B: Soils having a moderate infiltration rate even when thoroughly wet. These consist chiefly of moderately deep to deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C: Soils having slow infiltration rate even when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils having a moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D: Soils having a very slow infiltration rate (high runoff potential) even when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a hardpan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Group B/D: Soils having a dual soil classification type exhibit both soil characteristics under different conditions. B/D soils on urban development with drainage systems, would act like B type soils. However, highly saturated soils with no drainage system would typically act like D type soils.

2.2.4 Hydraulic Modeling

The hydraulic model conveys or "routes" the hydrographs through the pipes, channels, ponds, and lakes which constitute the stormwater system. This model calculates flow rates, water depths, and elevations within the stormwater system. The conceptual representation of the drainage system is based on the "link-node" concept. The links represent structures designed for stormwater conveyance such as pipes, channels, bridges, drop structures and pumps. The nodes represent storage areas such as lakes, channels and ponds, as well as connections or transitions between two dissimilar pipes or channels, such as manholes and inlets. They also provide a computation point that is used to determine water surface elevations within the primary storm system.

Links and nodes are combined and connected to represent the configuration of the actual storm system. The links and nodes for 25 primary drainage basins are presented in Appendix A. A detailed description of the hydraulic conduits used in this model can be found in Appendix B.

2.2.5 Hydraulic Parameters

Conduits

The first step was to identify the location of all outfalls and culverts on aerial topographic maps. This helps identify culverts connections and makes the data collection and verification phase more efficient.

Research was then performed to determine the sources and extent of available information including: previous studies; construction plans, survey data; and photographs within St. Pete Beach. This information was obtained, reviewed and categorized from the following entities:

- City of St. Pete Beach
- Florida Department of Transportation
- Pinellas County
- Southwest Florida Water Management District
- U.S. Geological Survey

In addition to the reports and plans listed above, the 25 primary drainage basins were field verified and approximate pipe invert and top elevations were obtained.

Table 2-6 presents the Manning's coefficient for the various pipe sizes that were obtained from literature sources based on type, size and pipe material.

TABLE 2-6: Manning's Coefficient for Stormwater Conduits

Pipe Type	Size	Manning's Coefficient
Reinforced Concrete	<36"	0.013
Reinforced Concrete	36" to 48"	0.012
Reinforced Concrete	54" and above	0.011
Corrugated Metal	All	0.024
PVC	All	0.012

A complete inventory of all data relating to the stormwater system conduits is presented in Appendix C.

Nodes

Nodes are established in the St. Pete Beach drainage basin adICPR model, to represent ponds, manholes, inlets and also separate dissimilar pipes or channels. As discussed earlier, several important parameters must be entered into the model to correctly utilize the nodes.

Data concerning available storage were assigned to each node. For non-storage nodes, either "no storage" or "minimal storage" was assigned to the node. No storage was assigned to nodes which connected reaches containing storage, such as channels. Minimal storage was attributed to nodes that connected non-storage reaches, such as pipes and weirs.

For storage nodes which represent lakes or ponds, the actual elevation/surface area relationships were entered into the model. Data was obtained from construction plans, permits, GIS and/or field review. The storage for the drainage basins was generated using the 0.3-foot contours developed in GIS. This storage was added to the model to create a realistic characterization of staged (standing) water in each basin.

Initial water elevations in the manholes, inlets or ponds being simulated by a node had to be established and is described as the elevation at which a water body (or structure in this case) is expected to be found prior to a storm event. This elevation, or normal high water elevation, was set the same as the tailwater elevation. The mean high water elevation, 0.3-ft NAVD 1988, was used as the tailwater elevation. In the model, the actual invert of the pipe was used as the initial starting water level if pipe inverts were above 0.3-ft..

The final element for which nodes are used in the model is to set boundary conditions. In order to accurately model the St. Pete Beach drainage basins, a stage-time relationship for the Gulf of Mexico and Boca Ciega Bay was needed. The SWFWMD guidelines and specifications recommend that the mean high water level be used when performing watershed (drainage basin) studies in tidally influenced areas. The National Geodetic Survey (NGS) control marker PID:AG5298 at N 27° 45.717 W 082° 37.967 (NAD 83) was used to determine the mean high water level. The marker is located in St. Petersburg, near the southwest corner of the Albert Whitted Municipal Airport, near the northeast corner of the housing area of the University of South Florida Bay Campus, in the top near the Northeast Corner of the concrete sea wall, 3.6-feet

east of the west end of the sea wall, 1.1 feet north of the north end of the of the north-south sea wall, and about 1-foot above the parking area. The mean high level used as the tailwater for 0.3-ft NAVD 1988. Elevations of interest at this location include:

- Mean Higher High Water (MHHW) = 2.26-ft which is 0.58ft NAVD 1988
- Mean High Water (MHW) = 1.98-ft which is 0.3-ft NAVD 1988
- Mean Sea Level (MSK) = 1.20-ft which is -0.48-ft NAVD 1988
- Mean Tide Level (MTL) = 1.18-ft which is -0.5-ft NAVD 1988
- Mean Low Water (MLW) = 0.38-ft which is -1.3-ft NAVD 1988
- Mean Lower Low Water (MLLW)-ft = 0.00 which is -1.68-ft NAVD 1988

NAVD 1988 is 0.9 feet lower than NGVD 1929 at this location.

2.3 Water Quality Analysis and Modeling

This section describes the procedures, calculations, and assumptions used to estimate the pollutant loading from the basin. There are a number of steps needed to compute the pollutant load discharged from a given area. First, the potential for the drainage basins to generate runoff and pollutant loads by computing the area-weighted Runoff Coefficient, C, and Event Mean Concentration (EMC) based on the area associated with the project is determined. This contributing area is generally determined based on land contours and existing stormwater conveyance systems.

2.3.1 Area-Weighted Runoff Coefficient, C

The area-weighted runoff coefficient is a computation that takes into account all the various land use and soil types within an area. The application determines the area associated with each land use/hydrologic soil group combination within the area, sums these up, and divides by the total area, as shown below. This value is computed for each basin.

$$C = \frac{\sum_{1}^{n}\left(C_{n,m} * \sum_{m=1}^{m} Area_{n,m}\right)}{\sum_{1}^{n}\left(\sum_{m=1}^{m} Area_{n,m}\right)} \qquad \text{Equation 1}$$

where

C = area-weighted runoff coefficient,
C_n = area-weighted runoff coefficient for a given land use, n,
$Area_n$ = area (acres) for land use, n, and HSG, m,
n = number of different land uses within the area, and
m = number of different HSGs within the area.

The land use based runoff coefficients are shown in Table 2-7. Land use data used in computing the area-weighted runoff coefficient and EMC are based on GIS coverage's for the Southwest Florida Water Management District. Runoff coefficients were not individually assigned to each land use category in the GIS (~160), but assigned each category to one of 16 major categories, shown in Table 2-8.

Table 2-7: Runoff Coefficient by Land Use and Soils

Land Use	Soils	Typical Year Runoff Coefficient
Commercial	A	0.29
Commercial	B/D	0.35
Commercial	C	0.40
Commercial	D	0.43
High Density Residential	A	0.14
High Density Residential	B/D	0.24
High Density Residential	C	0.30
High Density Residential	D	0.35
Industrial/Utility	A	0.18
Industrial/Utility	B/D	0.27
Industrial/Utility	C	0.32
Industrial/Utility	D	0.37
Institutional	A	0.14
Institutional	B/D	0.24
Institutional	C	0.30
Institutional	D	0.35
Open , Shrub, Recreation	A	0.02
Open , Shrub, Recreation	B/D	0.08
Open , Shrub, Recreation	C	0.16
Open , Shrub, Recreation	D	0.22
Transportation Facility	A	0.21
Transportation Facility	B/D	0.29
Transportation Facility	C	0.35
Transportation Facility	D	0.37
Water, Bay, Estuaries	A	1
Water, Bay, Estuaries	B/D	1
Water, Bay, Estuaries	C	1
Water, Bay, Estuaries	D	1
Wetlands	A	0.43
Wetlands	B/D	0.43
Wetlands	C	0.43
Wetlands	D	0.43

Note: Agriculture runoff coefficients apply to all four agricultural land uses: general, crop, citrus, and pasture.

Table 2-8: Land Use Types and Codes

FLUCCS	Land Use
1100-1199	Low-Density Residential
1200-1299	Medium Density Residential
1300-1399	High Density Residential
1400-1499, 1840-1849, 1870-1899	Commercial
1700-1799, 1830-1839, 1850-1869	Institutional
1500-1699, 8200-8399	Industrial/Utility
8000-8199	Transportation Facility
2100-2139	Pasture Agriculture
2210-2299	Citrus Agriculture
2140-2209, 2610-2999	Row Crops Agriculture
2000-2099, 2300-2599	General Agriculture
6000-6999	Wetland
5000-5999	Water
1800-1819, 1900-1999, 2600-2609, 3000 - 3999, 7000-7999	Open
1820-1829	Golf Course
4000-4999	Forest

2.3.2 Area-Weighted EMC

The area-weighted EMC computation is one that takes into account all the various land uses within a project's drainage basin. The area associated with each land use is multiplied by its associated EMC and then summed. The number is divided by the total area to compute the area weighted EMC for the drainage basin. This value is computed for each drainage basin.

$$EMC_X = \frac{\sum_{1}^{n} \left(EMC_n * Area_n \right)}{\sum_{1}^{n} Area_n} \qquad \text{Equation 2}$$

where

EMC_X = area-weighted EMC for the project for pollutant X(mg/L),
n = number of land uses within the area,
EMC_n = EMC (mg/L) for a given land use, and
$Area_n$ = area (acres) for a given land use (the total area, A, could also be used here).

EMCs used in this study are presented in Table 2-9 and are characteristic of Florida runoff.

Table 2-9: Land Use EMCs

Land Use Name	TN	TP	BOD	TSS	Cu	Pb	Zn
High Density Residential	2.32	0.520	11.3	77.8	0.009	0.006	0.086
Commercial	1.23	0.170	7.6	59.2	0.017	0.006	0.083
Institutional [A]	2.40	0.345	11.3	69.7	0.015	0.006[B]	0.160
Industrial/Utility	1.23	0.180	7.6	60.0	0.003	0.002	0.057
Transportation Facility	1.64	0.220	5.2	37.3	0.032	0.011	0.120
Wetland [E]	1.15	0.074	1.2	7.8	0.0	0.0	0.0
Water [E]	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open	1.15	0.074	1.2	7.8	--	--	--

Note: All EMC data from Harper 2000 except as noted below:
[A] – Values not provided from Harper, 2000. Value from High Density Residential used.
[B] – Values not provided from Harper, 2000. Value from Commercial used.
[C] – Values not provided from Harper, 2000. Values from Medium Density Residential used.
[D] – Values not provided from Harper, 2000. Values from Open used.
[E] – Value set to zero and not considered a source.

2.3.3 Annual Runoff Volume, Q

Once the area-weighted runoff coefficient has been computed, the annual volume of runoff from the associated area can be computed. This is shown in Equation 3 and is computed for each project.

$$Q = \frac{C * A * P_A}{12} \qquad \text{Equation 3}$$

where

Q = annual runoff volume (ac-ft).
C = area-weighted runoff coefficient,
A = total area (acres),
P_A = annual precipitation (inches), and
12 converts inches to feet.

The annual rainfall amount assumed for this study is 50.03 inches per year.

2.3.4 Annual Pollutant Loads

Finally, the annual pollutant load can be computed by incorporating the results of Equation 4, as shown in the following equation. This value must be computed for each drainage basin and for each pollutant x.

$$L_X = Q * Weighted\ EMC_X * 2.72$$ Equation 4

where:

L_X = annual pollutant load (lbs/yr) from the area associated with the project for pollutant X (e.g. nitrogen phosphorus, etc),
Q = annual runoff volume (ac-ft/yr) from the area associated with the project, as computed in Equation 3,
EMC_X = area-weighted event mean concentration (mg/L) for pollutant X, as computed in Equation 2, and
2.72 = a unit conversion value [(ac-ft/yr)*(mg/L) to lb/yr].

At the end of this computation, the load for all applicable pollutants from the areas associated with each drainage basin has been determined.

2.4 Problem Area Definitions

One of the main objectives of this study was to identify water quantity and water quality problem areas. In order to accurately identify, rank and prioritize problems in these areas, a working definition of what constitutes a problem needs to be developed. The following discussion clarifies what a problem is and distinguishes between a serious and nuisance problem.

Water Quantity

Serious Problem Area:

A serious problem, as defined in this study, is any condition which represents imminent threat to public safety, property, or human life. This would include the blocking of evacuation routes, hindering of emergency vehicle movement and flooding of homes or businesses. The criteria for a serious water quantity problem are as follow:

1. House or business flooding during the 100-year/24-hour design storm event

2. Roadways overtopped in design storm events of 25-year/24-hour duration or less

Nuisance Problem Area:

Nuisance problem areas in this study are defined as those areas which do not affect public health and safety. Such problems would include minor street flooding resulting in traffic delays, inconveniences and temporary blockage of secondary non-essential roadways.

Water Quality

Serious Problem Area:

A serious problem, as defined in this study, is any condition which violates Chapter 17-302, Florida Administrative Code, causes excessive degradation of wetland habitat or threatens the use of lakes. The criteria for a serious water quality problem are as follows:

Nuisance Problem Area:

A nuisance water quality problem area is defined as minor natural changes in color, odor or turbidity as defined within Chapter 17-302, FAC. Additionally, a water quality problem area is a water body having constituent concentrations mainly in the poor range as described in a previous section.

2.5 Evaluation of Preferred Best Management Practices

Best Management Practices (BMPs) are designs, philosophies and techniques which limit the adverse impact humans have on their environment. To reduce the concentrations and the loads of pollutants reaching the receiving waters, various BMPs have been developed. These BMPs fall into the following two primary categories: 1) non-structural BMPs which include the sub-categories of pollution prevention BMPs and source control BMPs; and, 2) structural BMPs which include facilities constructed to passively treat urban stormwater runoff before it enters the receiving waters. The following BMPs, as discussed in the FDEP Manual and the Urban Storm Drain Design Manual, represent the variety being applied in the study area.

Structural Stormwater Controls

- Extended Detention Basin (Dry)
- Retention Ponds (above ground or below ground storage) - On-Line and Off-Line)
- Exfiltration Trenches
- Irrigated Grass Buffer Strips
- Grass-Lined Swales
- Alternative Pervious Parking Surfaces
- Water Quality Inlets (Baffle Boxes, CDS etc.)
- Underdrains and Stormwater Filter Systems
- Aeration
- Modular Block Porous Pavement

- Parking Lot Storage
- Rooftop Runoff Disposal
- Increase Culvert Size
- Increase Pumping Capacity

Non-structural Source Controls

- Stormwater quality control planning for new developments and redevelopment
- Adoption of stormwater BMP criteria and standards, including standards for erosion and sediment control during construction
- Guidelines and educational programs covering the proper disposal of household waste, litter, pet waste, yard waste and toxic waste
- Guidelines for pesticides, herbicides and fertilizer application
- Suggestions on monitoring and elimination of illicit discharges, management of spills and illegal connections to storm sewer systems
- Landscaping and Vegetation Practices
- Street Sweeping
- Aquifer Recharge and directly connected impervious area minimization
- Bay Set-Back Requirements and Buffer Zones
- Regulations restricting the development within threatened areas

This section presents a comparison of BMPs considered for use in the City of St. Pete Beach for the treatment and management of stormwater runoff. The use of each specific BMP will be based on the site constraints and desired goals, either water quality or quantity control. A combination of non-structural and structural controls will yield the best results. Mixing and matching various BMPs is recommended to obtain the maximum benefit.

2.6 Alternative Evaluations

The problems that need to be alleviated within the drainage basins are of both quantity and quality. In order to adequately develop and prioritize possible solutions, several factors were identified as being important in this decision making process. Five of these factors are discussed below.

Technical Feasibility - The project must lie within currently acceptable and reliable standards. The technology should solve as many quantity and quality problems as possible. Risks to the public should be minimized in every instance by making public safety a priority.

Socio-Political Acceptability - The project should abide by all regulatory standards and be supported by the public it is intended to serve.

Economic Analysis - The project should achieve a maximum benefit from the expenditure of public funds. The cost-benefit ratio must be greater than unity.

Environmental Consistency - The environmental goals of the community should be considered in every action taken, ensuring that the environment is protected to the extent desired by the community.

Financial Feasibility - Each project should be within the constraints of the community's budget.

The following considerations were incorporated in the development of alternatives:

1. Realistic, technically feasible alternatives were selected. Where a less complex alternative was available, it was chosen over the more complex alternative.

2. Regulatory agency guidelines and public opinion of a project were considered in the selection of the project.

3. The most cost-effective alternative was selected based on the level of service obtained for both water quantity and water quality.

4. The response of the environmental and wetland communities was reviewed in the selection process.

5. The ability to pay for each project was considered in the selection process.

These considerations are intended to be used for evaluation of structural improvement alternatives only, even though the overall recommendation for the improvement of the City of St. Pete Beach includes both structural and non-structural management approaches.

3.0 EXISTING CONDITIONS RESULTS

The entire City of St. Pete Beach is approximately 1,321 acres or two square miles located in southwest Pinellas County. The City is bound by Boca Ciega Bay to the east and the Gulf of Mexico to the west. This study focuses on 25 major drainage basins covering 288 acres or 22 percent of the city. This study is a reexamination of the 25 basins studied in the 1993 stormwater master plan. The existing conditions are described from each of the 25 primary drainage basins within the City of St. Pete Beach. The basins are generally presented from north to south.

3.1 Basin 1A: 93rd Avenue

Basin Description

Basin 1A is located in the north drainage section of the city. It drains an area which includes McKenney Park and residential areas. The primary drainage basin area is divided into 5 sub-basins as summarized in Table 3-1. The system drains through a 15-inch RCP westward down 93rd Avenue and discharges into Blind Pass (intercoastal waterway) just south of Blind Pass Road. The outfall culvert is installed within a seawall along the lot line of two residential homes. The piping information for this basin is summarized in Table 3-2. The nodal map with aerial background for Basin 1A is presented in Figure 3-1.

Table 3-1: Basin 1A Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
1A-10	10	0.08	61.00	75.00
1A-20	10	0.56	80.82	0.00
1A-30	10	0.42	61.00	21.43
1A-40	10	1.53	83.15	25.49
1A-50	10	2.26	68.89	13.27

Table 3-2: Basin 1A Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
1A-RST-10	1A	93rd	1A-ST-10	1A-ST-25	1	18	15 Circular Bottom of Form
1A-RST-20	1A	Pond Outfall to 93rd	1A-ST-20	1A-ST-25	1	23	D/S with 12 Circular
1A-RST-25	1A	93rd	1A-ST-25	1A-ST-30	1	286	15 Circular
1A-RST-30	1A	93rd and Gulf Blvd	1A-ST-30	1A-ST-50	1	40	15 Circular
1A-RST-40	1A	93rd and Gulf Blvd	1A-ST-40	1A-ST-30	1	48	12 Circular
1A-RST-50	1A	93rd and Gulf Blvd	1A-ST-50	TW	1	130	15 Circular

Simulation Results

Advanced Interconnected Channel Pond Routing (adICPR version 3.10) was used to simulate the existing condition water elevations within the basin. The model produces both hydrologic and hydraulic output information. The maximum unrouted flows generated by the contributing areas within the Basin 1A are summarized in Table 3-3.

Table 3-3: Basin 1A Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
1A-10	0.2	0.2	0.2	0.3	0.4	0.4	0.5
1A-20	1.0	1.1	1.2	2.1	2.6	2.9	3.3
1A-30	0.5	0.5	0.6	1.1	1.5	1.7	2.0
1A-40	3.3	3.5	3.7	6.1	7.6	8.5	9.5
1A-50	2.9	3.3	3.5	6.8	8.8	10.2	11.6

The maximum stages reached during the various design storm events are summarized in Table 3-4. Expected flood depths within this basin are summarized in Table 3-5. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-4: Basin 1A Maximum Stages During Various Design Storm Events

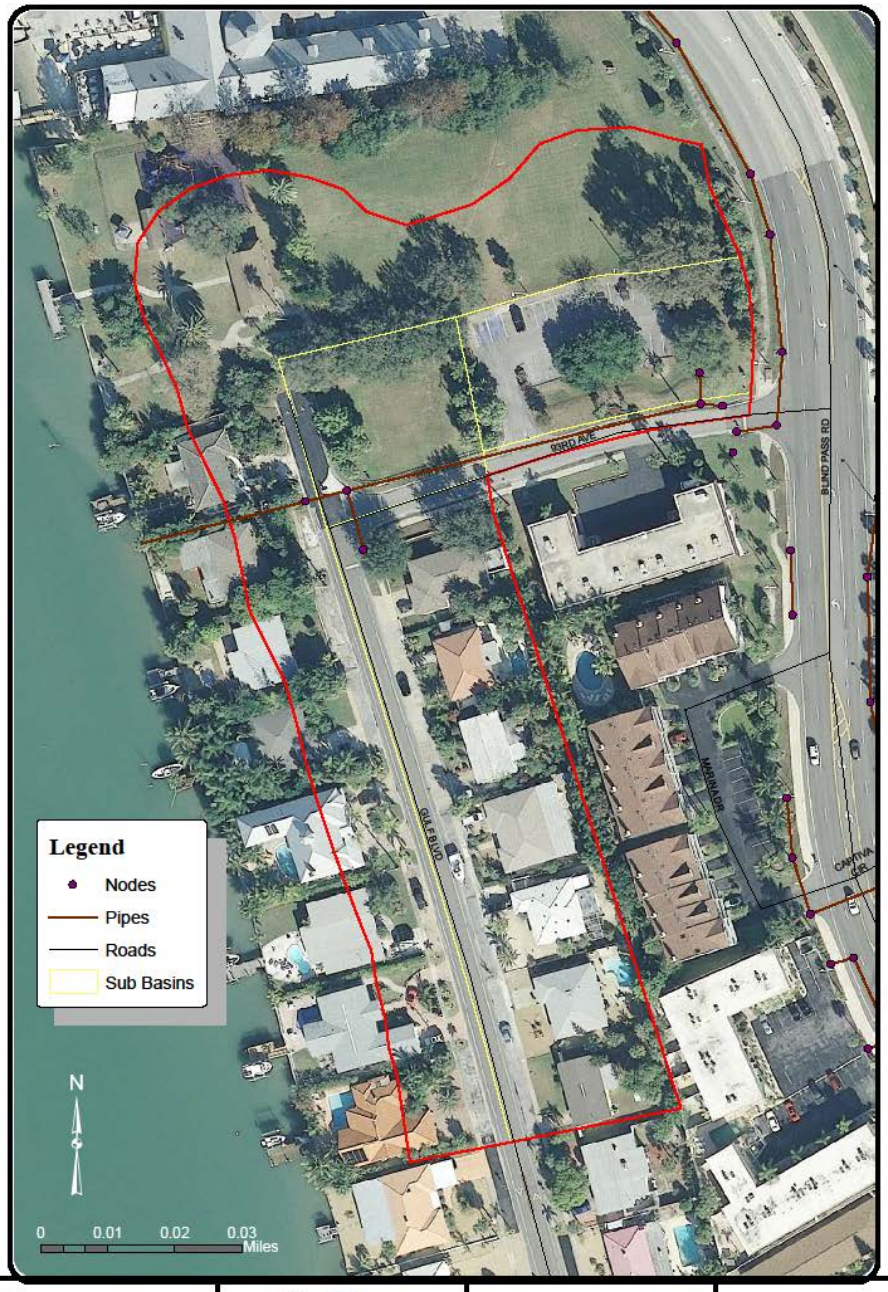
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
1A-ST-10	3.38	2.73	2.93	3.00	3.53	3.65	3.72	3.79
1A-ST-20	4.00	3.05	3.06	3.08	3.59	3.65	3.72	3.79
1A-ST-25	3.37	2.73	2.93	3.00	3.53	3.65	3.72	3.78
1A-ST-30	3.07	2.64	2.82	2.91	3.52	3.65	3.72	3.78
1A-ST-40	3.21	3.11	3.27	3.36	3.56	3.66	3.73	3.79
1A-ST-50	3.63	2.29	2.47	2.57	3.51	3.63	3.70	3.77

Table 3-5: Basin 1A Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	**Mean Annual**	**5-Year**	**10-year**	**25-year**	**50-year**	**100-year**
1A-ST-10	0.0	0.0	0.0	1.8	3.2	4.1	4.9
1A-ST-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1A-ST-25	0.0	0.0	0.0	1.9	3.4	4.2	4.9
1A-ST-30	0.0	0.0	0.0	5.4	7.0	7.8	8.5
1A-ST-40	0.0	0.7	1.8	4.2	5.4	6.2	7.0
1A-ST-50	0.0	0.0	0.0	0.0	0.0	0.8	1.7

Identified Problem Areas

For storm events as small as the 10-year, 24-hour storm event, the intersection of Gulf Blvd and 93rd Avenue is predicted to be flooded by nearly 6-inches of water. Additional inlet and pipe capacity may be needed to alleviate the flooding condition.



CPWG CRISE PHILBRICK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **1-A** **93RD AVENUE** **NODAL MAP**	FIGURE 3-1

3.2 Basin 2F: 85th Avenue and Boca Ciega Drive

Basin Description

Basin 2F is located in the north drainage section of the City, between 84th Avenue and 87th Avenue, east of Blind Pass Road. The area drained which includes, St. Alban's Episcopal Church, a school, and residential areas. The area has been divided into 3 sub-basins as presented in Table 3-6. The system drains through a 12-inch RCP east down 85th Avenue, through a 15-inch RCP at the intersection of 85th Avenue and Boca Ciega Drive, and outfalls through an 18-inch RCP into Boca Ciega Bay. The outfall culvert is located in a city pocket park which does not have a constructed seawall. There is damage to the inlet on 85th Avenue to the outfall pipe. Piping information for this basin is summarized in Table 3-7. The nodal map with aerial background for Basin 2F is presented in Figure 3-2.

Table 3-6: Basin 2F Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
2F-20	10	1.18	83.41	20.34
2F-30	10	2.81	74.55	15.30
2F-40	10	1.14	67.86	19.30

Table 3-7: Basin 2F Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
2F-RST-10	2F	85th Ave and Boca Ciega Dr.	2F-ST-10	2F-ST-20	1	151	12 Circular
2F-RST-20	2F	85th Ave and Boca Ciega Dr.	2F-ST-20	2F-ST-30	1	29	15 Circular
2F-RST-30	2F	85th Ave and Boca Ciega Dr.	2F-ST-30	2F-ST-40	1	86	15 Circular
2F-RST-40	2F	85th Ave and Boca Ciega Dr.	2F-ST-40	TW	1	91	18 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 2F is summarized in Table 3-8.

Table 3-8: Basin 2F Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
2F-20	2.5	2.7	2.9	4.7	5.8	6.5	7.3
2F-30	4.5	5.0	5.3	9.6	12.2	14.0	15.7
2F-40	1.5	1.7	1.8	3.5	4.5	5.2	5.9

The maximum stages reached during the various design storm events are summarized in Table 3-9. Expected flood depths within the basin are summarized in Table 3-10. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-9: Basin 2F Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
2F-ST-10	2.95	2.52	2.75	2.83	2.95	2.99	3.02	3.05
2F-ST-20	2.82	2.52	2.75	2.83	2.97	3.02	3.04	3.07
2F-ST-30	2.69	2.43	2.65	2.73	2.94	3.00	3.03	3.06
2F-ST-40	2.70	1.13	1.22	1.37	2.76	2.83	2.87	2.91

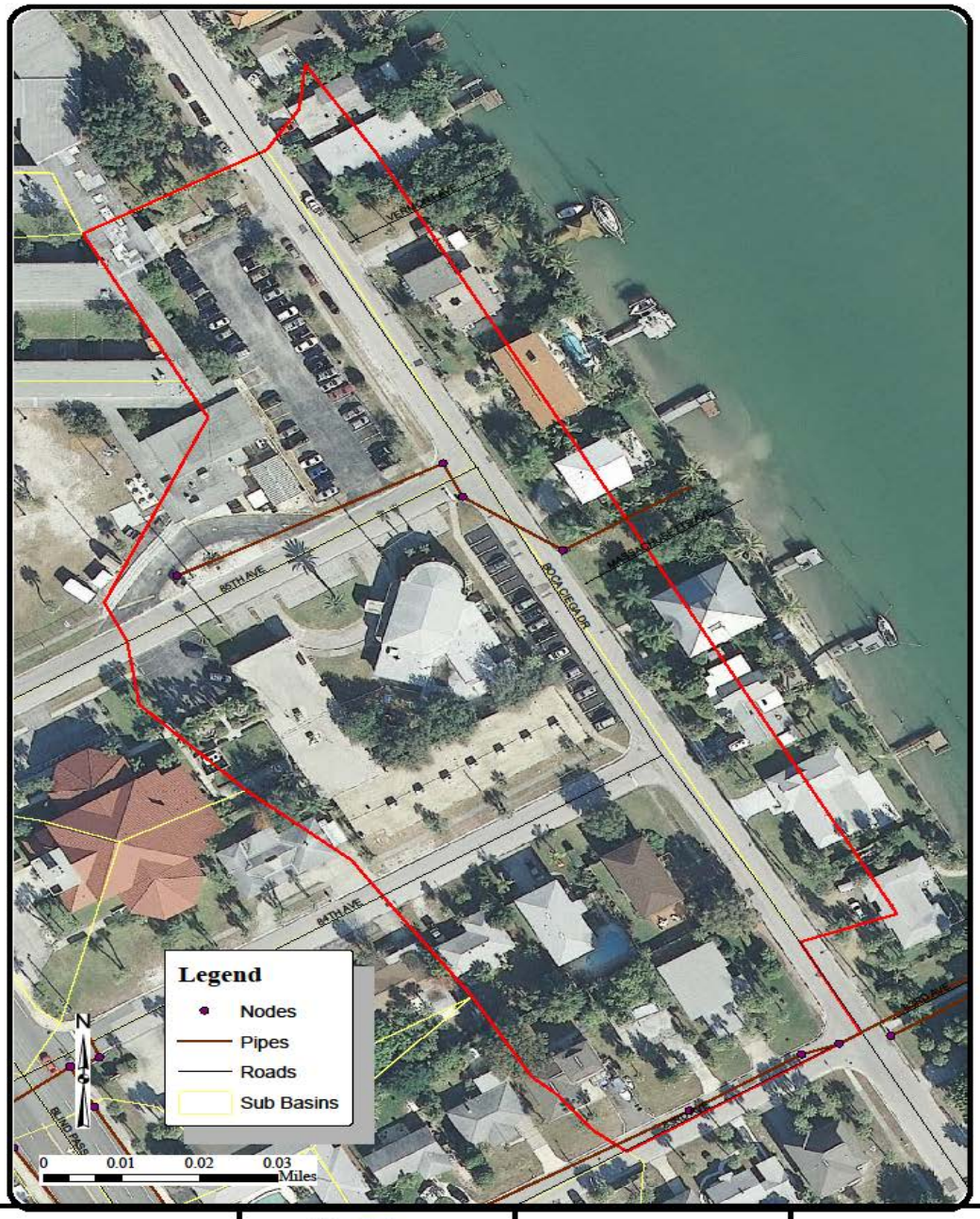
Table 3-10: Basin 2F Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
2F-ST-10	0.0	0.0	0.0	0.0	0.5	0.8	1.2
2F-ST-20	0.0	0.0	0.1	1.8	2.4	2.6	3.0
2F-ST-30	0.0	0.0	0.5	3.0	3.7	4.1	4.4
2F-ST-40	0.0	0.0	0.0	0.7	1.6	2.0	2.5

Identified Problem Areas

For storm events as small as the 10-year, 24-hour storm event the intersection of Boca Ciega Drive and 85th Avenue is predicted to be flooded by 3-inches. This flood depth increases to 4.4-inches for the 100-year storm event. Additional inlet and pipe capacity may be needed to alleviate the flooding condition.

