

Stormwater Management in the City of Savannah

City of Savannah Council Workshop

July 28, 2022

4:30 PM – 6:00 PM



Heath Lloyd, PE – ACM, Chief of Infrastructure and Development

Ron Feldner, PE – Water Resources Senior Director

Zack Hoffman, PE – Stormwater Management Director

Agenda

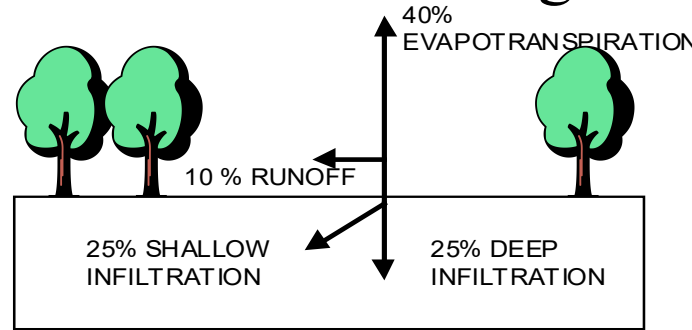
- Stormwater Management Overview
- Permitting
- Master Planning
- Capital Improvement Program
- Operations and Maintenance
- Funding
- Successes

Stormwater Management Overview

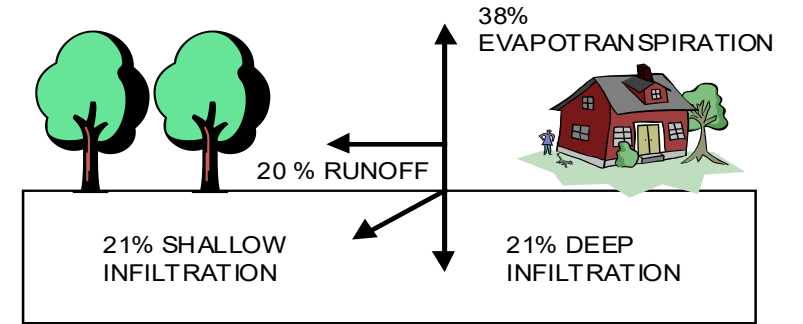


Land Use Changes = Increased Stormwater Runoff

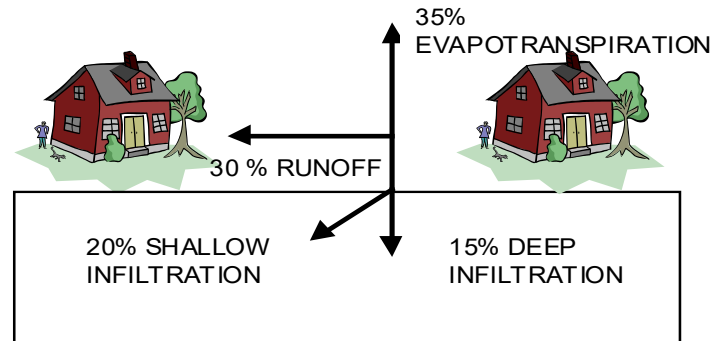
Changes in Runoff Flows



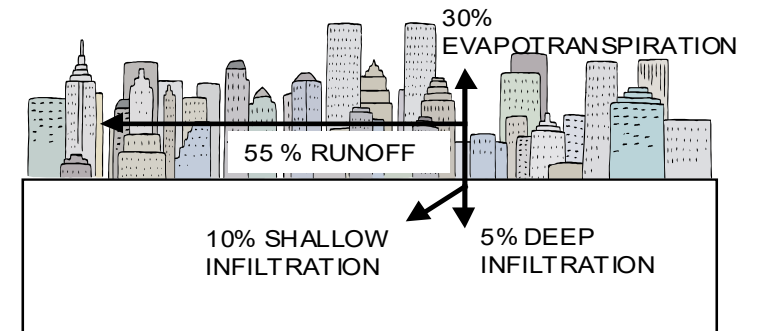
NATURAL GROUND COVER



10% - 20% IMPERVIOUS SURFACE



35% - 50% IMPERVIOUS SURFACE



75% - 100% IMPERVIOUS SURFACE

Savannah Stormwater Management Program (SMWP)

Mission/Role: Stormwater Management is responsible for the maintenance/repair of the open and closed drainage system, ensuring compliance with the National Pollutant Discharge Elimination System (NPDES) permit, reviewing private development plans to ensure compliance with pertinent City ordinances, and managing the flood reduction Capital Improvement Program.

Savannah SWMP Challenges

- Unpredictable and changing rainfall patterns
- Hurricanes and other tropical events
- Storm surge
- Tidal fluctuations
- Sea level rise
- Land development
- Flat topography
- Street flooding
- Supply Chain
- Customer service expectations
- Aging infrastructure & pump stations
- Aging fleet of heavy equipment
- Staff vacancies
- Major infrastructure projects
- Regulatory compliance
- Long-term funding
- Inflation

Savannah SWMP Key Activities & Services



Drainage System Operation,
Maintenance, and Repair



Regulatory Compliance activities
required by the City's NPDES
MS4 Permit



Capital Improvements Program
for Stormwater Drainage,
Conveyance, and Water Quality

Permitting



Stormwater Permit Compliance

NPDES MS4 Permit

- Environmental Compliance and Enforcement
- Operations & Maintenance
- Land Development Regulation
- Public Education and Outreach
- Construction Inspections
- Water Quality Monitoring
- Facility Stormwater Inspections



City of Savannah, Georgia

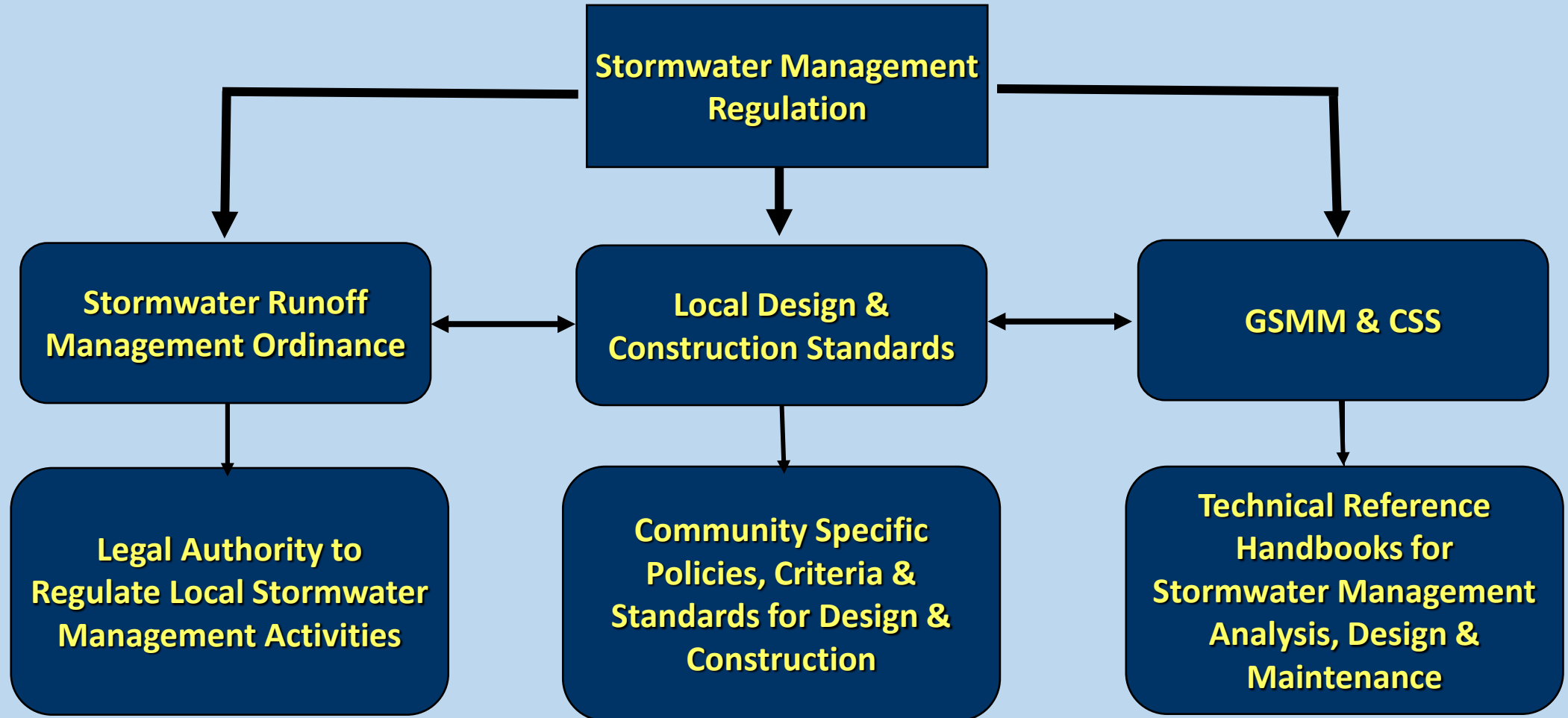
Stormwater Management Program

National Pollutant Discharge & Elimination System (NPDES)
Phase I Medium Municipal Separate Storm Sewer System (MS4) Permit 2017

