



# Stormwater Management Plan | *Town of Sunset Beach*

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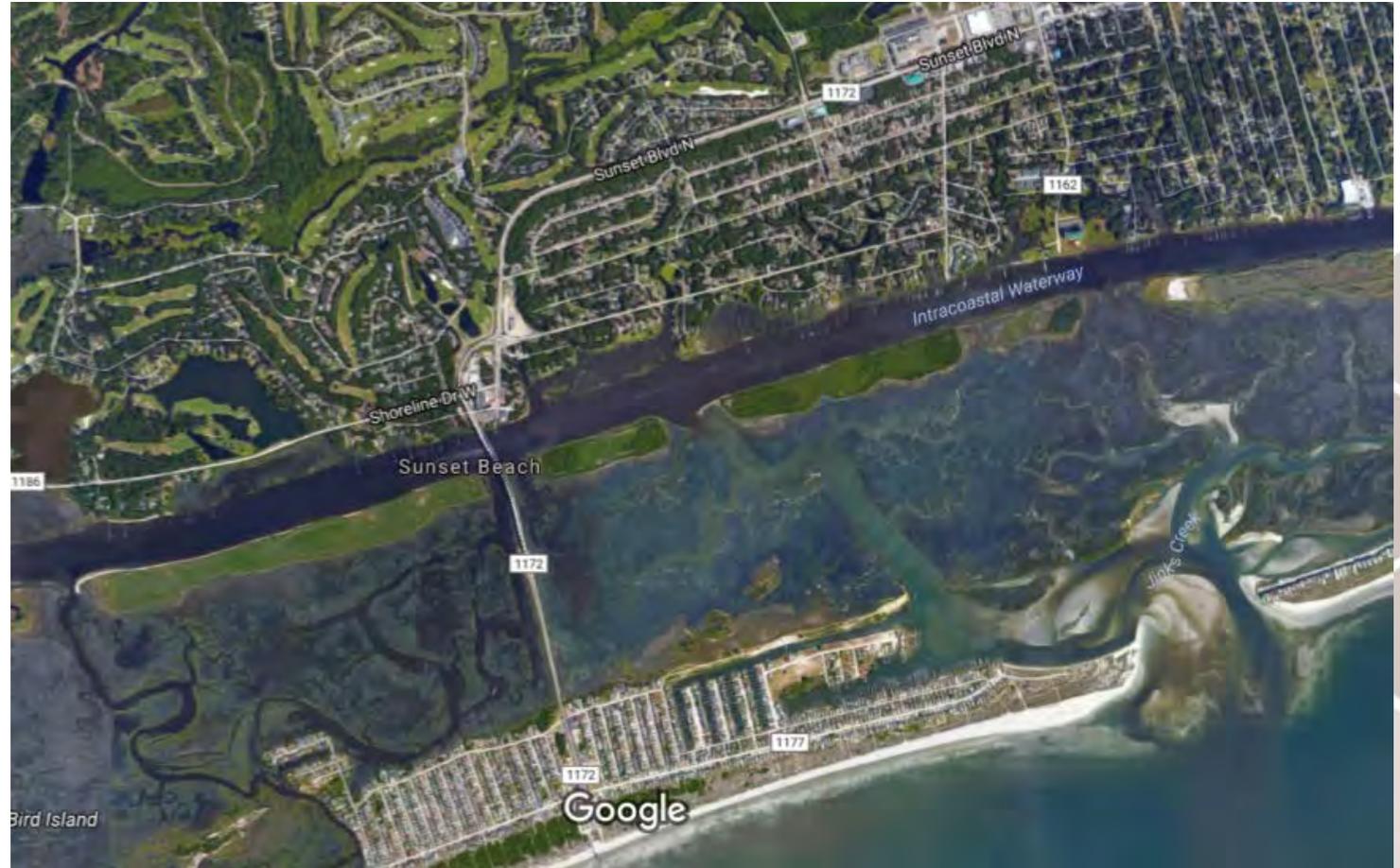
John Vilas

June 20, 2017



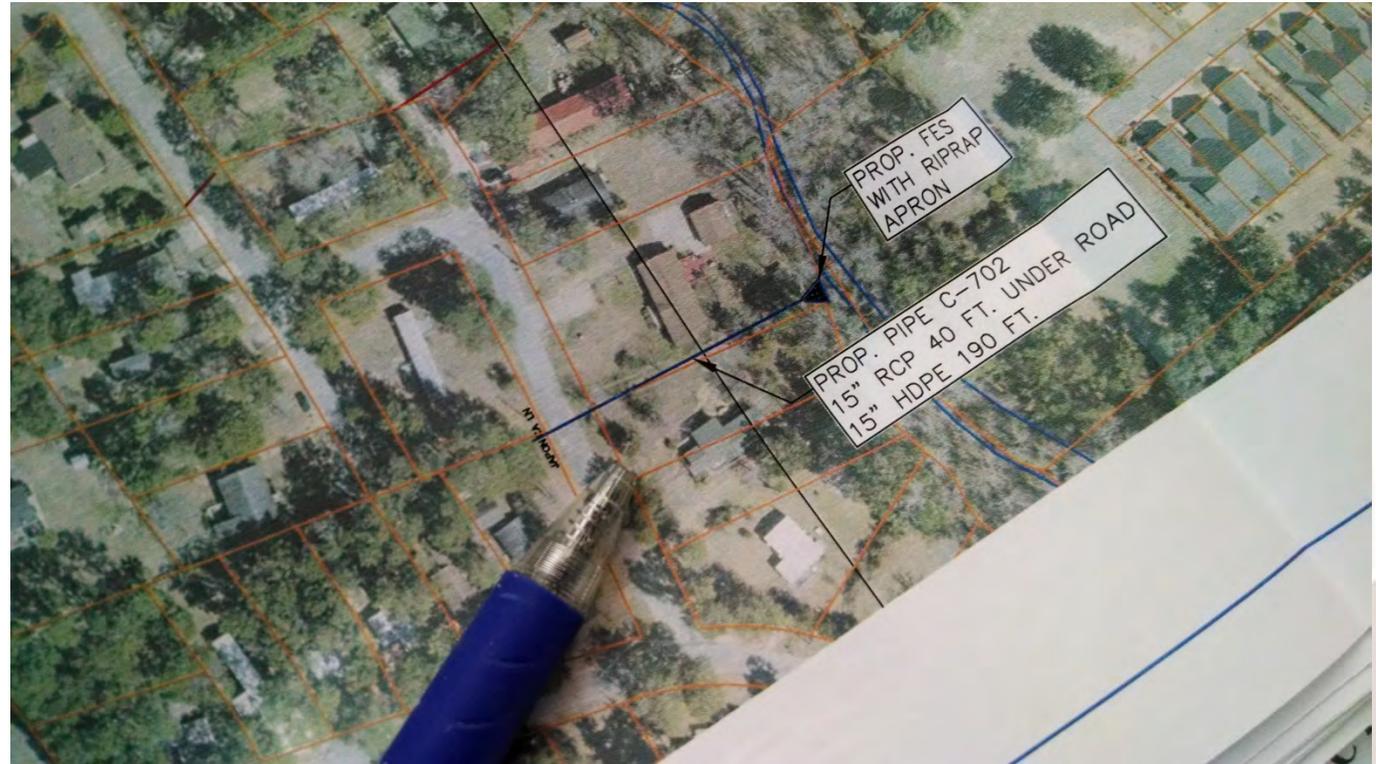
# Project Purpose ///

- Develop a Stormwater Management Plan to Repair, Upgrade and Modernize Existing Collection System.
- Evaluate Need and Opportunities for Water Quality Improvements.
- Make Recommendations for Specific Improvements.