About half of 85th Avenue is marginally sloped towards Blind Pass Road. Minor standing water may be experienced in this area. Additional inlets and piping, about 400 linear feet, would be needed to minimize the standing water condition and also divert flow from the already taxed Blind Pass Road System (Basin 2H) and into the 2F system.



CPWG CRIBB PHILBRICK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **2-F** **85TH AVENUE AND** **BOCA CIEGA DRIVE** **NODAL MAP**	FIGURE 3-2

3.3 Basin 2H: Blind Pass Road Outfall at 83rd Avenue

Basin Description

Basin 2H is located at the north drainage section of the city and is the primary drainage system for Blind Pass Road between 82nd Avenue and just north of 87th Avenue. The primary drainage basin area is divided into 67 sub-basins as summarized in Table 3-11. The system drains through a 60x38-inch ERCP on Blind Pass Road between 87th Avenue and 86th Avenue. The pipe size increases to 68x43-inch ERCP on Blind Pass Road between 86th and 83rd Avenue. Between 82nd and 83rd Avenues on Blind Pass Road, drainage is through an 18-inch RCP. The entire system drains eastward through a 68x43-inch ERCP on 83rd Avenue and discharges to Boca Ciega Bay. The outfall is installed within a seawall and is protected by a ring of bollards in the water. Piping information for this basin is summarized in Table 3-12. The nodal map with aerial background for Basin 2H is presented in Figure 3-3.

Table 3-11: Basin 2H Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
2H-S-100	10	1.28	59.36	10.94
2H-S-101	10	1.02	80.18	4.90
2H-S-103	10	0.36	47.19	2.78
2H-S-104	10	1.43	66.74	6.29
2H-S-106	10	0.77	68.50	14.29
2H-S-107	10	0.90	39.00	2.22
2H-S-108	10	0.76	39.00	0.00
2H-S-109	10	0.21	39.00	0.00
2H-S-111	10	1.37	69.27	16.06
2H-S-112	10	0.60	39.00	0.00
2H-S-113	10	0.52	77.10	7.69
2H-S-114	10	0.77	39.00	0.00
2H-S-115	10	0.27	82.61	11.11
2H-S-116	10	0.74	39.00	0.00
2H-S-119	10	0.39	39.00	0.00
2H-S-120	10	0.94	39.00	0.00
2H-S-72	10	0.43	92.22	25.58
2H-S-73	10	0.55	91.83	0.00
2HS-75	10	0.04	85.67	50.00
2H-S-77	10	0.59	83.81	11.86
2H-S-79	10	0.66	68.89	15.15
2H-S-81	10	0.45	88.75	8.89
2H-S-83	10	0.07	79.50	71.43
2H-S-84	10	0.16	98.00	0.00
2H-S-86A	10	0.31	79.70	25.81
2H-S-87	10	1.63	94.50	9.20
2H-S-89	10	0.57	78.79	17.54
2H-S-90	10	0.89	65.49	15.73
2H-S-91	10	0.52	68.50	15.38
2H-S-92	10	1.63	64.46	10.43
2H-S-94	10	0.19	98.00	78.95

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
2H-S-95	10	0.30	76.37	0.00
2H-S-96	10	1.04	73.42	19.23
2H-S-98	10	0.45	80.30	11.11
2H-S-99	10	1.11	66.76	23.42

Table 3-12: Basin 2H Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
2H-RS-72	2H	Blind Pass Road	2H-S-72	2H-S-75	1	180	18 Circular
2H-RS-73	2H	Blind Pass Road	2H-S-73	2H-S-74	1	112	18 Circular
2H-RS-74	2H	Blind Pass Road	2H-S-74	2H-S-78	1	59	18 Circular
2H-RS-75	2H	Blind Pass Road	2H-S-75	2H-S-76	1	20	18 Circular
2H-RS-76	2H	Blind Pass Road	2H-S-76	2H-S-80	1	31	18 Circular
2H-RS-77	2H	Blind Pass Road	2H-S-77	2H-S-76	1	16	18 Circular
2H-RS-78	2H	Blind Pass Road	2H-S-78	2H-S-81	1	49	18 Circular
2H-RS-79	2H	Blind Pass Road	2H-S-79	2H-S-77	1	25	18 Circular
2H-RS-80	2H	Blind Pass Road	2H-S-80	2H-S-165	1	277	68 x 43 Horz Ellipse
2H-RS-81	2H	Blind Pass Road	2H-S-81	2H-S-83	1	15	10 Circular
2H-RS-83	2H	Blind Pass Road	2H-S-83	2H-S-80	1	31	68 x 43 Horz Ellipse
2H-RS-84	2H	Blind Pass Road	2H-S-84	2H-S-84 CON	1	4	18 Circular
2H-RS-84 CON	2H	Blind Pass Road	2H-S-84 CON	2H-S-83	1	36	68 x 43 Horz Ellipse
2H-RS-86A	2H	Blind Pass Road	2H-S-86A	2H-S-84 CON	1	87	68 x 43 Horz Ellipse
2H-RS-87	2H	Blind Pass Road	2H-S-87	2H-S-87A	1	21	24 Circular
2H-RS-87A	2H	Blind Pass Road	2H-S-87A	2H-S-88	1	47	68 x 43 Horz Ellipse
2H-RS-88	2H	Blind Pass Road	2H-S-88	2H-S-86A	1	26	68 x 43 Horz Ellipse
2H-RS-89	2H	Blind Pass Road	2H-S-89	2H-S-88	1	16	18 Circular
2H-RS-90	2H	Blind Pass Road	2H-S-90	2H-S-87	1	28	18 Circular
2H-RS-91	2H	Blind Pass Road	2H-S-91	2H-S-89	1	25	18 Circular
2H-RS-92	2H	Blind Pass Road	2H-S-92	2H-S-93	1	4	18 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
2H-RS-93	2H	Blind Pass Road	2H-S-93	2H-S-705	1	85	68 x 43 Horz Ellipse
2H-RS-94	2H	Blind Pass Road	2H-S-94	2H-S-93	1	50	18 Circular
2H-RS-95	2H	Blind Pass Road	2H-S-95	2H-S-94	1	5	18 Circular
2H-RS-96	2H	Blind Pass Road	2H-S-96	2H-S-97	1	46	18 Circular
2H-RS-97	2H	Blind Pass Road	2H-S-97	2H-S-93	1	136	68 x 43 Horz Ellipse
2H-RS-98	2H	Blind Pass Road	2H-S-98	2H-S-97	1	68	18 Circular
2H-RS-99	2H	Blind Pass Road	2H-S-99	2H-S-96	1	27	18 Circular
2H-RS-100	2H	Blind Pass Road	2H-S-100	2H-S-98	1	21	18 Circular
2H-RS-101	2H	Blind Pass Road	2H-S-101	2H-S-102	1	99	18 Circular
2H-RS-102	2H	Blind Pass Road	2H-S-102	2H-S-97	1	87	68 x 43 Horz Ellipse
2H-RS-103	2H	Blind Pass Road	2H-S-103	2H-S-102	1	72	18 Circular
2H-RS-104	2H	Blind Pass Road	2H-S-104	2H-S-105	1	9	18 Circular
2H-RS-105	2H	Blind Pass Road	2H-S-105	2H-S-102	1	149	68 x 43 Horz Ellipse
2H-RS-106	2H	Blind Pass Road	2H-S-106	2H-S-104	1	27	18 Circular
2H-RS-107	2H	Blind Pass Road	2H-S-107	2H-S-106	1	22	18 Circular
2H-RS-108	2H	Blind Pass Road	2H-S-108	2H-S-109	1	57	18 Circular
2H-RS-109	2H	Blind Pass Road	2H-S-109	2H-S-110	1	5	18 Circular
2H-RS-110	2H	Blind Pass Road	2H-S-110	2H-S-105	1	172	60 x 38 Horz Ellipse
2H-RS-111	2H	Blind Pass Road	2H-S-111	2H-S-110	1	50	18 Circular
2H-RS-112	2H	Blind Pass Road	2H-S-112	2H-S-109	1	54	18 Circular
2H-RS-113	2H	Blind Pass Road	2H-S-113	2H-S-111	1	54	18 Circular
2H-RS-114	2H	Blind Pass Road	2H-S-114	2H-S-116	1	22	18 Circular
2H-RS-115	2H	Blind Pass Road	2H-S-115	2H-S-119	1	24	24 Circular
2H-RS-116	2H	Blind Pass Road	2H-S-116	2H-S-117	1	27	18 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
2H-RS-117	2H	Blind Pass Road	2H-S-117	2H-S-110	1	141	60 x 38 Horz Ellipse
2H-RS-119	2H	Blind Pass Road	2H-S-119	2H-S-117	1	68	24 Circular
2H-RS-120	2H	Blind Pass Road	2H-S-120	2H-S-120A	1	12	18 Circular
2H-RS-120A	2H	Blind Pass Road	2H-S-120A	2H-S-117	1	84	18 Circular
2H-RS-705	2H	Blind Pass Road	2H-S-705	2H-S-87A	1	27	68 x 43 Horz Ellipse
2H-RS-165	2H	Blind Pass Road DOT Outfall on 83rd	2H-S-165	2H-S-166	1	152	68 X 43 Horz Ellipse
2H-RS-166	2H	Blind Pass Road DOT Outfall on 83rd	2H-S-166	2H-S-167	1	25	68 X 43 Horz Ellipse
2H-RS-167	2H	Blind Pass Road DOT Outfall on 83rd	2H-S-167	TW	1	147	68 X 43 Horz Ellipse

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 2-H are summarized in Table 3-13.

Table 3-13: Basin 2H Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
2H-S-100	1.0	1.2	1.3	2.9	4.0	4.7	5.4
2H-S-101	1.8	2.0	2.1	3.7	4.7	5.4	6.0
2H-S-103	0.1	0.1	0.1	0.4	0.6	0.8	1.0
2H-S-104	1.5	1.7	1.9	3.9	5.2	6.0	6.9
2H-S-106	1.0	1.1	1.2	2.3	3.0	3.5	4.0
2H-S-107	0.1	0.1	0.1	0.4	0.8	1.2	1.5
2H-S-108	0.0	0.0	0.0	0.3	0.6	0.9	1.2
2H-S-109	0.0	0.0	0.0	0.1	0.2	0.3	0.3
2H-S-111	1.9	2.1	2.2	4.2	5.5	6.3	7.2
2H-S-112	0.0	0.0	0.0	0.3	0.5	0.7	1.0
2H-S-113	0.9	1.0	1.0	1.8	2.3	2.6	3.0

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
2H-S-114	0.0	0.0	0.0	0.3	0.6	0.9	1.2
2H-S-115	0.5	0.6	0.6	1.1	1.3	1.5	1.6
2H-S-116	0.0	0.0	0.0	0.3	0.6	0.9	1.2
2H-S-119	0.0	0.0	0.0	0.2	0.3	0.5	0.6
2H-S-120	0.0	0.0	0.0	0.4	0.8	1.1	1.5
2H-S-72	1.1	1.2	1.2	1.9	2.3	2.5	2.8
2H-S-73	1.3	1.5	1.5	2.4	2.9	3.2	3.6
2HS-75	0.1	0.1	0.1	0.2	0.2	0.2	0.3
2H-S-77	1.2	1.3	1.4	2.3	2.9	3.3	3.6
2H-S-79	0.9	1.0	1.1	2.0	2.6	3.0	3.4
2H-S-81	1.0	1.1	1.2	1.9	2.3	2.6	2.9
2H-S-83	0.2	0.2	0.2	0.3	0.4	0.4	0.5
2H-S-84	0.4	0.5	0.5	0.7	0.9	1.0	1.1
2H-S-86A	0.6	0.7	0.7	1.2	1.5	1.7	1.9
2H-S-87	4.2	4.5	4.7	7.2	8.7	9.7	10.7
2H-S-89	1.1	1.2	1.2	2.1	2.6	3.0	3.4
2H-S-90	1.0	1.2	1.3	2.5	3.3	3.8	4.4
2H-S-91	0.7	0.8	0.8	1.6	2.0	2.4	2.7
2H-S-92	1.7	1.9	2.1	4.3	5.7	6.7	7.7
2H-S-94	0.5	0.6	0.6	0.9	1.0	1.1	1.3
2H-S-95	0.5	0.5	0.5	1.0	1.3	1.5	1.7
2H-S-96	1.7	1.8	2.0	3.5	4.5	5.1	5.8
2H-S-98	0.8	0.9	1.0	1.7	2.1	2.4	2.7
2H-S-99	1.5	1.7	1.8	3.4	4.4	5.0	5.7

Maximum stages reached during the various design storm events are summarized in Table 3-14. Expected flood depths are summarized in Table 3-15. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-14: Basin 2H Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
2H-S-100	2.44	1.61	1.70	1.71	2.46	2.67	2.82	2.96
2H-S-101	2.78	1.64	1.74	1.75	2.52	2.83	2.96	3.11
2H-S-102	3.43	1.51	1.73	1.74	2.42	2.71	2.86	3.14
2H-S-103	2.21	1.58	1.67	1.67	2.38	2.73	2.90	3.05
2H-S-104	2.76	1.66	1.76	1.77	2.62	2.90	3.03	3.18
2H-S-105	3.46	1.65	1.66	1.66	2.39	2.84	3.03	3.12
2H-S-106	2.81	1.67	1.77	1.78	2.67	2.92	3.04	3.19
2H-S-107	2.72	1.67	1.77	1.78	2.67	2.92	3.05	3.19
2H-S-108	2.63	1.63	1.73	1.73	2.50	2.89	3.06	3.18
2H-S-109	2.92	1.63	1.72	1.72	2.49	2.90	3.06	3.18
2H-S-110	3.11	1.59	1.76	1.76	2.51	2.83	2.99	3.18
2H-S-111	2.92	1.70	1.81	1.82	2.71	2.99	3.09	3.19
2H-S-112	2.57	1.63	1.73	1.73	2.50	2.89	3.06	3.18
2H-S-113	2.58	1.71	1.82	1.83	2.71	2.99	3.09	3.20
2H-S-114	2.53	1.63	1.73	1.73	2.50	2.88	3.06	3.20
2H-S-115	2.28	1.65	1.74	1.74	2.51	2.88	3.06	3.20
2H-S-116	2.51	1.63	1.73	1.73	2.50	2.88	3.06	3.20
2H-S-117	3.39	1.66	1.71	1.71	2.46	2.91	3.11	3.14
2H-S-119	2.51	1.64	1.74	1.74	2.51	2.87	3.06	3.20
2H-S-120	2.87	1.63	1.73	1.73	2.50	2.90	3.10	3.24
2H-S-120A	3.56	1.63	1.73	1.73	2.50	2.90	3.09	3.24
2H-S-165	3.37	0.49	0.67	0.68	1.05	1.18	1.24	1.29
2H-S-166	3.59	0.49	0.53	0.54	0.77	0.85	0.89	0.92
2H-S-167	3.05	0.37	0.44	0.44	0.58	0.63	0.65	0.67
2H-S-705	3.15	1.44	1.38	1.39	2.14	2.46	2.60	2.70
2H-S-72	2.67	1.16	1.18	1.20	1.80	2.23	2.49	2.70
2H-S-73	2.80	1.37	1.39	1.41	2.84	3.07	3.12	3.15
2H-S-74	3.90	1.18	1.29	1.38	2.81	3.06	3.11	3.15
2H-S-75	2.70	0.86	0.94	0.98	1.74	2.13	2.36	2.57
2H-S-76	3.46	0.67	0.88	0.91	1.71	2.09	2.31	2.51

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
2H-S-77	2.45	0.69	0.89	0.93	1.82	2.27	2.50	2.59
2H-S-78	3.00	1.16	1.28	1.36	2.76	3.01	3.05	3.08
2H-S-79	2.40	0.70	0.90	0.93	1.85	2.32	2.51	2.60
2H-S-80	3.45	0.66	0.86	0.88	1.42	1.62	1.72	1.79
2H-S-81	3.90	1.14	1.27	1.35	2.72	2.98	3.04	3.07
2H-S-83	3.40	0.61	1.00	1.02	1.57	1.80	1.90	1.98
2H-S-84	2.90	0.83	1.04	1.06	1.71	1.95	2.06	2.15
2H-S-84 CON	3.04	0.90	1.03	1.05	1.71	1.95	2.06	2.15
2H-S-86A	3.10	0.87	1.20	1.22	1.86	2.13	2.25	2.35
2H-S-87	2.72	1.37	1.43	1.45	2.25	2.63	2.76	2.82
2H-S-87A	3.22	1.13	1.43	1.45	2.09	2.38	2.52	2.64
2H-S-88	3.00	1.21	1.21	1.23	1.97	2.26	2.39	2.50
2H-S-89	2.55	1.18	1.28	1.30	2.05	2.38	2.53	2.60
2H-S-90	2.61	1.37	1.45	1.47	2.30	2.66	2.77	2.83
2H-S-91	2.36	2.40	2.41	2.41	2.43	2.45	2.54	2.61
2H-S-92	0.79	1.51	1.59	1.61	2.31	2.67	2.82	2.88
2H-S-93	2.97	1.37	1.61	1.62	2.23	2.55	2.67	2.83
2H-S-94	2.79	1.50	1.58	1.59	2.25	2.58	2.73	2.83
2H-S-95	2.34	1.50	1.59	1.60	2.26	2.58	2.73	2.84
2H-S-96	2.64	1.63	1.74	1.76	2.65	2.77	2.86	2.99
2H-S-97	3.25	1.60	1.55	1.56	2.28	2.67	2.84	2.92
2H-S-98	2.38	1.60	1.69	1.70	2.42	2.66	2.81	2.95
2H-S-99	2.69	1.65	1.76	1.78	2.71	2.80	2.87	3.00

Table 3-15: Basin 2H Depth of Flooding

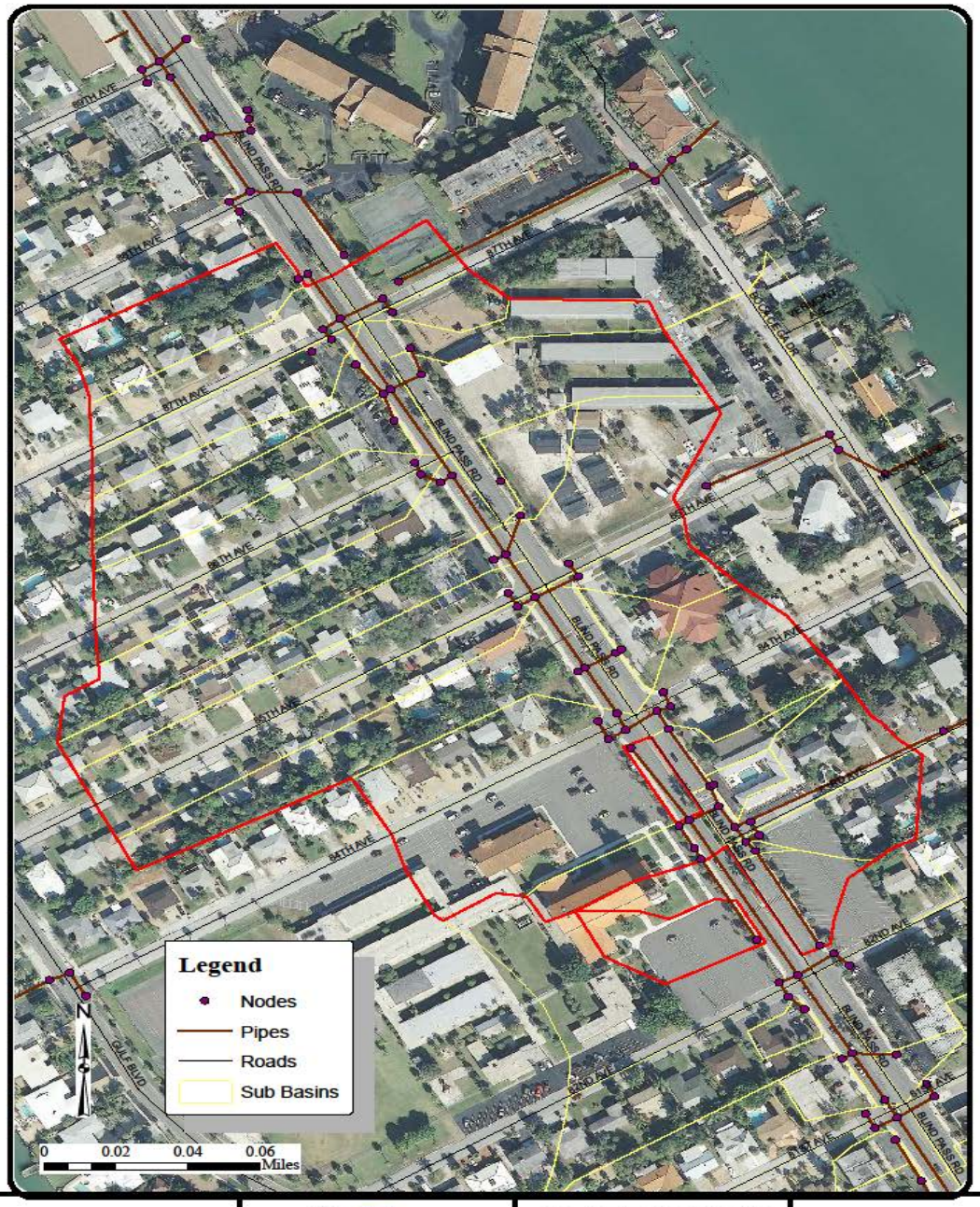
Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
2H-S-100	0.0	0.0	0.0	0.2	2.8	4.6	6.2
2H-S-101	0.0	0.0	0.0	0.0	0.6	2.2	4.0
2H-S-102	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-103	0.0	0.0	0.0	2.0	6.2	8.3	10.1
2H-S-104	0.0	0.0	0.0	0.0	1.7	3.2	5.0
2H-S-105	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-106	0.0	0.0	0.0	0.0	1.3	2.8	4.6
2H-S-107	0.0	0.0	0.0	0.0	2.4	4.0	5.6
2H-S-108	0.0	0.0	0.0	0.0	3.1	5.2	6.6
2H-S-109	0.0	0.0	0.0	0.0	0.0	1.7	3.1
2H-S-110	0.0	0.0	0.0	0.0	0.0	0.0	0.8
2H-S-111	0.0	0.0	0.0	0.0	0.8	2.0	3.2
2H-S-112	0.0	0.0	0.0	0.0	3.8	5.9	7.3
2H-S-113	0.0	0.0	0.0	1.6	4.9	6.1	7.4
2H-S-114	0.0	0.0	0.0	0.0	4.2	6.4	8.0
2H-S-115	0.0	0.0	0.0	2.8	7.2	9.4	11.0
2H-S-116	0.0	0.0	0.0	0.0	4.4	6.6	8.3
2H-S-117	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-119	0.0	0.0	0.0	0.0	4.3	6.6	8.3
2H-S-120	0.0	0.0	0.0	0.0	0.4	2.8	4.4
2H-S-120A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-165	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-166	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-167	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-705	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-72	0.0	0.0	0.0	0.0	0.0	0.0	0.4
2H-S-73	0.0	0.0	0.0	0.5	3.2	3.8	4.2
2H-S-74	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-75	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-76	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
2H-S-77	0.0	0.0	0.0	0.0	0.0	0.6	1.7
2H-S-78	0.0	0.0	0.0	0.0	0.1	0.6	1.0
2H-S-79	0.0	0.0	0.0	0.0	0.0	1.3	2.4
2H-S-80	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-81	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-83	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-84	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-84 CON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-86A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-87	0.0	0.0	0.0	0.0	0.0	0.5	1.2
2H-S-87A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-88	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-89	0.0	0.0	0.0	0.0	0.0	0.0	0.6
2H-S-90	0.0	0.0	0.0	0.0	0.6	1.9	2.6
2H-S-91	0.5	0.6	0.6	0.8	1.1	2.2	3.0
2H-S-92	8.6	9.6	9.8	18.2	22.6	24.4	25.1
2H-S-93	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-94	0.0	0.0	0.0	0.0	0.0	0.0	0.5
2H-S-95	0.0	0.0	0.0	0.0	2.9	4.7	6.0
2H-S-96	0.0	0.0	0.0	0.1	1.6	2.6	4.2
2H-S-97	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2H-S-98	0.0	0.0	0.0	0.5	3.4	5.2	6.8
2H-S-99	0.0	0.0	0.0	0.2	1.3	2.2	3.7

Identified Problem Areas

During a 100-year, 24-hour storm event, portions of Blind Pass Road are predicted to flood by as much as twelve inches. This depth of flood would still allow emergency vehicles to pass.

About half of 83rd Avenue is marginally sloped towards Blind Pass Road. Minor standing water may be experienced in this area. Additional inlets and piping, about 600 linear feet, would be needed to minimize the standing water condition and also divert flow from the already taxed Blind Pass Road System (Basin 2H) and into a local outfall at 83rd Avenue.



CPWG CRIBB PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **2-H** **BLIND PASS ROAD** **OUTFALL** **AT 83RD AVENUE** **NODAL MAP**	FIGURE 3-3

3.4 Basin 3D: 78th Avenue

Sub-Basin Description

Basin 3D is located in the north drainage section of the City near the intersection of 78th Avenue and Blind Pass Road. The primary drainage basin area is divided into 3 sub-basins as summarized in Table 3-16. The system drains through 12-inch and 15-inch RCP to the east side of Boca Ciega Drive. The system outfalls to Boca Ciega Bay through a 22-inch RCP. The outfall is installed within a constructed seawall. The piping information for this basin is summarized in Table 3-17. The nodal map with aerial background for Basin 3D is presented in Figure 3-4.

Table 3-16: Basin 3D Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3D-10	10	1.10	71.07	17.27
3D-20	10	0.90	65.95	11.11
3D-30	10	0.69	75.08	27.54

Table 3-17: Basin 3-D Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3D-RST-10 TO 20	3D	78th Ave. Local Drainage Outfall	3D-ST-10	3D-ST-20	1	23	12 Circular
3D-RST-10 TO 30	3D	78th Ave. Local Drainage Outfall	3D-ST-10	3D-ST-30	1	37	12 Circular
3D-RST-20	3D	78th Ave. Local Drainage Outfall	3D-ST-20	3D-ST-30	1	28	15 Circular
3D-RST-30	3D	78th Ave. Local Drainage Outfall	3D-ST-30	TW	1	146	22 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 3D are summarized in Table 3-18.

Table 3-18: Basin 3D Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3D-10	1.6	1.8	1.9	3.5	4.5	5.2	5.9
3D-20	1.0	1.1	1.2	2.5	3.3	3.8	4.4
3D-30	1.2	1.4	1.4	2.5	3.1	3.6	4.0

The maximum stages reached during the various design storm events are summarized in Table 3-19. Expected flood depths within the basin are summarized in Table 3-20. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-19: Basin 3D Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3D-ST-10	2.25	0.48	0.52	0.55	1.20	1.77	2.24	2.39
3D-ST-20	2.25	0.45	0.49	0.51	1.15	1.67	2.12	2.36
3D-ST-30	1.90	0.42	0.44	0.46	0.93	1.31	1.63	2.02

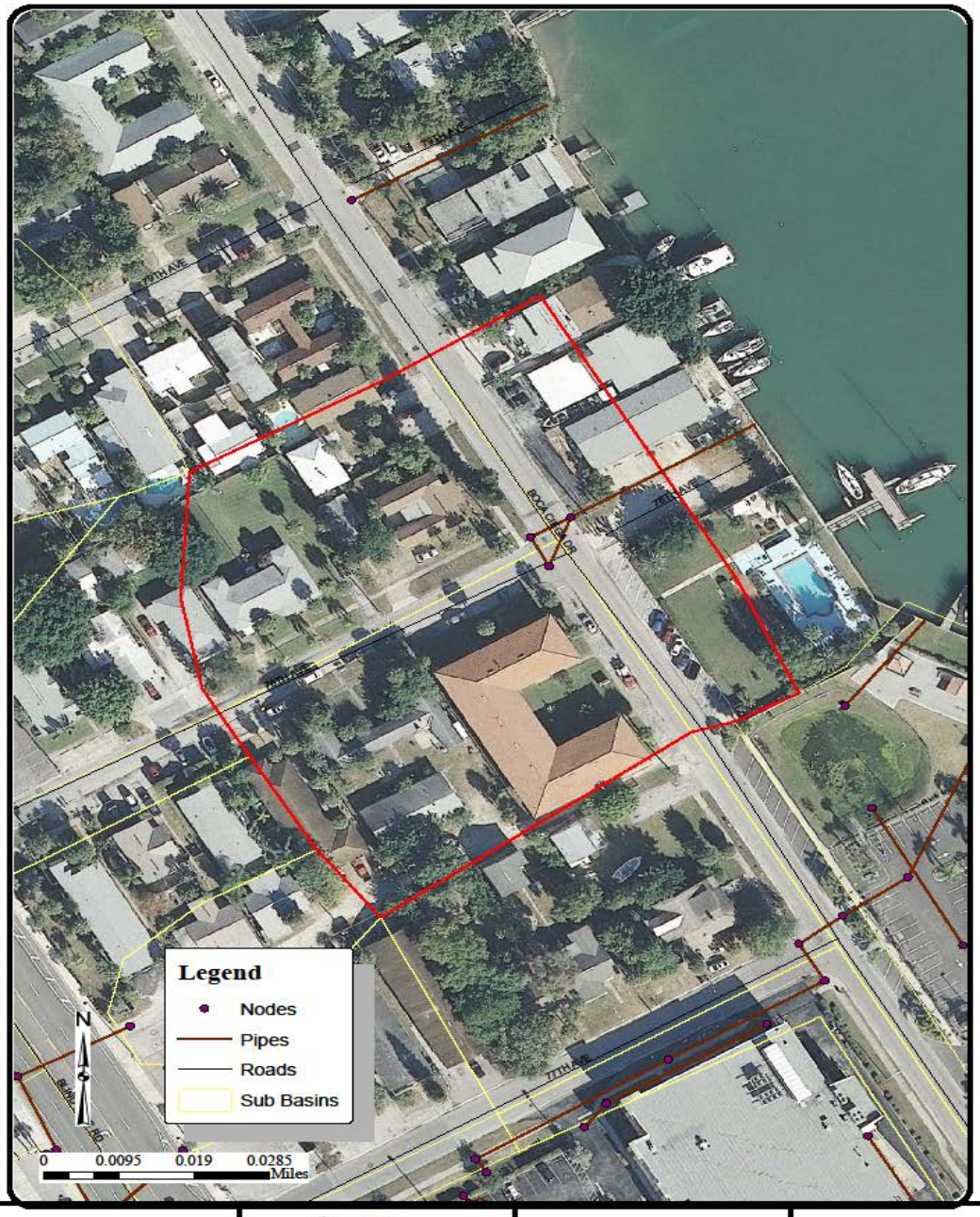
Table 3-20 Basin 3-D Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3D-ST-10	0.0	0.0	0.0	0.0	0.0	0.0	1.7
3D-ST-20	0.0	0.0	0.0	0.0	0.0	0.0	1.3
3D-ST-30	0.0	0.0	0.0	0.0	0.0	0.0	1.4

Identified Problem Areas

During the 100-year, 24-hour storm event, the intersection of Boca Ciega Drive and 78th Avenue has nearly 2-inches of standing water. There is also a standing water condition on Boca Ciega Drive on both sides of 78th Avenue.

