Swansboro LASII Stormwater Master Plan

Town of Swansboro

Onslow County, NC

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Glossary

FLOOD – a general and temporary condition of partial or complete inundation of normally dry land areas

HYDRAULICS - the science of dealing with fluids in motion that is used to determine how a quantity of water will flow through a channel or floodplain

HYDRAULIC GRADE LINE – a graphical representation of the sum of the pressure head and the elevation head along a conduit or an open channel

HYDROLOGY - the science of dealing with the distribution and circulation of water in the atmosphere, on land surfaces, and underground that is used to determine flood flow frequencies

IMPERVIOUS SURFACE - a hard surface that prevents water from infiltrating into the ground

INUNDATION - an area over which flood waters extend

INVERT - vertical elevation of specified point; for pipes, interior bottom elevation

LAND USE - the characterization of land surface based on what it is being used for or will be used for in the future

LF – Linear Feet

MANNING'S N - a coefficient which represents the roughness or friction applied to the flow based on the surface characteristics

OVERLAND FLOW – the movement of water (rainwater, snowmelt, or irrigation) across the land surface when it can no longer infiltrate the soil

RAINFALL DEPTH - the quantity of rain falling within a storm of a specific duration distributed uniformly over the watershed area

RCP – Reinforced Concrete Pipe

STORMWATER - water that originates from precipitation, including heavy rain and meltwater

CATCHMENT/SUBCATCHMENT - an area of land where all flowing surface water converges to a single point

TOPOGRAPHY - a detailed description or representation on a map of the natural and artificial features of an area

X-YEAR STORM - flood recurrence interval indicating that a storm of a certain magnitude has a 1/x% probability of occurring during any given year

Executive Summary

The Town of Swansboro (Town) has contracted WithersRavenel for the development of a Stormwater Master Plan (SWMP) to review and evaluate its existing stormwater infrastructure for the downtown area and of the portion of town southwest of Swansboro Loop Rd and East of Hammocks Beach Rd.

WithersRavenel surveyed storm drainage infrastructure and conducted a public input survey as part of the data collection efforts for this study. The Town facilitated a public input meeting to address how stormwater runoff impacts local residential neighborhoods and properties, inviting residents to share their concerns and insights. This initiative aimed to gather firsthand accounts of recurring flooding, property damage, and drainage issues experienced by homeowners, so that proposed improvements were directly informed by community needs and local expertise.

Using the stormwater GIS inventory, an existing conditions model was developed that utilized 1D elements for linear conveyance and a hybrid 1D/2D approach for areas with more complex overland flow. This model was used to simulate the 10-, 25-, and 100-year, 24-hour storm events. Maximum depth maps were then generated to depict the depths and extents of flooding for each simulated event, from which three (3) concept designs were identified. Conceptual level improvements for each area were developed and modeled that provide flood mitigation and decrease inundation time.

PCSWMM, with simulations run using EPA's Storm Water Management Model (SWMM) version 5.2.4 engine, was used to build a combined hydrologic/hydraulic model to assess the capacity of the existing system, identify deficiencies, and evaluate potential improvements. Results are to be reviewed at a Town-wide level and not an individual lot level of detail. This model did not include lot specific topographic data and was not analyzed at that scale.

The model results, along with Town input, were used to identify areas of concern. Areas of concern were areas where the resulting water surface elevations compared to the existing ground elevations would produce roadway inundation from the closed network system and/or impacted access to public or essential facilities.

An assessment of conceptual level stormwater improvements, designed to mitigate existing flooding conditions, along with Engineer's Opinion of Probable Cost, were provided for three (3) priority concept designs:

- **Concept Design 1: Forestbrook Neighborhood Drainage Improvements –** Proposed stormwater improvements for Concept Design 1 include upgrading existing stormwater infrastructure to larger and dual-barrel pipes across PAOCs 1 – 6 to increase drainage capacity. Model results indicate improvements reduce the depth and duration of roadway inundation along Forest Lane, Brook Crossing Road, and Oak Ridge Court by increasing system capacity.
  Engineer's Opinion of Probable Cost: $935,000
- **Concept Design 2: Holly Lane Drainage Improvements –** Proposed stormwater improvements for Concept Design 2 involve upsizing and extending the trunkline on Holly Lane and redirecting flow from an existing ditch behind Phillips Drive to a proposed system on Dogwood Lane (PAOCs 9 – 11). Model results indicate improvements reduce the depth and duration of roadway inundation along Holly Lane by increasing system capacity and diverting flow.
  Engineer's Opinion of Probable Cost: $2,474,000
- **Concept Design 3: Water Street & Church Street Drainage Improvements –** Concept Design 3 proposed stormwater improvements focused on increasing system capacity along Water Street, Church Street, and Front Street (PAOCs 26 – 28). CAMA outfall permitting limitations were also considered in this area. Model results indicate improvements reduce the depth and duration of

roadway and structural inundation along Water Street, Front Street, and Church Street by increasing the amount of flow the system can carry.

Engineer's Opinion of Probable Cost: $2,490,000

Budgetary cost opinions were prepared for the three (3) proposed improvements, which were subsequently ranked through a weighted decision matrix to determine order of priority for construction. Of the identified concepts, Concept Design 3: Water Street & Church Street Drainage Improvements is considered the top priority. It is recommended to focus on this design for upcoming funding cycles to take advantage of its potential for water quality improvements.

Based on the findings of this study, it is recommended the Town prioritize several key actions to address flood inundation and enhance its drainage infrastructure and management. First, it is recommended that a portion of the Town's stormwater utility charge be allocated to support the maintenance and long-term use of the stormwater asset inventory as a core component of system management. To ensure the inventory remains accurate and actionable, investment in dedicated GIS software and ongoing staff training will be necessary to support data management, routine updates, and effective use across departments. Secondly, a comprehensive pumping plan and rapid-deployment strategy for emergency flood walls should be considered. Standardization of emergency procedures is recommended to minimize response times and provide a reliable defense for residential and commercial zones at high risk of inundation. Additionally, as improving water quality is a vital component of the Town's environmental stewardship, it is recommended the conceptual designs detailed in this report be integrated with the Town's 9-element plan to restore impaired water quality (Town of Swansboro & North Carolina Coastal Federation, 2017). The installation of flap gates at major outfalls may also be considered as one potential option to reduce inundation but should be evaluated in detail before installation in case of adverse effects. Furthermore, the Town should formalize a CIP that integrates the priorities and project recommendations identified in its previously adopted watershed restoration plan and RCCP resilience strategy. The prioritization matrix provided to the Town in this report should be used as a guiding framework for evaluating, ranking, and sequencing capital projects within the CIP. Finally, proactive identification and pursuit of diverse funding opportunities – such as federal and state grants, cost-share programs, and partnerships with regional agencies—is recommended to support implementation of stormwater projects.

Introduction

The Town of Swansboro, designated as a zone highly vulnerable to storm surge and flooding, experiences significant flooding during hurricanes and tropical storms. For example, the town suffered from heavy flooding during Hurricane Matthew (2016), Hurricane Florence (2018), Hurricane Isaias (2020), and Hurricane Ian (2022). Hurricane Florence produced approximately 34 inches of total rainfall over the course of several days as shown in FIGURE 1 below (Collins, 2018). As the frequency and intensity of rainfall events continue to trend upward (Kunkel et al., 2020), the Town has a vested interest in addressing these stormwater related issues.

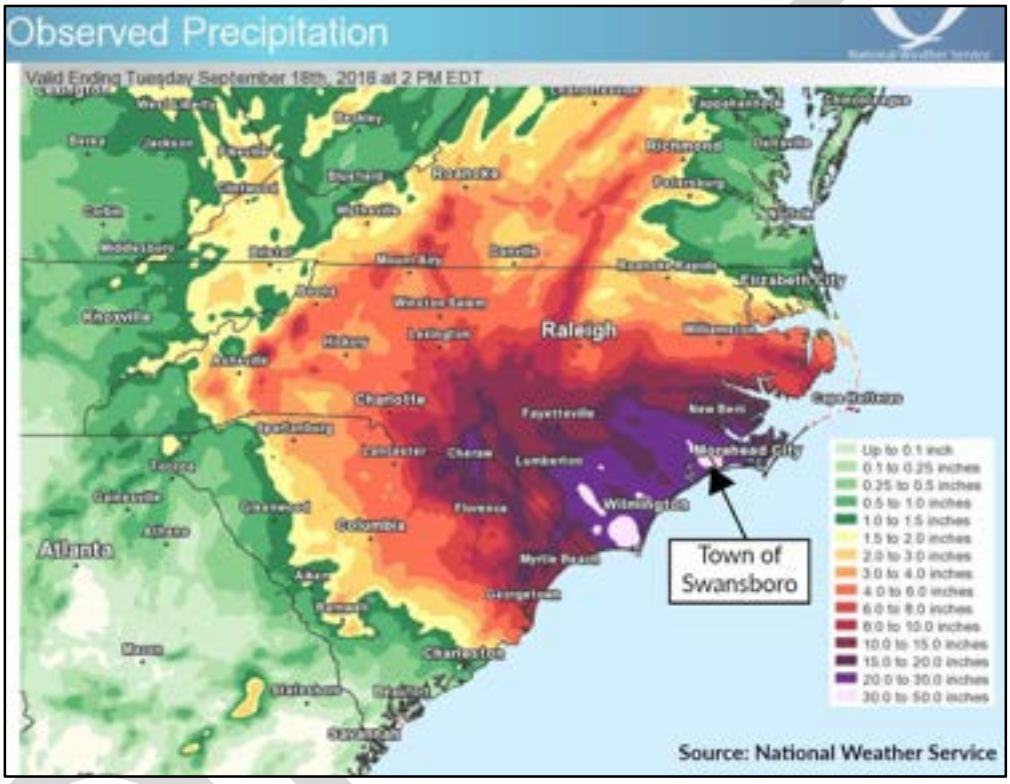

Figure 1. Hurricane Florence Cumulative Rainfall over Swansboro 09/18/2018 14:00

Town is utilizing Local Assistance for Stormwater Infrastructure Investments Program ("LASII") funds to map stormwater infrastructure and develop a master plan for the designated study area. The extents of the project can be seen in FIGURE 2; the analysis is focused inside the Town's jurisdiction but some of the drainage area falls outside the Town boundary.

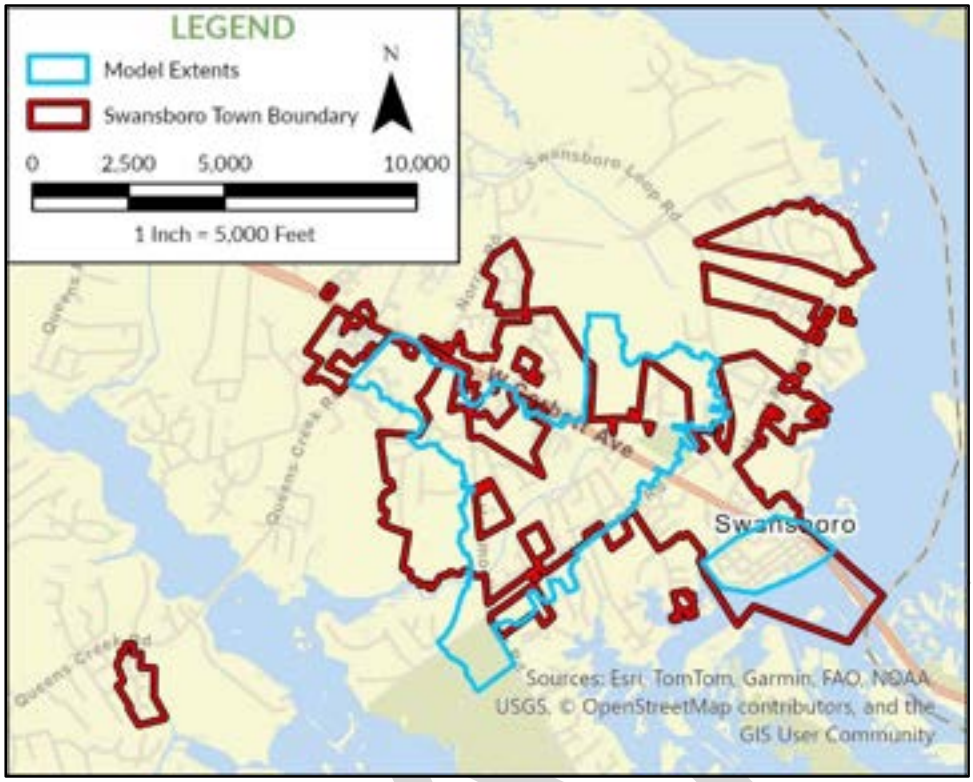

Figure 2. Project Extents Map

Previous Planning Efforts

The Town has previously completed two plans to address stormwater management, flooding, and water quality improvement: their 9-element "Watershed Restoration Plan" and "Resilient Coastal Communities Program" Resilience Strategy (Town of Swansboro & North Carolina Coastal Federation, 2017 and Dewberry Engineers Inc., 2022). The Watershed Restoration Plan provides a comprehensive framework for reducing stormwater runoff and associated pollution in the Town's creeks and tributaries that drain to the White Oak River and Queen Creek, setting measurable goals to infiltrate and reduce more than 13 million gallons of polluted runoff through targeted retrofits, community education, and stormwater control measures to restore natural hydrology and improve water quality over time. In contrast, the Resilience Strategy — developed as part of North Carolina's Resilient Coastal Communities Program — focuses on assessing local coastal hazards and vulnerabilities, public engagement, and prioritizing a portfolio of resilience projects (including stormwater, flooding, and nature-based solutions) so that the Town can plan for, design, and ultimately implement actions that enhance its resilience to coastal storm impacts and long-term climate risks.

Town Description

The Town of Swansboro is located in Onslow County, North Carolina. According to the United States Census completed in 2020, the Town has a population of 3,744 people. The Town encompasses an area of approximately 2.3 square miles.

Watershed Description

The Town is in the White Oak River basin and is situated within three (3) sub-watersheds as defined by the United States Geological Survey (USGS) 12-digit Hydrologic Unit Code (HUC). Much of the Town's residential and commercial districts lie within the Queen Creek and White Oak River sub-watersheds (12-digits HUC 030203010301 and HUC 030203010206, respectively) while the downtown area lies within Bogue Sound-Bogue Inlet sub-watershed (12-digit HUC 030203010304). The HUC-12 boundaries can be seen in FIGURE 3.

Due to its location in North Carolina's Coastal Plain, the town is characterized by low-lying topography as shown in the Digital Elevation Model (DEM) in FIGURE 3.

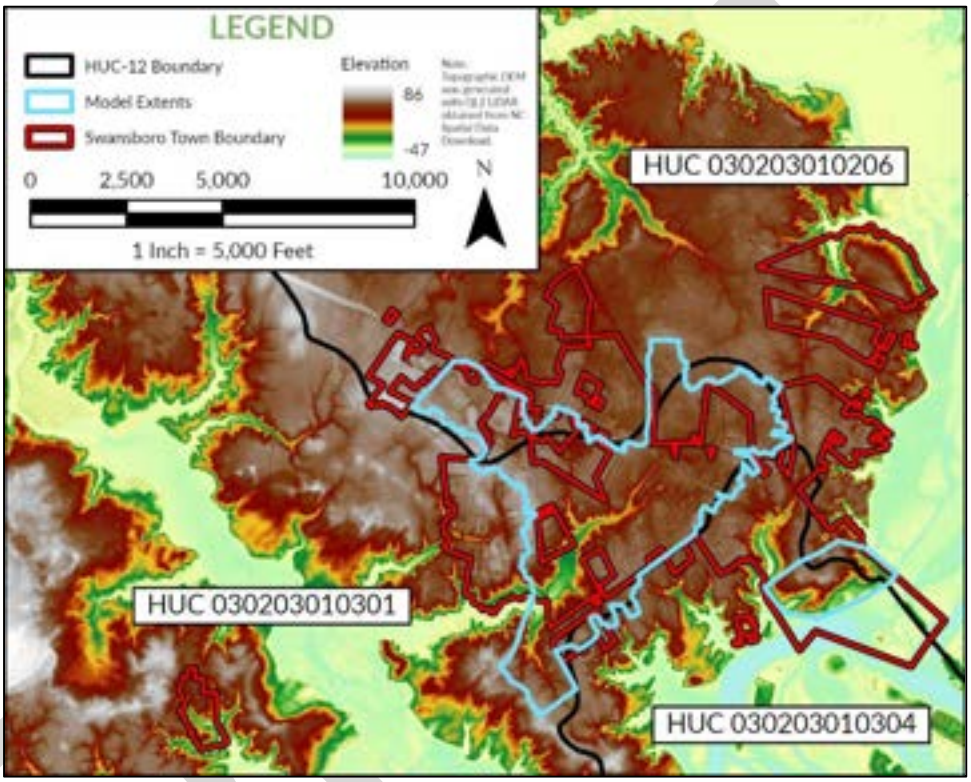

Figure 3: Digital Elevation Model Map

Study Overview

The development of the Town of Swansboro's Stormwater Master Plan consisted of six (6) major components:

- Stormwater GIS Inventory and Data Characterization
- Existing Hydrologic and Hydraulic Analysis
- Identification of Potential Areas of Concern
- Proposed Conceptual Improvements
- Preliminary Cost Opinions for Proposed Concept Designs
- Prioritization of Concept Designs

Stormwater GIS Inventory

Storm Sewer System Data

Stormwater inventory data collection involved the systematic identification, characterization, and documentation of existing pipes, storm drainage structures, outfalls, and drainage ditches within Town limits. Data collection was intentionally limited to publicly accessible areas, including rights-of-way, drainage easements, open space, and Town-owned properties; privately owned property was not accessed as part of this effort. WithersRavenel conducted a detailed, field-based stormwater infrastructure survey spanning June 2024 through February 2025 (non-continuous), using GPS-enabled data collection tools integrated with GIS to support the development of a comprehensive and spatially accurate stormwater asset inventory.

A total of 912 stormwater structures were inventoried, including 784 drop inlets and curb inlets and 128 manholes. For each accessible structure, field crews collected detailed attribute information including structure type, rim and invert elevations where feasible, pipe material, pipe size, connectivity, and observed condition. 114 inlets and 4 manholes were identified with the condition of “poor” or “needs repair.” Structures that did not meet survey-grade GPS quality or were otherwise inaccessible were documented accordingly, with location and attribute information supplemented using GIS analysis, aerial imagery, and LiDAR data. Field investigations were also conducted to identify ditch locations, drainage patterns, and system connectivity, including visual inspection of facilities and outfalls and limited assessment of blockages, structural issues, and conveyance deficiencies where observable.