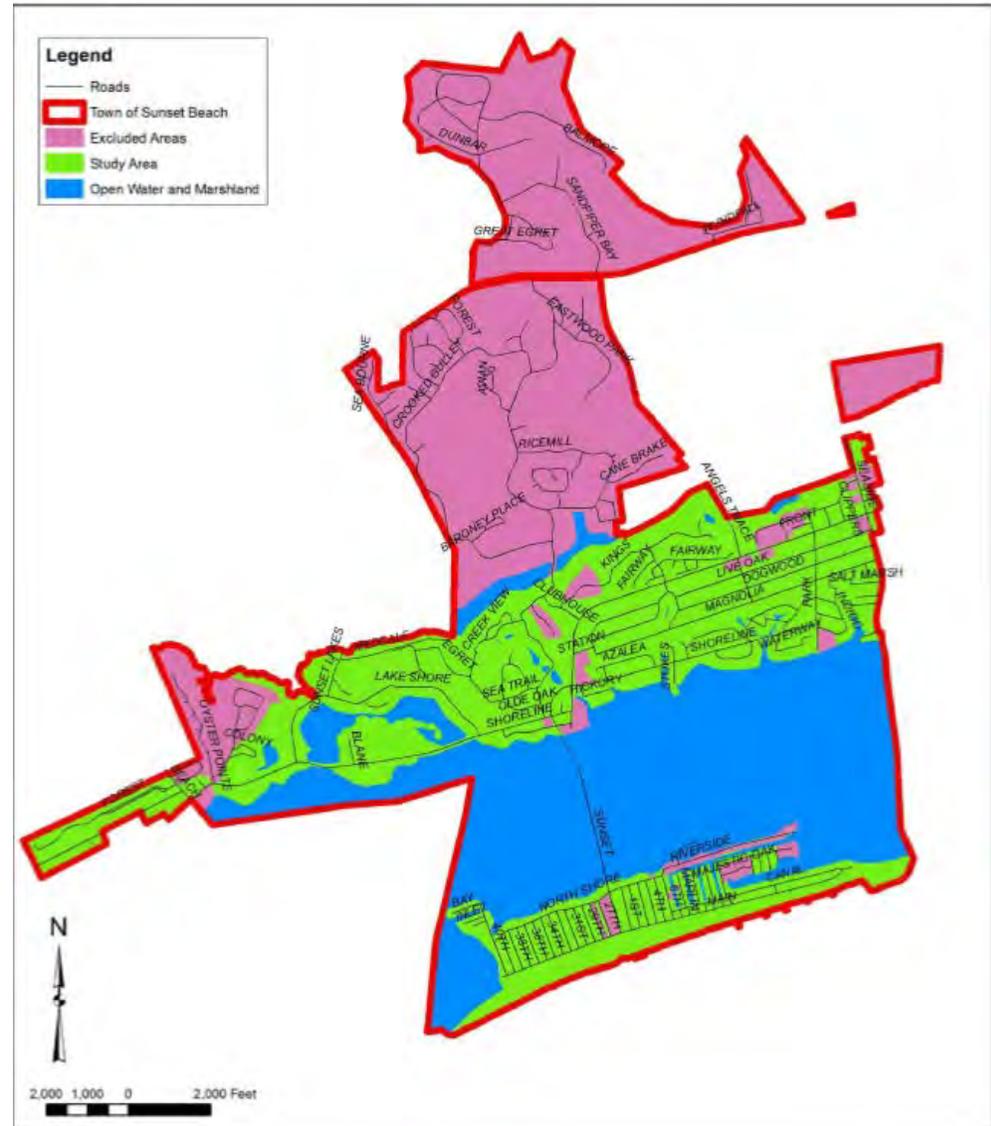
# Project Goals ///

- Map Existing System
- Develop GIS data for incorporation into the Town's GIS Database
- Evaluate System and Identify Deficiencies
- Evaluate Water Quality Issues Related to the Stormwater Drainage System
- Develop a Prioritized List of Projects to Address System Deficiencies and Water Quality Needs
- Identify Possible Funding Sources



# Study Area Maps ///

- 1600 Acre Study Area
- Excluded Areas
  - Open Water/Marsh
  - Areas Developed Under Recent/Current Development Standards

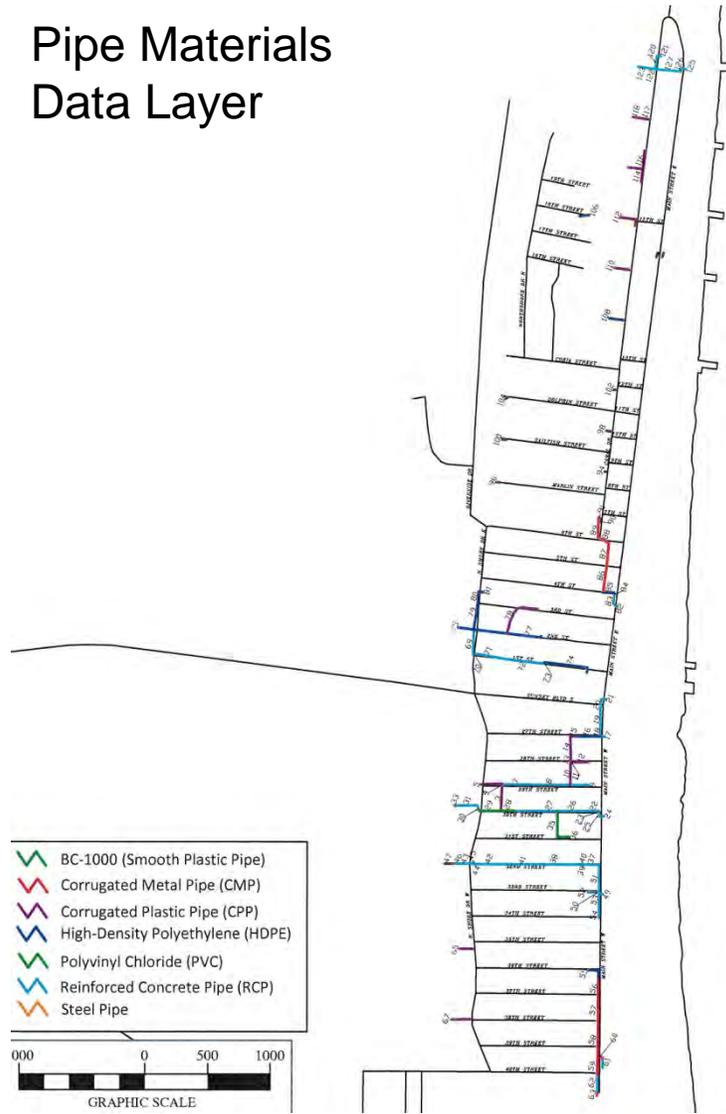


# Data Collection Phase ///

- New survey of entire stormwater drainage system owned and operated by the Town
- Visual inspection and evaluation of system components and drainage area
- Video inspection of select problem areas within the stormwater pipe system