Submitted to:
Environmental Protection Division (EPD)
Georgia Department of Natural Resources (DNR)

*October 2017 (Original Revision and Submission)
Revised November 2020 per EPD letter dated February 27, 2020*

Stormwater Land Development Regulation

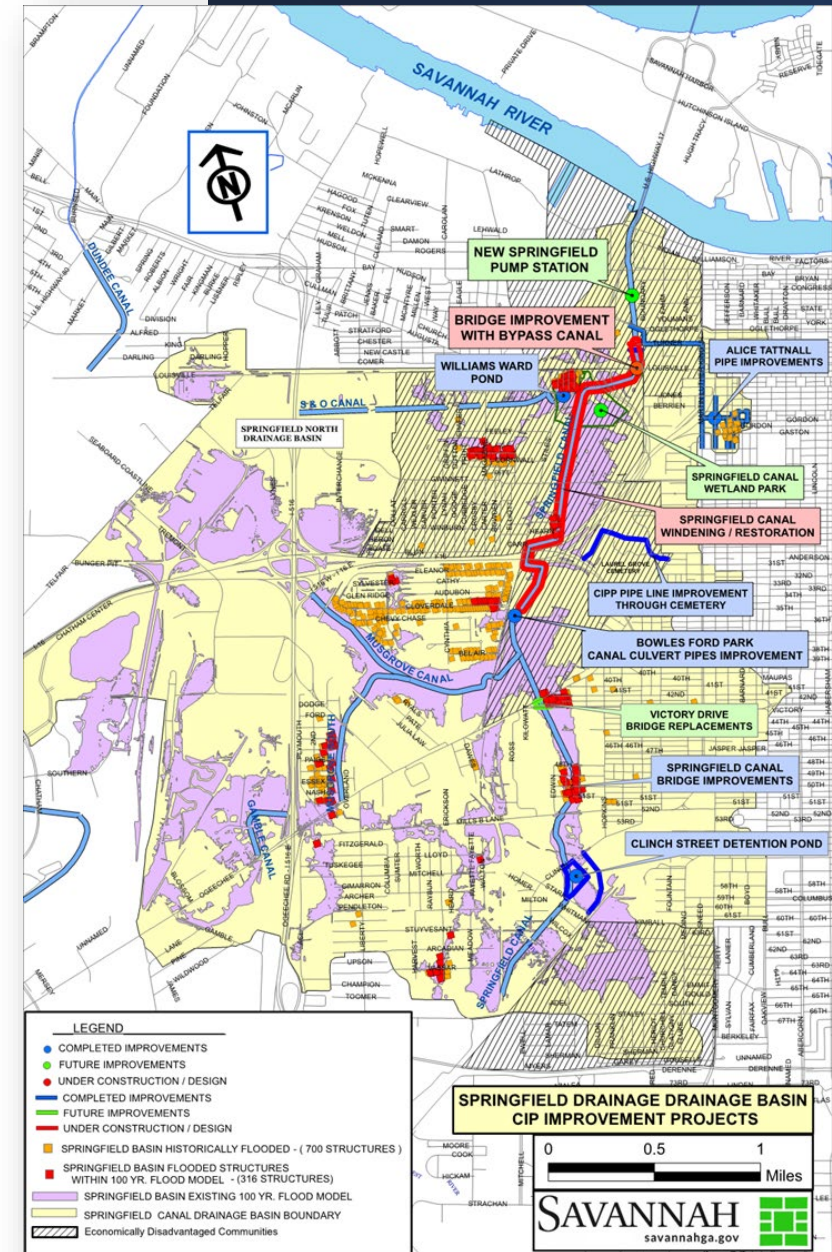


Master Planning



Citywide Stormwater Master Planning Components

- Flood Reduction Strategy
- Design Rainfall Events
- Stormwater Master Plan
 - *Public and Private Development*
 - *Capital Investments and Improvements*
 - *Operations and Maintenance of Existing Drainage System*
- Drainage System Resiliency



Stormwater Flood Reduction Strategy

Infrastructure: Buildings, Structures & Street Right-of-Ways

- Priority 1 - The City of Savannah will reduce building structure flooding resulting from the 25-year rain event (or approximately 6 inches of rain within a 24-hour period)
- Priority 2 - The City of Savannah will reduce street flooding resulting from the 25-year rain event

Design Rainfall Events

Rainfall Event	Rainfall Amount	Possibility of Occurrence
100 Year	Approx. 10" in a 24-hour Period of Time	1% Chance of occurring in any given year
25 Year	Approx. 6" in a 24-hour Period of Time	4% chance of occurring in any given year
2 Year	Approx. 4.6" in a 24-hour Period of Time	50% chance of occurring in any given year

Rainfall Events (2020 – Current)	
Date	Daily Rainfall Amt.
Feb. 6, 2020	3.79"
March 5, 2020	2.66"
April 9, 2020	2.13"
April 23, 2020	3.23"
June 23, 2020	3.28"
April 24, 2021	2.41"
Sept. 20, 2021	6.66"
Nov. 6, 2021	2.46"
July 11, 2022	3.72"

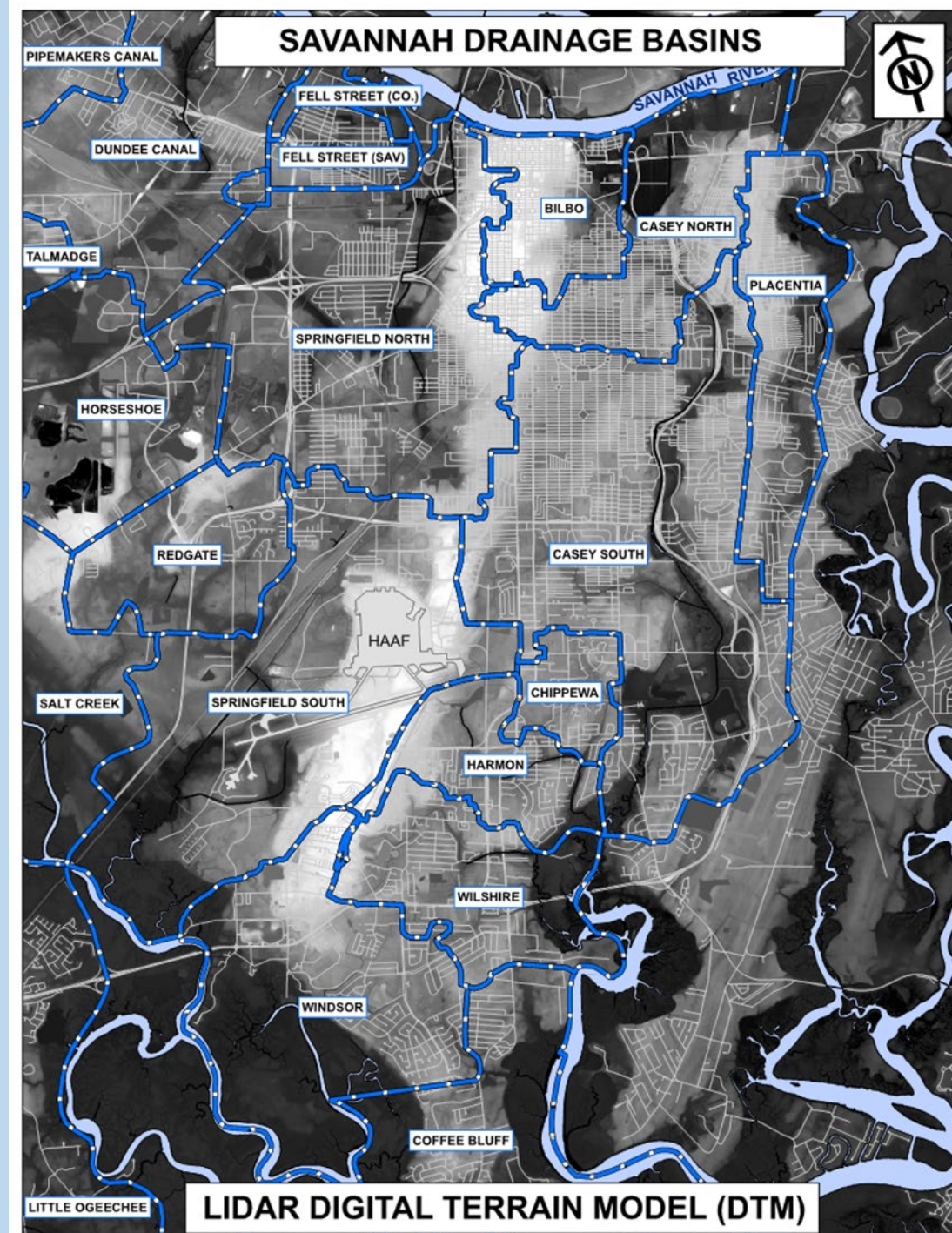
- Hurricane Matthew (Oct. 7 and 8, 2016) – 14.5" (12" to 17") of rainfall in an approx. 24-hours
- Rainfall Event on Sept. 20 and 21, 2021 – over 6" of rainfall in less than 24 hours.
- Rainfall Event on July 11, 2022 – 3" to 4" of rainfall in 2 hours (2.47 in/hr. recorded)