This effort represented a major focus of the project and was undertaken not solely to support hydrologic and hydraulic modeling, but to provide the Town with a durable, usable stormwater asset management resource. Data quality control and connectivity screening were performed using advanced GIS tools to identify inconsistencies, resolve topology issues, and improve flow direction accuracy throughout the network. Where assumptions were required due to limited access or incomplete information, those assumptions were informed by field observations, available data sources, and coordination with Town staff to incorporate institutional knowledge of the system.

On April 1, 2025, WithersRavenel delivered a new, consolidated stormwater inventory database to the Town. WithersRavenel also coordinated with Town staff to support incorporation of the stormwater database into the Town Fire Chief’s existing GIS and data management system to improve interdepartmental access, emergency response awareness, and long-term utility of the data. The finalized geodatabase provides the Town with a centralized, up-to-date stormwater infrastructure inventory that supports capital planning, maintenance prioritization, emergency response, and future system updates, in addition to serving as the foundation for stormwater modeling and analysis.

For modeling purposes, all inventoried infrastructure was conservatively assumed to be in good condition and operating as designed. In areas where portions of the system could not be located or accessed, assumptions regarding connectivity were made and documented, and were reviewed with the Town based on staff experience and historical understanding of the system.

Data Characterization

Topographic Data

The USGS Coastal National Elevation Database (CoNED) integrates Light Detection and Ranging (LiDAR) and bathymetric data into a single database that is both vertically and horizontally aligned to a matching

reference system (NOAA, 2022). Data for Onslow County was compiled in 2022 and collected 4 points per square meter. The data was downloaded from the National Oceanic and Atmospheric Administration's (NOAA) data access viewer as 1 meter Digital Elevation Models (DEM). The projected coordinate system used in all applications was NAD 1983 (2011) State Plane North Carolina FIPS 3200 (US Foot).

Soils Data

Soils data was obtained in digital formats from the NRCS Soil Survey Geographic (SSURGO) Database. Each Map Unit Symbol (MUSYM) corresponds to a hydrologic soil group (HSG) (See APPENDIX 2).

Land Use Data

WithersRavenel contracted Ecopia AI to delineate the Town's land cover. Ecopia uses an artificial intelligence-based (AI) mapping system to detect and extract land cover features captured in their input imagery, whether natural or manmade, and classifies the results into distinct layers depicting critical landscape elements and infrastructure (Ecopia AI, 2026). 26 distinct land use classes were identified. The land use raster was reviewed to ensure the impervious areas were accurately categorized. See APPENDIX 2 for a land use map of the Town.

Existing Hydrologic and Hydraulic Analysis

Precipitation Data

Total precipitation depths for the 10-, 25-, and 100-year, 24-hour storms were defined based on NOAA Atlas 14 precipitation data. The precipitation distribution for the project location follows the NRCS Type-III Synthetic 24-hour Rainfall Distributions (TR-55). For NOAA Atlas 14 precipitation data and cumulative rainfall depths for the three design storms, see TABLE 1 and APPENDIX 1.

Table 1. Rainfall Depths for Select Design Storms (24-hour)

Return Period (year)	Precipitation Depth (inch)
10	6.88
25	8.54
100	11.6

Subcatchment Characteristics and Hydrologic Calculations

Subcatchments were delineated using PCSWMM tools with 2022 LiDAR DEM, retrieved from the USGS CoNED, and existing drainage network to define contributing drainage areas to main drainage features. These subcatchments were then refined to combine and split where needed based on the DEM and the stormwater conveyance network.

PCSWMM's Alternative Runoff Method was utilized to compute runoff for the subcatchments. The Natural Resources Conservation Service (NRCS), formerly Soil Conservation Service (SCS), Unit Hydrograph and Curve Number (UH-CN) method was selected to compute runoff hydrographs (NRCS, 1986). The SCS curve number method is a widely used method for computing runoff from a rainfall event based on the drainage area, hydrologic soil group, land use, and hydrologic conditions. The following subcatchment parameters were applied to each subcatchment:

- Peak Rate Factor (K_p) = Standard (483.4)
- SCS Curve Number (CN) = Composite CN based on HSG data and land use
- Initial Abstraction Method = 0.2S
- Time of concentration (t_c) = User Defined (calculated using SCS Lag Method (NRCS, 2010 p. 15-5))

PCSWMM input parameters can be found in APPENDIX 2.

PCSWMM Integrated 1D-2D Hydraulic Model

The PCSWMM run using EPA Storm Water Management Model (SWMM) v. 5.2.4 was utilized to build a model of the Town's major stormwater network within the study area. A 1D hydraulic model was utilized for the study area draining west to Queen Creek. Meanwhile, an integrated 1D-2D hydraulic model was applied to the Downtown area which drains southeast and includes a small portion along W Corbett Avenue at its northwest intersection with Main Street Extension (FIGURE 4). SWMM's hydraulic model functions using a system of links and nodes, also known as physical objects. Runoff hydrographs developed from the rainfall-loss-runoff response of each subcatchment are combined and routed downstream along links, can fill and empty the volume of storage nodes, and exit the system at terminal nodes. The following elements were used to create the hydraulic models:

- Physical Objects
- Boundary Conditions

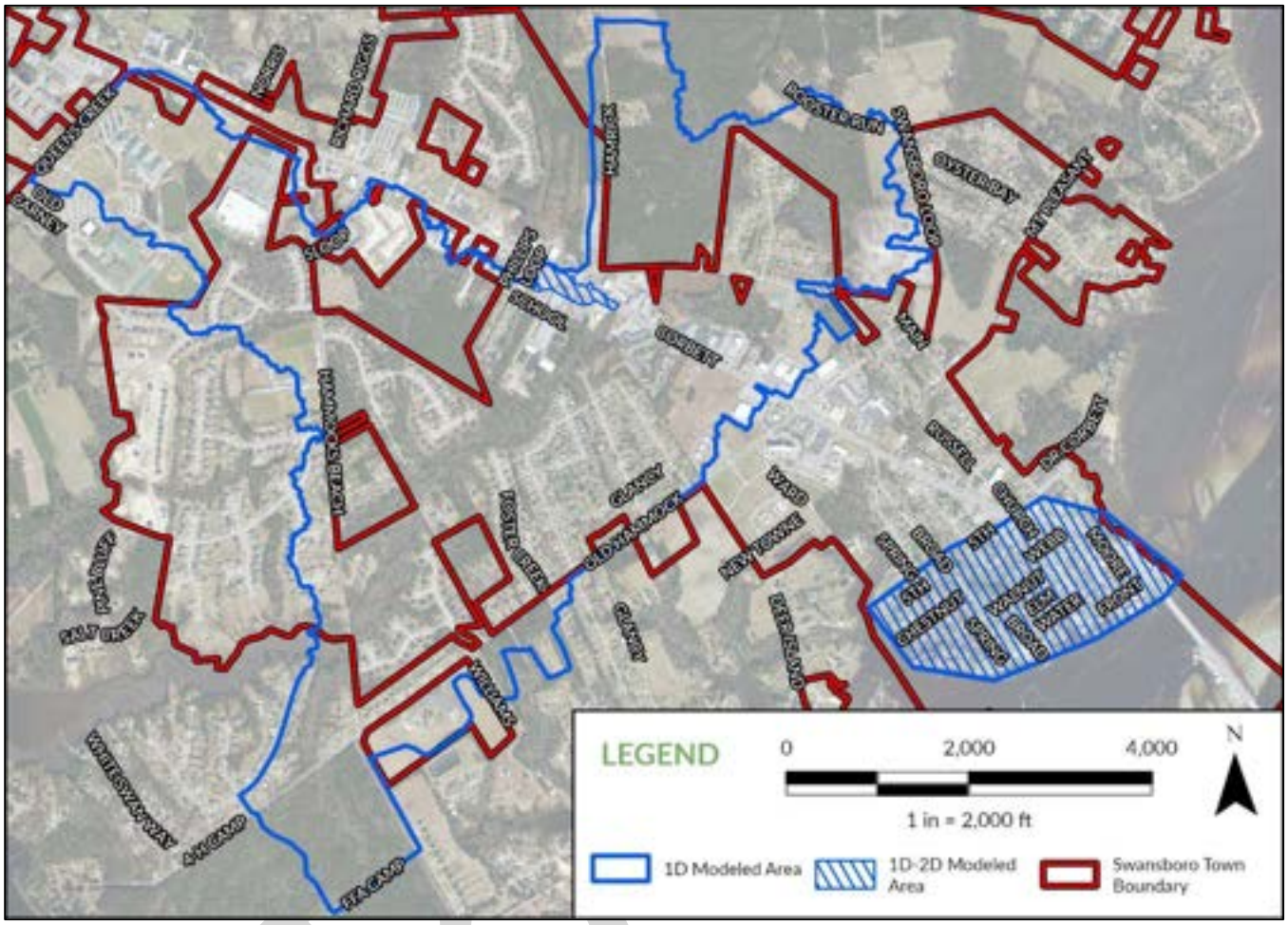

Figure 4. 1D vs 1D-2D Modeled Areas

Physical Objects

The 1-dimensional hydraulic model was created using the following model objects to represent the closed system: 1) conduits, 2) junctions, 3) outfalls, and 4) orifices. Conduits, junctions, and outfalls were imported into SWMM from GIS shapefiles that contained the surveyed stormwater data as well as connectivity and outfall assumptions. Orifices were used to connect the 1D model components to the 2D model components, where applicable.

For all input parameters used for 1D system conduits, junctions, and outfalls, see APPENDIX 2.

To model the 2D surface, PCSWMM generates a series of conduits and junctions to model the free surface flow along the topography. To create the 2D model components the following input data layers are required:

- A bounding layer to define the extents and subareas, node spacing, and mesh geometry.
- A downstream boundary condition line to define the limits of boundary outfalls.
- 2D Nodes layer to sample elevations from the LiDAR DEM for each 2D mesh junction.
- Obstruction layer created from building footprints to incorporate the influence of structures on surface water flows.

- Breaklines layer along areas with a sharp change in elevation to provide a higher level of detail

Boundary Conditions

A normal depth boundary condition was used at the terminal outfall in the 1D hydraulic model while tidal boundary conditions were utilized for the terminal outfalls in the 1D-2D hydraulic model. Tidal boundary conditions were defined using tidal curves synchronized with the respective storm events, as detailed in APPENDIX 2. The 10-, 25-, and 100-year tidal + surge stage hydrographs can be seen below in FIGURE 5.

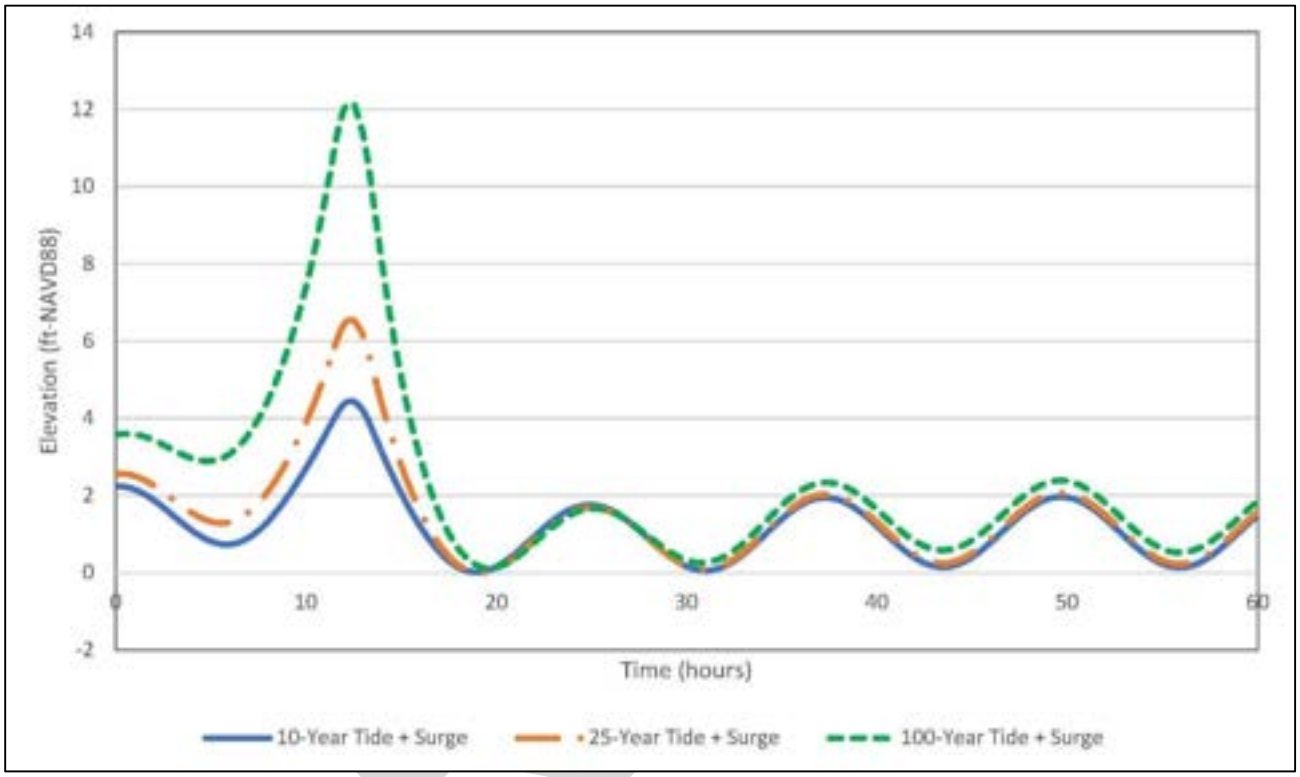

Figure 5. 10-, 25-, and 100-Year Tidal + Surge Stage Hydrographs

Data Assumptions

Due to the limitations of the data collection that focused on gathering data within the right-of-way and where accessible, assumptions needed to be made regarding the connectivity of the system. Where there were gaps in the data, assumed conduits were added using engineering judgement and anecdotal information provided by the Town to make connections between surveyed structures. Inverts for these conduits were assumed based on the connecting conduit inverts and the slope of the upstream and downstream conduits. These assumptions were discussed with the Town and adjusted based on their feedback.

Model Results Validation

Ideally, a hydraulic model is calibrated with respect to real-world conditions using available resources such as USGS gauge data and anecdotal evidence, such as high-water marks for a major rainfall event. As there are no USGS gauges within the study area, model results were verified using public input survey results, photo/video evidence from local news and social media, and direct observations from Town field staff.

Results are to be reviewed at a Town-wide level and not an individual lot level of detail. This model did not include lot specific topographic data and was not analyzed at that scale.

Existing Stormwater System Analysis

After model validation, results were analyzed across the study area for depth and duration of flooding. Hydraulic grade lines (HGL's) were established for all stormwater networks and open channel junctions. Max HGL's at each node were compared to their respective rim elevations; if the max HGL was higher than the rim elevation, the node is considered to be at max capacity. Conduits are identified by the maximum percentage of full capacity observed during the modeled event. Additionally, flood inundation rasters were generated for 2D modeled areas. Results were compiled to assess impacted structures, roadways, and infrastructure. FIGURE 6 shows the 10-year maximum depth flooding for the entire study area. Infiltration is excluded from the 2D surface to prevent double counting. The model already incorporates soil infiltration into the calculated curve numbers.

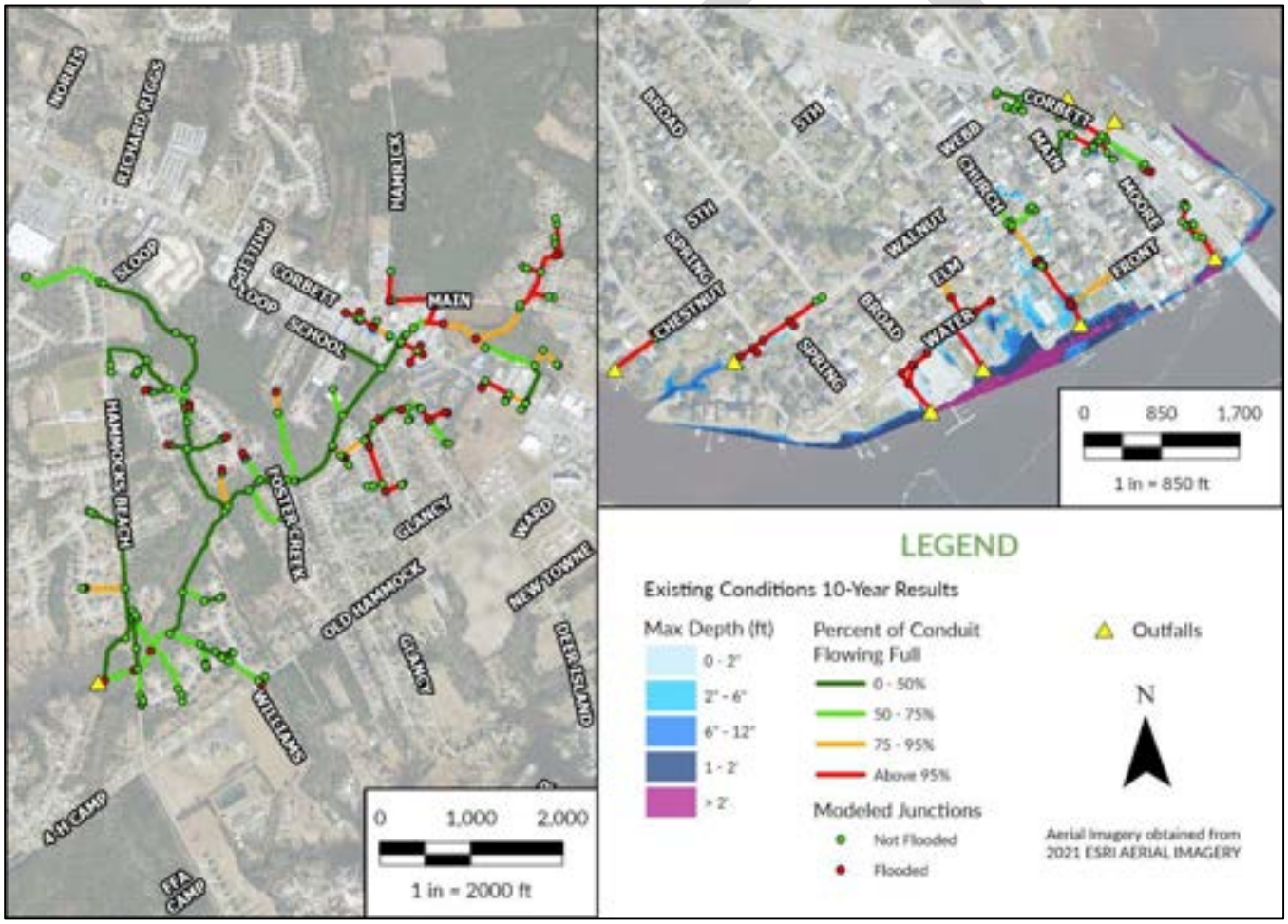

Figure 6. 10-Year Max Depth; Existing Conditions

Identification of Potential Areas of Concern

The resulting flood depths and inundation extents for each design storm were reviewed by WithersRavenel and Town staff. Thirty (30) Potential Areas of Concern (PAOCs) were identified based on model results, staff knowledge, historical flood events, and citizen feedback. These areas, which emphasize flood impacts within rights-of-way and to multiple structures, are depicted in FIGURE 7. A photo record of historical flood events can be found in APPENDIX 4.

