FINAL WATERSHED MANAGEMENT PLAN

CITY OF KEY WEST, FLORIDA

JUNE 2025

Final Watershed Management Plan Task 2 Requirements

An electronic copy of the completed WMP will be submitted to the Division no later than 17 months after the beginning of the Period of Performance. If applicable, the Sub-Recipient will revise the submitted WMP to comply with required revisions and feedback from the Division, and then resubmit the WMP to the Division no later than 17 months after the beginning of the Period of Performance. The Period of Performance begins with the date of execution of the subgrant agreement by both parties, and the Sub-Recipient shall provide the Division with the following no later than 17 months from the beginning of the Period of Performance before payment will be processed:

1. The completed WMP4 (after incorporating comments from the Division, if applicable); and

2. A signed letter from the applicable county's Local Mitigation Strategy (LMS) Chairperson attesting that the completed WMP will be adopted and used to update the risk assessment and mitigation strategy during the next LMS plan update.

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General Key West Description

The island of Key West is located approximately 130 miles southwest of Miami at the end of U.S. Highway 1 (Overseas Highway). The City of Key West consists of the main island, some surrounding smaller islands/keys, and the northern section of Stock Island located to the east of the main island. The entire Florida Keys, including Key West, are inside the Florida Keys National Marine Sanctuary boundary. The City consists of approximately 5.9 square miles of land, but the U.S. Navy occupies a large portion of the area. The main island is approximately 3.5 miles long and 1 mile wide. Key West is the county seat of Monroe County. The Monroe County airport also occupies approximately 250 acres of land created primarily on fill in a salt marsh on the southeast side of the island (a former Naval Air Station). North Stock Island is delineated from the southern island (county land) by U.S. 1 on the southern boundary. **Figure 1** shows the general land use on the island. City and county offices and U.S. Navy and county lands are shown as government use; schools, hospital, fire stations, and similar are shown as institutional use. These uses were derived from the Monroe County property appraiser database. The main island of Key West is primarily residential and commercial, excluding the naval bases. North Stock Island contains Florida Keys Community College, a closed landfill, hospital, elementary school, golf course with residences, botanical gardens, miscellaneous smaller businesses, and a county jail.

Topography

The City was initially developed on the higher land on the western portion of the main island, and this area is known as Old Town (generally west of 1st Street). The elevations are higher just east of Duval Street at nearly elevation 15 feet NAVD 88. Old Town's landscape slopes down toward the Gulf of Mexico to the north and the Atlantic Ocean to the south. East of 1st Street is called New Town and is relatively flat. **Figure 2** shows the general topography based on recent digital elevation model (DEM) data. This figure also includes the sub-basins used in the existing conditions model.

In 2008, the Florida Division of Emergency Management conducted a coastal mapping project that collected high-resolution aerial photographs and topographic (elevation) data, which were used in the 2012 Stormwater Master Plan. A newer published DEM topography was downloaded from the National Oceanic and Atmospheric Administration (NOAA) that was produced for the Coastal Management's Sea Level Rise and Coastal Flooding Impacts Viewer (NOAA 2020). NOAA created the DEM based on available light detection and ranging (LiDAR) data available at the time of DEM creation. These DEMs are the datasets used by NOAA to visualize the impacts of inundation resulting from SLR along the coastal United States and its territories. In general, this alternative data source should not vary from the 2012 data, but processing of the LiDAR data may produce slightly different results. It was downloaded and used in this update to be consistent

with other regional interpretations of potential coastal effects. The field survey data of stormwater facilities were the priority source of elevation information, and the DEM was for general modeling use only.

Geology

Key West is generally a low barrier island consisting of a layer of sandy or marly soil, typically 3 to 5 feet deep, on top of an oolitic limestone base. Freshwater seeping into the ground forms a thin layer of less dense- water and mixes with saltier groundwater over tidal cycles. The limestone is porous and because of cavities or cracks, it can be often very transmissive for groundwater. Because of this porous characteristic and because there are no potable deep groundwater sources in the City, shallow recharge wells are used for stormwater control. **Figure 3** shows the U.S. Department of Agriculture (USDA) Soil Survey for the island. Most of the island is listed as urban, which is a general term the USDA uses for developed land, and no published soil data exist. Most soil data are available from soil borings conducted during construction projects or City staff's general knowledge.

Experience has shown that the depth to rock varies greatly from one location to another. The groundwater table fluctuates with the tides because of the porosity of the rock. The elevation of the groundwater table is normally approximately 0.5 foot to 1.5 feet above the tide levels depending on proximity to the coast.

Climate Characteristics

Because of the proximity of the Gulf Stream to the Straits of Florida (approximately 12 miles) and the tempering effects of the Gulf of Mexico to the west and north, Key West has a notably mild, tropical maritime- climate where the average temperatures during the winter are only approximately 15 degrees Fahrenheit lower than in summer. Humidity remains relatively high during the entire year. There is no known record of frost, ice, sleet, or snow in Key West. Precipitation is characterized by dry and wet seasons. The period of December through April receives slightly less than 25 percent of the annual rainfall. This rainfall usually occurs in advance of cold fronts in a few heavy showers, or occasionally five to eight light showers per month. June through October is normally the wet season, receiving approximately 53 percent of the yearly rainfall total in the form of numerous showers and thunderstorms. Early morning is the most likely time for precipitation (Key West Chamber of Commerce 2021). Direct hurricane strikes are not common, but the City has experienced several severe windstorm flooding events (Tropical Storm Fay and Hurricanes Wilma and Irma are notable recent windstorms).[1]

[1] Refer to http://www.hurricanecity.com/city/keywest.htm for more information on hurricanes.

Table 1 includes a summary of monthly totals for precipitation and temperature. Included in this summary are the number of days with precipitation totals that exceed 0.1 and 1.0 inch. The 0.1 inch threshold is important because this value often is used to distinguish storms that may cause enough runoff to have a measurable effect, which are approximately 62 storms per year at the City. The larger storms are much fewer, approximately 11 storms per year. Of note in this NOAA dataset is the highest daily storm of 22.75 inches that occurred in November 1980. As shown in Table 1, storms with rainfall totals of more than 4 inches can occur almost any time of the year.

Figure 1 - General Land Use on Key West

Figure 2 - General Topography based on Recent Digital Elevation Model Data

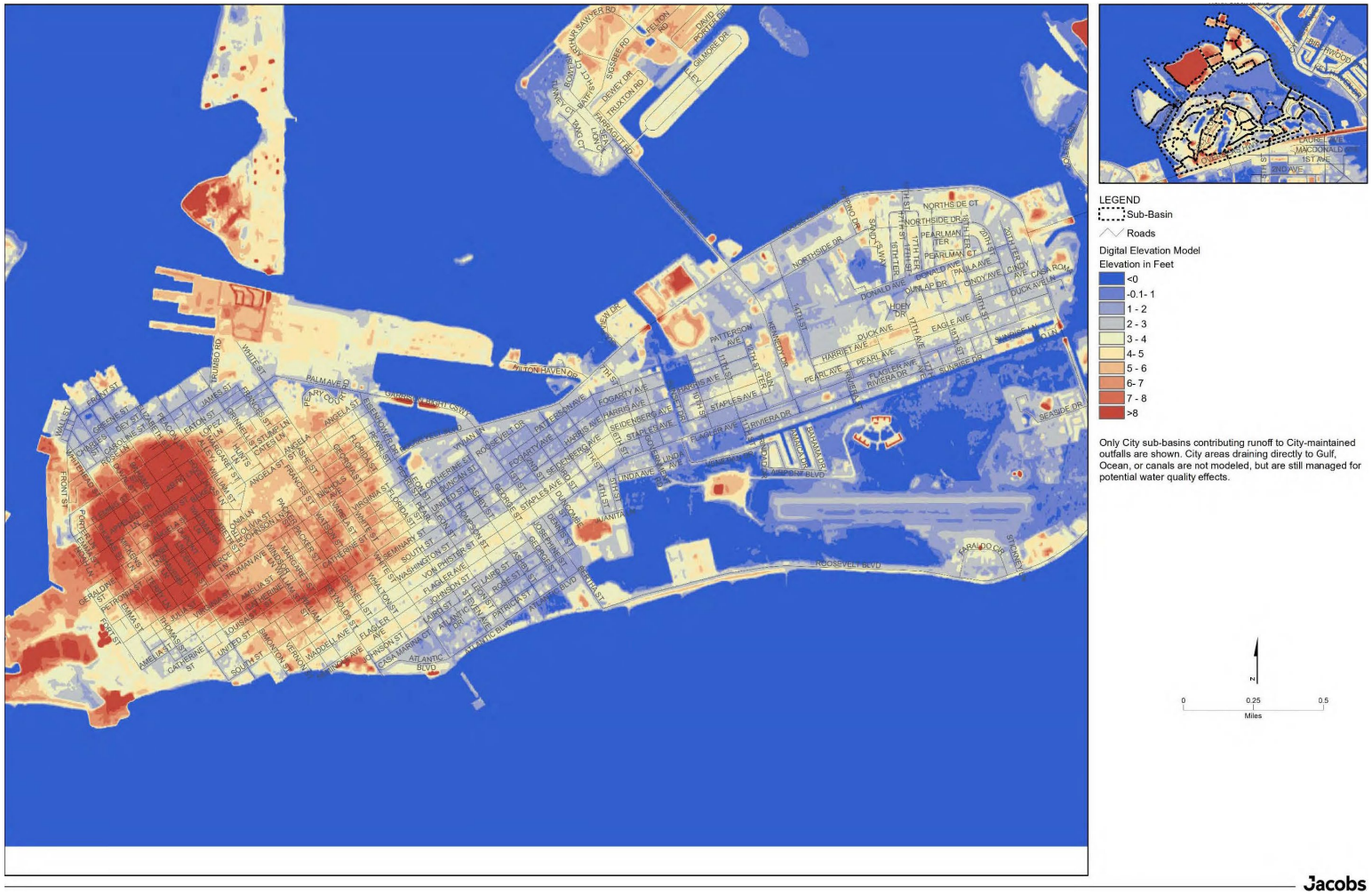


Figure 3 - USDA Soil Survey Results

Jacobs

Table 1 - Summary of Long-Term Climate Data for Key West

Month	Temperature[a]			Precipitation				
	Daily Max	Daily Min	Mean	Mean[b]	Median[b]	Highest Daily[b]	Mean No. of Days[c] ≥0.1 inch	Mean No. of Days[c] ≥1 inch
Jan	74.3	64.2	69.3	2.00	0.98	6.42	3.1	0.4
Feb	76.0	66.0	71.0	1.54	1.22	4.34	2.7	0.4
Mar	78.2	68.3	73.2	1.85	1.48	5.26	3.5	0.5
Apr	81.3	71.6	76.4	2.15	1.74	6.19	2.8	0.6
May	85.0	75.7	80.3	3.27	2.68	4.14	3.9	0.9
Jun	87.8	78.8	83.3	4.07	3.47	5.14	6.3	1.2
Jul	89.3	79.8	84.5	3.74	3.25	4.25	6.5	0.9
Aug	89.4	79.6	84.5	5.30	4.38	9.66	8.9	1.5
Sep	87.9	78.5	83.2	6.54	6.36	9.37	10.5	1.7
Oct	84.5	76.0	80.2	4.92	3.32	7.30	7.0	1.3
Nov	79.9	71.7	75.8	2.81	1.51	22.75	3.3	0.7
Dec	76.0	66.9	71.4	2.19	1.45	6.66	3.2	0.6
Annual	82.9	73.2	78.1	40.40	39.33	22.75	61.7	10.7

Source: NOAA (2021)

[a] Monthly summary of temperature from 1981 to 2010.
[b] Daily precipitation from 1980 through 2020.
[c] Monthly summary of events from 1981 to 2010.

≥ = greater than or equal to

Design Storms

An important rainfall data input is the storm characteristics used to assess and design infrastructure. Design storms are expressed in terms of a return period, which is an expression of probability (= 1/return period). For example, a 10-year storm means that there is a 1 in 10 chance that a storm at least as large as that one would occur in any given year. The Federal Emergency Management Agency (FEMA) often uses the 100-year storm (1 percent chance of occurrence per year) as a threshold for determining flooding potential. Building codes normally require the minimum first-floor elevation to be above the 100-year flood elevation. However, extensive flooding can occur with much smaller storms, including the 2-year storm (50 percent chance of occurrence).

The design storms used in the evaluation are shown in **Table 2**. In 2012, the rainfall volumes are based on standard literature values available from either the South Florida Water Management

District (SFWMD) or FDOT. Since 2012, NOAA has published updates to precipitation analysis, commonly referred to as Atlas 14 (Perica et al. 2013). The 2024 Update used the most recent available data. Some projections expect that rainfall volumes for design storms are going to increase with climate change because higher atmospheric temperatures will carry more moisture. As part of the assessments for the City's SLR policy review (Jacobs 2021b), the projected volume of future rainfall was examined by Jacobs, but it was determined that future rainfall was not going to change by a statistically significant amount. The mixture of high values between Atlas 14 and SFWMD was retained for this update.

Table 2 - Design Storms for the City of Key West

Return Period (years)	Duration (hours)	Distribution	2012 SWMP Storms (inches)	2013 Atlas 14 Volume (inches)
2	24	FLMOD	5.00	4.80
5	24	FLMOD	6.00	[a]6.20
10	24	FLMOD	7.00	[a]7.60
10	72	SFWMD72	10.50	9.25
25	24	FLMOD	9.00	9.90
25	72	SFWMD72	[a]12.00	11.90
100	24	FLMOD	12.00	14.10
100	72	SFWMD72	[a]17.00	16.90
500	24	Not simulated	NA	20.30
500	72	Not simulated	NA	24.20

[a] Volumes used in the 2024 Update.

Used ICPR distributions as identified above: Florida-modified Type II storm (FLMOD) or the SFWMD 72-hour distribution (SFWMD72). Atlas 14 volumes were used for this report.

NA = not applicable

The SFWMD guidance was used to establish the time distribution of rainfall intensities (hyetographs). The 500-year storms were not simulated but are listed because some new guidance is now referring to this storm for critical infrastructure design (Southeast Florida Regional Climate Compact 2020).

Key West Community Rating System Background

The Community Rating System (CRS) is a voluntary program, that provides for reductions of flood insurance premiums by 5 percent up to a maximum of 45 percent for most policy holders with insurable property located within CRS communities. The CRS recognizes 19 creditable activities organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Warning and Response.

Communities can choose to undertake any or all of these activities. Based on the number of credit points received, a community earns a rank in one of ten CRS classes. Premium discounts range from 5 percent to 45 percent. See **Table 3**.

Table 3 – CRS Classes and Discounts

CRS Credit Points	CRS Class	CRS Discount (Premium Reduction)
4,500+	1	45%
4,000 – 4,499	2	40%
3,500 – 3,999	3	35%
3,000 – 3,499	4	30%
2,500 – 2,999	5	25%
2,000 – 2,499	6	20%
1,500 – 1,999	7	15%
1,000 – 1,499	8	10%
500 – 999	9	5%
0 – 499	10	0

Key West joined CRS in October 2016 and has continually advanced in the CRS program. In 2020, Key West was awarded a CRS Class 5, scoring 2,874 CRS credit points. The Class 5 designation affords most NFIP policy holders with a 25% percent annual discount on flood insurance. **Table 4** outlines the CRS Activities and the current scores in each of the CRS Activities.

Table 4 - Point Breakdown from 2019 CRS Verification

Activity	CODE	Current Points Scored	Max Points Possible
Elevation Certificates 310		37	**116**
After application	CCMP (EC)	37	38
Post FIRM	ECPO		48
Pre FIRM	ECPR		30
Map Information Service 320		**90**	**90**
Providing insurance info from FIRM	MI1	30	30

Activity	CODE	Current Points Scored	Max Points Possible
LiMWA/floodway Info/CBRS area	MI2	20	20
Other flood problems not shown on FIRM	MI3		20
Flood depth data	MI4		20
Special flood related hazards	MI5		20
Historical/Repetitive flood information	MI6	20	20
Natural floodplain functions	MI7	20	20
Outreach Projects 330		**350**	**350**
Outreach projects	OP	200	200
Flood response preparations	FRP	70	50
Program for public information bonus	PPI	100	80
Stakeholder bonus	STK	60	50
Hazard Disclosure 340		**12**	**80**
Disclosure of Flood Hazard	DFH		35
Other disclosure requirements	ODR	12	25
Real estate brochure	REB		12
Disclosure of other Hazards	DOH		8
Flood Protection Information 350		**108**	**125**
Library	LIB	8	10
Locally pertinent documents in the library	LPD	10	10
Website	WEB	90	105
Flood Protection Assistance 360		**100**	**110**
Property protection advice	PPA	40	40
Advice after site visit	PPV	45	45
Financial assistance advice	FAA	15	15
Training	TNG		10
Flood Insurance Promotion 370		**90**	**110**
Flood insurance assessment	FIA	15	15
Coverage plan	CP	15	30
Plan implementation	CPI	60	60
Technical assistance	TA		35
Flood insurance brochure	FIB		25
Flood insurance meeting	FIM		40
Floodplain Mapping 410		**0**	**850**
New study	NS		350
Leverage	LEV		
State review	SR		60
***Higher study standards	HSS		200

Activity	CODE	Current Points Scored	Max Points Possible
Floodway standard	FWS		140
Special hazards mapping	MAPSH		100
Open Space Preservation 420		**849**	**2870**
Preserved open space	OSP	797	1450
Deed restriction	DR	2	50
Natural functions open space	NFOS	39.9	350
Special hazards open space	SHOS		150
Coastal erosion open space	CEOS		750
Open space incentives	OSI	10	250
Low density zoning	LZ		600
Natural shoreline protection	NSP		120
Higher Regulatory Standards 430		**187**	**2462**
Development limitations	DL		1330
Freeboard	FRB	33.08	500
Foundation protection	FDN		80
Cumulative substantial improvements	CSI	27	90
Lower substantial improvements	LSI		20
Protection of critical facilities	PCF		80
Enclosure limits	ENL		390
Building code	BC	68	100
Local drainage protection	LDP	10	120
Manufactured home park	MHP	15	15
***Coastal A zone regulations	CAZ		500
Special hazards regulations	SHR		100
Tsunami hazard regulations	TSR		50
Coastal erosion hazard regulations	CER		370
Other higher standards	OHS		100
State-mandated standards	SMS	13	20
Regulations administration	RA	21	67
Flood Data Maintenance 440		**137**	**222**
Additional map data	AMD	122	160
FIRM maintenance	FM	15	15
Benchmark maintenance	BMM		27
Erosion data maintenance	EDM		20
Stormwater Management 450		**176**	**755**
Stormwater management regulations	SMR	146	380
*Watershed master plan	WMP		315

Activity	CODE	Current Points Scored	Max Points Possible
Erosion & Sed control regulations	ESC	10	40
Water quality regulations	WQ	20	20
Floodplain Mgmt. Planning 510		**290**	**622**
Floodplain management planning	FMP	290	382
Repetitive loss area analysis	RLAA		140
Natural floodplain functions plan	NFP		100
Substantial damage management plan	SDP		140
Acquisition and Relocation 520		**0**	**2250**
Acquisition and relocation of buildings	All		2250
Flood Protection 530		**132**	**160**
Flood protection improvement	FPI	132	160
Drainage System Maintenance 540		**0**	**470**
Channel debris removal	CDR		200
Problem site maintenance	PSM		50
Capital improvements program	CIP		70
Stream dumping regulations	SDR		30
Storage basin maintenance	SBM		120
Flood Warning and Response 610		**276**	**395**
Flood threat recognition system	FTR	75	75
Emergency warning dissemination	EWD	75	75
Flood response operations	FRO	101	115
Critical facilities planning	CFP	25	75
StormReady Community	SRC		25
TsunamiReady Community	TRC		30
Dams 630			40
State dam safety program	SDS		
Element Point Total		**2,834**	
CGA = Series 400 Multiplier		**1.03**	
Element Points with Multiplier		**2,874**	

Note: All of the credit in the 400 series is multiplied by the County Growth Rate (CGR).

Source: 2017 CRS Coordinator's Manual / 2021 Addendum to the 2017 CRS Coordinator's Manual

Key West is also exploring the possibility of advancing to a CRS Class 4. Historically, one of the major hurdles for Florida Communities meeting the rigorous Class 4 prerequisites is linked to communities adopting a CRS qualifying Watershed Master Plan. It is anticipated that the Watershed Master Plan will meet the CRS Class 4 prerequisite by scoring, before the impact

adjustment is calculated, (a minimum of) 90 points for WMP 1 and 30 points for WMP. There is a possibility that the City may also receive credit for WMP 8, relative to funding sources, for an additional 25 points.

Based on the 2019 CRS Cycle Verification file, the City must document an additional 126 overall points and adopt a qualifying Watershed Master Plan to be in a position to apply for an improvement to a CRS Class 4. The CRS Class 4 prerequisites are shown in **Table 5**.

Table 5 - Class 4 Prerequisites

	Credit	Met
Class 4 Prerequisite		
Community agreed to show any draft LiMWAs on the final FIRM, if applic.		X
Enough points to warrant the Class (3,000+)	2,874	
If one or more rep loss properties, actions set in Sections 501-504 are met		X
All flood insurance policies on community owned properties are maintained		X
430—BCEGS of 4/4 or better	4/3	X
Activity 310 Elevation Certificates		
Maintain all required floodplain-related construction certificates		X
≥ 90% accuracy on construction certificates during annual review		X
Credit for construction certificate management procedures (CCMP)	29	X
Activity 430 Higher Regulatory Standards		
1ft Freeboard throughout the SFHA		X
≥ 700 pts. in all other 430 elements, including 422.a., e., and f. in 420 Open Space Preservation (after to imp. adj.)	964	
Activity 450 Watershed Master Plan (WMP)		
Adopt a Watershed Management Plan		
90 pts. for meeting all WMP prerequisites (WMP1)		
30 pts. managing all storms up to and including 100-yr. event (WMP 2)		
rWMP = 0.5 or greater (or show that WMP covers watersheds that comprise at least 50% of its growth)		
Activity 510 Floodplain Management Plan (FMP)		
Adopt a Floodplain Management Plan		X
≥ 50% of the maximum credit under Activity 510 after imp. adj. (≥ 191 pts.)	357	X
≥ 50% of available pts. in Planning Step 2 (≥ 60 pts.)	120	X
≥ 50% of available pts. in Planning Step 5 (≥ 26 pts.)	47	X
≥ 50% of available pts. in Planning Step 8 (≥ 30 pts.)	52	X
Natural Floodplain Functions		
At least 100 pts. (after impact adjustment) from one or a combination of the following elements:	139	
Life Safety Measures		

	Credit	Met
610 – obtain some credit under this Activity	282	X
620 – meet prerequisite 621.b(2) [map of all areas protected by levees]		
630 – meet prerequisite 631.b(1) [map of all areas flooded by the failure of a high hazard dam and critical facilities that would be flooded.]	n/a	X

It is key to note that Key West's CRS program is currently under review. A new score will be available within the next calendar year. The new score will be used to determine future Class 4 eligibility.

I. Data Inventory and Collection

1. Data inventory (used for initial flood modeling)

a. Inventory of ground characteristics

Marl and rocky soils occur in Miami-Dade, Monroe, and Collier counties along the southern extent of the Everglades. The Marl & Rocky Soils landscape denotes that area near the southern tip of the Florida peninsula adjacent to the tidal area of Florida Bay. Marl soils (mostly Aquents, an Entisol) are hydric and originate from the precipitation of calcite in the water by calcareous algae mats. Rocky soils have exposed limestone at or near the surface. These areas are poorly to very poorly drained. The seasonal high water table ranges from one foot below to one foot above the soil surface for four to seven months annually. Examples of these soil series include Biscayne, Perrine, and Rock Outcrops. Some areas are noted as drained phases, which means that there has been artificial drainage implemented; however, the degree or effectiveness of the drainage is not expressed. The City has a fairly high impervious area because of the relatively high density on the main island. In addition, the runoff potential is greater because of high groundwater levels relative to the ground surface. Key West's wetlands, part of the Key West National Wildlife Refuge, consist primarily of mangrove islands, sandy beaches, dunes, salt marsh, and coastal berm hammocks, supporting diverse wildlife like sea turtles, shorebirds, and wading birds.

Specific soil types include:

- Cudjoe soils have marly silt loam particle-sized control sections throughout and have bedrock at depths less than 50 centimeters (20 inches).
- Islamorada soils are composed entirely of organic materials, have bedrock at depths of 50 to 100 centimeters and occur on similar landform positions.
- Keylargo soils are composed entirely of organic materials, lack coastal marl deposits, and occur in similar landform positions.
- Lignumvitae soils have marly silt loam particle-sized control sections, have bedrock at depths of 50 to 100 centimeters (40 inches) and occur on similar landform positions.
- Matecumbe soils are composed entirely of organic materials, have bedrock at depths less than 18 centimeters (7 inches), and occur on similar landform positions.
- Saddlebunch soils have marly silt loam particle-sized control sections, have bedrock at depths less than 50 centimeters (20 inches) and occur on slightly higher landform positions.

- Tavernier soils are composed entirely of organic materials, have bedrock at depths less than 50 centimeters (20 inches), and occur on similar landform positions.

b. Inventory of existing drainage system

The City of Key West's (hereafter, the "City's") stormwater system consists of approximately 63 permitted outfalls and associated stormwater collection systems,[2] 54 vertical exfiltration drains, 5 pressurized wells (at three locations), approximately 120 stormwater gravity recharge wells, and associated collection and treatment systems. Most of the collection system is limited to drainage around intersections. Many residential streets have inlets around the intersection corners and there are drainage wells connected to them. Only a few streets, that Key West owns and operates, have longer stormwater sewers (Duval Street area, for example). There are other small facilities that include open-bottom catch basins and swales that assist in allowing ponded water to infiltrate into the porous soils on the island.

The City occupies the island of Key West, some nearby small islands, plus the northern half of North Stock Island (north of U.S. Highway 1 [U.S. 1]). Both Fleming Key and Sigsbee Park are part of Naval Air Station Key West and are inaccessible to the public; the Navy operates other properties on the island as well. Sunset Key (near Mallory Square) is residential and is part of the City but is physically isolated except for sanitary sewer service. The City is only responsible for operating its own stormwater systems (not the Navy's or Florida Department of Transportation's [FDOT's]) and this report focuses solely on the City's facilities. Key West operates its municipal separate storm sewer system (MS4) under a federal permit, called an MS4 National Pollution Discharge Elimination System permit. This operation is funded by a stormwater management utility (SMU).

Properties in the City of Key West contribute to the SMU, but not all properties are included in the MS4. By nuance of the Clean Water Act regulations, properties that discharge directly to waters of the United States, which includes some of the canals, tidal wetlands, and coastal waters, are not included in the MS4, *per se*. However, Florida law has recognized that SMUs serve the greater good of the community by maintaining access and services. Consequently, all property in Key West must abide by the SMU ordinance.

History of Stormwater Management in Key West

Much of the City's stormwater infrastructure was built on an as-needed basis. Over the years, the City realized the need to develop planning documents to assist in the prioritization of stormwater mitigation projects. A Drainage Investigation Report was prepared in 1989 (CH_2M 1989) and a stormwater runoff study was prepared in 1994 (KCA 1994). In 2001, the City

[2]There are other private property outfalls and approximately 40 Navy outfalls for which the City does not have direct responsibility.

developed its Long-Range Stormwater Utility Plan, which formed the basis of operations until 2012 (City of Key West 2001). In 2011 the City wanted to take advantage of recently obtained aerial mapping and topographic data to update its inventory of stormwater infrastructure and to develop the 2012 Stormwater Master Plan (CH2M 2012). The City constructed several stormwater projects identified in its 2012 Master Plan. This task is to update the simulation models and to begin preparation of a new 2021 Stormwater Master Plan (hereafter, the "2021 Update") so new projects can be identified for the next 7 to 10 years.

The City drainage systems are a combination of infrastructure designed to standards at the time they were constructed, but some older systems were nonstandard (that is, too small) when constructed. Many of these nonstandard systems appear to have been built by developers. Other nonstandard systems appear to have been built by City staff with whatever pipe and materials were on hand at the time of construction. These older (prior to 2000) outfall collection systems were not designed with pollution control as required by today's standards. There are several artificial and natural drainage systems that also serve the City.

Prior to the 1980s, stormwater gravity recharge wells were not as prevalent as they are today. The oldest operational City well located on Margaret Street between Virginia and Catherine Streets was constructed prior to the 1970s. The history of this well is unclear. A total of 12 wells were built as part of City development of Mallory Square, Key West Bight parking lots, police and fire facility parking lot, and the Southernmost Point.

In 1989, the City initiated its comprehensive planning efforts. CH_2M HILL Engineers, Inc. (CH_2M)[3] was tasked to begin the process of identifying drainage structures through field investigation, because plans did not exist in City records for much of the drainage system. The Drainage Investigation Report was completed in 1989.

As required by the City's Comprehensive Plan, Kisinger Campo & Associates (KCA) performed a 1994 stormwater runoff study that identified and mapped flood problems (KCA 1994). The report included aerial mapping using surveyed ground controls. Some surveying of stormwater facilities was included in the scope of work. Eight flood areas (several blocks large in some cases) were identified and ranked by severity. The number of structures and cost to address these problems were estimated. This report highlighted the state of the stormwater system and noted many deficiencies, such as clogged inlets, too few and poorly placed inlets, collapsed outfalls, and other similar problems common with an aged system. The 1994 KCA study recommended future work to include modeling and design as funds became available. A total of 20 wells were built by the

[3] On December 15, 2017, CH2M HILL Engineers, Inc., became a wholly owned subsidiary of Jacobs Engineering Group Inc.

City Engineering Department in the flood zones identified in the 1994 KCA report. The City also created the stormwater program in the Utilities Department in part resulting from the recommendations of this report.

The Utilities Department began a process of developing an inventory of its system (both sanitary and stormwater) and cleaning and repairing its sewers. In general, sanitary repairs were implemented at a higher priority because of health concerns. Regardless, progress was also made in improving the storm sewer system. The City created a Long-Range Stormwater Utility Plan in 2001 that identified 15 flood zones, which were principally located in low areas (City of Key West 2001). The plan further documented existing systems and identified capital projects and funding requirements. The City stormwater plan incorporated policies set out in a City-generated Water Quality Improvement white paper that was the basis for the policy related to diverting water from outfalls primarily by shallow recharge wells (City of Key West 2010a). One well was built in a flood zone identified in the 2001 Long Range Plan but funding limitations kept the ambitious plan from being implemented.

Based on changes to state law and rules, the City implemented a stormwater utility to fund their stormwater program in 2003. This utility allowed the City to implement many more projects than was previously possible. The City's Utilities Department led the installation of additional wells to address standing water problems not identified in the KCA Report or the 2001 Long Range Plan. In 2006, Perez Engineering & Development, Inc. (Perez) and Parsons prepared a Draft Design Memorandum for the City that updated the mapping and the City computer simulation model of the drainage system (Perez and Parsons 2006). This report helped identify additional locations where recharge wells may be located. This 2006 work provided the City with Adobe and AutoCAD maps of their stormwater system. Many of their existing inlets were surveyed to obtain elevations, and the main island was simulated in the Interconnected Pond Routing (ICPR) computer model. This 2006 ICPR model was referred to as the City's stormwater system model in the 2012 report. The 2012 Stormwater Master Plan project updated the ICPR model to the current version 3 and included new information available from the GIS inventory (CH2M 2012). The boundary condition and gravity wells rating curves were updated using then current information. However, the overall sub-basins and general layout of the model was still based on the 2006 work. This 2021 Update reviewed some of the sub-basin where new information was developed and has modified this City stormwater system model further.

A total of 49 stormwater gravity recharge wells were installed by the City's Engineering Department (not including the original Margaret Street well). The Utilities Department has constructed approximately 66 additional stormwater gravity wells and 7 stormwater pump-assisted injection wells (2 at Simonton/Front Street, 2 at White/Casa Marina Court, 1 at Patricia/Ashby, and 2 at Ashby/Catherine [aka George Street]). These pump-assisted wells are

also referred to as either pressurized or pressure wells, as opposed to the gravity wells. The gravity wells are also sometimes referred to as recharge wells. In addition, the Utilities Department restored hydraulic conveyance capacity to seven critical drainage flow ways (canals/ditches) and provided for the associated environmental mitigation. These flow ways directly serve more than 14 essential stormwater collection system outfalls.

Additional works since 2012 include implementing recommendations in the report or subsequent addendums. New inlets and pipes associated with street improvements around Duval, Whitehead, Front, and Caroline Streets included installation of six new gravity wells as part of the East Front Street project (2012 to 2014), and a storm sewer system for the Kamien neighborhood that is currently nearing completion (aka Patricia and Ashby project; 2021 expected completion). A new pump station near Venetia and Dennis Streets that leads to an outfall by the Salt Ponds has just been completed in 2020. These projects were either identified in the 2012 Stormwater Master Plan (like Kamien) or were included as opportunities associated with street improvements (like at Caroline Street). The City has also started to abandon some of the gravity wells located in low areas where the new projects can perform better. One well was abandoned at Dennis Street and up to 11 wells are proposed to be abandoned before the Kamien project is finished. These recent projects will be discussed as part of the model updates.

c. Inventory of data availability

The previous 2012 Stormwater Master Plan updated the cumulative studies conducted previously by others during a 20-year span and added new structure data as appropriate. Each new study builds on previous evaluations, and updates for new conditions, information, data, and regulatory criteria. The City built a computer model for the main island stormwater system. The 2005 City model was used as the starting point for the 2012 stormwater study. Data collected during the 2011 field inventory were used to update the City's model. In addition to field data, as-built drawings of projects were used to be sure that the revised City model was accurate. The old City model had drainage wells and some pipes and inlets in roads owned and operated by FDOT or the County, and not all of these were inventoried by the City. In these cases (mostly along Flagler, Truman, and Roosevelt Streets, both north and south drives), the former City model data were used as is. The computer modeling of the stormwater system on North Stock Island was conducted separately from the main island.

The data collection effort for the 2021 Update focused on updating the records for projects implemented since 2012. Some of the data that did not change were reused. The stormwater drainage reports, record drawings of stormwater infrastructure, and other data were collected. The global positioning system (GPS) survey data that inventoried stormwater facilities in the field during 2011 was relied on to help determine new additions (new recharge wells).

The 2024 Stormwater Master Plan Update similarly informed the most recent computer model of the stormwater system with updated structures. After the previous Master Plan was completed, some additional studies that supported some design work were conducted. During these focused evaluations, the existing model was used as a starting point and often more detail was added to incorporate proposed features. Typical detail included breaking some sub-basins into smaller units to better size pipes. Thereafter, the City retained another design firm to complete some of the designs. As-built drawings of the final projects were collected, used, and incorporated into this SWMP Update. When the previous model was modified, the portions with greater detail were used to update the 2021 model. The City also implemented some of the recommendations as part of the Front Street project and added recharge wells.