Stormwater Master Plan

- Assessment of the Drainage Basins within the City
- Inventory of the Drainage System
- Flood Studies of the Drainage Basins
- Identification and Prioritization of Capital Projects
- Development of Cost Estimates of Capital Projects
- Formulation of an Implementation Strategy
- Tool to Regulate Future Development

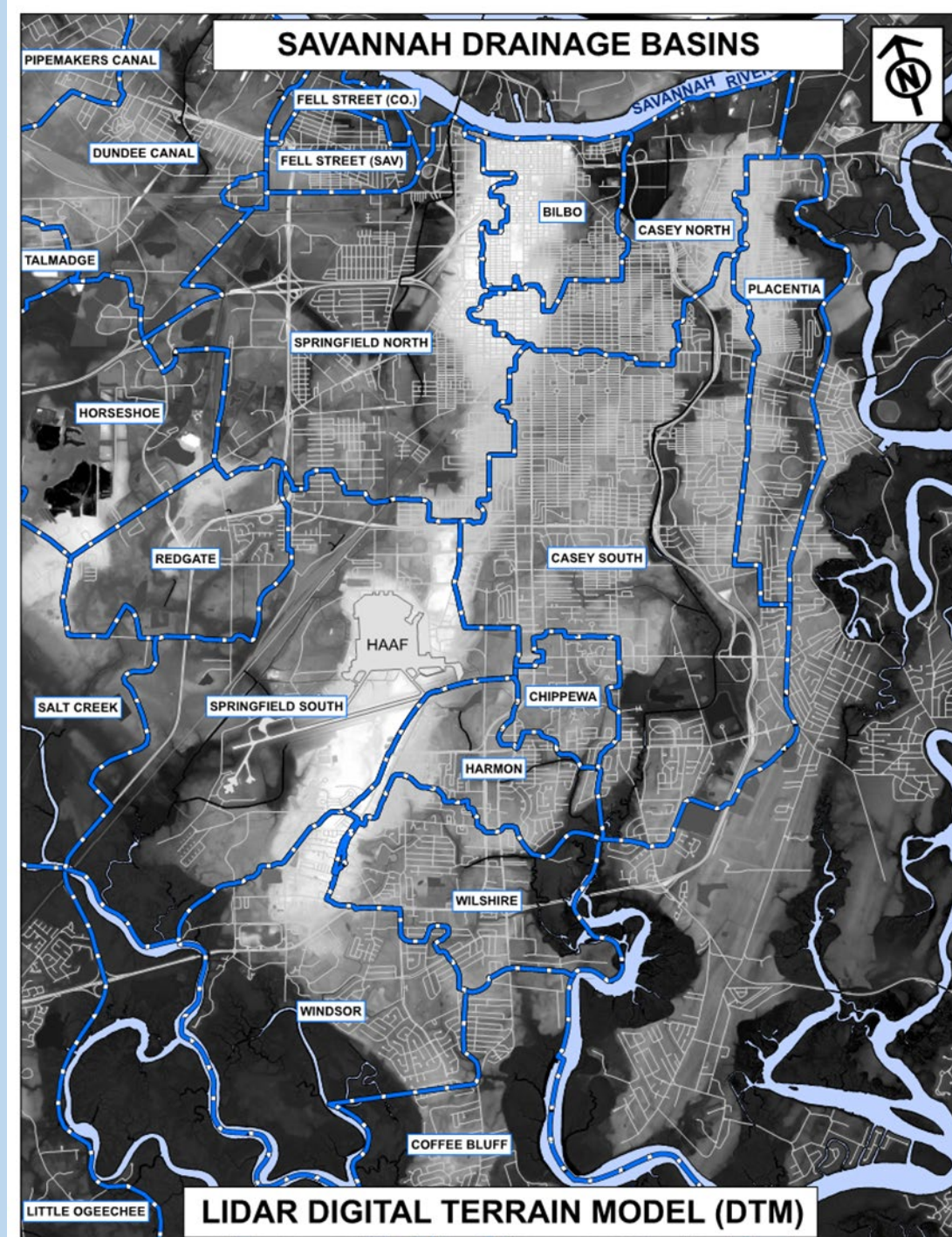
Stormwater Comprehensive Master Plan

Drainage Basin <i>(Within City Limits)</i>	Flood Study Status
Bilbo	Completed
Placentia	Completed
Casey South	Completed
Springfield North	Completed
Casey North	Currently Being Updated
Fell Street	Currently Being Modeled
Chippewa/Harmon	Not Modeled
Wilshire	Not Modeled
Windsor	Not Modeled
Coffee Bluff	Not Modeled



Stormwater Comprehensive Master Plan

Drainage Basin <i>(Partially within City Limits)</i>	Flood Study Status
Springfield South	Not Modeled
Dundee	Not Modeled
Horseshoe	Not Modeled
Redgate	Not Modeled
Salt Creek	Not Modeled
Pipe Makers	Not Modeled
Talmadge	Not Modeled
St. Augustine	Not Modeled
Ogeechee/Little Ogeechee	Not Modeled



Stormwater Capital Improvements, Capital Maintenance & Engineering Studies (5-20 Year Project Matrix)

- Stormwater Pump Station Improvements
 - 10 Projects
 - Total Cost: \$19 Million
- Localized Stormwater Infrastructure Construction Improvements
 - 13 Projects
 - Total Cost: \$5 Million
- Stormwater Yearly Capital Programs and Repairs
 - 3 Projects
 - Total Cost: \$2 Million/year
- Flood Study Modeling and Basin Studies
 - 14 Basins
 - Total Cost : \$2 Million
- Regional Stormwater Infrastructure Construction Improvements
 - 17 Projects
 - Total Cost: \$460 Million

Active Capital Improvement Projects

Project	Budgeted Cost
Bilbo Canal - Phase 2	\$5,500,000
Casey South - Phase 2A (54th Street)	\$13,000,000
Casey South - Phase 2B (56th and 57th Streets)	\$17,000,000
Casey South - Phase 2C (Habersham Village and Abercorn St.)	\$45,000,000*
Placentia - North and South Tompkins Culvert Replacement	\$1,265,928
Placentia - Semken & LaRoache Culvert Replacement	\$1,267,180
Placentia - Vicksburg Pond	\$2,000,000
Placentia -New Placentia Canal Outfall	\$11,000,000*
Springfield Basin - Arena and City Lot Canal Improvements	\$5,400,896
Springfield Basin - Phase 1A (Canal District)	\$12,000,000
Springfield Basin - Phase IB (Boundary and Louisville St.)	\$28,000,000

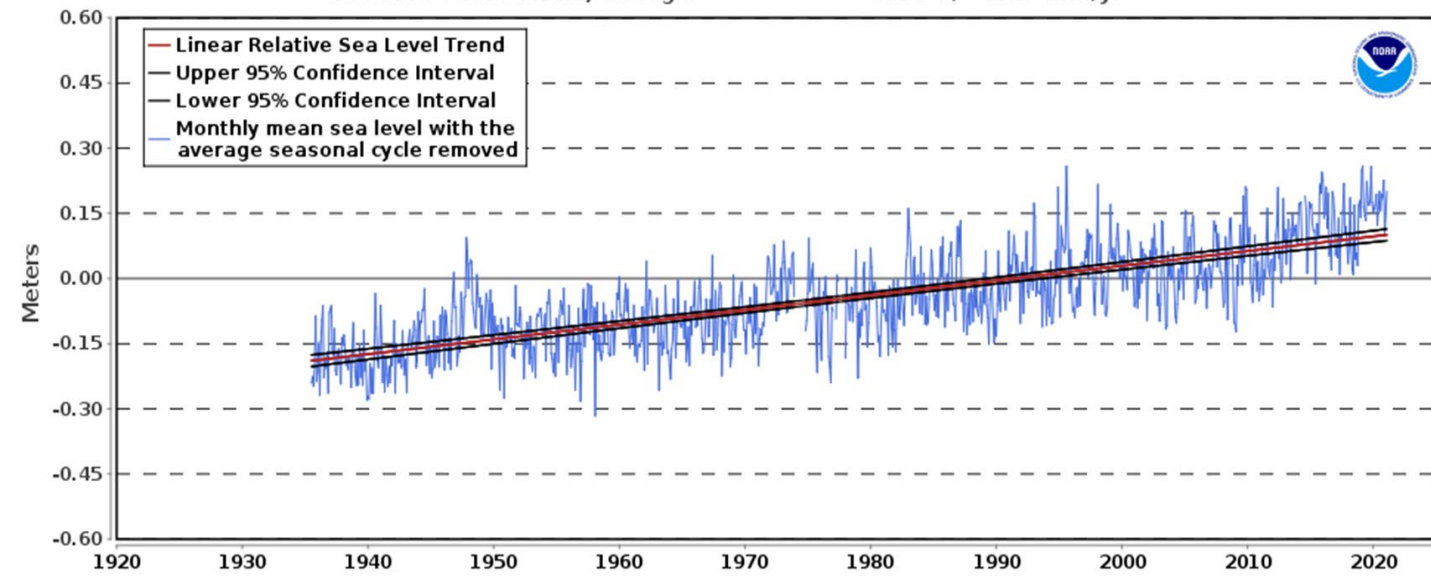
* Denotes Partially Budgeted Project Costs