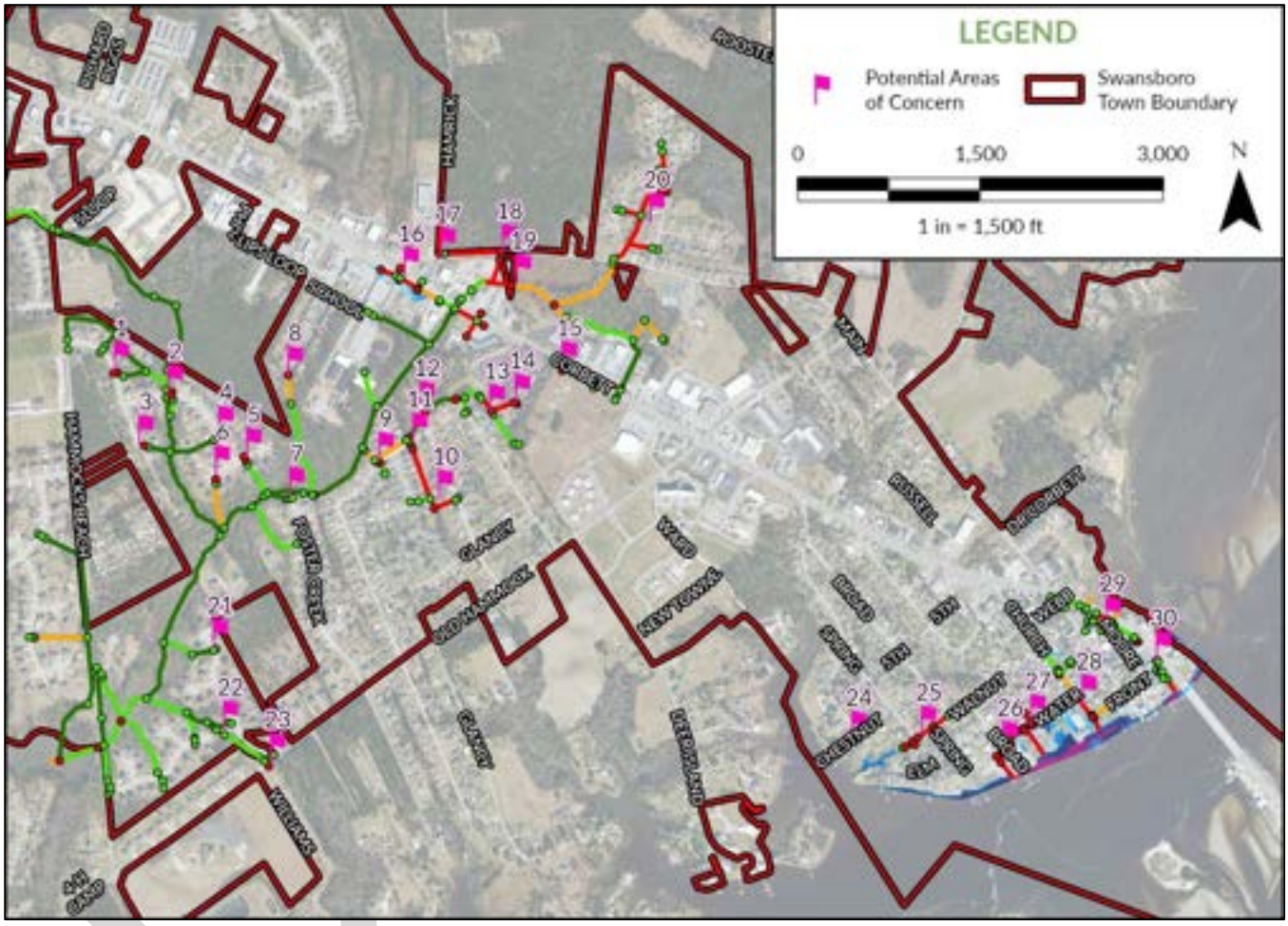

Figure 7. Potential Areas of Concern

Proposed Conceptual Improvements

After reviewing the identified PAOCs and consultation with the Town, three (3) areas were selected and assessed for proposed conceptual improvements to address the 10-year, 24-hour storm event (Design Storm). The existing conditions model was used as the base for the development of the three proposed concept designs. A proposed concept model was created by duplicating the existing conditions model and adjusting the model to include proposed concept alternatives.

The proposed concepts were designed to keep the 10-year, 24-hour HGL at or below the crown of the storm pipes or top of bank of ditches, to the maximum extent possible. The concept designs considered minimum system slopes, minimum structure depths, and tie-in elevations, where applicable. Additionally,

efforts were made for proposed concepts to be placed within existing rights-of-way and drainage easements. Proposed storm system sizing and inverts will require verification during final design stage, when more additional data and detailed survey is available. Proposed conditions maximum depth maps for the 10-, 25-, and 100-year storm events can be found in APPENDIX 5.

There is also an opportunity to integrate water quality and stormwater management measures into the final design of the proposed conceptual improvements, particularly at stormwater outfall locations where runoff directly discharges to local creeks and tidal waters. The Town's Watershed Restoration Plan identifies stormwater retrofits as an effective strategy for reducing pollutant loads before discharge, while the RCCP Resilience Strategy prioritizes stormwater and flooding projects that improve system performance and resilience. Coordinating the proposed improvements described below with these plans would support consistent implementation of best management practices, enhance water quality benefits, and advance the Town's broader watershed and coastal resilience objectives (Town of Swansboro & North Carolina Coastal Federation, 2017; Dewberry Engineers Inc., 2022).

Concept Design 1: Forestbrook Neighborhood Drainage Improvements (PAOCs 1 - 6)

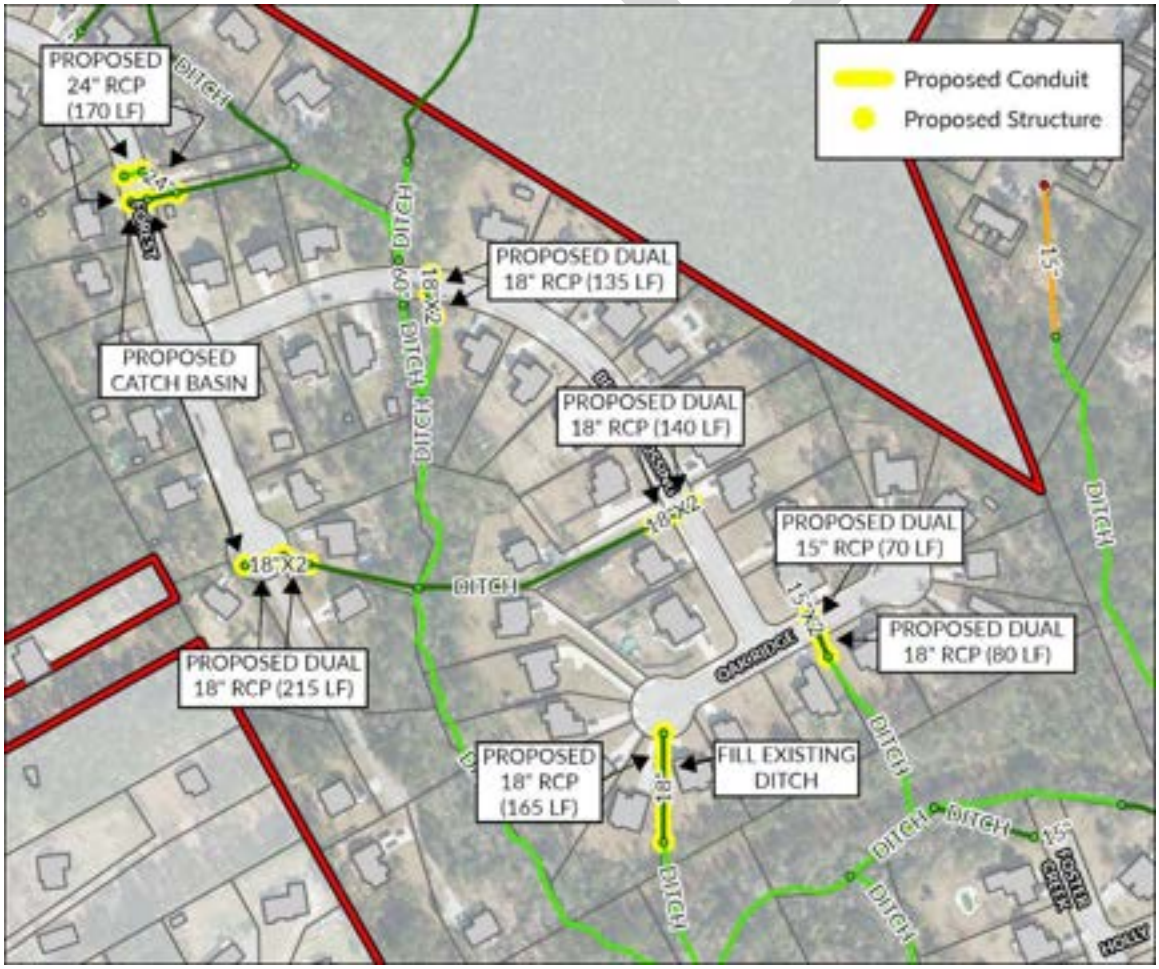

Figure 8. Concept Design 1 Proposed Improvements

Existing Conditions

Concept Design 1 is located within Forestbrook Neighborhood, east of Hammocks Beach Rd. The neighborhood's drainage is divided between two areas: the northwest branch of Halls Creek receives runoff from Forest Lane and the northern three-quarters of Brook Crossing Road, while the main channel of Halls Creek receives direct drainage from the southern end of Brook Crossing Road and Oak Ridge Court.

During the Design Storm, roadway inundation occurs at several PAOCs. Along Forest Lane, PAOC 1 (at 106 Forest Lane) sees approximately 0.1 – 3 feet of water, while the cul-de-sac at PAOC 3 (at 123 Forest Lane) experiences 0.1 – 1 foot. Brook Crossing Road is impacted at PAOC 2 (at 207 Brook Crossing Road) with 0.1 – 3 feet and at PAOC 4 (at 219 Brook Crossing Road) with 0.1 – 0.3 feet. Finally, PAOCs 5 and 6 along Oak Ridge Court experience 0.1 – 0.6 feet at 311 and 304 Oak Ridge Court, respectively.

Concept Design 1 features 15-inch and 18-inch pipes, which appear to be undersized and lack the capacity to convey the Design Storm. This results in roadway inundation on Forest Lane, Brook Crossing Road, and Oak Ridge Court.

Proposed Conditions

After analysis of proposed improvement alternatives, it is recommended to install a proposed storm network to collect additional runoff along Forest Lane, Brook Crossing Road, and Oak Ridge Court (FIGURE 8). Proposed stormwater improvements for Concept 1 include upsizing the existing 15-inch RCPs to 24-inch RCPs (95 LF) and installing 75 LF of 24-inch RCP across Forest Lane (PAOC 1). This proposed crossing will also include two proposed catch basins which will intercept southern drainage from Forest Lane. The drainage network at PAOC 1 will discharge east to the existing ditch. Furthermore, dual-barrel 18-inch RCPs will replace the existing 15-inch RCPs (275 LF) along Brook Crossing Road (PAOCs 2 and 4). A dual-barrel 18-inch RCP (215 LF) and one additional catch basin is proposed for the cul-de-sac of Forest Lane (PAOC 3). The existing 15-inch and 18-inch RCP across Oak Ridge Ct (PAOC 5) will be replaced with dual-barrel 15-inch (60 LF) and 18-inch (80 LF) RCP, respectively. Finally, an 18-inch RCP (165 LF) is proposed for PAOC 6. This pipe will extend through the existing ditch, which will, consequently, be filled.

Review of the proposed conditions model results indicate the proposed improvements will mitigate peak flooding so Forest Lane, Brook Crossing Road, and Oak Ridge Court, and the structures along them are no longer inundated during the Design Storm and the 25-year storm.

The following summarizes the improvements associated with Concept Design 1:

- ± 970 linear feet of stormwater pipe
- ± 100 linear feet of channel outlet improvements
- Replacement/installation of 15 stormwater structures

Concept Design 2: Holly Lane Drainage Improvements (PAOCs 9 - 11)

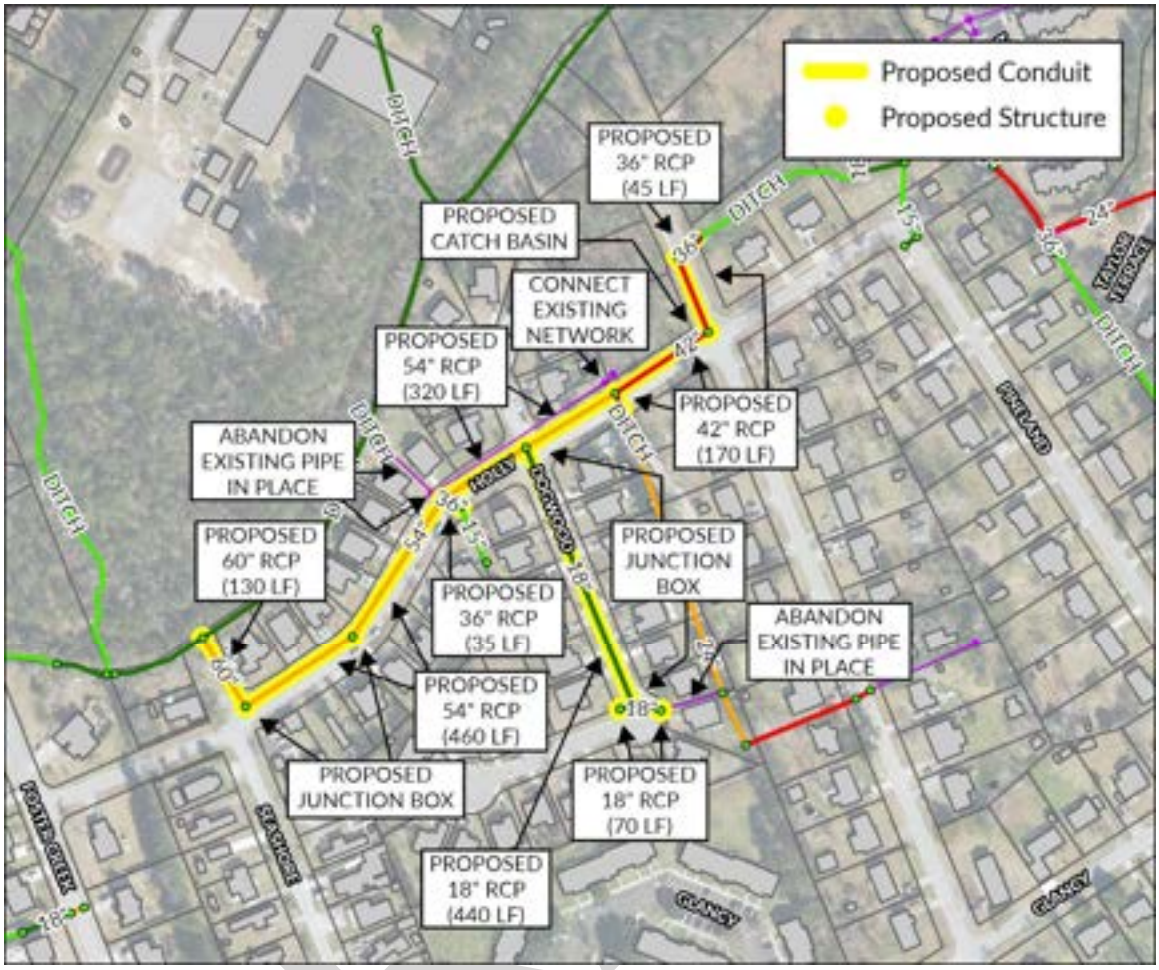

Figure 9. Concept Design 2 Proposed Improvements

Existing Conditions

Concept Design 2 is situated in a residential area north of Old Hammock Road, specifically along Holly Lane and between South Dogwood Lane and Phillips Drive. A defined open channel exists within the backyards of 729, 731, 733, and 735 W Phillips Drive. The area presents a primary drainage deficiency, attributed to two cross-pipes that appear to be undersized. The 24-inch corrugated plastic pipe across Holly Lane (PAOC 11) exhibits insufficient capacity for existing flow from the open channel and the storm network receiving flow from S Dogwood Lane and Phillips Drive. Additionally, the existing crossing at PAOC 9, a 15-inch corrugated metal pipe, appears to be undersized and lacks the capacity to convey the Design Storm; this deficiency results in roadway inundation on Holly Lane.

During the Design Storm, Holly Lane (PAOC 9) faces approximately 0.1 – 3 feet at 401 S Holly Lane and between 0.1 – 1.5 feet at 806 N Dogwood Lane (PAOC 11). Nearby on Dogwood Lane, inundation depths reach approximately 0.1 f at 822 S Dogwood Lane (PAOC 10).