Monroe County

Monroe County, Florida, has implemented a comprehensive sustainability program to address the impacts of climate change and sea-level rise. The cornerstone of this initiative is the Green Keys Sustainability Action Plan, which outlines the County's vulnerabilities and provides a five-year roadmap for proactive measures. This plan includes strategies for improving water quality, managing solid waste and recycling, and enhancing the resilience of infrastructure.

A significant focus of the program is on elevating and protecting roads. The County has undertaken projects such as the Mobile LiDAR data elevation project to gather accurate elevation data for all 300 miles of County roads. This data is crucial for projecting the effects of sea-level rise and planning necessary adaptations. The Countywide roads analysis, which began in 2018, uses this data to identify roads at risk of inundation and develop long-term adaptation plans. This planning effort using the same methodologies has been launched with all the Keys' municipalities as well.

Monroe County also emphasizes community engagement and education. The sustainability program includes public outreach efforts to inform residents about climate change impacts and involve them in resilience-building activities. The County's Chief Resilience Officer oversees these initiatives, ensuring that the community is well-prepared for future challenges.

In addition to infrastructure and community efforts, Monroe County has implemented environmental restoration projects. These include a comprehensive canal restoration project aimed at improving water quality and restoring natural habitats1. The County also monitors and enhances its solid waste and recycling programs to reduce environmental impact and promote sustainability.

Overall, Monroe County's sustainability program is a multifaceted approach to building a resilient community. By integrating climate adaptation and mitigation into existing systems, the County

aims to create a stronger, more sustainable future for its residents. (Sustainability | Monroe County, FL - Official Website (monroecounty-fl.gov)).

Florida Department of Transportation (FDOT)

The Florida Department of Transportation (FDOT) has crafted a detailed Resilience Action Plan (RAP) to tackle the challenges posed by flooding, storms, and sea-level rise on the State Highway System. This initiative, required by Section 339.157 of the Florida Statutes, aims to fortify transportation facilities throughout Florida.

The RAP conducts a thorough evaluation of the transportation network's vulnerabilities and proposes strategies to mitigate these risks. Key elements include enhancing infrastructure design, using advanced materials, and adopting innovative construction techniques to endure extreme weather conditions. Additionally, the plan underscores the importance of maintaining and upgrading existing infrastructure to ensure long-term resilience.

A significant component of the RAP is community engagement. FDOT has established a Community Engagement Plan (CEP) to involve local stakeholders in the resilience planning process. This includes opportunities for public comments, webinars, and workshops to gather input and address community needs and concerns.

Complementing the RAP, FDOT is also developing a Statewide Resilience Improvement Plan (RIP). This plan builds on the RAP's findings and seeks additional federal funding through the Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) grant program. The RIP focuses on assessing asset risk and criticality, further enhancing the resilience of Florida's transportation infrastructure.

FDOT's resilience initiatives are designed to create a robust and adaptable transportation system capable of withstanding the impacts of climate change and extreme weather events. These efforts are crucial for ensuring the safety, mobility, and economic well-being of Florida's communities. It was determined from the *FDOT Resilience Action Plan Appendix A (Project List)* that Key West falls under the medium tier project category.

Florida Keys Aqueduct Authority

The Florida Keys Aqueduct Authority (FKAA) has provided data to both the City of Key West and Monroe County in efforts to conduct Vulnerability Assessments simultaneously with this effort to produce the Watershed Management Plan. Data regarding critical facilities has been incorporated into baseline asset maps referenced later within this document. Because the City does not own or manage FKAA assets, they are considered "regionally significant" and will be

evaluated under the scenarios required by Section 380.093, F.S. and incorporated into the Critical Asset Inventory work.

2. Locations

a. Critical facilities, cultural/historical, and other places/areas of interest

Within Key West, the public has access to the water via beaches, marinas, boat ramps and parks. Key West has parks with water access facilities.

Infrastructure components in the coastal area include roads, water and sewer lines and drainage facilities. There are 42 bridges in Monroe County, few in the City. All the drainage structures within Key West are in the coastal area. The public infrastructure, as identified above, could sustain damage from a natural disaster. Relocation of infrastructure is not a viable solution since the existing infrastructure is necessary to protect the health and safety of the residents in Key West.

Key West is simultaneously conducting a Resilient Florida Vulnerability Assessment concurrently with this Watershed Management Plan. Asset Inventory Maps are in Appendix C and include the 4 primary asset classes as defined in Section 380.093(2), F.S. The four primary asset classes as defined by state statute are:

- Transportation assets and evacuation routes, including airports, bridges, bus terminals, ports, major roadways, marinas, rail facilities, and railroad bridges.
- Critical infrastructure, including wastewater treatment facilities and lift stations, stormwater treatment facilities and pump stations, drinking water facilities, water utility conveyance systems, electric production and supply facilities, solid and hazardous waste facilities, military installations, communications facilities, and disaster debris management sites.
- Critical community and emergency facilities, including schools, colleges, universities, community centers, correctional facilities, disaster recovery centers, emergency medical service facilities, emergency operation centers, fire stations, health care facilities, hospitals, law enforcement facilities, local government facilities, logistical staging areas, affordable public housing, risk shelter inventory, and state government facilities.
- Natural, cultural, and historical resources, including conservation lands, parks, shorelines, surface waters, wetlands, and historical and cultural assets.

The baseline infrastructure map series generally follows these 4 defined asset classes, but certain maps were separated further within that classification system because the maps would have

included too many assets to make them legible. For instance, there are 3 Critical Infrastructure Baseline Maps and 5 related to Natural, Cultural and Historical Resources. The asset data provided by the City was also supplemented with asset information from the State of Florida, the Department of Homeland Security, and the Florida Department of Transportation. Actual Asset Maps include the following:

- Aquatic Natural Areas Baseline.
- Community and Emergency Management Baseline.
- Critical Infrastructure Baseline (Potable Water).
- Critical Infrastructure Baseline (Sanitary Sewer).
- Critical Infrastructure Baseline (Other).
- Historical and Cultural Areas Baseline.
- Terrestrial Natural Areas Baseline.
- Transportation Baseline.

b. Vulnerable areas and their descriptions

As the majority of the basins in the City are classified as open basins with direct overland and stormwater management system connections to the coast, most flood inundation is the result of the coastal sea level compared to localized runoff. This condition places both coastal areas and any lower lying upland areas with restricted stormwater conveyance to the coast at risk of frequent flood inundation. This places much of the area in the City east of White Street and south of Harris Avenue vulnerable to both current and future rainfall and sea level conditions. In particular, due to restricted outfall capacity within lower lying areas of the City, those areas east of 7th Street and central to Donald Avenue are particularly vulnerable.

In addition, the lower lying areas of Stock Island are vulnerable due to lower elevations and less stormwater infrastructure to handle rainfall and prevent inundation. Additional information on the vulnerability assessment is included in Section II.

c. Natural and constructed drainage systems and channels

The City drainage infrastructure includes a system of stormwater conveyance features constructed over the years as defined in Section 1. This infrastructure includes stormwater pump stations, gravity fed stormwater injection wells and pump assisted stormwater injection wells.

Natural systems are limited to an existing saltwater conveyance channel along Donal Avenue and a saltwater canal south of Riviera Drive that feeds into the Fogarty Avenue areas and outfalls

north to the coast. Those these elements allow for additional outfall from stormwater infrastructure discharging to them, their capacity is limited and they are tidally connected which allows high tide and future SLR conditions to directly affect areas central to the City that may be farther from the coast.

3. Existing regulations and plans in place for reducing flood risks

From the City's Comprehensive Plan (Version February 21, 2025 available online) the following policies are included related to reducing flood risks and stormwater management:

Policy 1-1.1.14: - Prepare for Future Sea Level Rise.

The City, together with the private sector, shall consider proactive steps and pilot programs to adapt for sea level rise and storm surges, including but not limited to preserving transportation options, increasing residential building resiliency and indoor air quality, preserving landscaping and residential building aesthetics, and preserving water quality.

Policy 1-1.4.6: - Increase Resilience of General Landscaping.

The City shall use best available science and predictions for sea level rise and other climate change related issues to guide the long term health and appearance of landscape plantings. By 2014 the City shall work with sea level rise and native plant experts to create a "Climate Adaptation Planting Plan" ordinance to affect landscaping plans. This plan shall be reviewed every other year to stay up to date with climate change predictions.

Policy 1-1.10.4: - Establishing the Key West Historic District Adaptation Action Area.

The City shall endeavor to develop and adopt programs and procedures to minimize risk of climate change impacts to the Key West Historic District, with particular emphasis on protecting historic structures and sites from storm surge, tidal flooding, sea level rise, and wind hazards. Adaptative techniques shall include strategies of site protection, such as development of compact open space corridors, and accommodation, such as structure elevations and stormwater management techniques. The City shall endeavor to develop financial strategies to support program implementation for both public and private properties. The City shall develop an adaptation plan to protect historic structures and sites within the District based on vulnerability analyses, and shall incorporate public input, and provide technical assistance to property owners.

OBJECTIVE 1-1.12: - CONSIDER APPLICATION OF INNOVATIVE LAND AND WATER RESOURCE MANAGEMENT, CLIMATE ADAPTATION, AND ENERGY CONSERVATION CONCEPTS.

The City of Key West shall maintain Land Development Regulations which incorporate concepts for managing land, water, and energy resources which are responsive to unique development and conservation issues identified in the City's Comprehensive Plan. The City of Key West shall adopt Land Development Regulations which incorporate concepts for managing land, water, and the

built environment which are responsive to climate change issues including but not limited to sea level rise and increased frequency of intense rainfall events.

Monitoring Measure(s): Number of structures and sites protected through regulatory mechanisms.

Policy 1-1.12.1: - Incorporate Innovative Techniques in the Land Development Regulations.

The City's Land Development Regulations shall maintain land and water resource management techniques which have been demonstrated to be successful and cost effective in resolving development and conservation issues such as surface water management, soil erosion and sedimentation control, land clearing and excessive tree removal, loss of mature plants and wildlife habitat, and conservation of water supply. The City's Land Development Regulations shall incorporate climate adaptation techniques which have been demonstrated to be successful and cost effective in adapting to climate change issues including but not limited to sea level rise, intense rainfall events, surface water management, soil erosion and sedimentation control, loss of mature plants and wildlife habitat, and conservation of water supply.

Policy 1-1.12.5: - Increased Height.

The City shall consider allowing increased heights for new construction or redevelopment if such additional height is justified based on adopted Coastal High Hazard Maps and Storm Surge Flood Maps in order to promote safe new development and redevelopment based on sea level rise predictions. Such additional height must be compatible with surrounding development.

Policy 2-1.3.4: - Climate Change Preparedness.

The City shall consider current science and predictions for sea level rise and other climate change issues in planning future roadway improvements.

Policy 4-1.1.2: - Level of Service Standards.

E. Drainage:

The Drainage level of service standard below will be applicable to all types of development. Where two or more standards impact a specific development, the most restrictive standard shall apply:

Post development runoff shall not exceed the pre-development runoff rate for a 25-year storm event, up to and including an event with a 24 hour duration.

Stormwater treatment and disposal facilities shall be designed to meet the design and performance standards established in Chapter 62-25 Section 25.025, Florida Administrative Code, with treatment of the runoff from the first one inch of rainfall on-site to meet the water quality

standards required by Chapter 62-302, Florida Administrative Code. Stormwater facilities which directly discharge into "Outstanding Florida Waters" (OFW) shall provide an additional treatment pursuant to Section 62-25.025 (9), Florida Administrative Code.

Stormwater facilities must be designed so as to not degrade the receiving water body below the minimum conditions necessary to assure the suitability of water for the designated use of its classification as established in Chapter 62-302 Florida Administrative Code.

OBJECTIVE 9-1.2: - LIMITATION ON PUBLIC INVESTMENTS IN THE COASTAL HIGH HAZARD AREA.

The City shall continue to limit public expenditures that subsidize development permitted in coastal high-hazard areas to restoration or enhancement of natural resources. In addition, public funds for improved public facilities such as existing state and local roadways, central wastewater system improvements included in the capital improvements element, and water dependent structures such as beach access ways, piers, and beach renourishment activities may be permitted where approved by state and/or federal agencies having jurisdiction. These facilities are necessary to implement goals, objectives, and policies, of the traffic circulation, public facilities, coastal management, conservation, and recreation and open space elements of the Comprehensive Plan. Any public subsidy of development in the coastal high hazard area shall only be approved where found to be needed to protect the health and safety.

Monitoring Measure: Capital expenditures in Coastal High Hazard Areas.

OBJECTIVE 9-1.6: - REQUIRING DEVELOPMENT ORDERS AND PERMITS COMPLIANT WITH CONCURRENCY MANAGEMENT, LEVEL OF SERVICE STANDARDS, GREEN BUILDING STANDARDS, AND THE CAPITAL IMPROVEMENT SCHEDULE.

Decisions regarding the issuance of development orders, building permits, certificates of occupancy, and other applicable permits shall be consistent with goals, objectives, and policies of the respective Comprehensive Plan elements, the City's adopted Land Development Regulations, and requirements for adequate public facilities meeting stated levels of service criteria. The City shall ensure that land use decisions and fiscal decisions are coordinated with the adopted schedule of capital improvements to maintain adopted level of service standards and meet existing and future needs.

All new construction projects and renovations where the cost of construction is equal to or greater than 50 percent of the buildings replacement cost must meet at least LEED Silver, Green Globes Two Globes, Florida Green Building Coalition Silver, or other nationally recognized, high performance green building rating system. All renovations where the cost of construction is less than 50 percent of the buildings replacement cost must meet at least the lowest tier of LEED,

Green Globes, Florida Green Building Coalition, or other nationally recognized, high performance green building rating system.

In determining the availability of services or facilities, a developer may propose and the City of Key West may approve developments in stages or phases so that facilities and services needed for each phase will be available in accordance with the standards required by CH 163.3180, F.S.

If any change in the Comprehensive Plan future land use map is proposed, no such amendment shall be approved until the impacts of proposed new land use activities on existing infrastructure as well as infrastructure included in the City's adopted capital improvement program have been identified and evaluated. The plan amendment shall be approved only if the projected impacts have been resolved through amendments to the capital improvements program or through an enforceable development agreement which ensures that any public facility needs generated by the proposed change in land use shall be met concurrent with the impacts of development and that adopted level of service criteria shall be met.

> *Monitoring Measure: Issuance of development orders contingent upon the provision of facilities and services.*

Policy 9-1.6.1: - Level of Service Standards.

The City shall use the following LOS standards in reviewing the impacts of new development and redevelopment upon public facilities. The City shall strive to overachieve by conserving more than the LOS standards, and by creating future conservation LOS standards that public facilities will attain:

Drainage:

The Drainage level of service standard below will be applicable to all types of development. Where two or more standards impact a specific development, the most restrictive standard shall apply:

a. *Post development runoff shall not exceed the pre-development runoff rate for a 25-year storm event, up to and including an event with a 24-hour duration.*

b. *Stormwater treatment and disposal facilities shall be designed to meet the design and performance standards established in Chapter 62-25, Section 25.025, FAC, with treatment of the runoff from the first one inch of rainfall on-site to meet the water quality standards required by Chapter 62-302, FAC. Stormwater facilities which directly discharge into "Outstanding Florida Waters" (OFW) shall provide an additional treatment pursuant to Section 62-25.025(9), FAC.*

c. *Stormwater facilities must be designed so as to not degrade the receiving water body below the minimum conditions necessary to assure the suitability of water for the designated use of its classification as established in Chapter 62-302, FAC.*

§9-3: - MONITORING AND EVALUATING THE CAPITAL IMPROVEMENTS ELEMENT.

The Capital Improvements element shall be reviewed on an annual basis in order to ensure that the required fiscal resources are available to provide adequate public facilities needed to support future land use consistent with adopted level of service standards. The City Commission shall take action as it deems necessary in order to refine/update the Capital Improvements Element.

The monitoring and evaluation procedure shall incorporate the following considerations:

14. Climate Change Preparation. The City Planner and City Engineer shall review the latest science and predictions for sea level rise and other climate change related issues and recommend any needed action to address currently scheduled or future projects.

Related to the reduction of flood risk, the City has adopted numerous policies within the Coastal Element of the Comprehensive Plan. Several of these policies were recently adopted pursuant to the requirements of the Section 163.3178, F.S. (Peril of Flood) amendment process. They include:

Policy 5-1.1.3: - Protect, Stabilize, and Enhance the Coastal and Wetland Shorelines.

The City shall continue to enforce Land Development Regulations which stipulate that no native vegetation shall be removed from the coastal or wetland shoreline without a duly authorized permit. Similarly, the City shall continue to enforce criteria in the Land Development Regulations which require that applicants for development along the shoreline shall be required to revegetate, stabilize, and enhance damaged vegetative shorelines by planting native vegetation, including mangrove and/or other native plant species which:

1) *Contribute to fish and wildlife habitat, marine productivity and water quality;*

2) *Offer protection from erosion and flooding; and*

3) *Contribute to the natural soil building process.*

Hardening of the shoreline with rip-rap, bulkheads or other similar devices be discouraged unless the use of vegetation has failed to stabilize the shoreline over a five year period; non-rip-rap and natural shorelines are encouraged when feasible.

The City shall endeavor to develop a shoreline stabilization strategy to protect and enhance the built and natural environment from erosion and sea level rise impacts.

OBJECTIVE 5-1.4: - LIMITING PUBLIC SUBSIDY OF DEVELOPMENT IN THE COASTAL HIGH-HAZARD AREA.

The City shall limit public expenditures that subsidize development permitted in coastal high-hazard areas to restoration or enhancement of natural resources. In addition, public funds for improved public facilities such as existing state and local roadways, central wastewater system improvements included in the capital improvements element, and water dependent structures such as beach access ways, piers, and beach renourishment activities may be permitted where approved by state and/or federal agencies having jurisdiction. These facilities are necessary to implement goals, objectives, and policies, of the transportation, public facilities, coastal management, conservation, and recreation and open space elements of the Comprehensive Plan. Any public subsidy of development in the coastal high hazard area shall only be approved where found to be needed to protect the public health and safety.

Monitoring Measure: Public expenditures in Coastal High Hazard Areas.

Policy 5-1.4.1: - Public Investments in Coastal High-Hazard Area.

Publicly funded facilities shall not be built in the Coastal High-Hazard Area, unless the facility is for the protection of the public health and safety.

OBJECTIVE 5-1.5: - AVOID POPULATION CONCENTRATIONS IN COASTAL HIGH-HAZARD AREAS.

The City shall continue policies to direct population concentrations away from coastal high hazard areas by regulating the density of residential development and redevelopment within the coastal high hazard area.

Monitoring Measure: Number of amendments approved to increase residential density in Coastal High Hazard Areas.

Policy 5-1.5.1: - Restrict Development in Coastal High-Hazard Areas.

The City shall incorporate appropriate policies in the Land Development Regulations in order to direct population concentrations away from known or predicted coastal high-hazard areas.

Policy 5-1.5.2: - Definition of the City of Key West Coastal High-Hazard Area.

The City of Key West Coast High-Hazard Area is defined as the area below the elevation of the Category 1 storm surge line as established by a Sea, Lake and Overland Surges from Hurricanes (SLOSH) computerized storm surge model. The Coastal High Hazard Area is identified on the Future Land Use Map series.

Policy 5-1.5.2.5: - Local Coastal Construction Control Line and Coastal Construction Zones.

The City of Key West established a Local Coastal Construction Control Line in 1997 and shall endeavor to develop additional local code requirements applicable to land seaward of Coastal Construction Control Lines to provide additional resilience for man-made structures in these higher-risk areas of the island. These Coastal Construction Zones shall not preclude all new construction but shall endeavor to minimize inappropriate and unsafe development in coastal areas. Land development, site plan review and permit review for work in these areas may also require compliance with more stringent standards to reduce risk from wind, storm surge, tidal flooding, and sea level rise.

Policy 5-1.5.3: - Adaptation Action Areas.

For hazard mitigation purposes, the City will create Adaptation Action Areas which identify one or more areas that experience coastal flooding due to extreme high tides, storm surge, and that are vulnerable to the related impacts of sea level rise and climate change. Establishments of AAAs will improve the resilience of built and natural area and help prioritize funding for infrastructure needs and adaptation planning.

> *Criteria for identifying Adaptation Action Areas may include vulnerability related to geography, topology, demography, future scenarios, history of risk, habitat type, building type or infrastructure type.*
>
> *The City shall collaborate and coordinate with local, regional, state, and national governmental agencies, toward the implementation of AAA adaptation strategies and to identify risks, vulnerabilities, and opportunities associated with coastal hazards and the impacts from sea level rise. Strategies and opportunities include, but are not limited to, areas with several repetitive loss properties, build back standards, elevating, hardening or relocating structures, increasing green and blue infrastructure and corridors, amending City code, elevating or abandoning rights-of-way.*

From the City's Code of Ordinances (current), the following policies are provide the regulatory framework for stormwater within the City:

Sec. 14-364. - Stormwater retention.

Stormwater shall be retained on individual lots as required by city ordinance and shall not discharge into the city stormwater system.

Sec. 108-713. - Intent.

The surface water management requirements are intended to complement regulations of the state department of environmental protection (DEP) including but not limited to those found in F.A.C. ch. 17-25, entitled "Regulation of Stormwater Discharge," and the surface water

management rules of the South Florida Water Management District, all as adopted or as may be amended from time to time. Approval of a stormwater management system under this article shall not relieve any applicant of the necessity to obtain required permits or approvals from other state, regional, or local agencies, including specifically but not limited to observance of the state department of environmental protection permitting requirements for use of the "landward extent of waters of the state," as defined in F.A.C. 17-4.02(17). If a conflict occurs between the city regulations and state regulations, the more restrictive regulations shall prevail.

Sec. 108-777. - Water quality criteria.

All new surface water management systems will be evaluated based on the ability of the system to prevent degradation of receiving waters and the ability to conform to state water quality standards established in F.A.C. ch. 17-302. Developments which plan to utilize outstanding Florida waters for discharge of stormwater will be given more detailed evaluation by the city staff. The following criteria shall be met:

1) *Discharge. Projects shall be designed so that discharges will meet state water quality standards, as set forth in F.A.C. ch. 17-3.*

2) *Retention/detention criteria. Retention and detention criteria shall be as follows:*

    a. *The first flush of runoff contains the majority of pollutants. As a minimum, the amount of water to be treated in a stormwater management system shall be equal to the first inch of runoff or 2.5 inches times the percent of impervious coverage. Commercial or industrial projects shall provide at least one-half inch of dry detention or retention pretreatment as part of the required retention/detention.*

    b. *Systems with inlets in grassed areas will be credited with up to 20 percent of the required wet detention amount for the contributing areas. Full credit will be based on a ratio of 10:1 pervious area runoff to impervious areas with proportional credit granted for greater ratios. Grassed areas must be permanently protected from vehicular use and structural encroachment.*

    c. *Projects having greater than 40 percent impervious area which discharge directly to sensitive receiving water shall provide dry detention or retention pretreatment equal to 50 percent of the total required, depending on the arrangement of on-site facilities. Sensitive receiving waters are defined as:*

        i. *Class I or class II waters.*

        ii. *Class III, outstanding Florida waters.*

iii. Canals connecting with these waters.

d. Water surfaces can be deducted from site areas for water quality pervious/impervious calculations.

3) Master drainage plan for subdivisions. Projects to be subdivided for sale are required to have installed by the permittee, as a minimum, a stormwater management system which provides for a master stormwater collection and conveyance system to interconnect the retention/detention system with the outfall, with access points to the system available to each individual lot or tract. The systems shall be sized to limit discharge under design conditions to the allowable discharge. Projects permitted in such a manner may require deed restrictions which identify to lot or tract purchasers the amount of additional on-site stormwater management necessary to provide flood protection for specific design events and any additional retention/detention required for water quality proposed.

Sec. 108-778. - Water quantity criteria.

All new stormwater management systems will be evaluated on the ability of the system to prevent flooding of on-site structures, adjacent properties, roads, and road rights-of-way based upon antecedent rainfall conditions. The following criteria shall be met:

1) Discharge. Off-site discharge is limited to amounts which will not cause adverse off-site impacts. These amounts are:

a. Historic discharges based on natural site drainage patterns; or

b. Amounts determined in previous South Florida Water Management District or county permit actions.

2) (2) Drainage and flood protection criteria. The surface water management system shall be designed using a 24-hour rainfall duration and 25-year return frequency in computing allowable off-site discharge rate. The applicant shall also provide data indicating the effect of a 25-year, 72-hour storm on the development project as proposed. If the more intense storm event will cause drainage problems for the proposed surface water management system, than city staff shall require the surface water management system to be designed for the 25-year, 72-hour storm event instead of the 25-year, 24-hour storm event. Flood protection and floodplain encroachment standards shall be those established in this subpart B. If post-development conditions are such that a volume greater than the retention and/or detention volume required for stormwater management is already being retained on site, that condition will be maintained.

Sec. 118-300. - Stormwater management.

I. All subdivisions shall have an adequate comprehensive stormwater management system compliant with the surface water management requirements in article VIII of chapter 108, including necessary ditches, canals, swales, percolation areas, berms, dikes, piers, detention ponds, storm sewers, drain inlets, manholes, head walls, end walls, culverts, bridges and other appurtenances, shall be required in all subdivisions for the positive drainage of stormwater. In addition, stormwater treatment facilities shall be required in the subdivision to control stormwater runoff quality by providing for on-site percolation and/or retention or other appropriate treatment technique for stormwater. Such requirements shall be compliant with article VIII of chapter 108 as well as the environmental performance criteria of sections 108-1 and 108-957; and articles III, IV, V, VII and VIII of chapter 110 pertaining to environmental protection.

The design data of the drainage system shall be submitted along with the construction plans in a report form prepared by the applicant's engineer indicating the method of control of stormwater and groundwater pursuant to criteria of article VIII of chapter 108 pertaining to surface water management.

Article V of the City's Code provides the framework for the City's Utility Assessment System; it can be found in its entirety at Appendix B. The Floodplain Management Ordinance is included entirely in Appendix A.

II. Initial Flood Modeling

The City of Key West Vulnerability Assessment was carried out to meet the objectives of the 380.093(3), F.S. criteria for Vulnerability Assessments as well as some of the CRS Coordinator's Manual (2017 & 2021 Addendum). An overview of the modelling approach is provided below.

To understand the system's vulnerability, an analysis was done to evaluate risks associated with current and future conditions. This analysis considered the sea level rise, high tide flooding, storm surge, rainfall with flood modelling to develop the flood plains for Key West. This floodplain data was plotted and visualized using the geospatial software ArcGIS pro. Flood mapping does not include areas not part of City of Key West i.e., areas under U.S. Navy and U.S. Department of Transportation (DOT). Climate risk modelling involved developing flood plains for the years 2040, 2070 and 2100. The model approach and data used are described below.

The exposure and sensitivity of the critical assets defined in Subsection 380.093, F.S. will be determined by the locations and information stored within the GIS data gathered during the project timeline and produced to meet the minimum requirements outlined in FDEP's Standard Scope of Work and the Adaptation Planning Guidebook.

Modeling approaches and corresponding data requirements are described briefly below.

1. To model sea level rise, we will use the NOAA Office for Coastal Management's Detailed Method for Mapping Sea Level Rise Inundation (January 2017). This approach will show tidal inundation for the Intermediate Low and Intermediate High scenarios as detailed in NOAA Technical Report NOS CO-OPS 083, which provides global and regional sea level rise projections for the United States.
2. High tide flooding, commonly referred to as "king tides," will be modeled using a methodology like the one previously described. This approach will integrate high tide flooding thresholds as specified in NOAA Technical Report NOS CO-OPS 086, which examines patterns and projections of high tide flooding along the U.S. coastline using a standardized impact threshold. Additionally, the modeling will incorporate the Intermediate High scenario from NOAA Technical Report NOS CO-OPS 083, which outlines global and regional sea level rise projections for the United States
3. To model storm surge either 1) FEMA's HAZUS-MH software's Flood Hazard Analysis module where still water elevations derived from the most recent effective Flood Insurance Study are adjusted for to account for sea level rise or 2) United States Department of Energy's Sea Level Rise + Storm Surge Methodology (April 2016) is used.

4. The amount of precipitation is obtained from NOAA's Atlas 14 and future rainfall precipitation change factors derived from the SFWMD will be applied to account for future rainfall totals.

The CVA followed the Resilient Florida guidelines and utilized GIS-based methods to assess KW's assets with respect to the flood hazards identified. The modeling encompassed present-day conditions and planning horizons of scenarios for the years 2040, 2070, and 2100, incorporating assessments of 25-, 50-, 100-, 500-, and 1,000-year storm events. A total of 126 scenarios were un for this assessment. SLR scenarios included the 2017 NOAA intermediate-low (NIL) and intermediate-high (NIH) sea level rise projections as required by Section 380.093, F.S. at the time of the analysis. Data sources include (**Table 6** from the Vulnerability Assessment):

Table 6 - Data Sources for Flood Hazards

Flood Hazard	Data Source
Days of Tidal Flooding	NOAA Key West Tide Guage (with statistical analysis and bathtub modeling)
Current Rainfall	NOAA Atlas 14 (with HEC-RAS modeling)
Future Rainfall	NOAA Atlas 14 (with HEC-RAS modeling modified by SFWMD change factors)
Current and Future SLR	NOAA Key West Tide Guage and NOAA 2017 SLR Projections (with bathtub modeling)
Current and Future Storm Surge	FEMA FIS (Hazus-MH Modeling)

General Overview of the WMP

The previous 2012 Stormwater Master Plan updated the cumulative studies conducted previously by others during a 20-year span. Each new study builds on previous evaluations, and updates for new conditions, information, data, and regulatory criteria. The City contracted Perez and Parsons to build a computer model for the main island stormwater system. The 2005 City model was used as the starting point for the 2012 study. Data collected during the 2011 field inventory were used to update the City's model. In addition to field data, as-built drawings of projects were used to be sure that the revised City model was accurate. The previous City model had drainage wells and some pipes and inlets in roads owned and operated by FDOT or the County, and not all of these were inventoried by the City. In these cases (mostly along Flagler, Truman, and Roosevelt Streets, both north and south drives), the former City model data were

used as is. The computer modeling of the stormwater system on North Stock Island was conducted separately from the main island.

The 2024 Stormwater Master Plan Update similarly informed the most recent computer model of the stormwater system. After the previous Master Plan was completed, CH_2M HILL (now Jacobs) conducted some additional studies that supported some design work. During these focused evaluations, the existing model was used as a starting point and often more detail was added to incorporate proposed features. Typical detail included breaking some sub-basins into smaller units to better size pipes. Thereafter, the City retained another design firm to complete some of the designs. As-built drawings of the final projects were collected, used, and incorporated into this SWMP Update. When the previous model was modified, the portions with greater detail were used to update the 2021 model. The City also implemented some of the recommendations as part of the Front Street project and added recharge wells.

This section describes how the City's 2012 computer model was updated and provides the results of the updated simulated existing conditions for the main island.

a. Evaluations of the existing drainage system's runoff response from design storms using a hydrologic and hydraulic study with a hydrograph approach under current and predicted future land use conditions with assessments of the impacts of climate change and sea level rise for 10-, 25- & 100-year storm events.

Overview of ICPR Program

The ICPR computer program was used to simulate the design storms in the 2005 City model and was retained for subsequent updates. This computer program is popular in Florida and is often used in designing stormwater facilities. It is a stormwater node-link model where excess stormwater is estimated to predict runoff hydrographs (flow versus time) into nodes; and links are hydraulic elements such as pipes, channels, or street overflow. A node can be a pond, manhole, or a placeholder used to connect links. The recharge wells are associated with nodes, and their impact is simulated by using stage-discharge relationships (Section 2.3.4). This simulation tool is sometimes referred to as the H&H model because it incorporates both runoff and the routing of the runoff to the boundaries in one package.

In 2012, and other work done through 2020, ICPR version 3 was used as the H&H model. The ICPR developer, Streamline Technologies Inc., issued version 4 and quit supporting its earlier ICPR version 3 in 2019, including operating systems prior to Windows 10. Consequently, a main objective of updating the City H&H model was to update it to ICPR4. This was accomplished by using import tools and then the conversion was checked against version 3 results. New facilities were added to the ICPR4 model. There are two models, one for the main island and another for

Stock Island. There were no new facilities identified on Stock Island, so that version 3 model was converted to ICPR4 without other changes. This version 3 to version 4 and project update work was completed in 2021, but the SWMP was not completed until 2024.

The modeling approach previously used was retained for the 2024 Update. For simulating large storm events, hydrologic modeling entails predicting the stormwater runoff hydrograph from the sub-basins. The program was used to compute runoff using standard Soil Conservation Service (SCS) methods for the design storms described in Section 2. These SCS methods are standard practice and are accepted by the SFWMD. Unit hydrographs and rainfall distributions are defined by SFWMD criteria. Hydraulic modeling entails predicting flow rates in links and water depths at nodes in a process that is generically called routing the storm. Routing is accomplished by iterative numerical solutions to equations of physics (termed dynamic routing) that account for water staging up and backwater effects from downstream nodes. By using dynamic routing, the stormwater model can accurately compute the flows and water elevations in the entire drainage system for the flat topography in Key West. The stormwater model evaluates the capacity of the pipes, pump stations, and wells, but not the inlets. The capacity of street inlets is assumed to be nonlimiting in the computer model, which is a common assumption used in stormwater master plans. Sometimes this assumption is inaccurate, especially in older neighborhoods. This assumption requires that inlet capacity be considered independently of the modeling results during the design of new facilities.

Rainfall

An important rainfall data input is the storm characteristics used to assess and design infrastructure. Design storms are expressed in terms of a return period, which is an expression of probability (= 1/return period). For example, a 10-year storm means that there is a 1 in 10 chance that a storm at least as large as that one would occur in any given year. The Federal Emergency Management Agency (FEMA) often uses the 100-year storm (1 percent chance of occurrence per year) as a threshold for determining flooding potential. Building codes normally require the minimum first-floor elevation to be above the 100-year flood elevation. However, extensive flooding can occur with much smaller storms, including the 2-year storm (50 percent chance of occurrence).

The design storms used in the evaluation are shown in **Table 7**. In 2012, the rainfall volumes are based on standard literature values available from either the South Florida Water Management District (SFWMD) or FDOT. Since 2012, NOAA has published updates to precipitation analysis, commonly referred to as Atlas 14 (Perica et al. 2013). The 2024 Update used the most recent available data, which are shown in **Table 8**. Some projections expect that rainfall volumes for

design storms are going to increase with climate change because higher atmospheric temperatures will carry more moisture.

Table 7 - Design Storm Events

Frequency (years)	Duration (hours)	Precipitation (inches)
Mean Annual (2.33)	24	4.8
10	24	7.6
25	24	11.7
50	24	14.0
100	24	16.5
500	24	26.7
Source: NOAA, 2023		

Future precipitation amount was obtained by adjusting the NOAA precipitation depth for future scenarios 2040, 2070 and 2100.