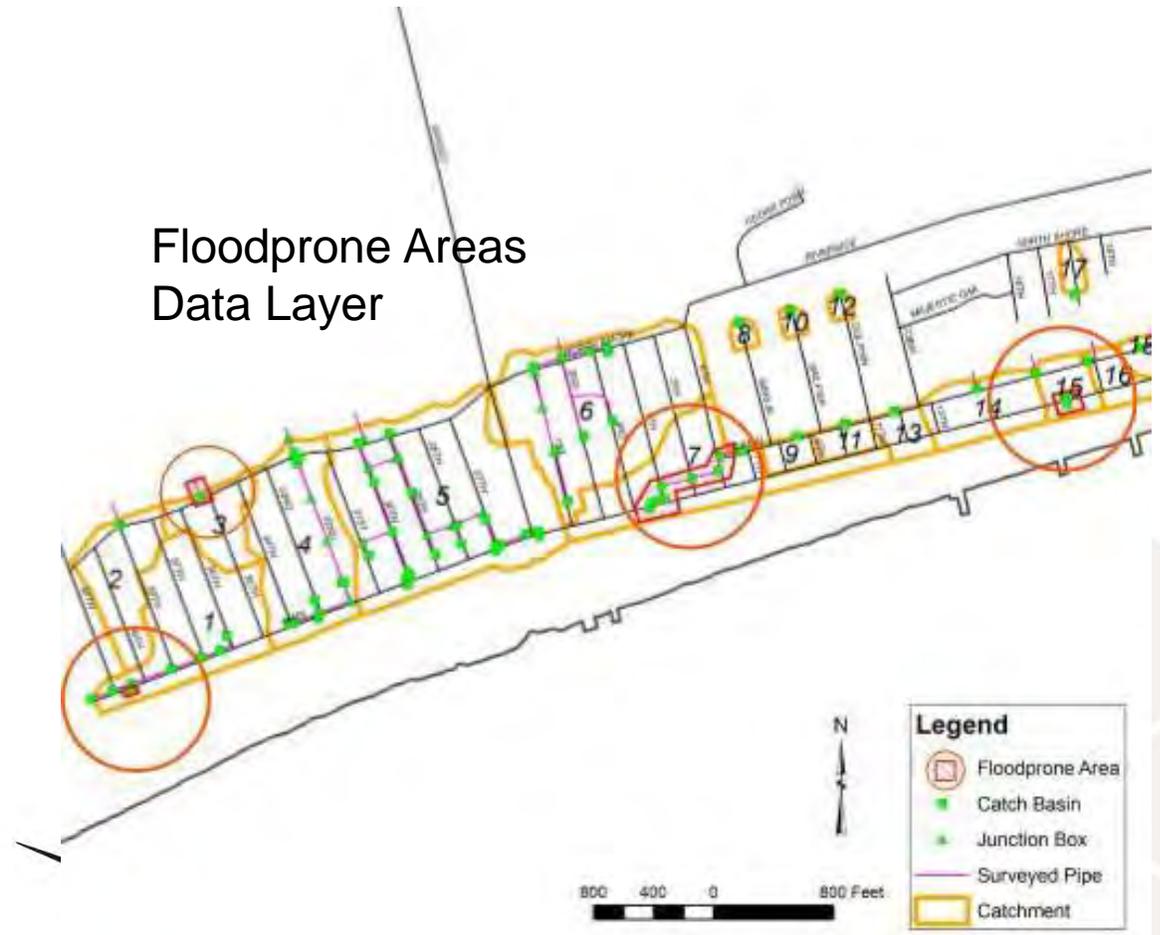
## Pipe Materials Data Layer



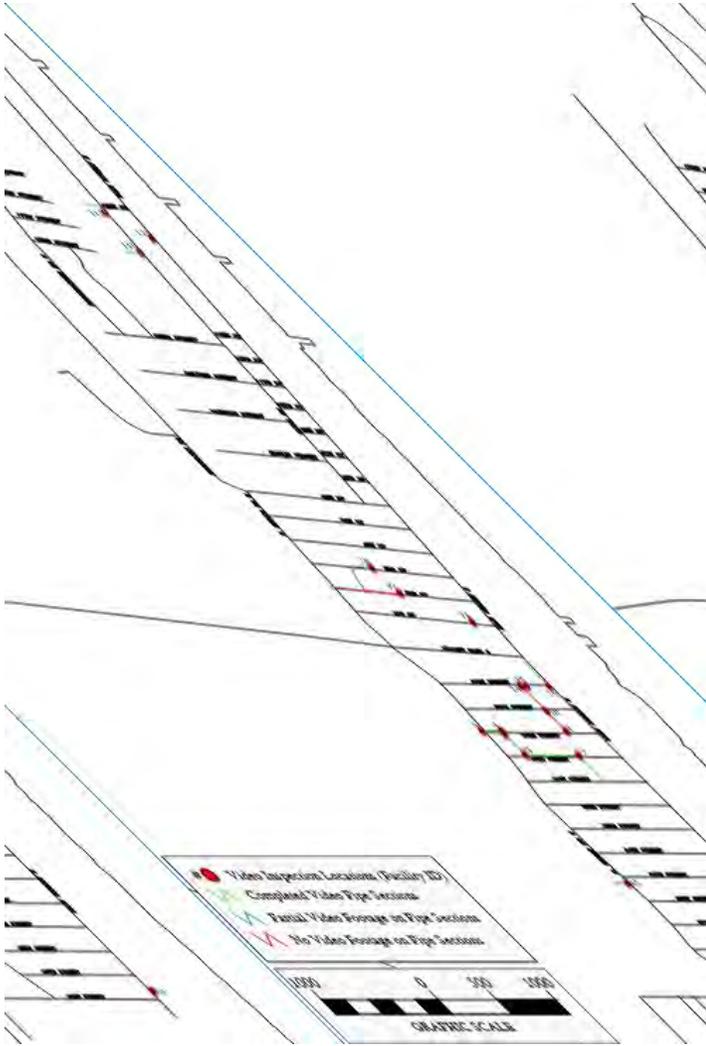
# System Survey and Data Collection



## Floodprone Areas Data Layer



# Pipe Video Inspections



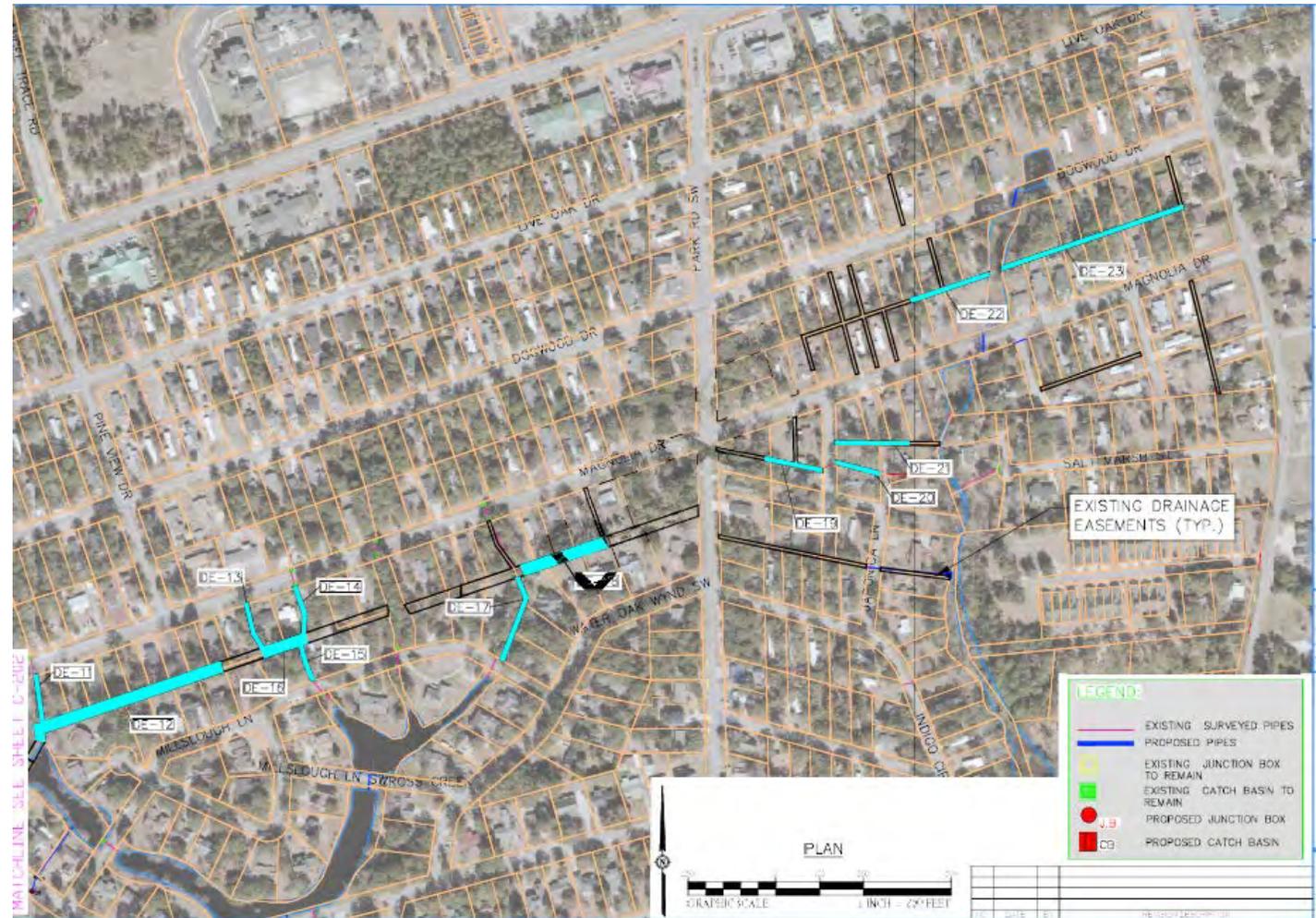
# Data Collection Phase ///

- GPS Mapping of non-surveyed features that are part of or influence stormwater processes within the study area