About half of 78th Avenue is marginally sloped towards Blind Pass Road. Minor standing water may be experienced in this area. Additional inlets and piping, about 600 linear feet, would be needed to minimize the standing water condition and also divert flow from the already taxed Blind Pass Road System (Basin 2H) and into a local outfall at 78th Avenue 3D). The standing water condition on Boca Ciega Drive can be address by repaving the roadway to remove depression in the pave and adding 400-ft of curb and piping.



CPWG CRIBB PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **3-D** **78TH AVENUE** **NODAL MAP**	FIGURE 3-4

3.5 Basin 3I: Blind Pass Road Outfall at 80th Avenue

Sub-Basin Description

Basin 3I is located in the northern drainage section of the City along Blind Pass Road (FDOT maintained road) between 75th Avenue and 82nd Avenue. The primary drainage basin area is divided into 61 sub-basins as summarized in Table 3-21. From 75th the stormwater flows north in a piped system (18-inch RCP to 83-inch x 53-inch ERCP in size) to the stormwater pond at the west side of the Blind Pass Road and 80th Avenue. From 82nd Avenue the stormwater flows south in a piped system (30-inch RCP to 83-inch x 53-inch ERCP in size) to the same stormwater pond referenced above. The pond discharges to the east down 80th Avenue via a 144-inch diameter drop structure and then through a 68-inch x 43-inch ERCP to the outfall at Boca Ciega Bay. The FDOT outfall is located under an unnamed City pocket park along the Bay, installed within a seawall and protected by a ring of bollards in the water. Table 3-22 summarizes the piping information for the basin. The nodal map with aerial background for Basin 3I is presented in Figure 3-5.

Table 3-21: Basin 3I Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3I-S-1	10	0.29	95.69	44.83
3I-S-10	10	0.28	67.22	17.86
3I-S-11	10	0.17	73.33	47.06
3I-S-12	10	0.32	82.12	21.88
3I-S-14	10	0.63	84.48	23.81

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3I-S-15	10	0.30	83.25	33.33
3I-S-17	10	0.78	74.62	33.33
3I-S-18	10	0.24	88.17	0.00
3I-S-19	10	0.13	98.00	30.77
3I-S-20	10	0.41	63.46	0.00
3I-S-21	10	0.44	70.05	13.64
3I-S-22	10	0.43	77.18	20.93
3I-S-24	10	0.24	70.77	45.83
3I-S-25	10	0.16	84.38	18.75
3I-S-26	10	0.59	74.82	5.08
3I-S-26B	10	0.39	85.48	15.38
3I-S-27	10	0.72	74.00	18.06
3I-S-28	10	0.36	86.65	27.78
3I-S-3	10	0.40	77.65	0.00
3I-S-30	10	0.51	67.81	17.65
3I-S-32	10	0.77	87.07	31.17
3I-S-33	10	0.20	98.00	0.00
3I-S-34	10	0.67	82.27	10.45
3I-S-35	10	0.19	93.08	36.84
3I-S-38	10	0.95	79.79	14.74
3I-S-39	10	0.76	71.68	14.47
3I-S-4	10	0.11	61.00	0.00
3I-S-40	10	0.33	65.55	36.36
3I-S-42	10	0.57	70.56	24.56
3I-S-44	10	1.32	47.05	0.00
3I-S-45	10	0.30	73.42	16.67
3I-S-48	10	0.50	64.96	50.00
3I-S-4A	10	0.63	95.69	47.62
3I-S-4B	10	0.62	96.43	22.58
3I-S-5	10	0.17	90.60	47.06
3I-S-50	10	0.30	64.96	16.67
3I-S-52	10	0.59	79.64	22.03

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3I-S-53	10	0.12	39.00	91.67
3I-S-54	10	0.07	68.50	71.43
3I-S-56	10	0.35	94.53	2.86
3I-S-57	10	0.88	69.90	5.68
3I-S-57A	10	0.17	83.25	0.00
3I-S-58	10	0.68	73.63	32.35
3I-S-6	10	0.26	91.06	38.46
3I-S-60	10	0.87	74.08	14.94
3I-S-61	10	1.03	68.18	11.65
3I-S-62	10	0.39	68.91	15.38
3I-S-63	10	0.16	91.83	31.25
3I-S-64	10	0.22	88.70	0.00
3I-S-66	10	0.14	92.71	0.00
3I-S-67	10	1.42	69.82	21.83
3I-S-68	10	0.95	81.97	20.00
3I-S-69	10	2.00	82.98	15.00
3I-S-7	10	0.11	98.00	45.45
3I-S-71	10	0.51	82.23	13.73
3I-S-85	10	0.15	83.20	66.67
3I-S-9	10	0.15	61.00	60.00
3I-S-9A	10	0.28	98.00	85.71
3I-S-9B	10	0.66	89.44	24.24

Table 3-22: Basin 3I Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3I-RS-1	3I	Blind Pass Road DOT Outfall on 80th	3I-S-1	3I-S-2	1	62	18 Circular
3I-RS-2	3I	Blind Pass Road	3I-S-2	3I-S-4B	1	207	30 Circular
3I-RS-3	3I	Blind Pass Road	3I-S-3	3I-S-709	1	115	24 Circular
3I-RS-4	3I	Blind Pass Road	3I-S-4	3I-S-3	1	58	18 Circular
3I-RS-4A	3I	Blind Pass Road	3I-S-4A	3I-S-710	1	6	18 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3I-RS-4B	3I	Blind Pass Road	3I-S-4B	3I-S-700	1	52	42 Circular
3I-RS-5	3I	Blind Pass Road	3I-S-5	3I-S-7	1	36	18 Circular
3I-RS-6	3I	Blind Pass Road	3I-S-6	3I-S-9	1	33	18 Circular
3I-RS-7	3I	Blind Pass Road	3I-S-7	3I-S-8	1	12	18 Circular
3I-RS-8	3I	Blind Pass Road	3I-S-8	3I-S-9B	1	318	48 Circular
3I-RS-9	3I	Blind Pass Road	3I-S-9	3I-S-8	1	92	18 Circular
3I-RS-9A	3I	Blind Pass Road	3I-S-9A	3I-S-9B	1	72	18 Circular
3I-RS-9B	3I	Blind Pass Road	3I-S-9B	3I-S-708	1	33	48 Circular
3I-RS-10	3I	Blind Pass Road	3I-S-10	3I-S-12	1	27	24 Circular
3I-RS-11	3I	Blind Pass Road	3I-S-11	3I-S-14	1	30	18 Circular
3I-RS-12	3I	Blind Pass Road	3I-S-12	3I-S-13	1	11	24 Circular
3I-RS-13	3I	Blind Pass Road	3I-S-13	3I-S-15	1	38	83 x 53 Horz Ellipse
3I-RS-14	3I	Blind Pass Road	3I-S-14	3I-S-13	1	82	24 Circular
3I-RS-15	3I	Blind Pass Road	3I-S-15	3I-S-18 CON	1	61	83 x 53 Horz Ellipse
3I-RS-17	3I	Blind Pass Road	3I-S-17	3I-S-15	1	66	24 Circular
3I-RS-18	3I	Blind Pass Road	3I-S-18	3I-S-18 CON	1	8	18 Circular
3I-RS-18 CON	3I	Blind Pass Road	3I-S-18 CON	3I-S-19	1	61	83 x 53 Horz Ellipse
3I-RS-19	3I	Blind Pass Road	3I-S-19	3I-S-702	1	75	83 x 53 Horz Ellipse
3I-RS-20	3I	Blind Pass Road	3I-S-20	3I-S-19	1	82	18 Circular
3I-RS-21	3I	Blind Pass Road	3I-S-21	3I-S-701	1	11	18 Circular
3I-RS-22	3I	Blind Pass Road	3I-S-22	3I-S-23	1	10	18 Circular
3I-RS-23	3I	Blind Pass Road	3I-S-23	3I-S-25	1	95	83 x 53 Horz Ellipse
3I-RS-24	3I	Blind Pass Road	3I-S-24	3I-S-26	1	19	18 Circular
3I-RS-25	3I	Blind Pass Road	3I-S-25	3I-S-26B	1	98	83 x 53 Horz Ellipse
3I-RS-26	3I	Blind Pass Road	3I-S-26	3I-S-170	1	10	18 Circular
3I-RS-26B	3I	Blind Pass Road	3I-S-26B	3I-S-29	1	62	83 x 53 Horz Ellipse
3I-RS-27	3I	Blind Pass Road	3I-S-27	3I-S-28	1	33	18 Circular
3I-RS-28	3I	Blind Pass Road	3I-S-28	3I-S-29	1	20	18 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3I-RS-29	3I	Blind Pass Road	3I-S-29	3I-S-30	1	30	83 x 53 Horz Ellipse
3I-RS-30	3I	Blind Pass Road	3I-S-30	3I-S-33	1	13	83 x 53 Horz Ellipse
3I-RS-32	3I	Blind Pass Road	3I-S-32	3I-S-30	1	59	18 Circular
3I-RS-33	3I	Blind Pass Road	3I-S-33	3I-S-703	1	49	83 x 53 Horz Ellipse
3I-RS-34	3I	Blind Pass Road	3I-S-34	3I-S-38	1	18	18 Circular
3I-RS-35	3I	Blind Pass Road	3I-S-35	3I-S-41	1	112	83 x 53 Horz Ellipse
3I-RS-38	3I	Blind Pass Road	3I-S-38	3I-S-35	1	85	24 Circular
3I-RS-39	3I	Blind Pass Road	3I-S-39	3I-S-40	1	26	24 Circular
3I-RS-40	3I	Blind Pass Road	3I-S-40	3I-S-44	1	52	83 x 53 Horz Ellipse
3I-RS-41	3I	Blind Pass Road	3I-S-41	3I-S-40	1	10	83 x 53 Horz Ellipse
3I-RS-42	3I	Blind Pass Road	3I-S-42	3I-S-41	1	72	18 Circular
3I-RS-44	3I	Blind Pass Road DOT Pond Oufall 80th Ave and 80th Way	3I-S-44	3I-S-162	1	246	D/S with 68 x 43 Horz Ellipse
3I-RS-45	3I	Blind Pass Road	3I-S-45	3I-S-50	1	23	18 Circular
3I-RS-47	3I	Blind Pass Road	3I-S-47	3I-S-44	1	15	83 x 53 Horz Ellipse
3I-RS-47A	3I	Blind Pass Road	3I-S-47A	3I-S-47	1	148	83 x 53 Horz Ellipse
3I-RS-48	3I	Blind Pass Road	3I-S-48	3I-S-47A	1	13	24 Circular
3I-RS-49	3I	Blind Pass Road	3I-S-49	3I-S-51	1	49	36 Circular
3I-RS-50	3I	Blind Pass Road	3I-S-50	3I-S-49	1	16	24 Circular
3I-RS-51	3I	Blind Pass Road	3I-S-51	3I-S-47A	1	31	83 x 53 Horz Ellipse
3I-RS-52	3I	Blind Pass Road	3I-S-52	3I-S-48	1	23	24 Circular
3I-RS-53	3I	Blind Pass Road	3I-S-53	3I-S-49	1	55	24 Circular
3I-RS-54	3I	Blind Pass Road	3I-S-54	3I-S-55	1	4	30 Circular
3I-RS-55	3I	Blind Pass Road	3I-S-55	3I-S-51	1	79	83 x 53 Horz Ellipse
3I-RS-56	3I	Blind Pass Road	3I-S-56	3I-S-53	1	31	18 Circular
3I-RS-57	3I	Blind Pass Road	3I-S-57	3I-S-54	1	75	18 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3I-RS-57A	3I	Blind Pass Road	3I-S-57A	3I-S-57	1	75	18 Circular
3I-RS-58	3I	Blind Pass Road	3I-S-58	3I-S-59	1	26	30 Circular
3I-RS-59	3I	Blind Pass Road	3I-S-59	3I-S-55	1	186	83 x 53 Horz Ellipse
3I-RS-60	3I	Blind Pass Road	3I-S-60	3I-S-59	1	28	30 Circular
3I-RS-61	3I	Blind Pass Road	3I-S-61	3I-S-58	1	28	24 Circular
3I-RS-62	3I	Blind Pass Road	3I-S-62	3I-S-60	1	23	24 Circular
3I-RS-63	3I	Blind Pass Road	3I-S-63	3I-S-65	1	62	18 Circular
3I-RS-64	3I	Blind Pass Road	3I-S-64	3I-S-65	1	10	18 Circular
3I-RS-65	3I	Blind Pass Road	3I-S-65	3I-S-704	1	87	83 x 53 Horz Ellipse
3I-RS-66	3I	Blind Pass Road	3I-S-66	3I-S-67	1	16	18 Circular
3I-RS-67	3I	Blind Pass Road	3I-S-67	3I-S-69	1	27	24 Circular
3I-RS-68	3I	Blind Pass Road	3I-S-68	3I-S-71	1	27	24 Circular
3I-RS-69	3I	Blind Pass Road	3I-S-69	3I-S-70	1	24	30 Circular
3I-RS-70	3I	Blind Pass Road	3I-S-70	3I-S-65	1	164	83 x 53 Horz Ellipse
3I-RS-162	3I	Blind Pass Road DOT Outfall on 80th	3I-S-162	3I-S-163	1	246	68 x 43 Horz Ellipse
3I-RS-163	3I	Blind Pass Road	3I-S-163	3I-S-164	1	180	68 x 43 Horz Ellipse
3I-RS-164	3I	Blind Pass Road	3I-S-164	3I-S-164A	1	34	68 x 43 Horz Ellipse
3I-RS-164A	3I	Blind Pass Road	3I-S-164A	TW	1	84	68 x 43 Horz Ellipse
3I-RS-170	3I	Blind Pass Road	3I-S-170	3I-S-25	1	62	18 Circular
3I-RS-700	3I	Blind Pass Road	3I-S-700	3I-S-8	1	7	42 Circular
3I-RS-701	3I	Blind Pass Road	3I-S-701	3I-S-22	1	9	18 Circular
3I-RS-702	3I	Blind Pass Road	3I-S-702	3I-S-23	1	11	83 x 53 Horz Ellipse
3I-RS-703	3I	Blind Pass Road	3I-S-703	3I-S-35	1	7	83 x 53 Horz Ellipse
3I-RS-704	3I	Blind Pass Road	3I-S-704	3I-S-59	1	33	83 x 53 Horz Ellipse
3I-RS-708	3I	Blind Pass Road	3I-S-708	3I-S-13	1	20	48 Circular
3I-RS-709	3I	Blind Pass Road	3I-S-709	3I-S-2	1	49	24 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3I-RS-71	3I	Blind Pass Road	3I-S-71	3I-S-70	1	66	24 Circular
3I-RS-710	3I	Blind Pass Road	3I-S-710	3I-S-4B	1	61	18 Circular
3I-RS-82	3I	Blind Pass Road	3I-S-82	3I-S-70	1	299	83 x 53 Horz Ellipse
3I-RS-85	3I	Blind Pass Road	3I-S-85	3I-S-82	1	151	36 Circular

Simulation Results

Table 3-23 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 3I.

Table 3-23: Basin 3I Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3I-S-1	0.8	0.8	0.9	1.3	1.6	1.7	1.9
3I-S-10	0.4	0.4	0.4	0.8	1.1	1.3	1.4
3I-S-11	0.3	0.4	0.4	0.6	0.8	0.9	1.0
3I-S-12	0.7	0.7	0.8	1.3	1.6	1.8	2.0
3I-S-14	1.4	1.5	1.6	2.6	3.1	3.5	3.9
3I-S-15	0.7	0.7	0.8	1.2	1.5	1.7	1.9
3I-S-17	1.4	1.6	1.7	2.8	3.6	4.1	4.5
3I-S-18	0.5	0.6	0.6	1.0	1.2	1.4	1.5
3I-S-19	0.4	0.4	0.4	0.6	0.7	0.8	0.9
3I-S-20	0.3	0.4	0.4	1.0	1.3	1.6	1.8
3I-S-21	0.6	0.7	0.7	1.4	1.8	2.0	2.3
3I-S-22	0.8	0.9	0.9	1.6	2.0	2.2	2.5
3I-S-24	0.5	0.5	0.5	0.9	1.1	1.2	1.4
3I-S-25	0.3	0.4	0.4	0.6	0.8	0.9	1.0
3I-S-26	0.9	1.0	1.1	1.9	2.5	2.9	3.2
3I-S-26B	0.9	0.9	1.0	1.6	2.0	2.2	2.4
3I-S-27	1.2	1.3	1.4	2.5	3.1	3.6	4.0
3I-S-28	0.8	0.9	0.9	1.5	1.8	2.1	2.3
3I-S-3	0.6	0.7	0.8	1.4	1.8	2.0	2.3
3I-S-30	0.7	0.8	0.8	1.5	2.0	2.3	2.6

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3I-S-32	1.8	2.0	2.0	3.2	4.0	4.4	4.9
3I-S-33	0.5	0.6	0.6	0.9	1.1	1.2	1.3
3I-S-34	1.3	1.4	1.5	2.6	3.2	3.6	4.1
3I-S-35	0.5	0.5	0.6	0.8	1.0	1.1	1.2
3I-S-38	1.8	2.0	2.1	3.5	4.4	5.0	5.6
3I-S-39	1.1	1.2	1.3	2.4	3.1	3.6	4.1
3I-S-4	0.1	0.1	0.1	0.2	0.3	0.4	0.5
3I-S-40	0.5	0.6	0.6	1.1	1.4	1.6	1.8
3I-S-42	0.9	1.0	1.0	1.9	2.4	2.8	3.1
3I-S-44	0.2	0.2	0.3	1.3	2.1	2.8	3.4
3I-S-45	0.5	0.5	0.6	1.0	1.3	1.5	1.7
3I-S-48	0.9	1.0	1.0	1.7	2.2	2.5	2.8
3I-S-4A	1.7	1.8	1.9	2.8	3.4	3.8	4.2
3I-S-4B	1.7	1.8	1.8	2.8	3.3	3.7	4.1
3I-S-5	0.4	0.5	0.5	0.7	0.9	1.0	1.1
3I-S-50	0.4	0.4	0.4	0.8	1.1	1.3	1.5
3I-S-52	1.1	1.3	1.3	2.2	2.8	3.2	3.5
3I-S-53	0.3	0.3	0.3	0.5	0.6	0.7	0.7
3I-S-54	0.2	0.2	0.2	0.3	0.3	0.4	0.4
3I-S-56	0.9	1.0	1.0	1.6	1.9	2.1	2.3
3I-S-57	1.1	1.2	1.3	2.6	3.4	3.9	4.5
3I-S-57A	0.3	0.4	0.4	0.7	0.8	0.9	1.0
3I-S-58	1.2	1.3	1.4	2.4	3.1	3.5	3.9
3I-S-6	0.7	0.7	0.7	1.1	1.4	1.5	1.7
3I-S-60	1.4	1.5	1.6	2.9	3.7	4.3	4.8
3I-S-61	1.3	1.4	1.5	3.0	3.9	4.6	5.2
3I-S-62	0.5	0.6	0.6	1.2	1.5	1.8	2.0
3I-S-63	0.4	0.4	0.5	0.7	0.9	0.9	1.0
3I-S-64	0.5	0.5	0.6	0.9	1.1	1.3	1.4
3I-S-66	0.4	0.4	0.4	0.6	0.7	0.8	0.9
3I-S-67	2.1	2.3	2.5	4.5	5.8	6.7	7.6
3I-S-68	1.9	2.1	2.2	3.7	4.6	5.2	5.8
3I-S-69	4.1	4.5	4.7	7.8	9.7	11.0	12.2
3I-S-7	0.3	0.3	0.3	0.5	0.6	0.7	0.7

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3I-S-71	1.0	1.1	1.2	2.0	2.5	2.8	3.1
3I-S-85	0.4	0.4	0.4	0.6	0.8	0.9	1.0
3I-S-9	0.3	0.3	0.3	0.5	0.7	0.8	0.8
3I-S-9A	0.8	0.8	0.8	1.3	1.5	1.7	1.9
3I-S-9B	1.6	1.7	1.8	2.8	3.4	3.8	4.2

Table 3-24 summarizes the maximum stages reached during the various design storm events. Table 3-25 summarized the expected flood depths. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-24: Basin 3I Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-1	4.22	3.29	3.31	3.33	3.52	3.82	3.86	3.77
3I-S-10	3.20	3.29	3.29	3.29	3.41	3.74	3.79	3.74
3I-S-11	3.07	3.23	3.23	3.23	3.42	3.73	3.79	3.74
3I-S-12	3.17	3.29	3.29	3.29	3.41	3.74	3.79	3.74
3I-S-13	3.14	3.33	3.33	3.33	3.41	3.74	3.79	3.74
3I-S-14	2.87	3.23	3.23	3.23	3.42	3.73	3.79	3.74
3I-S-15	3.03	2.91	2.91	2.91	3.00	3.78	3.79	3.74
3I-S-162	3.50	0.98	1.04	1.11	1.63	2.10	2.32	2.52
3I-S-163	3.37	0.76	0.80	0.85	1.20	1.51	1.66	1.80
3I-S-164	3.17	0.57	0.59	0.62	0.83	1.01	1.10	1.18
3I-S-164A	3.14	0.45	0.46	0.47	0.58	0.69	0.73	0.78
3I-S-17	2.91	3.24	3.24	3.26	3.47	3.75	3.78	3.74
3I-S-170	3.30	2.97	2.92	2.99	3.18	3.39	3.44	3.43
3I-S-18	2.64	3.21	3.22	3.22	3.38	3.90	3.81	3.77
3I-S-18 CON	3.69	3.40	3.43	3.42	3.61	3.98	3.86	3.39
3I-S-19	3.69	2.87	2.87	2.87	2.98	3.71	3.95	3.94
3I-S-2	4.81	3.29	3.31	3.33	3.52	3.82	3.85	3.76

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-20	2.91	3.15	3.15	3.14	3.28	3.70	3.77	3.77
3I-S-21	3.14	3.07	3.00	3.07	3.21	3.57	3.65	3.65
3I-S-22	3.14	3.06	3.00	3.06	3.21	3.57	3.65	3.65
3I-S-23	3.56	2.90	2.90	2.90	2.90	3.25	3.31	3.70
3I-S-24	3.04	2.99	2.94	3.01	3.22	3.39	3.44	3.43
3I-S-25	3.37	3.05	3.01	3.04	3.19	3.48	3.47	3.51
3I-S-26	4.22	2.99	2.94	3.00	3.22	3.39	3.44	3.43
3I-S-26B	3.27	2.56	2.51	2.56	2.73	3.19	3.20	3.40
3I-S-27	3.04	2.81	2.79	2.85	3.11	3.35	3.34	3.42
3I-S-28	5.56	2.80	2.77	2.83	3.09	3.34	3.33	3.41
3I-S-29	3.10	2.90	2.86	2.91	3.10	3.30	3.24	3.33
3I-S-3	4.02	3.30	3.31	3.33	3.52	3.83	3.87	3.77
3I-S-30	3.07	2.21	2.18	2.23	2.54	3.16	3.20	3.31
3I-S-32	3.06	2.70	2.69	2.74	2.99	3.25	3.20	3.31
3I-S-33	2.64	2.64	2.62	2.66	2.85	3.11	3.19	3.29
3I-S-34	3.14	2.21	2.23	2.27	2.64	3.03	3.15	3.18
3I-S-35	2.81	2.27	2.27	2.30	2.59	3.01	3.10	3.13
3I-S-38	2.94	2.19	2.20	2.24	2.59	2.96	3.07	3.11
3I-S-39	3.10	1.72	1.74	1.76	2.07	2.52	2.68	2.70
3I-S-4	3.04	3.29	3.31	3.33	3.52	3.83	3.87	3.77
3I-S-40	2.51	1.91	1.91	1.93	2.20	2.59	2.74	2.67
3I-S-41	3.50	1.63	1.63	1.66	2.03	2.51	2.61	2.82
3I-S-42	3.07	1.94	1.96	1.99	2.33	2.68	2.90	2.94
3I-S-44	1.20	1.56	1.57	1.58	1.84	2.24	2.45	2.65
3I-S-45	3.04	1.92	1.97	2.01	2.42	2.70	2.98	3.14
3I-S-47	3.30	1.78	1.79	1.81	2.08	2.41	2.68	2.76
3I-S-47A	3.14	1.56	1.59	1.62	1.95	2.22	2.52	3.12
3I-S-48	2.51	1.84	1.88	1.91	2.28	2.55	2.86	3.02
3I-S-49	3.10	1.87	1.92	1.95	2.35	2.63	2.91	3.14
3I-S-4A	4.05	3.30	3.32	3.34	3.55	3.84	3.88	3.85

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-4B	3.96	3.25	3.27	3.29	3.48	3.79	3.86	3.78
3I-S-5	3.69	3.24	3.25	3.27	3.46	3.77	3.82	3.76
3I-S-50	3.10	1.92	1.97	2.01	2.42	2.70	2.98	3.14
3I-S-51	3.37	2.10	2.15	2.18	2.55	2.81	3.09	3.12
3I-S-52	2.64	1.84	1.88	1.91	2.28	2.55	2.86	3.02
3I-S-53	3.07	1.93	1.98	2.01	2.42	2.70	2.98	3.14
3I-S-54	3.10	2.02	2.08	2.12	2.56	2.84	3.09	3.22
3I-S-55	3.14	1.79	1.84	1.89	2.31	2.56	2.80	3.27
3I-S-56	2.54	1.93	1.98	2.02	2.43	2.70	2.98	3.14
3I-S-57	2.68	2.02	2.09	2.13	2.65	2.84	3.08	3.22
3I-S-57A	2.68	2.03	2.09	2.14	2.66	2.84	3.08	3.23
3I-S-58	2.81	2.09	2.16	2.21	2.73	3.02	3.21	3.36
3I-S-59	3.66	2.26	2.33	2.37	2.83	3.10	3.34	3.05
3I-S-6	3.63	3.25	3.26	3.28	3.47	3.76	3.82	3.75
3I-S-60	2.87	2.09	2.16	2.21	2.70	3.01	3.21	3.37
3I-S-61	3.63	2.12	2.19	2.24	2.77	3.04	3.22	3.37
3I-S-62	2.94	2.12	2.19	2.24	2.74	3.02	3.21	3.37
3I-S-63	2.94	2.22	2.30	2.36	2.88	3.15	3.30	3.44
3I-S-64	2.67	2.22	2.30	2.36	2.89	3.11	3.28	3.42
3I-S-65	3.56	2.35	2.42	2.48	2.98	3.23	3.43	3.16
3I-S-66	2.74	2.36	2.45	2.51	2.98	3.19	3.33	3.43
3I-S-67	2.55	2.36	2.45	2.51	2.98	3.19	3.33	3.43
3I-S-68	2.78	2.34	2.43	2.49	2.98	3.19	3.33	3.43
3I-S-69	2.55	2.36	2.44	2.50	2.97	3.19	3.32	3.43
3I-S-7	3.66	3.24	3.25	3.27	3.46	3.76	3.82	3.75
3I-S-70	3.26	2.16	2.25	2.31	2.79	3.00	3.12	3.43
3I-S-700	3.82	3.28	3.29	3.31	3.50	3.81	3.79	3.72
3I-S-701	3.14	3.06	3.00	3.06	3.21	3.57	3.65	3.65
3I-S-702	2.87	3.07	3.07	3.06	3.14	3.62	3.67	3.68
3I-S-703	3.04	1.90	1.89	1.93	2.49	2.84	2.83	3.13

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-704	3.73	1.92	1.99	2.04	2.51	2.75	2.92	3.55
3I-S-708	2.94	3.20	3.21	3.21	3.42	3.73	3.79	3.74
3I-S-709	4.38	3.29	3.30	3.32	3.51	3.82	3.87	3.78
3I-S-71	2.77	2.34	2.43	2.49	2.98	3.19	3.33	3.43
3I-S-710	3.89	3.29	3.31	3.33	3.52	3.83	3.87	3.77
3I-S-8	3.79	3.19	3.21	3.23	3.42	3.72	3.83	3.78
3I-S-82	3.59	2.30	2.38	2.44	2.94	3.18	3.33	3.40
3I-S-85	3.10	2.25	2.33	2.39	2.90	3.14	3.28	3.43
3I-S-9	3.56	3.25	3.26	3.28	3.47	3.76	3.82	3.75
3I-S-9A	3.20	3.21	3.22	3.24	3.42	3.73	3.79	3.74
3I-S-9B	3.30	3.23	3.23	3.25	3.43	3.73	3.79	3.74

Table 3-25: Basin 3I Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-10	1.1	1.1	1.1	2.5	6.5	7.1	6.5
3I-S-11	1.9	1.9	1.9	4.2	7.9	8.6	8.0
3I-S-12	1.4	1.4	1.4	2.9	6.8	7.4	6.8
3I-S-13	2.3	2.3	2.3	3.2	7.2	7.8	7.2
3I-S-14	4.3	4.3	4.3	6.6	10.3	11.0	10.4
3I-S-15	0.0	0.0	0.0	0.0	9.0	9.1	8.5
3I-S-162	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-163	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-164	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-164A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-17	4.0	4.0	4.2	6.7	10.1	10.4	10.0
3I-S-170	0.0	0.0	0.0	0.0	1.1	1.7	1.6
3I-S-18	6.8	7.0	7.0	8.9	15.1	14.0	13.6