Table 8 – Future Precipitation

Year	Scenario	Precipitation (inches)
2040	25-Year	13.05
2040	100-Year	18.82
2070	25-Year	14.15
2070	100-Year	20.28
2100	25-Year	15.61
2100	100-Year	22.34

Subbasin Area

Sub-basins are used in the hydrologic model to estimate runoff, and each sub-basin is usually associated with at least one node. The 2005 City model was used as a starting point for the sub-basin delineation. Subsequent updates (2012 and 2021) modified sub-basins to better represent the runoff to specific facilities. Although the topography was updated with more detailed

mapping, the sub-basins in the City typically are defined by the pipe networks and street elevations. The blocks between major streets often form the sub-basin divides, and the 2005 work often used the sanitary sewer as-built manhole elevations near the middle of intersections as input data. The 2012 work used new global positioning system (GPS) inventory to modify the boundaries or split basins in a few locations to capture drainage features, especially for the newer facilities. This 2024 Update started with the 2012 GIS layers and incorporated the modeling studies completed after the 2012 Update, including new sub-basins. Some further adjustments were made near the Ferry Terminal area to better define the contributing areas to each outfall there. **Figure 4** illustrates the revised sub-basins for the new City ICPR4 model.

The City's 2005 model was reconstituted to form the basis of the 2012 ICPR3 model. A large change to the City's model in 2012 was to change all the input data into NAVD 88. This was done by subtracting 1.345 feet from every elevation data point in the model. The 2012 Update entered projects implemented since 2005, including the White Street pump-assisted wells and approximately 31 new intersections with gravity wells. Because the George Street pump-assisted well system was still being designed, it was not included in the 2012 existing conditions model. This facility is now updated into the 2021 H&H existing conditions model.

Figure 4 - Revised Sub-basins for the New City ICPR4 Model

Another 2012 decision was to construct one model for the entire main island and a separate model for Stock Island. The 2005 model was only for the main island. Sub-basins were assigned to "groups" in ICPR that generally corresponded to ocean outfalls. Also, the same node and pipe naming scheme from the 2005 City model was used in the 2012 model. The detailed studies sometimes split a larger sub-basin into smaller units. New sub-basin names often were derivatives of the original name. For continuity between studies, the same names were retained for the 2021 model.

The following steps also were completed to develop an accurate update to the City's stormwater model:

- Pipe sizes and pipe connectivity were checked against the 2011 GPS field data. If a difference in pipe sizes existed between the field data and former City model, the pipe size and connectivity provided in the field data were used. New as-built data were used to update pipe and inverts.
- Gravity recharge wells were already in the 2012 City model, and it included proposed wells that were turned off (no flow). However, some of the new projects were in other locations and some of the proposed wells were not constructed. The locations of the existing gravity recharge wells were identified from the 2011 field data and as-built drawings. A gravity recharge well is represented in the model as a node with rating curve associated with it. A typical rating curve was used for all the gravity wells (discussed further in Section 2.3.4).
- The GIS topographic data were used for elevation area for each basin. The 2012 Update used the DEM to intersect the sub-basin boundary to produce the stage-area table for each sub-basin and then data were entered into the model. This was conducted for the new sub-basins configured for the 2024 Update.

Curve Number Method

The SCS methods referred to in the overview section above included using the Curve Number Method to estimate excess runoff volume and a unit hydrograph to predict the timing of runoff. The peaking factor used for the unit hydrograph was 256, which is commonly used by the SFWMD for near-flat landscapes. The City is mostly built out and there have been no major land use changes on the main island since 2005, so the same curve numbers from the 2005 City model were used. **Table 9** lists those curve numbers used previously. By land use, these curve numbers are fairly high (more runoff volume), but the City has a fairly high impervious area because of the relatively high density on the main island. In addition, the runoff potential is greater because of

high groundwater levels relative to the ground surface. The time of concentrations for the unit hydrographs were adopted from the City's model that was based on the SCS TR-55 method.

Table 9 - Curve Number Used in Key West

Land Use	Percent Impervious	Curve Number
Residential High Density	60	91
Open Land	0	80
Retail Sales and Services	84	95
Residential Medium Density	45	88
Commercial and Services	79	94
Recreational	14	83
Institutional	73	93
Industrial	80	94
Mobile Home Units	65	92

Hydraulics

The hydraulic elements refer to those physical facilities that are designed to move stormwater and also include the overland flow that may occur when the pipes are too small to convey the runoff flow rates. Stormwater runoff reaches a node and then can stage up if the capacity of the inlets (also called the catch basins) are insufficient to allow the water to enter the pipes. If the pipe capacity is overwhelmed, then runoff also can stage up over the inlets in the streets until water starts to flow to lower elevations, very often through the streets. As noted in the beginning of this section, inlets are normally sized to exceed the capacity of connecting pipes so it is assumed in the H&H model that all stormwater can get into the pipes. This may not be the case if the inlets are blocked with debris or, as is likely in many parts of the City, if the inlets are relatively small. It is assumed in the City's model, as is typically done, that inlets are not limiting flow into the system, and are simulated in a maintained, free-flowing condition.

In coastal regions, there are two methods commonly applied to analyze stormwater systems: by sub-basin or by interconnected sub-basins. The sub-basin approach allows water to stage up only within the sub-basin until the pipes or other infrastructure can drain the stormwater. This approach is applicable when sizing elements to manage runoff from a limited area. The disadvantage of the sub-basin approach for a regional plan is that different sub-basins will stage up to different heights, and flood mapping will be discontinuous. For Key West's 2021 Stormwater Master Plan, the sub-basins were modeled interconnected by the streets or other low areas, which also was the approach used in past studies. The street connections were

simulated in the 2012 model as a typical two-lane street channel of irregular shape. In some instances, the streets were modeled as overland weirs with similar roadway shapes.

As part of the scope, two-dimensional (2-D) modeling was considered. The ICPR4 model has a new feature that allows for a 2-D computational method. After reviewing the new DEM data and considering the state of development already present in the City, it was determined that there was no advantage in using the 2-D model. Additionally, the 2-D module of ICPR4 generally is suited for broad expanses of open, low-lying- areas to better represent the spread of water in overland flow systems. Interconnecting the sub-basin with street channels better represents the most runoff flow in the City. Although the LiDAR data were originally reduced to be accurate for a 3-meter resolution, the NOAA DEM was resampled at a 5-meter resolution (16.4 feet), which would not capture the streets or other objects any better than was accomplished in the past work. The time to simulate storms and the file sizes become very large (almost unwieldly) when the 2-D option is used. Consequently, only one-dimensional modeling was conducted.

Storage to hold the excess runoff while it is being routed through the pipes or streets was determined by using the DEM. Elevation area was exported from the GIS and entered into ICPR for the nodes. Pipes included in the model mostly represented the main conveyances toward each outfall or recharge well. The invert elevations typically were the same used in the existing conditions model adjusted to NAVD 88 unless there were new as-built data for the new construction. Pipe diameters in the 2005 model were checked against the GPS inventory in 2012.

Specific Updates to the 2021 H&H Model

Different types of updated information were provided by the City or were available from work previously performed by Jacobs. When a study was performed by Jacobs, the project-specific model was available. The as-built survey or design plans were used to verify the final constructed facilities. There were only a few projects (since the 2012 update) to incorporate into the model, as described in the following subsections.

Patricia and Ashby Stormwater Improvements (2020)

This project included installing new inlets and stormwater pipes throughout the Kamien neighborhood and connecting them to the pressurized well facility located near the intersection of Patricia and Ashby Streets. The project was completed in July 2021. The design drawings were used to enter new pipes and inlets. The neighborhood was acting hydraulically like a bowl and was represented as one sub-basin in previous models. The design included breaking this one basin into 14 smaller sub-basins to align with the new pipe network. The project model was incorporated into the 2021 H&H model.

An add-on to this project included plugging 11 gravity wells in the neighborhood after the pipes were installed. This change was not included in the 2021 existing conditions model because the wells were not plugged yet. Because of the low landscape, the gravity wells had negligible impact on peak flood stages. These wells are now plugged and are turned off in the future conditions model.

Simonton Outfall (2016)

Emergency outfalls were added to the pressurized wells at Patricia and Ashby Streets, George Street, and Simonton Street. As part of the design of the Simonton outfall, the contributing areas along Simonton and Front Streets were updated to reflect the final design. Sub-basin boundaries were modified in the contributing area.

The emergency outfalls were permitted for operation during severe tropical weather to protect the pressurized wells from excess sand being pumped into the wells. The permit allows use of the outfalls for these pump stations to protect property from flooding. The capacity of these outfalls is controlled by the pump capacity. The four pressurized well systems with outfalls were assumed to have their emergency outfalls turned off during the design storms. But if they were on, the pump flow rate would remain the same.

George Street Pump Station (2014)

CH_2M was beginning a design of a new pressurized well system starting about the same time that the 2012 Master Plan was completed. This facility was installed, and the modeling conducted to support the design was used to upgrade the 2012 model for future conditions. For the 2021 model, the emergency outfall was included and as-built data were used to adjust the designed features into the existing conditions model.

Front Street Project (2015)

The City upgraded several outstanding items in a design project by Perez. The improvements were derived from the 2012 Stormwater Master Plan and an amendment. This project included routing the intersections around the Aquarium to a new outfall location (bigger pipe) because the old outfall failed. This project also included adding six gravity wells around Duval Street to offload runoff from the main stormwater pipe serving the commercial district. Sub-basins were split around the Wall Street and Mallory Square area, and along a couple of the streets with new gravity wells. As-built data were used to modify the ICPR4 model.

Caroline Street (2016)

As part of a street upgrade, Perez designed new stormwater inlets and upgraded an outfall between Duval and Grinnell Streets. A 12-inch outfall was replaced with a 24-inch pipe. CH2M

also amended the Stormwater Master Plan and modified the stormwater model in this area to include more sub-basins to support Perez's design. The as-built drawings were used to verify the new infrastructure in the design.

Dennis Street Pump Station (2020)

The intersection near Venetia and Dennis Streets was a priority project in 2012. Black and Veatch designed a pump station to discharge to an indirect outfall south of Key West High School that flows into the Salt Ponds. As-built drawings were used to include this new pump station in the 2021 model. This project varies from the pressurized wells because there are no wells and it directly pumps to the outfall.

Boundary Conditions

The boundary elevation at the outfalls used in the Master Plan was the same elevation reported for the Key West tidal gauge for the MHHW, a constant 0 NAVD 88. Again, studies can assume different boundary conditions, either constant or varying tides. In varying the tides, an assumed sinusoidal curve is used to represent boundary elevations. To be conservative, the timing of the curve would be such that the peak would cause the highest flooding on land. Alternatively, by assuming a constant high tide elevation, the timing of the tides is not an issue. However, the constant boundary condition assumption in the model will simulate long-duration flooding, which is overly conservative. Regardless, both approaches should provide similar peak flood elevations.

The methodology for these sea level rise projections involved several key components. Climate models were used to simulate the Earth's climate system and predict future changes based on various greenhouse gas emission scenarios, considering factors like temperature, precipitation, and atmospheric circulation. Historical data from tide gauges and satellites provided essential sea level measurements, which helped validate and calibrate these climate models. Projections were made under different scenarios, such as low, medium, and high greenhouse gas emissions, to estimate a range of possible future sea levels.

Local factors, including land subsidence, ocean currents, and proximity to melting glaciers and ice sheets, were considered to refine global projections for specific regions. Advanced statistical techniques, such as ensemble modeling and data decomposition, were employed to enhance the accuracy of these projections. Additionally, consensus projections from the Intergovernmental Panel on Climate Change (IPCC) reports, based on the latest scientific literature, were widely used for planning and policy-making.

The results concluded that the most conservative tide gauge, located at Naples, with the highest tidal range and normal wind setup levels, should be used as the reference point for stillwater levels during non-storm conditions along the coastline of the Florida Keys within Monroe County.

In case of Key West, the sea level rise (SLR) projection for the Key West Tide gage was used for the overall boundary condition . Additionally, consistent with Section 404 of the Coordinator's Manual, the NOAA Intermediate High sea level rise projection was utilized. This time-stage boundary condition represents the coastal fluctuation for each event. A summary of the sea level rise projection for each modeled storm event is listed in **Table 10** based on a NAVD88 zero datum adjustment from Key West gage 8724580.

Table 10 - Boundary Condition Elevations based on Sea Level Rise Projections for Key West from King Tides

SLR scenario for Key West using the Key West Tide Gauge (NOAA station 8724580)	Elevation for Boundary condition in NAVD88 (ft)
2025	0.00 + 1.93 = 1.93
2040	0.60 + 1.93 = 2.53
2070	2.50 + 1.93 = 4.43
2100	5.35 + 1.93 = 7.28
Source: NOAA Intermediate High, 2017 & King Tide and Normal Wind Setup Analysis for Monroe County, Florida, 2020	

Additionally, NOAA's 2017 intermediate high (Int-High) projections (NOAA 2017) were also independently assessed without the influence of King Tides and wind setup. This assessment allows for a direct SLR projection in ft (NAVD88) without the addition of most astronomical tides and wind setup as observed in the King Tides report, presenting a less severe NOAA intermediate high projection that will be used for the initial proposed - project setups. This report was also used to determine the SLR adjustment factor of 1.93 ft used in the King Tides report to account for the addition of the most astronomical tides. This adjustment factor was used to interpolate the 2070 SLR projection from the King Tides report in **Table 10**. A summary of the sea level rise projections from NOAA's Intermediate High projection is listed in **Table 11**.

Table 11 - Boundary Condition Elevations based on Sea Level Rise Projections for Key West from NOAA Intermediate High, 2017

SLR scenario for Key West using the Key West Tide Gauge (NOAA station 8724580)	Elevation for Boundary Condition-based NOAA 2017 Int High (ft NAVD88)
2025	0.00
2040	0.60
2070	2.53
2100	5.35

Source: NOAA Intermediate High, 2017

b. For currently fully developed watersheds: studies of existing development and the potential impact of any redevelopment.

The existing ICPR model was assessed for the City of Key West watershed on an overall basis. Since most basins within the City were classified as open basins with direct overland and stormwater management system connections to the coast, most flood inundation is a result of the coastal sea level compared to the localized runoff from subbasins. Therefore, most of the future inundation is a result of the SLR rather than future planned redevelopment.

c. Evaluations of different management scenarios for at least the 100-year rainfall event for a fully developed watershed at a scale sufficient to determine local problems.

The ICPR model was set up to address the current 2025 scenario, as well as to represent future conditions in 2040, 2070, and 2100 to assess impacts of SLR when compared to the existing conditions 2025 scenario. Each scenario was assessed based on two projected SLR sources as previously stated (i.e. 1) NOAA Int-High 2017 & 2) NOAA Int-High 2017 + King Tides Study). The difference in those projections is the inclusion of the largest astronomical tides for the King Tides study into the boundary condition elevations. Most of the basins in the City of Key West Watershed were classified as open basins with direct connections to the coast and therefore are less influenced by the intensity of the rainfall events compared to the projected elevations of the SLR and King Tide events.

d. Determinations of the change in runoff from current to future, fully developed conditions.

Differences in runoff from current to future conditions were determined to be minimal based on the available existing conditions and future land use classifications for the City of Key West's watershed. Existing vacant parcels with a designated land use were conservatively modeled in the existing conditions with the designated current land use in place. Additionally, it was determined that the City is currently built out and any new units or redevelopment will not make a significant difference on the flooding extents for the project locations as the adjacent parcels were originally designed assuming full build out. Additionally, the City of Key West consists of primarily open basins. Consequently, any discharge that would contribute to local flooding generally discharges towards the coast. Therefore, minor change (if any) between the existing land use/future land use classifications would result in minimal overall increases to runoff and flood risks due to the direct surface connection to the coast.

e. Recommendations for managing at least the 10-year and the 25-year rainfall events.

Due to the nature of flooding based on coastal risk and rising tailwater conditions, it is prudent for the City to plan for some level of future SLR for resiliency purposes. Several conceptually modeled solutions were examined to develop a preferred alternative for each study area. Preferred solutions are those that were identified as the most cost-effective while providing an increased LOS during the 10-year, 24-hour rain events. Efforts were made to develop solutions for greater than the 10-year rainfall events, but the general target for service along City roadways was the 10-year event under 1-foot tidal conditions, as well as the regionalized, resiliency based- solution approaches for the 2.7-foot tide boundary condition.

A summary of the proposed projects is provided in Section 6. In these cases the stormwater infrastructure is designed for conveyance that meets or exceeds the 10-year, 24-hour storm event so that as sea level rise occurs, should seawall and other areas be elevated, pump station integration or modification to existing pump stations may be approached without the need to increase conveyance capacity through the targeted project area.

5. For communities impacted by sea level rise: evaluations of the impacts of the NOAA Intermediate 2100 sea level rise scenario on the 100-year rainfall event

a. It is highly recommended to include 2 other scenarios up to 2100, which could be based on sea level for 2-time frames into the future or several feet of sea level rise within this period.

The existing conditions ICPR model was set up to address the 2025 present day time frame representing existing conditions, as well as the 2040, 2070, and 2100 to assess impacts of SLR. Each scenario was evaluated for Mean annual 24-hour (2.33 year), 10-year 24-hour, 25-year 24 hour, and 100-year 24-hour design storm events. The results of the SLR on the overall watershed is displayed in **Figures 8-9**.

For purposes of targeting SLR conditions for proposed stormwater improvement projects, the City evaluated the new tide data and recommendations from others and developed a draft SLR policy that sets certain target elevations for future infrastructure. In general, the policy considered the service life and criticality and may include a factor of safety. In practice, designing new infrastructure to blend into the existing residences and buildings is important and it may preclude raising roads or adding sea walls as much as desired. This SLR policy is available as guidance. Actual conditions and existing infrastructure may alter the design of specific projects.

Drainage and roads typically have a service life of approximately 25 to 35 years. This means 2050 is a typical planning horizon and the mean sea level at that time may be approximately elevation 1.15 feet NAVD 88 per the Compact intermediate high projections. The City Policy also recommends using the fall mean higher-high tide of approximately elevation 1.0 foot NAVD 88 for design of existing drainage facilities, so these two elevations are similar. The policy also recommended a sea wall barrier to be as high as elevation 5.0 feet NAVD 88, based on a 50-year service life and a 1-foot factor of safety.

SLR also will affect the groundwater levels in the City, given how the coral rock base of the islands allows direct interaction with the ocean. While the groundwater moves up and down with the tide at most locations, the rise and fall is muted and is expected to average higher than the mean water (ocean) level. For this update, the future groundwater levels were assumed to be 2 feet NAVD 88 across the island. This parameter will change the drainage performance of the groundwater wells (reduce capacity).

The SLR was applied to the MHHW elevation to obtain the proposed future stormwater tidal boundary condition elevation. Because the City is looking at the average fall season MHHW, a boundary condition of 1 foot NAVD 88 was simulated to assess near-term conditions for alternative comparison purposes. With 1.7 feet of SLR, the long-term ocean boundary condition was set at an elevation of 2.7 feet NAVD 88, with a groundwater elevation of 2.0 feet NAVD 88. The selection of study areas for further evaluation was based on the flooding encountered under existing mean tidal boundary conditions, and these same boundary conditions were used to test the size of and refine conveyance improvements.

When preferred conveyance routing and sizing were identified, the solutions were tested with both near-term (1-foot NAVD 88) and long-term (2050, 2.7-foot NAVD 88) tide scenarios to further develop the proposed improvements so they continue to provide benefits under future SLR. This technique helps avoid proposing oversized pipes to resolve flooding in a specific study area unless they also may provide a suitable LOS at the 2.7-foot NAVD 88 tidal boundary conditions.

As the tidal boundary condition is set to future conditions with the improvements in place, the improved study areas may receive more overland flow from the surrounding flooded sub-basins, limiting the benefits. Therefore, a regionalized approach that would contain resiliency-based concepts is needed to compartmentalize improvement zones, so improved areas function to the greatest extent possible (such as regional pump stations, potential road raising along many sections of roads citywide, and other innovative and non-traditional stormwater management measures).

Existing Model Results

The existing model results were primarily used to determine probable level of service from areas of inundation. In addition, City maintains a map showing flooding problem areas as provided on **Figure 5**. FEMA insurance claims include historical events that were not always a result of normal stormwater flooding (that is, hurricane and tropical storm claims were included). These FEMA claims are confidential data subject to the federal Privacy Act so no specific data about the affected parcels are available publicly. The City allowed Jacobs to show this map to illustrate where known flooding problems are located. The reported flooding problem areas generally correspond to those low spots that experience flooding already identified in previous studies and by the City through public complaints.

Figure 5 - Reported Flooding Zones in City

Preliminary Assessment of Existing Flooding Conditions

This section describes how the information and data provided in the previous sections were applied to develop and evaluate specific projects. The existing flooding conditions were presented in Section 3. To develop projects for the City capital improvement plan, the same three-step process that was used in the 2012 Stormwater Master Plan was followed:

1) Identify areas with larger flooding issues (that is, rank the sub-basins where excessive flooding occurs)

Evaluate projects for these areas to determine their effectiveness

Assess the potential projects to provide a priority for implementation

This section provides a preliminary identification of areas with larger flooding issues. Additional work in identifying projects will be conducted in Phase 2.

Key West has some unique characteristics that affect the way stormwater projects are prioritized. For example, the low elevations near the coast make traditional "pipe" projects less effective unless very large pipes are used. The highly developed island does not normally have sufficient area for large pipes, especially considering the other utilities. The City wants to reduce stormwater pollutant discharge into the nearshore coastal waters to help protect the natural resources, including beaches, and larger conveyances alone will not achieve this water quality goal. Residents are accustomed to standing water immediately after a larger rainfall and are normally tolerant if the runoff percolates or drains relatively quickly. Consequently, improvements to drainage are measured in sub-foot improvements and the ability to drain after the peak of the storm passes. However, as the sea level rises and persistent property flooding occurs, the City is reconsidering how to deal with the chronic flooded areas.

When defining and prioritizing projects, applying a strict benefit-cost comparison often tends to skew projects toward high-value neighborhoods that may cause some social justice concerns. A methodological ranking procedure that considers flooding issues equally regardless of the area is preferred. However, Federal FEMA funding often requires a positive benefit-cost ratio to justify grant money. Some master plans use a ranking procedure to include water quality values. This procedure tends to highlight highly developed sub-basins as higher pollutant sources because of high runoff volumes; however, because the entire island is mostly built-out in moderate to high density, this criterion is not necessary. The City's preferred technologies to reduce flooding include the recharge wells and infiltration best management practices, so water quality benefits will be included in the projects. New or larger outfalls will be considered only when other options to reduce flooding are limited.

Identification of Areas with Significant Flooding

Figure 3-4 and Appendix D provided the estimated flood levels for the existing stormwater system. These results were used to identify which sub-basins have more problems than others under existing conditions. This initial assessment and sub-basin ranking is useful for discussion purposes but does not in itself identify priority projects. The selection of priority projects will be conducted with further input from the City.

Level of service is a common term often used in drainage studies to define performance. For example, the SFWMD requires that local roads and parking lots drain at least a 5-year design storm, so a typical local road design would provide at least a 5-year level of service for flooding. Some stormwater plans use a scoring system to rank areas. Typical scoring criteria may address the following issues:

- Emergency structures operational during a 100-year flood
- Number of buildings or parcels with high water levels
    - Structures (residential and commercial) should be damage free during the 100-year flood
- Length of major roads under target depths of standing water
    - Major evacuation routes should be passable during the 100-year flood
    - Major streets should be passable in the 10-year flood
    - Residential streets should be passable during the 5-year storm
- Length of canals or ditches flooded out of bank
- Pounds per year of pollutant loads

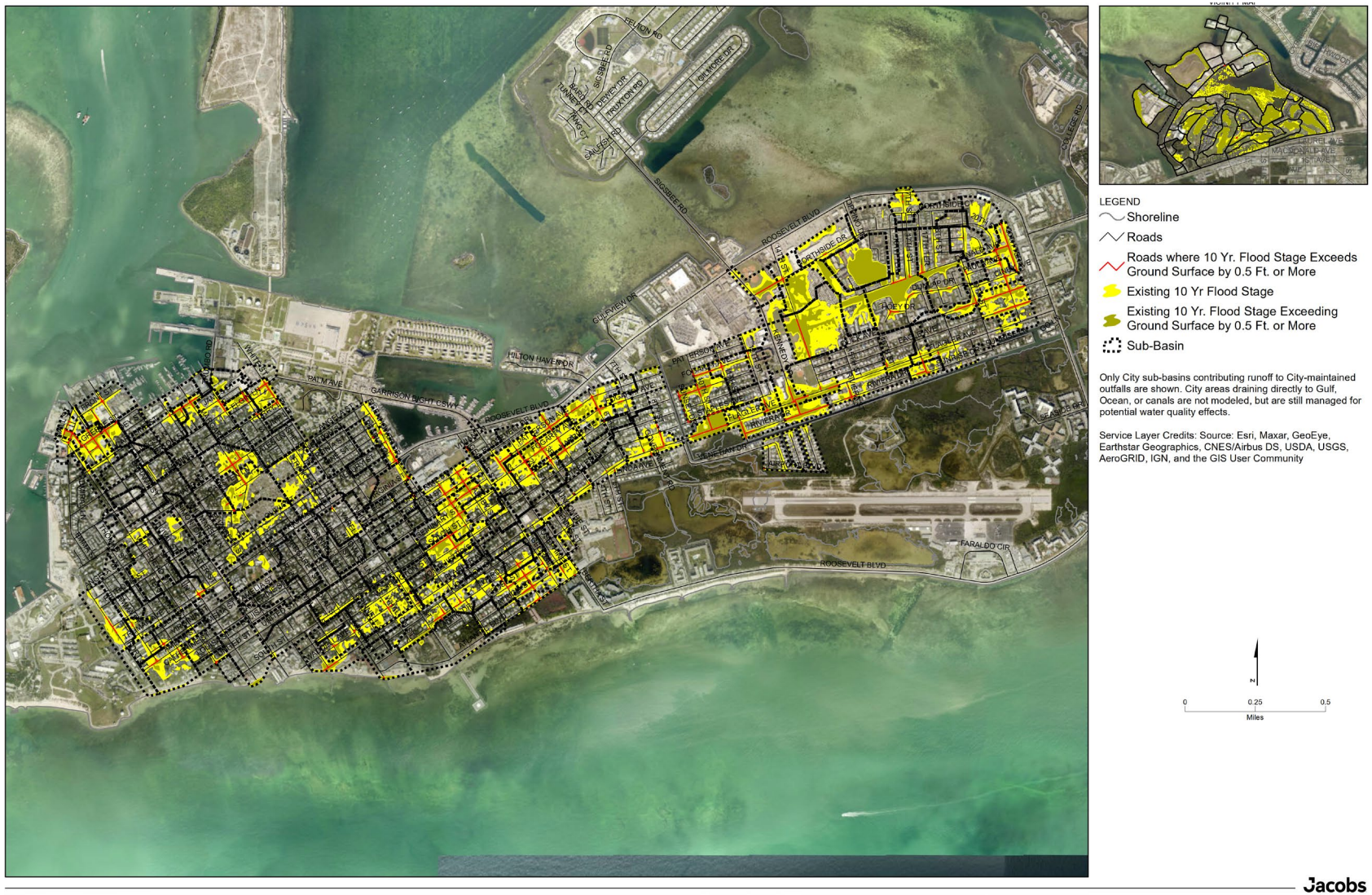
The ranking in the 2012 Stormwater Master Plan was based on CH_2M's experience in defining and conducting these types of assessments in coastal areas. Two criteria tend to differentiate projects: number of buildings or structures flooded during the 100-year flood and length of major streets flooded in the 10-year flood. Consequently, only these two criteria were carried over to this update.

To determine what constitutes damage to structures during the 100-year flood, the first-floor elevations of each structure would need to be known and that information is not often generally available. Some buildings would be damaged in lower floods, while other buildings are elevated. This assessment assumed that flooding more than 1 foot deep over the general landscape elevation (from LiDAR data) would potentially damage a structure. The Monroe County property assessor parcel database was used to identify lots. To be slightly more conservative, the assessment counted the parcels where there was some 100-year flooding greater than 1 foot deep, even if only a small part of the lot was that deep. **Figure 6** shows the 100-year flood and the zones deeper than 1 foot (darker red). Note that North Stock Island residences (in the golf course development) were permitted with first-floor elevations set more than 1 foot above the ground so North Stock Island was not included in the sub-basin ranking (no known problems).

The second criterion, length of streets not passable during the 10-year flood, was assessed to all roads in the sub-basins regardless of whether they are considered major. The Monroe County street GIS database was used to identify roads. The LiDAR data was used to determine areas deeper than 6 inches (0.5 feet) during the 10-year flood. While some studies may apply a higher value, the 6-inch threshold was selected as a reasonable depth that may last for a short time during a large rain event given the wide variety of roads on the island. The 6-inch centerline depth is also commonly used to test emergency vehicle access. The length of road was determined using GIS to intersect the road centerlines with the flood polygons. **Figure 7** shows the roads where flood staging occurs more than 6 inches. The darker shading shows the deeper staged stormwater.

Figure 6 - Parcels with 100 Year Flood Stage Exceeding Ground Surface by 1 Foot or More (from 2012 Stormwater Master Plan

Figure 7 - Existing Sub-basins where the Street Flooding is Greater Than or Equal to 0.5 Foot (from 2012 Stormwater Master Plan)



Jacobs

To rank the severity of flooding in sub-basins, a simple process was used. The number of parcels per sub-basin with 100-year floods was identified and sorted from most to least and then assigned a criterion sub-rank 1 through 137 (out of 229 sub-basins on the main island). The ranking stopped at 137 because only 136 sub-basins had impacted parcels and all parcels with 0 were assigned the same 137 score. No ties were assigned. The ranking was based on the standard sorting routine in Excel with the number of parcels ranked first, then by length of street flooded (10-year simulation, greater than 6 inches deep). Similarly, the length of street per sub-basin was identified and sorted from most to least, a secondary ranking based on flooded parcels rank was determined, and then the road flooding criterion was assigned a sub-rank 1 through 108. The scores of the two criteria were added and then the sub-basins were sorted by low total score, with number of parcels impacted used as a tiebreaker, up to a rank of 156. The remaining sub-basins had the same score. **Table 12** provides the 50 sub-basins that had the worst flood severity rankings.

Previously, some sub-basins ranked higher because of their relative size. For example, Sub-basin 130 scored somewhat higher than others in 2012 because the entire Kamien neighborhood has extensive peak stormwater flooding resulting from the low elevations. During the design of improvements during the past 8 years, the modeling was further refined to include more detail (smaller sub-basins), so these new sub-basins in this neighborhood moved down in the 2021 ranking because of the number of parcels and length of roads impacted with split from one to 11 sub-basins.

Identification of Potential Projects

The ranking of sub-basins is a tool that the City can use to identify areas that are likely to have more severe flood issues. However, the rankings need to be evaluated based on additional information, including consideration of past projects and areas of potential new development. The low areas around the coast continue to be an issue because of the low elevations and increasing vulnerability to rising ocean levels.

Table 12 - Top 50 Sub-basin Rankings to Identify Areas with Greater Flooding (from 2012 Stormwater Master Plan)

Sub-basin	Road N-S Reference	Road E-W Reference	Road Length (ft) where 10-Yr Flood Stage Exceeds Ground Surface by 0.5 ft or More	Rank of Length of Flooding in Streets at Least 0.5 ft During 10-yr Storm	Number of Parcels impacted with at Least 1-ft Flooding During 100-yr Storm	Rank of No. of Parcels with at Least 1-ft Flooding During 100-yr Storm	Sum of Scores	Final Sub-basin Ranking
B6000	10th Street	Harris Avenue	1516.97	2	49	4	6	1
B3930	20th Street	Duck to Eagle Avenue	1913.76	1	36	7	8	2
B4147	18th Ter	Donald Avenue	1468.94	3	36	8	11	3
B2830	Thompson Street	Seminary Street	955.41	9	55	3	12	4
B2840	Leon Street	South Street	1037.71	7	37	6	13	5
B2550	Southard Street	Margaret Street	862.85	10	42	5	15	6
B3790	14th Street	Nr. Stadium Apts.	750.96	11	30	10	21	7
B2120	Duval Street	Greene and Front Streets	1048.43	6	23	17	23	8
B3610	Between 10th and 11th Streets	Flagler Avenue	1176.99	4	21	21	25	9
B3220	4th Street	Fogarty Avenue	996.07	8	22	18	26	10
B1015	6th Street	Patterson Avenue	665.39	15	26	13	28	11
B3030	Ashby Street	United Street	636.82	17	28	11	28	12
B2510	White Street	Eaton Street	625.89	18	27	12	30	13
B3837	13th Street	Riviera Drive	1059.98	5	18	27	32	14

Sub-basin	Road N-S Reference	Road E-W Reference	Road Length (ft) where 10-Yr Flood Stage Exceeds Ground Surface by 0.5 ft or More	Rank of Length of Flooding in Streets at Least 0.5 ft During 10-yr Storm	Number of Parcels impacted with at Least 1-ft Flooding During 100-yr Storm	Rank of No. of Parcels with at Least 1-ft Flooding During 100-yr Storm	Sum of Scores	Final Sub-basin Ranking
B4110	17th Street	Donald area	730.64	12	20	24	36	15
B3020	Ashby Street	Catherine Street	511.94	24	26	14	38	16
B2560	Margaret Street	Angela Street	416.43	38	59	2	40	17
B130010	Ashby Street	Rose Street	546.52	23	19	25	48	18
B3600	11th Street	Flagler Avenue to Riviera	584.07	22	18	26	48	19
B4150	20th Street	Cindy Avenue	501.22	25	18	28	53	20
B3800	Rivera Street (15th)	Flagler Avenue to Riviera Drive	447.85	34	20	23	57	21
B2705	Jose Marti Drive Eisenhower Drive	Truman Avenue	596.65	20	13	39	59	22
B2820	Thompson Street	Catherine Street	481.58	27	16	32	59	23
B3260	2nd Street	Fogarty Avenue	593.55	21	13	41	62	24
B210	White Street	Laird Street	464.11	32	16	31	63	25
B2110	Simonton Street	PS	324.92	45	21	20	65	26
B3200	4th Street	Patterson Avenue	700.75	13	10	53	66	27
B605	Emma Street	Amelia Street	456.59	33	13	45	78	28
B3760	13th Street	Northside Drive	465.96	31	11	50	81	29
B2520	Frances Street	Eaton Street	430.76	36	11	48	84	30

Sub-basin	Road N-S Reference	Road E-W Reference	Road Length (ft) where 10-Yr Flood Stage Exceeds Ground Surface by 0.5 ft or More	Rank of Length of Flooding in Streets at Least 0.5 ft During 10-yr Storm	Number of Parcels impacted with at Least 1-ft Flooding During 100-yr Storm	Rank of No. of Parcels with at Least 1-ft Flooding During 100-yr Storm	Sum of Scores	Final Sub-basin Ranking
B3830	**Between 13th and 14th Streets**	**Flagler Avenue**	656.05	16	8	68	84	31
B3115	**1st Street**	**Patterson Avenue**	603.02	19	8	66	85	32
B3400	**8th Street**	**Flagler Avenue**	469.01	30	9	56	86	33
B2120b	**Ann Street**	**Greene Street**	469.25	29	8	63	92	34
B4120	**18th Street**	**Donald Avenue**	324.65	46	12	46	92	35
B240	**Whalton Street**	**Von Phister Street**	169.14	59	14	35	94	36
B3620	**12th Street**	**Flagler Avenue**	385.95	39	9	58	97	37
B3210	**3rd Street**	**Patterson Avenue**	232.91	51	11	49	100	38
B2400	**Margaret Street**	**Caroline Street**	429.42	37	8	64	101	39
B2100c	**Fitzpatrick Street**	**Front Street**	678.54	14	4	88	102	40
B3820	**14th Street**	**Flagler Avenue**	334.81	43	9	59	102	41
B130	**Ashby Street**	**Patricia Street**	495.42	26	5	78	104	42
B3912	**18th Street**	**Riviera Drive**	445.47	35	7	70	105	43
B4145	**19th Street**	**Cindy Avenue**	469.95	28	6	77	105	44
B130012	**Ashby Street**	**Johnson Street**	210.40	54	9	55	109	45
B200	**White Street**	**Between Atlantic Blvd. and Casa Marina Court**	5.77	101	32	9	110	46
B3810	**16th Street**	**Flagler Avenue**	71.59	74	14	36	110	47

Sub-basin	Road N-S Reference	Road E-W Reference	Road Length (ft) where 10-Yr Flood Stage Exceeds Ground Surface by 0.5 ft or More	Rank of Length of Flooding in Streets at Least 0.5 ft During 10-yr Storm	Number of Parcels impacted with at Least 1-ft Flooding During 100-yr Storm	Rank of No. of Parcels with at Least 1-ft Flooding During 100-yr Storm	Sum of Scores	Final Sub-basin Ranking
B130005	**Josephine Street**	**Atlantic Blvd.**	161.52	60	9	54	114	48
B4130	**20th Street**	**Donald Avenue**	60.49	77	14	37	114	49
B400	**Alberta Street**	**Seminole Avenue**	359.79	40	6	76	116	50

Project Identification and Evaluations

Inundation levels were reviewed, and LOS metrics related to length of roads flooded during a 10-year event and parcels experiencing flooding during a 100-year event were identified to develop a preliminary ranking as described in the previous section.