  - Driveway pipes
  - Roadside Ditches
  - Existing Stormwater Control Measures (SCM)
  - Known Flood Prone Areas



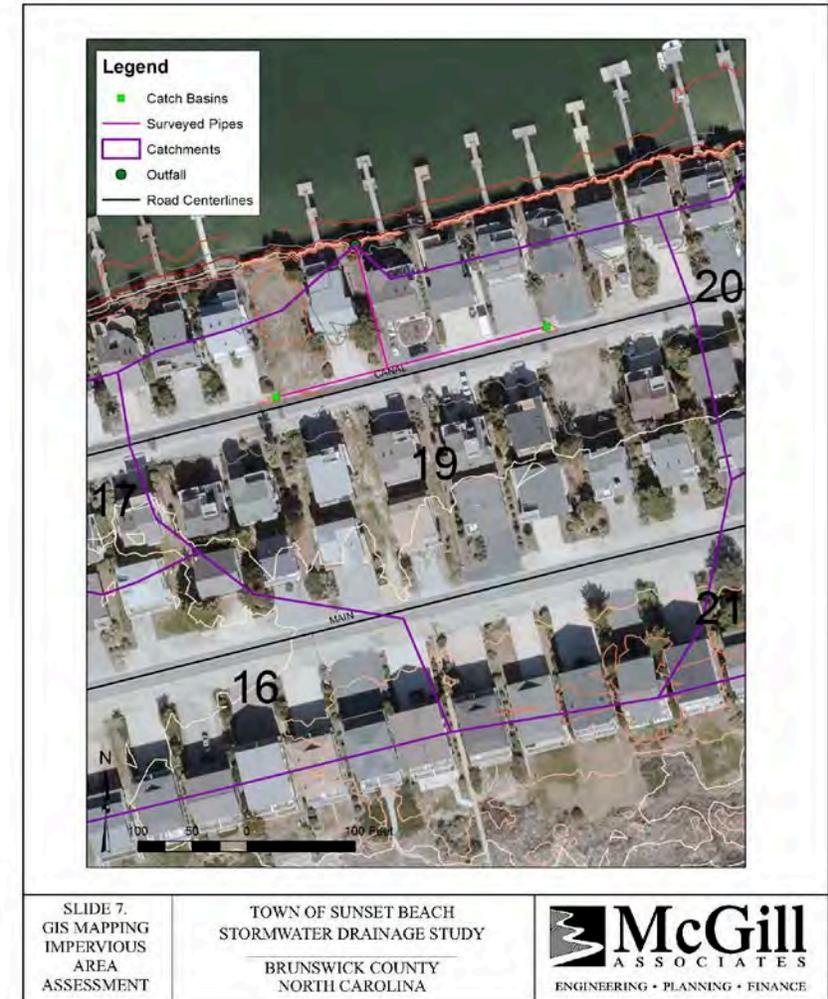
# New Stormwater Easement Survey ///

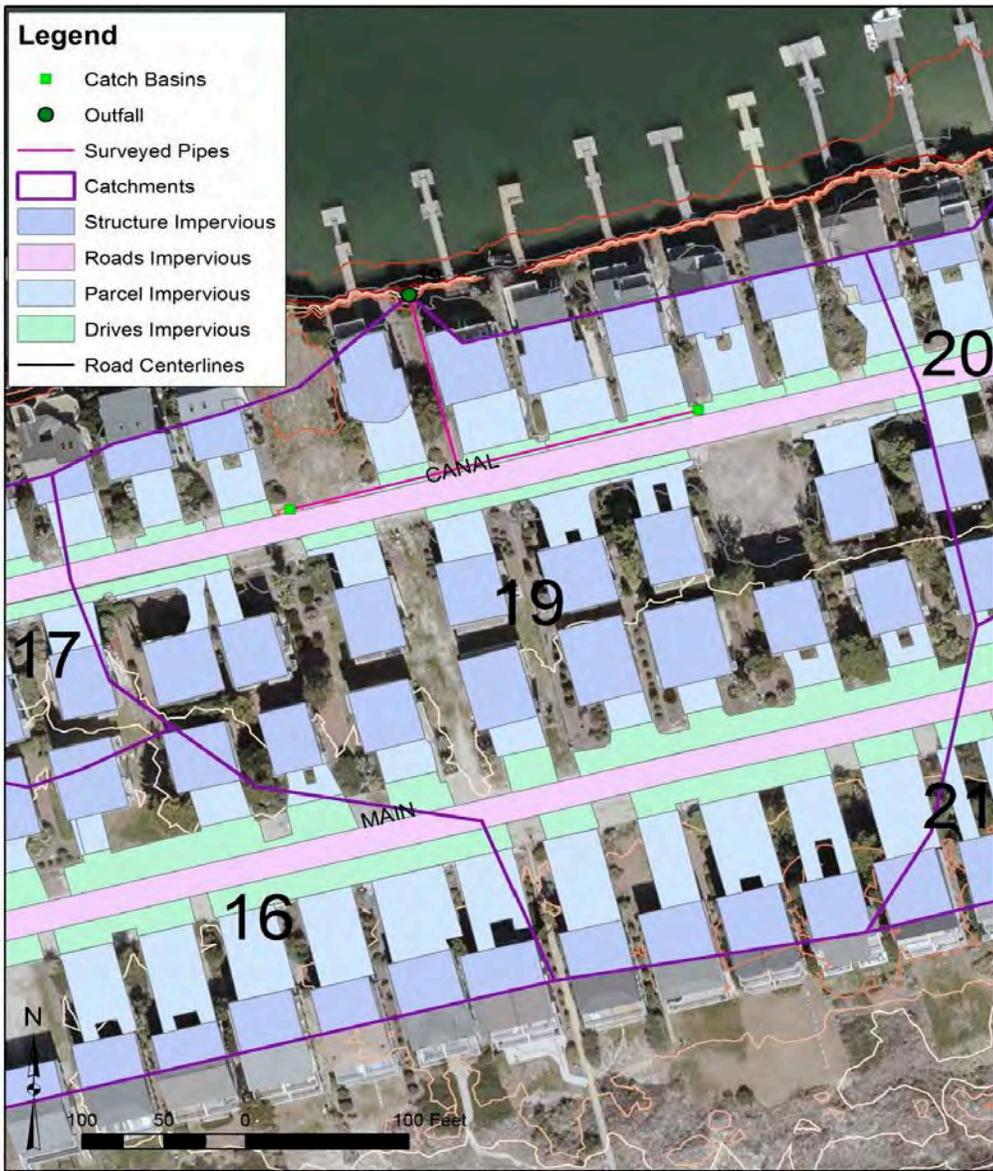
A new survey of all stormwater drainage Easements on both the island and mainland was completed as part of this project.