Project	Budgeted Cost
Springfield Basin - Phase 3 (I-16 to Gwinnett St.)	\$3,500,000
Fell St. Pump Station Outfall Replacement	\$5,000,000
Fell St. Pump Station Structural and Exterior Rehabilitation	\$1,500,000
Montgomery Pump Station Control Upgrade	\$377,305
Lathrop, Fell, Kayton, & Springfield Pump Station Control Upgrades	\$1,419,287
CIPP Lining - 36th St./MLK/37th St. Bull to Burroughs St.	\$600,000
CIPP Lining - Bull St. between Henry & E 36th St.	\$150,000
CIPP Lining - Duffy St. between Montgomery and Abercorn	\$980,000
Bilbo Drainage Basin Model Update	\$67,500
Casey North Drainage Basin Study	\$105,000
Fell Street Drainage Basin Study	\$110,000

TOTAL ESTIMATED ACTIVE DRAINAGE CIP PROJECT COSTS: \$155 MILLION

8670870 Fort Pulaski, Georgia

3.39 +/- 0.27 mm/yr



Drainage System Resiliency

Issues

- Storm Surge
- Sea Level Rise

Mitigation Measures

- Pump Stations
- Tide Gates
- Berms, Dikes, Sea Walls
- Design Standards

Capital Improvement Program

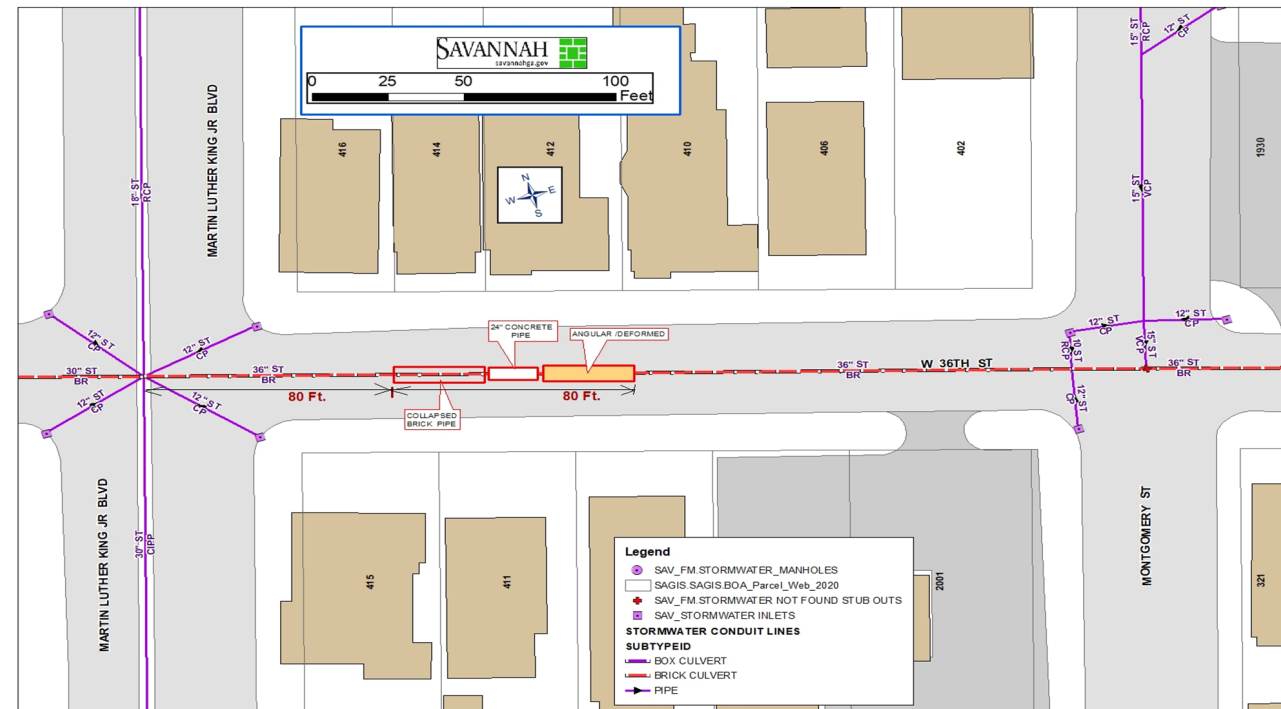


Stormwater Infrastructure Systems

- Brick Line Pipes
- Unreinforced Concrete Pipe
- Terracotta Pipe
- Corrugated Metal Pipe