The updated 2024 SWMP reviewed all sub-basins within the City, and areas with the worst flood inundation were similar to the 2012 stormwater master plan. The City needs are extensive and funding for capital projects is limited. Consequently, the stormwater master plan targets conceptual designs for seven high priority- sub-basins. Specifically, the intent of the analysis was to identify the types of projects needed to address potential SLR in the next 30 years in these selected study areas. The results of this SWMP help the City to recalibrate its expectations for the type of projects needed to maintain resiliency to climate change.

North Stock Island is part of the City, and modeling was included in the 2021 SWMP update. However, no priority projects were identified on Stock Island. The 2012 SWMP noted that the outfalls servicing College Road need regular maintenance and debris cleanout to prevent clogging by the mangroves. The City installed inlet rack inserts to capture debris and sediment and serviced the outfalls with mangrove trimming. These operations and maintenance (O&M) services must continue, even though additional projects have not been identified for North Stock Island at this time.

Conceptual Approach to Defining Projects

Larger areas where more than one adjacent sub-basin was considered higher priority were grouped into “zones.” These zones were developed for report organizational purposes and are not intended to represent any current City planning or neighborhood naming convention. **Figure 8** illustrates the zones and study areas (that is, priority sub-basins) evaluated as part of this phase.

Each zone encompasses one or more sub-basins. The numbering of each study area is a relative priority rankings. Not every top-ranked sub-basin was included in the list because they were not selected for further study. Conversely, southern Bahama Village was added later and was listed last. The zones were based on the larger groupings where sub-basins interacted with each other, so more than seven sub-basins were included in the project evaluation.

Study Areas

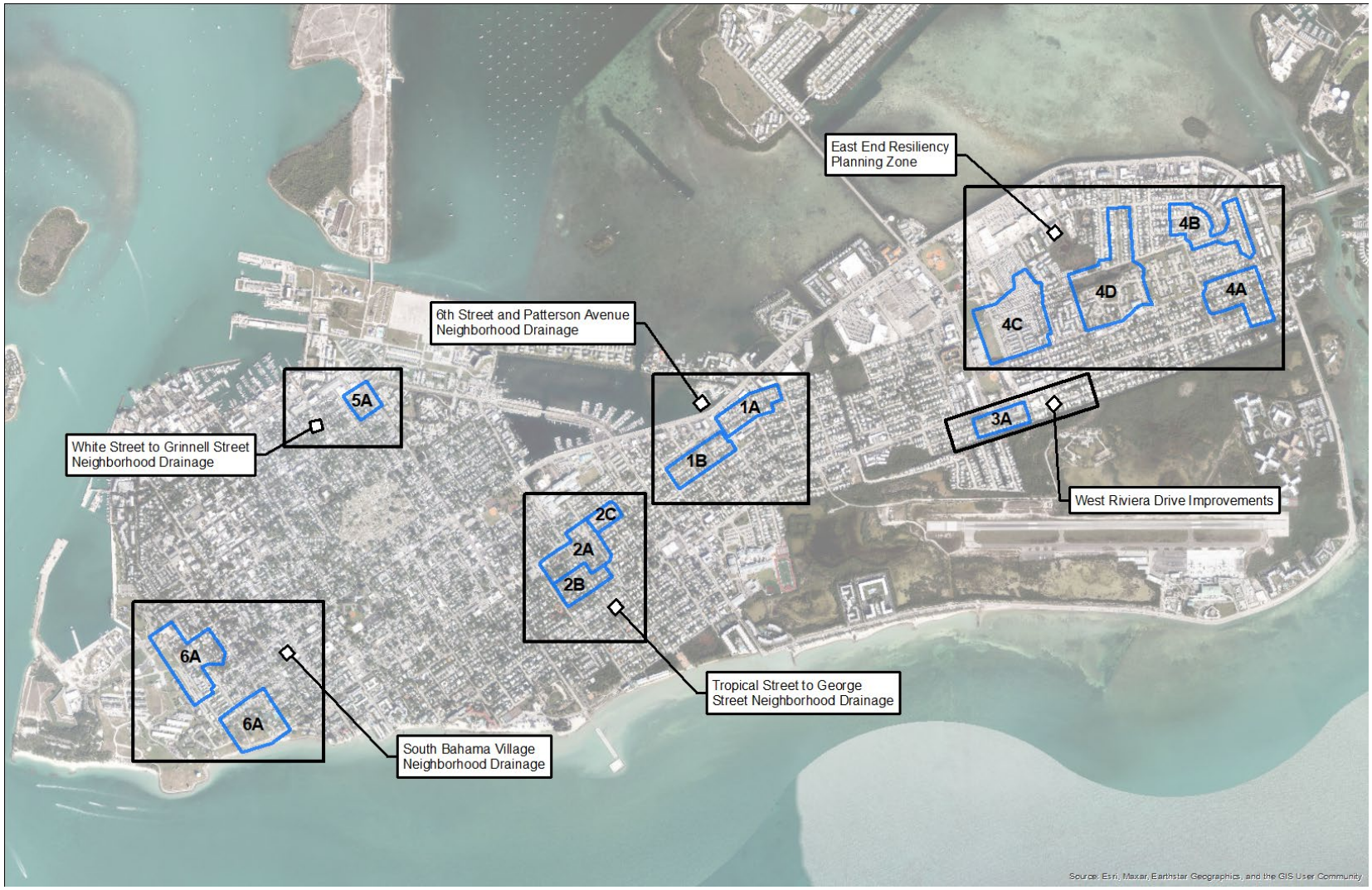
Study areas are described as follows:

1. 6th Street and Patterson Avenue Neighborhood Drainage
    a. 2nd Street to 5th Street between Patterson Avenue and Harris Avenue

b. Patterson Avenue between 5th Street and 7th Street

2. Tropical Street to George Street Neighborhood Drainage
    a. Tropical Street to Thompson Street between Duncan Street and Washington Street
    b. Washington Street between Tropical Street and Thompson Street
    c. Duncan Street to Seminary Street between Thompson Street and George Street
3. West Riviera Drive Improvements
    a. Riviera Drive Improvements
4. East End Resiliency Planning Zone
    a. Eagle Avenue at 20th Street
    b. 18th Terrace at Donald Avenue east to 20th Terrace
    c. Glynn Archer Jr. Drive between Glynn Archer Jr. Street and Duck Avenue
    d. Northside Drive to Duck Avenue between 15th Terrace and 17th Terrace
5. White Street to Grinnell Street Neighborhood Drainage
    a. Frances Street to White Street between Eaton Street and Fleming Street
6. Southern Bahama Village
    a. Specific request to address flooding near two community centers at Olivia Street and Emma Street (gym) and Catherine Street and Thomas Street (park with pool).
    b. The contributing sub-basins are bounded to the east near Whitehead Street by the U.S. Navy facilities west of Fort Street, and Angela Street to the north.

Figure 8 - Study Areas



6. The plan must include a strategy and action plan to address the results of the studies for:

a. Controlling the timing of peak flows to prevent or minimize problems for the entire watershed due to new development, redevelopment, and fully developed conditions.

With high groundwater conditions as compared to existing elevations across the City, as well as high tailwater conditions associated with the coastal outfalls the City manages, there is limited capability for conventional stormwater detention facilities to effectively control the timing of peak flows. Instead, the City must rely on stormwater conveyance capacity and stormwater pump stations to manage these conditions. Solutions developed for the stormwater master plan consider initial stormwater conveyance improvements that are capable of full integration with stormwater pump stations to rise to the challenges presented by rising tidal elevations in the face of a fully developed condition.

In addition, differences in runoff from current to future conditions were determined to be minimal based on the available existing conditions and future land use classifications for the Key West watershed. Existing vacant parcels with a designated land use were conservatively modeled in the existing conditions with the designated current land use in place. Therefore, there was negligible change between the existing and use/future land use classifications leading to no major changes in peak flows from new development, redevelopment, and fully developed conditions.

b. The impact of climate change and sea level rise on fully developed conditions.

Future (fully developed) scenarios account for increased rainfall through a product of SFWMD's rainfall change factors with predicted rainfall depth from NOAA Atlas 14 for Monroe County. As mentioned, the basin maximum stages are primarily a result of SLR determined by the coastal boundary condition (set to NOAA's intermediate high projection and NOAA's intermediate high with the addition of King Tides) rather than the rainfall event's intensity.

Low lying zones within the upland areas of the City are particularly vulnerable to impacts of climate change, as the increased rainfall depths result in more localized inundation with restricted coastal outfall capacity. Proposed stormwater infrastructure for these regions will include capacity improvements to stormwater conveyance features, expanded stormwater outfall capacity, and eventually the integration of stormwater pump stations.

In addition, all coastal areas within the City are at risk of inundation due to sea level rise. Proposed infrastructure associated with the targeted projects includes identifying tidal backflow

prevention measures such as tidal check valves, raising seawall where appropriate and the integration of stormwater pump stations where appropriate.

When analyzing the conceptual solutions for the proposed study areas with future tide boundary conditions, several assumptions are required to size the facilities. To plan for these conditions, the following modeling conditions were used:

- The anticipated design of these solutions must consider given SLR conditions of 1.0 foot NAVD 88 and 2.7 feet NAVD 88 for near term and long term, respectively. Some of the existing stormwater features would be completely inundated by the tidal conditions alone. All stormwater outfalls are assumed to have flap gates or check valves installed that will prevent high-tide conditions from flowing directly into the low-lying landscapes through the stormwater conveyance system.

- The proposed conveyance improvements and stormwater pump stations are conceptually sized to remove flooding conditions when subjected to the 10-year, 24-hour storm event with a tidal boundary condition of 2.7 feet NAVD 88. This LOS was selected because much of the island that is currently lower than that elevation will no longer be able to rely on gravity flow, infiltration, and other current means to dissipate flooding conditions. As such, flood duration and depth will continue to increase, creating a reliance on these stormwater solutions and the potential need to modify and upgrade them over time to meet continually changing conditions.

- All stormwater gravity injection wells are assumed to operate at a reduced capacity based on changes to the rating curve that considers rising groundwater conditions. The modeled flow condition in these wells is set to positive only, assuming that ineffective wells will be plugged over time. As groundwater rises, these wells may begin to contribute to standing water in the intersections, so they will be obvious. For example, most of the gravity wells in the Kamien neighborhood have been abandoned so groundwater would not flow into the new storm sewers. This is possible because the new drainage pipe network leads to a pressurized injection well system. For simulation purposes, gravity wells that become ineffective are assumed to not work, or work only marginally.

- Aside from the stormwater outfalls, there may be areas of the island, such as along Riviera Canal south of Riviera Drive, that are below the future tide boundary conditions. As such, either seawalls or roads that discharge through overland flow to these areas will be raised to prevent sunny-day flooding, accordingly according to strategies independent of these projects as adopted by the City. The cost opinions included in this report do not include costs for these regional sea barrier measures.

- The proposed solutions assume that raising the roads in residential areas will not be practical at this time without a high degree of planning and preparation. Target flood relief for these areas assumes only up to 6 inches maximum of road raising may be applicable without detailed survey information available to confirm. A raised-road condition was not modeled explicitly. The study areas have some of the lowest landscape elevations, and though raising the road may decrease some storage within the sub-basin, it would also reset the LOS within them to the new top-of-road elevation. A higher road also may marginally improve conveyance through the stormwater network servicing the area. In other words, significant road raising would have to be evaluated on a case-by-case basis during detailed design. Target LOS criteria for this analysis assumes that up to 6 inches of flooding above the low area of the roadway may be mitigated by road raising.

- The proposed solutions assume that, given the projected future tidal boundary condition of 2.7 feet NAVD 88 and the landscape elevations encountered in the study areas, it will be permittable to construct new upsized regionally located coastal outfalls to handle peak-flow conditions for the targeted LOS. Rights-of-way and access issues for these outfalls have not been evaluated for the master plan.

c. At least the 25-year rainfall event in fully developed conditions, with a list of possible solutions for addressing at least the 25-year rainfall event.

Maximum flood inundation stages are primarily a result of SLR determined by the coastal boundary condition rather than the rainfall event's intensity. Since the basins in Key West openly discharge towards the coast via overland flow or constructed stormwater management systems, the intensity of the storm event does not induce flooding to the same extent as SLR. Also, due to high groundwater conditions, there is limited capability across the City for detention ponds and other facilities to assist vs the 25-year, 24-hour storm event. As such, the solutions focus on the 10-year, 24-hour storm event as compared to various sea level rise conditions as outlined. As the sea level rise conditions trigger the need for pump stations, the pump stations should be designed with upgrades in mind to handle larger storm events as the need arises after seawall and other overland flow routes to the coast can be addressed by the City. Possible solutions to overcome the challenges presented by the 25-year rainfall event include the following:

- Targeted road raising.
- Resilience based improvements to raise seawall and other overland flow areas.
- Neighborhood stormwater management system expansion.
- Additional stormwater outfalls with tidal backflow prevention servicing lower lying areas.

- The integration of stormwater pump stations or pump assisted stormwater injection wells.

d. At least one event larger than the 25-year rainfall event, with a list of possible solutions for addressing this event.

Similarly, to part C, the peak flood stages are only marginally affected by rainfall after tidal elevations exceed 2.7 feet NAVD 88. As such, the City may also need to include measures such as more comprehensive raising of roads and elevating parcels in combination with the stormwater conveyance improvements and pump stations included with the stormwater master plan projects.

e. Ensuring that flood hazards from the 10-year and the 25-year events are not increased by future development (the 2-year storm is also recommended).

The proposed projects result in no noticeable differences in maximum stages from pre to post conditions across the modelled storm events and tidal conditions. The solutions focus on raising low-lying roadway elevations and future pumping options that are designed to eliminate adverse conditions to the areas surrounding the projects.

Engineer's Estimate of Construction Costs

Cost opinions for the preferred solutions have been developed based on historical construction cost information from past stormwater projects in the City, as well as relevant projects throughout the region. Cost escalation factors have been used to project historical project cost data to the current conditions based on Engineer News Record (ENR) cost indices. Likewise, where regional construction data were used from resources such as the FDOT construction cost tracking data, a location factor was applied to adjust for the local market on the island. These values, as well as contingencies and various soft costs, are included in the cost opinions.

The cost opinions are provided with each individual project area.

Project Alternatives Evaluation

The general approach for evaluation was to determine effective conveyance solutions with boundary water elevations at 1 foot NAVD 88, with the expectation that pumps could be installed to improve the outfall capacity under higher 2.7-foot boundary conditions. The rationale is that a pump station is expensive, and if it can be deferred, the effort should be focused on improving gravity drainage under current (or near-current) conditions.

The study areas refer to the selected study focus sub-basins as shown in **Figure 8**. The numbering of the study areas does not reflect the ranking.

- **Study Area 1A, 6th Street and Patterson Avenue**

Although Study Area 1A is located just east of Study Area 1B and is in the same Patterson zone, Area 1A has its own outfall to the east, and modeling analysis confirms a benefit from keeping solutions for Area 1A independent of Area 1B.

The proposed conveyance improvements for this area focus on disconnecting the pipe running west down Patterson Avenue to 6th Street and tying it directly to the outfall pipe behind the commercial properties north of Patterson Avenue at 7th Street. Outfall pipes down 6th Street and behind the commercial properties then must be increased in size.

It is important to note that the outfall location to the east presents an additional challenge when compared to the tidal boundary condition of 2.7 feet NAVD 88. The existing roads in the vicinity of the outfall are currently lower than the future tide boundary condition. These areas should be addressed independently as a part of other ongoing activities by the City.

The proposed improvements for the preferred alternative include the following:

- Plug (abandon) existing 15-inch pipe headed west down Patterson Avenue from the intersection of 7th Street.
- Install proposed 190 linear feet (LF) of 36-inch-diameter reinforced concrete pipe (RCP4) along 7th Street from the intersection with Patterson Avenue to connect to the outfall heading east.
- Remove 250 LF of existing 12-inch-diameter pipe along 7th Street from Fogarty Avenue to Patterson Avenue and replace with 24-inch-diameter RCP.
- Remove 260 LF of existing 12-inch-diameter pipe along 6th Street from Fogarty Avenue to Patterson Avenue and replace with 30-inch-diameter RCP.
- Remove 180 LF of existing 12-inch-diameter pipe along 6th Street from Patterson Avenue to the outfall headed east along the commercial access area north of Patterson Avenue and replace with 48-inch-diameter RCP.
- Remove 550 LF of existing 12-inch-diameter pipe along the outfall to the east along the commercial access area north of Patterson Avenue to the proposed pump station vault located east of the intersection with 7th Street and replace with 54-inch-diameter RCP.

[4] Alternate pipe material is acceptable. Buoyancy may be an issue for pumped systems with large-diameter pipes or boxes. The designers must consider this. For consistency, all discussion in the SWMP will refer to concrete pipes.

- Remove 470 LF of existing 24-inch-diameter pipe extending to the outfall location east of 7th Street and replace with 54-inch-diameter RCP.
- Add a proposed 50 cfs (22,440 gallons per minute) peak-flow stormwater pump station located in the vicinity of the commercial access drive north of Patterson Avenue and east of 7th Street; proposed vault to be 440 square feet, extending to elevation -10 feet NAVD 88; pump station to tie into proposed new outfall pipe for discharge piping.

Figure 9 identifies the proposed conveyance improvements anticipated through Study Area 1A. The proposed flood stage results are included in **Table 13**.

Figure 9 - Proposed Improvements in Study Area 1A

Study Area 1A Proposed Improvements

Legend

ICPR Node — Proposed Pipes

ICPR Link

ICPR Sub-basin

Table 13 - Summary of Study Area 1A Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes

Study Area Sub-basins	10-year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pump)
Patterson Avenue at 7th Street (N1005)	1.76	2.67	1.71	2.68	0.69
Fogarty Avenue at 7th Street (N1030)	1.23	2.12	1.86	2.38	1.07
Patterson Avenue at 6th Street (N1015)	1.14	2.09	1.71	2.37	0.70
Fogarty Avenue at 6th Street (N1020)	1.17	2.10	1.79	2.37	0.90

Because the elevations in this study area are slightly higher than some of the other study areas, there is a greater flood stage reduction when compared to the elevation 1.0-foot NAVD 88 tide boundary scenario. This may allow for selective road elevation raising in this area to remove flood stage from the road under these conditions. As the existing flooding is within 0.6 foot of the roadway low points and this is a local road, road raising has not been considered as a part of the preferred solution costs for this alternative.

In addition to the increased conveyance capacity headed to the outfall to the east, it is understood that the tidal salt pond this study area discharged to, located at the northern end of Sunset Drive, is environmentally sensitive and experiences sunny-day flooding on top of the conditions caused from typical rain events. The City is currently evaluating the Sunset Drive area with an ongoing project, including considerations for a tidal barrier that may alter flow from the west side. The pump station proposed for Study Area 1A may be modified to be located farther east, where it may direct the discharge flow away from the salt pond as needed to fit the two project needs.

Class 4 cost opinions were developed for the preferred solution both with and without pumps included. **Table 14** identifies the estimated costs without a pump station in place (costs associated with gravity based- conveyance improvements only), while **Table 15** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 14 - Study Area 1A Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$2,152,549
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$322,882
Contractor Profit	10%	$215,255
Engineering/Design	22%	$473,561
Contingency/Market Volatility	25%	$672,672
Total Including Contingencies		$3,836,919

Table 15 - Study Area 1A Cost Opinion – without Pump Station

Construction Subtotal (with Pump Station)		$6,275,075
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$941,261
Contractor Profit	10%	$627,508
Engineering/Design	22%	$1,380,517
Contingency/Market Volatility	25%	$1,960,961
Total Including Contingencies		$11,185,322

- **Study Area 1B, 3rd Street and Patterson Avenue**

Study Area 1B lies in the central portion of the island, on the northwest side of New Town. Low-lying areas at frequently flooded intersections are at or near elevation 1.0 foot NAVD 88. Review of historical aerial photography of the area reveals frequent ponding and associated roadway damage along 3rd Street. The existing stormwater system includes inlets in higher-elevation areas to the south that convey flow into the study area where the system likely experiences a backflow condition during large storm events. The existing stormwater system also is undersized, with many pipes less than 12 inches in diameter. For purposes of this SWMP, this area was called the Patterson Avenue Improvement Zone.

The proposed conveyance pipe sizing and routing for this area includes bypassing existing pipe connections around the lower-lying areas to prevent any backflow from coming directly into those areas. Conceptual conveyance pipe sizing and routing based on current tidal boundary conditions is included on **Figure 10**. Proposed flood stage results are included in **Table 16**. The

outfall pipe crossing FDOT-owned North Roosevelt Boulevard must be increased in size to allow for stormwater to discharge during both near-term and long-term tide boundary conditions.

The proposed improvements for the preferred alternative include the following:

- Plug existing 12-inch-diameter pipe headed north from the intersection of Harris Avenue at 3rd Street.
- Install proposed 350 LF of 30-inch-diameter elliptical reinforced concrete pipe (ERCP) from Harris Avenue at 3rd Street to Harris Avenue at 4th Street. ERCP is suggested given the low landscape but the final pipe material and size is the responsibility of the design.
- Remove 220 LF of 10-inch-diameter polyvinyl chloride pipe along 4th Street to the intersection with Fogarty Avenue and replace with 30-inch-diameter ERCP.
- Remove 275 LF of existing 15-inch-diameter pipe along 4th Steet from Fogarty Avenue to Patterson Avenue and replace with 42-inch-diameter ERCP. Connect 42-inch-diameter ERCP to proposed pump station vault proposed near the intersection of 4th Street at Patterson Avenue.
- Remove 280 LF of existing 8-inch-diameter pipe along 2nd Street from Harris Avenue to Fogarty Avenue; plug the existing connection east along Fogarty Avenue.
- Install proposed 530 LF of 30-inch-diameter ERCP along 2nd Street from Harris Avenue to Patterson Avenue.
- Remove 780 LF of existing 12-inch-diameter and 8-inch-diameter pipe along Patterson Avenue from 2nd Street to the proposed stormwater pump station vault located near the intersection with 4th Street and replace with 30-inch-diameter ERCP.
- Proposed 395 LF of 48-inch-diameter ERCP outfall pipe along 4th Street from Patterson Avenue to the outfall north of North Roosevelt Boulevard; existing 24-inch-diameter outfall pipe to remain.
- Proposed 150-cfs-peak-flow stormwater pump station located near the intersection of Patterson Avenue at 4th Street; proposed vault to be 440 feet, extending to elevation -10 feet NAVD 88; pump station to tie into proposed new outfall pipe for discharge piping.

Figure 10 - Proposed Improvements in Study Area 1B

Table 16 - Summary of Study Area 1B Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes

Study Area Sub-basins	10-Year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pump)
Patterson Avenue at 2nd Street and 3rd Street (N3210)	1.12	2.06	1.82	2.37	0.00
Patterson Avenue at 4th Street (N3200)	0.61	2.02	1.74	2.37	0.00
Fogarty Avenue at 3rd Street and 4th Street (N3220)	0.79	2.08	1.84	2.37	0.00
Harris Avenue at 3rd Street (N3250)	1.34	2.08	1.86	2.37	0.69
Harris Avenue at 2nd Street (N3260)	1.07	2.08	1.86	2.37	0.15
Harris Avenue at 4th Street (N3240)	1.27	2.12	1.87	2.37	0.61

Because of the low elevations along the roadway and the total drainage area tributary to this outfall, conveyance pipe and stormwater pump station sizing in this area will be directly influenced by both the desired flood LOS for the area (whether any minor flooding is allowed during the subject storm event) and an ability to raise roadway elevations throughout the area. The DEM indicates that the low elevations continue through some of the residential parcels, creating a challenge for either option.

Class 4 cost opinions were developed for the preferred solution both with and without pumps. **Table 17** identifies the estimated costs without a pump station in place (costs associated with gravity based- conveyance improvements only), while **Table 18** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 17 - Study Area 1B Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$4,895,860
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$734,379

Contractor Profit	10%	$489,586
Engineering/Design	22%	$1,077,089
Contingency/Market Volatility	25%	$1,529,956
Total Including Contingencies		$8,726,871

Table 18 - Study Area 1B Cost Opinion – with Pump Station

Construction Subtotal (with Pump Station)		$13,140,912
Markups		
Contractors Overhead, General Conditions, Temp Facilities	15%	$1,971,137
Contractor Profit	10%	$1,314,091
Engineering/Design	22%	$2,891,001
Contingency/Market Volatility	25%	$4,106,535
Total Including Contingencies		$23,423,676

- **Study Areas 2A, 2B, and 2C, Tropical to George**

Study Areas 2A, 2B, and 2C are in the middle of the island (on the east side of Old Town) and in close proximity to each other. These drainage sub-basins are essentially well connected through overland or channelized flow via roadways and intersections. There are higher elevations to the south before Flagler Road that create a ridge that naturally forces the stormwater from Study Area 2B north to the lower-lying roads of Study Area 2A. Study Area 2C is east of and adjacent to Study Area 2A. Analyses that included independent modeling simulations for Study Areas 2A and 2B did not reveal a solution that could isolate either sub-basin without raising roads or blocking other overland flow routes to create barriers. Altering topography was not considered feasible given the surrounding flat and densely developed residential property.

In general, the recommended conveyance strategy is to direct runoff to Jose Marti Pond because it is the closest outfall location. Given the existing piping leading there, this would require significant rework in some blocks in front of Horace O'Bryant School. This network is discussed later in this section. However, there is an important consideration that needs to be highlighted prior to discussing the entire proposal. The proposed outfall for this system is by the Jose Marti Drive area next to the pond (node Jose Marti Pond), which is also low-lying and currently experiences frequent flooding from rain events, as well as sunny-day flooding from King Tide events. The City is already planning a limited modification in the Jose Marti Drive area, so it was not included as a study area in the SWMP, but this is a key outfall location and worthy of a larger,

regional project. This Jose Marti Drive area collects runoff from upland sub-basins to the west as well as those from the south and southeast.

Review of the flood-reduction benefits of proposed solutions versus existing tide conditions of 0 foot NAVD 88 and 1.0 foot NAVD 88 reveals that with an upgraded conveyance system and reductions in peak flood elevations are offset with even the modest near-term SLR. Consequently, to alleviate flooding conditions throughout this neighborhood, the overall area would benefit from a larger, regional pump station solution. Based on modeling several potential scenarios versus both near-term and long-term projected tidal boundary conditions, the following stormwater conveyance system upgrades are proposed:

- Proposed 415 LF of 24-inch-diameter RCP along Von Phister Street from Tropical Street to Leon Street; plug existing gravity wells through this area.
- Proposed 475 LF of 30-inch-diameter RCP along Leon Street from Von Phister Street to South Street; plug existing gravity wells through this area.
- Proposed 915 LF of 42-inch-diameter RCP along Leon Street from South Street to Catherine Street.
- Disconnect and plug existing 24-inch-diameter pipe connection headed north along Thompson Street at intersection with Seminary Street.
- Proposed 390 LF of 36-inch-diameter RCP along Seminary Street from Thompson Street to Leon Street.
- Proposed 675 LF of 36-inch-diameter RCP along Leon Street from Seminary Street to Catherine Street.
- Remove and dispose of 675 LF of existing 42- and 36-inch-diameter pipe along Leon Street from Duncan Street to Jose Marti Pond.
- Proposed 450 LF of 60-inch-diameter RCP along Leon Street from Catherine Street to proposed Bayview Park pump station vault.
- Proposed 100 LF of 36-inch-diameter RCP from Jose Marti Drive to Bayview Park pump station vault.
- Proposed-150-cfs-peak-flow stormwater pump station at Bayview Park; vault to be 440 feet, extending to elevation -10 feet NAVD 88.
- Proposed 100 LF of 60-inch-diameter pump discharge to Jose Marti Pond.

These upgrades are planned to be incorporated into a regional pump station located in the Bayview Park area near Jose Marti Drive. A map outlining the proposed improvements is included on **Figure 11**.

Figure 11 - Proposed Improvements in Study Areas 2A, 2B, and 2C

Table 19 provides the simulation results for the recommended conveyance system improvements with 1-foot boundary conditions as compared to the existing conditions and roadway low elevations. Table 19 also identifies existing conditions with a 2.7-foot boundary condition and a modification to the conveyance system that includes a regional stormwater pump station rated for 150 cfs (67,325 gallons per minute). The results table includes an incidental benefit to Study Area 2C upon installation of the pump station at Bayview Park.

Table 19 - Summary of Study Areas 2A and 2B Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes and a Regional Pump Station

Study Area Sub-basins	10-Year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pump)
Washington Street at Leon Street (N2840)	1.71	2.32	2.02	2.34	1.44
Seminary Street at Thompson Street (N2830)	1.53	2.12	2.02	2.31	1.97
Catherine Street at Leon Street (N2810)	1.66	1.74	1.34	2.31	0.28
Jose Marti Drive (N2802)	0.76	1.84	1.49	2.34	0.41
Von Phister Street at Tropical Street (N2838)	2.58	2.88	2.76	2.88	2.74
Von Phister Street at Leon Street (N2836)	2.47	2.68	2.26	2.68	1.89
Benefits Incidental to Study Area 2C					
United Street at Ashby Street (N3030)	1.06	2.10	N/A	2.31	1.91
Ashby Street at Seminary Street (N3040)	1.65	2.12	N/A	2.31	1.96
United Street at George Street (N3010)	1.30	1.84	N/A	2.31	1.98

Class 4 cost opinions have been developed for the preferred solution for Study Areas 2A and 2B, both with and without pumps. **Table 20** identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 21** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 20 - Study Areas 2A and 2B Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$4,592,780
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$688,917
Contractor Profit	10%	$459,278
Engineering/Design	22%	$1,010,412
Contingency/Market Volatility	25%	$1,435,244
Total Including Contingencies		$8,186,631

Table 21 - Study Areas 2A and 2B Cost Opinion – with Pump Station

Construction Subtotal (no Pump Station)		$12,837,832
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,925,675
Contractor Profit	10%	$1,283,783
Engineering/Design	22%	$2,824,323
Contingency/Market Volatility	25%	$4,011,823
Total Including Contingencies		$22,883,436

As presented in **Table 19**, Study Area 2C near the intersection of United Street and Ashby Street sees an incidental benefit from the proposed improvements to Study Areas 2A and 2B to the west. Because there are recent stormwater projects constructed in this area, the preferred alternative includes leaving those improvements in place and raising road elevations at the low-lying intersection to a minimum 1.5 feet NAVD 88. This presents a solution that will prevent large-scale removal and replacement of recent construction work and limit flood depth and duration during the 10-year, 24-hour storm event.

Class 4 cost opinions have been developed for the preferred solution for Study Area 2C as shown in **Table 22**. The cost opinion for this solution is based on raising roadway elevations and adjusting utilities, curb and gutter, and sidewalk.

Table 22 - Study Area 2C Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$1,117,808
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$167,671
Contractor Profit	10%	$111,781
Engineering/Design	22%	$245,918
Contingency/Market Volatility	25%	$349,315
Total Including Contingencies		$1,992,493

- **Study Area 3A, Riviera Drive**

Study Area 3A includes Riviera Drive from 11th Street to the west and 17th Street to the east (western end). There are two small-diameter outfalls servicing Riviera Drive exclusively that discharge south to the Riviera Canal through residential properties that are closely spaced. There are also two larger-diameter outfalls that service both Flagler Avenue to the north and Riviera Drive. These outfalls are located through alleys that lead directly to the canal and are easily accessible for conveyance improvements. Riviera Drive elevations are lower through these areas, which contributes to frequent, sustained flooding through the area. This portion of Riviera Drive will become increasingly vulnerable to sunny-day flooding and will be overcome without a resiliency plan for the area that includes raising seawall elevations along both private and public seawalls in the area. These resiliency measures should be evaluated independently of this analysis. When a solution to raise the seawalls can be identified, the preferred solution for reducing flood stage in the area may be implemented.

Resilience-based solutions such as raising the elevation along Riviera Drive by repaving and improving drainage features will be limited, as they must prevent blocking flow from Flagler Avenue and contributing to flooding conditions along the county road. A review of the available elevation data identified that pavement elevations may be limited to 1.5 feet to 2.0 feet NAVD 88 without requiring additional improvements along Flagler Avenue. Road raising projects also will need to raise elevations along Kennedy Drive, Riviera Street, and 11th Street between the two roads.