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-18 CON	0.0	0.0	0.0	0.0	3.5	2.0	0.0
3I-S-19	0.0	0.0	0.0	0.0	0.2	3.1	3.0
3I-S-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-20	2.9	2.9	2.8	4.4	9.5	10.3	10.3
3I-S-21	0.0	0.0	0.0	0.8	5.2	6.1	6.1
3I-S-22	0.0	0.0	0.0	0.8	5.2	6.1	6.1
3I-S-23	0.0	0.0	0.0	0.0	0.0	0.0	1.7
3I-S-24	0.0	0.0	0.0	2.2	4.2	4.8	4.7
3I-S-25	0.0	0.0	0.0	0.0	1.3	1.2	1.7
3I-S-26	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-26B	0.0	0.0	0.0	0.0	0.0	0.0	1.6
3I-S-27	0.0	0.0	0.0	0.8	3.7	3.6	4.6
3I-S-28	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-29	0.0	0.0	0.0	0.0	2.4	1.7	2.8
3I-S-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-30	0.0	0.0	0.0	0.0	1.1	1.6	2.9
3I-S-32	0.0	0.0	0.0	0.0	2.3	1.7	3.0
3I-S-33	0.0	0.0	0.2	2.5	5.6	6.6	7.8
3I-S-34	0.0	0.0	0.0	0.0	0.0	0.1	0.5
3I-S-35	0.0	0.0	0.0	0.0	2.4	3.5	3.8
3I-S-38	0.0	0.0	0.0	0.0	0.2	1.6	2.0
3I-S-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-4	3.0	3.2	3.5	5.8	9.5	10.0	8.8
3I-S-40	0.0	0.0	0.0	0.0	1.0	2.8	1.9
3I-S-41	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-42	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-44	4.3	4.4	4.6	7.7	12.5	15.0	17.4
3I-S-45	0.0	0.0	0.0	0.0	0.0	0.0	1.2
3I-S-47	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-47A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-48	0.0	0.0	0.0	0.0	0.5	4.2	6.1

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3I-S-49	0.0	0.0	0.0	0.0	0.0	0.0	0.5
3I-S-4A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-4B	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-5	0.0	0.0	0.0	0.0	1.0	1.6	0.8
3I-S-50	0.0	0.0	0.0	0.0	0.0	0.0	0.5
3I-S-51	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-52	0.0	0.0	0.0	0.0	0.0	2.6	4.6
3I-S-53	0.0	0.0	0.0	0.0	0.0	0.0	0.8
3I-S-54	0.0	0.0	0.0	0.0	0.0	0.0	1.4
3I-S-55	0.0	0.0	0.0	0.0	0.0	0.0	1.6
3I-S-56	0.0	0.0	0.0	0.0	1.9	5.3	7.2
3I-S-57	0.0	0.0	0.0	0.0	1.9	4.8	6.5
3I-S-57A	0.0	0.0	0.0	0.0	1.9	4.8	6.6
3I-S-58	0.0	0.0	0.0	0.0	2.5	4.8	6.6
3I-S-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-6	0.0	0.0	0.0	0.0	1.6	2.3	1.4
3I-S-60	0.0	0.0	0.0	0.0	1.7	4.1	6.0
3I-S-61	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-62	0.0	0.0	0.0	0.0	1.0	3.2	5.2
3I-S-63	0.0	0.0	0.0	0.0	2.5	4.3	6.0
3I-S-64	0.0	0.0	0.0	2.6	5.3	7.3	9.0
3I-S-65	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-66	0.0	0.0	0.0	2.9	5.4	7.1	8.3
3I-S-67	0.0	0.0	0.0	5.2	7.7	9.4	10.6
3I-S-68	0.0	0.0	0.0	2.4	4.9	6.6	7.8
3I-S-69	0.0	0.0	0.0	5.0	7.7	9.2	10.6
3I-S-7	0.0	0.0	0.0	0.0	1.2	1.9	1.1
3I-S-70	0.0	0.0	0.0	0.0	0.0	0.0	2.0
3I-S-700	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-701	0.0	0.0	0.0	0.8	5.2	6.1	6.1
3I-S-702	2.4	2.4	2.3	3.2	9.0	9.6	9.7

Node Name	Depth of Flooding in inches						
	2-year	**Mean Annual**	**5-Year**	**10-year**	**25-year**	**50-year**	**100-year**
3I-S-703	0.0	0.0	0.0	0.0	0.0	0.0	1.1
3I-S-704	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-708	3.1	3.2	3.2	5.8	9.5	10.2	9.6
3I-S-709	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-71	0.0	0.0	0.0	2.5	5.0	6.7	7.9
3I-S-710	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-8	0.0	0.0	0.0	0.0	0.0	0.5	0.0
3I-S-82	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3I-S-85	0.0	0.0	0.0	0.0	0.5	2.2	4.0
3I-S-9	0.0	0.0	0.0	0.0	2.4	3.1	2.3
3I-S-9A	0.1	0.2	0.5	2.6	6.4	7.1	6.5
3I-S-9B	0.0	0.0	0.0	1.6	5.2	5.9	5.3

Identified Problem Areas

During the 100-year, 24-hour storm event, portions of Blind Pass Road are predicted to flood on average ten inches, but as deep as 18-inch in some locations. A depth of less than 12-inches would still allow emergency vehicles to pass. However the high depth requires additional evaluation to determine effects of health and safety of the public.

CPWG, Inc.
708 Lithia Pinecrest Road, Suite 101
Brandon FL 33510
Tel 813-361-2644
Fax 813-662-2295

CITY OF ST. PETE BEACH
STORMWATER MASTER PLAN

PINELLAS COUNTY, FLORIDA

ST. PETE BEACH
3-I
BLIND PASS ROAD OUTFALL AT 80TH NODAL MAP

FIGURE

3-5

3.6 Basin 3J: 77th Avenue and Boca Ciega Drive

Sub-Basin Description

Basin 3J is located in the north drainage section of the City near the intersection of 77th Avenue and Blind Pass Road. The primary drainage basin area is divided into 5 sub-basins as summarized in Table 3-26. Sweetbay grocery store and residential land use are within the basin. The City's Community Center is adjacent to this basin, but drainage is captured by an on-site drainage system and not included in this basin. Sweetbay discharges in a long linear dry pond on the north side of the parking lot. The dry pond discharges through a type C ditch bottom inlet control structure and then through a series of 12-inch RCP and 15-inch RCP pipes until outfall into Boca Ciega Bay. The outfall is installed within a constructed seawall. Piping information for this basin is summarized in Table 3-27. The nodal map with aerial background for Basin 3J is presented in Figure 3-6.

Table 3-26: Basin 3J Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3J-10	10	2.04	93.63	0.00
3J-40	10	0.63	91.06	50.79
3J-50	10	1.07	59.49	15.89
3J-60	10	0.28	75.80	82.14
3J-90	10	1.68	84.92	0.00

Table 3-27: Basin 3J Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3J-RST-10	3J	Pond Outfall to 77th - Sweet Bay	3J-ST-10	3J-ST-20	1	14	D/S with 15 Circular
3J-RST-20	3J	77th Ave and Boca Ciega Dr.	3J-ST-20	3J-ST-30	1	150	15 Circular
3J-RST-30	3J	77th Ave and Boca Ciega Dr.	3J-ST-30	3J-ST-40	1	120	12 Circular
3J-RST-40	3J	77th Ave and Boca Ciega Dr.	3J-ST-40	3J-ST-50	1	31	12 Circular
3J-RST-50	3J	77th Ave and Boca Ciega Dr.	3J-ST-50	3J-ST-60	1	34	15 Circular
3J-RST-60	3J	77th Ave and Boca Ciega Dr.	3J-ST-60	3J-ST-70	1	51	15 Circular
3J-RST-70	3J	77th Ave and Boca Ciega Dr.	3J-ST-70	TW	1	180	15 Circular

Simulation Results

Table 3-28 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 3J.

Table 3-28: Basin 3J Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3J-10	5.2	5.5	5.8	8.9	10.8	12.1	13.3
3J-40	1.6	1.7	1.8	2.8	3.3	3.7	4.1
3J-50	1.0	1.1	1.2	2.6	3.5	4.1	4.7
3J-60	0.7	0.8	0.8	1.2	1.5	1.6	1.8
3J-90	3.4	3.8	4.0	6.6	8.2	9.3	10.3

The maximum stages reached during the various design storm events is summarized in Table 3-29. Expected flood depths are summarized in Table 3-30. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-29: Basin 3J Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3J-ST-10	5.00	4.02	4.06	4.09	4.34	4.46	4.52	4.57
3J-ST-20	4.50	3.93	3.97	3.99	4.25	4.37	4.44	4.48
3J-ST-30	4.50	3.65	3.69	3.71	3.97	4.10	4.17	4.22
3J-ST-40	2.13	2.93	2.97	2.99	3.26	3.39	3.47	3.56
3J-ST-50	2.81	2.93	2.97	2.99	3.26	3.39	3.47	3.56
3J-ST-60	3.40	2.92	2.96	2.99	3.25	3.39	3.46	3.55
3J-ST-70	3.63	2.59	2.62	2.64	2.83	2.92	3.14	3.48

Table 3-30: Basin 3-J Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3J-ST-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3J-ST-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3J-ST-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3J-ST-40	9.6	10.1	10.3	13.6	15.1	16.1	17.2
3J-ST-50	1.4	1.9	2.2	5.4	7.0	7.9	9.0
3J-ST-60	0.0	0.0	0.0	0.0	0.0	0.7	1.8
3J-ST-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Identified Problem Areas

For a 10-year, 24-hour storm event the intersection of Boca Ciega Drive and 77th Avenue is flooded between 6 and 12 inches of water. There is also a standing water condition on 77th Avenue and on both side 77th Avenue on Boca Ciega Drive

About half of 77th Avenue is marginally sloped towards Blind Pass Road. Minor standing water may be experienced in this area. Additional inlets and piping, about 600 linear feet, would be needed to minimize the standing water condition and also divert flow from the already taxed Blind Pass Road System (Basin 2H) and into a local outfall at 77th Avenue 3I). The standing water condition on Boca Ciega Drive can be address by repaving the roadway to remove depression in the pave and adding 500-ft of curb and piping.

CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **3-J** **77TH AVENUE AND BOCA CIEGA DRIVE NODAL MAP**	FIGURE 3-6

3.7 Basin 3K: 76th Avenue and Gulf boulevard

Sub-Basin Description

Basin 3K is located in the north drainage section of the City west of Blind Pass Road between 79th Avenue and 75th Avenue. The primary drainage basin area is divided into 22 sub-basins as summarized in Table 3-31. Stormwater flows south from 79th Avenue through an 18-inch RCP until it reaches 76th Avenue. At 76th Avenue, the piping system turns west and flows along 76th Avenue through 24-inch RCP. Just west of Coquina Way the piping system changes from a 24-inch RCP to a 30-inch RCP before discharging into Blind Pass (intercoastal waterway). This basin also contains a small detention pond the collects stormwater runoff from a portion of a bank parking lot in the basin. The outfall culvert for the basin is installed within a seawall along the west boundary of Stan Cidlowski Sr. Park. The piping information for this basin is summarized in Table 3-32. The nodal map with aerial background for Basin 3K is presented in Figure 3-7.

Table 3-31: Basin 3K Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3K-10	10	0.78	67.18	12.82
3K-20	10	1.06	62.20	16.98
3K-30	10	0.64	66.89	15.63
3K-50	10	0.48	80.73	14.58
3K-60	10	0.91	64.08	12.09
3K-70	10	0.69	71.09	17.39
3K-80	10	1.05	70.51	16.19
3K-90	10	0.79	60.61	11.39

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3K-100	10	0.35	58.67	20.00
3K-110	10	1.14	89.06	13.16
3K-130	10	0.36	65.45	16.67
3K-140	10	1.24	89.70	14.52
3K-150	10	0.39	86.52	23.08
3K-160	10	0.34	90.60	11.76
3K-170	10	0.35	75.16	11.43
3K-180	10	1.96	69.02	13.78
3K-185	10	0.48	83.87	0.00
3K-190	10	1.63	82.90	20.86
3K-200	10	0.48	65.22	22.92
3K-210	10	0.47	70.14	23.40
3K-220	10	1.01	78.14	7.92
3K-230	10	0.64	79.28	15.63

Table 3-32: Basin 3K Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3K-RST-10	3K	Gulf Blvd	3K-ST-10	3K-ST-20	1	30	12 Circular
3K-RST-20	3K	Gulf Blvd	3K-ST-20	3K-ST-40	1	119	18 Circular
3K-RST-30	3K	Gulf Blvd	3K-ST-30	3K-ST-40	1	14	12 Circular
3K-RST-40	3K	Gulf Blvd	3K-ST-40	3K-ST-70	1	209	18 Circular
3K-RST-50	3K	Gulf Blvd	3K-ST-50	3K-ST-60	1	22	12 Circular
3K-RST-60	3K	Gulf Blvd	3K-ST-60	3K-ST-40	1	115	12 Circular
3K-RST-70	3K	Gulf Blvd	3K-ST-70	3K-ST-90	1	72	18 Circular
3K-RST-80	3K	Gulf Blvd	3K-ST-80	3K-ST-70	1	31	12 Circular
3K-RST-90	3K	Gulf Blvd	3K-ST-90	3K-ST-110	1	155	18 Circular
3K-RST-100	3K	Gulf Blvd	3K-ST-100	3K-ST-90	1	30	18 Circular
3K-RST-110	3K	Gulf Blvd	3K-ST-110	3K-ST-120	1	20	18 Circular
3K-RST-120	3K	Gulf Blvd	3K-ST-120	3K-ST-140	1	90	18 Circular
3K-RST-130	3K	Gulf Blvd	3K-ST-130	3K-ST-120	1	31	18 Circular
3K-RST-140	3K	Gulf Blvd	3K-ST-140	3K-ST-150	1	43	18 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3K-RST-150	3K	Gulf Blvd	3K-ST-150	3K-ST-160	1	45	24 Circular
3K-RST-160	3K	76th Ave	3K-ST-160	3K-ST-165	1	233	24 Circular
3K-RST-165	3K	76th Ave	3K-ST-165	3K-ST-190	1	130	24 Circular
3K-RST-170	3K	76th Ave	3K-ST-170	3K-ST-160	1	31	12 Circular
3K-RST-180	3K	76th Ave	3K-ST-180	3K-ST-190	1	40	12 Circular
3K-RST-185	3K	Pond Outfall to 76th - Bank	3K-ST-185	3K-ST-165	1	51	D/S with 18 Circular
3K-RST-190	3K	76th Ave	3K-ST-190	3K-ST-200	1	88	24 Circular
3K-RST-200	3K	76th Ave	3K-ST-200	3K-ST-230	1	208	30 Circular
3K-RST-210	3K	76th Ave	3K-ST-210	3K-ST-200	1	28	15 Circular
3K-RST-220	3K	76th Ave	3K-ST-220	3K-ST-230	1	27	12 Circular
3K-RST-240	3K	76th Ave	3K-ST-230	TW	1	155	30 Circular

Simulation Results

Table 3-33 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 3K.

Table 3-33: Basin 3K Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3K-10	0.9	1.1	1.1	2.2	2.9	3.4	3.9
3K-100	0.3	0.4	0.4	0.9	1.1	1.4	1.6
3K-110	2.7	2.9	3.0	4.8	5.9	6.6	7.3
3K-130	0.4	0.5	0.5	1.0	1.3	1.6	1.8
3K-140	3.0	3.2	3.3	5.3	6.4	7.2	8.0
3K-150	0.9	1.0	1.0	1.6	2.0	2.2	2.5
3K-160	0.8	0.9	0.9	1.5	1.8	2.0	2.2
3K-170	0.6	0.6	0.7	1.2	1.5	1.7	2.0
3K-180	2.6	2.9	3.1	5.9	7.7	8.9	10.1
3K-185	1.0	1.0	1.1	1.9	2.3	2.6	2.9
3K-190	3.4	3.7	3.9	6.5	8.0	9.0	10.0
3K-20	1.1	1.3	1.4	2.8	3.7	4.3	4.9
3K-200	0.6	0.7	0.7	1.4	1.8	2.1	2.4

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3K-210	0.7	0.8	0.8	1.5	2.0	2.3	2.5
3K-220	1.7	1.9	2.0	3.6	4.6	5.2	5.8
3K-230	1.2	1.3	1.4	2.4	3.0	3.4	3.8
3K-30	0.8	0.9	1.0	1.9	2.4	2.8	3.2
3K-50	0.9	1.0	1.1	1.8	2.3	2.6	2.9
3K-60	0.9	1.1	1.2	2.4	3.2	3.7	4.3
3K-70	1.0	1.1	1.2	2.2	2.9	3.3	3.7
3K-80	1.5	1.7	1.8	3.3	4.3	4.9	5.6
3K-90	0.7	0.8	0.9	1.9	2.5	3.0	3.5

Table 3-34 summarizes the maximum stages reached during the various design storm events. Table 3-35 summarized the expected flood depths. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-34: Basin 3K Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3K-ST-10	3.02	3.26	3.29	3.31	3.47	3.53	3.56	3.60
3K-ST-100	2.97	3.16	3.17	3.18	3.30	3.39	3.44	3.50
3K-ST-110	3.06	3.10	3.12	3.13	3.26	3.36	3.41	3.47
3K-ST-120	2.99	2.98	3.01	3.03	3.21	3.32	3.38	3.43
3K-ST-130	3.17	2.98	3.01	3.03	3.21	3.33	3.38	3.43
3K-ST-140	2.85	2.75	2.85	2.88	3.17	3.29	3.35	3.40
3K-ST-150	2.60	2.41	2.53	2.62	3.13	3.26	3.31	3.36
3K-ST-160	3.06	2.30	2.42	2.51	3.11	3.24	3.29	3.34
3K-ST-165	3.06	1.88	2.00	2.09	2.70	3.11	3.17	3.23
3K-ST-170	2.80	2.31	2.43	2.53	3.11	3.24	3.29	3.34
3K-ST-180	2.71	2.02	2.23	2.39	2.84	2.90	2.97	3.04
3K-ST-185	4.00	1.40	1.54	1.63	2.72	3.12	3.18	3.24
3K-ST-190	2.71	1.67	1.80	1.89	2.62	2.84	2.93	3.01

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3K-ST-20	3.35	3.26	3.29	3.31	3.47	3.53	3.56	3.60
3K-ST-200	2.69	1.12	1.21	1.27	1.83	2.15	2.52	2.75
3K-ST-210	2.75	1.13	1.22	1.28	1.87	2.20	2.58	2.78
3K-ST-220	2.46	0.86	0.94	1.01	1.76	2.31	2.49	2.53
3K-ST-230	2.45	0.75	0.80	0.83	1.20	1.42	1.61	1.79
3K-ST-30	3.21	3.26	3.28	3.30	3.46	3.52	3.56	3.59
3K-ST-40	3.47	3.26	3.28	3.30	3.46	3.52	3.56	3.59
3K-ST-50	3.12	3.26	3.29	3.30	3.47	3.53	3.56	3.59
3K-ST-60	3.12	3.26	3.29	3.30	3.47	3.53	3.56	3.59
3K-ST-70	3.28	3.22	3.25	3.26	3.37	3.43	3.48	3.53
3K-ST-80	3.22	3.27	3.29	3.31	3.47	3.57	3.63	3.69
3K-ST-90	3.09	3.16	3.17	3.18	3.29	3.39	3.44	3.50

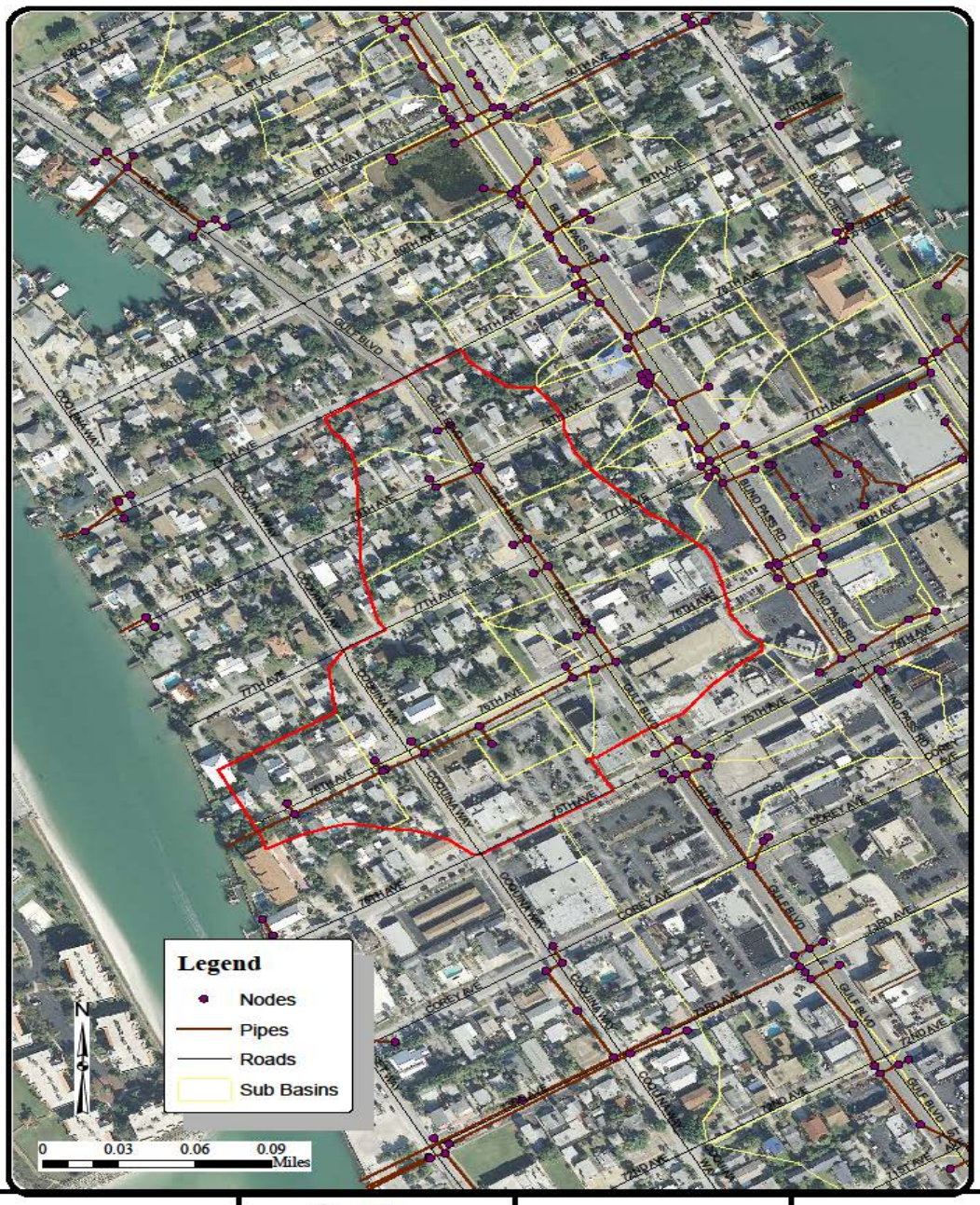
Table 3-35: Basin 3K Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3K-ST-10	2.9	3.2	3.5	5.4	6.1	6.5	7.0
3K-ST-100	2.3	2.4	2.5	4.0	5.0	5.6	6.4
3K-ST-110	0.5	0.7	0.8	2.4	3.6	4.2	4.9
3K-ST-120	0.0	0.2	0.5	2.6	4.0	4.7	5.3
3K-ST-130	0.0	0.0	0.0	0.5	1.9	2.5	3.1
3K-ST-140	0.0	0.0	0.4	3.8	5.3	6.0	6.6
3K-ST-150	0.0	0.0	0.2	6.4	7.9	8.5	9.1
3K-ST-160	0.0	0.0	0.0	0.6	2.2	2.8	3.4
3K-ST-165	0.0	0.0	0.0	0.0	0.6	1.3	2.0
3K-ST-170	0.0	0.0	0.0	3.7	5.3	5.9	6.5
3K-ST-180	0.0	0.0	0.0	1.6	2.3	3.1	4.0
3K-ST-185	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3K-ST-190	0.0	0.0	0.0	0.0	1.6	2.6	3.6

Node Name	Depth of Flooding in inches						
	2-year	**Mean Annual**	**5-Year**	**10-year**	**25-year**	**50-year**	**100-year**
3K-ST-20	0.0	0.0	0.0	1.4	2.2	2.5	3.0
3K-ST-200	0.0	0.0	0.0	0.0	0.0	0.0	0.7
3K-ST-210	0.0	0.0	0.0	0.0	0.0	0.0	0.4
3K-ST-220	0.0	0.0	0.0	0.0	0.0	0.4	0.8
3K-ST-230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3K-ST-30	0.6	0.8	1.1	3.0	3.7	4.2	4.6
3K-ST-40	0.0	0.0	0.0	0.0	0.6	1.1	1.4
3K-ST-50	1.7	2.0	2.2	4.2	4.9	5.3	5.6
3K-ST-60	1.7	2.0	2.2	4.2	4.9	5.3	5.6
3K-ST-70	0.0	0.0	0.0	1.1	1.8	2.4	3.0
3K-ST-80	0.6	0.8	1.1	3.0	4.2	4.9	5.6
3K-ST-90	0.8	1.0	1.1	2.4	3.6	4.2	4.9

Identified Problem Areas

The model predicts flooding along Gulf Boulevard for even the smallest storm event. Flooding depths range from 1-inch for a year storm to 6-inches for the 100-year storm event. There is also conveyance and inlet issues that need to be addressed for the intersection of 79th Avenue and Gulf Boulevard. It appears the raised crosswalks in the area may be contributing to the standing water condition. 76th Avenue is predicted to flood by 6 to 9-inches for the 100-year, 24-hour storm event.



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CITY OF ST. PETE BEACH
STORMWATER MASTER PLAN

PINELLAS COUNTY, FLORIDA

ST. PETE BEACH
3-K
76TH AVENUE AND
GULF BOULEVARD
NODAL MAP

FIGURE
3-7

3.8 Basin 3P: Corey Causeway (75th Avenue)

Sub-Basin Description

Basin 3P is located in the middle drainage section of the City along 75th Avenue (FDOT maintained Avenue). The primary drainage basin area is divided into 28 sub-basins as summarized in Table 3-36. From the intersection of 73rd Avenue and Boca Ciega Drive stormwater flows north towards 75th Avenue. From the intersection of Blind Pass Road and 75th Avenue, stormwater flows east on 75th Avenue. From the intersection of 75th Avenue and Boca Ciega Drive the stormwater continues to flow east towards the Corey Causeway Bridge. The system discharges to the north through one of three outfalls in Horan Park. All three outfall culverts are installed within a constructed seawall. Table 3-37 summarizes the piping information for the basin. The nodal map with aerial background for Basin 3P is presented in Figure 3-8.

Table 3-36: Basin 3P Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3P-10C	10	0.57	61.00	0.00
3P-200	10	0.67	61.00	0.00
3P-210	10	0.17	61.00	0.00
3P-300	10	0.53	61.00	0.00
3P-330	10	0.14	61.00	0.00
3P-355	10	0.12	61.00	0.00
3P-370	10	0.09	61.00	0.00
3P-375	10	0.06	61.00	0.00
3P-400	10	0.72	58.52	0.00
3P-410	10	0.71	39.00	0.00

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3P-420	10	0.30	40.16	0.00
3P-430	10	0.38	40.16	0.00
3P-440	10	0.63	65.22	0.00
3P-440A	10	0.81	65.22	0.00
3P-450	10	0.22	61.00	0.00
3P-460	10	0.59	61.00	0.00
3P-470	10	0.37	61.00	0.00
3P-480	10	0.49	61.00	0.00
3P-490	10	0.69	61.00	0.00
3P-500	10	0.25	61.00	0.00
3P-520	10	0.75	61.00	0.00
3Pcityhall	10	1.70	61.00	0.00
3P-S1	10	2.02	61.00	0.99
3P-S13	10	1.13	61.00	0.00
3P-S5	10	0.35	61.00	0.00
3P-S6	10	2.15	61.00	0.00
3P-S7	10	2.29	61.00	0.00
3P-S9	10	1.38	61.54	0.72

Table 3-37: Basin 3P Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
Waiting on information from FDOT							

Simulation Results

Table 3-38 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 3P.

Table 3-38: Basin 3P Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3P-10C	0.4	0.4	0.5	1.2	1.7	2.0	2.4
3P-200	0.4	0.5	0.6	1.4	2.0	2.4	2.8
3P-210	0.1	0.1	0.2	0.4	0.5	0.6	0.7
3P-300	0.4	0.4	0.5	1.1	1.6	1.9	2.2
3P-330	0.1	0.1	0.1	0.3	0.4	0.5	0.6
3P-355	0.1	0.1	0.1	0.3	0.4	0.4	0.5
3P-370	0.1	0.1	0.1	0.2	0.3	0.3	0.4
3P-375	0.0	0.1	0.1	0.1	0.2	0.2	0.3
3P-400	0.4	0.5	0.5	1.4	2.0	2.4	2.8
3P-410	0.0	0.0	0.0	0.3	0.6	0.9	1.1
3P-420	0.0	0.0	0.0	0.1	0.3	0.4	0.5
3P-430	0.0	0.0	0.0	0.2	0.4	0.5	0.7
3P-440	0.6	0.6	0.7	1.6	2.1	2.5	2.9
3P-440A	0.7	0.8	0.9	2.0	2.7	3.2	3.7
3P-450	0.1	0.2	0.2	0.5	0.7	0.8	0.9
3P-460	0.4	0.5	0.5	1.3	1.7	2.1	2.4
3P-470	0.2	0.3	0.3	0.8	1.1	1.3	1.5
3P-480	0.3	0.4	0.4	1.0	1.5	1.7	2.0
3P-490	0.5	0.5	0.6	1.5	2.0	2.4	2.9
3P-500	0.2	0.2	0.2	0.5	0.7	0.9	1.0
3P-520	0.5	0.6	0.7	1.6	2.2	2.7	3.1
3Pcityhall	1.1	1.3	1.5	3.6	5.0	6.0	7.0
3P-S1	1.4	1.6	1.8	4.3	6.0	7.2	8.4
3P-S13	0.7	0.9	1.0	2.4	3.3	4.0	4.7
3P-S5	0.2	0.3	0.3	0.7	1.0	1.2	1.5
3P-S6	1.4	1.7	1.9	4.6	6.4	7.6	8.9
3P-S7	1.5	1.8	2.0	4.9	6.8	8.1	9.5
3P-S9	1.0	1.1	1.3	3.0	4.2	5.0	5.8
3P-10C	0.4	0.4	0.5	1.2	1.7	2.0	2.4

The maximum stages reached during the various design storm events are summarized in Table 3-39. Expected flood depths are summarized in Table 3-40. The storms were

simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-39: Basin 3P Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
Waiting on Information From FDOT								

Table 3-40: Basin 3P Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
Waiting on Information From FDOT							

Identified Problem Areas

Additional inlets and conveyance systems are needed on Boca Ciega Drive between 73rd Avenue and 75th Avenue. In addition, it appears that two of the three outfall pipes for this drainage basin may be more than half blocked by sediment in the Bay.

CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 3-P COREY CAUSWAY / 75TH AVENUE NODAL MAP	FIGURE 3-8

3.9 Basin 3Q: Gulf Boulevard and Coquina Way Outfall

Sub-Basin Description

Basin 3Q is located in the middle drainage section of the City along Gulf Boulevard (FDOT maintained road) between 75th Avenue and 68th Avenue. The land use is commercial, multi-family and residential. The primary drainage basin area is divided into 18 sub-basins as summarized in Table 3-41. Stormwater flows north on Gulf Boulevard from 68th Avenue to 73rd Avenue and south on Gulf Boulevard from just north of 75th Avenue to 73rd Avenue. At 73rd Avenue the piping system turns west and discharges to Blind Pass (intercoastal waterway). The flow along Gulf Boulevard is conveyed through a series of 15-inch, 18-inch, 24-inch and 30-inch RCP pipes. The system also collects about a 2-block radius down Coquina Way through an 18x12-inch ERCP. Stormwater is conveyed through a 42-inch RCP westward down 73rd Avenue to the outfall. The outfall culvert is installed within a seawall. Piping information for this basin is summarized in Table 3-42. The nodal map with aerial background for Basin 3Q is presented in Figure 3-9.

Table 3-41: Basin 3Q Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3Q-10	10	0.90	39.00	0.00
3Q-100	10	2.38	77.33	15.55
3Q-140	10	2.20	84.19	19.55
3Q-150	10	2.79	81.65	18.64
3Q-180	10	1.89	95.07	22.75
3Q-20	10	0.59	39.00	0.00
3Q-200	10	3.00	90.21	25.33
3Q-220	10	0.87	98.00	27.59
3Q-240	10	1.96	90.56	21.94
3Q-260	10	0.94	86.80	19.15
3Q-270	10	0.54	86.80	33.33
3Q-290	10	0.80	88.75	30.00
3Q-30	10	0.46	39.00	0.00
3Q-300	10	0.33	83.20	39.39
3Q-40	10	1.30	39.00	0.00
3Q-50	10	0.96	82.15	29.17
3Q-60	10	1.56	76.41	20.51
3Q-80	10	2.01	78.31	18.41

Table 3-42: Basin 3Q Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3QR-10	3Q	Gulf Blvd	3Q-10	3Q-20	1	82	15 Circular
3QR-20	3Q	Gulf Blvd	3Q-20	3Q-30	1	201	18 Circular
3QR-30	3Q	Gulf Blvd	3Q-30	3Q-50	1	262	18 Circular
3QR-40	3Q	Gulf Blvd	3Q-40	3Q-30	1	65	15 Circular
3QR-50	3Q	Gulf Blvd	3Q-50	3Q-70	1	18	24 Circular
3QR-60	3Q	Gulf Blvd	3Q-60	3Q-50	1	66	15 Circular
3QR-70	3Q	Gulf Blvd	3Q-70	3Q-80	1	114	24 Circular
3QR-80	3Q	Gulf Blvd	3Q-80	3Q-90	1	155	24 Circular
3QR-90	3Q	Gulf Blvd	3Q-90	3Q-120	1	18	30 Circular
3QR-100	3Q	Gulf Blvd	3Q-100	3Q-90	1	41	15 Circular
3QR-110	3Q	Gulf Blvd	3Q-110	3Q-100	1	21	15 Circular
3QR-120	3Q	Gulf Blvd	3Q-120	3Q-130	1	113	30 Circular
3QR-130	3Q	Gulf Blvd	3Q-130	3Q-140	1	136	30 Circular
3QR-140	3Q	Gulf Blvd	3Q-140	3Q-160	1	17	30 Circular
3QR-150	3Q	Gulf Blvd	3Q-150	3Q-140	1	65	15 Circular
3QR-160	3Q	Gulf Blvd	3Q-160	3Q-170	1	15	30 Circular
3QR-170	3Q	Gulf Blvd	3Q-170	3Q-310	1	314	42 Circular
3QR-180	3Q	Gulf Blvd	3Q-180	3Q-170	1	25	30 Circular
3QR-190	3Q	Gulf Blvd	3Q-190	3Q-180	1	30	30 Circular
3QR-200	3Q	Gulf Blvd	3Q-200	3Q-190	1	30	15 Circular
3QR-210	3Q	Gulf Blvd	3Q-210	3Q-190	1	254	30 Circular
3QR-220	3Q	Gulf Blvd	3Q-220	3Q-210	1	49	15 Circular
3QR-220A	3Q	Gulf Blvd	3Q-220A	3Q-220	1	18	12 Circular
3QR-230	3Q	Gulf Blvd	3Q-230	3Q-210	1	137	30 Circular
3QR-235	3Q	Gulf Blvd	3Q-235	3Q-230	1	101	30 Circular
3QR-240	3Q	Gulf Blvd	3Q-240	3Q-235	1	30	18 Circular
3QR-260	3Q	Gulf Blvd	3Q-260	3Q-235	1	31	24 Circular
3QR-270	3Q	Gulf Blvd	3Q-270	3Q-260	1	13	24 Circular
3QR-280	3Q	Gulf Blvd	3Q-280	3Q-270	1	19	15 Circular
3QR-290	3Q	Gulf Blvd	3Q-290	3Q-280	1	47	15 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3QR-300	3Q	73rd Street Outfall from Gulf Blvd	3Q-300	3Q-290	1	56	15 Circular
3QR-310	3Q	73rd Street Outfall from Gulf Blvd	3Q-310	3Q-315	1	114	42 Circular
3QR-315	3Q	73rd Street Outfall from Gulf Blvd	3Q-315	3Q-320	1	354	42 Circular
3QR-320	3Q	73rd Street Outfall from Gulf Blvd	3Q-320	TW	1	352	42 Circular
3QR-500	3Q	Coquina Way	3Q-500	3Q-510	1	37	18 x 12 Horz Ellipse
3QR-510	3Q	Coquina Way	3Q-510	3Q-520	1	26	18 x 12 Horz Ellipse
3QR-520	3Q	Coquina Way	3Q-520	3Q-530	1	164	18 x 12 Horz Ellipse
3QR-530	3Q	Coquina Way	3Q-530	3Q-315	1	93	18 x 12 Horz Ellipse

Simulation Results

Table 3-43 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 3Q.

Table 3-43: Basin 3Q Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3Q-10	0.0	0.0	0.0	0.4	0.8	1.1	1.4
3Q-100	4.2	4.6	4.9	8.5	10.8	12.3	13.8
3Q-140	4.7	5.1	5.4	8.8	10.9	12.3	13.6
3Q-150	5.6	6.1	6.4	10.8	13.4	15.2	16.9
3Q-180	5.0	5.3	5.5	8.4	10.1	11.3	12.4
3Q-20	0.0	0.0	0.0	0.2	0.5	0.7	0.9
3Q-200	7.3	7.9	8.3	12.9	15.7	17.5	19.4
3Q-220	2.3	2.5	2.6	3.9	4.7	5.2	5.7
3Q-240	4.8	5.2	5.4	8.5	10.3	11.5	12.7
3Q-260	2.1	2.3	2.4	3.9	4.8	5.4	5.9

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3Q-270	1.3	1.4	1.4	2.3	2.8	3.1	3.4
3Q-290	1.9	2.1	2.2	3.4	4.2	4.7	5.1
3Q-30	0.0	0.0	0.0	0.2	0.4	0.6	0.7
3Q-300	0.7	0.8	0.8	1.4	1.7	1.9	2.1
3Q-40	0.0	0.0	0.0	0.5	1.1	1.6	2.1
3Q-50	2.0	2.2	2.3	3.8	4.7	5.3	5.9
3Q-60	2.7	3.0	3.2	5.6	7.1	8.0	9.0
3Q-80	3.7	4.0	4.3	7.4	9.3	10.5	11.8
3Q-10	0.0	0.0	0.0	0.4	0.8	1.1	1.4
3Q-100	4.2	4.6	4.9	8.5	10.8	12.3	13.8
3Q-140	4.7	5.1	5.4	8.8	10.9	12.3	13.6
3Q-150	5.6	6.1	6.4	10.8	13.4	15.2	16.9
3Q-180	5.0	5.3	5.5	8.4	10.1	11.3	12.4
3Q-20	0.0	0.0	0.0	0.2	0.5	0.7	0.9
3Q-200	7.3	7.9	8.3	12.9	15.7	17.5	19.4
3Q-220	2.3	2.5	2.6	3.9	4.7	5.2	5.7
3Q-240	4.8	5.2	5.4	8.5	10.3	11.5	12.7
3Q-260	2.1	2.3	2.4	3.9	4.8	5.4	5.9
3Q-270	1.3	1.4	1.4	2.3	2.8	3.1	3.4
3Q-290	1.9	2.1	2.2	3.4	4.2	4.7	5.1
3Q-30	0.0	0.0	0.0	0.2	0.4	0.6	0.7
3Q-300	0.7	0.8	0.8	1.4	1.7	1.9	2.1
3Q-40	0.0	0.0	0.0	0.5	1.1	1.6	2.1
3Q-50	2.0	2.2	2.3	3.8	4.7	5.3	5.9
3Q-60	2.7	3.0	3.2	5.6	7.1	8.0	9.0
3Q-80	3.7	4.0	4.3	7.4	9.3	10.5	11.8

The maximum stages reached during the various design storm events are summarized in Table 3-44. Expected flood depths are summarized in Table 3-45. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-44: Basin 3Q Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3Q-10	6.11	3.71	3.79	3.85	4.40	4.67	4.98	5.33
3Q-100	4.08	3.54	3.55	3.57	3.73	3.82	3.89	3.95
3Q-110	3.52	3.54	3.55	3.57	3.73	3.82	3.89	3.95
3Q-120	3.30	3.31	3.33	3.35	3.53	3.65	3.73	3.81
3Q-130	3.76	3.19	3.23	3.25	3.48	3.61	3.69	3.78
3Q-140	2.97	3.06	3.11	3.15	3.33	3.42	3.47	3.53
3Q-150	2.97	3.12	3.16	3.18	3.36	3.44	3.50	3.55
3Q-160	3.05	2.87	2.97	3.02	3.26	3.35	3.40	3.46
3Q-170	3.15	2.62	2.72	2.77	3.13	3.24	3.31	3.37
3Q-180	2.62	2.77	2.84	2.87	3.18	3.28	3.35	3.41
3Q-190	3.72	2.93	3.00	3.05	3.37	3.49	3.55	3.62
3Q-20	5.98	3.71	3.79	3.85	4.40	4.65	4.95	5.28
3Q-200	2.62	2.95	3.02	3.07	3.39	3.51	3.58	3.64
3Q-210	4.21	3.07	3.14	3.18	3.47	3.57	3.62	3.67
3Q-220	3.53	3.14	3.22	3.27	3.56	3.61	3.65	3.69
3Q-220A	3.70	3.14	3.22	3.27	3.56	3.61	3.65	3.69
3Q-230	3.91	3.13	3.20	3.24	3.50	3.59	3.65	3.70
3Q-235	3.71	3.19	3.26	3.30	3.53	3.62	3.68	3.73
3Q-240	3.02	3.20	3.27	3.31	3.54	3.63	3.69	3.74
3Q-260	3.40	3.22	3.28	3.32	3.54	3.63	3.69	3.74
3Q-270	3.17	3.23	3.29	3.33	3.54	3.63	3.69	3.74
3Q-280	3.51	3.27	3.32	3.36	3.55	3.64	3.70	3.74
3Q-290	3.70	3.32	3.37	3.40	3.61	3.70	3.74	3.77
3Q-30	5.38	3.71	3.79	3.85	4.39	4.62	4.87	5.17
3Q-300	3.30	3.33	3.37	3.40	3.61	3.70	3.74	3.77
3Q-310	3.54	2.00	2.07	2.11	2.37	2.51	2.64	2.77
3Q-315	3.54	1.63	1.70	1.73	1.93	2.04	2.14	2.24

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3Q-320	2.82	0.97	1.00	1.01	1.11	1.17	1.22	1.27
3Q-40	5.34	3.71	3.79	3.85	4.40	4.65	4.93	5.25
3Q-50	4.10	3.71	3.79	3.85	4.34	4.42	4.48	4.53
3Q-500	2.50	1.63	1.70	1.73	1.93	2.04	2.14	2.24
3Q-510	2.70	1.63	1.69	1.73	1.93	2.04	2.14	2.24
3Q-520	2.90	1.63	1.70	1.73	1.93	2.04	2.14	2.24
3Q-530	3.10	1.63	1.70	1.73	1.93	2.04	2.14	2.24
3Q-60	4.80	3.86	3.99	4.07	4.76	4.88	4.91	4.94
3Q-70	4.30	3.68	3.75	3.80	4.31	4.39	4.44	4.49
3Q-80	4.11	3.61	3.68	3.72	4.13	4.22	4.28	4.33
3Q-90	3.52	3.38	3.41	3.43	3.61	3.70	3.78	3.86

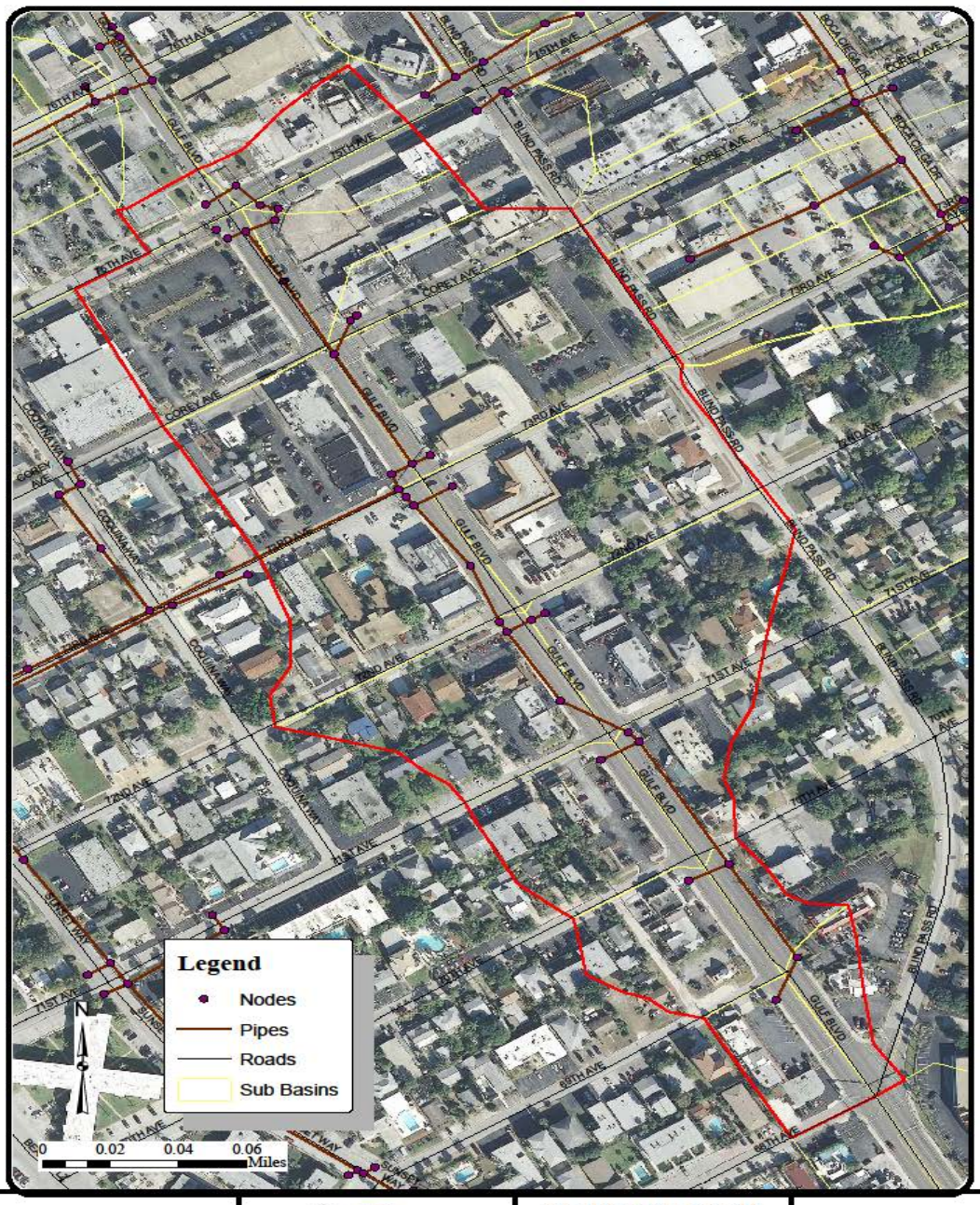
Table 3-45: Basin 3Q Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3Q-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-110	0.2	0.4	0.6	2.5	3.6	4.4	5.2
3Q-120	0.1	0.4	0.6	2.8	4.2	5.2	6.1
3Q-130	0.0	0.0	0.0	0.0	0.0	0.0	0.2
3Q-140	1.1	1.7	2.2	4.3	5.4	6.0	6.7
3Q-150	1.8	2.3	2.5	4.7	5.6	6.4	7.0
3Q-160	0.0	0.0	0.0	2.5	3.6	4.2	4.9
3Q-170	0.0	0.0	0.0	0.0	1.1	1.9	2.6
3Q-180	1.8	2.6	3.0	6.7	7.9	8.8	9.5
3Q-190	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-200	4.0	4.8	5.4	9.2	10.7	11.5	12.2
3Q-210	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3Q-220	0.0	0.0	0.0	0.4	1.0	1.4	1.9
3Q-220A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-235	0.0	0.0	0.0	0.0	0.0	0.0	0.2
3Q-240	2.2	3.0	3.5	6.2	7.3	8.0	8.6
3Q-260	0.0	0.0	0.0	1.7	2.8	3.5	4.1
3Q-270	0.7	1.4	1.9	4.4	5.5	6.2	6.8
3Q-280	0.0	0.0	0.0	0.5	1.6	2.3	2.8
3Q-290	0.0	0.0	0.0	0.0	0.0	0.5	0.8
3Q-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-300	0.4	0.8	1.2	3.7	4.8	5.3	5.6
3Q-310	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-315	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-320	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-50	0.0	0.0	0.0	2.9	3.8	4.6	5.2
3Q-500	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-510	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-520	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-530	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3Q-60	0.0	0.0	0.0	0.0	1.0	1.3	1.7
3Q-70	0.0	0.0	0.0	0.1	1.1	1.7	2.3
3Q-80	0.0	0.0	0.0	0.2	1.3	2.0	2.6
3Q-90	0.0	0.0	0.0	1.1	2.2	3.1	4.1

Identified Problem Areas

Flooding is predicted to be up to 12-inches along Gulf Boulevard within this basin. Additional piping capacity and inlets may be needed to alleviate this situation.



CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 3-Q GULF BOULEVARD AND COQUINA WAY OUTFALL AT 73RD AVENUE NODAL MAP	FIGURE 3-9

3.10 Basin 3S: 71st Avenue and Boca Ciega Drive

Sub-Basin Description

Basin 3S is located in the middle drainage section of the City near the intersection of 71st Avenue and Boca Ciega Avenue. This area is primarily residential land use. The primary drainage basin area is divided into 5 sub-basins as summarized in Table 3-46. The stormwater overland flows south down Boca Ciega Drive and both east and west down 71st towards three inlets at the intersection of Boca Ciega Drive and 71st Avenue. These inlets are connected by 12-inch and 24-inch RCP pipes. The area then outfalls between two house through two pipes, an older 15-inch RCP and a newer 24-inch pipe. Both outfall culverts are installed within a seawall. Piping information for this basin is summarized in Table 3-47. The nodal map with aerial background for Basin 3S is presented in Figure 3-10.

Table 3-46: Basin 3S Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
3S-10	10	1.58	71.40	18.99
3S-20	10	5.45	65.15	15.41
3S-30	10	1.07	58.43	23.36
3S-40	10	0.40	51.65	0.00
3S-50	10	1.36	74.02	25.00

Table 3-47: Basin 3S Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
3S-RST-10	3S	71st Ave and Boca Ciega Drive	3S-ST-10	3S-ST-20	1	40	12 Circular
3S-RST-20	3S	71st Ave and Boca Ciega Drive	3S-ST-20	3S-ST-40	1	51	24 Circular
3S-RST-30	3S	71st Ave and Boca Ciega Drive	3S-ST-30	3S-ST-40	1	59	24 Circular
3S-RST-40	3S	71st Ave and Boca Ciega Drive	3S-ST-40	TW	1	128	15 Circular
3S-RST-40-50	3S	71st Ave and Boca Ciega Drive	3S-ST-40	3S-ST-50	1	8	12 Circular
3S-RST-50	3S	71st Ave and Boca Ciega Drive	3S-ST-50	TW	1	128	24 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 3S is summarized in Table 3-48.

Table 3-48: Basin 3S Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
3S-10	2.4	2.6	2.8	5.1	6.6	7.6	8.6
3S-20	6.3	7.1	7.6	15.1	19.9	23.2	26.6
3S-30	1.1	1.2	1.3	2.7	3.6	4.2	4.8
3S-40	0.1	0.1	0.2	0.5	0.8	1.0	1.2
3S-50	2.3	2.6	2.7	4.8	6.0	6.9	7.7

Maximum stages reached during the various design storm events is summarized in Table 3-49. Expected flood depths are summarized in Table 3-50. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-49: Basin 3S Maximum Stages During Various Design Storm Events

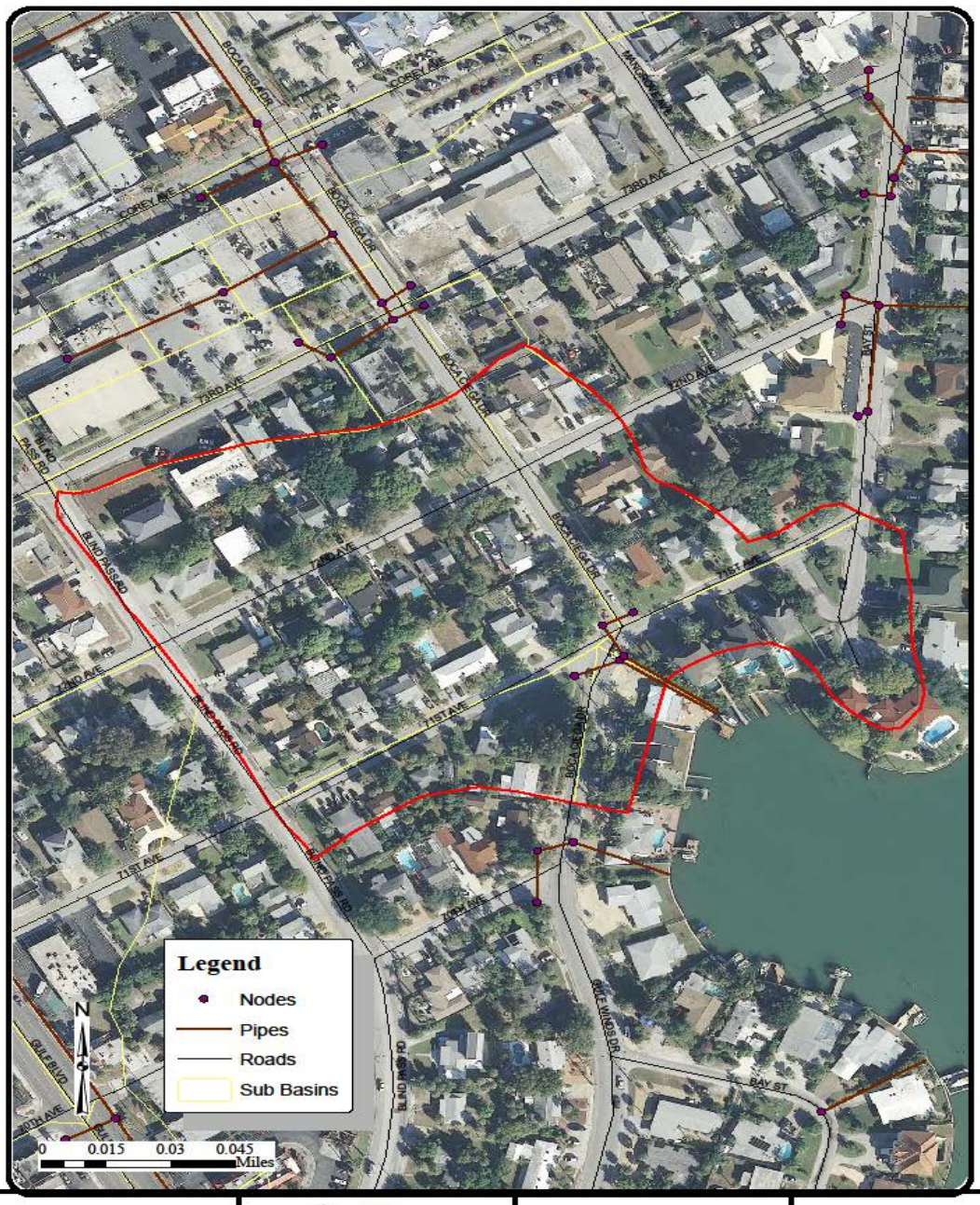
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3S-ST-10	2.50	2.25	2.53	2.57	3.20	3.38	3.44	3.50
3S-ST-20	2.40	1.96	2.29	2.47	3.19	3.37	3.43	3.48
3S-ST-30	2.88	1.79	2.07	2.28	3.15	3.33	3.38	3.43
3S-ST-40	3.20	1.78	2.07	2.28	3.15	3.32	3.37	3.42
3S-ST-50	3.20	1.43	1.56	1.65	3.05	3.26	3.31	3.36

Table 3-50: Basin 3S Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
3S-ST-10	0.0	0.4	0.8	8.4	10.6	11.3	12.0
3S-ST-20	0.0	0.0	0.8	9.5	11.6	12.4	13.0
3S-ST-30	0.0	0.0	0.0	3.2	5.4	6.0	6.6
3S-ST-40	0.0	0.0	0.0	0.0	1.4	2.0	2.6
3S-ST-50	0.0	0.0	0.0	0.0	0.7	1.3	1.9

Identified Problem Areas

Flooding of up to 13-inches can be expected in this area. Low spots on Boca Ciega Drive cause chronic standing water. Increasing the piping capacity and extending the inlet/piping system along Boca Ciega Drive would help alleviate this situation.



CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 3-S 71ST AVENUE AND BOCA CIEGA DRIVE NODAL MAP	FIGURE 3-10

3.11 Basin 4S: Gulf Boulevard Outfall at 2nd Street E

Sub-Basin Description

Basin 4S is located in the middle drainage section of the City along Gulf Boulevard between 58th Avenue and Blind Pass Road and discharges to the east at 2nd Street East. The land use includes commercial, multi-family and residential. The primary drainage basin area is divided into 19 sub-basins as summarized in Table 3-51. Stormwater flows north from 57th Avenue on Gulf Boulevard before being conveyed to the east between two commercial buildings. Stormwater is conveyed through this section by a series of 15inch, 18-inch and 30-inch RCP pipes. Stormwater flows south on Gulf Boulevard from Blind Pass Road through a series of 15-inch, 18-inch, 24-inch, 30-inch and 36-inch RCP pipes. Flows from the south and north merge about 400-feet north of the intersection of Gulf Boulevard and Gulf Winds Drive where the flows turn east towards Boca Ciega Bay. A 42-inch RCP runs east along a drainage easement and along 2nd Street East. The pipe continues under a shaded parking structure for Sylvette Condominiums and discharges through an outfall culvert installed with a seawall. Piping information for this basin is summarized in Table 3-52. The nodal map with aerial background for Basin 4S is presented in Figure 3-11.

Table 3-51: Basin 4S Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
4S-10	10	1.52	88.44	24.34
4S-100	10	2.08	98.00	20.67
4S-120	10	1.03	85.90	24.27
4S-130	10	0.79	88.64	29.11
4S-150	10	0.32	70.50	28.13
4S-160	10	0.79	86.76	20.25
4S-170	10	0.62	82.61	25.81
4S-180	10	0.91	91.06	25.27
4S-190	10	0.90	97.03	32.22
4S-200	10	0.88	86.20	26.14
4S-210	10	0.85	89.00	30.59
4S-220	10	1.80	88.60	20.56
4S-230	10	1.88	97.75	20.74
4S-240	10	0.82	91.50	9.76
4S-30	10	3.91	91.24	8.70
4S-50	10	1.15	94.73	24.35
4S-60	10	0.84	92.31	42.86
4S-70	10	4.55	92.37	8.79
4S-90	10	2.12	95.67	22.17

Table 3-52: Basin 4S Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
4SR-10	4S	Gulf Blvd	4S-10	4S-20	1	122	15 Circular
4SR-20	4S	Gulf Blvd	4S-20	4S-40	1	188	18 Circular
4SR-30	4S	Gulf Blvd	4S-30	4S-20	1	31	15 Circular
4SR-40	4S	Gulf Blvd	4S-40	4S-60	1	128	18 Circular
4SR-50	4S	Gulf Blvd	4S-50	4S-40	1	34	15 Circular
4SR-60	4S	Gulf Blvd	4S-60	4S-80	1	376	30 Circular
4SR-70	4S	Gulf Blvd	4S-70	4S-60	1	66	18 Circular
4SR-80	4S	Gulf Blvd	4S-80	4S-220	1	214	42 Circular
4SR-90	4S	Gulf Blvd	4S-90	4S-80	1	215	36 Circular
4SR-100	4S	Gulf Blvd	4S-100	4S-90	1	65	18 Circular
4SR-110	4S	Gulf Blvd	4S-110	4S-90	1	307	30 Circular
4SR-120	4S	Gulf Blvd	4S-120	4S-110	1	15	30 Circular
4SR-130	4S	Gulf Blvd	4S-130	4S-120	1	65	15 Circular
4SR-140	4S	Gulf Blvd	4S-140	4S-120	1	259	24 Circular
4SR-150	4S	Gulf Blvd	4S-150	4S-140	1	66	15 Circular
4SR-160	4S	Gulf Blvd	4S-160	4S-140	1	184	24 Circular
4SR-170	4S	Gulf Blvd	4S-170	4S-160	1	66	15 Circular
4SR-180	4S	Gulf Blvd	4S-180	4S-160	1	65	15 Circular
4SR-190	4S	Gulf Blvd	4S-190	4S-180	1	65	15 Circular
4SR-200	4S	Gulf Blvd	4S-200	4S-180	1	168	18 Circular
4SR-210	4S	Gulf Blvd	4S-210	4S-200	1	65	15 Circular
4SR-220	4S	Gulf Winds Drive and 2nd Ave	4S-220	4S-230	1	31	42 Circular
4SR-230	4S	Gulf Winds Drive and 2nd Ave	4S-230	4S-240	1	179	42 Circular
4SR-240	4S	2nd Street E Outfall from Gulf Blvd	4S-240	TW	1	202	42 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 4S is summarized in Table 3-53.