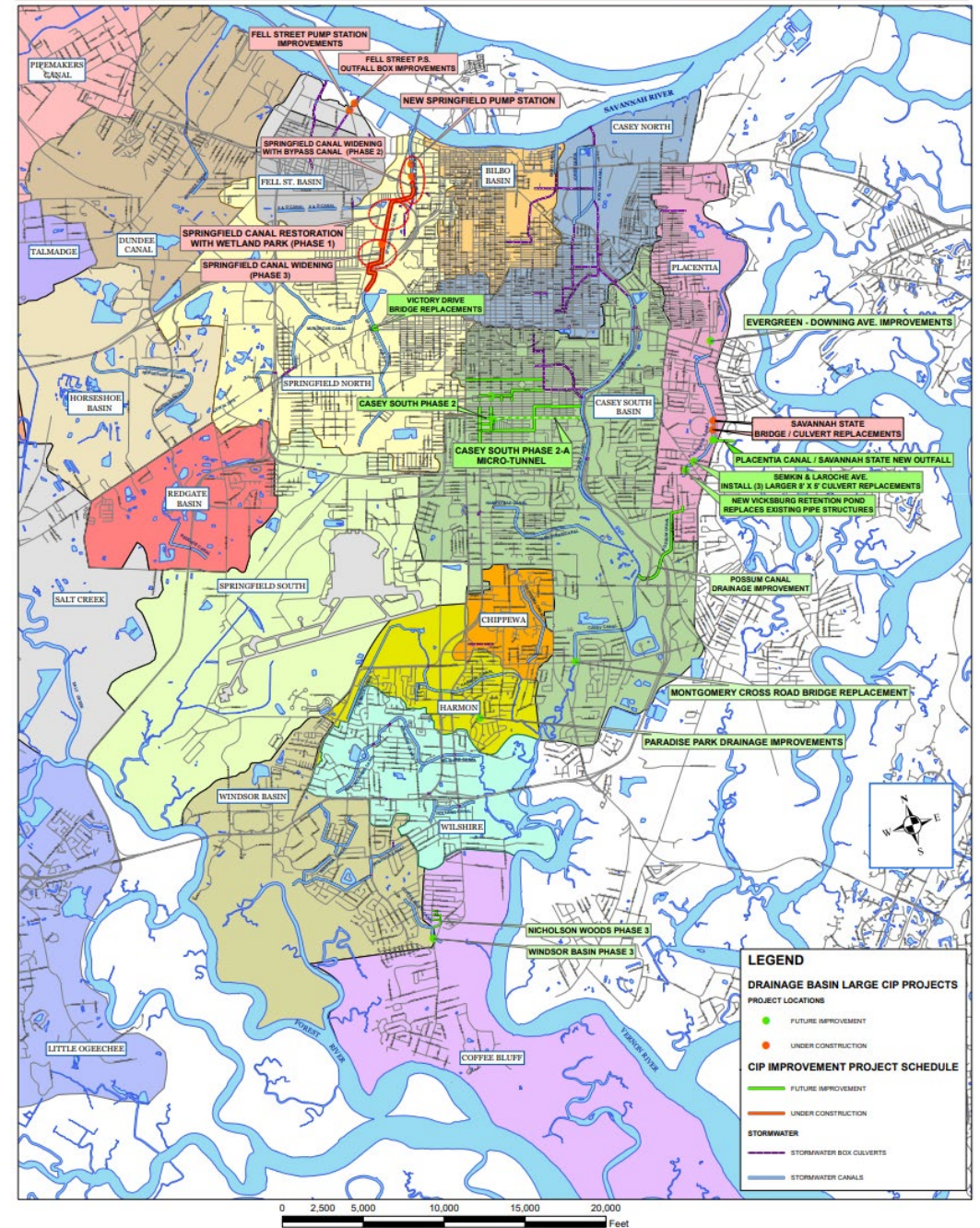


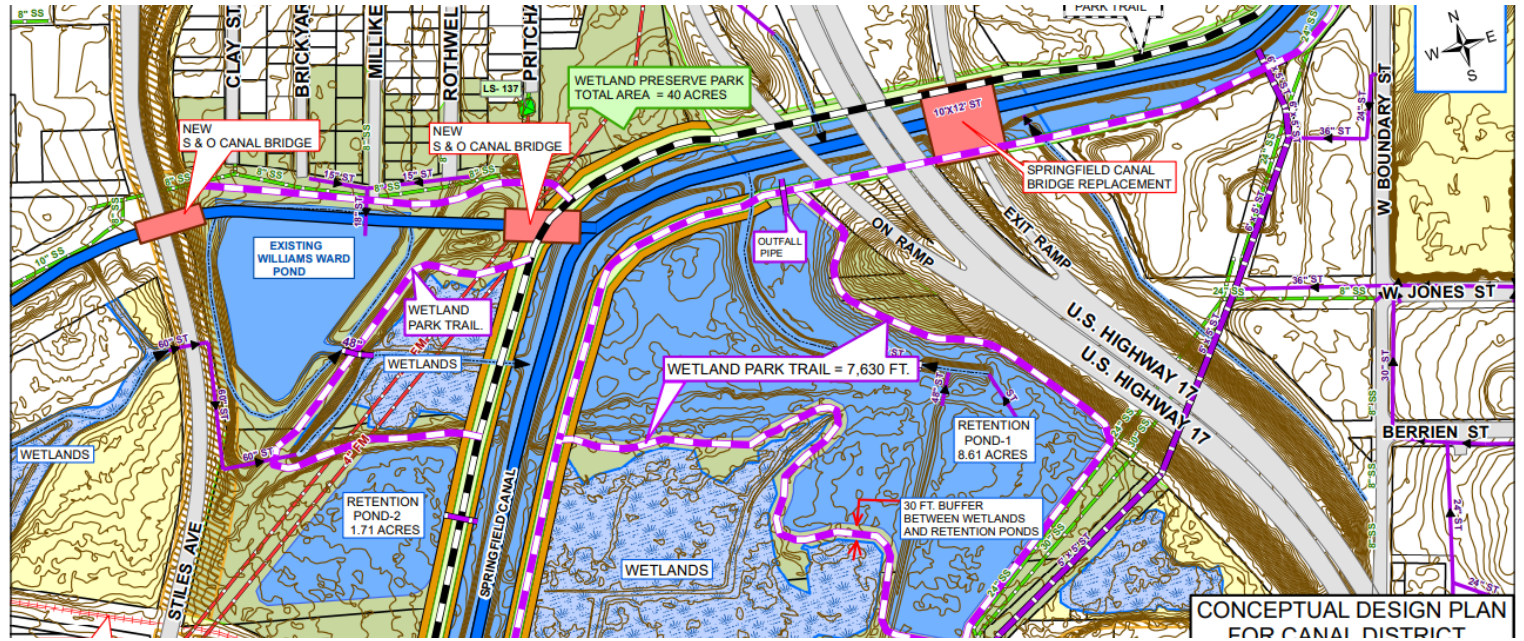
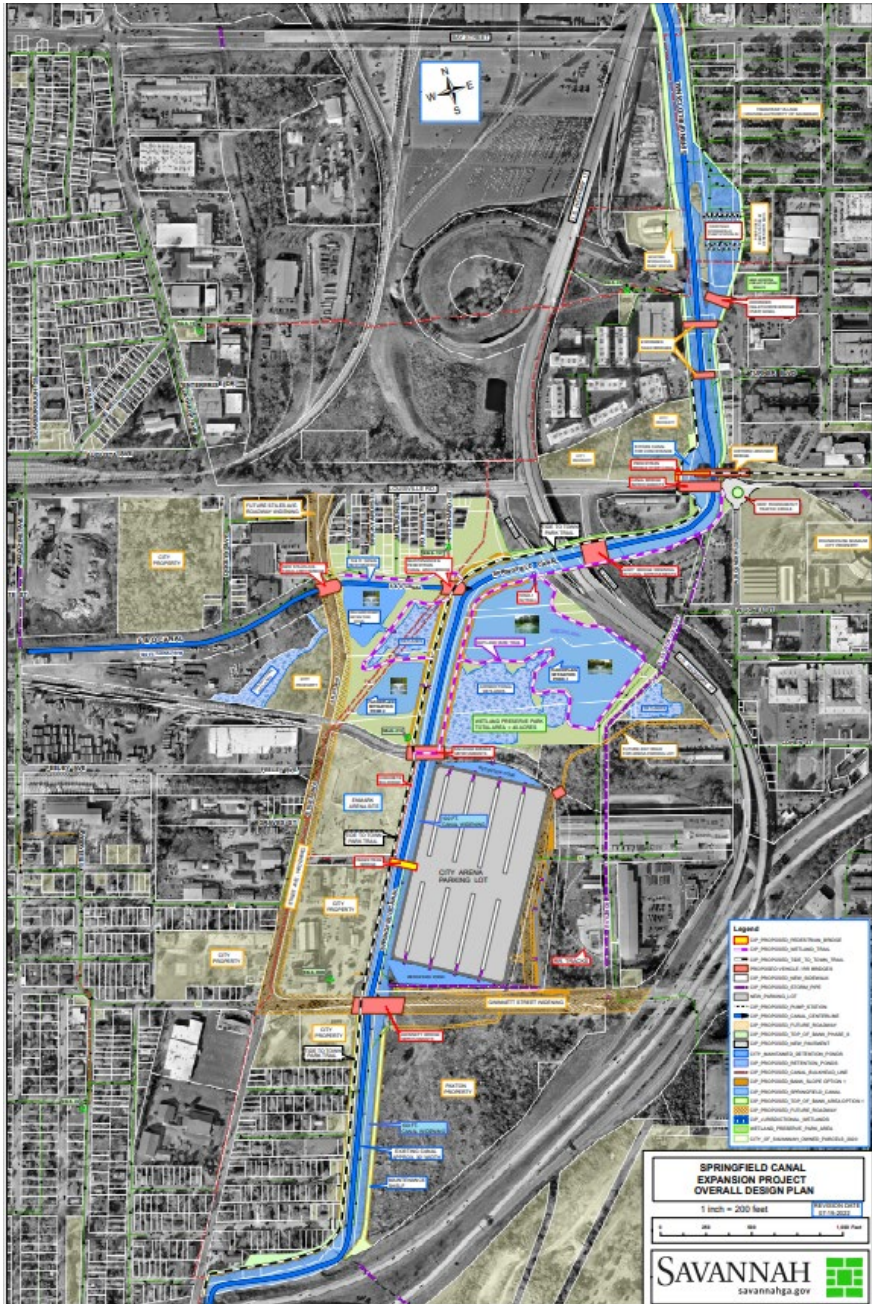
Stormwater Capital Improvements – Neighborhood Drainage System Repair (MLK Blvd. at 36th St.)