The proposed solution for this area includes a combination of raising road elevations and improving outfall conveyance capacity of the larger two outfalls to the canal. The proposed solution also will require stormwater vaults and pump stations located at 11th Street and Riviera Street where the seawall elevation in the direct vicinity can be built up within the right of way.

The proposed improvements for the preferred alternative include the following:

- Install proposed 180 LF of 48-inch-diameter ERCP outfall from Riviera Drive to the canal at 11th Street; existing 42-inch outfall extending from Flagler Avenue to remain.
- Install proposed 180 LF of 48-inch-diameter ERCP outfall from Riviera Drive to the canal at Riviera Street; existing 48-inch-diameter outfall extending from Flagler Avenue to remain.
- Install tidal check valves at both the existing and proposed outfall locations.
- Raise existing roadway areas to elevation of 1.5 feet NAVD 88 at minimum or higher at Riviera Street, 11th Street, Kennedy Drive, and other low-lying areas along Riviera Drive; install curb and gutter system and roadside drainage along these areas to prevent blocking existing drainage paths.
- Proposed 50-cfs peak-flow stormwater pump stations located in the Riviera Street and 11th Street alleys south of Riviera Drive; proposed vault to be 440 feet extending to elevation -10 feet NAVD 88; pump station to tie into proposed new outfall pipe for discharge piping.

Figure 12 provides a schematic of the preferred conceptual solution for the area. **Table 23** presents a summary of Study Area 3A simulation results.

Figure 12 - Proposed Improvements in Study Area 3A

Table 23 - Summary of Study Area 3A Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes and a Pump Station

Study Area Sub-basins	10-Year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pumps)
11th Street at Riviera Drive (N3600)	0.58	1.93	1.33	2.70	1.04
Kennedy Drive at Riviera Drive (N3837)	0.65	2.09	2.01	2.71	2.02
Riviera Street at Riviera Drive (N3800)	0.65	1.99	1.43	2.71	1.00
17th Street at Riviera Drive (N3912)	1.46	2.39	2.39	2.77	2.39

The preferred solution makes use of the existing larger outfalls from Flagler Avenue and services the area with its own expanded outfalls that handle both Riviera Drive and overflow from flooding on Flagler Avenue. When paired with the road raising included with this solution, flooding during the 10-year, 24-hour event will be limited to within 6 inches for a limited duration when subjected to the 1.0-foot NAVD 88 tide boundary condition. Road raising also will reduce flood depth and duration for the tow areas along Riviera Drive currently serviced by outfalls that are not easily accessible as they pass through private property leading to the canal. Directly connecting these areas to the new outfalls does not appear to provide a suitable reduction in flood stage and duration by comparison.

Class 4 cost opinions were developed for the preferred solution both with and without pumps. **Table 24** identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 25** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 24 - Study Area 3A Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$2,415,964
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$362,395
Contractor Profit	10%	$241,596

Engineering/Design	22%	$531,512
Contingency/Market Volatility	25%	$754,989
Total Including Contingencies		$4,306,455

Table 25 - Study Area 3A Cost Opinion – with Pump Station

Construction Subtotal (with Pump Station)		$10,035,137
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,505,270
Contractor Profit	10%	$1,003,514
Engineering/Design	22%	$2,207,730
Contingency/Market Volatility	25%	$3,135,980
Total Including Contingencies		$17,887,631

- **Study Areas 4A and 4B, East End**

Study Areas 4A and 4B are within the northern portion of the East End Resiliency Opportunity Zone and defined generally as the residential areas around Donald Avenue and 20th Street, east to Flagler Avenue. This entire East End has low slopes and the existing stormwater piping does not provide sufficient drainage capacity. The area has a low-elevation landscape and is vulnerable to SLR. Significant new conveyance will be required to move water to larger outfalls.

While these two areas are independent sub-basin areas, analysis of the potential solutions identified for each showed increased benefit from simulating the proposed solutions as a group because Study Area 4A includes undersized conveyance piping that shares an outfall with an already restricted 42-inch-diameter pipe from the Flagler Avenue system. The basins have similar landscape elevations, which increases overland sheet flow between them, especially during future tidal boundary elevation scenarios.

In addition to the restricted conveyance, study area elevations are lower through these areas, which contributes to frequent, sustained flooding. The eastern area of the City will become increasingly vulnerable to sunny-day flooding and will be overcome without a resiliency plan for the area that includes raising seawall elevations along both private and public seawalls or other solutions. These resiliency measures should be evaluated independently of this analysis. When a solution to raise the seawalls can be identified, the preferred solution for reducing flood stage in the area may be implemented.

The preferred solution alternative for Study Area 4A includes the following proposed improvements:

- Proposed 955 LF of 42-inch-diameter ERCP along 20th Street from Duck Avenue to Flagler Avenue.
- Proposed 685 LF of 42-inch-diameter ERCP along Flagler Avenue from 20th Street to 19th Street.
- Proposed 175 LF of 54-inch-diameter ERCP along 19th Street from Flagler Avenue to Sunrise Lane, to the canal along Sunrise Lane.
- Existing stormwater network through roadways to remain and tie to new proposed pipes and inlets.
- Proposed 150-cfs peak-flow stormwater pump station near 19th Street at Sunrise Lane; consider converting the road in this area to an alleyway or otherwise modifying it to fit; vault to be 440 feet extending to elevation -10 feet NAVD 88.
- The preferred solution alternative for Study Area 4B includes the following proposed improvements:
- Remove 300 LF of existing 12-inch-diameter pipe along 20th Street from Paula Avenue to Donald Avenue and replace with 48-inch-diameter RCP.
- Remove 400 LF of existing 15-inch-diameter pipe along Donald Avenue from 19th Street to 20th Street and replace with 48-inch-diameter RCP.
- Remove 600 LF of existing 36-inch-diameter pipe along 20th Street from Donald Avenue to the outfall pipe near 24 North Hotel and replace with 48-inch-diameter RCP.
- Remove 750 LF of existing 36-inch-diameter pipe along outfall near 24 North Hotel and replace with twin 48-inch-diameter RCP.
- Proposed 150-cfs peak-flow stormwater pump station near 20th Street at the outfall pipe; vault to be 440 feet extending to elevation -10 feet NAVD 88.

Figure 13 presents the overall schematic associated with the preferred alternative proposed improvements in these areas.

Figure 13 - Proposed Improvements in Study Areas 4A and 4B

Several alternatives were evaluated for this area that focus on routing the conveyance through shared outfalls or oversizing the conveyance system to either eliminate roadway flooding for the 10-year, 24-hour event or reduce the peak stage to limit the anticipated inundation to less than 0.25 foot above the lower roadway segments. These alternatives proved that, although possible, there is a diminishing return on value in oversizing the pipes to the level required. Likewise, the area will continue to be subjected to SLR that will further degrade the expected peak flood stage reduction without the use of a pump station. **Table 26** presents the flood stage results from simulations of Study Areas 4A and 4B.

Table 26 - Summary of Study Areas 4A and 4B Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes and Pump Stations

Study Area Sub-basins	10-year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/ pump)
20th Street East to Flagler Avenue (N3930)	1.75	2.71	2.16	2.90	0.22
Flagler Avenue Northeast of 17th Street (N3900)	1.52	2.28	1.40	2.77	0.00
Northside Drive (N4125)	2.30	2.58	1.80	2.88	0.00
20th Street near Donald Avenue (N4130)	1.65	2.71	2.16	2.90	0.15
Donald Avenue near 20th Terrace (N4147)	1.31	2.85	2.34	2.94	0.86
20th Street from Paula Avenue to Cindy Avenue (N4150)	1.69	2.71	2.14	2.90	0.21
Northside Drive near 18th Terrace (N4160)	**2.59**	**2.72**	**2.28**	**2.89**	**0.00**

Class 4 cost opinions were developed for the preferred solution for Study Areas 4A and 4B, both with and without pumps. **Table 27** and **Table 29** identify the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 28** and **Table 30** identify the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 27 - Study Area 4A Cost Opinion – without Pump Station

Study Area 4A Construction Subtotal (no Pump Station)		$2,681,795
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$402,269
Contractor Profit	10%	$268,179
Engineering/Design	22%	$589,995
Contingency/Market Volatility	25%	$838,061
Total Including Contingencies		$4,780,299

Table 28 - Study Area 4A Cost Opinion – with Pump Station

Study Area 4A Construction Subtotal (with Pump Station)		$10,926,847
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,639,027
Contractor Profit	10%	$1,092,685
Engineering/Design	22%	$2,403,906
Contingency/Market Volatility	25%	$3,414,640
Total Including Contingencies		$19,477,104

Table 29 - Study Area 4B Cost Opinion – without Pump Station

Study Area 4B Construction Subtotal (no Pump Station)		$3,760,106
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$564,016
Contractor Profit	10%	$376,011
Engineering/ Design	22%	$827,223
Contingency /Market Volatility	25%	$1,175,033
Total Including Contingencies		$6,702,389

Table 30 - Study Area 4B Cost Estimate – with Pump Station

Study Area 4B Construction Subtotal (with Pump Station)		$12,005,158

Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,800,774
Contractor Profit	10%	$1,200,516
Engineering/Design	22%	$2,641,135
Contingency/Market Volatility	25%	$3,751,612
Total Including Contingencies		$21,399,194

- **Study Area 4C, Kennedy Drive to 15th Court**

Study Area 4C includes a large drainage area located from Kennedy Drive to 15th Court in the middle of New Town. Two outfalls service the area, including a 60-inch-diameter pipe extending west from Kennedy Drive that discharges west of 10th Street and an open channel extending north along the eastern side of the mobile home park, where flow becomes restricted upon crossing Northside Drive. Study Area 4D also makes use of the open channel outfall because of the similar elevations across the area and overland flow connectivity from the contributing basins.

The preferred solution alternative for Study Area 4C includes the following proposed improvements:

- Plug existing pipe connection headed north on Glynn Archer Jr. Drive just south of Rex Weech Field and install new inlets and proposed 545 LF of 36-inch-diameter ERCP west to Kennedy Drive.
- Remove and replace 230 LF of existing 24-inch-diameter pipe with 36-inch-diameter ERCP north along Kennedy Drive to the west main outfall.
- Remove and replace 260 LF of existing 24-inch-diameter pipe with 30-inch-diameter ERCP from Glynn Archer Jr. Drive just north of Rex Weech Field.
- Remove and replace the 290 LF of existing 30-inch-diameter pipe with 48-inch-diameter ERCP south along Kennedy Drive to the west main outfall.
- Remove and replace the 360 LF of existing 24-inch-diameter pipe with 36-inch-diameter RCP from Kennedy Drive at the Northside Drive intersection to the west main outfall.
- Connect the existing 60-inch-diameter west main outfall to a proposed 150-cfs peak-flow stormwater pump station located near the commercial area just north of the Patterson

Avenue at 10th Street intersection; vault to be 440 feet extending to elevation -10 feet NAVD 88.

- Install 250 LF of discharge piping from the pump station to the outfall west of 10th Street.
- Selective road raising at low-lying areas of Glynn Archer Jr. Drive to minimum elevation of 1.5 feet NAVD 88.

Conceptual stormwater conveyance pipe sizing and routing for Study Area 4C based on current tidal boundary conditions is included on **Figure 14**.

Figure 14 - Proposed Improvements in Study Area 4C

Table 31 provides the simulation results for the recommended conveyance system improvements with 1.0-foot boundary conditions as compared to the existing conditions and roadway low elevations. The table also identifies existing conditions with a 2.7-foot boundary condition and a modification to the conveyance system that includes the regional pump station.

Table 31 - Summary of Study Area 4C Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes and Pump Stations

Study Area Sub-basins	10-year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pump)
Glynn R. Archer Jr. Drive at Poinciana Field (N3790)	1.06	2.52	2.35	2.76	1.99
Glynn R. Archer Jr. Drive at Rex Weech Field (N3780)	1.24	2.34	2.27	2.75	1.64
Kennedy Drive at Northside Drive (N3760)	0.82	2.52	2.36	2.78	1.91
Kennedy Drive at Weech Field (N3750)	1.24	2.31	2.23	2.74	1.46
Kennedy Drive at Poinciana Field (N3740)	1.91	2.22	2.21	2.74	1.36
Patterson Avenue at 12th Street (N3710)	1.05	2.11	2.08	2.73	0.37
Patterson Avenue at 11th Street (N3700)	1.25	1.86	1.83	2.72	0.00

Review of **Figure 14** indicates that the sub-basins along Glynn R. Archer Jr. Drive are unable to be fully removed from flooding during the 10-year, 24-hour storm event with the proposed improvements in place when subject to a tidal boundary condition of 2.7 feet NAVD 88. To fully remove the subject areas from the 10-year, 24-hour flood event, the proposed improvements include raising the road elevations where possible because the roadway locations below the flood stage are located in isolated areas where the opportunity is available. A review of the elevation information included in the DEM identifies that a minimum road elevation of 1.5 feet NAVD 88 may be suitable to prevent flooding in the localized areas by more than 6 inches when subject to the 10-year, 24-hour storm event.

It is important to note that the west outfall location presents an additional challenge when compared to the tidal boundary condition of 2.7 feet NAVD 88. The existing roads in the vicinity

of the outfall are currently lower than the future tide boundary condition. These areas should be addressed independently as a part of meeting the resiliency standards adopted by the City.

In addition to the increased conveyance capacity headed to the outfall to the west, it is understood that the small salt pond located at the northern end of Sunset Drive is environmentally sensitive and experiences sunny-day flooding on top of the conditions caused from typical rain events. The City is currently evaluating this area with a different project, including considerations for a tidal barrier that may push the increased flow to the area to the coast. In addition to the ongoing evaluation, the pump station proposed for this area may be modified to be located farther west where it may direct the discharge flow north of any tidal barrier or other features implemented as a part of that study. Costs for this are not included in the cost opinion for this alternative.

An alternative solution that directs flow to the north through a new outfall proposed through the Kennedy Drive at North Roosevelt Boulevard intersection is evaluated with Study Area 4D. The additional pump and outfall proposed with Study Area 4D provide a mutual benefit to the area that may prevent the Glynn R. Archer Jr. Drive area from flooding. As that solution includes a new outfall location, it may only be considered upon the decision to move forward with the solution proposed in Study Area 4D.

Class 4 cost opinions have been developed for the preferred solution both with and without pumps. **Table 32** identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 33** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 32 - Study Area 4C Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$2,849,691
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$427,454
Contractor Profit	10%	$284,969
Engineering/Design	22%	$626,932
Contingency/Market Volatility	25%	$890,528
Total Including Contingencies		$5,079,574

Table 33 - Study Area 4C Cost Opinion – with Pump Station

Construction Subtotal (with Pump Station)		$11,094,743
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,664,211
Contractor Profit	10%	$1,109,474
Engineering/Design	22%	$2,440,843
Contingency/Market Volatility	25%	$3,467,107
Total Including Contingencies		$19,776,379

- **Study Area 4D, Donald Avenue**

Study Area 4D is located along the north and south sides of Donald Avenue and in the East End Resilience Opportunity Zone. Most of the area drains south to an open ditch and wetland on the south side of Donald Avenue. This ditch currently is a major flow path from drainage areas to the east (including Study Areas 4A and 4B). The Poinciana Plaza apartments to the south drain to this system as well.

This existing ditch drains west through an enclosed 72-inch-diameter arch pipe, then through an open channel that heads north to Northside Drive, where it travels underground beneath the commercial property (shopping center with Publix) and Roosevelt Boulevard through two 24-inch-diameter pipes that discharge to the coast. The conveyance capacity through the twin 24-inch-diameter pipes in restricted as compared to the open channel. The area along Donald Avenue is at or near elevation 1.0 foot NAVD 88, and the already limited storage capacity of the ponded area will be even more restricted when modeled with future tidal boundary conditions.

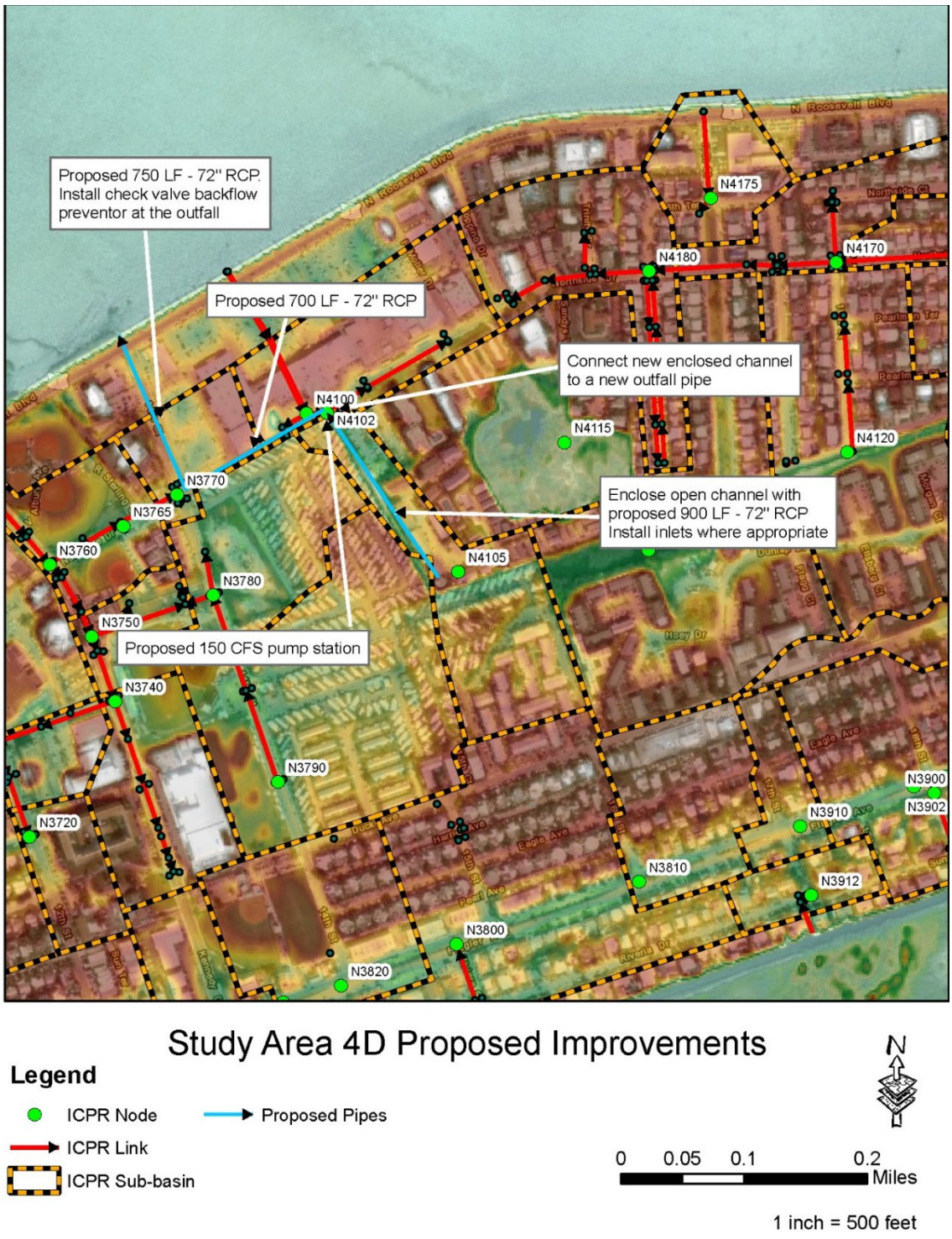
Although there is a stormwater system servicing some of the properties north of Donald Avenue, the existing pipe capacity is limited, as the low elevations throughout appear to encounter backflow conditions. The neighborhood also is serviced by a gravity well system that will experience reduced performance as SLR continues to impact the island.

Several alternatives were evaluated for this area, with a focus on interconnecting the Donald Avenue stormwater system to either an additional proposed outfall location to the north or increasing outfall capacity through the Northside Drive system. Analysis also was completed to identify any potential to increase storage near the pond south of Donald Avenue by building up a berm or gravity wall without contributing to peak flood stage increases to the contributing area. The preferred alternative for this study area includes the following proposed improvements:

- Enclose the open channel headed north to Northside Drive with a proposed 900 LF of 72-inch-diameter RCP, maintaining a similar capacity as the previous project enclosing this channel as it heads east to Donald Avenue; install inlets along this pipe run where appropriate to maintain drainage from the surrounding area.
- Connect the new, enclosed channel system at Northside Drive to a new outfall pipe; allow the existing two 24-inch-diameter pipes to handle the outfall for the roadside system only at Northside Drive.
- Install proposed 700 LF of 72-inch-diameter RCP west along Northside Drive to the intersection with Glynn Archer Jr. Drive.
- Install proposed 750 LF of 72-inch-diameter RCP north to the outfall past North Roosevelt Boulevard; install a check valve backflow preventor at the outfall.
- Connect the proposed 72-inch-diameter outfall to a proposed 150-cfs peak-flow stormwater pump station located near the connection at Northside Drive; proposed vault to be 440 feet extending to elevation -10 feet NAVD 88.

Proposed new outfalls for Study Area 4D are shown on **Figure 15**.

Figure 15 - Potential New Outfalls for Study Area 4D



The proposed improvements for this study area also are reflected in reduced flood stages for Study Area 4D, as shown in **Table 34**.

Table 34 - Summary of Study Area 4D Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes and Pump Stations

Study Area Sub-basins	10-Year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pump)
Donald Avenue West (N4110)	1.14	2.69	2.24	2.90	1.26
Donald Avenue at Poinciana Mobile Home Park (N4105)	1.38	2.68	2.19	2.90	1.01
16th Terrace at Donald Avenue (N4180)	2.10	2.69	2.35	2.90	2.37
Donald Avenue at 18th Street (N4120)	1.51	2.69	2.25	2.90	1.42
Donald Avenue at 19th Street (N4140)	2.02	2.75	2.53	2.91	2.22
Donald Avenue at 16th Terrace (N4147)	1.22	2.84	2.77	2.95	2.71

The proposed condition results identify that constructing and oversizing a new outfall that services the Donald Avenue area will provide a benefit to all lower-lying areas along the eastern part of the City. When in place, other study area solution alternatives may be modified to take advantage of the additional stormwater conveyance capacity through this area. For example, Donald Avenue at 19th Street and Donald Avenue at 16th Terrace could both be modified with larger conveyance pipes into the Donald Avenue area to remove their subject basins from the 10-year, 24-hour flood stage.

Class 4 cost opinions were developed for the preferred solution both with and without pumps. **Table 35** identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 36** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 35 - Study Area 4D Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$3,529,222
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$529,383.31
Contractor Profit	10%	$352,922.21
Engineering/Design	22%	$776,428.86
Contingency/Market Volatility	25%	$1,102,881.90
Total Including Contingencies		$6,290,838

Table 36 - Study Area 4D Cost Opinion – with Pump Station

Construction Subtotal (with Pump Station)		$11,774,274
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$1,766,141.09
Contractor Profit	10%	$1,177,427.39
Engineering/Design	22%	$2,590,340.26
Contingency/Market Volatility	25%	$3,679,460.60
Total Including Contingencies		$20,987,643

- **Study Area 5A, White Street to Grinnell Street**

Study Area 5A is in the northwestern area of the island and is isolated from the other study areas. This area is in the White to Grinnell Neighborhood Drainage Zone. The neighborhood is currently serviced by a gravity well system that will experience reduced capacity as SLR continues to impact the island. The busy intersection of Eaton Street and White Street is at or near elevation 1.0 foot NAVD88, where it receives incoming flow from the surrounding area with limited capacity to convey it to the outfall located at Grinnell Street (by the ferry terminal). The flow path between White Street and Grinnell Street is under commercial buildings and cannot be fully investigated. It includes some large, old pipes or culverts, but the flow path is constrained prior to the outfall. A lot of drainage areas south of the ferry use these outfalls. Because the near-term tide condition of 1.0 foot is already at the intersection's elevation, solutions for this area will require resiliency measures such as stormwater pumps, pump-assisted injection wells, or road raising.

Conceptual stormwater conveyance pipe sizing and routing based on current tidal boundary conditions is included on **Figure 16**. The preferred gravity outfall route for the stormwater system

is to tie directly to the 4-foot by 6-foot box culvert located north of the intersection on White Street. A proposed pump station may be located anywhere from the White Street at Eaton Street intersection to the outfall corridor down Grinnell Street or adjacent to it. The pump station will require an outfall with which to connect.

There is currently a vault near the ferry that is near the terminus of the culvert. The piping along Mustin Street to the Grinnell Street outfalls is not well understood. There may be a better way to connect this box culvert to an outfall. Increased pump vault capacity may help reduce stormwater pump station size requirements to provide a benefit for long-term future tide boundary conditions. Alternatively, a pump station and new outfall down White Street may be pursued, but this will cross U.S. Navy/federal property. The pump station discharge piping is estimated along the longer path to the outfalls to allow for optimization of the conveyance improvements when survey is obtained and the existing conditions are further analyzed.

The proposed improvements for the preferred alternative include the following:

- Proposed 450 LF of 24-inch-diameter RCP from Southard Street at Frances Street to the intersection of Fleming Street at White Street.
- Proposed 550 LF of 36-inch-diameter RCP from Southard Street at White Street to the proposed pump station vault near the intersection of White Street at Eaton Street.
- Proposed 460 LF of 36-inch-diameter RCP from Fleming Street at Frances Street to the intersection of Fleming Street at White Street.
- Proposed 120 LF of 36-inch-diameter RCP from Fleming Street at White Street to the proposed pump station vault near the intersection of White Street at Eaton Street.
- Proposed 80-cfs peak-flow stormwater pump station located near the intersection of White Street and Eaton Street; proposed vault to be 440 feet extending to elevation -10 feet NAVD 88.
- Proposed discharge piping to outfall location near Grinnell Street (1,800 LF). There are already two pipe outfalls here, so a new outfall may need to be east of the ferry terminal.

Figure 16 shows the proposed improvements for Study Area 5A.

Figure 16 - Proposed Improvements in Study Area 5A

The proposed reduction in flood stage with the preferred solution in place is included in **Table 37**.

Table 37 - Summary of Study Area 5A Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes and Pump Stations

Study Area Sub-basins	10-year, 24-hour Elevation (feet NAVD 88)				
	Roadway Low Point (feet)	Existing Conditions, 1-ft Tide	Proposed Solution, 1-ft Tide (no pump)	Existing Conditions, 2.7-ft Tide	Proposed Solution, 2.7-ft Tide (w/pump)
Eaton Street at White Street (N2510)	1.19	2.02	1.70	2.48	0.00
Fleming Street at White Street (N700)	1.69	2.65	2.06	2.63	0.63
Fleming Street at Frances Street (N705)	2.34	3.19	2.94	3.20	2.22
Eaton Street at Frances Street (N2520)	1.11	2.04	1.87	2.48	0.73
Caroline Street at Grinnell Street (N2500)	1.40	1.83	1.48	2.48	1.48

Class 4 cost opinions have been developed for the preferred solution both with and without pumps. **Table 38** identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 39** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 38 - Study Area 5A Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$3,950,007
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$592,501
Contractor Profit	10%	$395,001
Engineering/Design	22%	$869,002
Contingency/Market Volatility	25%	$1,234,377
Total Including Contingencies		$7,040,888

Table 39 - Study Area 5A Cost Opinion – with Pump Station

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

- **Study Area 6A, Southern Bahama Village**

Study Area 6A lies in the southwest corner of the island, just before the Naval Air Station. The study area focuses on flooding at the Frederick Douglass Gym, at the intersection of Emma and Olivia Streets, and at Nelson English Park, on the corner of Thomas and Catherine Streets. This study area represents all drainage infrastructure south of Geraldine Street and west of Thomas Street. Much of the area is low lying near the coast, with a majority of the existing infrastructure at an elevation of 4 feet NAVD88 or less. There are currently no pump stations in the area, but there is a good-sized outfall flowing southeast on Fort Street out to the ocean. The system lacks connectivity to this outfall, resulting in sheet flow channelization in the streets and sustained flooding at the intersections. The system is overwhelmed and cannot direct flow from this area fast enough. However, near Nelson English Park, the streets are low (less than elevation 2 feet NAVD 88) and there is a sanitary pump station (Pump Station A) that has to be considered.

The proposed solution for this area includes adding connectivity to the intersection of Emma Street and Olivia Street, adding redundancy on Fort Street and Amelia Street, and installing two pump stations. In addition, a check valve backflow preventer is recommended at the outfall to reduce tidal influences at the existing outfall. Conceptual conveyance pipe sizing and routing based on current tidal boundary conditions is included on **Figure 17**. Proposed flood stage results are included in **Table 40**.

The proposed improvements for the preferred alternative include the following:

- Install proposed 330 LF of 36-inch-diameter RCP along Olivia Street from Emma Street to Fort Street.
- Install proposed 1,030 LF of 48-inch-diameter RCP along Fort Street from Olivia Street to Amelia Street, paralleling the existing 24-inch-diameter RCP.

- Install proposed 470 LF of 24-inch-diameter RCP along Thomas Street from Catherine Street to Amelia Street and continuing west along Amelia Street from Thomas Street to Howe Street, paralleling the existing 12-inch-diameter RCP.
- Install proposed 615 LF of 36-inch-diameter RCP along Amelia Street from Howe Street to Fort Street, paralleling the existing 24-inch-diameter and 36-inch-diameter RCP.
- Remove and replace 550 LF of 48-inch-diameter RCP from Fort Street to the outfall with 72--inch -diameter RCP.
- Install a tidal check valve at the existing outfall location. The City was already planning to do this.
- Construct proposed 50-cfs peak-flow stormwater pump station located in the parking lot at the Frederick Douglass Gym on the corner of Fort Street and Olivia Street; proposed vault extending to elevation -10 feet NAVD 88.
- Construct proposed 18.5-cfs peak-flow stormwater pump station located in the parking lot at the Nelson English Park; proposed vault extending to elevation -10 feet NAVD 88.

Figure 17 shows the proposed improvements for Study Area 6A.

Figure 17 - Proposed Improvements in Study Area 6A

Table 40 presents a summary of the simulation results for the 10-year, 24-hour storm with upgrades provided at Study Area 6A.

Table 40 - Summary of Study Area 6A Simulation Results for the 10-year Storm with Upgraded Conveyance Pipes

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

Review of Table 40 shows the solution with or without a pump station will provide flood reduction at both target areas, especially at Emma and Olivia Streets. By adding pump stations at two locations in the system, with the 2.7-foot NAVD88 tidal boundary conditions, the flood conditions will be significantly reduced. Results with the pump for the 2.7-foot tide solidify long-term benefits when SLR continues. The proposed backflow preventer on the outfalls also will reduce negative impacts of SLR.

Class 4 cost opinions were developed for the preferred solution both with and without pumps. **Table 41** identifies the estimated costs without a pump station in place (costs associated with gravity-based conveyance improvements only), while **Table 42** identifies the estimated costs with a pump station in place (costs associated with gravity-based conveyance improvements plus pump station).

Table 41 - Study Area 6A Cost Opinion – without Pump Station

Construction Subtotal (no Pump Station)		$2,648,279
Markups		
Contractors Overhead, General Conditions, Temporary Facilities	15%	$397,242

Contractor Profit	10%	$264,828
Engineering/Design	22%	$582,621
Contingency/Market Volatility	25%	$827,587
Total Including Contingencies		$4,720,557

Table 42 - Study Area 6A Cost Opinion – with Pump Station

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

7. The community must adopt the final plan.

The community will adopt the final Watershed Management Plan by Resolution when it is completed and submitted to the City Commission.

8. If applicable, WMP plans more than 5 years old must be evaluated to ensure that they remain applicable to current conditions. For instance, are previous assumptions on hydrology, sea level rise and future land use still applicable.

This is the City's first Watershed Management Plan for CRS and this is inapplicable.

III. Jurisdiction Specific Comments for Task 1

Task 1.1: Data collection for structures – The City of Key West shall provide a list of critical assets, including regionally significant, to be evaluated for potential impacts by flooding and sea level rise including (but not limited to) transportation assets and evacuation routes; critical infrastructure; critical community and emergency facilities; and natural, cultural, and historical resources.

> *Please refer to Section II of this Preliminary Project Plan outlining the work of the Vulnerability Assessment that was conducted. The descriptions within that section provide an accounting of all critical and regionally significant assets to be evaluated grouped according to asset class. All assets will be evaluated for the Vulnerability Assessment using ArcGIS according to Section 380.093(3), F.S. requirements.*

Additionally, the City of Key West shall include an individualized assessment with updated structures from the 2019 Watershed Management Plan, and any additional field work and analysis stemming from the Countywide Roads and Stormwater Assessment (2022).

> *The 2019 Watershed Management Plan refers to Monroe County's previously approved and credited Watershed Management Plan. To the extent pertinent structure or analytical data would be relevant, it has been included with the Vulnerability Assessment and ICPR Model being developed for this Watershed Management Plan for Key West in 2025. Given that was a County plan, very little data has been extracted from that effort because this Watershed Management Plan for Key West 2025 is based on Key West-specific geographical boundaries, conditions, critical facilities and assets. The same holds true for the Countywide Roads and Stormwater Assessment (2022) because that effort focused on unincorporated County assets and structures, while this Watershed Management Plan for Key West 2025 focuses on Key West-specific structures, assets and data.*

Tasks 1.2 and 1.3: Preliminary Flood Modeling and Project Plan – In addition to the above Minimum Criteria, the City shall align the Project Plan modeling effort with Section 380.093, F.S., and the approach for this assessment will include:

1) Mapping potential future regular tidal inundation from sea level rise, high tide flooding, and

> *This work has been conducted in the context of the Key West Vulnerability Assessment and the initial map series has been described earlier in this Preliminary Project Plan. All scenarios have been listed previously. Tide gauge data and*

inundation levels have been coordinated between the Vulnerability Assessment and ICPR modeling effort for this Watershed Management Plan for Key West.

2) Map potential storm surge events to project multiple sea-level-adjusted designed storm events (at a minimum, the 100-year event).

This scenario was modeled as previously discussed.

Additionally, the City will clarify in writing which tasks and efforts have already been completed prior to contract execution. With the mapping efforts, the City shall provide the source and dates of data acquisition, locational accuracy, and map projection and coordinate system information of geospatial data.

IV. References

E. Shahsi, 2015, Menon's in Transmission Pipeline Calculations and Simulations Manual.

FDOT, 2023, FDOT Resilience Action Plan Appendix A (Project List).

Monroe County 2020, King Tide and Normal Wind Setup Analysis for Monroe County, Florida.

SJRWMD 1990, Procedure for Selection of SCS Peak Rate Factors for use in MSSW Permit Applications.

SJRWMD 2012, Chapter 3: Watershed Hydrology, Appendix 3.A.: Land Use Classification/Grouping from SJRWMD Technical Reports.

South Florida Water Management District 2022, Adoption of Future Extreme Rainfall Change Factors for Flood Resiliency Planning in South Florida.