Table 3-53: Basin 4S Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
4S-10	3.6	3.9	4.1	6.4	7.9	8.8	9.7
4S-100	5.6	6.0	6.2	9.4	11.2	12.5	13.7
4S-120	2.3	2.5	2.6	4.3	5.2	5.9	6.5
4S-130	1.9	2.0	2.1	3.4	4.1	4.6	5.1
4S-150	0.5	0.6	0.6	1.1	1.4	1.6	1.8
4S-160	1.8	1.9	2.0	3.3	4.0	4.5	5.0
4S-170	1.3	1.4	1.5	2.5	3.1	3.4	3.8
4S-180	2.3	2.4	2.5	4.0	4.8	5.3	5.9
4S-190	2.4	2.6	2.7	4.0	4.9	5.4	5.9
4S-200	2.0	2.2	2.3	3.7	4.5	5.0	5.6
4S-210	2.1	2.2	2.3	3.6	4.4	4.9	5.5
4S-220	4.2	4.6	4.8	7.6	9.3	10.4	11.5
4S-230	5.0	5.4	5.6	8.5	10.2	11.3	12.4
4S-240	2.0	2.2	2.3	3.5	4.3	4.8	5.3
4S-30	9.5	10.3	10.8	16.8	20.5	22.9	25.2
4S-50	3.0	3.2	3.4	5.1	6.2	6.9	7.6
4S-60	2.2	2.3	2.4	3.7	4.5	5.0	5.5
4S-70	11.3	12.2	12.8	19.8	24.0	26.8	29.5
4S-90	5.6	6.0	6.2	9.5	11.4	12.7	13.9

Maximum stages reached during the various design storm events are summarized in Table 3-54. The expected flood depths are summarized in Table 3-55. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-54: Basin 4S Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
4S-10	5.10	5.12	5.14	5.15	5.44	5.58	5.65	5.71
4S-100	5.00	3.86	4.13	4.24	4.97	5.12	5.18	5.25
4S-110	5.67	4.00	4.27	4.43	5.32	5.56	5.68	5.72
4S-120	5.50	4.14	4.42	4.58	5.52	5.66	5.75	5.78
4S-130	6.40	4.22	4.51	4.68	5.71	5.80	5.87	5.92
4S-140	7.06	4.75	5.08	5.28	6.17	6.31	6.39	6.44
4S-150	7.05	4.76	5.09	5.29	6.19	6.33	6.41	6.47
4S-160	6.94	5.19	5.55	5.77	6.62	6.75	6.81	6.87
4S-170	6.67	5.23	5.59	5.82	6.69	6.75	6.82	6.88
4S-180	6.19	6.21	6.26	6.28	6.64	6.76	6.83	6.89
4S-190	6.15	6.23	6.27	6.29	6.65	6.77	6.83	6.89
4S-20	5.86	4.86	4.93	5.00	5.43	5.58	5.65	5.71
4S-200	6.51	6.32	6.36	6.38	6.66	6.78	6.84	6.90
4S-210	6.55	6.35	6.39	6.42	6.67	6.78	6.84	6.90
4S-220	4.32	2.50	2.65	2.73	3.32	3.57	3.73	3.94
4S-230	4.20	2.11	2.23	2.30	2.84	3.07	3.22	3.38
4S-240	4.70	1.27	1.34	1.37	1.68	1.82	1.91	2.01
4S-30	5.00	4.97	5.03	5.07	5.44	5.58	5.65	5.72
4S-40	5.25	4.52	4.62	4.68	5.18	5.30	5.33	5.36
4S-50	5.10	4.66	4.78	4.86	5.19	5.30	5.34	5.37
4S-60	5.00	3.87	4.00	4.07	4.65	4.99	5.11	5.21
4S-70	4.90	4.60	4.67	4.71	5.03	5.13	5.20	5.27
4S-80	5.14	3.11	3.28	3.37	3.99	4.24	4.48	4.78
4S-90	5.00	3.56	3.79	3.90	4.66	4.95	5.10	5.21

Table 3-55: Basin 4S Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
4S-10	0.2	0.5	0.6	4.1	5.8	6.6	7.3
4S-100	0.0	0.0	0.0	0.0	1.4	2.2	3.0
4S-110	0.0	0.0	0.0	0.0	0.0	0.1	0.6
4S-120	0.0	0.0	0.0	0.2	1.9	3.0	3.4
4S-130	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-140	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-160	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-170	0.0	0.0	0.0	0.2	1.0	1.8	2.5
4S-180	0.2	0.8	1.1	5.4	6.8	7.7	8.4
4S-190	1.0	1.4	1.7	6.0	7.4	8.2	8.9
4S-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-200	0.0	0.0	0.0	1.8	3.2	4.0	4.7
4S-210	0.0	0.0	0.0	1.4	2.8	3.5	4.2
4S-220	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-230	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-240	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-30	0.0	0.4	0.8	5.3	7.0	7.8	8.6
4S-40	0.0	0.0	0.0	0.0	0.6	1.0	1.3
4S-50	0.0	0.0	0.0	1.1	2.4	2.9	3.2
4S-60	0.0	0.0	0.0	0.0	0.0	1.3	2.5
4S-70	0.0	0.0	0.0	1.6	2.8	3.6	4.4
4S-80	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4S-90	0.0	0.0	0.0	0.0	0.0	1.2	2.5

Identified Problem Areas

During the 100-year storm event, standing water of up to 8-inches can be expected in this area. Expanding the outfall pipe or diverting non-FDOT stormwater to a separate system may help alleviate this situation

CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 4-S GULF BOULEVARD OUTFALLAT 2ND STREET E NODAL MAP	FIGURE 3-11

3.12 Basin 6B: 46th Avenue

Sub-Basin Description

Basin 6B is located in the middle drainage section of the City along 46th Avenue east of Gulf Boulevard. The land use is a combination of commercial and residential. The primary drainage basin area is divided into 5 sub-basins as summarized in Table 3-56. A portion of the Publix Shopping Center parking lot drains to a small detention pond on the west end of 46th Avenue near Gulf Boulevard. Stormwater flows east through a 15-inch RCP on 46th Avenue. The system outfalls between two houses through a 48x24-inch ERCP. The outfall culvert is installed within a seawall. Piping information for this basin is summarized in Table 3-57. The nodal map with aerial background for Basin 6B is presented in Figure 3-12.

Table 3-56: Basin 6B Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
6B-10	10	2.84	91.69	0.00
6B-30	10	2.58	57.19	7.36
6B-40	10	1.09	82.99	16.51
6B-80	10	3.58	76.25	10.34
6B-90	10	2.19	85.16	16.44

Table 3-57: Basin 6B Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
6B-RST-10	6B	Pond Outfall to 46th - Publix	6B-ST-10	6B-ST-20	1	6	D/S with 15 Circular
6B-RST-20	6B	46th Avenue	6B-ST-20	6B-ST-50	1	84	15 Circular
6B-RST-30	6B	46th Avenue	6B-ST-30	6B-ST-40	1	28	12 Circular
6B-RST-40	6B	46th Avenue	6B-ST-40	6B-ST-50	1	9	12 Circular
6B-RST-50	6B	46th Avenue	6B-ST-50	6B-ST-60	1	216	15 Circular
6B RST-60	6B	46th Avenue	6B-ST-60	6B-ST-70	1	100	15 Circular
6B RST-70	6B	46th Avenue	6B-ST-70	6B-ST-90	1	396	15 Circular
6B RST-80	6B	46th Avenue	6B-ST-80	6B-ST-90	1	28	12 Circular
6B-RST-90	6B	46th Avenue	6B-ST-90	6B-ST-100	1	28	15 Circular
6B-RST-100	6B	46th Avenue	6B-ST-100	TW	1	117	48 x 24 Horz Ellipse

Simulation Results

Table 3-58 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 6B.

Table 3-58: Basin 6B Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
6B-10	6.9	7.5	7.8	12.2	14.9	16.6	18.3
6B-30	1.6	1.9	2.1	5.2	7.2	8.7	10.2
6B-40	2.2	2.4	2.6	4.3	5.3	6.0	6.7
6B-80	5.8	6.5	6.9	12.4	15.8	18.0	20.3
6B-90	4.7	5.2	5.4	8.9	10.9	12.3	13.6

Maximum stages reached during the various design storm events are summarized in Table 3-59. Expected flood depths are summarized in Table 3-60. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-59: Basin 6B Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6B-ST-10	3.50	3.03	3.04	3.05	3.09	3.18	3.26	3.33
6B-ST-100	2.75	0.47	0.49	0.51	0.98	1.44	1.66	1.86
6B-ST-20	2.70	2.78	2.80	2.82	3.06	3.18	3.26	3.33
6B-ST-30	2.40	2.75	2.79	2.81	3.06	3.18	3.26	3.33
6B-ST-40	2.26	2.75	2.79	2.81	3.06	3.18	3.25	3.33
6B-ST-50	2.67	2.75	2.79	2.81	3.05	3.17	3.25	3.33
6B-ST-60	3.40	2.64	2.74	2.78	3.04	3.16	3.24	3.32
6B-ST-70	3.60	2.63	2.71	2.72	2.95	3.05	3.11	3.17
6B-ST-80	2.70	2.83	2.87	2.89	3.06	3.16	3.23	3.28
6B-ST-90	2.75	2.62	2.76	2.79	2.98	3.08	3.14	3.19

Table 3-60: Basin 6B Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6B-ST-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6B-ST-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6B-ST-20	1.0	1.2	1.4	4.3	5.8	6.7	7.6
6B-ST-30	4.2	4.7	4.9	7.9	9.4	10.3	11.2
6B-ST-40	5.9	6.4	6.6	9.6	11.0	11.9	12.8
6B-ST-50	1.0	1.4	1.7	4.6	6.0	7.0	7.9
6B-ST-60	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6B-ST-70	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6B-ST-80	1.6	2.0	2.3	4.3	5.5	6.4	7.0
6B-ST-90	0.0	0.1	0.5	2.8	4.0	4.7	5.3

Identified Problem Areas

Due to the small pipe sizes in this drainage basin, flooding can be expected in this area during normal rainfall events. Flooding ranges from 5 to 12 inches during the 100-year storm event.

CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **6-B** **46TH AVENUE** **NODAL MAP**	FIGURE 3-12

3.13 Basin 6F Boca Ciega Isle Drive (East End)

Sub-Basin Description

Basin 6F is located in the middle drainage section of the City at the eastern end of Boca Ciega Isle Drive. The land use is residential. The primary drainage basin area is divided into 3 sub-basins as summarized in Table 3-61. Stormwater flows east on both the northern and southern portion of Boca Ciega Isle Drive toward an inlet at the far east end. The system conveys stormwater through a series of 12-inch and 18-inch RCP pipes. Flow is conveyed eastward through a 24-inch RCP to outfall between two houses in the Bay. The outfall culvert is installed within a seawall. Piping information for this basin is summarized in Table 3-62. The nodal map with aerial background for Basin 6F is presented in Figure 3-13.

Table 3-61: Basin 6F Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
6F-30	10	2.50	75.00	0.00
6F-50	10	2.16	75.00	0.00
6F-60	10	3.73	75.00	0.00

Table 3-62: Basin 6F Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
6F-RST-10	6F	Boca Ciega Isle Drive (East End)	6F-10	6F-20	1	34	8 Circular
6F-RST-20	6F	Boca Ciega Isle Drive (East End)	6F-20	6F-40	1	17	18 Circular
6F-RST-30	6F	Boca Ciega Isle Drive (East End)	6F-30	6F-20	1	33	12 Circular
6F-RST-40	6F	Boca Ciega Isle Drive (East End)	6F-40	6F-60	1	86	18 Circular
6F-RST-50	6F	Boca Ciega Isle Drive (East End)	6F-50	6F-60	1	19	12 Circular
6F-RST-60	6F	Boca Ciega Isle Drive (East End)	6F-60	TW	1	148	24 Circular

Simulation Results

Table 3-63 summarizes the maximum unrouted flows generated by the contributing areas within the 6F.

Table 3-63: Basin 6F Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
6F-30	3.6	4.0	4.3	8.1	10.5	12.0	13.6
6F-50	3.1	3.5	3.7	7.0	9.0	10.4	11.8
6F-60	5.3	6.0	6.4	12.1	15.6	18.0	20.3

Table 3-64 summarizes the maximum stages reached during the various design storm events. Table 3-65 summarized the expected flood depths. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-64: Basin 6F Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6F-10	1.35	0.95	1.04	1.11	1.70	1.53	1.61	1.87
6F-20	1.40	0.95	1.04	1.11	1.40	1.53	1.61	1.40

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6F-30	0.99	1.33	1.45	1.53	1.80	1.81	1.83	1.98
6F-40	1.20	0.90	1.00	1.06	1.46	1.51	1.59	1.78
6F-50	1.09	1.17	1.33	1.43	1.64	1.69	1.72	1.81
6F-60	1.27	0.82	0.92	0.98	1.43	1.51	1.58	1.78

Table 3-65: Basin 6F Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6F-10	0.0	0.0	0.0	4.2	2.2	3.1	6.2
6F-20	0.0	0.0	0.0	0.0	1.6	2.5	0.0
6F-30	4.1	5.5	6.5	9.7	9.8	10.1	11.9
6F-40	0.0	0.0	0.0	3.1	3.7	4.7	7.0
6F-50	1.0	2.9	4.1	6.6	7.2	7.6	8.6
6F-60	0.0	0.0	0.0	1.9	2.9	3.7	6.1

Identified Problem Areas

The model predicts 1 to 4 inches of flooding during normal rainfall events. Flooding of between 6 and 12 inches is predicted during the 100-year storm event. Additional inlets and pipe capacity may be needed to address the issue.

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3.14 Basin 6H: 45th Avenue and 2nd Street E

Sub-Basin Description

Basin 6H is located in the middle drainage section of the City along 45th Avenue east of Gulf Boulevard. The land use in the area is primarily residential. The primary drainage basin area is divided into 12 sub-basins as summarized in Table 3-66. Stormwater flows east from 1st Street East to Plaza Way. Drainage from the intersection of Lido Drive and 2nd Street E flows south and joins the piping system on 45th Avenue. The drainage system outfalls between two houses at the intersection of 45th Avenue and Plaza Drive. Pipes in this system are 18x12-inch ERCP. The outfall culvert is installed within a seawall. Piping information for this basin is summarized in Table 3-67. The nodal map with aerial background for Basin 6H is presented in Figure 3-14.

Table 3-66: Basin 6H Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
6H-10	10	3.21	71.65	11.21
6H-20	10	2.02	66.23	12.87
6H-30	10	1.04	77.16	16.35
6H-50	10	0.78	71.71	15.38
6H-52	10	1.28	63.84	10.94
6H-54	10	1.13	65.08	16.81
6H-56	10	1.66	67.70	12.65
6H-60	10	0.64	77.82	12.50
6H-65	10	0.90	77.19	11.11

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
6H-67	10	0.79	76.42	8.86
6H-70	10	1.04	79.29	16.35
6H-80	10	2.91	78.68	14.43

Table 3-67: Basin 6H Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
6H-RST-10	6H	2nd St. E and Lido Dr.	6H-ST-10	6H-ST-30	1	32	18 x 12 Horz Ellipse
6H-RST-20	6H	2nd St. E and Lido Dr.	6H-ST-20	6H-ST-30	1	31	18 x 12 Horz Ellipse
6H-RST-30	6H	2nd St. E and Lido Dr.	6H-ST-30	6H-ST-60	1	190	18 x 12 Horz Ellipse
6H-RST-50	6H	45th Avenue	6H-ST-50	6H-ST-60	1	23	18 x 12 Horz Ellipse
6H-RST-52	6H	45th Avenue	6H-ST-52	6H-ST-55	1	21	18 x 12 Horz Ellipse
6H-RST-54	6H	45th Avenue	6H-ST-54	6H-ST-55	1	8	18 x 12 Horz Ellipse
6H-RST-55	6H	45th Avenue	6H-ST-55	6H-ST-57	1	342	18 x 12 Horz Ellipse
6H-RST-56	6H	45th Avenue	6H-ST-56	6H-ST-57	1	20	18 x 12 Horz Ellipse
6H-RST-57	6H	45th Avenue	6H-ST-57	6H-ST-60	1	4	18 x 12 Horz Ellipse
6H-RST-60	6H	45th Avenue	6H-ST-60	6H-ST-67	1	315	18 x 12 Horz Ellipse
6H-RST-65	6H	45th Avenue	6H-ST-65	6H-ST-67	1	25	18 x 12 Horz Ellipse
6H-RST-67	6H	45th Avenue	6H-ST-67	6H-ST-70	1	317	18 x 12 Horz Ellipse
6H-RST-70	6H	45th Avenue	6H-ST-70	6H-ST-80	1	22	18 x 12 Horz Ellipse
6H-RST-80	6H	45th Avenue	6H-ST-80	TW	1	126	18 x 12 Horz Ellipse

Simulation Results

Table 3-68 summarizes the maximum unrouted flows generated by the contributing areas within the Basin 6H.

Table 3-68: Basin 6H Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
4S-10	3.6	3.9	4.1	6.4	7.9	8.8	9.7
6H-10	4.5	5.0	5.4	10.1	13.1	15.1	17.1
6H-20	2.3	2.6	2.8	5.7	7.5	8.7	9.9
6H-30	1.8	2.0	2.1	3.7	4.7	5.4	6.0
6H-50	1.1	1.3	1.4	2.5	3.2	3.7	4.2
6H-52	1.3	1.5	1.6	3.3	4.4	5.2	6.0
6H-54	1.3	1.5	1.6	3.2	4.2	4.8	5.5
6H-56	2.0	2.3	2.5	4.8	6.3	7.3	8.4
6H-60	1.1	1.2	1.3	2.3	2.9	3.3	3.7
6H-65	1.5	1.7	1.8	3.2	4.0	4.6	5.2
6H-67	1.3	1.4	1.5	2.7	3.5	4.0	4.5
6H-70	1.9	2.1	2.3	3.9	4.8	5.5	6.2
6H-80	5.3	5.8	6.1	10.7	13.4	15.2	17.1

Maximum stages reached during the various design storm events are summarized in Table 3-69. Expected flood depths are summarized in Table 3-70. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-69: Basin 6H Maximum Stages During Various Design Storm Events

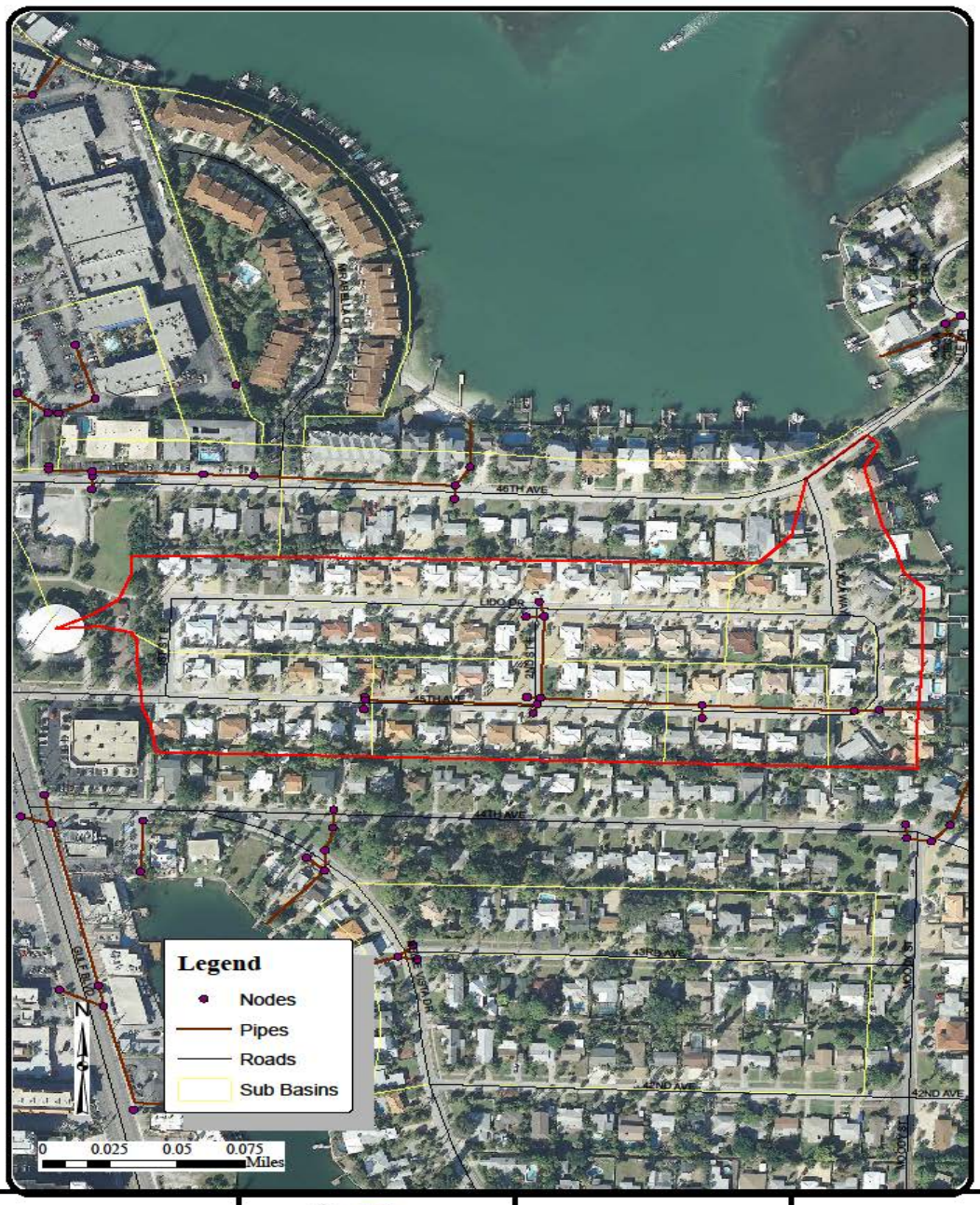
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6H-ST-10	1.80	2.58	2.62	2.65	3.01	3.16	3.23	3.30
6H-ST-20	2.50	2.58	2.62	2.65	3.01	3.16	3.23	3.30
6H-ST-30	1.90	2.58	2.62	2.65	3.01	3.16	3.23	3.29
6H-ST-50	1.85	2.57	2.62	2.65	3.01	3.15	3.22	3.28
6H-ST-52	2.25	2.58	2.62	2.65	3.01	3.16	3.23	3.29
6H-ST-54	2.20	2.58	2.62	2.65	3.01	3.16	3.23	3.29
6H-ST-55	2.40	2.58	2.62	2.65	3.01	3.15	3.22	3.29
6H-ST-56	1.70	2.58	2.62	2.65	3.01	3.15	3.22	3.29
6H-ST-57	2.25	2.57	2.62	2.65	3.01	3.15	3.22	3.29
6H-ST-60	1.60	2.57	2.61	2.65	3.01	3.15	3.22	3.28
6H-ST-65	2.40	2.57	2.61	2.64	3.00	3.14	3.21	3.27
6H-ST-67	2.50	2.57	2.61	2.64	3.00	3.14	3.21	3.27
6H-ST-70	3.00	2.48	2.56	2.60	2.98	3.12	3.18	3.24
6H-ST-80	2.80	2.42	2.49	2.53	2.86	2.95	3.00	3.06

Table 3-70: Basin 6H Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
6H-ST-10	9.4	9.8	10.2	14.5	16.3	17.2	18.0
6H-ST-20	1.0	1.4	1.8	6.1	7.9	8.8	9.6
6H-ST-30	8.2	8.6	9.0	13.3	15.1	16.0	16.7
6H-ST-50	8.6	9.2	9.6	13.9	15.6	16.4	17.2
6H-ST-52	4.0	4.4	4.8	9.1	10.9	11.8	12.5
6H-ST-54	4.6	5.0	5.4	9.7	11.5	12.4	13.1
6H-ST-55	2.2	2.6	3.0	7.3	9.0	9.8	10.7
6H-ST-56	10.6	11.0	11.4	15.7	17.4	18.2	19.1
6H-ST-57	3.8	4.4	4.8	9.1	10.8	11.6	12.5
6H-ST-60	11.6	12.1	12.6	16.9	18.6	19.4	20.2
6H-ST-65	2.0	2.5	2.9	7.2	8.9	9.7	10.4
6H-ST-67	0.8	1.3	1.7	6.0	7.7	8.5	9.2
6H-ST-70	0.0	0.0	0.0	0.0	1.4	2.2	2.9
6H-ST-80	0.0	0.0	0.0	0.7	1.8	2.4	3.1

Identified Problem Areas

This area is predicted to experience flooding at even normal storm events and up to 19-inches of standing water during the 100-year storm event.



CPWG CRISE PIRLINCK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 6-H 45TH AVENUE AND 2ND STREET E NODAL MAP	FIGURE 3-14

3.15 Basin 7A: 40th Avenue and Belle Vista Drive

Sub-Basin Description

Basin 7A is located in the middle drainage section of the City along 40th Avenue and Belle Vista Drive. The land use is primarily residential. The primary drainage basin area is divided into 3 sub-basins as summarized in Table 3-71. Stormwater sheet flows west down 40th Avenue and is captured by one of three inlets. Flow is conveyed across 40th Avenue through an 18x12-inch ERCP. Stormwater is conveyed through a 24-inch RCP under Belle Vista Drive. A 36x22-inch ERCP outfall is located along the lot line of two houses and to Boca Ciega Bay. The outfall culvert is installed within a seawall. Piping information for this basin is summarized in Table 3-72. The nodal map with aerial background for Basin 7A is presented in Figure 3-15.

Table 3-71: Basin 7A Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
7A-10	10	3.16	58.66	16.77
7A-20	10	4.59	63.10	10.68
7A-30	10	0.43	82.57	18.60

Table 3-72: Basin 7A Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
7A-RST-10	7A	40th Avenue and Belle Vista Drive	7A-ST-10	7A-ST-20	1	37	18 x 12 Horz Ellipse
7A-RST-20	7A	40th Avenue and Belle Vista Drive	7A-ST-20	7A-ST-30	1	50	24 Circular
7A-RST-30	7A	40th Avenue and Belle Vista Drive	7A-ST-30	TW	1	148	36 x 22 Horz Ellipse

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin **7**A is summarized in Table 3-73.

Table 3-73: Basin 7A Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
7A-10	2.8	3.2	3.5	7.4	10.1	11.9	13.7
7A-20	4.4	5.1	5.5	11.6	15.6	18.3	21.1
7A-30	0.9	1.0	1.0	1.7	2.1	2.4	2.6

Maximum stages reached during the various design storm events are summarized in Table 3-74. Expected flood depths are summarized in Table 3-75. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-74: Basin 7A Maximum Stages During Various Design Storm Events

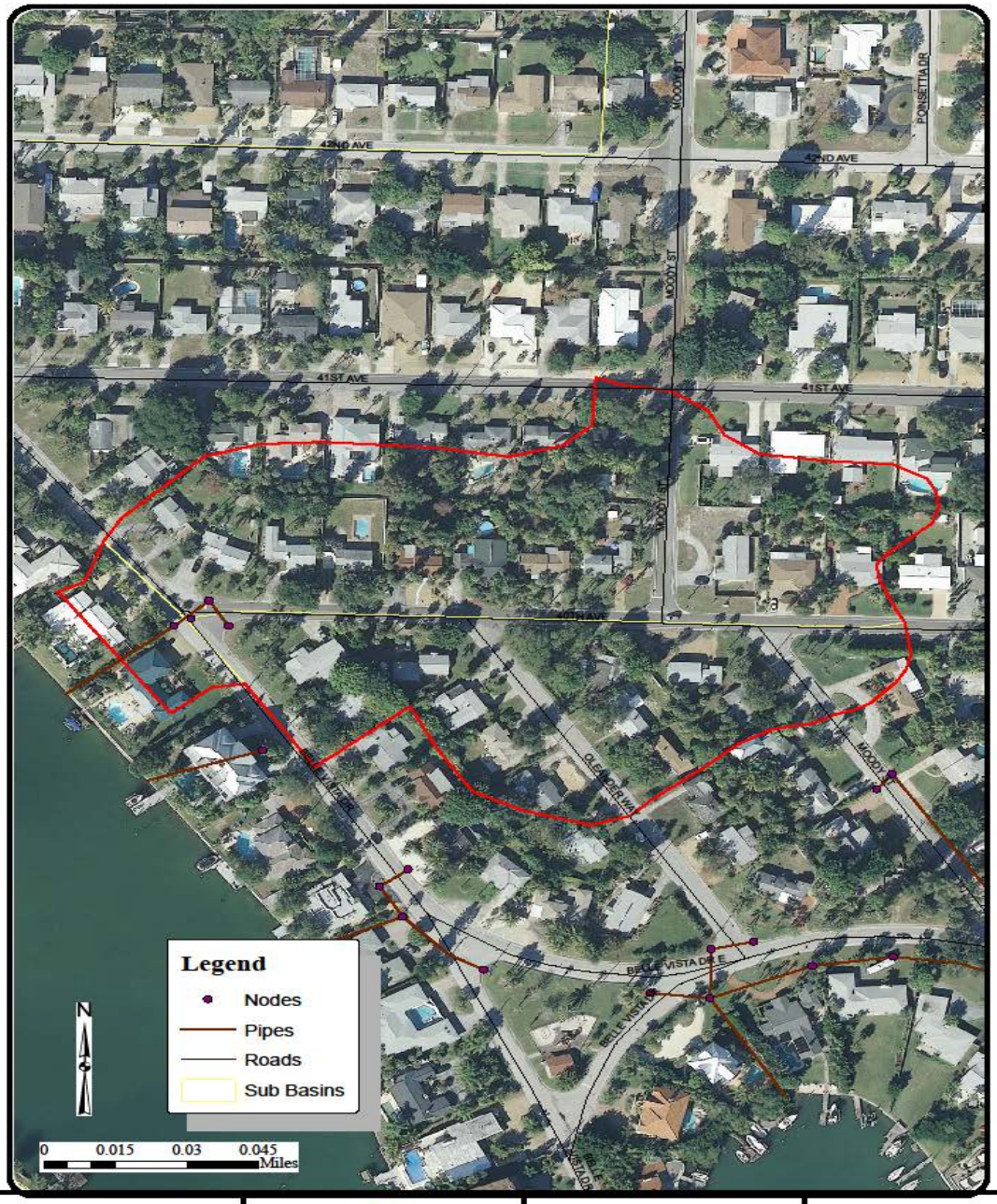
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
7A-ST-10	1.70	0.77	0.91	1.01	1.85	2.06	2.23	2.32
7A-ST-20	1.50	0.62	0.71	0.78	1.68	2.01	2.19	2.28
7A-ST-30	2.00	0.43	0.47	0.50	1.26	1.90	2.10	2.18

Table 3-75: Basin 7A Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
7A-ST-10	0.0	0.0	0.0	1.8	4.3	6.4	7.4
7A-ST-20	0.0	0.0	0.0	2.2	6.1	8.3	9.4
7A-ST-30	0.0	0.0	0.0	0.0	0.0	1.2	2.2

Identified Problem Areas

The model predicts flooding between 2 and 10 inches at the intersection of Belle Vista Drive and 40th Avenue. Addition inlets and pipes capacity would be need to address the problem.