Proposed Conditions

After analysis of proposed improvement alternatives, installing a proposed storm network along South Dogwood Lane and Holly Lane is recommended to increase the system's capacity and reduce the frequency of backflow (FIGURE 9). Proposed stormwater improvements for Concept 2 include upsizing and extending the existing 48-inch trunkline along Holly Lane to a new outfall location on Seashore Drive. This proposed trunkline begins with 140 LF of 42-inch RCP on Phillips Dr and Holly Lane, increases to 780 LF of 54-inch RCP, then increases to 130 LF of 60-inch RCP on Seashore Drive. The existing 15-inch RCP across Holly Lane (PAOC 9) will be upsized to a 36-inch RCP (35 LF). To redirect flow from the existing trunkline and open channel between South Dogwood Lane Phillips Drive (PAOC 10), 510 LF of 18-inch RCP is proposed on South Dogwood Lane. Additionally, the existing 36-in pipe across Holly Lane (PAOC 11) will be upsized to 30 LF of 42-inch RCP.

These improvements are expected to mitigate peak flooding so that Holly Lane is no longer flooded during the Design Storm and the 25-year storm.

The following summarizes the improvements associated with Concept Design 2:

- ± 1670 linear feet of stormwater pipe
- ± 100 linear feet of channel outlet improvements
- Replacement/installation of 12 stormwater structures

Concept Design 3: Water Street & Church Street Drainage Improvements (PAOCs 26 – 28)

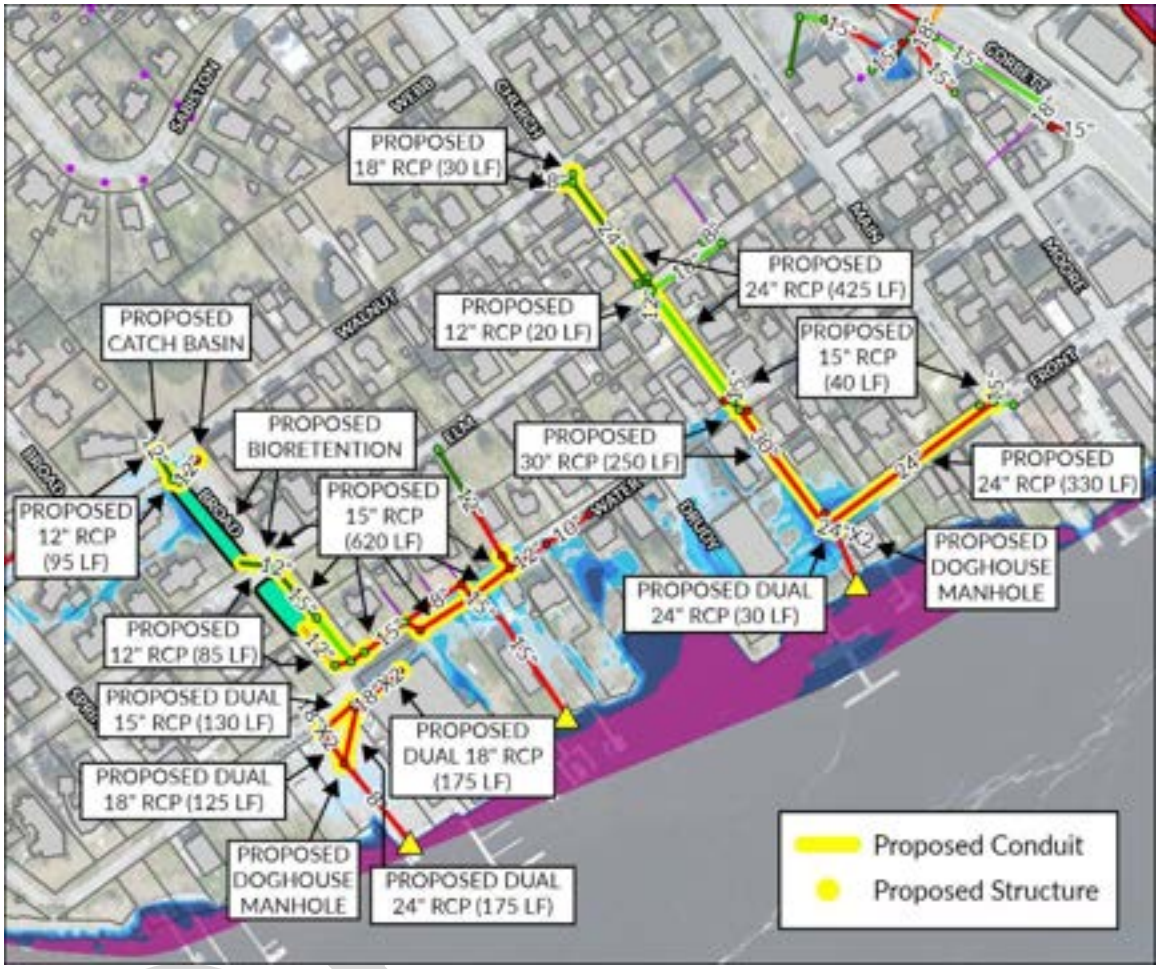

Figure 10. Concept Design 3 Proposed Improvements

Existing Conditions

Concept Design 3 encompasses the Town's downtown historic district that drains to Bogue Sound. The existing drainage networks near PAOCs 26 – 28 appear to be undersized and do not provide adequate capacity to convey the Design Storm. Furthermore, due to its proximity and direct hydraulic connections to White Oak River and Hawkins Creek, flooding in the PAOCs is not only driven by heavy rainfall, but also tailwater conditions established by the river and creek. When wind or storm surges raise water levels in White Oak River and Hawkins Creek, water is pushed back into the PAOCs. This reduces drainage capacity and, when combined with heavy rainfall, causes inundation that persists until water surface elevations recede.

During the Design Storm, 1 commercial structure, 301 S Water Street, is within the modeled inundation boundary at PAOC 26. Additionally, 1 commercial (219 S Water Street) and 2 residential (217 and 220 S Water Street) structures at PAOC 27 are within the modeled inundation boundary. Water Street, along PAOC 27, experiences 0.1 – 1 feet of surface inundation depth across the full length of the roadway. PAOC 28 experiences 0.1 – 2 feet of surface inundation depth at the intersection of Front Street and

Church Street that extends across the full length of the roadway. The intersection just upstream, at Church Street and Water Street, 0.1 – 0.5 feet of surface inundation depth expands across the entire span of the roadway. 7 commercial (99, 101, and 105 W Church Street; 129, 131, 135, and 137 Front Street), 1 historical (207 S Water Street), and 7 residential (118 and 204 S Water Street; 202, 204, 205, and 308 W Church Street; 119 Elm Street) structures are within the modeled inundation boundary.

Proposed Conditions

After analysis of proposed improvement alternatives, upsizing the existing stormwater pipes is recommended to increase the system's capacity and, therefore, capture additional runoff along Water Street, Front Street, and Church Street (FIGURE 10). Concept 3 proposed improvements include upsizing existing drainage network in the parking lot of PAOC 26 to dual-barrel pipes (130 LF of 15-inch RCP, 300 LF of 18-inch RCP, and 175 LF of 24-inch RCP) before discharging through the existing 8-inch RCP outfall. Proposed improvements in PAOC 27 were derived from a previous drainage improvement project in which the Town had contracted WithersRavenel to design two bioretention cells along Broad St. Proposed drainage network will be installed along Broad Street to capture additional runoff and discharge the bioretention cells to the system on Water Street. The existing network on Water Street will also be upsized to accommodate additional drainage. A proposed network on Broad and Water Street will include 2 proposed catch basins, 180 LF of 12-inch RCP, and 620 LF of 15-inch RCP. This drainage improvement project was part of Phase 3 of a larger Resilient Coastal Communities Program (RCCP) for the Town to identify a "series of projects that are intended to address community vulnerabilities to coastal hazards" as related to stormwater management (Dewberry Engineers Inc., 2022, p. C-1). The design for this project was previously completed by WithersRavenel and can be viewed in detail in APPENDIX 4. The existing Church Street trunkline along PAOC 28 will be upsized to 425 LF of 24-inch RCP, 250 LF of 30-inch RCP, and 30 LF of 24-inch dual-barrel RCP before discharging through the existing 24-inch RCP outfall. The existing 18-inch pipe along Front St will be upsized to a 24-inch RCP (330 LF).

Doghouse manholes, proposed for PAOC 26 & 28, will intentionally flood to relieve surcharging in the system (pumping is also recommended). Proposed improvements will extend only ~90 ft (minimum) upstream of the existing outfalls due to anticipation of Coastal Area Management Act (CAMA) outfall permitting limitations.

Model results indicate proposed improvements will reduce the depth and duration of roadway and structural inundation along Water Street, Front Street, and Church Street during the Design Storm. Other potential benefits for larger storm events include temporary flood walls and/or emergency pumping plans in combination with the proposed improvements described.

The following summarizes the improvements associated with Concept Design 3:

- ± 2530 linear feet of stormwater pipe
- Replacement/installation of 33 stormwater structures
- Construction of 2 bioretention cells

Preliminary Cost Opinions for Proposed Concept Designs

Preliminary cost opinions were based on installation and replacement of stormwater infrastructure quantities only; costs for survey and construction labor were based off a percentage of the stormwater infrastructure material costs. Additional costs associated with engineering design and permitting, utility relocation, and traffic control were each considered as lump sum costs. These cost opinions are based on current pricing as of the date of this report and do not consider cost increases due to inflation. The

detailed design process and site investigation may identify additional costs. See APPENDIX 6 for a more detailed breakdown of cost opinions for each area of concern.

TABLE 2 summarizes the preliminary cost opinions for each area of concern described above:

Table 2. Preliminary Cost Opinion for Budgetary Purposes

Proposed Concept Design	Probable Cost
Concept Design 1 – Forestbrook Neighborhood (PAOC 1 – 6)	$ 935,000
Concept Design 2 – Holly Lane (PAOC 9 – 11)	$ 2,474,000
Concept Design 3 – Water Street & Church Street (PAOC 26 – 28)	$ 2,490,000
TOTAL =	$ 5,899,000

Prioritization of Concept Designs

The Concept Designs were scored and ranked for the purpose of prioritizing potential improvement projects according to their overall effectiveness. After receiving input from the Town, four criteria were selected for scoring each project. Each project was assigned a score of 0, 1, 3, or 5 in each category. The Design Storm was the basis for determining impacts. In addition, each criterion was assigned a weighted value representing the relative importance of each criterion. The scoring thresholds, along with subsequent prioritization rankings and summary are listed below in TABLES 3, 4, and 5.

Prioritization Criteria

Condition of Infrastructure (10%)

The condition of infrastructure scoring was determined based on the condition assessment conducted during detailed survey, limited field assessment, and staff knowledge. Condition was assessed based on assumed structural integrity of the observed infrastructure along with the observed capacity (clogged condition) at the time of the data collection. The following summarizes the spectrum on which the criterion was assessed and its associated score:

- Infrastructure has major signs of damage and is close to failing or has completely failed. Infrastructure is not performing as intended. — 5 points
- Infrastructure shows some visible signs of damage but appears to be mostly performing as intended. — 3 points
- Infrastructure shows no or minor signs of damage and appears to be performing as intended. — 1 point

Project Cost (20%)

Project cost scoring was based on the preliminary cost opinions for each Concept Design. Lower-cost improvement plans were assigned a higher score because they were considered more accessible and easier to fund. High-cost projects were assigned a lower score, as they would require more funding and resources. The following summarizes the project cost scoring:

- < $500,000 — 5 points
- $500,000 - $1,000,000 — 3 points
- > $1,000,000 — 1 point

Severity of Flooding (45%)

Concept Designs were assigned a score to capture the flooding impact in a 10-year storm event. Severity was characterized based on width of roadway flooding, occurrence of documented historical structural flooding, and the type of road flooding occurred on. If no documented historical structural flooding has occurred, a score of 0 was assigned for this criterion. The following summarizes the severity of flooding scoring:

- Width of roadway fooding extends to the full roadway; Documented Historical Structural Flooding; Road to Public Facility/Essential Facility — 5 points
- Width of roadway fooding extends to a full lane; Combined Residential and Commercial Road; — 3 points
- Width of roadway fooding extends to a half lane; Residential Road — 1 point

Project Drainage Area Served (25%)

Project drainage area (DA) served was evaluated based on the DA (acres) that will be impacted by the implementation of the project. Each DA was calculated by the summation of all square footage upstream, and therefore, draining to each project area. The following summarizes the project drainage area served scoring:

- > 50 acres — 5 points
- 20 to 50 acres — 3 points
- > 0 to < 20 acres — 1 point

Table 3. Prioritization Scoring Criteria Matrix

Criteria	1 point	3 points	5 points
Condition of Infrastructure (10%)			
Visual assessment of infrastructure per town staff and/or engineer.	Infrastructure shows no or minor signs of damage and appears to be performing as intended.	Infrastructure shows some visible signs of damage but appears to be mostly performing as intended.	Infrastructure has major signs of damage and is close to failing or has completely failed. Infrastructure is not performing as intended.
Project Cost (20%)			
Project construction cost estimate.	> $1,000,000	$500,000 - $1,000,000	< $500,000
Severity of Flooding (10-year Event) **(Totaling 45%)**			
Evaluates flooding impacts in a 10-year storm event to roadways, to lots, and to safety access.	Width of roadway fooding extends to a half lane.	Width of roadway fooding extends to a full lane.	Width of roadway fooding extends to the full roadway.
			Documented Historical Structural Flooding
	Residential Road	Combined Residential and Commercial Road	Road to Public Facility/Essential Facility
Project Drainage Area Served (10-year Event) **(25%)**			
Drainage area (acres) that will be impacted by the implementation of the project.	> 0 to < 20	20 to 50	> 50

Prioritization of Proposed Projects

TABLES 4 and 5 summarize the scoring for each project per the scoring criteria described above and rank the projects based on the resultant raw and weighted scores.

Table 4. Project Prioritization Ratings

	Condition of Infrastructure		Project Cost		Severity of Flooding						Project DA Served		Score	
Concept Design	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Raw Score**	**Weighted Score**
Concept Design 1: Forestbrook Neighborhood PAOCs 1 - 6	Infrastructure shows some visible signs of damage but appears to be mostly performing as intended.	3	$935,000	3	Width of roadway fooding extends to the full roadway.	5	N/A	0	Residential Road	1	17	1	13	1.85
Concept Design 2: Holly Lane PAOCs 9 - 11	Infrastructure shows some visible signs of damage but appears to be mostly performing as intended.	3	$2,474,000	3	Width of roadway fooding extends to the full roadway.	5	N/A	0	Residential Road	1	83	5	15	2.45
Concept Design 3: Water Street and Church Steet PAOCs 26 - 28	Infrastructure has major signs of damage and is close to failing or has completely failed. Infrastructure is not performing as intended.	5	$2,490,000	1	Width of roadway fooding extends to the full roadway.	5	Documented Historical Structural Flooding	5	Road to Public Facility/Essential Facility	5	27	3	24	3.7

Table 5. Project Prioritization Summary

Rank	AOC	Raw Score	Weighted Score
1	Concept Design 3: Water Street and Church Street	24	3.7
2	Concept Design 2: Holly Lane	15	2.45
3	Concept Design 1: Forestbrook Neighborhood	13	1.85

When two PAOCs occur in series, i.e. one is downstream from another, the downstream project must occur first. This sequence is necessary to ensure the downstream area has the capacity to handle potential increases in flow and prevent erosion once the upstream work begins. Project areas with equal rankings that are not in series should then be prioritized by their proposed project costs.

Recommendations

The proposed concepts developed as part of this study only address flood mitigation problems in a few areas of the Town. It is recommended that the Town look at the following options in the future to address additional flooding issues and enhance its drainage infrastructure and management:

- **Stormwater Asset Inventory Management**
  It is recommended that, a portion of the Town's stormwater utility charge be allocated to support the maintenance and long-term use of the stormwater asset inventory as a core component of system management. The stormwater asset inventory developed as part of this study is intended to serve as the Town's authoritative stormwater asset registry. The dataset should be maintained within the Town's GIS environment and updated as capital projects are completed, development projects are reviewed, and system improvements are constructed. Ongoing maintenance of the dataset will support asset management, regulatory compliance, and future planning efforts. To ensure the inventory remains accurate and actionable, investment in dedicated GIS software and ongoing staff training will be necessary to support data management, routine updates, and effective use across departments.
- **Emergency Flood Response and Pumping**
  It is recommended that the Town consider a state approved floodwater management discharge plan for pumping and a rapid-deployment strategy for emergency flood walls to protect critical infrastructure during extreme storm events. This plan should clearly outline the logistical requirements for transporting and installing barriers, as well as the staging of high-capacity pumps to manage interior drainage when outfalls are submerged. Standardizing these emergency procedures will minimize response times and provide a reliable defense for residential and commercial zones at high risk of inundation.
- **Watershed Restoration Plan and Historic District Preservation**
  Improving water quality is a vital component of the Town's environmental stewardship. It is recommended proposed improvements, particularly in the Downtown historic district, be integrated with the Town's watershed restoration plan to restore impaired water quality (Town of Swansboro & North Carolina Coastal Federation, 2017). By focusing on the historic district, the Town can implement localized "green" solutions—such as permeable surfaces or bio-retention—that preserve the area's aesthetic character while effectively managing runoff and reducing pollutant loads.