V. Appendix A: Floodplain Management Code of Ordinances

ARTICLE II. FLOODPLAIN MANAGEMENT[5]

Secs. 34-26—34-121. Reserved.

Sec. 34-122. General

1) *Title.* These regulations shall be known as the floodplain management ordinance of City of Key West, hereinafter referred to as "this ordinance."

2) *Scope.* The provisions of this ordinance shall apply to all development that is wholly within or partially within any flood hazard area, including, but not limited to, the subdivision of land; filling, grading, and other site improvements and utility installations; construction, alteration, remodeling, enlargement, improvement, replacement, repair, relocation or demolition of buildings, structures, and facilities that are exempt from the Florida Building Code; placement, installation, or replacement of manufactured homes and manufactured buildings; installation or replacement of tanks; placement of recreational vehicles; installation of swimming pools; and any other development.

3) *Intent.* The purposes of this ordinance and the flood load and flood-resistant construction requirements of the Florida Building Code are to establish minimum requirements to safeguard the public health, safety, and general welfare and to minimize public and private losses due to flooding through regulation of development in flood hazard areas to:

    (a) Minimize unnecessary disruption of commerce/access and public service during times of flooding;

    (b) Require the use of appropriate construction practices in order to prevent or minimize future flood damage;

    (c) Manage filling, grading, dredging, mining, paving, excavation, drilling operations, storage of equipment or materials, and other development which may increase flood damage or erosion potential;

    (d) Manage the alteration of flood hazard areas, and shorelines to minimize the impact of development on the natural and beneficial functions of the floodplain;

    (e) Minimize damage to public and private facilities and utilities;

[5] Editor's note(s)—Sec. 1 of Ord. No. 13-05, adopted Mar. 19, 2013, repealed art. II, Flood damage prevention, consisting of §§ 34-26—34-121, deriving from the 1986 Code; and Ord. No. 04-11, adopted June 2, 2004. Sec. 2 of Ord. No. 13-05 enacted new provisions to read as herein set out.

(f) Help maintain a stable tax base by providing for the sound use and development of flood hazard areas;

(g) Minimize the need for future expenditure of public funds for flood control projects and response to and recovery from flood events; and

(h) Meet the requirements of the National Flood Insurance Program for community participation as set forth in the Title 44 Code of Federal Regulations, Section 59.22.

4) *Coordination with the Florida Building Code.* This ordinance is intended to be administered and enforced in conjunction with the Florida Building Code. Where cited, ASCE 24 refers to the edition of the standard that is referenced by the Florida Building Code.

5) *Warning.* The degree of flood protection required by this ordinance and the Florida Building Code, as amended by this community, is considered the minimum reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur. Flood heights may be increased by man-made or natural causes. This ordinance does not imply that land outside of mapped special flood hazard areas, or that uses permitted within such flood hazard areas, will be free from flooding or flood damage. The flood hazard areas and base flood elevations contained in the flood insurance study and shown on flood insurance rate maps and the requirements of Title 44 Code of Federal Regulations, Sections 59 and 60 may be revised by the Federal Emergency Management Agency, requiring the city to revise these regulations to remain eligible for participation in the National Flood Insurance Program. No guaranty of vested use, existing use, or future use is implied or expressed by compliance with this ordinance.

6) *Disclaimer of liability.* This ordinance shall not create liability on the part of city commission of the City of Key West or by any officer or employee thereof for any flood damage that results from reliance on this ordinance or any administrative decision lawfully made thereunder.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-123. Applicability.

1) *General.* Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

2) *Areas to which this ordinance applies.* This ordinance shall apply to all flood hazard areas within the City of Key West, as established in section 34-123(3) of this ordinance.

3) *Basis for establishing flood hazard areas.* The Flood Insurance Study for Monroe County, Florida, and Incorporated Areas dated February 18, 2005, and all subsequent amendments and revisions, and the accompanying flood insurance rate maps (FIRM), and all subsequent amendments and revisions to such maps, are adopted by reference as a part of this ordinance and shall serve as the minimum basis for establishing flood hazard areas. Flood hazard areas that have been delineated on the printed FIRM as subject to wave heights between one and one-half feet and three feet

shall be established as Coastal A Zones. Studies and maps that establish flood hazard areas are on file at the FEMA Coordinator/Floodplain Administrator located at the City of Key West Planning Department, Key West, Florida.

(a) *Submission of additional data to establish flood hazard areas.* To establish flood hazard areas and base flood elevations, pursuant to section 34-127 of this ordinance the floodplain administrator may require submission of additional data. Where field surveyed topography prepared by a Florida-licensed professional surveyor or digital topography accepted by the community indicates that ground elevations:

1. Are below the closest applicable base flood elevation, even in areas not delineated as a special flood hazard area on a FIRM, the area shall be considered as flood hazard area and subject to the requirements of this ordinance and, as applicable, the requirements of the Florida Building Code.

2. Are above the closest applicable base flood elevation, the area shall be regulated as special flood hazard area unless the applicant obtains a letter of map change that removes the area from the special flood hazard area.

4) *Other laws.* The provisions of this ordinance shall not be deemed to nullify any provisions of local, state or federal law.

5) *Abrogation and greater restrictions.* This ordinance supersedes any ordinance in effect for management of development in flood hazard areas. However, it is not intended to repeal or abrogate any existing ordinances including, but not limited to, land development regulations, zoning ordinances, stormwater management regulations, or, the Florida Building Code. In the event of a conflict between this ordinance and any other ordinance, the more restrictive shall govern. This ordinance shall not impair any deed restriction, covenant or easement, but any land that is subject to such interests shall also be governed by this ordinance.

6) *Interpretation.* In the interpretation and application of this ordinance, all provisions shall be:

(a) Considered as minimum requirements;

(b) Liberally construed in favor of the governing body; and

(c) Deemed neither to limit nor repeal any other powers granted under state statutes.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-125. Duties and powers of the floodplain administrator.

1) *Designation.* The FEMA Coordinator is designated as the floodplain administrator. The floodplain administrator may delegate performance of certain duties to other employees.

2) *General.* The floodplain administrator is authorized and directed to administer and enforce the provisions of this ordinance. The floodplain administrator shall have the authority to render interpretations of this ordinance consistent with the intent and purpose of this ordinance and may establish policies and procedures in order to clarify the application of its provisions. Such interpretations, policies, and procedures shall not have the effect of waiving requirements specifically provided in this ordinance without the granting of a variance pursuant to section 34-129 of this ordinance.

3) *Applications and permits.* The floodplain administrator, in coordination with other pertinent offices of the community, shall:

    (a) Review applications and plans to determine whether proposed new development will be located in flood hazard areas;

    (b) Review applications for modification of any existing development in flood hazard areas for compliance with the requirements of this ordinance;

    (c) Interpret flood hazard area boundaries where such interpretation is necessary to determine the exact location of boundaries; a person contesting the determination shall have the opportunity to appeal the interpretation;

    (d) Provide available flood elevation and flood hazard information;

    (e) Determine whether additional flood hazard data shall be obtained from other sources or shall be developed by an applicant;

    (f) Review applications to determine whether proposed development will be reasonably safe from flooding;

    (g) Issue floodplain development permits or approvals for development other than buildings and structures that are subject to the Florida Building Code, including buildings, structures and facilities exempt from the Florida Building Code when compliance with this ordinance is demonstrated, or disapprove the same in the event of noncompliance;

    (h) Coordinate with and provide comments to the building official to assure that applications, plan reviews, and inspections for building permits for buildings and structures in flood hazard areas comply with the requirements of this ordinance.

4) *Substantial improvement and substantial damage determinations.* For applications for building permits to improve buildings and structures, including alterations, movement, enlargement, replacement, repair, change of occupancy, additions, rehabilitations, renovations, substantial improvements, repairs of substantial damage, and any other improvement of or work on such buildings and structures, the floodplain administrator, shall:

(a) Estimate the market value, or require the applicant to submit appraisals - not older than one year - of the market value prepared by a qualified independent appraiser, of the building or structure before the start of construction of the proposed work; in the case of repair, the market value of the building or structure shall be the market value before the damage occurred and before any repairs are made;

(b) Compare the cost to perform the improvement, the cost to repair a damaged building to its pre-damaged condition, or the combined costs of improvements and repairs, if applicable, to the market value of the building or structure;

(c) Determine and document whether the proposed work constitutes substantial improvement or repair of substantial damage; the determination requires evaluation of previous permits issued for improvements and repairs as specified in the definition of "substantial improvement"; for proposed work to repair damage caused by flooding, the determination requires evaluation as specified in the definition of "substantial damage"; and

(d) Notify the applicant if it is determined that the work constitutes substantial improvement or repair of substantial damage and that compliance with the flood-resistant construction requirements of the Florida Building Code and this ordinance is required.

(e) When determining costs as described in this subsection, pursuant to FEMA desk reference P-758, the floodplain administrator shall include:

i. Materials, labor, including the estimated value of donated or discounted materials and owner or volunteer labor as explained in FEMA desk reference P-758;

ii. Site preparation related to the improvement or repair;

iii. Demolition and construction debris disposal as explained in FEMA desk reference P-758;

iv. Labor and other costs associated with demolishing, moving, or altering building components to accommodate improvements, additions, and making repairs as explained in FEMA desk reference P-758;

v. Costs associated with complying with any other regulations or code requirement that is triggered by the work, including costs to comply with the requirements of the Americans with Disabilities Act as explained in FEMA desk reference P-758;

vi. Reserved;

vii. Construction management supervision;

viii. Contractor's overhead and profit;

ix. Sales tax on materials;

x. Structural elements and exterior finishes;

xi. Interior finish elements;

xii. Utility and service equipment;

xiii. In the event of an owner/builder, paragraphs i through xii shall be estimated as fair market value in the City of Key West.

5) *Modifications of the strict application of the requirements of the Florida Building Code.* The floodplain administrator shall review requests submitted to the building official that seek approval to modify the strict application of the flood load and flood-resistant construction requirements of the Florida Building Code to determine whether such requests require the granting of a variance pursuant to section 34-129 of this ordinance.

6) *Notices and orders.* The floodplain administrator shall coordinate with appropriate local agencies for the issuance of all necessary notices or orders to ensure compliance with this ordinance.

7) *Inspections.* The floodplain administrator shall make the required inspections as specified in section 34-128 of this ordinance for development that is not subject to the Florida Building Code, including buildings, structures and facilities exempt from the Florida Building Code. The floodplain administrator shall inspect flood hazard areas to determine if development is undertaken without issuance of a permit.

8) *Other duties of the floodplain administrator.* The floodplain administrator shall have other duties, including, but not limited to:

(a) Establish, in coordination with the building official, procedures for administering and documenting determinations of substantial improvement and substantial damage made pursuant to section 34-125(4) of this ordinance;

(b) Require applicants who submit hydrologic and hydraulic engineering analyses to support permit applications to submit to FEMA the data and information necessary to maintain the flood insurance rate maps if the analyses propose to change base flood elevations, or flood hazard area boundaries; such submissions shall be made within six months of such data becoming available;

(c) Review required design certifications and documentation of elevations specified by this ordinance and the Florida Building Code and this ordinance to determine that such certifications and documentations are complete and include photographs that at a minimum show the front and rear of the building and its foundation;

(d) Notify the Federal Emergency Management Agency when the corporate boundaries of City of Key West are modified; and

(e) Advise applicants for new buildings and structures, including substantial improvements that are located in any unit of the Coastal Barrier Resources System established by the Coastal Barrier Resources Act (Pub. L. 97-348) and the Coastal Barrier Improvement Act of 1990 (Pub. L. 101-591) that federal flood insurance is not available on such construction; areas subject to this limitation are identified on Flood Insurance Rate Maps as "Coastal Barrier Resource System Areas" and "Otherwise Protected Areas."

9) *Floodplain management records.* Regardless of any limitation on the period required for retention of public records, the floodplain administrator shall maintain and permanently keep and make available for public inspection all records that are necessary for the administration of this ordinance and the flood-resistant construction requirements of the Florida Building Code, including flood insurance rate maps; letters of change; records of issuance of permits and denial of permits; determinations of whether proposed work constitutes substantial improvement or repair of substantial damage; required design certifications and documentation of elevations specified by the Florida Building Code and this ordinance; documentation related to appeals and variances, including justification for issuance or denial; and records of enforcement actions taken pursuant to this ordinance and the flood-resistant construction requirements of the Florida Building Code. These records shall be available for public inspection at the City of Key West Planning Department, Key West, Florida.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 16-07, § 1, 5-17-2016; Ord. No. 17-07, § 1, 8-15-2017; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-126. Permits.

1) *Permits required.* Any owner or owner's authorized agent (hereinafter "applicant") who intends to undertake any development activity within the scope of this ordinance, including buildings, structures and facilities exempt from the Florida Building Code, which is wholly within or partially within any flood hazard area shall first make application to the floodplain administrator, and the building official if applicable, and shall obtain the required permit(s) and approval(s). No such permit or approval shall be issued until compliance with the requirements of this ordinance and all other applicable codes and regulations has been satisfied.

2) *Floodplain development permits or approvals.* Floodplain development permits or approvals shall be issued pursuant to this ordinance for any development activities not subject to the requirements of the Florida Building Code, including buildings, structures and facilities exempt from the Florida Building Code. Depending on the nature and extent of proposed development that includes a building or structure, the floodplain administrator may determine that a floodplain development permit or approval is required in addition to a building permit.

(a) Buildings, structures and facilities exempt from the Florida Building Code. Pursuant to the requirements of federal regulation for participation in the National Flood Insurance Program (44 C.F.R. Sections 59 and 60), floodplain development permits or approvals shall

be required for the following buildings, structures and facilities that are exempt from the Florida Building Code and any further exemptions provided by law, which are subject to the requirements of this ordinance:

1. Railroads and ancillary facilities associated with the railroad.
2. Nonresidential farm buildings on farms, as provided in F.S. § 604.50.
3. Temporary buildings or sheds used exclusively for construction purposes.
4. Mobile or modular structures used as temporary offices.
5. Chickees constructed by the Miccosukee Tribe of Indians of Florida or the Seminole Tribe of Florida. As used in this paragraph, the term "chickee" means an open-sided wooden hut that has a thatched roof of palm or palmetto or other traditional materials, and that does not incorporate any electrical, plumbing, or other non-wood features.
6. Family mausoleums not exceeding 250 square feet in area which are prefabricated and assembled on site or preassembled and delivered on site and have walls, roofs, and a floor constructed of granite, marble, or reinforced concrete.
7. Temporary housing provided by the department of corrections to any prisoner in the state correctional system.
8. Structures identified in F.S. § 553.73(10)(k), are not exempt from the Florida Building Code if such structures are located in flood hazard areas established on flood insurance rate maps.

3) *Application for a permit or approval.* To obtain a floodplain development permit or approval the applicant shall first file an application in writing on a form furnished by the community. The information provided shall:

(a) Identify and describe the development to be covered by the permit or approval.

(b) Describe the land on which the proposed development is to be conducted by legal description, street address or similar description that will readily identify and definitively locate the site.

(c) Indicate the use and occupancy for which the proposed development is intended.

(d) Be accompanied by a site plan or construction documents as specified in section 34-127 of this ordinance.

(e) State the valuation of the proposed work.

(f) Be signed by the applicant or the applicant's authorized agent.

(g) Give such other data and information as required by the floodplain administrator.

(h) Applications utilizing the Building Height Exception under section 122-1149, requires specific floodplain approval ensuring enclosures below elevated lowest floors do not exceed 299 square feet, and remain subject to the usage limitations specified in section 1612 of the Florida Building Code, or section R322 of the Florida Residential Code.

(i) For projects proposing to enclose areas under elevated buildings that are larger than 100 sq. ft, and for non-elevated accessory structures that are larger than 100 sq. ft., include signed declaration of land restriction (nonconversion agreement); the agreement shall be recorded with the county clerk prior to issuance of the permit.

4) *Validity of permit or approval.* The issuance of a floodplain development permit or approval pursuant to this ordinance shall not be construed to be a permit for, or approval of, any violation of this ordinance, the Florida Building Codes, or any other ordinance of this community. The issuance of permits based on submitted applications, construction documents, and information shall not prevent the floodplain administrator from requiring the correction of errors and omissions.

5) *Expiration.* A floodplain development permit or approval shall become invalid unless the work authorized by such permit is commenced within 180 days after its issuance, or if the work authorized is suspended or abandoned for a period of 180 days after the work commences. Extensions for periods of not more than 180 days each shall be requested in writing and justifiable cause shall be demonstrated.

6) *Suspension or revocation.* The floodplain administrator is authorized to suspend or revoke a floodplain development permit or approval if the permit was issued in error, on the basis of incorrect, inaccurate or incomplete information*, or in violation of this ordinance or any other ordinance, regulation or requirement of this community.*

7) *Other permits required. Floodplain development perm*its and building permits shall include a condition that all other applicable state or federal permits be obtained before commencement of the permitted development, including, but not limited to, the following:

(a) The South Florida Water Management District; F.S. § 373.036.

(b) Florida Department of Health for onsite sewage treatment and disposal systems; section 381.0065, F.S. and Chapter 64E-6, F.A.C.

(c) Florida Department of Environmental Protection for activities subject to the Joint Coastal Permit; F.S. § 161.055.

(d) Florida Department of Environmental Protection for activities that affect wetlands and alter surface water flows, in conjunction with the U.S. Army Corps of Engineers; Section 404 of the Clean Water Act.

(e) For properties identified by the U.S. Wildlife Service on FEMA's species focus area maps and/or RE list as potentially containing suitable habitat for specific endangered species, the U.S. Wildlife Service shall first render its approval and/or conditions.

(f) Federal permits and approvals.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 16-07, § 2, 5-17-2016; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-127. Site plans and construction documents.

1) *Information for development in flood hazard areas.* The site plan or construction documents for any development subject to the requirements of this ordinance shall be drawn to scale and shall include, as applicable to the proposed development:

(a) Delineation of flood hazard areas and flood zone(s), base flood elevation(s), and ground elevations if necessary for review of the proposed development.

(b) Location of the proposed activity and proposed structures, and locations of existing buildings and structures; in coastal high hazard areas, new buildings shall be located landward of the reach of mean high tide.

(c) Location, extent, amount, and proposed final grades of any filling, grading, or excavation.

(d) Where the placement of fill is proposed, the amount, type, and source of fill material; compaction specifications; a description of the intended purpose of the fill areas; and evidence that the proposed fill areas are the minimum necessary to achieve the intended purpose.

(e) Extent of any proposed alteration of sand dunes or mangrove stands, provided such alteration is approved by the Florida Department of Environmental Protection.

The floodplain administrator is authorized to waive the submission of site plans, construction documents, and other data that are required by this ordinance but that are not required to be prepared by a registered design professional if it is found that the nature of the proposed development is such that the review of such submissions is not necessary to ascertain compliance with this ordinance.

2) *Additional analyses and certifications.* As applicable to the location and nature of the proposed development activity, and in addition to the requirements of this section, the applicant shall have the following analyses signed and sealed by a Florida-licensed engineer for submission with the site plan and construction documents:

(a) For activities that propose to alter sand dunes or mangrove stands in coastal high hazard areas (Zone V), an engineering analysis that demonstrates that the proposed alteration will not increase the potential for flood damage.

3) *Submission of additional data.* When additional hydrologic, hydraulic or other engineering data, studies, and additional analyses are submitted to support an application, the applicant has the right to seek a letter of map change from FEMA to change the base flood elevations, or change boundaries of flood hazard areas shown on FIRMs, and to submit such data to FEMA for such purposes. The analyses shall be prepared by a Florida-licensed engineer in a format required by FEMA. Submittal requirements and processing fees shall be the responsibility of the applicant.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-128. Inspections.

1) *General.* Development for which a floodplain development permit or approval is required shall be subject to inspection.

(a) *Development other than buildings and structures.* The floodplain administrator shall inspect all development to determine compliance with the requirements of this ordinance and the conditions of issued floodplain development permits or approvals.

(b) *Buildings, structures and facilities exempt from the Florida Building Code.* The floodplain administrator shall inspect buildings, structures and facilities exempt from the Florida Building Code to determine compliance with the requirements of this ordinance and the conditions of issued floodplain development permits or approvals.

1. *Buildings, structures and facilities exempt from the Florida Building Code, lowest floor inspection.* Upon placement of the lowest floor, including basement, and prior to further vertical construction, the owner of a building, structure or facility exempt from the Florida Building Code, or the owner's authorized agent, shall submit to the floodplain administrator the certification of elevation of the lowest floor prepared and sealed by a Florida-licensed professional surveyor.

(c) *Buildings, structures and facilities exempt from the Florida Building Code, final inspection.* As part of the final inspection, the owner or owner's authorized agent shall submit to the floodplain administrator a final certification of elevation of the lowest floor or final documentation of the height of the lowest floor above the highest adjacent grade; such certifications and documentations shall be prepared as specified in section 34-128(1)(b)1 of this ordinance.

(d) *Manufactured homes.* The floodplain administrator shall inspect manufactured homes that are installed or replaced in flood hazard areas to determine compliance with the requirements of this ordinance and the conditions of the issued permit. Upon placement

of a manufactured home, certification of the elevation of the bottom of frame shall be submitted to the floodplain administrator.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-129. Variances and appeals.

1) *General.* The planning board shall hear and decide on requests for variances from the strict application of this ordinance. Pursuant to F.S. § 553.73(5), the planning board shall hear and decide on requests for *variances* from the strict application of the flood resistant construction requirements of the Florida Building Code. This section does not apply to Section 3109 of the Florida Building Code, Building.

2) *Appeals.* The city commission shall hear and decide appeals when it is alleged there is an error in any requirement, decision, or determination made by the floodplain administrator in the administration and enforcement of this ordinance. Any person aggrieved by the decision of the city commission may appeal such decision to the circuit court, as provided by Florida Statutes.

3) *Limitations on authority to grant variances.* The planning board shall base its decisions on variances on technical justifications submitted by applicants, the considerations for issuance in section 34-129(6) of this ordinance, the conditions of issuance set forth in section 34-129(7) of this ordinance, and the comments and recommendations of the floodplain administrator and the building official. The planning board has the right to attach such conditions as it deems necessary to further the purposes and objectives of this ordinance.

4) *Historic buildings.* For structures listed on the city historic preservation survey, exemption variance from the flood-resistant construction/elevation requirements is authorized for the repair, improvement, or rehabilitation of a historic building that is determined eligible for exception under the Florida Building Code, Existing Building, Chapter 12 Historic Buildings, subject to the following conditions:

    (a) The proposed repair, improvement, addition, development or rehabilitation will not preclude the building's continued designation as a historic building and the work is the minimum necessary to preserve the historic character and design of the building, and

    (b) Machinery, power distribution panels and other equipment subject to damage from floodwaters shall be elevated at or above the base flood elevation, except that,

        1. Pursuant to the historic architectural review commission's guidelines, the commission or its staff may exempt such equipment or machinery from compliance with subsection (b) above, when it is determined that compliance with that elevation requirement conflicts with the intent of preserving a structure's historic fabric and/or character.

5) *Functionally dependent uses.* A variance is authorized to be issued for the construction or substantial improvement necessary for the conduct of a functionally dependent use, as defined in this ordinance, is the minimum necessary deviation from the requirements of this ordinance, considering the flood hazard, and all due consideration has been given to use of methods and materials that minimize flood damage during occurrence of the base flood.

6) *Considerations for issuance of variance.* In reviewing requests for variances, the planning board shall consider all technical evaluations, all relevant factors, all other applicable provisions of the Florida Building Code, this ordinance, and the following:

   (a) The danger that materials and debris may be swept onto other lands resulting in further injury or damage;

   (b) The danger to life and property due to flooding or erosion damage;

   (c) The susceptibility of the proposed development, including contents, to flood damage and the effect of such damage on current and future owners;

   (d) The importance of the services provided by the proposed development to the community;

   (e) The availability of alternate locations for the proposed development that are subject to lower risk of flooding or erosion;

   (f) The compatibility of the proposed development with existing and anticipated development;

   (g) The relationship of the proposed development to the comprehensive plan and floodplain management program for the area;

   (h) The safety of access to the property in times of flooding for ordinary and emergency vehicles;

   (i) The expected heights, velocity, duration, rate of rise and debris and sediment transport of the floodwaters and the effects of wave action, if applicable, expected at the site; and

   (j) The costs of providing governmental services during and after flood conditions including maintenance and repair of public utilities and facilities such as sewer, gas, electrical and water systems, streets and bridges.

7) *Conditions for issuance of variances.* Variances shall be issued only upon:

   (a) Submission by the applicant, of a showing of good and sufficient cause that the unique characteristics of the size, configuration, or topography of the site limit compliance with any provision of this ordinance or the required elevation standards;

(b) Determination by the planning board that:

1. Failure to grant the variance would result in exceptional hardship due to the physical characteristics of the land that render the lot undevelopable; increased costs to satisfy the requirements or inconvenience do not constitute hardship;

2. The granting of a variance will not result in increased flood heights, additional threats to public safety, extraordinary public expense, nor create nuisances, cause fraud on or victimization of the public or conflict with existing local laws and ordinances; and

3. The variance is the minimum necessary deviation from the requirements of this ordinance, considering the flood hazard, to afford relief;

(c) Receipt of a signed statement by the applicant that the variance, if granted, shall be recorded in the office of the clerk of the court in such a manner that it appears in the chain of title of the affected parcel of land; and

(d) If the request is for a variance to allow construction of the lowest floor of a new building, or substantial improvement of a building, below the required elevation, a copy in the record of a written notice from the floodplain administrator to the applicant for the variance, specifying the difference between the base flood elevation and the proposed elevation of the lowest floor, stating that the cost of federal flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation (up to amounts as high as $25.00 for $100.00 of insurance coverage), and stating that construction below the base flood elevation increases risks to life and property.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-130. Violations.

1) *Violations.* Any development that is not within the scope of the Florida Building Code but that is regulated by this ordinance that is performed without an issued permit, that is in conflict with an issued permit, or that does not fully comply with this ordinance, shall be deemed a violation of this ordinance. A building or structure without the documentation of elevation of the lowest floor, other *required* design certifications, or other evidence of compliance required by this ordinance or the Florida Building Code is presumed to be a violation until such time as that documentation is provided.

2) *Authority.* For development that is not within the scope of the Florida Building Code but that is regulated by this ordinance and that is determined to be a violation, the floodplain administrator is authorized to serve notices of violation or stop work orders to owners of the property involved, to the owner's agent, or to the person or persons performing the work.

3) *Unlawful continuance.* Any person who shall continue any work after having been served with a notice of violation or a stop work order, except such work as that person is directed to perform to remove or remedy a violation or unsafe condition, shall be subject to penalties as prescribed by law.

(Ord. No. 13-05, § 2, 3-19-2013)

Sec. 34-131. Definitions, general.

1) *Scope.* Unless otherwise expressly stated, the following words and terms shall, for the purposes of this ordinance, have the meanings shown in this section.

2) *Terms defined in the Florida Building Code.* Where terms are not defined in this ordinance and are defined in the Florida Building Code, such terms shall have the meanings ascribed to them in that code.

3) *Terms not defined.* Where terms are not defined in this ordinance or the Florida Building Code, such terms shall have ordinarily accepted meanings such as the context implies.

(Ord. No. 13-05, § 2, 3-19-2013)

Sec. 34-132. Definitions, specific.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section:

Accessory structure. For the purposes of this ordinance, a structure used only for parking and storage on the same parcel of property as a principal structure and the use of which is incidental to the use of the principal structure and used only for parking and storage.

Appeal. A request for a review of the floodplain administrator's interpretation of any provision of this ordinance.

ASCE 24. A standard titled "Flood Resistant Design and Construction" that is referenced by the Florida Building Code. ASCE 24 is developed and published by the American Society of Civil Engineers, Reston, VA.

Base flood. A flood having a one-percent chance of being equaled or exceeded in any given year. [Also defined in FBC, B, Section 1612.2.] The base flood is commonly referred to as the "100-year flood" or the "one-percent-annual chance flood."

Base flood elevation. The elevation of the base flood, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the flood insurance rate map (FIRM). [Also defined in FBC, B, Section 1612.2.]

Basement. The portion of a building having its floor subgrade (below ground level) on all sides. [Also defined in FBC, B, Section 1612.2.]

Building. (See structure)

Coastal A Zone. Area within a special flood hazard area, landward of a V zone or landward of an open coast without mapped coastal high hazard areas. In a coastal A zone, the principal source of flooding must be astronomical tides, storm surges, seiches or tsunamis, not riverine flooding. During the base flood conditions, the potential for breaking wave height shall be greater than or equal to 1 ½ feet (457 mm). The inland limit of the coastal A zone is (a) the Limit of Moderate Wave Action if delineated on a FIRM, or (b) designated by the authority having jurisdiction.

Coastal high hazard area. A special flood hazard area extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms or seismic sources. Coastal high hazard areas are also referred to as "high hazard areas subject to high velocity wave action" or "V Zones" and are designated on Flood Insurance Rate Maps (FIRM) as Zone V1-V30, VE, or V.

Declaration of Land Restriction (Nonconversion Agreement). A form provided by the Floodplain Administrator to be signed by the owner and recorded with the County Clerk, for the owner to agree not to convert or modify enclosures below elevated buildings or accessory structures, in any manner that is inconsistent with the terms of the building permit and these regulations, as applicable.

Design flood. The flood associated with the greater of the following two areas: [Also defined in FBC, B, Section 1612.2.]

1. Area with a floodplain subject to a one-percent or greater chance of flooding in any year; or

2. Area designated as a flood hazard area on the community's flood hazard map, or otherwise legally designated.

Design flood elevation. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where the depth number is not specified on the map, the depth number shall be taken as being equal to two feet. [Also defined in FBC, B, Section 1612.2.]

Development. Any man-made change to improved or unimproved real estate, including, but not limited to, buildings or other structures, tanks, temporary structures, temporary or permanent storage of equipment or materials, mining, dredging, filling, grading, paving, excavations, drilling operations or any other land disturbing activities.

Dry floodproofing. See floodproofing, dry.

Encroachment. The placement of fill, excavation, buildings, permanent structures or other development into a flood hazard area which may impede or alter the flow capacity of riverine flood hazard areas.

Existing building and existing structure. Any buildings and structures for which the "start of construction" commenced before August 5, 1974. [Also defined in FBC, B, Section 1612.2.]

Federal Emergency Management Agency (FEMA). The federal agency that, in addition to carrying out other functions, administers the National Flood Insurance Program.

Flood or *flooding.* A general and temporary condition of partial or complete inundation of normally dry land from: [Also defined in FBC, B, Section 1612.2.]

1. The overflow of inland or tidal waters.
2. The unusual and rapid accumulation or runoff of surface waters from any source.

Flood damage-resistant materials. Any construction material capable of withstanding direct and prolonged contact with floodwaters without sustaining any damage that requires more than cosmetic repair. [Also defined in FBC, B, Section 1612.2.]

Flood hazard area. The greater of the following two areas: [Also defined in FBC, B, Section 1612.2.]

1. The area within a floodplain subject to a one-percent or greater chance of flooding in any year.
2. The area designated as a flood hazard area on the community's flood hazard map, or otherwise legally designated.

Flood insurance rate map (FIRM). The official map of the community on which the Federal Emergency Management Agency has delineated both special flood hazard areas and the risk premium zones applicable to the community. [Also defined in FBC, B, Section 1612.2.]

Flood insurance study (FIS). The official report provided by the Federal Emergency Management Agency that contains the flood insurance rate map, the flood boundary and floodway map (if applicable), the water surface elevations of the base flood, and supporting technical data. [Also defined in FBC, B, Section 1612.2.]

Floodplain administrator. The office or position designated and charged with the administration and enforcement of this ordinance (may be referred to as the floodplain manager).

Floodplain development permit or approval. An official document or certificate issued by the community, or other evidence of approval or concurrence, which authorizes performance of specific development activities that are located in flood hazard areas and that are determined to be compliant with this ordinance.

Floodproofing. Any combination of structural and non-structural additions, changes, or adjustments to structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents.

Floodproofing, Dry. Floodproofing method used to render a structure envelope substantially impermeable to the entrance of floodwater, outside of type "V" flood zones.

Floodproofing, Wet. The permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding by allowing flood waters to enter the structure.

Flood damage resistant materials. Any construction material capable of withstanding direct and prolonged contact with floodwaters, without sustaining any damage that requires more than cosmetic repair.

Florida Building Code. The family of codes adopted by the Florida Building Commission, including: Florida Building Code, Building; Florida Building Code, Residential; Florida Building Code, Existing Building; Florida Building Code, Mechanical; Florida Building Code, Plumbing; Florida Building Code, Fuel Gas.

Functionally dependent use. A use which cannot perform its intended purpose unless it is located or carried out in close proximity to water, including only docking facilities, port facilities that are necessary for the loading and unloading of cargo or passengers, and ship building and ship repair facilities; the term does not include long-term storage or related manufacturing facilities.

Highest adjacent grade. The highest natural elevation of the ground surface prior to construction next to the proposed walls or foundation of a structure.

Historic structure. Any structure that is determined eligible for the exception to the flood hazard area requirements of the Florida Building Code, Existing Building, Chapter 12 Historic Buildings.

Letter of map change (LOMC). An official determination issued by FEMA that amends or revises an effective flood insurance rate map or flood insurance study. Letter of map change include:

1. *Letter of map amendment (LOMA):* An amendment based on technical data showing that a property was incorrectly included in a designated special flood hazard area. A LOMA amends the current effective flood insurance rate map and establishes that a specific property, portion of a property, or structure is not located in a special flood hazard area.

2. *Letter of map revision (LOMR):* A revision based on technical data that may show changes to flood zones, flood elevations, special flood hazard area boundaries and floodway delineations, and other planimetric features.

3. *Letter of map revision based on fill (LOMR-F):* A determination that a structure or parcel of land has been elevated by fill above the base flood elevation and is, therefore, no longer located within the special flood hazard area. In order to qualify for this

determination, the fill must have been permitted and placed in accordance with the community's floodplain management regulations.

4. *Conditional letter of map revision (CLOMR):* A formal review and comment as to whether a proposed flood protection project or other project complies with the minimum NFIP requirements for such projects with respect to delineation of special flood hazard areas. A CLOMR does not revise the effective flood insurance rate map or flood insurance study; upon submission and approval of certified as-built documentation, a letter of map revision may be issued by FEMA to revise the effective FIRM.

Light-duty truck. As defined in 40 C.F.R. 86.082-2, any motor vehicle rated at 8,500 pounds gross vehicular weight rating or less which has a vehicular curb weight of 6,000 pounds or less and which has a basic vehicle frontal area of 45 square feet or less, which is:

1. Designed primarily for purposes of transportation of property or is a derivation of such a vehicle; or

2. Designed primarily for transportation of persons and has a capacity of more than 12 persons; or

3. Available with special features enabling off-street or off-highway operation and use.

Limit of Moderate Wave Action. Line shown on FIRMs to indicate the inland limit of the 1 ½-foot (457 mm) breaking wave height during the base flood.