Stormwater Capital Improvements – Projects Under Construction

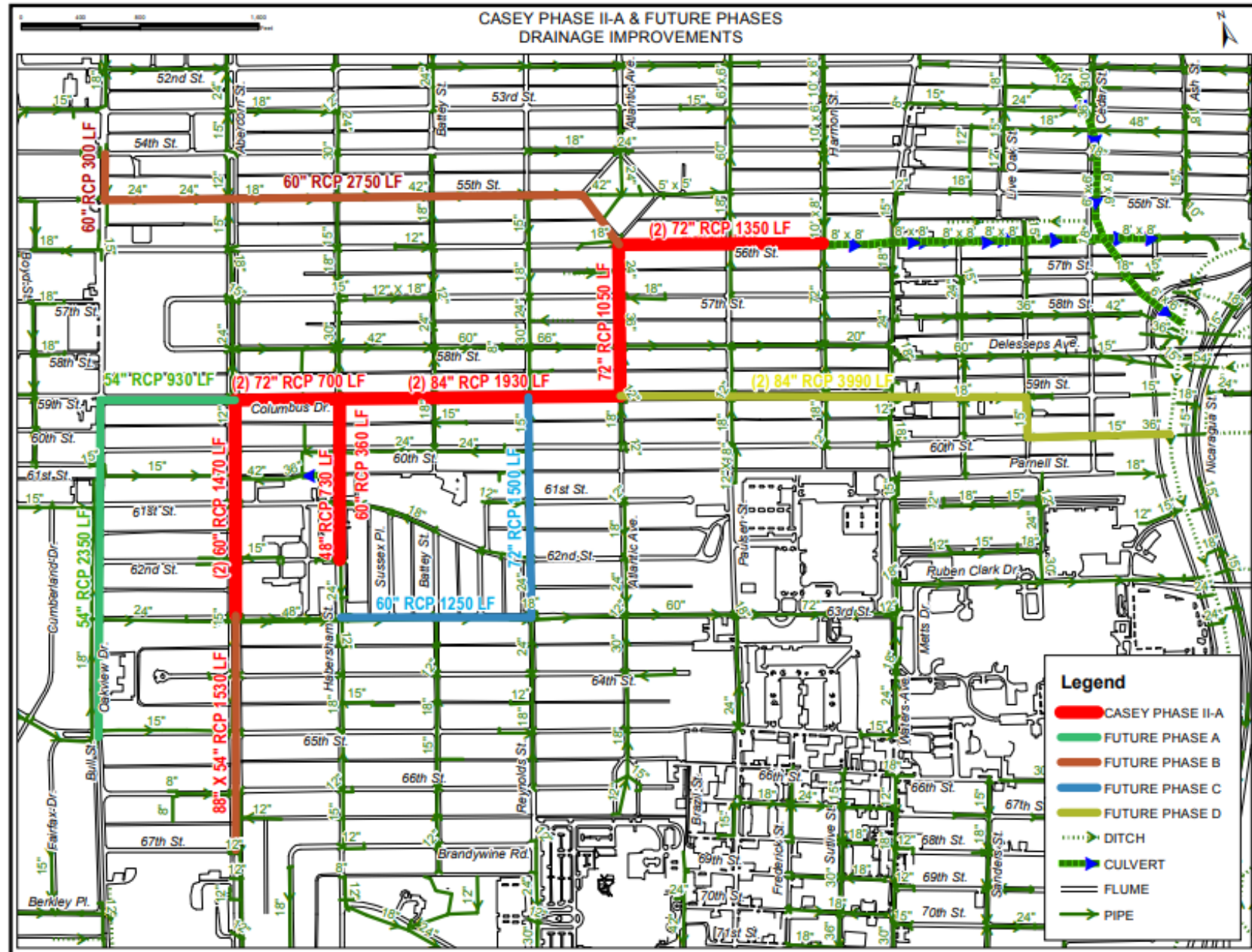
SAVANNAH CIP DRAINAGE IMPROVEMENT ACTIVE PROJECTS





Stormwater Capital Improvements – Springfield Canal

Stormwater Capital Improvements – Casey Canal

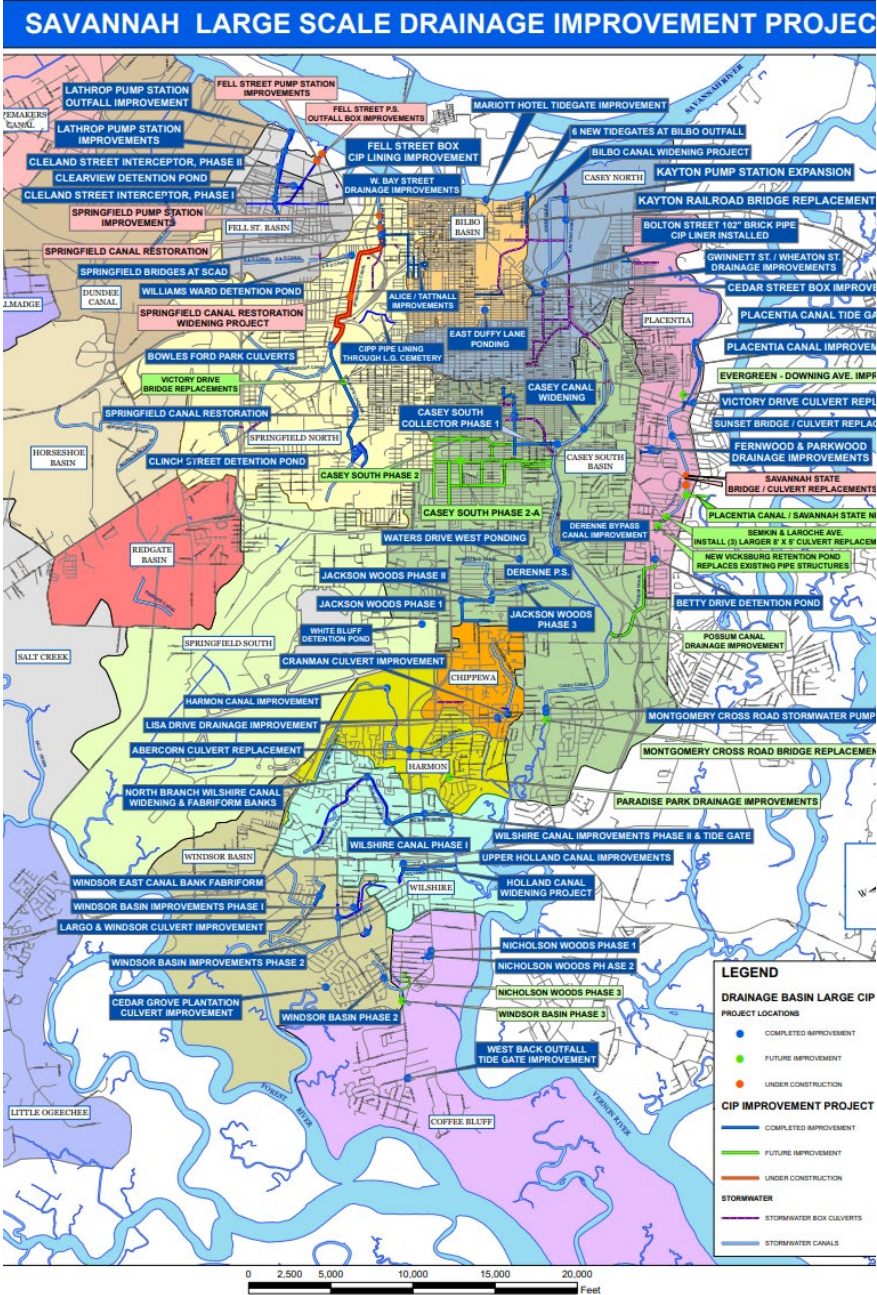


Stormwater Capital Improvements – Pump Stations

- Gwinnett Street (1975) – 2 Pumps
- Fell Street (1977) (Improved 1986 & 2004) – 5 Pumps
- Kayton (1978) (Improved 2001) – 12 Pumps
- DeRenne (1997) (Improved 2000 & 2001) – 11 Pumps
- Springfield (1999) – 6 Pumps
- Montgomery Crossroads (2002) – 5 Pumps
- Lathrop (2003) – 6 Pumps

Total Pumping Capacity = 4.3 Billion GPD





Stormwater Capital Improvements –
Project Map & Examples

Operations & Maintenance



Stormwater Operations & Maintenance (O&M)



- 412.97 miles of pipe (closed system)
- 152.48 miles of ditches/canals (open system)
- 7 pump stations
- 6 stormwater detention ponds
- 31 tide gates
- 14,000 catch basins
- 6,200 manholes

Stormwater Operations & Maintenance

Annual Maintenance Contracts

- Pump Station Generator Maintenance
- Pump Station Pump Repairs
- Hand Crew Ditch Maintenance
- Pipe Televising, Cleaning, and Lining
- Point Repairs



Service requests
(10/2020 -
7/2022)

1894 Total
service requests

Average of 22
requests/week

Most Common Service Requests

- Clogged Storm Drain
- Ditch Debris or Blocked Ditch
- Ditch Maintenance (Mowing)

Stormwater Service Requests Via 311

- City Services - Call 311
 - Work orders created, managed, and tracked
- Extent of Service Policy
 - Public property
 - City streets and right of ways
 - City easements
 - *No services performed on private property*
- Level of Service Policy
 - Public demand for higher levels of service
 - Evaluated based on the order received
 - Prioritized Response