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CITY OF ST. PETE BEACH
STORMWATER MASTER PLAN

PINELLAS COUNTY, FLORIDA

ST. PETE BEACH
7-A
40TH AVENUE AND
BELLE VISTA DRIVE
NODAL MAP

FIGURE
3-15

3.16 Basin 7S: 43rd Avenue and Belle Vista Drive

Sub-Basin Description

Basin 7S is located in the middle drainage section of the City along 43rd Avenue and Belle Vista Drive The land use is primarily residential. The primary drainage basin area is divided into 3 sub-basins as summarized in Table 3-76. The stormwater sheet flows west down 43rd Avenue and enters one of three inlets. 12-inch RCP pipes connect the inlets under Belle Vista Drive. The system outfalls through an 18-inch RCP between the lot line of two houses. The outfall culvert is installed within a seawall that discharges to Boca Ciega Bay. Piping information for the basin is summarized in Table 3-77. The nodal map with aerial background for Basin 7S is presented in Figure 3-16.

Table 3-76: Basin 7S Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
7S-10	10	3.58	66.73	9.78
7S-20	10	6.15	70.87	7.32
7S-30	10	0.90	79.41	13.33

Table 3-77: Basin 7S Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
7S-RST-10	7S	43th Avenue and Belle Vista Drive	7S-ST-10	7S-ST-30	1	39	12 Circular
7S-RST-20	7S	43th Avenue and Belle Vista Drive	7S-ST-20	7S-ST-30	1	35	12 Circular
7S-RST-30	7S	43th Avenue and Belle Vista Drive	7S-ST-30	TW	1	143	18 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 7S is summarized in Table 3-78.

Table 3-78: Basin 7S Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
7S-10	4.0	4.6	4.9	9.9	13.1	15.3	17.5
7S-20	8.0	9.0	9.6	18.7	24.3	28.2	32.0
7S-30	1.7	1.8	1.9	3.3	4.2	4.7	5.3

Maximum stages reached during the various design storm events are summarized in Table 3-79. Expected flood depths are summarized in Table 3-80. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-79 Basin 7S Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
7S-ST-10	2.61	2.97	3.04	3.07	3.42	3.55	3.61	3.67
7S-ST-20	2.94	3.06	3.09	3.11	3.43	3.56	3.63	3.69
7S-ST-30	2.90	2.96	3.03	3.07	3.42	3.54	3.60	3.66

Table 3-80 Basin 7S Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
7S-ST-10	4.3	5.2	5.5	9.7	11.3	12.0	12.7
7S-ST-20	1.4	1.8	2.0	5.9	7.4	8.3	9.0
7S-ST-30	0.7	1.6	2.0	6.2	7.7	8.4	9.1

Identified Problem Areas

The model predicts 3 to 12 inches of flooding in this area. Additional inlets and increased pipes sizes may be needed in this area.

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3.17 Basin 7V Gulf Boulevard and 36th Avenue

Sub-Basin Description

Basin 7V is located in the south drainage section of the City along Gulf Boulevard (FDOT maintained road) between just north of 37th Avenue and 35th Avenue (Pinellas Bayway). The area is a mix of commercial and residential land uses. The primary drainage basin area is divided into 14 sub-basins as summarized in Table 3-81. Stormwater flows north from 35th Avenue along Gulf Boulevard through a 30-inch RCP until 36th Avenue. Stormwater also flow south along Gulf Boulevard in a series of 15-inch, 18-inch and 24-inch RCP pipes. At 36th Street, flow is eastward towards the outfall at Boca Ciega Bay. The piping system along 36th Avenue is comprised entirely of 36-inch RCP. There is 16-inch PVC pipe installed in the seawall at the outfall that is flush with the existing ground/pavement. The PVC pipe allows seawater to flood the local streets during high tides. To the north of the outfall, an entire section of seawall is missing, allowing tidal waters to flood the street on 37th Avenue. The outfall culvert is installed within a seawall. Piping information for the basin is summarized in Table 3-80. The nodal map with aerial background for Basin 7V is presented in Figure 3-17.

Table 3-81: Basin 7V Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
7V-10	10	3.16	52.63	4.75
7V-20	10	1.07	72.97	38.32

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
7V-30	10	1.42	80.12	30.28
7V-40	10	1.51	60.91	7.28
7V-50	10	2.13	62.29	11.27
7V-70	10	2.32	78.33	23.71
7V-80	10	0.84	79.49	38.10
7V-90	10	1.91	71.22	20.42
7V-110	10	0.07	78.33	57.14
7V-115	10	0.56	64.03	41.07
7V-140	10	4.37	64.29	8.01
7V-150	10	1.57	65.75	12.10
7V-170	10	1.43	76.56	18.18
7V-SEAWALL	10	3.36	71.41	16.67

Table 3-82: Basin 7V Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
7V-RST-10	7V	Gulf Blvd	7V-ST-10	7V-ST-20	1	295	29 Circular
7V-RST-20	7V	Gulf Blvd	7V-ST-20	7V-ST-30	1	65	30 Circular
7V-RST-30	7V	Gulf Blvd	7V-ST-30	7V-ST-60	1	322	30 Circular
7V-RST-40	7V	Gulf Blvd	7V-ST-40	7V-ST-50	1	36	15 Circular
7V-RST-50	7V	Gulf Blvd	7V-ST-50	7V-ST-60	1	80	15 Circular
7V-RST-60	7V	Gulf Blvd	7V-ST-60	7V-ST-120	1	105	36 Circular
7V-RST-70	7V	Gulf Blvd	7V-ST-70	7V-ST-80	1	65	15 Circular
7V-RST-80	7V	Gulf Blvd	7V-ST-80	7V-ST-60	1	270	24 Circular
7V-RST-90	7V	Gulf Blvd	7V-ST-100	7V-ST-90	1	73	15 Circular
7V-RST-100	7V	Gulf Blvd	7V-ST-110	7V-ST-90	1	51	15 Circular
7V-RST-110	7V	Gulf Blvd	7V-ST-90	7V-ST-80	1	186	18 Circular
7V-RST-115	7V	Gulf Blvd	7V-ST-115	7V-ST-110	1	17	15 Circular
7V-RST-120	7V	36th Avenue	7V-ST-120	7V-ST-130	1	109	36 Circular
7V-RST-130	7V	36th Avenue	7V-ST-130	7V-ST-160	1	44	36 Circular
7V-RST-140	7V	36th Avenue	7V-ST-140	7V-ST-160	1	16	15 Circular

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
7V-RST-150	7V	36th Avenue	7V-ST-150	7V-ST-160	1	18	15 Circular
7V-RST-160	7V	36th Avenue	7V-ST-160	7V-ST-170	1	107	36 Circular
7V-RST-170	7V	36th Avenue	7V-ST-170	TW	1	168	36 Circular
7V-RST-170A	7V	36th Avenue	7V-ST-170	TW	1	6	16 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 7-V is summarized in Table 3-83.

Table 3-83: Basin 7V Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
7V-10	1.2	1.5	1.7	5.0	7.3	9.0	10.7
7V-20	2.0	2.2	2.3	3.9	4.9	5.5	6.2
7V-30	2.9	3.2	3.3	5.5	6.9	7.7	8.6
7V-40	1.2	1.4	1.5	3.4	4.7	5.6	6.5
7V-50	2.0	2.3	2.5	5.3	7.1	8.4	9.7
7V-70	4.4	4.8	5.1	8.7	10.8	12.3	13.7
7V-80	1.8	1.9	2.0	3.3	4.1	4.6	5.1
7V-90	2.9	3.2	3.4	6.2	8.0	9.2	10.4
7V-SEAWALL	4.9	5.5	5.9	10.8	13.9	16.0	18.1
7V-110	0.2	0.2	0.2	0.3	0.4	0.4	0.4
7V-115	0.9	1.0	1.0	1.8	2.3	2.7	3.0
7V-140	4.3	4.9	5.3	11.2	15.0	17.6	20.3
7V-150	1.8	2.0	2.1	4.3	5.7	6.7	7.6
7V-170	2.5	2.7	2.9	5.1	6.4	7.3	8.2

Maximum stages reached during the various design storm events are summarized in Table 3-84. Expected flood depths are summarized in Table 3-85. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-84: Basin 7V Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
7V-ST-10	4.22	1.56	1.83	1.97	3.05	3.37	3.51	3.65
7V-ST-100	3.70	2.52	2.92	3.14	3.59	3.73	3.78	3.82
7V-ST-110	3.70	2.34	2.70	2.88	3.36	3.45	3.57	3.70
7V-ST-115	2.90	2.35	2.71	2.89	3.37	3.45	3.58	3.70
7V-ST-120	2.10	1.29	1.50	1.60	2.19	2.27	2.32	2.36
7V-ST-130	1.85	1.11	1.29	1.37	1.89	2.01	2.07	2.13
7V-ST-140	2.20	1.22	1.44	1.54	2.23	2.33	2.38	2.42
7V-ST-150	2.20	1.02	1.18	1.27	1.80	1.96	2.05	2.13
7V-ST-160	1.75	0.98	1.13	1.20	1.65	1.81	1.88	1.95
7V-ST-170	1.60	0.68	0.76	0.80	1.04	1.11	1.19	1.30
7V-ST-20	3.62	1.56	1.82	1.97	2.99	3.26	3.38	3.49
7V-ST-30	4.22	1.55	1.81	1.95	2.93	3.17	3.28	3.38
7V-ST-40	4.22	1.76	2.10	2.30	3.86	4.19	4.30	4.37
7V-ST-50	4.22	1.74	2.07	2.26	3.75	4.06	4.25	4.34
7V-ST-60	3.20	1.47	1.70	1.83	2.56	2.72	2.82	2.93
7V-ST-70	3.50	2.48	2.74	2.82	3.45	3.58	3.63	3.70
7V-ST-80	4.22	2.05	2.34	2.46	3.11	3.37	3.54	3.67
7V-ST-90	3.30	2.32	2.68	2.86	3.34	3.43	3.56	3.69

Table 3-85: Basin 7V Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
7V-ST-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-100	0.0	0.0	0.0	0.0	0.4	1.0	1.4
7V-ST-110	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-115	0.0	0.0	0.0	5.6	6.6	8.2	9.6
7V-ST-120	0.0	0.0	0.0	1.1	2.0	2.6	3.1
7V-ST-130	0.0	0.0	0.0	0.5	1.9	2.6	3.4
7V-ST-140	0.0	0.0	0.0	0.4	1.6	2.2	2.6
7V-ST-150	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-160	0.0	0.0	0.0	0.0	0.7	1.6	2.4
7V-ST-170	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-40	0.0	0.0	0.0	0.0	0.0	1.0	1.8
7V-ST-50	0.0	0.0	0.0	0.0	0.0	0.4	1.4
7V-ST-60	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-70	0.0	0.0	0.0	0.0	1.0	1.6	2.4
7V-ST-80	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7V-ST-90	0.0	0.0	0.0	0.5	1.6	3.1	4.7

Identified Problem Areas

The model predicts flooding of up to 9 inches in this basin. The contours in this area form a bowl at elevation 1.2 feet at the intersection of 36th Avenue and Casablanca Avenue. Even normal tides cause street flooding in the area.

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STORMWATER MASTER PLAN

PINELLAS COUNTY, FLORIDA

ST. PETE BEACH
7-V
GULF BOULEVARD AND 36TH AVENUE NODAL MAP

FIGURE
3-17

3.18 Basin 8P: W Vina Del Mar Blvd between Lee Pl and Hermosita Dr.

Sub-Basin Description

Basin 8P is located in the south drainage section of the City along W. Vista Del Mar Boulevard between Hermosita Drive and Lee Place. The area is residential in nature. The primary drainage basin area is divided into 2 sub-basins as summarized in Table 3-86. The stormwater is collected by two inlets on W. Vina Del Mar Boulevard. These inlets are connected by a 12-inch RCP. The system discharges between two houses through a 15-RCP into Boca Ciega Bay. The outfall culvert is installed within a seawall. Piping information for the basin is summarized in Table 3-87. The nodal map with aerial background for Basin 8P is presented in Figure 3-18.

Table 3-86: Basin 8P Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
8P-10	10	3.54	78.15	11.02
8P-20	10	2.01	83.54	13.43

Table 3-87: Basin 8P Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
8P-RST-10	8P	W Vina Del Mar south of Lee Pl	8P-ST-10	8P-ST-20	1	28	12 Circular
8P-RST-20	8P	W Vina Del Mar south of Lee Pl	8P-ST-20	TW	1	129	15 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 8P is summarized in Table 3-88.

Table 3-88: Basin 8P Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
8P-10	6.2	6.8	7.2	12.7	16.1	18.3	20.5
8P-20	4.1	4.5	4.8	7.9	9.8	11.1	12.3

Maximum stages reached during the various design storm events are summarized in Table 3-89. Expected flood depths are summarized in Table 3-90. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-89: Basin 8P Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
8P-ST-10	4.01	4.15	4.16	4.17	4.29	4.36	4.41	4.45
8P-ST-20	3.80	3.93	3.95	3.96	4.11	4.18	4.22	4.27
9O-ST-60	2.25	0.62	0.71	0.78	1.82	2.29	2.31	2.32

Table 3-90: Basin 8P Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
8P-ST-10	1.7	1.8	1.9	3.4	4.2	4.8	5.3
8P-ST-20	1.6	1.8	1.9	3.7	4.6	5.0	5.6

Identified Problem Areas

The model predicts 2 to 6 inches of flooding in this basin. The storm pipe sizes are reversed as it appears that a 15-inch pipe is flowing into the 12-inch outfall pipe. A standing water condition also exists on W Vina Del Mar Boulevard.

CPWG CRISE PIRLINCK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 8-P W VINA DEL MAR BLVD BETWEEN LEE PL AND HERMOSITA DR NODAL MAP	FIGURE 3-18

3.19 Basin 9C W Vina Del Mar Blvd between Tessier Dr. and Mar St.

Sub-Basin Description

Basin 9C is located in the south drainage section of the City along W Vista Del Mar Boulevard between Mar Street and South Tessier Drive. The area is residential. The primary drainage basin area is divided into 2 sub-basins as summarized in Table 3-91. The stormwater is collected by two inlet on W Vina Del Mar Boulevard. These inlets are connected by a 18-inch RCP. The system discharges along the lot line of two houses through a 12-RCP into Boca Ciega Bay. The outfall culvert is installed within a seawall. Piping information for this basin is summarized in Table 3-92. The nodal map with aerial background for Basin 9C is presented in Figure 3-19.

Table 3-91: Basin 9C Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
9C-10	10	2.93	75.00	0.00
9C-20	10	1.72	75.00	0.00

Table 3-92: Basin 9C Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
9C-RST-10	9C	W Vina Del Mar south of Tessier Dr	9C-ST-10	9C-ST-20	1	32	18 Circular
9C-RST-20	9C	W Vina Del Mar south of Tessier Dr	9C-ST-20	TW	1	124	12 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 9C is summarized in Table 3-93.

Table 3-93: Basin 9C Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
9C-10	4.2	4.7	5.0	9.5	12.3	14.1	16.0
9C-20	2.5	2.8	3.0	5.6	7.2	8.3	9.4

Maximum stages reached during the various design storm events are summarized in Table 3-94. Expected flood depths are summarized in Table 3-95. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-94: Basin 9C Maximum Stages During Various Design Storm Events

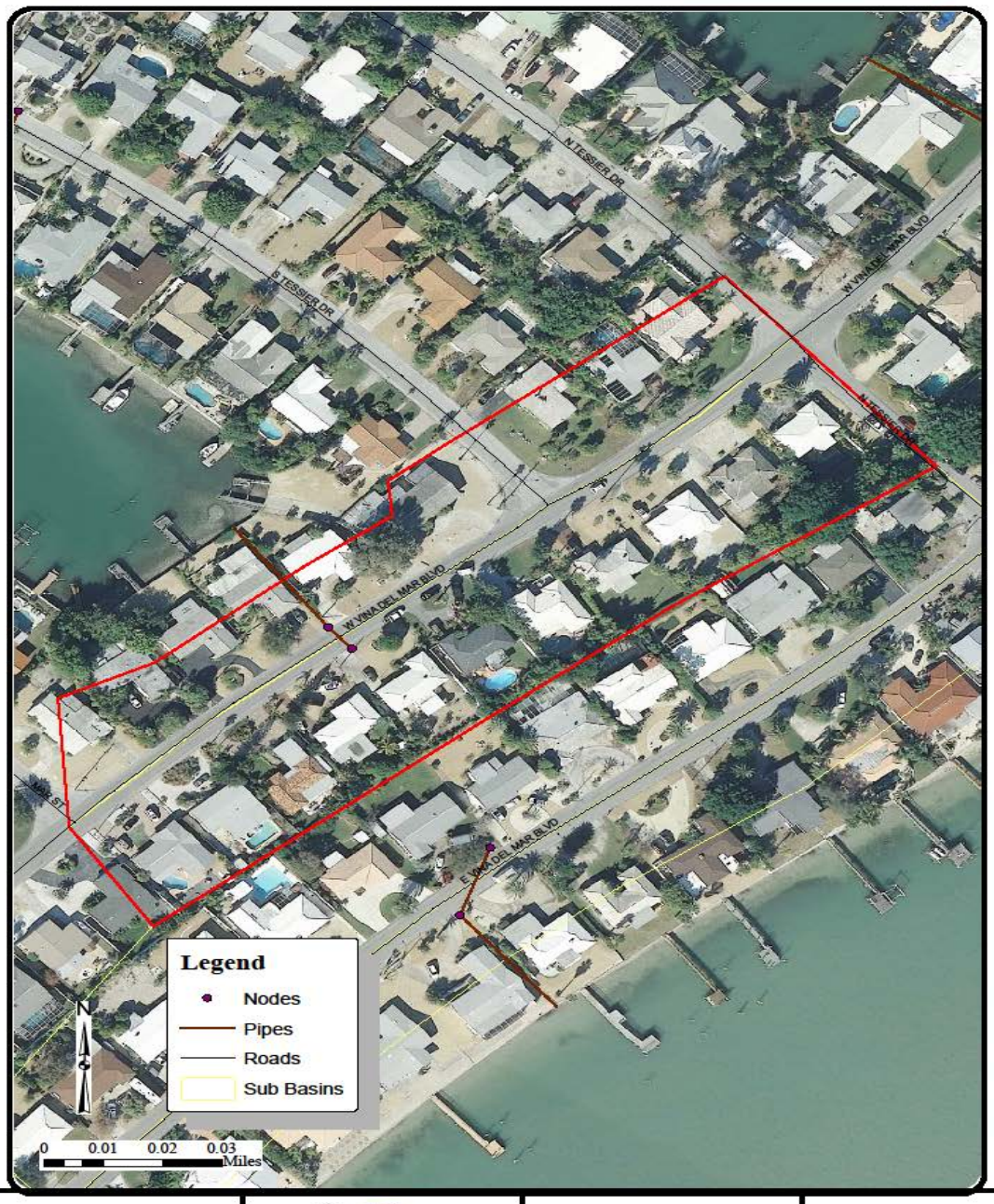
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9C-ST-10	4.80	4.81	4.87	4.88	4.97	5.04	5.08	5.12
9C-ST-20	4.73	4.53	4.74	4.81	4.96	5.02	5.06	5.10

Table 3-95: Basin 9C Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9C-ST-10	0.1	0.8	1.0	2.0	2.9	3.4	3.8
9C-ST-20	0.0	0.1	1.0	2.8	3.5	4.0	4.4

Identified Problem Areas

The model predicts 5 inches of flooding within the basin. The storm pipe sizes are reversed as it appears that a 18-inch pipe is flowing into the 12-inch outfall pipe



CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 9-C W VINA DEL MAR BLVD BETWEEN TESSIER DR. AND MAR ST. NODAL MAP	FIGURE 3-19

3.20 Basin 9D: E Vina Del Mar Blvd south of 21st Avenue

Sub-Basin Description

Basin 9D is located in the south drainage section of the City at the southern end of E Vista Del Mar Boulevard, south of 21st Avenue. The area is residential. The primary drainage basin area is divided into 2 sub-basins as summarized in Table 3-96. The stormwater is collected by two inlets on E Vina Del Mar Boulevard. These inlets are connected by a 18-inch RCP. The system discharges along the lot line of two houses through a 24-RCP into Boca Ciega Bay. The outfall culvert is installed within a seawall. Piping information for the basin is summarized in Table 3-97. The nodal map with aerial background for Basin 9D is presented in Figure 3-20.

Table 3-96: Basin 9D Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
9D-10	10	2.05	75.00	0.00
9D-20	10	2.42	75.00	0.00

Table 3-97: Basin 9D Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
9D-RST-10	9D	E Vina Del Mar south of 21st Ave	9D-ST-10	9D-ST-20	1	27	18 Circular
9D-RST-20	9D	E Vina Del Mar south of 21st Ave	9D-ST-20	TW	1	128	24 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 9D is summarized in Table 3-98.

Table 3-98: Basin 9D Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
9D-10	2.9	3.3	3.5	6.6	8.6	9.9	11.2
9D-20	3.5	3.9	4.2	7.8	10.1	11.7	13.2

Maximum stages reached during the various design storm events are summarized in Table 3-99. Expected flood depths are summarized in Table 3-100. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-99: Basin 9D Maximum Stages During Various Design Storm Events

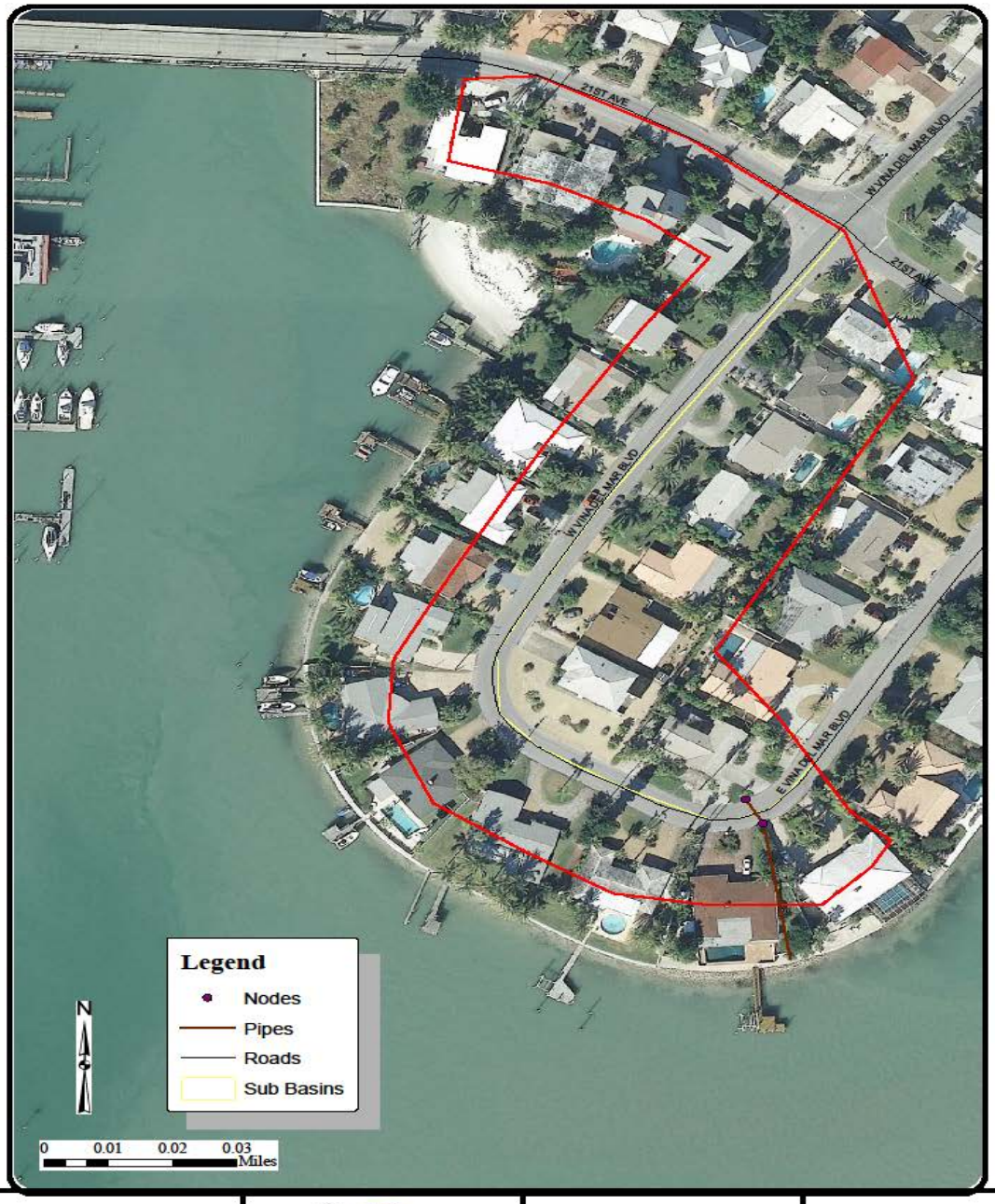
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9D-ST-10	6.02	3.51	3.57	3.62	4.14	4.48	4.77	5.09
9D-ST-20	4.97	0.48	0.53	0.57	1.34	2.03	2.52	2.97

Table 3-100: Basin 9D Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9D-ST-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9D-ST-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Identified Problem Areas

The model predicts that the outfall pipes are large enough to handle the flow. The inlet receives runoff from the bridge, nearly 1,000 feet away. Addition inlets and pipes may be needed to reduce standing water, high sheet flow elevations, and high sheet flow velocities.



CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-381-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 9-D E VINA DEL MAR BLVD SOUTH OF 21ST AVENUE NODAL MAP	FIGURE 3-20

3.21 Basin 9F: E Vina Del Mar Blvd between 21st Avenue and N Tessier Dr.

Sub-Basin Description

Basin 9F is located in the south drainage section of the City along E Vina Del Mar Boulevard between 21st Avenue and N Tessier Drive. The area is residential. The primary drainage basin area is divided into 2 sub-basins as summarized in Table 3-101. The stormwater is collected by two inlets on E Vina Del Mar Boulevard. These inlets are connected by a 12-inch RCP. The system discharges along the lot line of two houses through an 18-RCP into Boca Ciega Bay. The outfall culvert is installed within a seawall. Piping information for the basin is summarized in Table 3-102. The nodal map with aerial background for Basin 9F is presented in Figure 3-21.

Table 3-101: Basin 9F Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
9F-10	10	3.37	75.00	0.00
9F-20	10	2.25	75.00	0.00

Table 3-102: Basin 9F Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
9F-RST-10	9F	E Vina Del Mar south of Tessier Dr	9F-ST-10	9F-ST-20	1	54	12 Circular
9F-ST-20	9F	E Vina Del Mar south of Tessier Dr	9F-ST-20	TW	1	135	18 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 9F is summarized in Table 3-103.

Table 3-103: Basin 9F Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
9F-10	4.8	5.4	5.8	10.9	14.1	16.2	18.4
9F-20	3.2	3.6	3.9	7.3	9.4	10.8	12.3

Maximum stages reached during the various design storm events are summarized in Table 3-104. Expected flood depths are summarized in Table 3-105. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-104: Basin 9F Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9F-ST-10	4.50	4.52	4.56	4.58	4.78	4.87	4.92	4.97
9F-ST-20	4.52	3.17	3.37	3.52	4.67	4.76	4.81	4.86

Table 3-105: Basin 9F Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9F-ST-10	0.2	0.7	1.0	3.4	4.4	5.0	5.6
9F-ST-20	0.0	0.0	0.0	1.8	2.9	3.5	4.1

Identified Problem Areas

The model predicts standing water for even the 2-year storm event and nearly 6 inches of standing water during the 100-year storm event.

CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 9-F E VINA DEL MAR BLVD BETWEEN 21ST AVE AND N TESSIER DR. NODAL MAP	FIGURE 3-21

3.22 Basin 9O: Pass-a-Grill Way At 14th Avenue

Sub-Basin Description

Basin 9O is located in the south drainage section of the City along 14th Avenue at the intersection with Pass-A-Grill Way. The area is primarily residential. The primary drainage basin area is divided into 6 sub-basins as summarized in Table 3-106. Stormwater flows north through a 12-inch RCP from mid-block in the alleyway just south of 13th Avenue. The stormwater continues to flow east through a 12-inch RCP to Pass-a-Grill Way. From Pass-a-Grill Way the system discharges through an 18-inch RCP into Boca Ciega Bay. The outfall culvert is installed within a seawall. Piping information for the basin is summarized in Table 3-107. The nodal map with aerial background for Basin 9O is presented in Figure 3-22.

Table 3-106:Basin 9O Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
9O-10	10	0.35	69.39	5.71
9O-20	10	0.69	69.59	20.29
9O-30	10	0.28	50.80	28.57
9O-40	10	1.59	67.44	12.58
9O-50	10	0.25	44.90	20.00
9O-60	10	0.39	67.61	15.38

Table 3-107: Basin 9O Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
9O-RST-10	9O	Pass-a-Grill at 14th Avenue	9O-ST-10	9O-ST-20	1	107	12 Circular
9O-RST-20	9O	Pass-a-Grill at 14th Avenue	9O-ST-20	9O-ST-30	1	115	12 Circular
9O-RST-30	9O	Pass-a-Grill at 14th Avenue	9O-ST-30	9O-ST-40	1	28	12 Circular
9O-RST-40	9O	Pass-a-Grill at 14th Avenue	9O-ST-40	9O-ST-50	1	39	18 Circular
9O-RST-50	9O	Pass-a-Grill at 14th Avenue	9O-ST-50	TW	1	98	18 Circular
9O-RST-60	9O	Pass-a-Grill at 14th Avenue	9O-ST-60	9O-ST-50	1	241	12 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 9O is summarized in Table 3-108.