Lowest floor. The lowest floor of the lowest enclosed area of a building or structure, including basement, but excluding any unfinished or flood-resistant enclosure, other than a basement, usable solely for vehicle parking, building access or limited storage provided that such enclosure is not built so as to render the structure in violation of the non-elevation requirements of the Florida Building Code or ASCE 24. [Also defined in FBC, B, Section 1612.2.]

Manufactured home. A structure, transportable in one or more sections, which is eight feet or more in width and greater than 400 square feet, and which is built on a permanent, integral chassis and is designed for use with or without a permanent foundation when attached to the required utilities. The term "manufactured home" does not include a "recreational vehicle" or "park trailer." [Also defined in 15C-1.0101, F.A.C.]

Manufactured home park or subdivision. A parcel (or contiguous parcels) of land divided into two or more manufactured home lots for rent or sale.

Market value. The value of buildings and structures, excluding the land and other improvements on the parcel. Market value is the actual cash value (like-kind replacement cost depreciated for age, wear and tear, neglect, and quality of construction) determined by a qualified independent appraiser, or tax assessment value adjusted to approximate market value by a factor provided by the county property appraiser.

New construction. For the purposes of administration of this ordinance and the flood-resistant construction requirements of the Florida Building Code, structures for which the "start of construction" commenced on or after August 5, 1974 (or date as may subsequently be modified by FEMA) and includes any subsequent improvements to such structures.

Park trailer. A transportable unit which has a body width not exceeding 14 feet and which is built on a single chassis and is designed to provide seasonal or temporary living quarters when connected to utilities necessary for operation of installed fixtures and appliances. [Defined in F.S. § 320.01]

Recreational vehicle. A vehicle, including a park trailer, which is: [See F.S. § 320.01)

1. Built on a single chassis;
2. Four hundred square feet or less when measured at the largest horizontal projection;
3. Designed to be self-propelled or permanently towable by a light-duty truck; and
4. Designed primarily not for use as a permanent dwelling but as temporary living quarters for recreational, camping, travel, or seasonal use.

Sand dunes. Naturally occurring accumulations of sand in ridges or mounds landward of the beach.

Special flood hazard area (SFHA). Land in the floodplain subject to a 1% or greater chance of flooding in any given year; area delineated on the Flood Insurance Rate Map as Zone A, AE, A1-30, A99, AR, AO, AH, Coastal A, V, VO, VE, or V1-30.

Start of construction. The date of issuance for new construction and substantial improvements to existing structures, provided the actual start of construction, repair, reconstruction, rehabilitation, addition, placement, or other improvement is within 180 days of the date of the issuance. The actual start of construction means either the first placement of permanent construction of a building (including a manufactured home) on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns.

Permanent construction does not include land preparation (such as clearing, grading, or filling), the installation of streets or walkways, excavation for a basement, footings, piers, or foundations, the erection of temporary forms or the installation of accessory buildings such as garages or sheds not occupied as dwelling units or not part of the main buildings. For a substantial improvement, the actual "start of construction" means the first alteration of any wall, ceiling, floor or other structural part of a building, whether or not that alteration affects the external dimensions of the building. [Also defined in FBC, B Section 1612.2.]

Structure. For floodplain management purposes:

1. A structure with two or more outside rigid walls and a fully secured roof, that is affixed to a permanent site; or

2. A manufactured home (a "manufactured home," also known as a mobile home, is a structure built on a permanent chassis, transported to its site in one or more sections, and affixed to a permanent foundation); or

3. A travel trailer without wheels, built on a chassis and affixed to a permanent foundation, that is regulated under the community's floodplain management and building ordinances or laws.

4. A gas or liquid storage tank.

Substantial damage. Damage of any origin sustained by a structure whereby the cost of restoring the structure to its before-damaged condition would equal or exceed 50 percent of the market value of the structure before the damage occurred. The term also includes flood-related damage sustained by a structure on two separate occasions during a ten-year period for which the cost of repairs at the time of each such flood event, on average, equals or exceeds 25 percent of the market value of the structure before the damage occurred, which is known as a "repetitive loss." Accumulated deterioration or decay contributes toward substantial damage.

Substantial improvement. Any combination of repair, reconstruction, rehabilitation, alteration, addition, or other improvement or alteration of a building or structure, taking place during a one-year period, the cumulative cost of which equals or exceeds 50 percent of the market value of the building or structure before the improvement or repair is started. For each building or structure, the one-year period begins on the date when a permit is closed. If the structure has incurred "substantial damage," any repairs are considered substantial improvement regardless of the actual repair work performed. Structures that have been moved, or structures that have new, replaced, or substantially modified foundations are considered to be substantially improved. The term does not, however, include either:

1. Any project for improvement of a building required to correct existing health, sanitary, or safety code violations identified and cited by a duly authorized city official and that are the minimum necessary to assure safe living conditions, if cited prior to a Building Permit Application.

2. Any alteration of a historic structure provided the alteration will not preclude the structure's continued designation as a historic structure and the alteration is approved by variance issued pursuant to section 34-129 of this ordinance, unless the building has been moved or the foundation replaced.

Variance. A grant of relief from the requirements of this ordinance, or the flood-resistant construction requirements of the Florida Building Code, which permits construction in a manner that would not otherwise be permitted by this ordinance or the Florida Building Code.

Wet floodproofing. See *floodproofing, wet*.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 16-07, § 3, 5-17-2016; Ord. No. 17-07, § 2, 8-15-2017; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-133. Flood-resistant development; buildings and structures.

1) *Design and construction of buildings, structures and facilities exempt from the Florida Building Code.* Pursuant to section 34-126(2)(a) of this ordinance, buildings, structures, and facilities that are exempt from the Florida Building Code, including substantial improvement or repair of substantial damage of such buildings, structures and facilities, shall be designed and constructed in accordance with the flood load and flood-resistant construction requirements of ASCE 24. Structures exempt from the Florida Building Code that are not walled and roofed buildings shall comply with the requirements of section 34-139 of this ordinance.

2) *Non-elevated accessory structures.* Non-elevated accessory structures are permitted below the base flood elevation provided the accessory structures are used only for parking or storage and:

    (a) If located in special flood hazard areas other than coastal high hazard areas, are one-story and not larger than 600 sq. ft. and have flood openings in accordance with Section R322.2 of the Florida Building Code, Residential.

    (b) If located in coastal high hazard areas (Zone V/VE), are not located below elevated buildings and are not larger than 100 sq. ft.

    (c) Are anchored to resist flotation, collapse or lateral movement resulting from flood loads.

    (d) Have flood damage-resistant materials used below the base flood elevation plus one (1) foot.

    (e) Have mechanical, plumbing and electrical systems, including plumbing fixtures, elevated to or above the base flood elevation plus one (1) foot.

    (f) A declaration of land restriction (nonconversion agreement) is submitted when accessory structures are larger than 100 sq. ft.

3) *Appliances.*

    (a) Appliances servicing a building, to be replaced or substantially repaired more than 50 percent of its salvage value, shall be installed at a minimum height of design flood elevation.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 16-07, § 4, 5-17-2016; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-134. Subdivisions.

1) *Minimum requirements.* Subdivision proposals, including proposals for manufactured home parks and subdivisions, shall be reviewed to determine that:

    (a) Such proposals are consistent with the need to minimize flood damage and will be reasonably safe from flooding;

(b) All public utilities and facilities such as sewer, gas, electric, communications, and water systems are located and constructed to minimize or eliminate flood damage; and

(c) Adequate drainage is provided to reduce exposure to flood hazards; in Zones AH and AO, adequate drainage paths shall be provided to guide floodwaters around and away from proposed buildings and structures.

2) *Subdivision plats.* Where any portion of proposed subdivisions, including manufactured home parks and subdivisions, lies within a flood hazard area, the following shall be required:

(a) Delineation of flood hazard areas and flood zones, and design flood elevations, as appropriate, shall be shown on preliminary plats and final plats; and

(b) Compliance with the site improvement and utilities requirements of section 34-135 of this ordinance.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-135. Site improvements, utilities and limitations.

1) (1) *Minimum requirements.* All proposed new development shall be reviewed to determine that:

(a) Such proposals are consistent with the need to minimize flood damage and will be reasonably safe from flooding;

(b) All public utilities and facilities such as sewer, gas, electric, communications, and water systems are located and constructed to minimize or eliminate flood damage; and

(c) Adequate drainage is provided to reduce exposure to flood hazards; in Zones AH and AO, adequate drainage paths shall be provided to guide floodwaters around and away from proposed buildings and structures.

2) *Sanitary sewage facilities.* All new and replacement sanitary sewage facilities, private sewage treatment plants (including all pumping stations and collector systems), and on-site waste disposal systems shall be designed in accordance with the standards for onsite sewage treatment and disposal systems in Chapter 64E-6, F.A.C. and ASCE 24 Chapter 7 to minimize or eliminate infiltration of floodwaters into the facilities and discharge from the facilities into floodwaters, and impairment of the facilities and systems.

3) *Water supply facilities.* All new and replacement water supply facilities shall be designed in accordance with the water well construction standards in Chapter 62-532.500, F.A.C. and ASCE 24 Chapter 7 to minimize or eliminate infiltration of floodwaters into the systems.

4) [Reserved.]

5) *Limitations on placement of fill.* Subject to the limitations of this ordinance, fill shall be designed to be stable under conditions of flooding including rapid rise and rapid drawdown of floodwaters, prolonged inundation, and protection against flood-related erosion and scour. In addition to these requirements, if intended to support buildings and structures (Zone A only), fill shall comply with the requirements of the Florida Building Code.

6) *Limitations on sites in coastal high hazard areas (Zone V).* In coastal high hazard areas, alteration of sand dunes and mangrove stands shall be permitted only if such alteration is approved by the Florida Department of Environmental Protection and only if the engineering analysis required by section 34-127(3)(b) of this ordinance demonstrates that the proposed alteration will not increase the potential for flood damage. Construction or restoration of dunes under or around elevated buildings and structures shall comply with section 34-139(8)(c) of this ordinance.

(Ord. No. 13-05, § 2, 3-19-2013)

Sec. 34-136. Manufactured homes.

1) *General.* Manufactured homes are prohibited in coastal high hazard areas and coastal A zones. All manufactured homes installed in flood hazard areas shall be installed by an installer that is licensed pursuant to F.S. § 320.8249, and shall comply with the requirements of Chapter 15C-1, F.A.C. and the requirements of this ordinance.

2) *Foundations.* All new manufactured homes and replacement manufactured homes installed in flood hazard areas shall be installed on permanent, reinforced foundations that are designed in accordance with the foundation requirements of the Florida Building Code, Residential Section R322.2 and this ordinance.

3) *Anchoring.* All new manufactured homes and replacement manufactured homes shall be installed using methods and practices which minimize flood damage and shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse or lateral movement. Methods of anchoring include, but are not limited to, use of over-the-top or frame ties to ground anchors. This anchoring requirement is in addition to applicable state and local anchoring requirements for wind resistance.

4) *Elevation.* All manufactured homes that are placed, replaced, moved, or substantially improved in flood hazard areas shall be elevated such that the bottom of the frame is at or above the base flood elevation plus one (1) foot.

5) *Enclosures.* Enclosed areas below elevated manufactured homes shall comply with the requirements of the Florida Building Code, Residential Section R322 for such enclosed areas, as applicable to the flood hazard area.

6) *Utility equipment.* Utility equipment that serves manufactured homes, including electric, heating, ventilation, plumbing, and air conditioning equipment and other service facilities, shall comply

with the requirements of the Florida Building Code, Residential Section R322, as applicable to the flood hazard area.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-137. Recreational vehicles and park trailers.

1) *Temporary placement.* Recreational vehicles and park trailers placed temporarily in flood hazard areas shall:

   (a) Be on the site for fewer than 180 consecutive days; or

   (b) Be fully licensed and ready for highway use, which means the recreational vehicle or park model is on wheels or jacking system, is attached to the site only by quick-disconnect type utilities and security devices, and has no permanent attachments such as additions, rooms, stairs, decks and porches.

2) *Permanent placement.* Recreational vehicles and park trailers that do not meet the limitations in section 34-137(1) of this ordinance for temporary placement shall meet the requirements of section 34-136 of this ordinance for manufactured homes.

(Ord. No. 13-05, 2, 3-19-2013; Ord. No. 23-28, § 1, 9-14-2023)

Sec. 34-138. Tanks.

1) *Underground tanks.* Underground tanks in flood hazard areas shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrodynamic and hydrostatic loads during conditions of the design flood, including the effects of buoyancy assuming the tank is empty.

2) *Above-ground tanks, not elevated.* Above-ground tanks that do not meet the elevation requirements of section 34-138(3) of this ordinance shall:

   (a) Be permitted in flood hazard areas (Zone A) other than coastal high hazard areas, provided the tanks are anchored or otherwise designed and constructed to prevent flotation, collapse or lateral movement resulting from hydrodynamic and hydrostatic loads during conditions of the design flood, including the effects of buoyancy assuming the tank is empty and the effects of flood-borne debris.

   (b) Not be permitted in coastal high hazard areas (Zone V).

3) *Above-ground tanks, elevated.* Above-ground tanks in flood hazard areas shall be attached to and elevated to or above the design flood elevation on a supporting structure that is designed to prevent flotation, collapse or lateral movement during conditions of the design flood. Tank-supporting structures shall meet the foundation requirements of the applicable flood hazard area.

4) *Tank inlets and vents.* Tank inlets, fill openings, outlets and vents shall be:

(a) At or above the design flood elevation or fitted with covers designed to prevent the inflow of floodwater or outflow of the contents of the tanks during conditions of the design flood; and

(b) Anchored to prevent lateral movement resulting from hydrodynamic and hydrostatic loads, including the effects of buoyancy, during conditions of the design flood.

(Ord. No. 13-05, § 2, 3-19-2013)

Sec. 34-139. Other development.

1) *General requirements for other development.* All development, including man-made changes to improved or unimproved real estate for which specific provisions are not specified in this ordinance or the Florida Building Code, shall:

(a) Be located and constructed to minimize flood damage;

(b) Be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic loads, including the effects of buoyancy, during conditions of the design flood;

(c) Be constructed of flood damage-resistant materials; and

(d) Have mechanical, plumbing, and electrical systems above the design flood elevation, except that minimum electric service required to address life safety and electric code requirements is permitted below the design flood elevation provided it conforms to the provisions of the electrical part of building code for wet locations.

2) *Elevators.* Elevators located within flood hazard areas shall have a default cab return to any floor at or above the design flood elevation.

3) Reserved.

4) Reserved.

5) *Concrete slabs used as parking pads, enclosure floors, landings, decks, walkways, patios and similar nonstructural uses in coastal high hazard areas (Zone V).* In coastal high hazard areas, concrete slabs used as parking pads, enclosure floors, landings, decks, walkways, patios and similar nonstructural uses are permitted beneath or adjacent to buildings and structures provided the concrete slabs are designed and constructed to be:

(a) Structurally independent of the foundation system of the building or structure;

(b) Frangible and not reinforced, so as to minimize debris during flooding that is capable of causing significant damage to any structure; and

(c) Have a maximum slab thickness of not more than four inches.

6) *Decks and patios in coastal high hazard areas (Zone V).* In addition to the requirements of the Florida Building Code, in coastal high hazard areas decks and patios shall be located, designed, and constructed in compliance with the following:

   (a) A deck that is structurally attached to a building or structure shall have the bottom of the lowest horizontal structural member at or above the design flood elevation and any supporting members that extend below the design flood elevation shall comply with the foundation requirements that apply to the building or structure, which shall be designed to accommodate any increased loads resulting from the attached deck.

   (b) A deck or patio that is located below the design flood elevation shall be structurally independent from buildings or structures and their foundation systems, and shall be designed and constructed either to remain intact and in place during design flood conditions or to break apart into small pieces to minimize debris during flooding that is capable of causing structural damage to the building or structure or to adjacent buildings and structures.

   (c) A deck or patio that has a vertical thickness of more than 12 inches or that is constructed with more than the minimum amount of fill necessary for site drainage shall not be approved unless an analysis prepared by a qualified registered design professional demonstrates no harmful diversion of floodwaters or wave runup and wave reflection that would increase damage to adjacent buildings and structures.

   (d) A deck or patio that has a vertical thickness of 12 inches or less and that is at natural grade or on nonstructural fill material that is similar to and compatible with local soils and is the minimum amount necessary for site drainage may be approved without requiring analysis of the impact on diversion of floodwaters or wave runup and wave reflection.

7) *Other development in coastal high hazard areas (Zone V).* In coastal high hazard areas, development activities other than buildings and structures shall be permitted only if also authorized by the appropriate federal, state or local authority; if located outside the footprint of, and not structurally attached to, buildings and structures; and if analyses prepared by qualified registered design professionals demonstrate no harmful diversion of floodwaters or wave runup and wave reflection that would increase damage to adjacent buildings and structures. Such other development activities include, but are not limited to:

   (a) Bulkheads, seawalls, retaining walls, revetments, and similar erosion control structures;

   (b) Solid fences and privacy walls, and fences prone to trapping debris, unless designed and constructed to fail under flood conditions less than the design flood or otherwise function to avoid obstruction of floodwaters; and

   (c) On-site sewage treatment and disposal systems defined in 64E-6.002, F.A.C., as filled systems or mound systems.

8) Nonstructural fill in coastal high hazard areas (Zone V). In coastal high hazard areas:

(a) Minor grading and the placement of minor quantities of nonstructural fill shall be permitted for landscaping and for drainage purposes under and around buildings.

(b) Nonstructural fill with finished slopes that are steeper than one unit vertical to five units horizontal shall be permitted only if an analysis prepared by a qualified registered design professional demonstrates no harmful diversion of floodwaters or wave runup and wave reflection that would increase damage to adjacent buildings and structures.

(c) Where authorized by the Florida Department of Environmental Protection or applicable local approval, sand dune construction and restoration of sand dunes under or around elevated buildings are permitted without additional engineering analysis or certification of the diversion of floodwater or wave runup and wave reflection if the scale and location of the dune work is consistent with local beach-dune morphology and the vertical clearance is maintained between the top of the sand dune and the lowest horizontal structural member of the building.

(Ord. No. 13-05, § 2, 3-19-2013; Ord. No. 16-07, § 5, 5-17-2016; Ord. No. 23-28, § 1, 9-14-2023)

VI. Appendix B: Stormwater Utility Ordinance

ARTICLE V. STORMWATER UTILITY SYSTEM

Sec. 74-361. Definitions.

For the purpose of this article, the following definitions shall apply. The word "shall" is mandatory and not discretionary. The word "may" is permissive. Words not defined herein shall be construed to have the meaning given by common and ordinary use as defined in the latest edition of Webster's Dictionary.

Annual rate resolution means the resolution approving a stormwater assessment roll for a specific fiscal year.

Assessed property means all parcels of real property included on the stormwater assessment roll that receive a special benefit from the stormwater improvements and stormwater management services identified in an annual rate resolution.

Authorized Enforcement Agency means employees or designees of the City Manager designated to enforce this ordinance.

Best Management Practices (BMPs) means methods that are the most effective means of preventing or reducing pollution from non-point sources, such as pollutants carried by runoff. BMPs can be structural (e.g., baffle boxes, oil and water separator, silt fences, hay-bales) or non-structural (education, maintenance).

Bonds means revenue bonds, notes, loans or any other debt obligations issued or incurred to finance the costs of construction.

Clean Water Act. The Federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Construction activity means any manmade change to improved or unimproved real estate, including, but not limited to, buildings or other structures, clearing, filling, grading, paving, excavation or operations altering natural or historic drainage, and other site preparation on a parcel of land.

Costs of construction means costs reasonably incurred in connection with providing capital improvements to the system or any portion thereof, including but not limited to, the costs of:

(1) Acquisition of all property, real or personal, and all interests in connection therewith including all rights-of-way and easements therefor;

(2) Physical construction, installation and testing, including the costs of labor, services, materials, supplies and utility services used in connection therewith;

(3) Architectural, engineering, legal and other professional services;

(4) Insurance premiums taken out and maintained during construction, to the extent not paid for by a contractor for construction and installation;

(5) Any taxes or other charges which become due during construction;

(6) Expenses incurred by the city or on its behalf with its approval in seeking to enforce any remedy against any contractor or subcontractor in respect of any default under a contract relating to construction;

(7) Principal of and interest of any bonds; and

(8) Miscellaneous expenses incidental thereto.

Comprehensive plan means the comprehensive plan adopted by the city pursuant to Chapter 163, Part II, Florida Statutes.

Debt service means, with respect to any particular fiscal year and any particular series of bonds, an amount equal to the sum of:

(1) All interest payable on such bonds during such fiscal year, plus;

(2) Any principal installments of such bonds during such fiscal year.

Developed property means real property other than undisturbed property.

Dwelling unit means a single unit or apartment providing complete, independent living facilities for one or more persons including permanent provisions for living, sleeping, eating, cooking and sanitation.

Equivalent stormwater unit and *ESU* mean the average impervious area of residentially developed property per dwelling unit located within the city and as established by city commission resolution as provided in this article.

ESU rate means a fee charged on each ESU as established by city commission resolution or ordinance as provided in this article.

Exempt property means public rights-of-way, public streets, public alleys and public sidewalks, public parks, undisturbed property, conservation areas and easements; any property on which is retained 100 percent of the total volume of runoff within the property (measured on the basis of a 72-hour, 100-year storm event); any property which does not contribute any storm water runoff to the city's stormwater management systems (as determined by the city manager's designee and/or the process set forth in section 74-365(f)(3)), and any property owned by the U.S. Navy which by agreement with the city is deemed exempt.

Extension and replacement means costs of extensions, additions and capital improvements to, or the renewal and replacement of capital assets of, or purchasing and installing new equipment for, the

system, or land acquisition for the system and any related costs thereto, or paying extraordinary maintenance and repair, including the costs of construction, or any other expenses that are not costs of operation and maintenance or debt service.

Final assessment resolution means the resolution which shall confirm, modify or repeal the initial assessment resolution and which shall be the final proceeding for the imposition of the initial stormwater assessment.

Fiscal year means a 12-month period commencing on October 1 of any year, or such other 12-month period adopted as the fiscal year of the city.

Hazardous Materials. Any material, including any substance, waste, or combination thereof, which because of its quality, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal discharge means any direct or indirect non-stormwater discharge to the storm drain system, except as exempted in Sec. 74-32, discharges to natural outlets; or any discharge that causes or tends to cause water pollution.

Illicit connection means either of the following:

(1) Any surface, or subsurface, drain or conveyance which allows an illegal discharge to enter the storm drain system, including, but not limited to, any conveyances which allow any non-stormwater discharge including sewage, wastewater, and wash water to enter the storm drain system and any connections to the storm drain system from indoor drains and sinks, notwithstanding whether said drain or connection has been previously allowed, permitted, or approved by an authorized agency; or

(2) Any drain or conveyance connected from a commercial or industrial land use to the storm drain system which has not been documented in plans, maps, or equivalent records and approved by an authorized agency.

Impervious area means the number of square feet of surface area that either prevents or retards the entry of water into soil as water would otherwise enter it under natural conditions if the surface were undisturbed property; and/or causes water to run off the surface in greater quantities or at an increased rate of flow from that present under natural conditions on undisturbed property. Impervious area includes, but is not limited to, structures, roofs, roof extensions, patios, porches, driveways, parking areas, sidewalks, pavement and athletic courts.

Industrial activity means activities subject to NPDES Industrial Permits, as defined in 40 CFR, Section 122.26(b)(14).

Initial assessment resolution means the resolution which shall be the initial proceeding for the imposition of the stormwater assessment.

Municipal Separate Storm Sewer (MS4) means a conveyance or system of conveyances like roads with stormwater systems, municipal streets, catch basins, curbs, gutters, constructed channels or storm drains, as defined in Rule 62-624.200, Florida Administrative Code.

National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit means a permit or authorization to use the State of Florida Generic Permit, issued by the Florida Department of Environmental Protection to allow discharge of stormwater from a Municipal Separate Stormwater System (MS4); or a permit or authorization to use the State of Florida Generic Permit, issued by the Florida Department of Environmental Protection that is applicable to an individual group.

Nonresidential developed property means developed property that is put to a commercial, governmental, philanthropic or other purpose that is not set forth under the definition of residential developed property.

Non-stormwater discharge means any discharge to the storm drain system that is not comprised entirely of storm water.

Obligations mean a series of bonds or other evidence of indebtedness including but not limited to, notes, commercial paper, capital leases or any other obligations of the city issued or incurred to finance any portion of the capital cost of a stormwater improvement and secured, in whole or in part, by proceeds of the stormwater improvement assessments.

Operating budget means the annual system operating budget adopted by the city for the succeeding fiscal year.

Operations and maintenance means the current expenses, paid or accrued, of operation, maintenance and current repair of the system, as calculated in accordance with sound accounting practice, and includes, without limiting the generality of the foregoing, insurance premiums, administrative expenses, labor, executive compensation, the cost of materials and supplies used for current operations, and charges for the accumulation of appropriate operations, and charges for the accumulation of appropriate reserves for current expenses not annually incurred, but which are such as may reasonably be expected to be incurred in accordance with sound accounting practice.

Person means any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or as the owner's agent.

Pledged revenue means, as to any series of obligations:

A. The proceeds of such obligations, including investment earnings,

B. Proceeds of the stormwater improvement assessments pledged to secure the payment of such obligations, and

C. Any other legally available non-ad valorem revenue pledged to secure the payment of such obligations, as specified by the resolution authorizing such obligations.

Pollutant means anything which causes or contributes to pollution. Pollutants may include, but are not limited to, paints, varnishes, and solvents, oil and other automotive fluids; grease, oils and fats; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, and accumulations, so that same may cause or contribute to pollution, pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage and other biological waste, dissolved and particulate metals; animal wastes; waste and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

Premises means any building, lot, parcel of land, or portion of land whether improved or unimproved, including adjacent sidewalks and parking strips.

Property appraiser means the office of the county property appraiser.

Residential developed property means developed property that is used for dwelling, including, but not limited to, single-family, duplex, accessory residential, multifamily, manufactured housing, group homes, mobile homes, residential dwellings holding a transient rental license, residential properties where home occupations occur, and vacant residential dwelling units.

Revenues mean all rates, fees, assessments, rentals, or other charges or other income received in connection with the management and operation of the system, including amounts received from the investment or deposit of moneys in any fund or account and any amounts contributed by the city, all as calculated in accordance with sound accounting practice.

Runoff coefficients are those numbers approved by the city commission that are used to estimate the impervious area for each nonresidential developed property. A list of the coefficients used for Key West is attached hereto as Exhibit "A".

Editor's note(s)—Exhibit "A" referenced above is not set out at length herein, but is on file in the office of the city clerk.

Storm Drainage System means publicly-owned facilities by which storm water is collected and/or conveyed, including, but not limited to, any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage channels, reservoirs, and other drainage structures.

Storm Water (also stormwater) means any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation and resulting from such precipitation.

Stormwater assessment means either a stormwater improvement assessment, a stormwater service assessment, or both.

Stormwater assessment roll means the roll created that includes all parcels within the city and their assigned stormwater assessment relating to stormwater improvements or stormwater management services approved by a final assessment resolution or an annual rate resolution.

Stormwater basin means a part of the earth's surface that contributes stormwater runoff to a drainage system, which consists of diffuse surface waters, together with all natural or artificial tributary surface streams and/or bodies of impounded surface water.

Stormwater basin plan means a policy document that is adopted by the city commission for each stormwater basin or hydrologic subarea thereof in which stormwater improvements are proposed and that provides for implementation of the stormwater master plan.

Stormwater improvement means land, capital facilities and improvements acquired or provided to detain, retain, convey or treat stormwater.

Stormwater improvement assessment means a special assessment imposed by the city within a stormwater improvement area to fund the capital cost or the debt service and related cost of obligations issued to finance the project cost of a stormwater improvement.

Stormwater management system and system shall mean and include all natural and manmade elements used to convey stormwater from the first point of impact with the surface of the earth to a suitable receiving water body or location internal or external to the boundaries of the city. The stormwater management system includes all pipes, channels, streams, ditches, wetlands, sinkholes, detention/retention basins, ponds, and other stormwater conveyance and treatment facilities.

Stormwater Pollution Prevention Plan means a document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a site and the actions to eliminate or reduce pollutant discharges to stormwater, stormwater conveyance systems, and/or receiving waters to the maximum extent practicable.

Stormwater service area means the geographic area described in the initial assessment resolution that encompasses all parcels within the city which specially benefit from the stormwater management service and all parcels to which stormwater management services are provided.

Stormwater service assessment means a special assessment imposed by the city within the stormwater service area to fund the stormwater service cost.

Stormwater service cost means the estimated amount for any fiscal year of all expenditures and reasonable reserves that are properly attributable to the stormwater management service provided within the stormwater service area under generally accepted accounting principles, including, without limiting the generality of the foregoing, reimbursement to the city for any moneys advanced for the stormwater management service, and interest on any interfund or intrafund loan for such purpose.

Tax collector means the Monroe County Tax Collector.

Tax roll means the real property ad valorem tax assessment roll maintained by the property appraiser for the purpose of the levy and collection of ad valorem taxes.

Uniform Assessment Collection Act means F.S. §§ 197.3632 and 197.3635, or any successor statutes authorizing the collection of non-ad valorem assessments on the same bill as ad valorem taxes, and any applicable regulations promulgated thereunder.

Undisturbed property means real property that has not been altered from its natural state.

User fee means a user fee authorized by state law and this article which is established to pay operations and maintenance, extension and replacement and debt service.

Wastewater means any water or other liquid, other than uncontaminated storm water, discharged from a facility.

(Ord. No. 01-06, 6-5-2001; Ord. No. 02-16, § 1, 6-18-2002; Ord. No. 13-10, § 1, 6-18-2013; Ord. No. 20-11, § 1, 8-19-2020)

Sec. 74-362. Findings, determinations and powers.

(a) It is hereby found, determined, and declared that those elements of the system that provide for the collection, treatment, and disposal of stormwater and the regulation of groundwater are of benefit and provide services to all property within the incorporated city limits, including property not currently served by the storm elements of the system. The beneficiaries of the system include all real properties within the city that benefit by the provision, operation, and improvement of the system. Such benefits may include, but are not limited to, the provision of adequate systems of collection, conveyance, detention, treatment, and release of stormwater; the reduction of hazard to property and life resulting from stormwater runoff; improvement in general health and welfare through reduction of undesirable stormwater conditions; and improvement to the water quality in the stormwater and surface water system and its receiving waters.

(b) The city, under the direction of the director of utilities or other authorized city personnel, shall have the power to:

(1) Prepare regulations as needed to implement this article, and forward the regulations to the city commission for consideration and adoption, and adopt such procedures as are required to implement such regulations or carry out other responsibilities of the system;

(2) Administer the acquisition, design, construction, maintenance and operation of the system, including capital improvements designated in the comprehensive drainage plan;

(3) Administer and enforce this article and all regulations and procedures adopted relating to the alteration of the system including, but not limited to, the quantity, quality and/or velocity of the stormwater conveyed thereby;

(4) Inspect private systems as necessary to determine the compliance of such systems with this article and any regulations adopted under this article;

(5) Advise the city commission, city manager and other city departments on matters relating to the system;

(6) Prepare and revise a comprehensive drainage plan for adoption by the city commission periodically;

(7) Review plans, approve or deny, inspect, and accept extensions to the system;

(8) Establish and enforce regulations to protect and maintain water quality within the system in compliance with water quality standards established by state, regional and/or federal agencies as now adopted or hereafter amended; and

(9) Analyze the cost of services and benefits provided, and the system and structure of fees, charges, fines, and other revenues of the system annually.

(Ord. No. 01-06, § 2, 6-5-2001; Ord. No. 02-16, § 2, 6-18-2002)

Sec. 74-363. Creation of stormwater user fees.

Pursuant to Article VIII, Section 1 of the Florida Constitution, F.S. ch. 166, and the powers granted in the Charter of the city, there are hereby established stormwater user fees and accompanying regulations, whereby the city will be responsible for the operation, construction, maintenance and repair of stormwater facilities; for stormwater system planning; and for water quality management.

(Ord. No. 01-06, § 2, 6-5-2001; Ord. No. 02-16, § 3, 6-18-2002)

Sec. 74-364. Operating budget.

The city shall adopt an operating budget not later than the first day of each fiscal year. The operating budget shall set forth for such fiscal year the estimated revenues and the estimated costs for operations and maintenance, extension and replacement and debt service.

(Ord. No. 01-06, § 2, 6-5-2001)

Sec. 74-365. User fee.

(a) *Fee established.* Subject to the provisions of this article, there is hereby imposed on each and every residential developed property and nonresidential developed property, other than exempt property, and the owners thereof, a user fee. The user fee shall be an annual service charge.

(b) *User fee for residential developed property.* The user fee for residential developed property shall be the ESU rate multiplied by the number of individual dwelling units existing on the property.

(c) User fee for nonresidential developed property.

(1) The user fee for nonresidential developed property shall be the ESU rate multiplied by the numerical factor obtained by multiplying the gross area of a property by the runoff coefficient for

that property. The minimum user fee for any nonresidential developed property shall be equal to the charge for one ESU rate. In the event of newly developed nonresidential developed property, the charge for the user fee attributable to that development shall commence, or increase in the case of additional development to property that is already developed property, upon the issuance of the certificate of occupancy for such additional development, or in the event that no certificate of occupancy will be issued for that development, or in the event development has halted, then on the date that the city manager's designee determines, in his or her reasonable judgment, that the development is substantially complete or has been halted for at least three months.

(2) In the event of separately metered nonresidential developed property with joint users of common impervious areas, the city manager's designee shall calculate and allocate the pro rata user fee among the users. Any owner or non-owner user disagreeing with the city manager's designee's calculation or allocation may appeal such determination to the city manager's designee as provided in paragraph (e)(5) of this section.

(d) *Dwelling unit and impervious area calculation.*

(1) The city manager's designee shall initially, and from time to time, determine the number of dwelling units located on residential developed property in order to establish the user fee provided by subsection (b) of this section.

(2) Nonresidential developed property in the city shall have its gross square footage calculated in order to establish the user fee provided by subsection (c) of this section. The city manager's designee shall make the initial calculation and may from time to time change this calculation from such information and data deemed pertinent by the city manager's designee.

(e) *Appeal of dwelling unit and impervious area calculation.* Any person disagreeing with the calculation of the stormwater user charge, as provided in this section, may appeal such determination to the city manager's designee. Any appeal must be filed in writing and shall include a survey prepared by a registered surveyor or registered engineer showing dwelling units, total property area, impervious area or nonresidential developed property, as appropriate. The city manager's designee may request additional information from the appealing party. Based upon the information provided by the city and the appealing party, the city manager's designee shall make a final calculation of the user fee. The city manager's designee shall notify the parties, in writing, of the city manager's designee's decision. If still dissatisfied, a party may request, in writing, a review by the city manager of the city manager's designee's decision. Such request must cite specific error by the city manager's designee and provide the calculation that the party believes is correct. The city manager shall review the record presented and render a written decision. The city manager may request additional information from either party.