# Impervious Area Assessment //'

- Source areas for stormwater runoff
- Digitized from 2012 aerial imagery
- Includes Buildings, Roads, Driveways, Parking Areas, Sidewalks, Accessory Structures
- Impervious areas measured on both individual parcels and in Right-of-Way areas throughout the study area
- Prepare Capital Improvements Plan (CIP) to aid in planning for execution of the proposed improvements





## GIS IMPERVIOUS AREA MAPPING

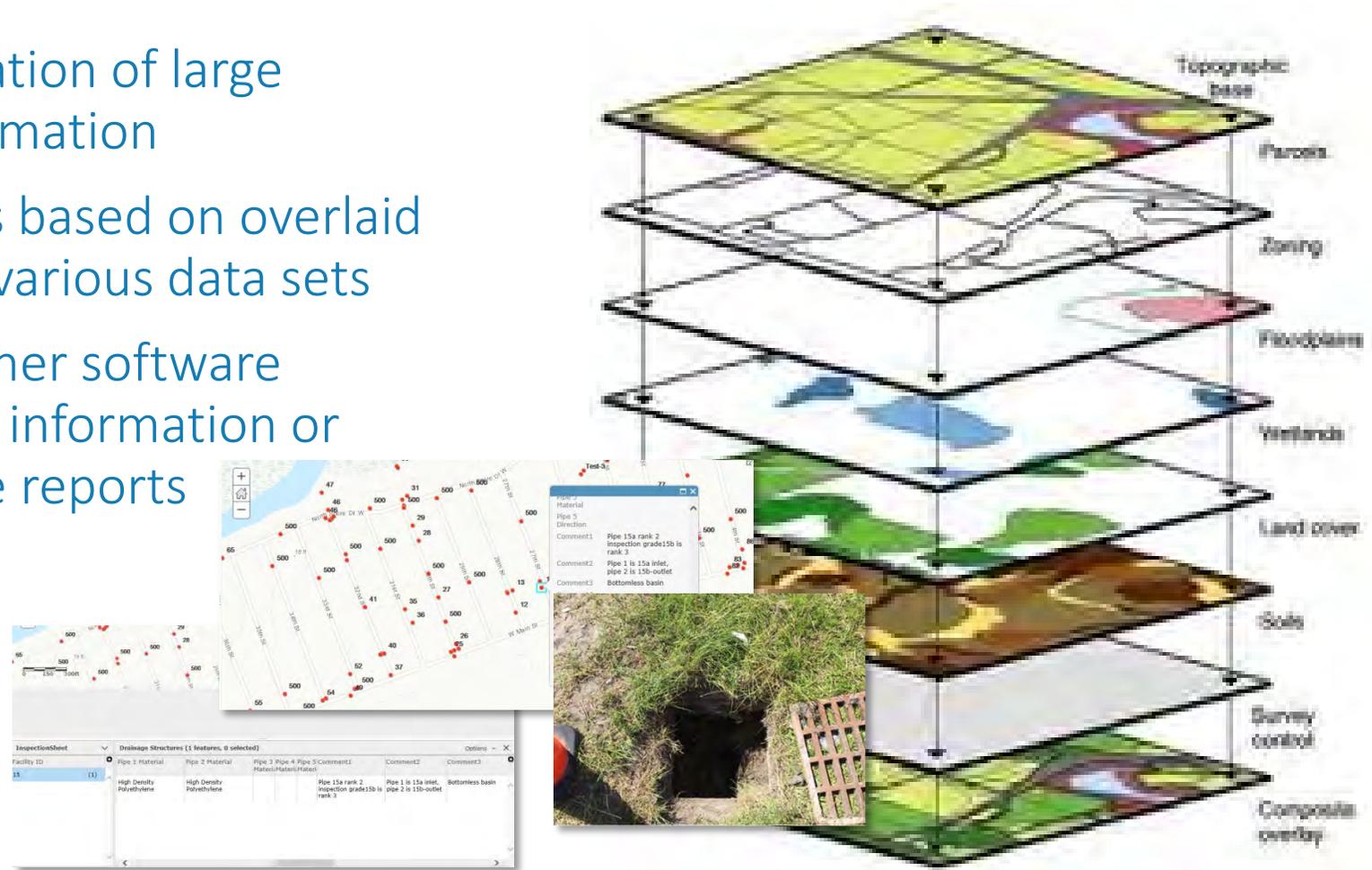
Impervious areas are shown in this slide as colored polygons.

Within GIS, the square footage of each polygon is calculated.

Impervious area polygons are clipped to the boundary of each catchment.

# Geographic Information System – GIS ///

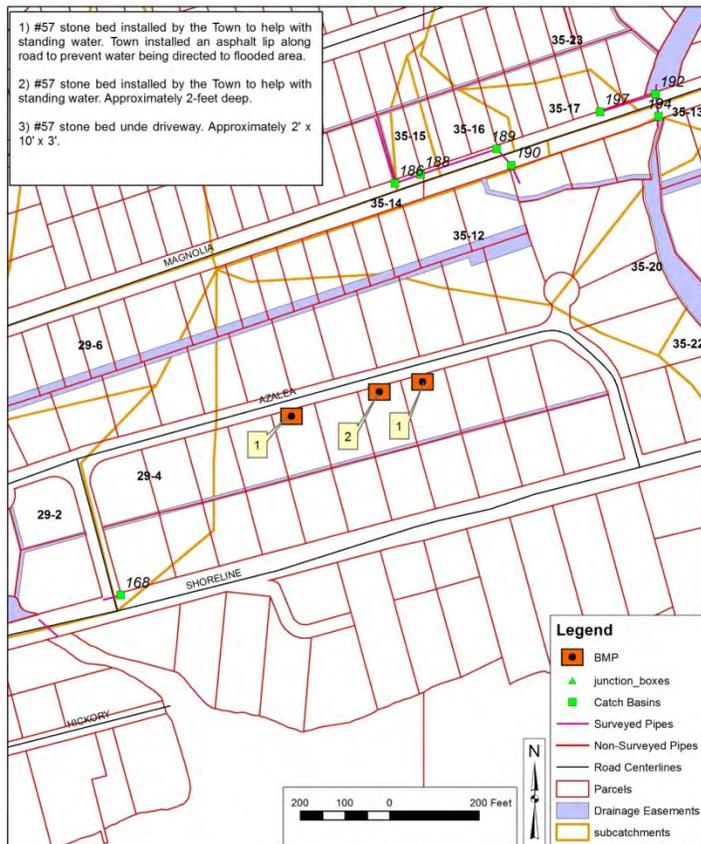
- Allows for assimilation of large quantities of information
- Facilitates analysis based on overlaid characteristics of various data sets
- Interfaces with other software platforms to track information or activities, produce reports