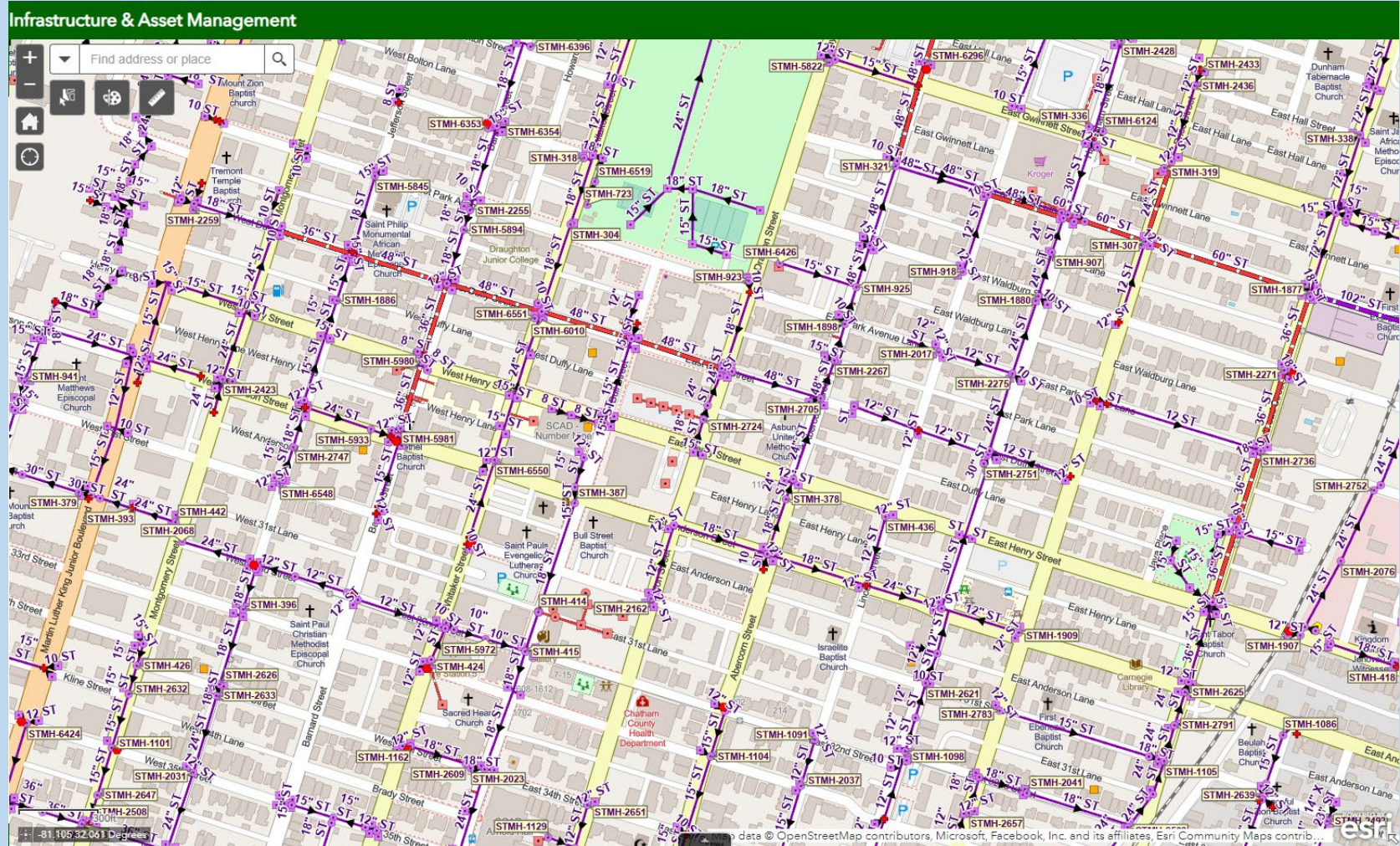
Stormwater Operations & Maintenance – Service Requests

Top Neighborhood Stormwater Service Requests per District (October 2020 to July 2022)

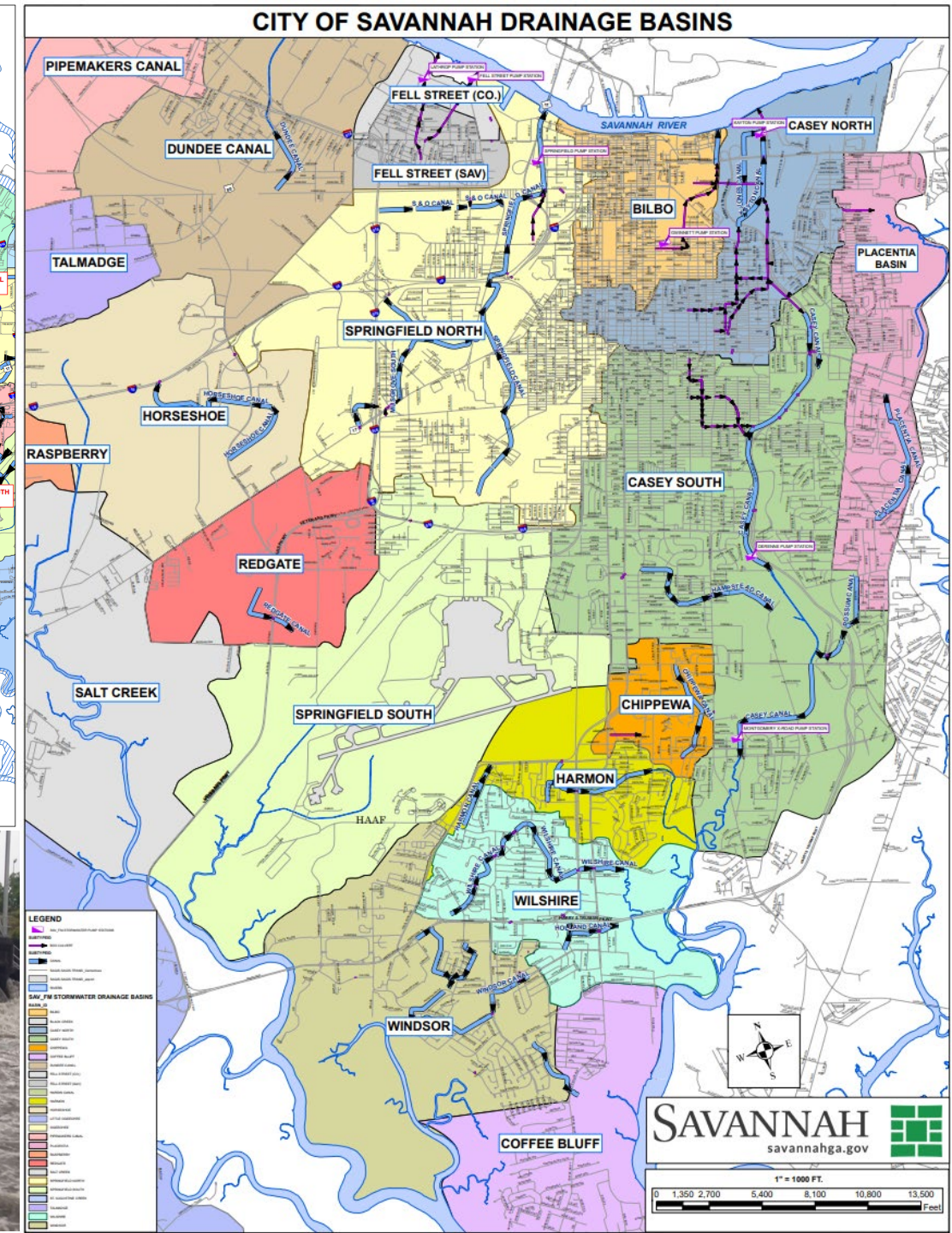
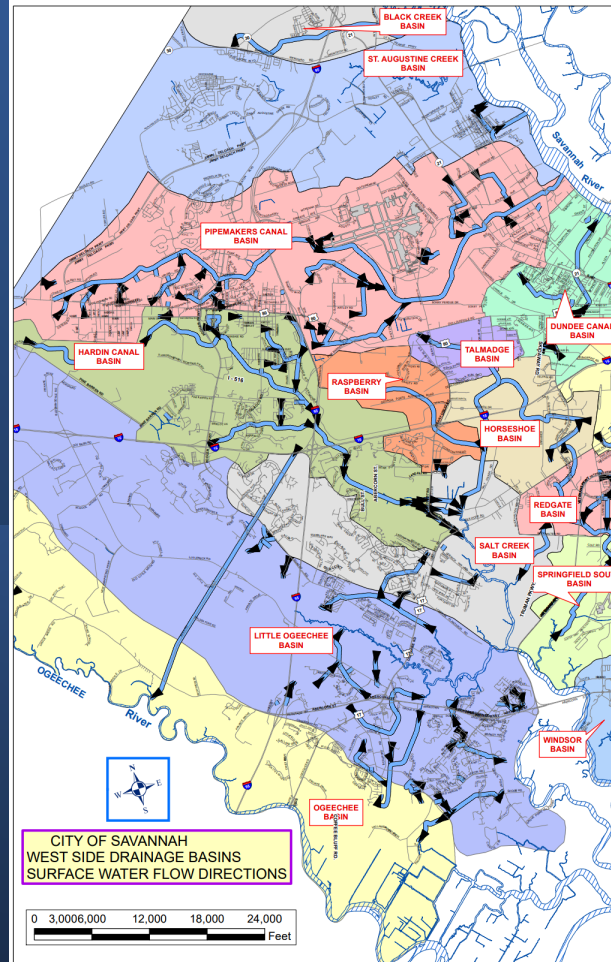
<u>Neighborhood Name</u>	<u>Council District</u>
Cloverdale	1
North Historic District	2
LaRoche Park/Springhill/Daffin Heights/Wilemere/Shirley Park	3
Ardmore/Gould Estates/Olin Heights	4
Liberty City/Summerside/Southover/Richfield	5
Windsor Forest	6

Stormwater Operations & Maintenance – Ditches, Pipes, and Inlets

- GIS / Savannah Area Geographic Information System (SAGIS)
- ESRI Survey 123 and Field Maps
 - Maintenance Tracking
 - Field Inspections
 - Construction Inspections
 - Environmental Compliance and Sampling
 - MS4 Permit Compliance