- **Outfall Protection and Backflow Prevention**
  A recommended physical upgrade to the current drainage network includes consideration of installing flap gates at major outfalls as one potential option to reduce inundation. These gates function as one-way valves, allowing stormwater to discharge while limiting riverine or tidal backflow that can enter the system and contribute to street flooding. Installation of flap gates at low-lying outfalls could reduce the frequency of "sunny day" flooding and improve the performance of the existing storm sewer network during high-water events. However, prior to implementation, this option should be evaluated in detail based on the specific flap gate technology or manufacturer under consideration, site-specific hydraulic conditions, and potential adverse effects, such as restricted drainage capacity, increased maintenance requirements, debris accumulation, or water quality impacts.
- **Formalized Capital Improvement Plan**
  It is recommended the Town move forward with adopting a formalized Capital Improvement Program (CIP) that integrates the priorities and project recommendations identified in its previously adopted watershed restoration plan and RCCP resilience strategy. The prioritization matrix provided to the Town in this report should be used as a guiding framework for evaluating, ranking, and sequencing capital projects within the CIP. By aligning capital investments with these existing plans and applying a consistent, transparent prioritization methodology, the CIP can function as an effective implementation tool to advance stormwater management, flood mitigation, and long-term climate resilience goals. This coordinated approach will support strategic decision-making, improve competitiveness for grant and state funding opportunities, and ensure financial resources are directed toward projects with the greatest environmental, infrastructure, and community benefit.
- **Identification and Pursuit of Stormwater Funding Opportunities**
  Proactive identification and pursuit of diverse funding opportunities—such as federal and state grants, cost-share programs, and partnerships with regional agencies—is recommended to support implementation of stormwater projects. Leveraging existing planning efforts, including the watershed restoration plan and the RCCP resilience strategy, can strengthen grant applications by demonstrating project readiness, prioritization, and alignment with state and federal objectives. Coordinated tracking of funding cycles and applications can help advance high-priority projects while minimizing reliance on local funds.

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Appendix 1: Background Information

- NOAA Atlas 14 Point Precipitation Frequency Estimates
- FEMA FIRM 3720535500K
- FEMA FIRM 3720536500L
- FEMA FIRM 3720535400K
- FEMA FIRM 3720536400L

NOAA Atlas 14, Volume 2, Version 3
Location name: Swansboro, North Carolina, USA*
Latitude: 34.6895°, Longitude: -77.1206°
Elevation: 26 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.488** (0.451-0.530)	**0.573** (0.530-0.621)	**0.662** (0.610-0.717)	**0.745** (0.686-0.807)	**0.841** (0.770-0.909)	**0.919** (0.838-0.994)	**0.994** (0.903-1.08)	**1.07** (0.965-1.16)	**1.17** (1.04-1.27)	**1.25** (1.11-1.36)
10-min	**0.780** (0.720-0.847)	**0.917** (0.848-0.994)	**1.06** (0.977-1.15)	**1.19** (1.10-1.29)	**1.34** (1.23-1.45)	**1.46** (1.34-1.58)	**1.58** (1.44-1.71)	**1.70** (1.53-1.84)	**1.84** (1.65-2.00)	**1.97** (1.74-2.15)
15-min	**0.975** (0.900-1.06)	**1.15** (1.07-1.25)	**1.34** (1.24-1.45)	**1.51** (1.39-1.63)	**1.70** (1.56-1.84)	**1.85** (1.69-2.00)	**2.00** (1.81-2.16)	**2.14** (1.93-2.32)	**2.32** (2.07-2.52)	**2.47** (2.19-2.70)
30-min	**1.34** (1.23-1.45)	**1.59** (1.47-1.73)	**1.90** (1.76-2.06)	**2.18** (2.01-2.36)	**2.52** (2.30-2.72)	**2.79** (2.55-3.02)	**3.06** (2.78-3.31)	**3.33** (3.00-3.61)	**3.69** (3.30-4.02)	**4.00** (3.55-4.37)
60-min	**1.67** (1.54-1.81)	**2.00** (1.85-2.16)	**2.44** (2.25-2.64)	**2.84** (2.62-3.08)	**3.35** (3.07-3.62)	**3.78** (3.45-4.09)	**4.21** (3.83-4.56)	**4.67** (4.21-5.07)	**5.30** (4.74-5.76)	**5.84** (5.18-6.37)
2-hr	**2.04** (1.87-2.23)	**2.47** (2.27-2.69)	**3.09** (2.83-3.37)	**3.67** (3.36-4.00)	**4.45** (4.04-4.84)	**5.13** (4.64-5.58)	**5.85** (5.26-6.36)	**6.62** (5.91-7.21)	**7.72** (6.82-8.42)	**8.70** (7.62-9.52)
3-hr	**2.20** (2.01-2.43)	**2.66** (2.44-2.93)	**3.35** (3.06-3.68)	**4.01** (3.66-4.41)	**4.92** (4.46-5.39)	**5.74** (5.16-6.29)	**6.62** (5.91-7.24)	**7.58** (6.71-8.30)	**8.99** (7.86-9.86)	**10.3** (8.88-11.3)
6-hr	**2.67** (2.43-2.98)	**3.23** (2.94-3.60)	**4.08** (3.70-4.54)	**4.89** (4.42-5.44)	**6.02** (5.41-6.67)	**7.04** (6.28-7.80)	**8.14** (7.20-9.01)	**9.37** (8.21-10.4)	**11.2** (9.64-12.3)	**12.8** (10.9-14.2)
12-hr	**3.16** (2.86-3.55)	**3.82** (3.46-4.29)	**4.85** (4.37-5.44)	**5.85** (5.25-6.56)	**7.24** (6.44-8.09)	**8.53** (7.53-9.50)	**9.92** (8.68-11.0)	**11.5** (9.94-12.8)	**13.8** (11.8-15.4)	**16.0** (13.4-17.8)
[illegible]										
2-day	**4.26** (3.86-4.75)	**5.16** (4.67-5.75)	**6.62** (5.98-7.38)	**7.89** (7.09-8.78)	**9.80** (8.74-10.9)	**11.5** (10.1-12.7)	**13.3** (11.7-14.8)	**15.4** (13.3-17.2)	**18.6** (15.8-20.8)	**21.4** (17.8-24.1)
3-day	**4.52** (4.11-5.01)	**5.47** (4.97-6.07)	**6.99** (6.34-7.75)	**8.28** (7.48-9.17)	**10.2** (9.14-11.3)	**11.8** (10.5-13.1)	**13.7** (12.0-15.1)	**15.7** (13.7-17.4)	**18.8** (16.1-21.0)	**21.5** (18.1-24.2)
4-day	**4.79** (4.36-5.28)	**5.79** (5.28-6.39)	**7.36** (6.70-8.12)	**8.68** (7.86-9.57)	**10.6** (9.54-11.7)	**12.2** (10.9-13.5)	**14.0** (12.4-15.5)	**16.0** (14.0-17.7)	**19.0** (16.4-21.1)	**21.6** (18.4-24.2)
7-day	**5.55** (5.09-6.09)	**6.69** (6.13-7.34)	**8.42** (7.69-9.22)	**9.84** (8.97-10.8)	**11.9** (10.8-13.0)	**13.6** (12.3-14.9)	**15.5** (13.8-17.0)	**17.5** (15.5-19.2)	**20.4** (17.7-22.6)	**22.9** (19.6-25.5)
10-day	**6.23** (5.73-6.82)	**7.47** (6.86-8.18)	**9.26** (8.50-10.1)	**10.7** (9.83-11.7)	**12.9** (11.7-14.1)	**14.6** (13.2-16.0)	**16.5** (14.8-18.1)	**18.6** (16.5-20.4)	**21.5** (18.9-23.8)	**24.0** (20.7-26.6)
20-day	**8.33** (7.72-9.03)	**9.92** (9.20-10.8)	**12.1** (11.2-13.1)	**13.8** (12.8-15.0)	**16.4** (15.0-17.7)	**18.4** (16.8-19.9)	**20.6** (18.7-22.3)	**22.9** (20.6-24.9)	**26.1** (23.1-28.6)	**28.7** (25.2-31.6)
30-day	**10.2** (9.54-11.0)	**12.2** (11.3-13.1)	**14.6** (13.6-15.7)	**16.6** (15.4-17.9)	**19.3** (17.9-20.8)	**21.5** (19.8-23.1)	**23.7** (21.8-25.6)	**26.0** (23.7-28.2)	**29.2** (26.3-31.8)	**31.7** (28.3-34.6)
45-day	**12.8** (11.9-13.8)	**15.1** (14.1-16.3)	**18.0** (16.8-19.4)	**20.4** (19.0-22.0)	**23.8** (22.0-25.6)	**26.5** (24.4-28.6)	**29.3** (26.9-31.7)	**32.3** (29.3-34.9)	**36.3** (32.6-39.5)	**39.6** (35.2-43.3)
60-day	**15.5** (14.5-16.6)	**18.3** (17.1-19.6)	**21.6** (20.2-23.1)	**24.2** (22.6-25.8)	**27.7** (25.8-29.7)	**30.5** (28.3-32.7)	**33.4** (30.8-35.8)	**36.2** (33.3-39.0)	**40.1** (36.5-43.4)	**43.1** (38.9-46.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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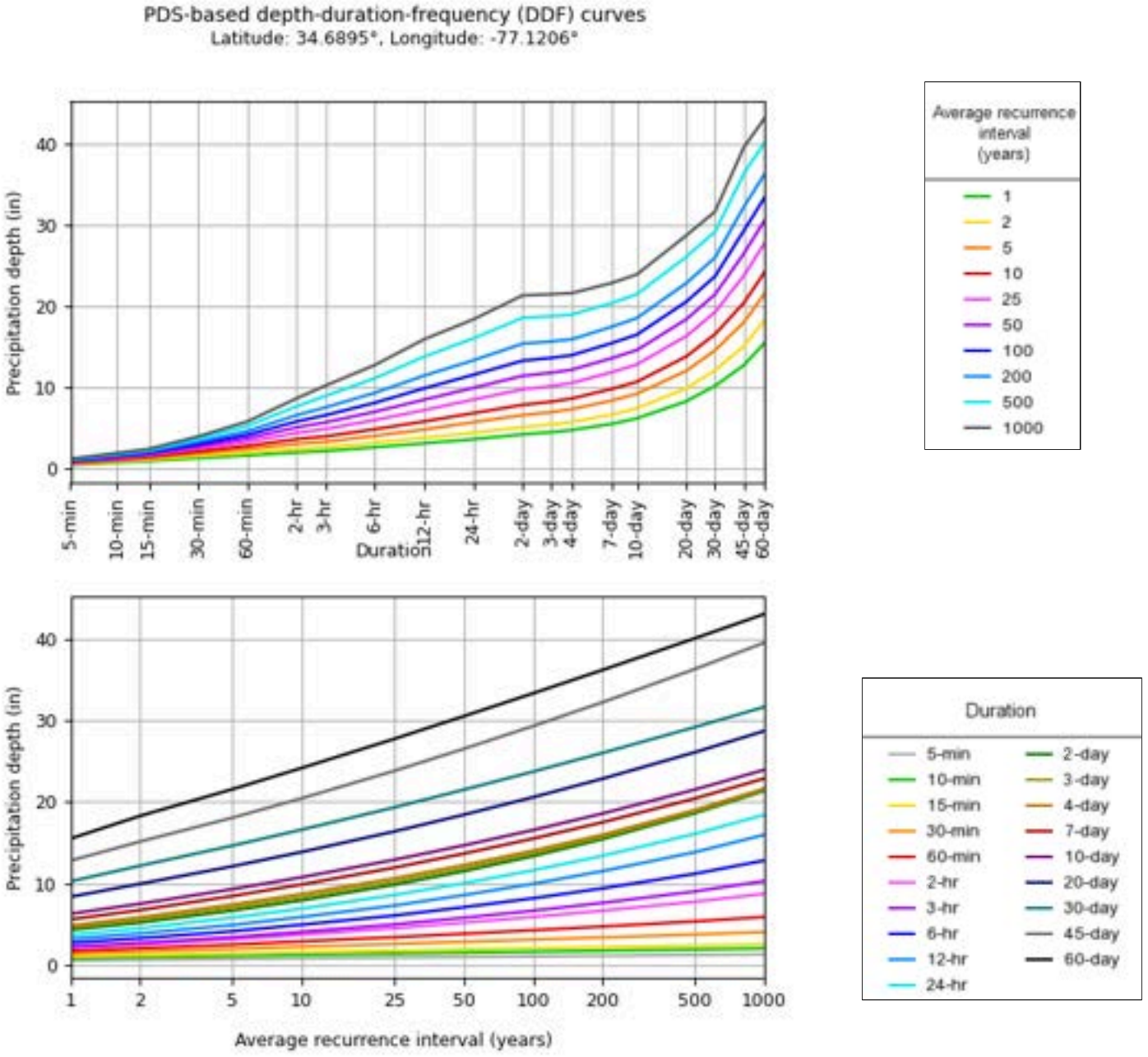
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Wed Mar 26 13:27:53 2025

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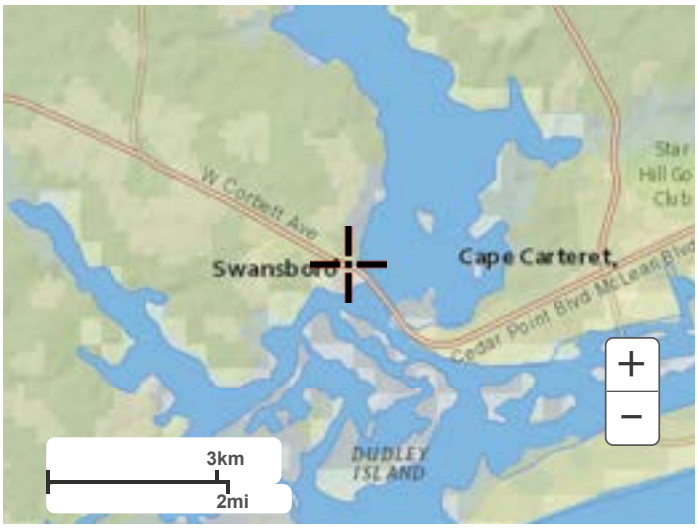
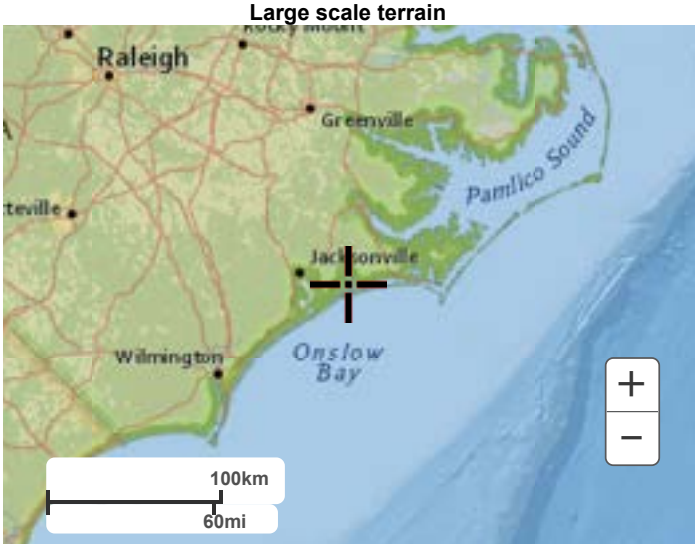
Maps & aerials

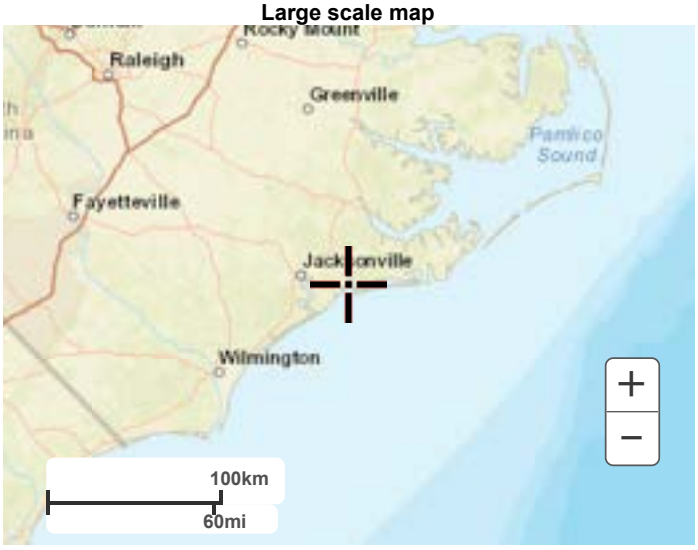
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP FOR FIRM PANEL LAYOUT

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	Limit of Study
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Limit of Moderate Wave Action (LiMWA)

SCALE

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North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet

0 75 150 300 Meters

PANEL LOCATOR

FEMA

National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 5355

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
ONSLOW COUNTY	370340	5355	K
SWANSBORO, TOWN OF	370179	5355	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720535500K

MAP REVISED
June 19, 2020

NORTH CAROLINA Cooperating Technical State
FEMA'S COOPERATING TECHNICAL PARTNER

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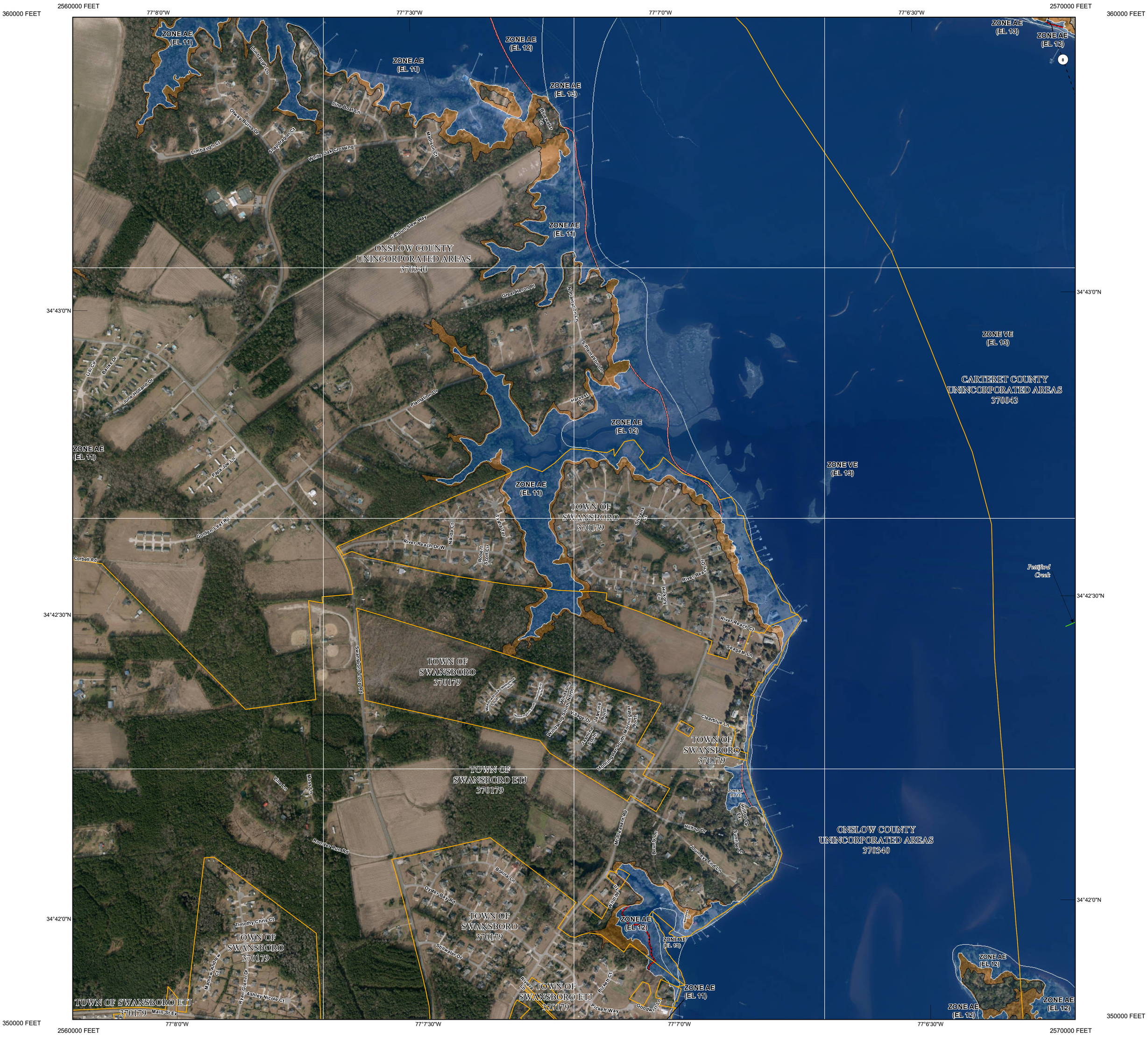