# Geographic Information System – GIS ///

GOAL- To build on existing platform and available data to create a data driven management program that can:

- Store new data from this study
- Track changes in system
- Track maintenance/complaints/new problems
- Facilitate planning and scheduling for needed activities
- Allows expansion to other infrastructure



# System Analysis Phase ///

GOAL – Evaluate existing system for capacity and condition

- Existing system survey
- Visual inspection of system condition
- Hydrologic modeling of drainage areas
- Hydraulic analysis of pipe systems
- Identify deficiencies
- Make recommendations



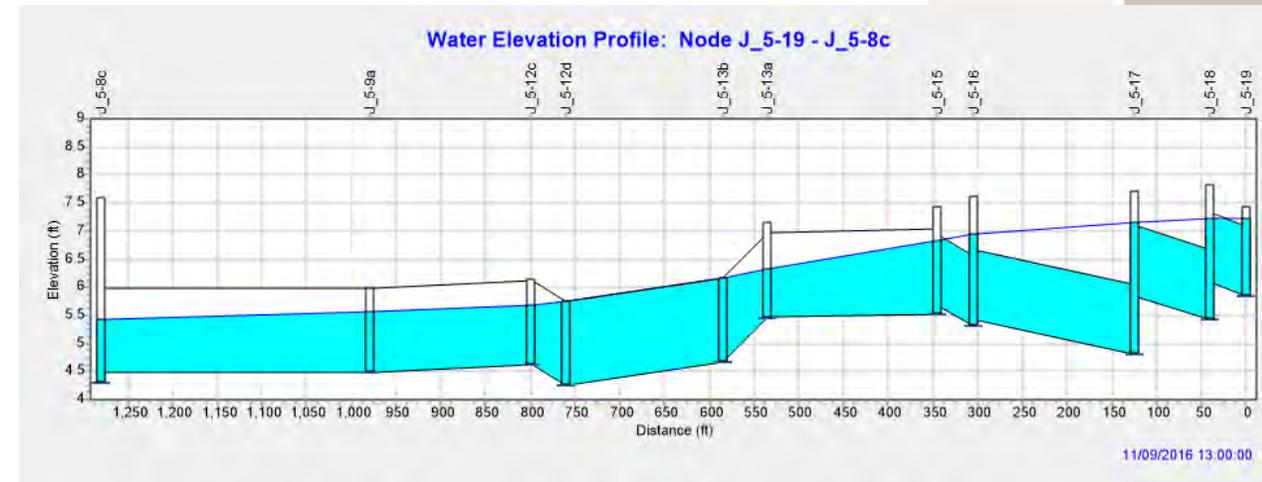
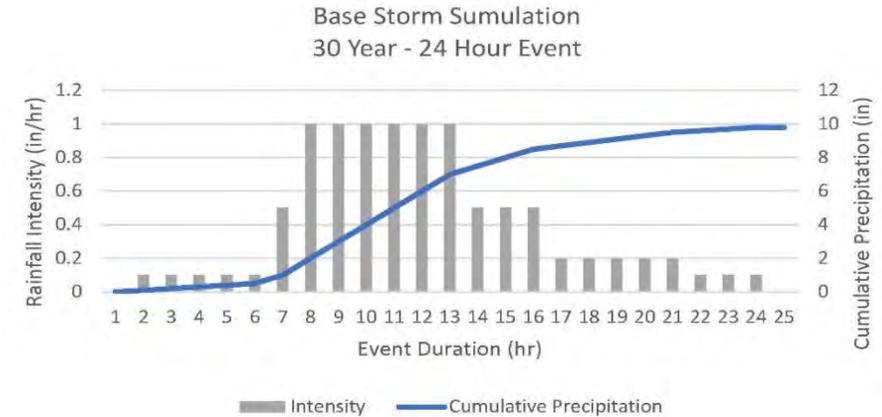
# System Analysis Phase ///

- Determine and map drainage areas for each outfall within the study area (Catchments)
- Sub-drainage areas to each stormwater inlet or pipe (Sub-Catchments)
- Quantify various hydrologic characteristics for each drainage area
  - Soil type
  - % Impervious cover
  - Slope
  - Connectedness of impervious areas



# System Analysis Phase ///

- EPA StormWater Management Model (SWMM)
- Base Storm Event – 30 year – 24 hour storm
  - 9.8 inches of rain
  - 24 hours
- Model runs assumed all pipes in good condition



# Water Quality ///

- Numerous documented WQ issues in receiving waters around Sunset Beach
  - Bacteria
  - Turbidity
  - Nutrients
  - Dissolved Oxygen
- Focus on local stormwater discharge
- Rain washes stuff off surfaces
- Stormwater carries that stuff to natural water bodies
- The less the better



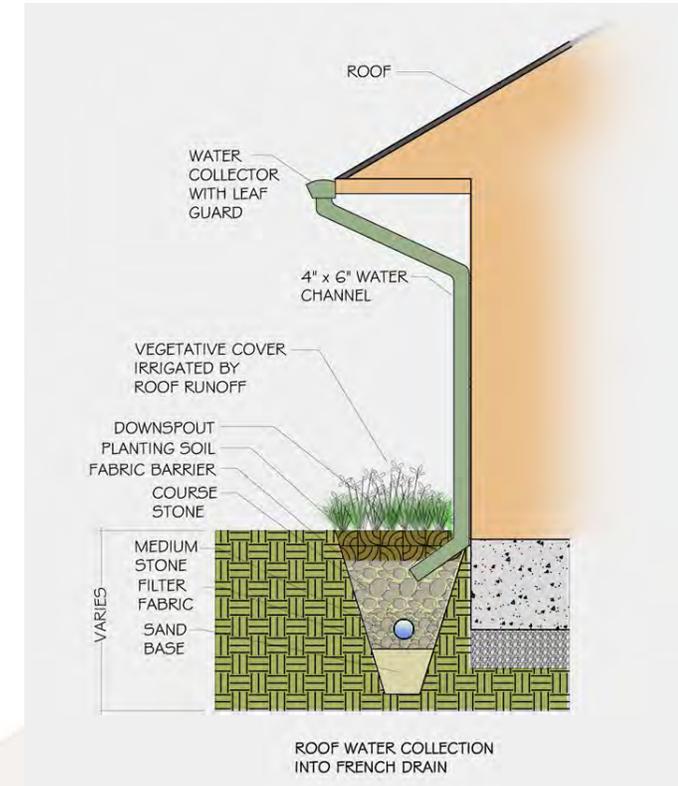
# Water Quality Goal ///

- Reduce the total volume of stormwater discharge, from all sources, that enters natural waterways
  - Source Control
  - In System Treatment
  - End of Pipe Treatment