(f) *User fee adjustments and exempt property determinations.* After the city has determined a user fee based on impervious area calculations, residential and nonresidential developed property owners may be eligible for an exempt property determination or a user fee adjustment when certain criteria

are met. It is the property owner's responsibility to provide proof that conditions exist that may qualify a property for a particular adjustment or exempt property determination.

(1) Retention/detention fee adjustment. The city may allow adjustment of stormwater user fees for privately maintained retention and/or detention facilities upon an inspection and approval of such facilities by a certified engineer. French vertical drains are not acceptable stormwater facilities when determining fee adjustment eligibility. The rate of adjustment for privately maintained retention/detention facilities is based on the following:

a. Where stormwater management facilities are constructed and maintained, which collect and retain 100 percent of runoff on the property (measured on the basis of a 72-hour, 25-year storm event), the property owner shall receive a reduction of the user fee by 15 percent.

b. Where stormwater management facilities are constructed and maintained, which collect and retain 100 percent of runoff on the property (measured on the basis of a 72-hour, 50-year storm event), the property owner shall receive a reduction of the user fee by 25 percent.

The following conditions must be met in order for an eligible property owner to receive the user fee adjustment: The property owner must apply for the user fee adjustment in writing and provide proof of 100 percent runoff retention on the property by submitting hydraulic/hydrologic calculations and topographic maps signed and sealed by a certified engineer to the city manager's designee. The city manager's designee must agree that 100 percent of the property's runoff will not have an impact on city owned or maintained stormwater facilities. The property owner must enter into a maintenance agreement with the city for continued maintenance of private stormwater facilities.

(2) Senior citizen and permanently and totally disabled residential developed property user fee adjustment. The senior citizen and permanently and totally disabled residential user fee adjustment shall mean a 15 percent reduction in the user fee for a property which is the residence of a qualified senior citizen or other citizen who is totally and permanently disabled. Any subscriber who is 60 years of age or older by October 1 of the year in which the base charge adjustment is established, or who is totally and permanently disabled, and whose total annual income does not exceed the maximum social security benefit amount established each year shall be entitled to the reduction upon submission of such proof of age, disability, residency, and income as the city manager may reasonably require. Proof of age may be submitted anytime after the October 1 date at which time the fee adjustment will be made effective from that day forward.

(3) *Exempt property determinations.* The following conditions must be met in order for an eligible exempt property owner to receive an exempt property determination:

a. The property owner must apply for the exempt property determination in writing to the city manager's designee and provide proof that the property constitutes an exempt property as defined in section 74-361 of the Key West Code of Ordinances. The proof submitted by the property owner shall include, but shall not be limited to, survey data and engineering reports,

performed by either a registered professional land surveyor currently registered in the State of Florida or a professional engineer currently registered in the State of Florida where appropriate to support the request and as deemed necessary by the city manager's designee.

b. The city manager's designee will review the proof and information submitted by the property owner and make a determination as to whether the subject property constitutes an exempt property as defined in section 74-361 of the Key West Code of Ordinances. The determination of the city manager's designee shall be in writing. Any credit or refund of user fees resulting from the exempt property determination shall be retroactive to the date the application was complete, including submission of all required documentation but in no event shall exceed one year from the date of the determination.

c. In the event a property owner is not satisfied with the determination of the city manager's designee, the property owner may, within 30 days of the determination, appeal in writing to the city manager. Thereafter, the city manager will review any material submitted by the property owner or city manager's designee and within 30 days of receipt of the written appeal, issue a final written determination.

(Ord. No. 01-06, § 2, 6-5-2001; Ord. No. 02-16, § 5, 6-18-2002; Ord. No. 09-13, § 1, 6-2-2009; Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-366. Stormwater service assessments.

(A) The commission is hereby authorized to impose stormwater service assessments against property located within the stormwater service area. The stormwater service cost may be assessed against developed property located within the stormwater service area at a rate of assessment based upon the special benefit accruing to such property from the stormwater management service provided by the city, measured by the number of ESUs attributable to each parcel or classification of property.

(B) Notwithstanding the foregoing, if the commission specifically determines that any portion of the stormwater service area receives a distinct special benefit from any component of the stormwater management service that is materially different in kind or degree from the special benefit received by other portions of the stormwater service area, the stormwater service cost related to such component shall be assessed against the portion of the stormwater service area receiving the distinct special benefit.

(Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—Ord. No. 13-10, adopted June 18, 2013, repealed § 74-366, which pertained to collection of fee, and derived from Ord. No. 01-06, adopted June 5, 2001; and Ord. No. 02-16, adopted June 18, 2002. Said ordinance then enacted new provisions designated as § 74-366 as herein set out.

Sec. 74-367. Stormwater improvement assessments.

(A) The commission is hereby authorized to impose stormwater improvement assessments to fund all or any portion of the capital cost or the debt service and related cost of obligations issued to finance

the project cost of a stormwater improvement identified in any stormwater basin plan. Stormwater improvement assessments to fund the capital cost or the debt service and related cost of obligations issued to finance the project cost of each stormwater improvement may be imposed against all parcels of property within the stormwater improvement area at a rate of assessment based upon the special benefit accruing to such property from the stormwater improvement measured by the number of ESUs attributable to each parcel or classification of property.

{B) If stormwater improvement assessments are imposed to fund the debt service and related cost of obligations issued to finance the project cost of a stormwater improvement, the stormwater improvement assessment may include the amount required to fund any amounts withdrawn during the prior fiscal year from any debt service reserve account established for obligations and the amount of any principal of and interest on obligations that has become due and remains unpaid.

(Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—Ord. No. 13-10, adopted June 18, 2013, added provisions to be numbered 74-367—74-384, and renumbered §§ 74-367—74-369 as §§ 74-385—74-387, respectively.

Sec. 74-368. Initial assessment resolution.

The initial proceeding for imposition of the stormwater assessments shall be the commission's adoption of an initial assessment resolution. The initial assessment resolution shall:

(A) Describe the stormwater improvement or stormwater management service proposed for funding from the proceeds of the stormwater assessments and stormwater fees;

(B) Estimate the capital cost or stormwater service cost;

(C) Describe with particularity the proposed method of apportioning the capital cost or stormwater service cost among the parcels of property located within the stormwater improvement area or stormwater service area, as applicable, such that the owner of any parcel of property can objectively determine the amount of the stormwater assessments, based upon its value, use or physical characteristics; and

(D) Include specific legislative findings that recognize the equity provided by the apportionment methodology and specific legislative findings that recognize the special benefit provided by the stormwater improvement or stormwater management service. At its option, the commission may adopt separate initial assessment resolutions for the stormwater service assessment and each stormwater improvement assessment.

(Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—See editor's note following § 74-367.

Sec. 74-369. Stormwater assessment roll.

(A) The city manager shall prepare, or direct the preparation of, a preliminary stormwater assessment roll that contains the following information:

(1) A summary description of each parcel of property (conforming to the description contained on the tax roll) subject to the stormwater assessment;

(2) The name of the owner of record of each parcel as shown on the tax roll;

(3) The number of ESUs (or other units used to determine the amount of the stormwater assessment) attributable to each parcel;

(4) The estimated maximum stormwater assessment to become due in any fiscal year for each ESU or other units used to determine the amount of the stormwater assessment;

(5) The estimated maximum stormwater assessment to become due in any fiscal year for each parcel: and

(6) At the option of the commission, the stormwater assessment roll may also include the estimated maximum annual stormwater assessment to become due in any future fiscal year for each ESU (or other units used to determine the amount of the stormwater assessment) and each parcel.

(B) Copies of the initial assessment resolution and the preliminary stormwater assessment roll shall be on file in the office of the city manager and open to public inspection. The foregoing shall not be construed to require that the stormwater assessment roll be in printed form if the amount of the stormwater assessment for each parcel of property can be determined by use of a computer terminal available for use by the public.

(Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—See editor's note following § 74-367.

Sec. 74-370. Notice by publication.

After filing the stormwater assessment roll in the office of the city manager, as required by section 3.05 [section 74-369] hereof, the city manager shall publish once in a newspaper of general circulation within the city a notice stating that a public hearing of the commission will be held on a certain day and hour, not earlier than 20 calendar days from such publication, at which hearing the commission will receive written comments and hear testimony from all interested persons regarding adoption of the final assessment resolution and approval of the stormwater assessment roll. The published notice shall conform to the requirements set forth in the Uniform Assessment Collection Act for purposes of the stormwater assessments.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-371. Notice by mail.

In addition to the published notice required by section 74-370, the city manager shall provide notice of the proposed stormwater assessments by first class mail to the owner of each parcel of property subject to the stormwater Assessments, which notice shall conform to the requirements set forth in the Uniform Assessment Collection Act. Notice shall be mailed at least 20 calendar days prior to the hearing to each property owner at such address as is shown on the tax roll on the twentieth calendar day prior to the date of mailing. Notice shall be deemed mailed upon delivery thereof to the possession of the U.S. Postal Service. The city manager shall provide proof of such notice by affidavit. Failure of the owner to receive such notice due to mistake or inadvertence shall not affect the validity of the stormwater assessment roll nor release or discharge any obligation for the payment of a stormwater assessment imposed by the commission pursuant to this ordinance.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-372. Final assessment resolution.

At the time named in such notice, or such time to which an adjournment or continuance may be taken, the commission shall receive written objections and hear testimony of interested persons and may then, or at any subsequent meeting of the commission, adopt the final assessment resolution which shall:

(A) Confirm, modify or repeal the initial assessment resolution with such amendments, if any, as may be deemed appropriate by the commission;

(B) Approve the stormwater assessment roll, with such amendments as it deems just and right; and

(C) Determine the method of collection.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-373. Annual rate resolution.

During its budget adoption process, the commission shall adopt an annual rate resolution for each fiscal year following adoption of the final assessment resolution. The final assessment resolution shall constitute the annual rate resolution for the initial fiscal year. The annual rate resolution shall approve the stormwater assessment roll for such fiscal year. The stormwater assessment roll shall be prepared in accordance with the initial assessment resolution, as confirmed or amended by the final assessment resolution. If the proposed stormwater assessment for any parcel of developed property exceeds the maximum amount established in the final assessment resolution or if a stormwater assessment is imposed against property not previously subject thereto, the commission shall provide notice to the owner of such property in accordance with section 74-371 hereof and conduct a public hearing prior to adoption of the annual rate resolution. Failure to adopt an annual rate resolution during the budget adoption process for a fiscal year may be cured at any time.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-374. Effect of stormwater resolutions.

The adoption of the final assessment resolution or annual rate resolution shall be the final adjudication of the issues presented (including, but not limited to, the apportionment methodology, the rate of assessment, the adoption of the stormwater assessment roll and the levy and lien of the stormwater assessments), unless proper steps are initiated in a court of competent jurisdiction to secure relief within 20 days from the date of commission adoption of the final assessment resolution. The stormwater assessments for each fiscal year shall be established upon adoption of the annual rate resolution. The stormwater assessment roll, as approved by the final assessment resolution or annual rate resolution, shall be delivered to the tax collector, or such other official as the commission, by resolution, deems appropriate.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-375. Lien of stormwater assessments.

(A) Upon adoption of the annual rate resolution for each fiscal year, stormwater assessments to be collected under the uniform assessment collection act shall constitute a lien against assessed property equal in rank and dignity with the liens of all state, county, district or municipal taxes and other non-ad valorem assessments. Except as otherwise provided by law, such lien shall be superior in dignity to all other prior liens, titles and claims, until paid. The lien shall be deemed perfected upon adoption by the commission of the annual rate resolution and shall attach to the property included on the stormwater assessment roll as of the prior January 1, the lien date for ad valorem taxes.

(B) Upon adoption of the final assessment resolution, stormwater assessments to be collected under the alternative method of collection provided in section 74-377 hereof shall constitute a lien against assessed property equal in rank and dignity with the liens of all state, county, district or municipal taxes and other non-ad valorem assessments. Except as otherwise provided by law, such lien shall be superior in dignity to all other prior liens, titles and claims, until paid. The lien shall be deemed perfected on the date notice thereof is recorded in the Official Records of Monroe County, Florida.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-376. Method of collection of stormwater assessments.

Unless directed otherwise by the commission, stormwater assessments shall be collected pursuant to the Uniform Assessment Collection Act, and the city shall comply with all applicable provisions thereof. Any hearing or notice required by this ordinance may be combined with any other hearing or notice required by the Uniform Assessment Collection Act.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-377. Alternative method of collection of stormwater assessments.

In lieu of using the Uniform Assessment Collection Act, the city may elect to collect the stormwater assessment by any other method which is authorized by law or under an alternative collection method provided by this section.

(A) The city shall provide stormwater assessment bills by first class mail to the owner of each affected parcel of property, other than government property. The bill or accompanying explanatory material shall include:

(1) A brief explanation of the stormwater assessment,

(2) A description of the ESU calculation used to determine the amount of the assessment,

(3) The number of ESUs attributed to the parcel,

(4) The total amount of the parcel's stormwater assessment for the appropriate period,

(5) The location at which payment will be accepted,

(6) The date on which the stormwater assessment is due, and

(7) A statement that the stormwater assessment constitutes a lien against assessed property equal in rank and dignity with the liens of all state, county, district or municipal taxes and other non-ad valorem assessments.

(B) A general notice of the lien resulting from imposition of the stormwater assessments shall be recorded in the Official Records of Monroe County, Florida. Nothing herein shall be construed to require that individual liens or releases be filed in the official records.

(C) The city shall have the right to appoint or retain an agent to foreclose and collect all delinquent stormwater assessments in the manner provided by law. A stormwater assessment shall become delinquent if it is not paid within 30 days from the date any installment is due. The city or its agent shall notify any property owner who is delinquent in payment of his or her stormwater assessment within 60 days from the date the stormwater assessment was due. Such notice shall stale [state] in effect that the city or its agent will initiate a foreclosure action and cause the foreclosure of such property subject to a delinquent stormwater assessment in a method now or hereafter provided by law for foreclosure of mortgages on real estate, or otherwise as provided by law.

(D) All costs, fees and expenses, including reasonable attorney fees and title search expenses related to any foreclosure action as described herein shall be included in any judgment or decree rendered therein. At the sale pursuant to decree in any such action, the city may be the purchaser to the same extent as an individual person or corporation. The city may join in one foreclosure action the collection of stormwater assessments against any or all property assessed in accordance with the provisions hereof. All delinquent property owners whose property is foreclosed shall be liable for an apportioned amount of reasonable costs and expenses incurred

by the city and its agents, including reasonable attorney fees, in collection of such delinquent stormwater assessments and any other costs incurred by the city as a result of such delinquent stormwater assessments including, but not limited to, costs paid for draws on a credit facility and the same shall be collectible as a part of or in addition to, the costs of the action.

(E) In lieu of foreclosure, any delinquent stormwater assessment and the costs, fees and expenses attributable thereto, may be collected pursuant to the Uniform Assessment Collection Act; provided however, that:

(F) Notice is provided to the owner in the manner required by law and this ordinance, and

(G) Any existing lien of record on the affected parcel for the delinquent stormwater assessment is supplanted by the lien resulting from certification of the stormwater assessment roll to the tax collector.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-378. Collection of stormwater assessments from government property.

(A) Unless directed otherwise by the commission, the city may provide stormwater assessment bills by first class mail to the owner of each affected parcel of government property. The bill or accompanying explanatory material shall include:

(1) A brief explanation of the stormwater assessment,

(2) A description of the ESUs or other unit used to determine the amount of the stormwater assessment,

(3) The number of ESUs (or other units used to calculate the amount of the stormwater assessment) attributed to the parcel,

(4) The total amount of the parcel's stormwater assessment for the appropriate period,

(5) The location at which payment will be accepted, and

(6) The date on which the stormwater assessment is due.

(B) A stormwater assessment shall become delinquent if it is not paid within 30 days from the date any installment is due. The city shall notify the owner of any government property that is delinquent in payment of its stormwater assessment within 60 days from the date the stormwater assessment was due. Such notice shall state in effect that the city will initiate a mandamus or other appropriate judicial action to compel payment.

(C) All costs, fees and expenses, including reasonable attorney fees and title search expenses, related to any mandamus or other action as described therein shall be included in any judgment or decree rendered therein. All delinquent owners of government property against which a mandamus or

other appropriate action is filed shall be liable for an apportioned amount of reasonable costs and expenses incurred by the city, including reasonable attorney fees, in collection of such delinquent stormwater assessments and any other costs incurred by the city as a result of such delinquent stormwater assessments including, but not limited to, costs paid for draws on a credit facility and the same shall be collectible as a part of or in addition to, the costs of the action.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-379. Responsibility for enforcement.

The city and its agent, if any, shall maintain the duty to enforce the prompt collection of stormwater assessments by the means provided herein. The duties related to collection of stormwater assessments may be enforced at the suit of any holder of obligations in a court of competent jurisdiction by mandamus or other appropriate proceedings or actions.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-380. Revisions to stormwater assessments.

If any stormwater assessment made under the provisions of this ordinance is either in whole or in part annulled, vacated or set aside by the judgment of any court, or if the commission is satisfied that any such stormwater assessment is so irregular or defective that the same cannot be enforced or collected, or if the commission has failed to include any property on the stormwater assessment roll that should have been so included, the commission may take all necessary steps to impose a new stormwater assessment against any such property, following as nearly as may be practicable, the provisions of this ordinance and in case such second stormwater assessment is annulled, the commission may obtain and impose other stormwater assessments until a valid stormwater assessment is imposed.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-381. Procedural irregularities.

Any irregularity in the proceedings in connection with the levy of any stormwater assessment under the provisions of this ordinance shall not affect the validity of the same after the approval thereof, and any stormwater assessment as finally approved shall be competent and sufficient evidence that such stormwater assessment was duly levied, that the stormwater assessment was duly made and adopted, and that all other proceedings adequate to such stormwater assessment were duly had, taken and performed as required by this ordinance; and no variance from the directions hereunder shall be held material unless it be clearly shown that the party objecting was materially injured thereby. Notwithstanding the provisions of this section 74-381, any party objecting to a stormwater assessment imposed pursuant to this ordinance must file an objection with a court of competent jurisdiction within the time periods prescribed in section 74-372 of this ordinance.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-382. Correction of errors and omissions.

(A) No act of error or omission on the part of the commission, city manager, property appraiser, tax collector, clerk, or their respective deputies, employees or designees, shall operate to release or discharge any obligation for payment of any stormwater assessment imposed by the commission under the provisions of this ordinance.

(B) The number of ESUs attributed to a parcel of property may be corrected at any time by the city manager. Any such correction which reduces a stormwater assessment shall be considered valid from the date on which the stormwater assessment was imposed and shall in no way affect the enforcement of the stormwater assessment imposed under the provisions of this ordinance. Any such correction which increases a stormwater assessment or imposes a stormwater assessment on omitted property shall first require notice to the affected owner in the manner described in section 74-371 hereof, providing the date, time and place that the commission will consider confirming the correction and offering the owner an opportunity to be heard.

(C) After the stormwater assessment roll has been delivered to the tax collector, any changes, modifications or corrections thereto shall be made in accordance with the procedures applicable to errors and insolvencies for ad valorem taxes.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-383. Applicability.

This ordinance and the city's authority to impose stormwater assessments pursuant hereto shall be applicable throughout the city.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-384. Alternative method.

This ordinance shall be deemed to provide an additional and alternative method for the doing of the things authorized hereby and shall be regarded as supplemental and additional to powers conferred by other laws, and shall not be regarded as in derogation of any powers now existing or which may hereafter come into existence. This ordinance, being necessary for the welfare of the inhabitants of the city, shall be liberally construed to effect the purposes hereof.

(Ord. No. 13-10, § 1, 6-18-2013)

Sec. 74-385. Program responsibility.

It shall be the duty of the city's department of utilities to administer the stormwater management user fee system. The department shall keep an accurate record of all persons using the services and facilities of the stormwater management system of the city and to make changes in accordance with the rates and changes established in this article.

(Ord. No. 01-06, § 2, 6-5-2001; Ord. No. 02-16, § 6, 6-18-2002; Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—See editor' note following § 74-367.

Sec. 74-386. Stormwater management utility enterprise fund.

(a) All user fees collected by the city shall be paid into a separate fund which is hereby created, to be known as the "stormwater management fund". Such fund shall be used for the purpose of paying the costs of construction, operations, and maintenance, and administration of the stormwater facilities of the city and to carry out all other purposes of the system. To the extent that the user fees collected are insufficient to construct the needed stormwater drainage facilities, the cost of the same may be paid from such city fund as may be determined by the city commission, but the city commission may order the reimbursement of such fund if additional charges are thereafter collected.

(b) The fees paid shall not be used for general or other governmental or proprietary purposes of the city, except to pay for the equitable share of the cost of accounting, management and government thereof. Other than as described above, the fees shall be used solely as provided herein.

(ord. No. 01-06, § 2, 6-5-2001; Ord. No. 02-16, § 7, 6-18-2002; Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—See editor's note following § 74-367.

Sec. 74-387. Equivalent stormwater unit (ESU) rate.

The user fee charged on each ESU shall be $7.80. This rate may be adjusted by resolution of the city commission each October 1, by up to 100 percent of the percentage increase in the CPI-(U), the U.S. City Averages (as of June). The city commission shall enact an ordinance amendment to this section in order to increase the ESU in excess of the CPI.

(Ord. No. 02-17, § 1, 6-18-2002; Ord. No. 03-26, § 1, 9-11-2003; Ord. No. 06-20, § 1, 10-3-2006; Ord. No. 07-12, § 1, 9-5-2007; Ord. No. 13-10, § 1, 6-18-2013)

Editor's note(s)—See editor's note following § 74-367.

Sec. 74-388. National pollutant discharge elimination system.

The purpose and intent of this ordinance is to protect the health, safety, and general welfare of the citizens of Key West through the regulation of non-stormwater discharges entering the storm drain system generated from any developed or undeveloped lands unless explicitly exempted by law.

(A) This ordinance shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless explicitly exempted by law.

(B) The City of Key West shall administer, implement, and enforce the provisions of this ordinance. Any powers granted or duties impose upon the authorized enforcement agency to persons or entities acting in the beneficial interest of or in the employ of the agency.

(C) The provisions of this ordinance are hereby declared to be severable. If any provision, clause, sentence, or paragraph of this Ordinance or the application thereof to any person, establishment, or circumstances shall be held invalid, such invalidity shall not affect the other provisions or application of this Ordinance.

(D) The standards set forth herein and promulgated pursuant to this ordinance are minimum standards, therefore, this ordinance does not intend nor imply that compliance by any person will ensure that there will be no contamination, pollution, nor unauthorized discharge of pollutants.

(1) *Prohibition of Illegal Discharges* No person shall discharge or cause to be discharged into the municipal storm drain system or water courses any materials, including, but not limited to, pollutants or waters containing any pollutants that cause or contribute to a violation of applicable water quality standards, other than storm water.

The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described as follows:

(a) The following discharges are exempt from discharge prohibitions established by this ordinance: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wetland flows, swimming pools (if dechlorinated, less than 1 ppm chlorine), fire fighting activities, and any other water source not containing pollutants.

(b) Discharges specified in writing by the authorized enforcement agency as being necessary to protect public health and safety.

(c) Dye testing is an allowable discharge but requires a verbal notification to the authorized enforcement agency prior to the time of the test.

(d) The prohibition shall not apply to any non-storm water discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

(2) *Prohibition of Illicit Connections.*

(a) The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.

(b) This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

(c) A person is considered to be in violation of this ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.

(Ord. No. 20-11, § 2, 8-19-2020)

Sec. 74-389. Suspension of MS4 access.

The City of Key West may, without prior notice, suspend MS4 discharge access to a person when such suspension is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the MS4 or Outstanding Florida Waters. If the violator fails to comply with a suspension order issued in an emergency, the authorized enforcement agency may take such steps as deemed necessary to prevent or minimize damage to the MS4 or Outstanding Florida Waters, or minimize danger to persons.

Suspension due to the Detection of Illicit Discharge.

(a) A person discharging to the MS4 in violation of this ordinance may have their MS4 access terminated if such termination would abate or reduce an illicit discharge. The authorized enforcement agency will notify a violator of the proposed termination of its MS4 access. The violator may petition the authorized enforcement agency for a reconsideration and hearing.

(b) A person commits an offense if the person reinstates the MS4 access to premises terminated pursuant to this section, without the prior approval of the authorized enforcement agency.

(Ord. No. 20-11, § 3, 8-19-2020)

Sec. 74-390. Industrial or construction activity discharges.

Any person subject to an industrial or construction activity NPDES storm water discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in form acceptable to the City of Key West, prior to the allowing of discharges to the MS4.

(Ord. No. 20-11, § 4, 8-19-2020)

Sec. 74-391. Monitoring of discharges.

(A) *Applicability.* This section applies to all facilities that have storm water discharges associated with industrial activity, including construction activity.

(B) Access to Facilities.

(1) The City of Key West shall be permitted to enter and inspect facilities subject to regulation under this ordinance as often as may be necessary to determine compliance with this ordinance. If a

discharger has security measures in force which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the authorized enforcement agency.

(2) Facility operators shall allow the City of Key West ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit to discharge storm water, and the performance of any additional duties as defined by state and federal law.

(3) The City of Key West shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the authorized enforcement agency to conduct monitoring and/or sampling of the facility's storm water discharge.

(4) The City of Key West has the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the discharger at its own expense. All devices used to measure stormwater flow and quality shall be calibrated to ensure their accuracy.

(5) Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the City of Key West and shall not be replaced. The costs of clearing such access shall be borne by the operator.

(6) Unreasonable delays in allowing the City of Key West access to a permitted facility is a violation of a storm water discharge permit and of this ordinance. A person who is the operator of a facility with a NPDES permit to discharge storm water associated with industrial or construction activity commits an offense if the person denies the authorized enforcement agency reasonable access to the permitted facility for the purpose of conducting and activity authorized or required by this ordinance.

(7) If the City of Key West has been refused access to any part of the premises from which stormwater is discharged, and he/she is able to demonstrate probable cause to believe that there may be a violation of this ordinance, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this ordinance or any order issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the authorized enforcement agency may seek issuance of a search warrant from any court of competent jurisdiction.

(Ord. No. 20-11, § 5, 8-19-2020)

Sec. 74-392. Requirement to prevent, control, and reduce storm, water pollutants by the use of best management practices.

(A) The City of Key West will adopt requirements identifying Best Management Practices for any activity, operation, or facility which may cause or contribute to pollution or contamination of storm water, the

storm drain system, or Outstanding Florida Waters. The owner or operator of a commercial or industrial establishment shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or nearshore waters through the use of these structural and non-structural BMPs to prevent the further discharge of pollutants to the municipal separate storm sewer system. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of stormwater associated with construction or industrial activity, to the extent practicable, shall be deemed compliance with the provisions of this section. These BMPs shall be part of a stormwater pollution prevention plan (SWPPP), as necessary for compliance with requirements of the NPDES permit.

(B) All sites, regardless of size where construction activity requires the issuance of a Florida Building Permit for any type of construction or where a permit for clearing or grading is issued, shall implement erosion and sediment controls to prevent the discharge of sediment laden runoff from the site. Those controls may be based on generally accepted sediment and erosion control methods adopted by any Department of the State of Florida as long as the controls are effective.

(C) All sites, regardless of size, where construction activity requires the issuance of a Florida Building Permit for any type of construction or where a permit for clearing or grading is issued, shall utilize BMPs practices, not limited to containment and removal, in order to manage waste, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that if un-controlled could become part of a non-stormwater discharge from the site.

(Ord. No. 20-11, § 6, 8-19-2020)

Sec. 74-393. Notification of spills.

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, or Outstanding Florida Waters, said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the authorized enforcement agency in person or by phone no later than the next business day. Notifications in person or by phone shall be confirmed by written notice, addressed and mailed to The City of Key West, Utilities Department, within three business days of the phone notice. If the discharge of prohibited materials emanates from a construction site, commercial or industrial establishment, the superintendent, owner or operator shall retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

(Ord. No. 20-11, § 7, 8-19-2020)

Sec. 74-394. Enforcement.

(A) *Notice of a Violation.* Whenever the City of Key West finds that a person has violated a prohibition or failed to meet a requirement of this Ordinance, the authorized enforcement agency may order compliance by written notice of violation to the responsible person. Such notice may require without limitation:

(1) The performance of monitoring, analyses, and reporting;

(2) The elimination of illicit connections or discharges;

(3) That violating discharges, practices, or operations shall cease and desist;

(4) The abatement or remediation of storm water pollution or contamination hazards and the restoration of any affected property;

(5) Payment of a fine to cover administrative and remediation costs;

(6) The implementation of source control or treatment BMPs; and

(7) Notification of the State FDEP or Water Management District to enable those agencies to also pursue remedies and corrective action as allowed by State Law.

(B) If abatement of a violation and/or restoration of affected property is required, the notice shall set forth a reasonable time within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

(C) Should the violation continue beyond the time specified for correction, the authorized enforcement agency shall notify the special magistrate and request a hearing. The special magistrate, through clerical staff, shall schedule a hearing, and written notice of such hearing shall be hand delivered or mailed as provided in section 2-638 to the violator. At the option of the special magistrate, notice may additionally be served by publication or posting as provided in section 2-638. If the violation is corrected and then recurs or if the violation is not corrected by the time specified for correction by the authorized enforcement agency, the case may be presented to the special magistrate, even if the violation has been corrected prior to the hearing and the notice shall so state.

(D) If a repeat violation is found, the authorized enforcement agency shall notify the violator but is not required to give the violator a reasonable time to correct the violation. The authorized enforcement agency, upon notifying the violator of a repeat violation, shall notify the special magistrate and request a hearing. The special magistrate, through its clerical staff, shall schedule a hearing and shall provide notice pursuant to section 2-638. The case may be presented to the special magistrate even if the repeat violation has been corrected prior to the special magistrate hearing, and the notice shall so state. If the repeat violation has been corrected, the special magistrate retains the right to schedule a hearing to determine the costs and impose the payment of reasonable enforcement fees upon the

repeat violator. The repeat violator may choose to waive his rights to this hearing and pay the costs as determined by the special magistrate.

(E) If the authorized enforcement agency has reason to believe a violation or the condition causing the violation presents a serious threat to the public health, safety, and welfare or if the violation is irreparable or irreversible in nature, the authorized enforcement agency shall make a reasonable effort to notify the violator and may immediately notify the special magistrate and request a hearing.

(F) If the owner of the property which is subject to an enforcement proceeding before the special magistrate or court transfers ownership of such property between the time the initial pleading was served and the time of the hearing, such owner shall:

(1) Disclose in writing, the existence and nature of the proceeding to the prospective transferee.

(2) Deliver to the prospective transferee a copy of the pleadings, notices, and other materials relating to the code compliance proceeding received by the transferor.

(3) Disclose, in writing, to the prospective transferee that the new owner will be responsible for compliance with the applicable code and with orders issued in the code compliance hearing.

(4) File a notice with the code compliance official of the transfer of the property, with the identity and address of the new owner and copies of the disclosures made to the new owner, within five days after the date of the transfer.

(G) A failure to make the disclosures described in subsections (F)(1), (2), and (3) of this section before the transfer creates a rebuttable presumption of fraud. If the property is transferred before the hearing, the proceeding shall not be dismissed, but the new owner shall be provided a reasonable period of time to correct the violation before the hearing is held.

(Ord. No. 20-11, § 8, 8-19-2020)

Sec. 74-395. Appeal of notice of violation.

Any person receiving a Notice of Violation may appeal the determination of the authorized enforcement agency.

(A) *Appeals process.* Assessments of civil penalty(ies) and other enforcement decisions made under this ordinance may be appealed by filing a written notice of appeal with Key West Code Compliance. The notice of appeal must be received within ten days after the date of notification of the assessment of civil penalty(ies) or other enforcement decision. The failure to give notice of appeal within this time period shall constitute a waiver of the right to contest the assessment of penalty(ies) or other enforcement decision. Appeals shall be heard by the special magistrate or other individual ("hearing officer") hired by the City of Key West to rule upon code compliance citations. The hearing officer's decision is subject to review in the manner provided by law in the circuit court.

(B) *Appeal Standard.* The hearing officer shall review an appeal from the assessment of civil penalty(ies) or other enforcement decisions using a preponderance of the evidence standard. Notwithstanding a determination that the preponderance of the evidence supports the assessment of civil penalty(ies) or other enforcement decision, the hearing officer shall have the discretion to dismiss or reduce civil penalty(ies) or reverse any other enforcement decision where warranted. Upon any appellate finding that a violation of this chapter has occurred, the hearing officer may also assess a reasonable administrative fee based upon the evidence produced.

(Ord. No. 20-11, § 9, 8-19-2020)

Sec. 74-396. Enforcement measures after appeal.

If the violation has not been corrected, pursuant to the requirements set forth in the Notice of Violation, or, in the event of an appeal, within 30 days of the decision of the municipal authority upholding the decision of the authorized enforcement agency, then representatives of the authorized enforcement agency shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the government agency or designated contractor to enter upon the premises for the purposes set forth above.

(Ord. No. 20-11, § 10, 8-19-2020)

Sec. 74-397. Cost of abatement of the violation.

Within 30 days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within 30 days. If the amount due is not paid within a timely manner as determined by the decision of the municipal authority or by the expiration of the time in which to file an appeal, the charges shall become a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

Any person violating any of the provisions of this article shall become liable to the city by reason of such violation.

(Ord. No. 20-11, § 11, 8-19-2020)

Sec. 74-398. Injunctive relief.

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this ordinance. If a person has violated or continues to violate the provisions of this ordinance, the authorized enforcement agency may petition for a preliminary or permanent injunction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

(Ord. No. 20-11, § 12, 8-19-2020)

Sec. 74-399. Violations deemed a public nuisance.

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provisions of this ordinance is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

(Ord. No. 20-11, § 13, 8-19-2020)

Sec. 74-400. Criminal prosecution.

Any person that has violated or continues to violate this ordinance shall be liable to criminal prosecution to the fullest extent of the law, and shall be subject to a criminal penalty $500.00 dollars per violation per day and/or imprisonment for a period of time not to exceed 60 days.

The authorized enforcement agency may recover all attorney's fees, court costs and other expenses associated with enforcement of this ordinance, including sampling and monitoring expenses.

(Ord. No. 20-11, § 14, 8-19-2020)

Sec. 74-401. Remedies not exclusive.

The remedies listed in this ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the authorized enforcement agency to seek cumulative remedies.

(Ord. No. 20-11, § 15, 8-19-2020)

Appendix C: Asset Map Series

Appendix D: Flood Modeling Results