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	Profile Baseline
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	Limit of Study
	Jurisdiction Boundary

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Limit of Moderate Wave Action (LiMWA)

SCALE

Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet
0 75 150 300 Meters

PANEL LOCATOR

National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 5365

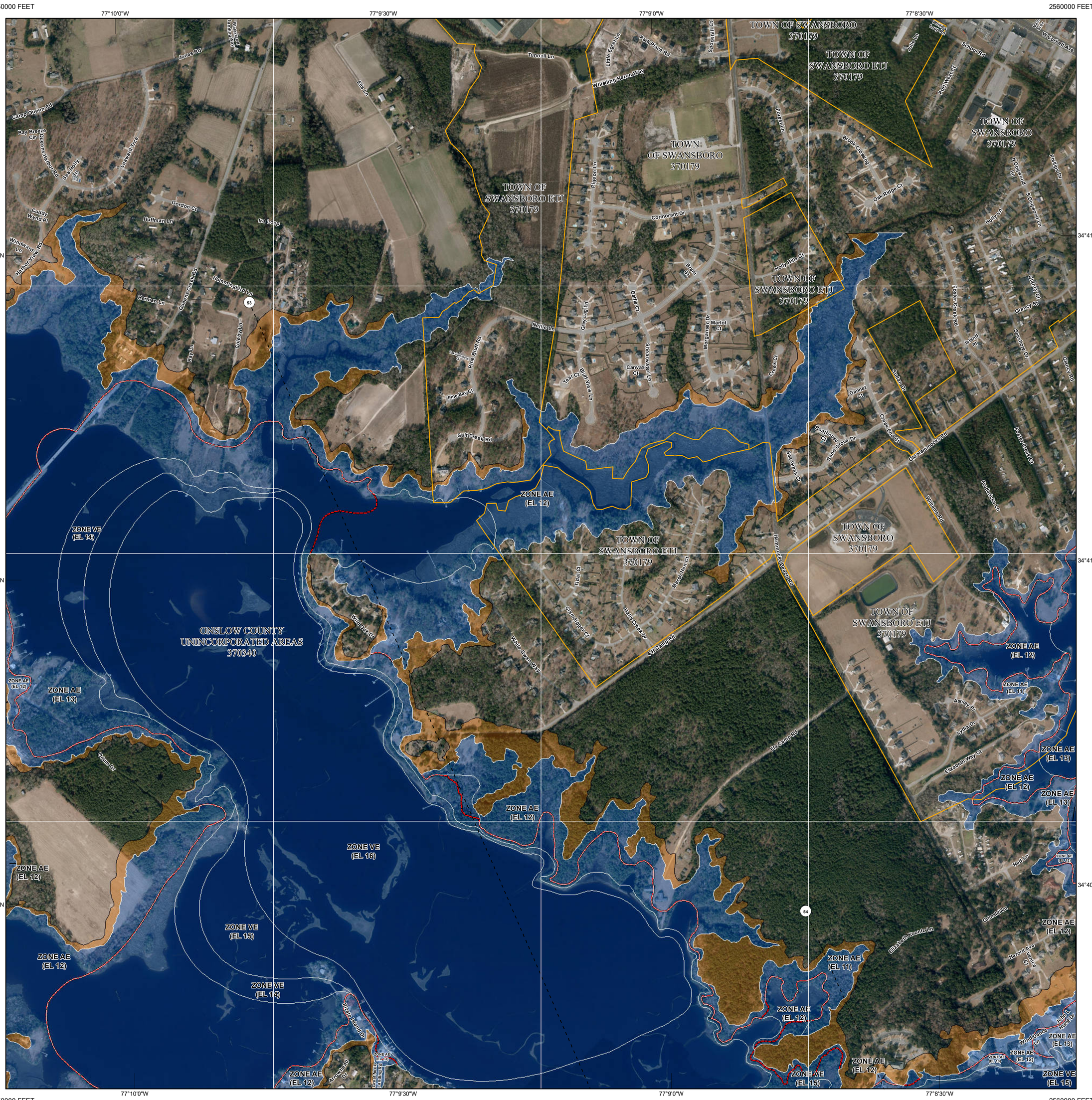
Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
CARTERET COUNTY	370043	5365	L
ONSLOW COUNTY	370340	5365	L
SWANSBORO, CITY OF	370179	5365	L

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720536500L

MAP REVISED
June 19, 2020



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	Jurisdiction Boundary

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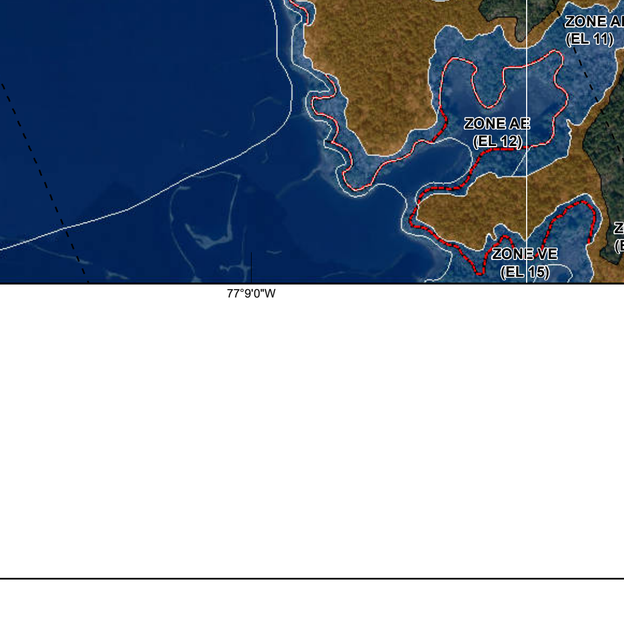


NATIONAL FLOOD INSURANCE PROGRAM

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 5354

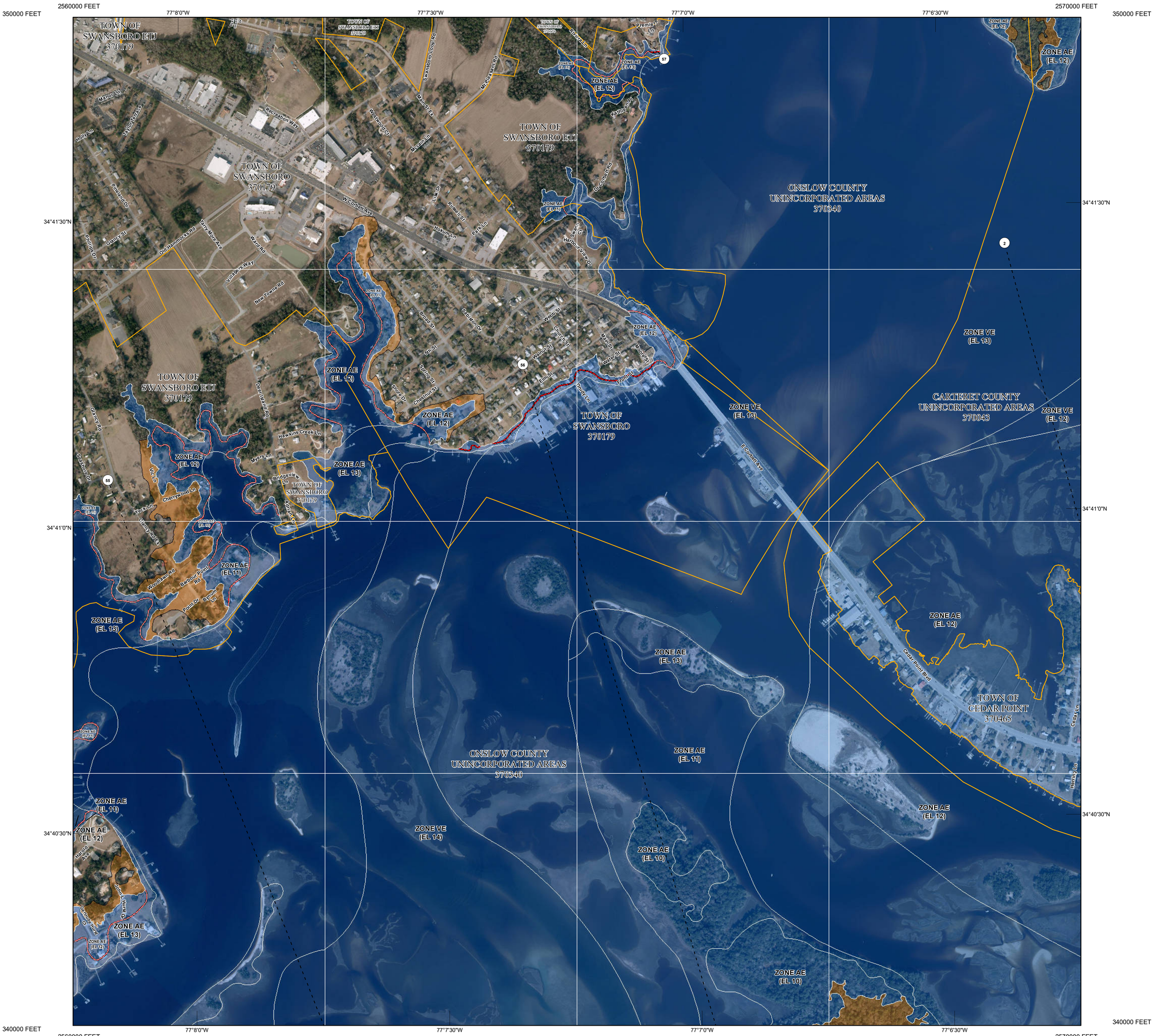
Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
ONSLOW COUNTY	370340	5354	K
SWANSBORO, TOWN OF	370179	5354	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720535400K

MAP REVISED
June 19, 2020



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LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Limit of Moderate Wave Action (LiMWA)

SCALE

Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet
0 75 150 300 Meters

PANEL LOCATOR

FEMA
National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 5364

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
CARTERET COUNTY	370043	5364	L
CEDAR POINT, TOWN OF	370465	5364	L
ONSLOW COUNTY	370340	5364	L
SWANSBORO, CITY OF	370179	5364	L

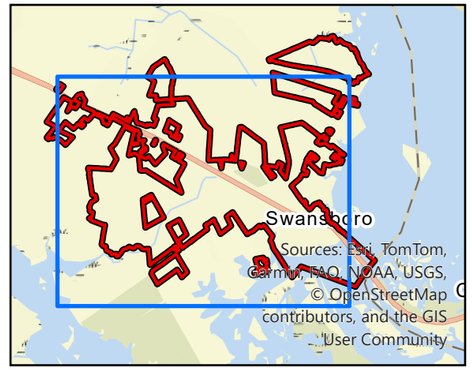
VERSION NUMBER
2.3.3.2

MAP NUMBER
3720536400L

MAP REVISED
June 19, 2020

Appendix 2: Hydrologic and Hydraulic Parameterization

- Land Use Map
- SSURGO Soils Map
- Watershed Basin Map
- Time of Concentration Calculations
- PCSWMM Input Parameters
- Tidal Stage Hydrographs



LEGEND

Land Use

- Bareland
- Buildings
- Impervious
- Roads and Parking Lots
- Open Space
- Woods
- Water

0 500 1,000 2,000 N

1 Inch = 1,000 Feet

Swansboro LASII Stormwater Master Plan Land Use Map

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license #: F-1479
www.withersravenel.com

Map Scale: 1:90,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 1000 2000 4000 6000

Feet
0 4000 8000 16000 24000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Carteret County, North Carolina
Survey Area Data: Version 28, Sep 9, 2024

Soil Survey Area: Onslow County, North Carolina
Survey Area Data: Version 27, Sep 9, 2024

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Dec 1, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AaA	Altavista loamy fine sand, 0 to 2 percent slopes	C	17.4	0.0%
Ag	Augusta loamy fine sand	B/D	31.7	0.1%
Ap	Arapahoe fine sandy loam	A/D	74.7	0.2%
AuB	Autryville loamy fine sand, 0 to 6 percent slopes	A	69.7	0.2%
Be	Beaches, coastal		152.3	0.4%
Bf	Beaches, storm tidal		38.8	0.1%
ByB	Baymeade fine sand, 1 to 6 percent slopes	A	621.5	1.8%
CH	Carteret sand, frequently flooded	A/D	173.5	0.5%
CL	Carteret sand, low, frequently flooded	A/D	411.4	1.2%
CnB	Conetoe loamy fine sand, 0 to 5 percent slopes	A	47.6	0.1%
Co	Corolla fine sand	A	94.8	0.3%
CrB	Craven loam, 1 to 4 percent slopes	D	94.2	0.3%
Cu	Corolla-Urban land complex	A	60.6	0.2%
Du	Duckston fine sand, frequently flooded	A/D	57.2	0.2%
Fr	Fripp fine sand, 2 to 30 percent slopes	A	122.8	0.4%
GoA	Goldsboro loamy fine sand, 0 to 2 percent slopes	B	49.5	0.1%
HB	Hobucken mucky fine sandy loam, frequently flooded	B/D	301.0	0.9%
KuB	Kureb sand, 0 to 6 percent slopes	A	63.1	0.2%
Ln	Leon sand	A/D	210.8	0.6%
Ly	Lynchburg fine sandy loam	A/D	168.9	0.5%
MA	Masontown mucky loam, frequently flooded	A/D	82.8	0.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Nc	Newhan-Corolla complex, 0 to 30 percent slopes	A	85.9	0.2%
Nd	Newhan fine sand, dredged, 2 to 30 percent slopes	A	95.7	0.3%
Nh	Newhan fine sand, 2 to 30 percent slopes	A	150.8	0.4%
NoB	Norfolk loamy fine sand, 2 to 6 percent slopes	A	93.2	0.3%
On	Onslow loamy sand	A	349.5	1.0%
Ra	Rains fine sandy loam, 0 to 2 percent slopes, Atlantic Coast Flatwoods	B/D	199.8	0.6%
Se	Seabrook fine sand	A	305.2	0.9%
To	Torhunta mucky fine sandy loam	A/D	72.2	0.2%
W	Water		3,279.8	9.4%
WaB	Wando fine sand, 0 to 6 percent slopes	A	702.7	2.0%
Subtotals for Soil Survey Area			**8,279.1**	**23.7%**
Totals for Area of Interest			**34,955.6**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AnB	Alpin fine sand, 1 to 6 percent slopes	A	35.4	0.1%
BaB	Baymeade fine sand, 0 to 6 percent slopes	A	1,974.4	5.6%
BmB	Baymeade-Urban land complex, 0 to 6 percent slopes	A	127.7	0.4%
Bo	Bohicket silty clay loam	D	3,640.5	10.4%
Ca	Carteret fine sand	A/D	65.9	0.2%
CrB	Craven fine sandy loam, 1 to 4 percent slopes	D	344.6	1.0%
CrC	Craven fine sandy loam, 4 to 8 percent slopes	D	20.0	0.1%
Da	Dorovan muck	B/D	0.0	0.0%
Dc	Duckston fine sand	A/D	91.2	0.3%
FoA	Foreston loamy fine sand, 0 to 2 percent slopes	B	264.0	0.8%
GoA	Goldsboro fine sandy loam, 0 to 2 percent slopes	A/D	500.4	1.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
KuB	Kureb fine sand, 1 to 6 percent slopes	A	383.0	1.1%
La	Longshoal muck	A/D	177.1	0.5%
Le	Lenoir loam	C/D	5.7	0.0%
Ln	Leon fine sand	A/D	675.3	1.9%
Ly	Lynchburg fine sandy loam, 0 to 2 percent slopes, Atlantic Coast Flatwoods	B/D	192.1	0.5%
MaC	Marvyn loamy fine sand, 6 to 15 percent slopes	B	790.2	2.3%
Md	Masontown mucky fine sandy loam	A/D	33.8	0.1%
Mk	Muckalee loam	B/D	353.7	1.0%
Mu	Murville fine sand	A/D	206.0	0.6%
NeE	Newhan-Beaches complex, 0 to 30 percent slopes	A	736.1	2.1%
NfC	Newhan fine sand, dredged, 2 to 10 percent slopes	A	327.0	0.9%
NoA	Norfolk loamy fine sand, 0 to 2 percent slopes	A	214.1	0.6%
NoB	Norfolk loamy fine sand, 2 to 6 percent slopes	A	2,097.2	6.0%
On	Onslow loamy fine sand	A	3,108.9	8.9%
Pa	Pactolus fine sand	A	132.9	0.4%
Pn	Pantego mucky loam	A/D	8.3	0.0%
Pt	Pits		2.2	0.0%
Ra	Rains fine sandy loam, 0 to 2 percent slopes, Atlantic Coast Flatwoods	B/D	745.7	2.1%
St	Stallings loamy fine sand	A/D	160.3	0.5%
To	Torhunta fine sandy loam	A/D	430.9	1.2%
W	Water		5,236.8	15.0%
WaB	Wando fine sand, 1 to 6 percent slopes	A	1,060.1	3.0%
Wo	Woodington loamy fine sand	A/D	236.9	0.7%
YaA	Yaupon fine sandy loam, 0 to 3 percent slopes	D	15.3	0.0%
Subtotals for Soil Survey Area			**24,394.0**	**69.8%**
Totals for Area of Interest			**34,955.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