Table 3-108: Basin 9O Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
9O-10	0.4	0.5	0.5	1.0	1.3	1.6	1.8
9O-20	1.0	1.1	1.2	2.2	2.8	3.2	3.7
9O-30	0.3	0.3	0.3	0.6	0.8	1.0	1.1
9O-40	1.9	2.2	2.3	4.6	6.0	7.0	8.0
9O-50	0.1	0.2	0.2	0.4	0.6	0.7	0.8
9O-60	0.5	0.6	0.6	1.2	1.5	1.7	2.0

Maximum stages reached during the various design storm events are summarized in Table 3-109. Expected flood depths are summarized in Table 3-110. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-109: Basin 9O Maximum Stages During Various Design Storm Events

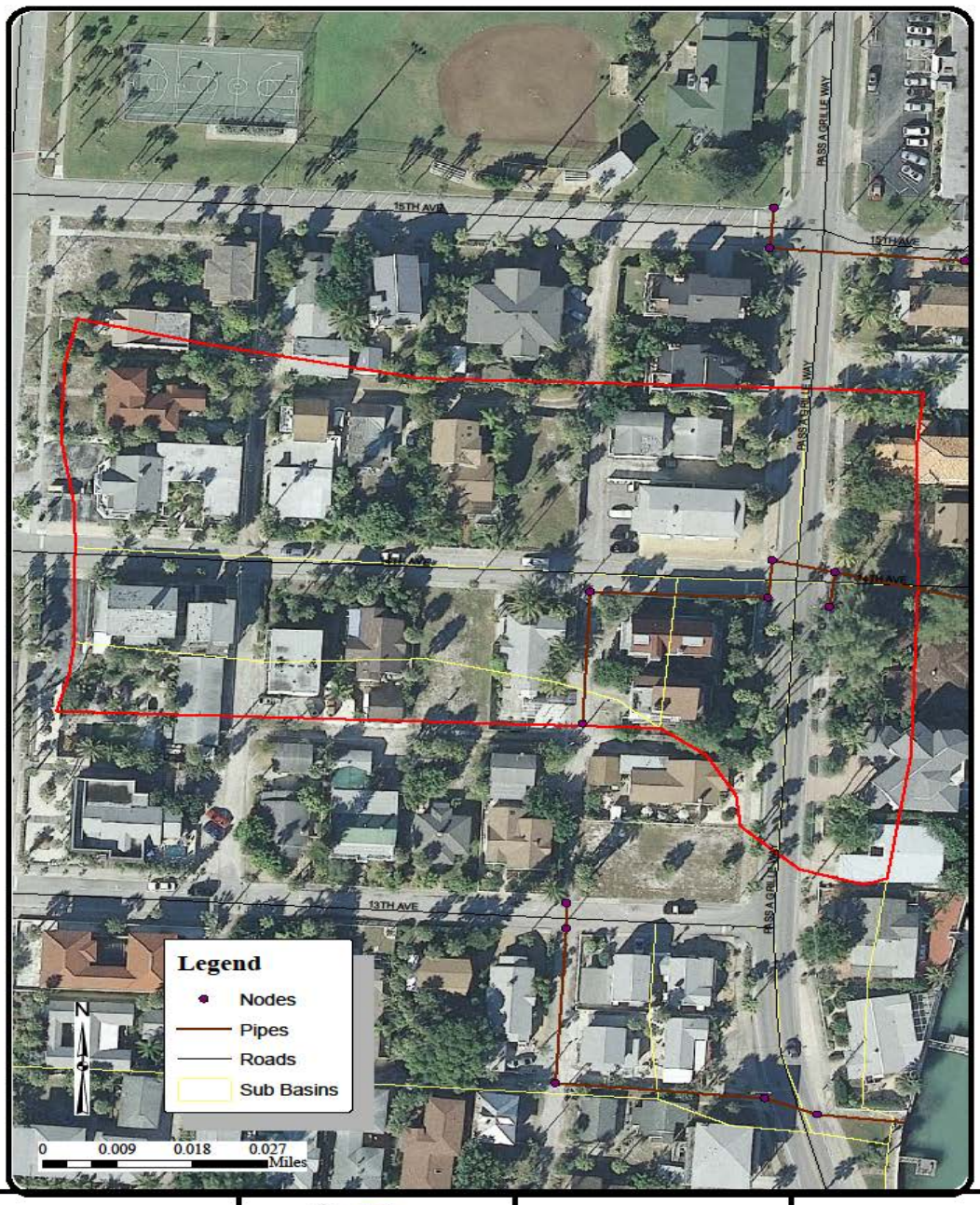
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9O-ST-10	2.50	1.35	1.51	1.62	2.52	2.54	2.56	2.57
9O-ST-20	2.40	1.33	1.49	1.59	2.47	2.50	2.52	2.54
9O-ST-30	2.05	1.13	1.23	1.30	2.16	2.31	2.36	2.41
9O-ST-40	2.10	1.01	1.09	1.14	2.10	2.28	2.34	2.38
9O-ST-50	2.12	0.57	0.66	0.71	1.57	2.14	2.21	2.26
9O-ST-60	2.25	0.62	0.71	0.78	1.82	2.29	2.31	2.32

Table 3-110: Basin 9O Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
9O-ST-10	0.0	0.0	0.0	0.2	0.5	0.7	0.8
9O-ST-20	0.0	0.0	0.0	0.8	1.2	1.4	1.7
9O-ST-30	0.0	0.0	0.0	1.3	3.1	3.7	4.3
9O-ST-40	0.0	0.0	0.0	0.0	2.2	2.9	3.4
9O-ST-50	0.0	0.0	0.0	0.0	0.2	1.1	1.7
9O-ST-60	0.0	0.0	0.0	0.0	0.5	0.7	0.8

Identified Problem Areas

The alleyway in the drainage basin is predicted to flood by 1 to 4 inches. Additional inlets and increased pipes sizes may be needed to reduce the risk of flooding. Based on the ground elevations, the basin could be experiencing tidal flooding.



CPWG CRISE PHRUBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **9-O** **PASS-A-GRILL WAY** **AT 14TH AVENUE** **NODAL MAP**	FIGURE 3-22

3.23 Basin 10A: Pass-a-Grill Way between 12th Avenue and 13th Avenue

Sub-Basin Description

Basin 10A is located in the south drainage section of the City between 12th Avenue and 13th Avenue at the intersection with Pass-A-Grill Way. The primary drainage basin area is divided into 5 sub-basins as summarized in Table 3-111. Stormwater flows south from 13th Avenue down an alleyway though a 12-inch RCP. At mid-block the pipe turns and flows east between the lot line of two houses through an 18-inch RCP towards Boca Ciega Bay. The system outfalls through an 18x12-inch ERCP through a seawall into the Bay. Piping information for this basin is summarized in Table 3-112. The nodal map with aerial background for Basin 10A is presented in Figure 3-23.

Table 3-111: Basin 10A Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
10A-10	10	1.48	68.26	15.54
10A-20	10	0.85	63.84	10.59
10A-30	10	0.36	52.88	5.56
10A-40	10	0.28	67.10	21.43
10A-50	10	0.26	68.50	23.08

Table 3-112: Basin 10A Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
10A-RST-10	10A	Pass-a-Grill b/w 12th and 13th Avenue	10A-ST-10	10A-ST-20	1	16	12 Circular
10A-RST-20	10A	Pass-a-Grill b/w 12th and 13th Avenue	10A-ST-20	10A-ST-30	1	116	12 Circular
10A-RST-30	10A	Pass-a-Grill b/w 12th and 13th Avenue	10A-ST-30	10A-ST-40	1	121	18 Circular

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 10A is summarized in Table 3-113.

Table 3-113: Basin 10A Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
10A-10	1.9	2.2	2.3	4.4	5.8	6.7	7.6
10A-20	0.9	1.0	1.1	2.2	2.9	3.4	4.0
10A-30	0.2	0.2	0.2	0.6	0.9	1.0	1.2
10A-40	0.4	0.4	0.5	0.9	1.1	1.3	1.4
10A-50	0.4	0.4	0.4	0.8	1.1	1.2	1.4

Maximum stages reached during the various design storm events are summarized in Table 3-114. Expected flood depths are summarized in Table 3-115. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-114: Basin 10A Maximum Stages During Various Design Storm Events

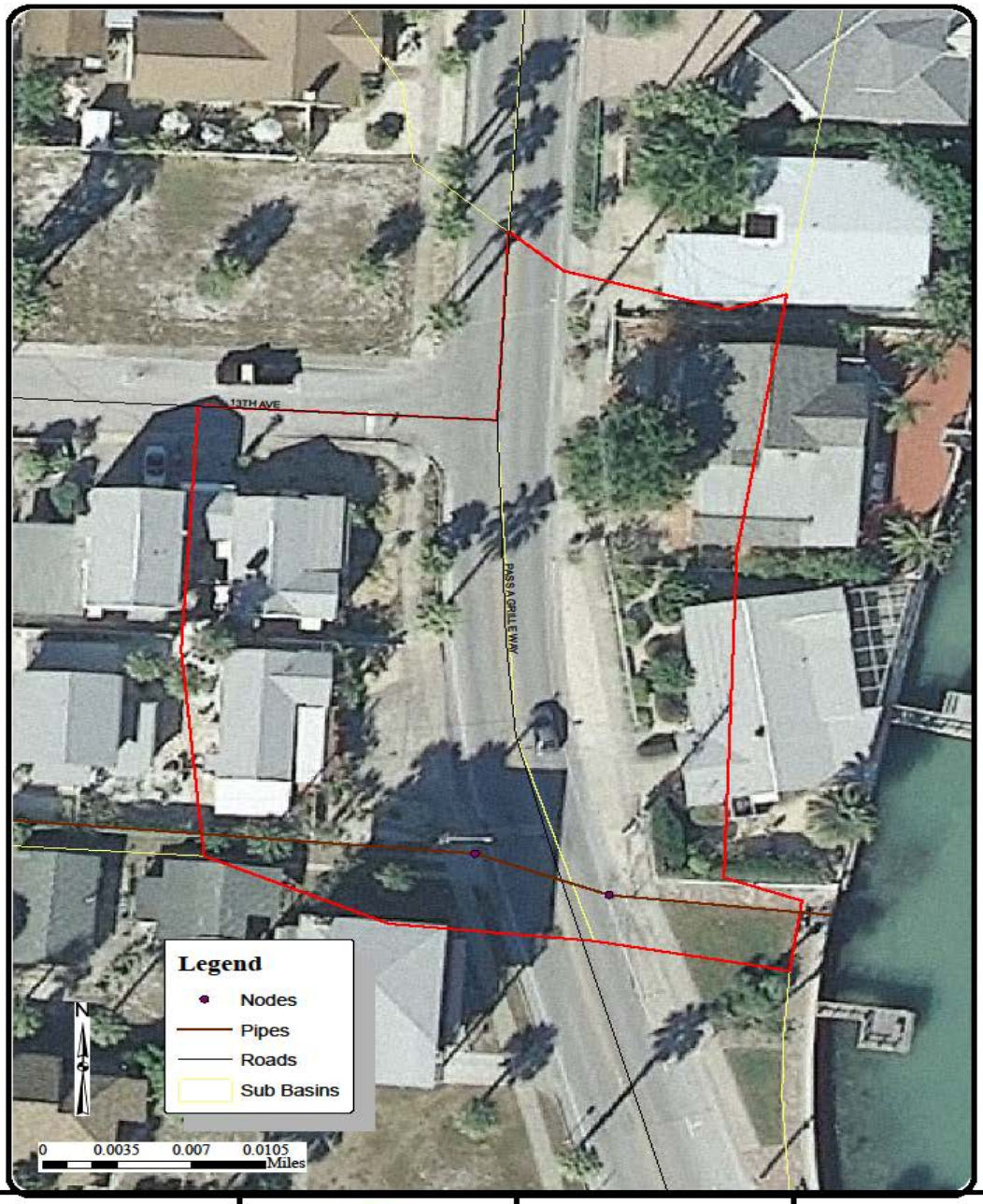
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
10A-ST-10	2.61	1.77	2.14	2.41	2.67	2.75	2.83	2.90
10A-ST-20	2.29	1.65	1.99	2.24	2.49	2.72	2.81	2.89
10A-ST-30	2.97	0.87	1.02	1.13	2.44	2.71	2.80	2.88
10A-ST-40	3.03	0.76	0.87	0.96	2.00	2.23	2.32	2.39
10A-ST-50	3.13	0.58	0.65	0.70	1.33	1.50	1.58	1.66

Table 3-115: Basin 10A Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
10A-ST-10	0.0	0.0	0.0	0.7	1.7	2.6	3.5
10A-ST-20	0.0	0.0	0.0	2.4	5.2	6.2	7.2
10A-ST-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10A-ST-40	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10A-ST-50	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Identified Problem Areas

The alleyway is predicted to flood by 3 to 7 inches. Additional inlets and increased pipes sizes may be needed to reduce the risk of flooding.



CPWG CRISE PHRIBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	St. Pete Beach THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH 10-A PASS-A-GRILL WAY BETWEEN 12TH AVENUE AND 13TH AVENUE NODAL MAP	FIGURE 3-23

3.24 Basin 10B: Pass-a-Grill Way at 12th Avenue

Sub-Basin Description

Basin 10B is located in the south drainage section of the City along 12th Avenue at the intersection with Pass-A-Grille Way. There is only one sub-basin summarized in Table 3-116. The basin is primarily residential. Stormwater drains through a single inlet on the southwest corner of Pass-A-Grill Way and 12nd Avenue. From the inlet the stormwater discharges to Boca Ciega Bay through a single 18x12-inch ERCP. The outfall culvert is installed in a seawall. Piping information for the basin is summarized in Table 3-117. The nodal map with aerial background for Basin 10B is presented in Figure 3-24.

Table 3-116: Basin 10B Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
10B-10	10	4.07	65.33	24.57

Table 3-117: Basin 10B Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
10B-RST-10	10B	Pass-a-Grill at 12 Ave	10B-ST-10	TW	1	51	18 x 12 Horz Ellipse

Simulation Results

The maximum unrouted flows generated by the contributing areas within the Basin 10B is summarized in Table 3-113.

Table 3-118: Basin 10B Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
10B-10	5.4	6.0	6.4	12.1	15.7	18.2	20.7

Maximum stages reached during the various design storm events are summarized in Table 3-119. Expected flood depths are summarized in Table 3-120. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-119: Basin 10B Maximum Stages During Various Design Storm Events

Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
10B-ST-10	2.78	1.88	2.06	2.19	3.06	3.22	3.30	3.37

Table 3-120: Basin 10B Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
10B-ST-10	0.0	0.0	0.0	3.4	5.3	6.2	7.1

Identified Problem Areas

The model predicts 3 to 7 inches of flooding in the basin depending on the severity of the storm event. The low ground elevation in this basin increases susceptibility to tidal flooding.

CPWG CRISE PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **10-B** **PASS-A-GRILL WAY** **AT 12TH AVENUE** **NODAL MAP**	FIGURE 3-24

3.25 Basin 10-K Pass-a-Grill Way between 2nd Avenue

Sub-Basin Description

Basin 10K is located in the south drainage section of the City along 2nd Avenue at the intersection with Pass-A-Grille Way. There is only one sub-basin summarized in Table 3-121. The basin is primarily residential. The system drains through a single inlet on the northwest corner of Pass-s-Grill Way and 2nd Avenue. From the inlet the stormwater discharges to Boca Ciega Bay through a single 18x12-inch ERCP. The outfall culvert extends below the seawall and discharges to the beach area. At the time of this study, the outfall pipe was covered with sand and did not appear to allow drainage. Piping information for the basin is summarized in Table 3-122. The nodal map with aerial background for Basin 10K is presented in Figure 3-25.

Table 3-121: Basin 10K Contributing Areas

Basin Name	Time of Concentration	Area (acres)	Curve Number	DCIA (%)
10K-10	10	3.04	61.00	0.00

Table 3-122: Basin 10K Stormwater Conveyance Features

Reach Name	Group	Location	From Node	To Node	Number of Pipes	Length (ft)	Description
10K-RST-10	10K	Pass-a-Grill Way at 2nd Ave	10K-ST-10	TW	1	60	18 x 12 Horz Ellipse

Simulation Results

The maximum unrouted flows generated by the contributing areas within Basin 10K is summarized in Table 3-123.

Table 3-123: Basin 10K Maximum Unrouted Hydrograph Flows

Basin Name	2-year (cfs)	Mean Annual (cfs)	5-Year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
10K-10	2.0	2.4	2.6	6.4	9.0	10.8	12.6

Maximum stages reached during the various design storm events are summarized in Table 3-124. Expected flood depths are summarized in Table 3-125. The storms were simulated assuming that a normal water condition existed prior to the occurrence of the design storm.

Table 3-124: Basin 10K Maximum Stages During Various Design Storm Events

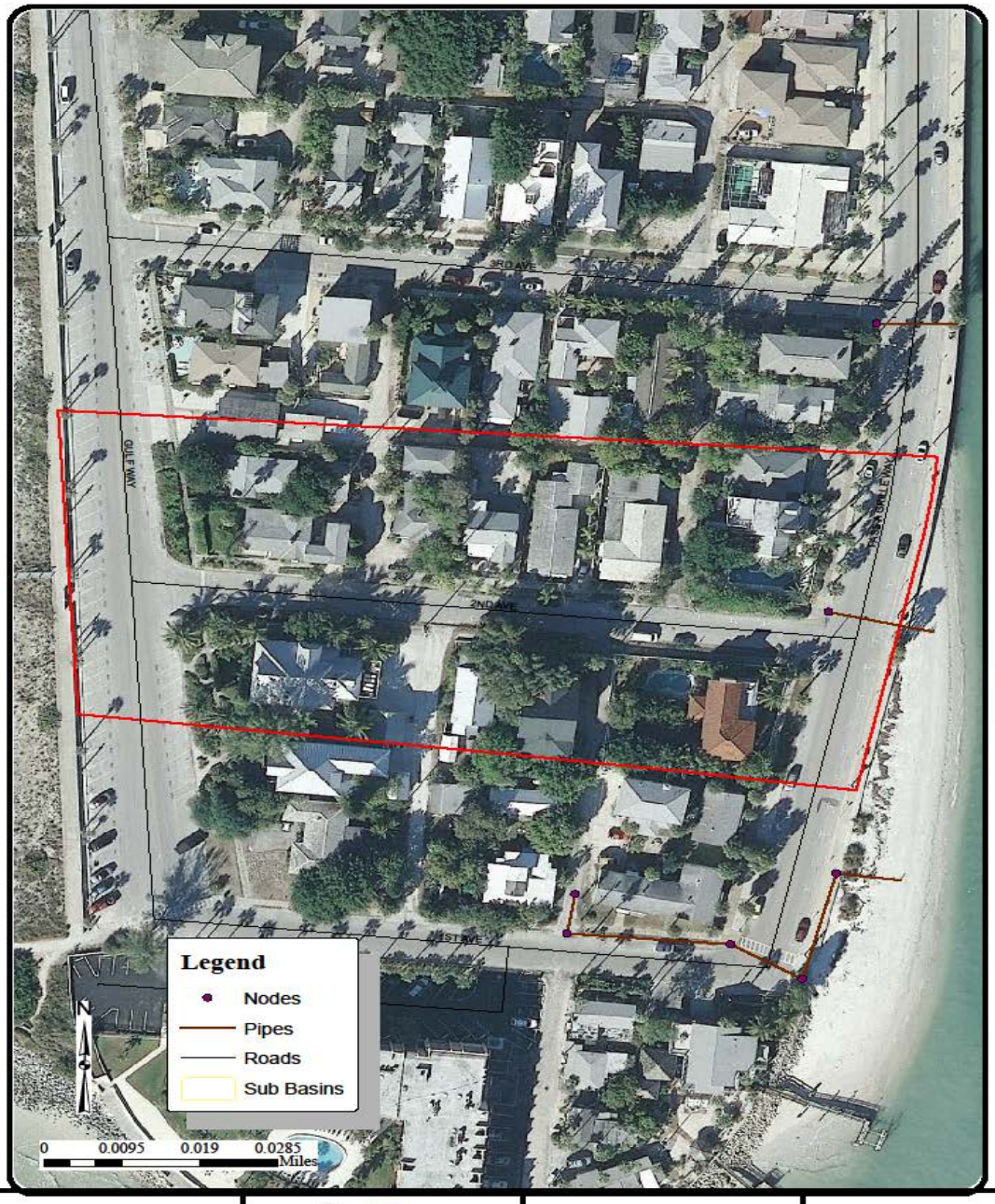
Node Name	Warning Elevation	Maximum Water Elevation in Feet (NAVD 1988)						
		2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
10K-ST-10	1.40	0.38	0.42	0.45	1.32	1.88	2.14	2.31

Table 3-125: Basin 10K Depth of Flooding

Node Name	Depth of Flooding in inches						
	2-year	Mean Annual	5-Year	10-year	25-year	50-year	100-year
10K-ST-10	0.0	0.0	0.0	0.0	5.8	8.9	10.9

Identified Problem Areas

The model predicts 6 to 11 inches of flooding during the 25-year to 100-year storm events. However, the model assume that the outfall pipe is open and flowing. Outfalls for Basin 10K and Basin 10L were observed to be buried. Clogged outfalls will increase flooding stages and the duration of the standing water.

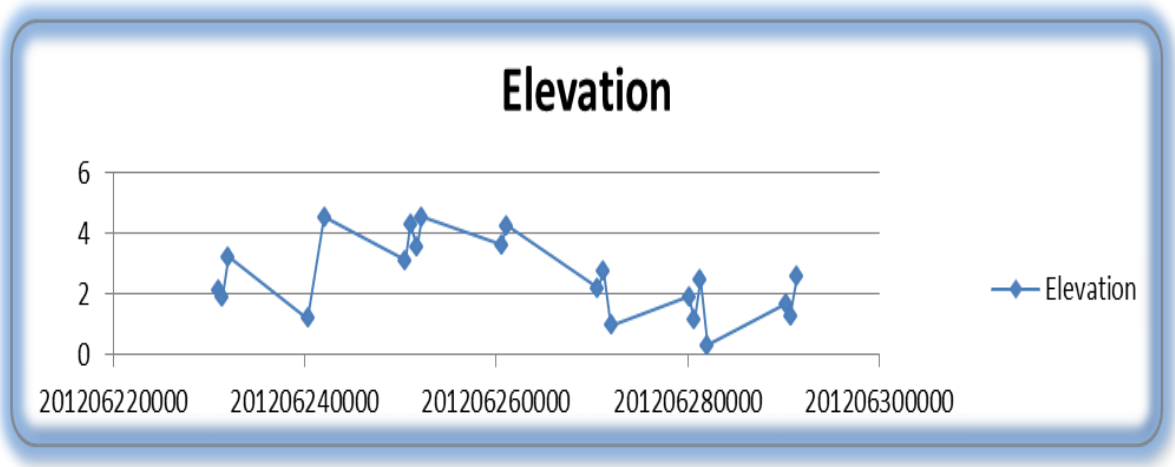


CPWG CRIBB PHILBECK WEAVER GROUP CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	ST. PETE BEACH THE SUNSET CAPITAL OF FLORIDA CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	**ST. PETE BEACH** **10-K** **PASS-A-GRILL WAY** **AT 2ND AVENUE** **NODAL MAP**	FIGURE 3-25

3.26 Storm Surge Flooding Potential

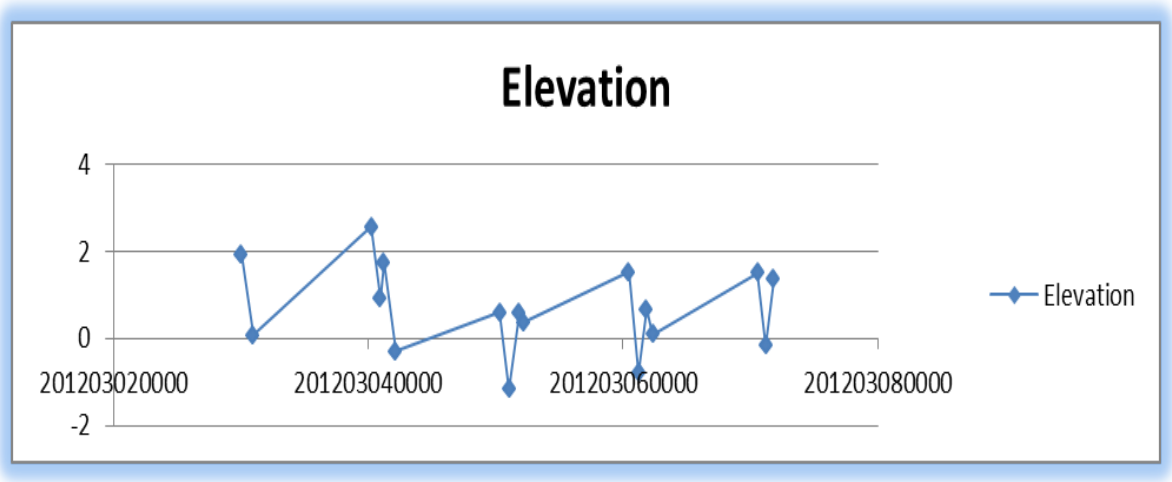
The stormwater modeling results presented in the previous sections are based on storm events occurring with minimum to no storm surge. The models assume the Gulf of Mexico and Boca Ciega Bay are at an elevation 0.3-ft NAVD 1988 throughout the duration of the storm event. As the City is well aware, tides often exceed this elevation during hurricane and other tropic storm events.

During this study, Tropical Storm Debby brought flooding to the City of St. Pete Beach. Tropical Storm Debby occurred on June 26, 2012. The rainfall totals in the area ranged from 10.72 inches in St Petersburg, 12.96 inches in Oldsmar, 14.05 inches in Largo, and 14.55 inches in Tarpon Springs. The tide elevations for June 26, 2012 to June 29, 2012 are shown in the figure below. The highest tide elevation was 4.55-ft NAVD 1988. As with all tides, they oscillate on a cycle, but for about two days the tide was at approximately 4-feet. Without valves, tide gates and pump stations the tidal water remains in the areas of the City that are below an elevation of 4-feet.



Based on the LIDAR information, Figures 3-26 to 3-29 display the degree of flooding if the tidal stages remain at 1-foot, 2-feet, 3-feet and 4-feet respectively. As expected, as the height of the tide rises the area inundated increased.

Tropical stormwater and other large storms are not a daily occurrence. Most of the time, the tides are normal and present little risk of flooding in the area. A typical winter tide between March 3, 2012 and March 7, 2012 is depicted in the figure below. The high elevation is 2.5-ft NAVD 1988 during this time period.



CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH FLOODPLAIN MAP TO 1-FT CONTOUR	FIGURE 3-26

CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH FLOODPLAIN MAP TO 2-FT CONTOUR	FIGURE 3-27

CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST. PETE BEACH FLOODPLAIN MAP TO 3-FT CONTOUR	FIGURE 3-28

CPWG CPWG, Inc. 708 Lithia Pinecrest Road, Suite 101 Brandon FL 33510 Tel 813-361-2644 Fax 813-662-2295	CITY OF ST. PETE BEACH STORMWATER MASTER PLAN PINELLAS COUNTY, FLORIDA	ST.PETE BEACH FLOODPLAIN MAP TO 4-FT CONTOUR	FIGURE 3-29

3.27 Annual Pollutant Load

The annual pollutant load to Boca Ciega Bay from the City of St. Pete Beach was calculated using a spreadsheet model that incorporates State wide established Event Mean Concentrations (EMCs) based on city-wide land use and soil data. Pollutants evaluated include total phosphorus, total nitrogen, biological oxygen demand (BOD), total suspended solids (TSS), Copper, lead and zinc. The total Pollutant Loads from the Cit are summarized in Table 3-126

Table 3-X: City Wide Pollutant Load to Boca Ciega Bay

Soil Type	Land Use	Area (Acres)	Runoff Coefficient	Annual Runoff Volume (ac-ft)	EMCs							Annual Pollutant Load (lb/yr)						
					TN	TP	BOD	TSS	Cu	Pb	Zn	TN	TP	BOD	TSS	Cu	Pb	Zn
A	BAYS AND ESTUARIES	0.58	1	2.40	--	--	--	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A	COMMERCIAL AND SERVICES	203.76	0.29	246.36	1.23	0.17	7.6	59.2	0.017	0.006	0.083	824.2	113.9	5092.7	39669.3	11.4	4.0	55.6
A	INSTITUTIONAL	3.14	0.14	1.83	2.4	0.345	11.3	69.7	0.015	0.006	0.16	12.0	1.7	56.3	347.5	0.1	0.0	0.8
A	RECREATIONAL	26.79	0.02	2.23	1.15	0.074	1.2	7.8	--	--	--	7.0	0.4	7.3	47.4	0.0	0.0	0.0
A	RESIDENTIAL, HIGH DENSITY (SIX OR MORE DWELLING UNITS PER ACRE)	328.74	0.14	191.88	2.32	0.52	11.3	77.8	0.009	0.006	0.086	1210.8	271.4	5897.5	40604.3	4.7	3.1	44.9
A	SHRUB AND BRUSHLAND	23.44	0.02	1.95	1.15	0.074	1.2	7.8	--	--	--	6.1	0.4	6.4	41.5	0.0	0.0	0.0
A	UTILITIES	3.88	0.18	2.91	1.23	0.18	7.6	60	0.003	0.002	0.057	9.7	1.4	60.2	475.3	0.0	0.0	0.5
B	BAYS AND ESTUARIES	8.82	1	36.75	--	--	--	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	COMMERCIAL AND SERVICES	100.47	0.35	146.60	1.23	0.17	7.6	59.2	0.017	0.006	0.083	490.5	67.8	3030.6	23606.9	6.8	2.4	33.1
B	INSTITUTIONAL	14.56	0.24	14.57	2.4	0.345	11.3	69.7	0.015	0.006	0.16	95.1	13.7	447.7	2761.4	0.6	0.2	6.3
B	RECREATIONAL	11.72	0.08	3.91	1.15	0.074	1.2	7.8	--	--	--	12.2	0.8	12.8	83.0	0.0	0.0	0.0
B	RESIDENTIAL, HIGH DENSITY (SIX OR MORE DWELLING UNITS PER ACRE)	488.20	0.24	488.49	2.32	0.52	11.3	77.8	0.009	0.006	0.086	3082.6	690.9	15014.2	103372.1	12.0	8.0	114.5
B	SHRUB AND BRUSHLAND	0.002	0.08	0.00	1.15	0.074	1.2	7.8	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B	TRANSPORTATION	1.11	0.29	1.34	1.64	0.22	5.2	37.3	0.032	0.011	0.12	6.0	0.8	19.0	136.4	0.1	0.0	0.4
B	WETLAND HARDWOOD FORESTS	0.08	0.43	0.14	1.15	0.074	1.2	7.8	--	--	--	0.5	0.0	0.5	3.1	0.0	0.0	0.0
D	BAYS AND ESTUARIES	4.42	1	18.43	--	--	--	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	COMMERCIAL AND SERVICES	1.60	0.43	2.86	1.23	0.17	7.6	59.2	0.017	0.006	0.083	9.6	1.3	59.1	460.7	0.1	0.0	0.6
D	MAJOR BODIES OF WATER	0.03	1	0.14	--	--	--	--	--	--	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	RECREATIONAL	1.62	0.22	1.48	1.15	0.074	1.2	7.8	--	--	--	4.6	0.3	4.8	31.4	0.0	0.0	0.0
D	RESIDENTIAL, HIGH DENSITY (SIX OR MORE DWELLING UNITS PER ACRE)	95.01	0.35	138.63	2.32	0.52	11.3	77.8	0.009	0.006	0.086	874.8	196.1	4261.0	29336.9	3.4	2.3	32.4
D	SHRUB AND BRUSHLAND	2.07	0.22	1.90	1.15	0.074	1.2	7.8	--	--	--	5.9	0.4	6.2	40.3	0.0	0.0	0.0
D	WETLAND HARDWOOD FORESTS	1.28	0.43	2.29	1.15	0.074	1.2	7.8	--	--	--	7.2	0.5	7.5	48.6	0.0	0.0	0.0
	TOTAL POLLUTANT LOAD (lb/yr)											6658.8	1961.8	33983.9	241066.0	39.2	20.1	289.0
	TOTAL POLLUTANT LOAD (ton/yr)											3.3	0.7	17.0	120.5	0.0	0.0	0.1