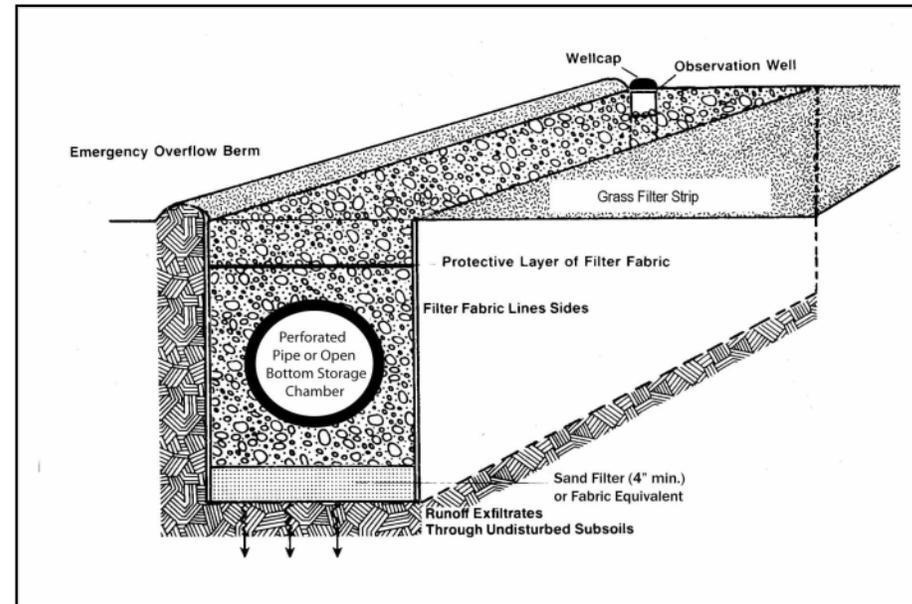
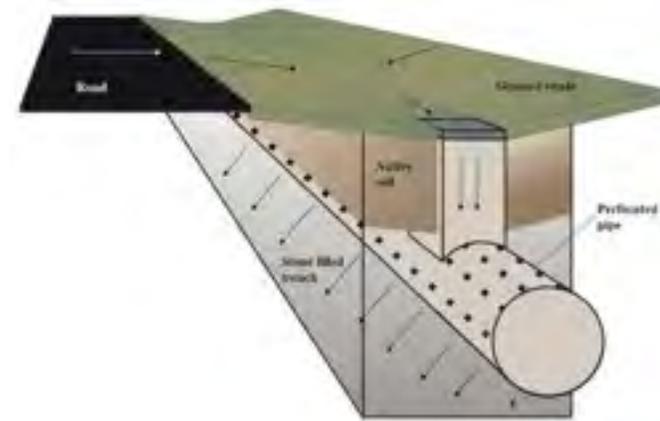
# Water Quality Strategies ///

- Source Controls
  - Rooftop Disconnection
    - Rain Barrels
    - Downspout Redirection
    - Downspout Dry Wells or Rain Gardens
    - Drip Line Infiltration
  - Permeable Pavers
    - Driveways and Residential Parking
    - Patios
  - Flow Redirection



# Water Quality Strategies ///

- Capture and Treat
- Infiltration
  - Infiltration Swales
  - Perforated Stormwater Pipes
  - Catch Basin Drywells
- Existing ponds



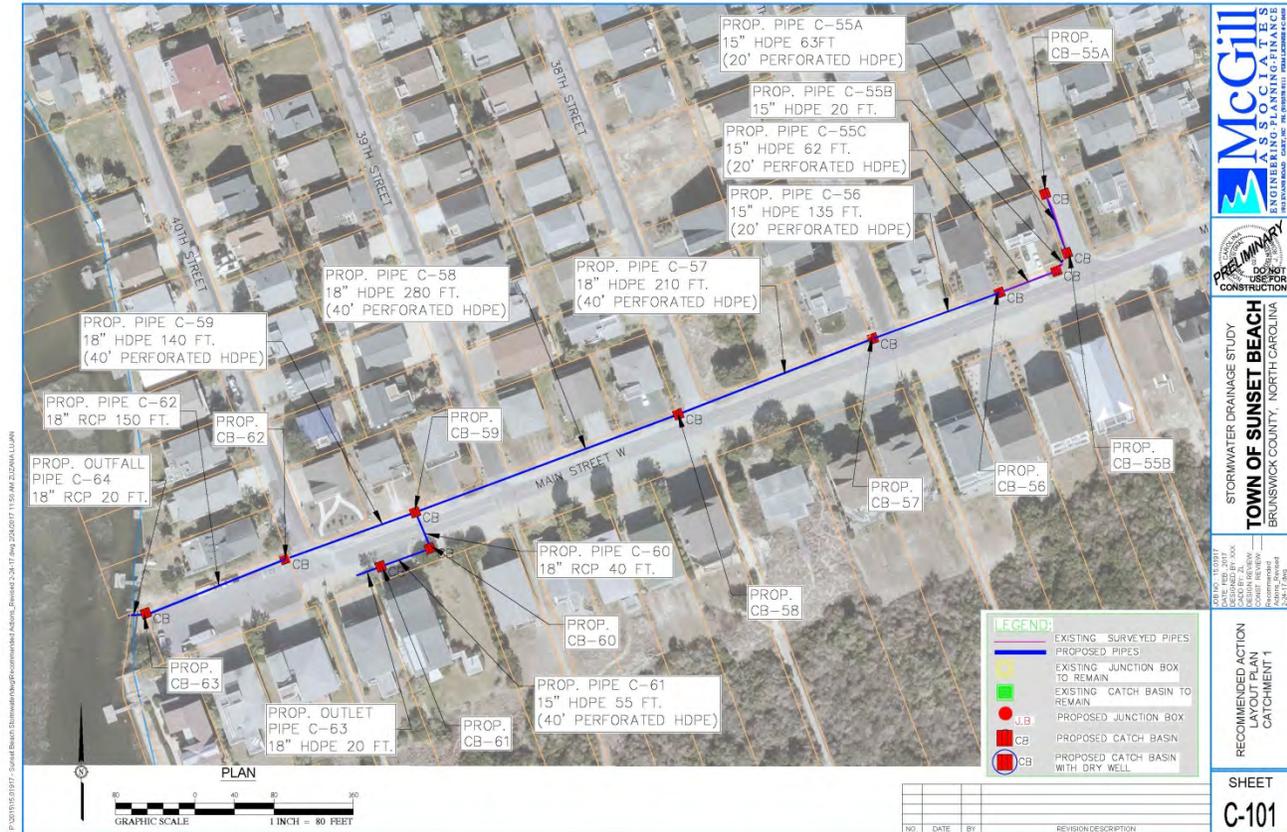
# Capital Improvements Plan - CIP ///

- Pipe System Projects
- Easement Projects
- Equipment Purchase
- Geographic Information System O&M
- Management and personnel training



# CIP – Pipe System Projects ///

- 21 Pipe System Projects
  - 11 Island Projects
  - 10 Mainland Projects
- Broad Range of Projects
  - From One Catch Basin and 30 ft. of pipe
  - To 13 Junctions and 2640 ft. of pipe
- Projects Include Infiltration Measures to Reduce Volume and Improve Water Quality
  - Perforated Infiltration Pipe – 2376 linear feet
  - Catch Basin Dry Wells - 42