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

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

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

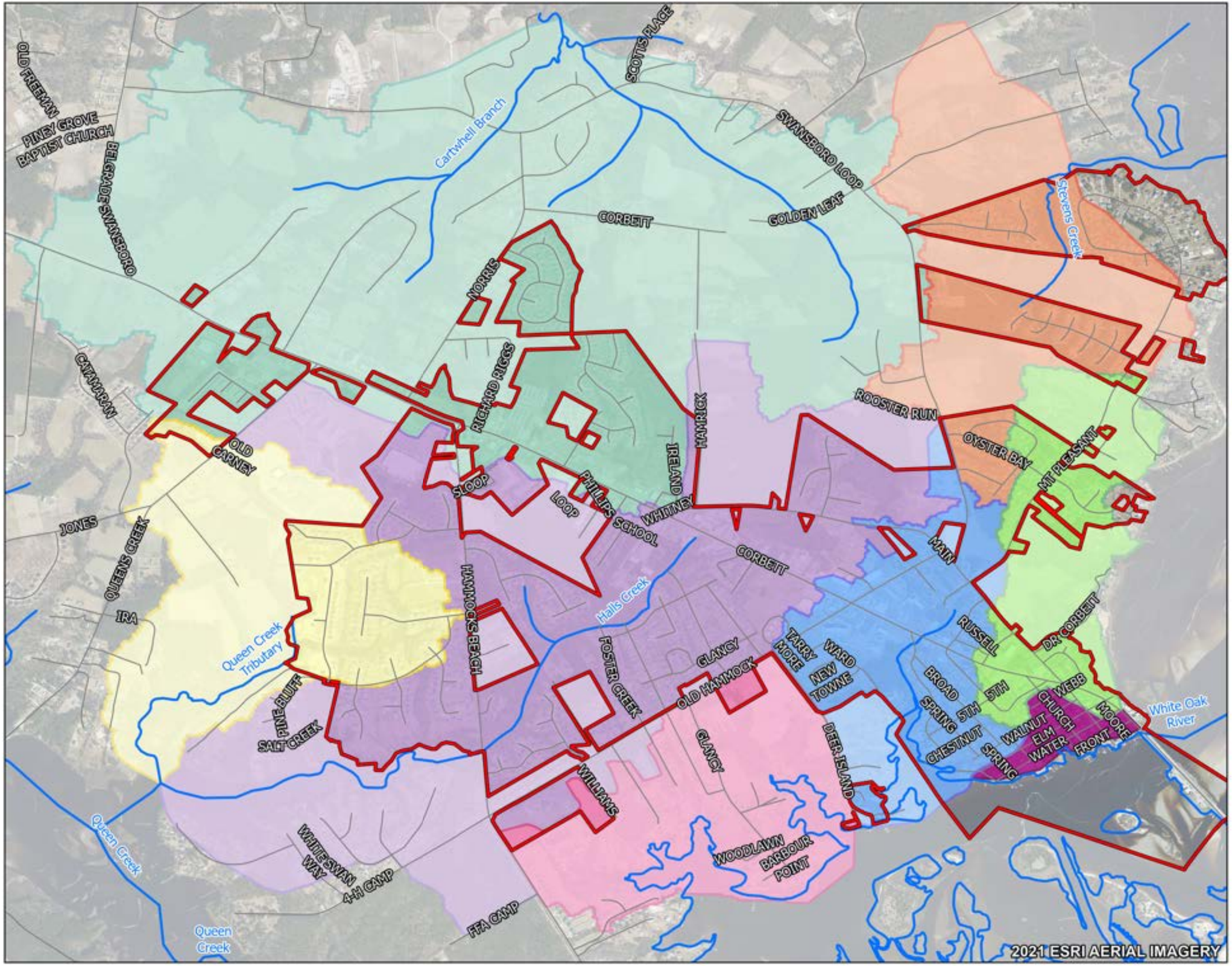
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



LEGEND

Subwatersheds

- Cartwhell Branch
- Halls Creek
- Stevens Creek
- Downtown Intracoastal Waterway
- Hawkins Creek
- Intracoastal Waterway
- Queens Creek
- White Oak River

- NHD Flowline
- Town Boundary
- Outside Town

0 750 1,500 3,000

1 Inch = 1,500 Feet

N

Swansboro LASII Stormwater Master Plan Watershed Basin Map

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Existing Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
1	0.0393	207.3	77	3.0	8.455	0.0567	5.00
2	0.0194	102.5	65	5.4	8.988	0.0435	5.00
3	0.0734	387.5	74	3.5	7.113	0.1111	6.67
4	0.1046	552.2	78	2.8	4.314	0.1686	10.12
5	0.0612	322.9	70	4.3	8.981	0.0955	5.73
6	0.0750	396.2	95	0.5	3.973	0.0709	5.00
7	0.0235	123.8	95	0.5	3.444	0.0300	5.00
8	0.0416	219.8	96	0.4	2.22	0.0562	5.00
9	0.0499	263.3	59	6.9	9.442	0.1052	6.31
10	0.1643	867.6	71	4.1	3.551	0.3258	19.55
11	0.1880	992.7	79	2.7	4.727	0.2498	14.99
12	0.0747	394.3	71	4.1	4.31	0.1574	9.44
13	0.5108	2697.0	63	5.9	3.659	0.9820	58.92
14	0.0335	176.8	90	1.1	3.342	0.0508	5.00
15	0.0431	227.5	63	5.9	3.058	0.1486	8.91
16	0.1234	651.4	78	2.8	4.956	0.1795	10.77
17	0.5644	2979.8	63	5.9	2.979	1.1787	70.72
18	0.2890	1525.8	42	13.8	5.888	0.8400	50.40
19	0.1108	585.0	64	5.6	3.278	0.2978	17.87
20	0.1152	608.2	66	5.2	3.454	0.2841	17.05
21	0.0744	392.7	69	4.5	6.286	0.1371	8.23
22	0.0287	151.6	68	4.7	5.592	0.0697	5.00
23	0.0292	154.2	63	5.9	6.861	0.0727	5.00
24	0.1286	679.1	59	6.9	3.537	0.3669	22.01
25	0.0517	272.9	71	4.1	4.72	0.1120	6.72
26	0.0800	422.2	92	0.9	2.121	0.1176	7.06
27	0.2407	1271.1	81	2.3	2.635	0.3830	22.98
28	0.0392	206.9	79	2.7	9.573	0.0501	5.00
29	0.1021	539.2	71	4.1	4.373	0.2007	12.04
30	0.1833	967.8	46	11.7	4.548	0.5976	35.86
31	0.0267	141.0	75	3.3	9.498	0.0416	5.00
32	0.6366	3361.4	62	6.1	3.444	1.2385	74.31
33	0.0543	286.5	72	3.9	4.342	0.1181	7.09
34	0.0846	446.6	67	4.9	2.798	0.2402	14.41
35	0.1177	621.4	56	7.9	2.576	0.4319	25.91
36	0.1544	815.2	81	2.3	2.517	0.2747	16.48
37	0.0406	214.1	92	0.9	2.539	0.0624	5.00
38	0.0788	416.2	73	3.7	4.559	0.1512	9.07
39	0.2157	1139.1	82	2.2	5.932	0.2264	13.58
40	0.1206	636.6	81	2.3	2.519	0.2253	13.52
41	0.0321	169.6	90	1.1	2.132	0.0616	5.00
42	0.0833	439.9	87	1.5	2.964	0.1258	7.55
43	0.4722	2493.2	64	5.6	3.015	0.9901	59.41
44	0.1570	828.7	84	1.9	3.408	0.2166	13.00
45	0.1846	974.4	58	7.2	1.812	0.7018	42.11
46	0.1205	636.1	36	17.8	3.753	0.6170	37.02
47	0.1045	551.7	83	2.0	2.356	0.1946	11.68
48	0.1108	585.1	65	5.4	3.444	0.2831	16.99
49	0.0367	193.5	91	1.0	1.766	0.0721	5.00
50	0.1697	896.1	34	19.4	3.658	0.8715	52.29

Existing Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
51	0.1547	816.8	67	4.9	3.156	0.3665	21.99
52	0.0033	17.5	64	5.6	11.358	0.0096	5.00
53	0.0088	46.6	39	15.6	7.003	0.0513	5.00
54	0.0040	20.9	46	11.7	13.729	0.0160	5.00
55	0.1171	618.5	54	8.5	5.268	0.3165	18.99
56	0.2095	1106.3	55	8.2	4.404	0.5374	32.24
57	0.1026	541.6	71	4.1	3.127	0.2381	14.29
58	0.3163	1669.9	46	11.7	4.35	0.9453	56.72
59	0.3036	1602.7	67	4.9	4.516	0.5254	31.53
60	0.1631	861.4	47	11.3	5.822	0.4689	28.13
61	0.1913	1010.0	76	3.2	6.628	0.2339	14.04
62	0.0940	496.5	79	2.7	5.285	0.1357	8.14
63	0.0380	200.4	87	1.5	6.72	0.0445	5.00
64	0.3672	1938.8	53	8.9	3.566	0.9840	59.04
65	0.3625	1914.2	78	2.8	4.005	0.4730	28.38
66	0.1774	936.9	70	4.3	2.901	0.3939	23.63
67	0.1723	910.0	40	15.0	7.779	0.5102	30.61
68	0.0751	396.5	68	4.7	5.71	0.1489	8.93
69	0.0748	395.1	89	1.2	2.048	0.1287	7.72
70	0.0405	213.6	94	0.6	2.247	0.0604	5.00
71	0.0727	383.7	64	5.6	4.148	0.1889	11.33
72	0.1643	867.6	54	8.5	4.242	0.4623	27.74
73	0.0856	452.1	54	8.5	3.897	0.2864	17.18
74	0.1163	614.3	56	7.9	5.493	0.2931	17.58
75	0.1629	860.2	45	12.2	6.324	0.4733	28.40
76	0.2644	1396.2	56	7.9	5.927	0.5442	32.65
77	0.1319	696.2	48	10.8	7.837	0.3322	19.93
78	0.1266	668.4	58	7.2	6.918	0.2657	15.94
79	0.0405	213.9	56	7.9	4.764	0.1353	8.12
80	0.1228	648.6	62	6.1	5.069	0.2737	16.42
81	0.3047	1608.7	56	7.9	4.081	0.7345	44.07
82	0.4374	2309.3	56	7.9	4.291	0.9566	57.39
83	0.2002	1057.2	40	15.0	9.927	0.5092	30.55
84	0.0756	399.0	42	13.8	13.926	0.1868	11.21
85	0.0839	442.9	71	4.1	5.33	0.1553	9.32
86	0.1336	705.6	74	3.5	2.985	0.2771	16.63
87	0.0486	256.4	69	4.5	2.054	0.1705	10.23
88	0.2442	1289.6	55	8.2	2.788	0.7636	45.82
89	0.0276	145.7	62	6.1	2.526	0.1174	7.04
90	0.0496	261.8	69	4.5	3.636	0.1303	7.82
91	0.0886	467.8	72	3.9	2.311	0.2397	14.38
92	0.0635	335.4	64	5.6	1.973	0.2460	14.76
93	0.4701	2481.9	56	7.9	4.433	0.9970	59.82
94	0.1195	630.8	54	8.5	7.948	0.2617	15.70
95	0.0540	285.3	68	4.7	2.954	0.1591	9.54
96	0.1856	980.1	37	17.0	6.328	0.6526	39.15
97	0.1764	931.6	55	8.2	6.555	0.3839	23.03
98	0.2159	1139.7	52	9.2	4.464	0.5897	35.38
99	0.1777	938.0	64	5.6	7.726	0.2829	16.98
100	0.5331	2814.8	49	10.4	5.98	1.1333	68.00
101	0.1450	765.3	59	6.9	4.041	0.3777	22.66

Existing Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
102	0.0372	196.6	71	4.1	6.388	0.0741	5.00
103	0.0735	388.1	74	3.5	9.004	0.0989	5.93
104	0.1025	541.4	57	7.5	7.885	0.2156	12.94
105	0.0704	371.6	68	4.7	3.933	0.1703	10.22
106	0.1551	819.1	71	4.1	5.323	0.2541	15.25
107	0.1453	767.1	51	9.6	4.489	0.4394	26.36
108	0.3864	2040.3	51	9.6	3.72	1.0556	63.34
109	0.7621	4023.6	36	17.8	6.24	2.0929	125.57
110	0.0769	406.1	90	1.1	2.664	0.1108	6.65
111	0.1612	851.0	62	6.1	4.723	0.3524	21.14
112	0.1056	557.5	84	1.9	3.125	0.1648	9.89
113	0.0862	455.3	88	1.4	4.839	0.0975	5.85
114	0.3107	1640.4	69	4.5	2.657	0.6618	39.71
115	0.2305	1217.1	63	5.9	5.046	0.4425	26.55
116	0.3735	1972.3	45	12.2	4.621	1.0755	64.53
117	0.2637	1392.4	46	11.7	7.325	0.6299	37.80
118	0.0732	386.6	43	13.3	9.214	0.2180	13.08
119	0.2609	1377.8	43	13.3	7.372	0.6737	40.42
120	0.0636	336.0	84	1.9	6.274	0.0776	5.00
121	0.0581	306.5	94	0.6	1.859	0.0887	5.32
122	0.0442	233.3	94	0.6	2.032	0.0682	5.00
123	0.0323	170.8	96	0.4	1.856	0.0502	5.00
124	0.1273	672.4	91	1.0	2.109	0.1787	10.72
125	0.0205	108.0	95	0.5	2.172	0.0339	5.00
126	0.0335	176.8	83	2.0	2.573	0.0749	5.00
127	0.0619	327.0	76	3.2	5.697	0.1024	6.14
128	0.0744	392.9	91	1.0	4.418	0.0804	5.00
129	0.0506	267.2	87	1.5	3.167	0.0817	5.00
130	0.0569	300.2	80	2.5	11.765	0.0590	5.00
131	0.0073	38.5	53	8.9	4.525	0.0380	5.00
132	0.0402	212.0	77	3.0	9.62	0.0541	5.00
133	0.0503	265.8	85	1.8	5.293	0.0676	5.00
134	0.0683	360.6	60	6.7	5.191	0.1780	10.68
135	0.0881	464.9	71	4.1	4.368	0.1783	10.70
136	0.2052	1083.7	49	10.4	7.154	0.4828	28.97
137	0.3516	1856.3	55	8.2	2.47	1.0857	65.14
138	0.1984	1047.6	49	10.4	2.13	0.8612	51.67
139	0.0748	394.8	51	9.6	7.554	0.1991	11.95
140	0.1573	830.4	60	6.7	5.513	0.3366	20.19
141	0.1448	764.5	66	5.2	3.241	0.3522	21.13
142	0.0629	332.0	68	4.7	7.539	0.1124	6.74
143	0.0773	408.0	65	5.4	6.583	0.1535	9.21
144	0.0538	284.1	63	5.9	5.381	0.1338	8.03
145	0.0812	428.8	72	3.9	7.616	0.1232	7.39
146	0.0298	157.1	67	4.9	8.988	0.0581	5.00
147	0.0513	270.8	64	5.6	7.448	0.1067	6.40
148	0.0206	108.8	38	16.3	12.121	0.0790	5.00
149	0.0337	177.8	59	6.9	10.882	0.0716	5.00
150	0.0441	233.0	61	6.4	10.105	0.0877	5.26
151	0.0665	351.1	69	4.5	7.2	0.1171	7.03
152	0.0307	162.1	77	3.0	3.487	0.0725	5.00

Proposed Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
1	0.0393	207.3	77	3.0	8.455	0.0567	5.00
2	0.0194	102.5	65	5.4	8.988	0.0435	5.00
3	0.0734	387.5	74	3.5	7.113	0.1111	6.67
4	0.1046	552.2	78	2.8	4.314	0.1686	10.12
5	0.0612	322.9	70	4.3	8.981	0.0955	5.73
6	0.0750	396.2	95	0.5	3.973	0.0709	5.00
7	0.0235	123.8	95	0.5	3.444	0.0300	5.00
8	0.0416	219.8	96	0.4	2.22	0.0562	5.00
9	0.0499	263.3	59	6.9	9.442	0.1052	6.31
10	0.1643	867.6	71	4.1	3.551	0.3258	19.55
11	0.1880	992.7	79	2.7	4.727	0.2498	14.99
12	0.0747	394.3	71	4.1	4.31	0.1574	9.44
13	0.5108	2697.0	63	5.9	3.659	0.9820	58.92
14	0.0335	176.8	90	1.1	3.342	0.0508	5.00
15	0.0431	227.5	63	5.9	3.058	0.1486	8.91
16	0.1234	651.4	78	2.8	4.956	0.1795	10.77
17	0.5644	2979.8	63	5.9	2.979	1.1787	70.72
18	0.2890	1525.8	42	13.8	5.888	0.8400	50.40
19	0.1108	585.0	67	4.9	3.278	0.2754	16.52
20	0.1152	608.2	66	5.2	3.454	0.2841	17.05
21	0.0744	392.7	69	4.5	6.286	0.1371	8.23
22	0.0287	151.6	68	4.7	5.592	0.0697	5.00
23	0.0292	154.2	63	5.9	6.861	0.0727	5.00
24	0.1286	679.1	59	6.9	3.537	0.3669	22.01
25	0.0517	272.9	71	4.1	4.72	0.1120	6.72
26	0.0800	422.2	92	0.9	2.121	0.1176	7.06
27	0.2407	1271.1	81	2.3	2.635	0.3830	22.98
28	0.0392	206.9	79	2.7	9.573	0.0501	5.00
29	0.1021	539.2	71	4.1	4.373	0.2007	12.04
30	0.1833	967.8	46	11.7	4.548	0.5976	35.86
31	0.0267	141.0	75	3.3	9.498	0.0416	5.00
32	0.6366	3361.4	62	6.1	3.444	1.2385	74.31
33	0.0543	286.5	72	3.9	4.342	0.1181	7.09
34	0.0846	446.6	67	4.9	2.798	0.2402	14.41
35	0.1177	621.4	56	7.9	2.576	0.4319	25.91
36	0.1544	815.2	81	2.3	2.517	0.2747	16.48
37	0.0406	214.1	94	0.6	2.539	0.0569	5.00
38	0.0788	416.2	73	3.7	4.559	0.1512	9.07
39	0.2157	1139.1	82	2.2	5.932	0.2264	13.58
40	0.1206	636.6	81	2.3	2.519	0.2253	13.52
41	0.0321	169.6	90	1.1	2.132	0.0616	5.00
42	0.0833	439.9	87	1.5	2.964	0.1258	7.55
43	0.4722	2493.2	64	5.6	3.015	0.9901	59.41
44	0.1570	828.7	84	1.9	3.408	0.2166	13.00
45	0.1846	974.4	58	7.2	1.812	0.7018	42.11
46	0.1205	636.1	36	17.8	3.753	0.6170	37.02
47	0.1045	551.7	83	2.0	2.356	0.1946	11.68
48	0.1108	585.1	65	5.4	3.444	0.2831	16.99
49	0.0367	193.5	91	1.0	1.766	0.0721	5.00
50	0.1697	896.1	34	19.4	3.658	0.8715	52.29