Stormwater Operations & Maintenance – Canals and Pump Stations



Stormwater Operations & Maintenance

Near Term Action Items & Objectives

O&M Plan

Goal: Ensure existing drainage system is providing optimum performance

- Update list of reoccurring problem areas & flooding hotspots
- Formulate enhanced & prioritized proactive maintenance program
- Customer Education
 - Aesthetics (landscaping) vs. Maintenance (ditch cleaning)
 - Illegal dumping (yard waste, tires, trash)
 - 311 system for complaints

City Council Input

- Obtain concurrence for proposed O&M Plan
- Incorporate feedback for FY23 budgeting and resource allocation

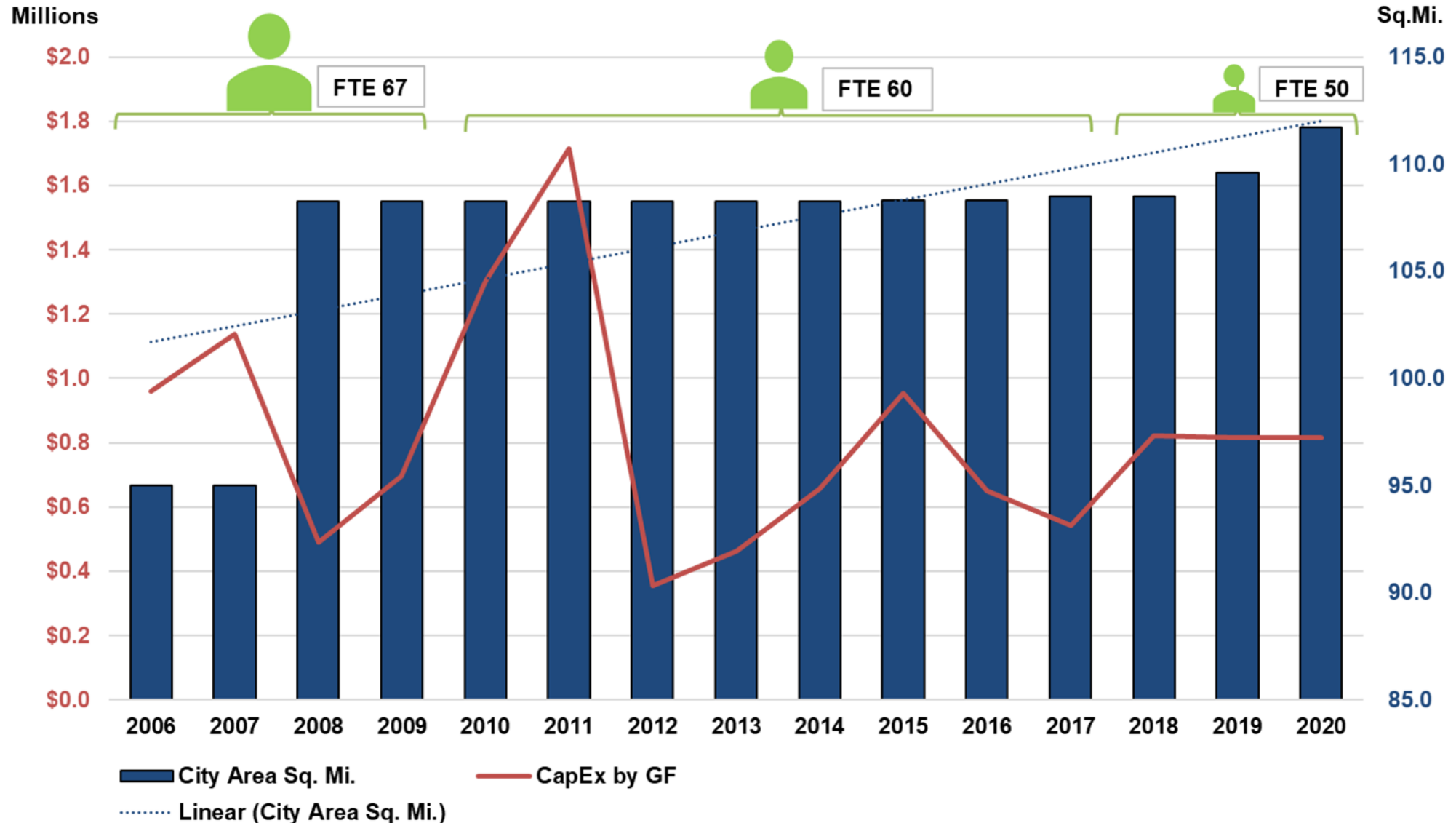


Funding

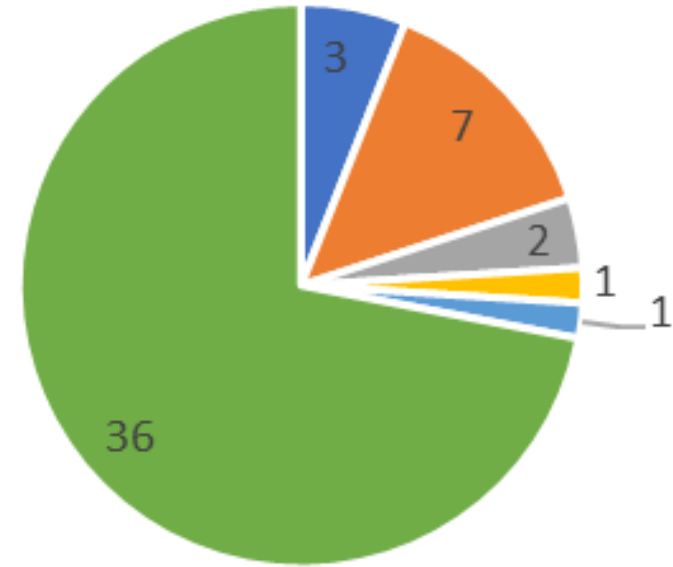


SWMP Historical Resource Allocation

CapEx, City Area, and FTE by Year



Stormwater Management Staff



- Administrative
- Capital Improvement Program
- Private Development Permit/Inspection
- Environmental Compliance
- Records
- Operations & Maintenance

Current
SWMP
Staffing

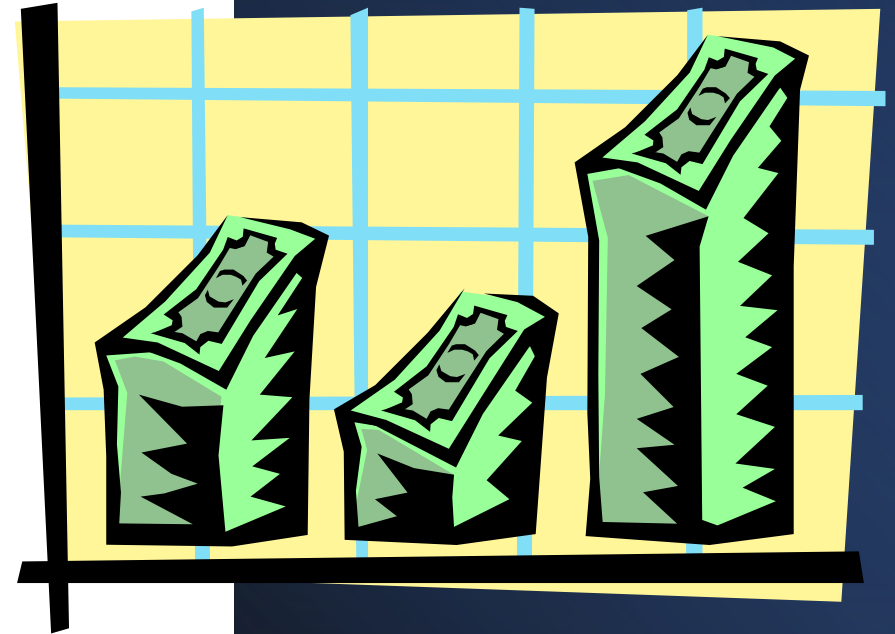
SWMP Funding

Existing

- General Fund
- Special Purpose Local Option Sales Tax (SPLOST)
- Federal and State Grants

Future Options

- Transportation SPLOST (TSPLOST)
- Tax Allocation District (TAD)
- Bonds and/or GEFA Loans
- Fees



Savannah Stormwater Management Successes

- Pump stations upgrades
- Over \$83M in CIP expenditures since 2015
- Over \$110M in CIP expenditures since 2007
- Ongoing O&M of an extensive network of drainage infrastructure with reduced staff
- NPDES permit compliance
- Effective development plan review to ensure protection of those down stream and to improve water quality
- Cured In Place Pipe (CIPP) program
- Point repair program
- Drainage basin modeling and master planning
- Water quality protection
- Major storm and hurricane response
- Use of technology for asset management and regulatory permit compliance
- Utilization of grants
- Green Infrastructure Bank

Questions & Discussion