# CIP – Pipe System Projects ///

- Most projects involve repairs and upgrades to existing systems
- Some project reroute sections to improve maintenance access
- A few projects will add significant lengths of new pipe to address known flooding problems
- Project designs are conceptual and intended to define scope and magnitude – final designs may vary

PRELIMINARY PROJECT COST ESTIMATE				
May 2017				
SUNSET BEACH STORMWATER DRAINAGE STUDY				
SUNSET BEACH, NORTH CAROLINA				
McGill Associates				
CATCHMENT 1				
No.	DESCRIPTION	QTY.	UNIT	EXTENSION
1	Mobilization (3%)	1	LS	\$ - \$ 3,516.25
2	Demolition (Existing Asphalt Road, Asphalt Driveway)	264	SY	\$ 8.00 \$ 2,112.89
3	15" HDPE	195	LF	\$ 25.00 \$ 4,875.00
4	18" HDPE	470	LF	\$ 27.00 \$ 12,690.00
5	15" HDPE (Perforated, in #57 stone)	40	LF	\$ 62.00 \$ 2,480.00
6	18" HDPE (Perforated, in #57 stone)	180	LF	\$ 67.00 \$ 12,060.00
7	18" RCP	210	LF	\$ 35.00 \$ 7,350.00
8	Catch Basin with Grate	11	EA	\$ 2,000.00 \$ 22,000.00
9	Existing Pipe Removal	1,095	LF	\$ 8.00 \$ 8,760.00
10	Existing Structure Removal	9	EA	\$ 500.00 \$ 4,500.00
11	Asphalt Road Repair	246	SY	\$ 125.00 \$ 30,751.67
12	Gravel Driveway Repair	117	SY	\$ 70.00 \$ 8,166.67
13	Asphalt Driveway Repair	18	SY	\$ 80.00 \$ 1,422.22
14	Miscellaneous Private Property Repair	12	LOT	\$ 200.00 \$ 2,400.00
<b>Subtotal Construction Cost Estimate</b>				<b>\$ - \$ 123,124.70</b>
Contingency (15%)				\$ 18,468.70
<b>TOTAL CONSTRUCTION ESTIMATE</b>				<b>\$ 141,593.40</b>
No.	DESCRIPTION			EXTENSION
1	Surveying, Geotechnical, Design, Permitting (20%)			\$ 28,318.68
<b>TOTAL COST ESTIMATE</b>				<b>\$ 169,912.08</b>

- NOTE:
- 1) Drainage easement acquisition cost is **not included**
  - 2) The cost of clearing, grading and stabilization is **not included**, but is estimated to be approximately \$10/sy.

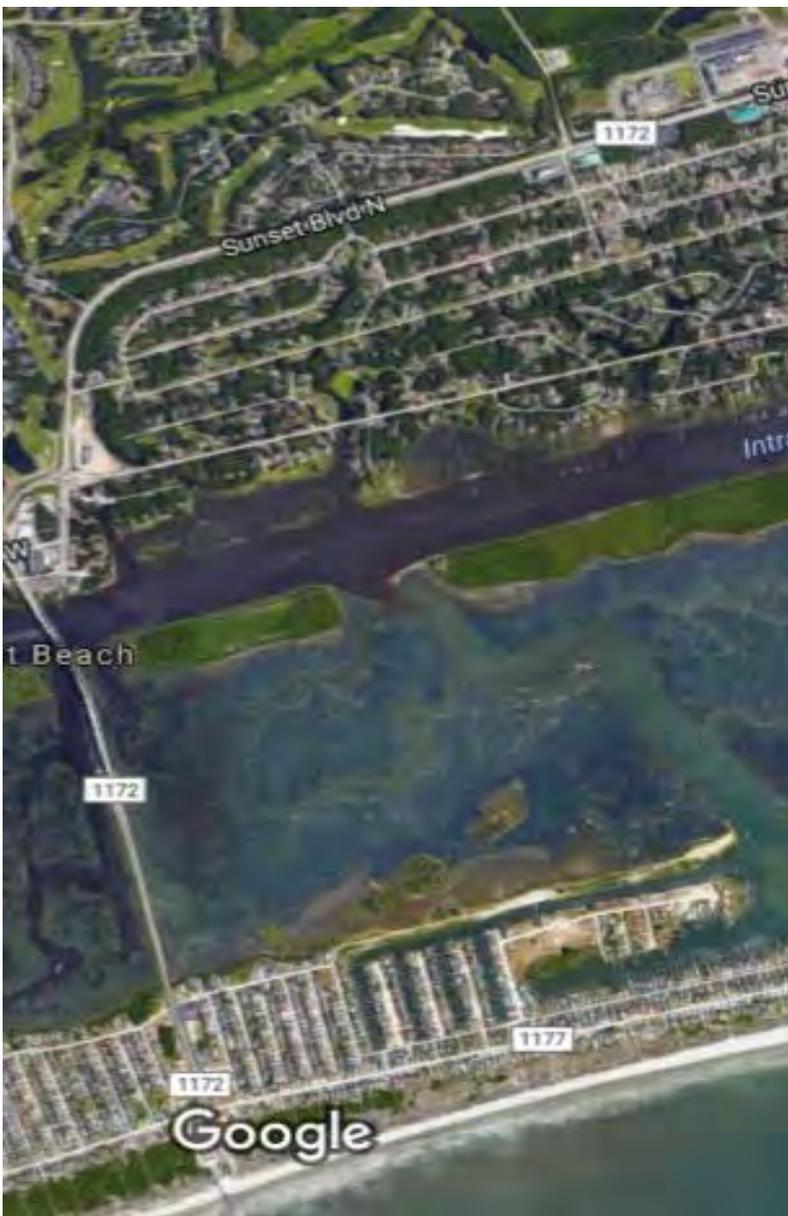


McGill Associates  
 TOWN OF SUNSET BEACH  
 STORMWATER DRAINAGE STUDY  
 CATCHMENT 1  
 SHEET C-108



# CIP – Maintenance Program Recommendations

- Maintenance is a major component of stormwater management program
  - Over 3 miles of storm drainage pipe
  - Catch basins, junctions
  - Ditches
  - Growing number of infiltration measures
- Many system components 20 to 30 years old
- Many known problems – More anticipated





# CIP – Maintenance Program Recommendations

- Regular inspections
- Cleanout and minor repairs
- Scheduled activity vs Emergency response
- In-house capability facilitates regular routine operations
- In-house capability requires equipment, trained personnel, and a managed process

# CIP – Equipment Recommendations



- Pipeline inspection camera system
- Combination Hydro-Vacuum Truck
- Street Sweeper

# Pipeline Inspection Camera System

## IN-HOUSE ADVANTAGE

- Allows routine use for inspections and project planning
- Allows inspection inside closed pipe systems
- Locates spot failures – avoids waiting for a sink hole
- Determination of required action – structural repair or routine maintenance
- Identifies problems early and avoids emergency repairs

# Combination Hydro-Vacuum Truck

## IN-HOUSE ADVANTAGE

- Cleaning pipes and boxes becomes routine maintenance not occasional subcontracted service
- Rapid response to reported/discovered problems
- Immediate post-storm maintenance

# Street Sweeper

## IN-HOUSE ADVANTAGE

- Maintain sidewalks and bike lanes rapidly and efficiently
- Maintenance of permeable pavers that will enhance function and prolong system lifespan



# NEXT STEPS ///

- Formal adoption of SWM Plan and CIP
- Establish Implementation Team
- Identify budgetary needs
- Annual review of CIP budgets
- Move forward with annual CIP projects
- Reviews of completed and planned projects and activities