Proposed Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
51	0.1547	816.8	67	4.9	3.156	0.3665	21.99
52	0.0033	17.5	64	5.6	11.358	0.0096	5.00
53	0.0088	46.6	39	15.6	7.003	0.0513	5.00
54	0.0040	20.9	46	11.7	13.729	0.0160	5.00
55	0.1171	618.5	54	8.5	5.268	0.3165	18.99
56	0.2095	1106.3	55	8.2	4.404	0.5374	32.24
57	0.1026	541.6	71	4.1	3.127	0.2381	14.29
58	0.3163	1669.9	46	11.7	4.35	0.9453	56.72
59	0.3036	1602.7	67	4.9	4.516	0.5254	31.53
60	0.1631	861.4	47	11.3	5.822	0.4689	28.13
61	0.1913	1010.0	76	3.2	6.628	0.2339	14.04
62	0.0940	496.5	79	2.7	5.285	0.1357	8.14
63	0.0380	200.4	87	1.5	6.72	0.0445	5.00
64	0.3672	1938.8	53	8.9	3.566	0.9840	59.04
65	0.3625	1914.2	78	2.8	4.005	0.4730	28.38
66	0.1774	936.9	70	4.3	2.901	0.3939	23.63
67	0.1723	910.0	40	15.0	7.779	0.5102	30.61
68	0.0751	396.5	68	4.7	5.71	0.1489	8.93
69	0.0748	395.1	89	1.2	2.048	0.1287	7.72
70	0.0405	213.6	94	0.6	2.247	0.0604	5.00
71	0.0727	383.7	64	5.6	4.148	0.1889	11.33
72	0.1643	867.6	54	8.5	4.242	0.4623	27.74
73	0.0856	452.1	54	8.5	3.897	0.2864	17.18
74	0.1163	614.3	56	7.9	5.493	0.2931	17.58
75	0.1629	860.2	45	12.2	6.324	0.4733	28.40
76	0.2644	1396.2	56	7.9	5.927	0.5442	32.65
77	0.1319	696.2	48	10.8	7.837	0.3322	19.93
78	0.1266	668.4	58	7.2	6.918	0.2657	15.94
79	0.0405	213.9	56	7.9	4.764	0.1353	8.12
80	0.1228	648.6	62	6.1	5.069	0.2737	16.42
81	0.3047	1608.7	56	7.9	4.081	0.7345	44.07
82	0.4374	2309.3	56	7.9	4.291	0.9566	57.39
83	0.2002	1057.2	40	15.0	9.927	0.5092	30.55
84	0.0756	399.0	42	13.8	13.926	0.1868	11.21
85	0.0839	442.9	71	4.1	5.33	0.1553	9.32
86	0.1336	705.6	74	3.5	2.985	0.2771	16.63
87	0.0486	256.4	69	4.5	2.054	0.1705	10.23
88	0.2442	1289.6	55	8.2	2.788	0.7636	45.82
89	0.0276	145.7	62	6.1	2.526	0.1174	7.04
90	0.0496	261.8	69	4.5	3.636	0.1303	7.82
91	0.0886	467.8	72	3.9	2.311	0.2397	14.38
92	0.0635	335.4	64	5.6	1.973	0.2460	14.76
93	0.4701	2481.9	56	7.9	4.433	0.9970	59.82
94	0.1195	630.8	54	8.5	7.948	0.2617	15.70
95	0.0540	285.3	68	4.7	2.954	0.1591	9.54
96	0.1856	980.1	37	17.0	6.328	0.6526	39.15
97	0.1764	931.6	55	8.2	6.555	0.3839	23.03
98	0.2159	1139.7	52	9.2	4.464	0.5897	35.38
99	0.1777	938.0	64	5.6	7.726	0.2829	16.98
100	0.5331	2814.8	49	10.4	5.98	1.1333	68.00
101	0.1450	765.3	59	6.9	4.041	0.3777	22.66

Proposed Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
102	0.0372	196.6	71	4.1	6.388	0.0741	5.00
103	0.0735	388.1	74	3.5	9.004	0.0989	5.93
104	0.1025	541.4	57	7.5	7.885	0.2156	12.94
105	0.0704	371.6	68	4.7	3.933	0.1703	10.22
106	0.1551	819.1	71	4.1	5.323	0.2541	15.25
107	0.1453	767.1	51	9.6	4.489	0.4394	26.36
108	0.3864	2040.3	51	9.6	3.72	1.0556	63.34
109	0.7621	4023.6	36	17.8	6.24	2.0929	125.57
110	0.0769	406.1	90	1.1	2.664	0.1108	6.65
111	0.1612	851.0	62	6.1	4.723	0.3524	21.14
112	0.1056	557.5	84	1.9	3.125	0.1648	9.89
113	0.0862	455.3	88	1.4	4.839	0.0975	5.85
114	0.3107	1640.4	69	4.5	2.657	0.6618	39.71
115	0.2305	1217.1	63	5.9	5.046	0.4425	26.55
116	0.3735	1972.3	45	12.2	4.621	1.0755	64.53
117	0.2637	1392.4	46	11.7	7.325	0.6299	37.80
118	0.0732	386.6	43	13.3	9.214	0.2180	13.08
119	0.2609	1377.8	43	13.3	7.372	0.6737	40.42
120	0.0636	336.0	84	1.9	6.274	0.0776	5.00
121	0.0581	306.5	94	0.6	1.859	0.0887	5.32
122	0.0442	233.3	94	0.6	2.032	0.0682	5.00
123	0.0323	170.8	96	0.4	1.856	0.0502	5.00
124	0.1273	672.4	91	1.0	2.109	0.1787	10.72
125	0.0205	108.0	95	0.5	2.172	0.0339	5.00
126	0.0335	176.8	83	2.0	2.573	0.0749	5.00
127	0.0619	327.0	76	3.2	5.697	0.1024	6.14
128	0.0744	392.9	91	1.0	4.418	0.0804	5.00
129	0.0506	267.2	87	1.5	3.167	0.0817	5.00
130	0.0569	300.2	80	2.5	11.765	0.0590	5.00
131	0.0073	38.5	53	8.9	4.525	0.0380	5.00
132	0.0402	212.0	77	3.0	9.62	0.0541	5.00
133	0.0503	265.8	85	1.8	5.293	0.0676	5.00
134	0.0683	360.6	60	6.7	5.191	0.1780	10.68
135	0.0881	464.9	71	4.1	4.368	0.1783	10.70
136	0.2052	1083.7	49	10.4	7.154	0.4828	28.97
137	0.3516	1856.3	55	8.2	2.47	1.0857	65.14
138	0.1984	1047.6	49	10.4	2.13	0.8612	51.67
139	0.0748	394.8	52	9.2	7.449	0.1955	11.73
140	0.0370	195.5	49	10.4	8.562	0.1122	6.73
141	0.1448	764.5	66	5.2	3.213	0.3537	21.22
142	0.0629	332.0	68	4.7	7.53	0.1125	6.75
143	0.0472	249.2	56	7.9	7.966	0.1182	7.09
144	0.0607	320.7	56	7.9	8.405	0.1409	8.45
145	0.0812	428.8	71	4.1	7.626	0.1265	7.59
146	0.0312	164.5	76	3.2	7.908	0.0501	5.00
147	0.0229	120.9	55	8.2	6.245	0.0768	5.00
148	0.0223	117.8	39	15.6	11.643	0.0835	5.01
149	0.0201	105.9	65	5.4	6.133	0.0541	5.00
150	0.0893	471.7	65	5.4	8.372	0.1528	9.17
151	0.0304	160.6	68	4.7	7.064	0.0650	5.00
152	0.0179	94.4	81	2.3	4.845	0.0353	5.00
153	0.0273	144.0	61	6.4	8.488	0.0651	5.00

Proposed Conditions Time of Concentration Calculations

Drainage Area No.	Longest Flow Path (mi)	Longest Flow Path (ft)	Curve No.	Maximum Potential Retention (in)	Average Watershed Land Slope (%)	Time of Concentration (hr)	Time of Concentration (min)
154	0.0362	190.9	82	2.2	4.397	0.0630	5.00
155	0.0382	201.9	66	5.2	6.465	0.0859	5.16
156	0.0422	222.8	64	5.6	7.073	0.0936	5.62
157	0.0602	317.9	65	5.4	5.55	0.1369	8.21
158	0.0483	255.1	67	4.9	5.941	0.1053	6.32
159	0.0953	503.3	59	6.9	4.755	0.2490	14.94
160	0.0427	225.5	64	5.6	5.869	0.1038	6.23
161	0.0519	274.2	70	4.3	6.828	0.0961	5.76
162	0.0328	172.9	72	3.9	8.581	0.0561	5.00

Existing ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
1	SWDI0034	0.095	5	SCS CN	0.2 S	0.597	77	Standard (483.4)
2	SWDI0310	0.079	5	SCS CN	0.2 S	1.077	65	Standard (483.4)
3	SWDI0039	1.534	6.67	SCS CN	0.2 S	0.703	74	Standard (483.4)
4	SWDI0042	3.105	10.12	SCS CN	0.2 S	0.564	78	Standard (483.4)
5	SWDI0044	0.258	5.73	SCS CN	0.2 S	0.857	70	Standard (483.4)
6	SWDI0048	1.449	5	SCS CN	0.2 S	0.105	95	Standard (483.4)
7	SWDI0009	0.074	5	SCS CN	0.2 S	0.105	95	Standard (483.4)
8	SWDI0046	0.254	5	SCS CN	0.2 S	0.083	96	Standard (483.4)
9	SWMH0072	1.477	6.31	SCS CN	0.2 S	1.39	59	Standard (483.4)
10	SWDI0653	2.836	19.55	SCS CN	0.2 S	0.817	71	Standard (483.4)
11	CP0156	5.774	14.99	SCS CN	0.2 S	0.532	79	Standard (483.4)
12	CP0174	1.36	9.44	SCS CN	0.2 S	0.817	71	Standard (483.4)
13	CP0163	38.767	58.92	SCS CN	0.2 S	1.175	63	Standard (483.4)
14	SWDI0045	0.09	5	SCS CN	0.2 S	0.222	90	Standard (483.4)
15	CP0254	0.771	8.91	SCS CN	0.2 S	1.175	63	Standard (483.4)
16	SWDI0043	1.631	10.77	SCS CN	0.2 S	0.564	78	Standard (483.4)
17	CP0168	58.52	70.72	SCS CN	0.2 S	1.175	63	Standard (483.4)
18	J10	9.488	50.4	SCS CN	0.2 S	2.762	42	Standard (483.4)
19	SWDI0143	4.346	17.87	SCS CN	0.2 S	1.125	64	Standard (483.4)
20	SWDI0148	1.482	17.05	SCS CN	0.2 S	1.03	66	Standard (483.4)
21	SWDI0595	1.395	8.23	SCS CN	0.2 S	0.899	69	Standard (483.4)
22	SWDI0312	0.223	5	SCS CN	0.2 S	0.941	68	Standard (483.4)
23	SWDI0041	0.192	5	SCS CN	0.2 S	1.175	63	Standard (483.4)
24	J18	6.882	22.01	SCS CN	0.2 S	1.39	59	Standard (483.4)
25	SWDI0028	0.54	6.72	SCS CN	0.2 S	0.817	71	Standard (483.4)
26	SWDI0263	0.614	7.06	SCS CN	0.2 S	0.174	92	Standard (483.4)
27	DP0209	6.357	22.98	SCS CN	0.2 S	0.469	81	Standard (483.4)
28	SWMH0005	0.247	5	SCS CN	0.2 S	0.532	79	Standard (483.4)
29	SWDI0037	1.605	12.04	SCS CN	0.2 S	0.817	71	Standard (483.4)
30	SWDI0172	8.262	35.86	SCS CN	0.2 S	2.348	46	Standard (483.4)
31	SWDI0035	0.196	5	SCS CN	0.2 S	0.667	75	Standard (483.4)
32	J30	124	74.31	SCS CN	0.2 S	1.226	62	Standard (483.4)
33	SWDI0189	0.787	7.09	SCS CN	0.2 S	0.778	72	Standard (483.4)
34	SWDI0190	0.887	14.41	SCS CN	0.2 S	0.985	67	Standard (483.4)
35	SWDI0150	2.298	25.91	SCS CN	0.2 S	1.571	56	Standard (483.4)
36	SWDI0147	2.452	16.48	SCS CN	0.2 S	0.469	81	Standard (483.4)
37	SWDI0141	0.348	5	SCS CN	0.2 S	0.174	92	Standard (483.4)
38	J23	2.434	9.07	SCS CN	0.2 S	0.74	73	Standard (483.4)
39	CP0305	1.556	13.58	SCS CN	0.2 S	0.439	82	Standard (483.4)
40	SWDI0142	3.719	13.52	SCS CN	0.2 S	0.469	81	Standard (483.4)
41	SWDI0139	0.255	5	SCS CN	0.2 S	0.222	90	Standard (483.4)
42	SWDI0144	2.58	7.55	SCS CN	0.2 S	0.299	87	Standard (483.4)
43	CP0160	21.72	59.41	SCS CN	0.2 S	1.125	64	Standard (483.4)
44	J28	5.311	13	SCS CN	0.2 S	0.381	84	Standard (483.4)
45	CP0027	8.007	42.11	SCS CN	0.2 S	1.448	58	Standard (483.4)
46	J34	5.666	37.02	SCS CN	0.2 S	3.556	36	Standard (483.4)
47	SWDI0265	1.163	11.68	SCS CN	0.2 S	0.41	83	Standard (483.4)
48	SWDI0430	1.901	16.99	SCS CN	0.2 S	1.077	65	Standard (483.4)
49	SWDI0428	0.509	5	SCS CN	0.2 S	0.198	91	Standard (483.4)
50	CP0145	5.028	52.29	SCS CN	0.2 S	3.882	34	Standard (483.4)

Existing ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
51	CP0145	4.703	21.99	SCS CN	0.2 S	0.985	67	Standard (483.4)
52	SWDI0658	0.058	5	SCS CN	0.2 S	1.125	64	Standard (483.4)
53	SWDI0660	0.165	5	SCS CN	0.2 S	3.128	39	Standard (483.4)
54	SWDI0659	0.057	5	SCS CN	0.2 S	2.348	46	Standard (483.4)
55	J33	3.545	18.99	SCS CN	0.2 S	1.704	54	Standard (483.4)
56	WEIR0022	9.109	32.24	SCS CN	0.2 S	1.636	55	Standard (483.4)
57	SWDI0293	1.711	14.29	SCS CN	0.2 S	0.817	71	Standard (483.4)
58	DP0236	11.037	56.72	SCS CN	0.2 S	2.348	46	Standard (483.4)
59	CP0256	10.108	31.53	SCS CN	0.2 S	0.985	67	Standard (483.4)
60	CP0283	4.906	28.13	SCS CN	0.2 S	2.255	47	Standard (483.4)
61	J4	9.096	14.04	SCS CN	0.2 S	0.632	76	Standard (483.4)
62	SWDI0177	2.446	8.14	SCS CN	0.2 S	0.532	79	Standard (483.4)
63	CP0293	0.376	5	SCS CN	0.2 S	0.299	87	Standard (483.4)
64	CP0281	21.886	59.04	SCS CN	0.2 S	1.774	53	Standard (483.4)
65	CP0283	22.22	28.38	SCS CN	0.2 S	0.564	78	Standard (483.4)
66	SWDI0188	2.773	23.63	SCS CN	0.2 S	0.857	70	Standard (483.4)
67	J13	3.202	30.61	SCS CN	0.2 S	3	40	Standard (483.4)
68	SWDI0171	0.941	8.93	SCS CN	0.2 S	0.941	68	Standard (483.4)
69	SWDI0429	0.438	7.72	SCS CN	0.2 S	0.247	89	Standard (483.4)
70	SWDI0290	0.267	5	SCS CN	0.2 S	0.128	94	Standard (483.4)
71	SWDI0174	0.833	11.33	SCS CN	0.2 S	1.125	64	Standard (483.4)
72	SWDI0497	2.96	27.74	SCS CN	0.2 S	1.704	54	Standard (483.4)
73	SWDI0388	0.758	17.18	SCS CN	0.2 S	1.704	54	Standard (483.4)
74	SWDI0229	1.43	17.58	SCS CN	0.2 S	1.571	56	Standard (483.4)
75	CP0309	4.496	28.4	SCS CN	0.2 S	2.444	45	Standard (483.4)
76	CP0015	8.01	32.65	SCS CN	0.2 S	1.571	56	Standard (483.4)
77	SWMH0074	2.24	19.93	SCS CN	0.2 S	2.167	48	Standard (483.4)
78	DP0172	4.632	15.94	SCS CN	0.2 S	1.448	58	Standard (483.4)
79	SWDI0488	0.469	8.12	SCS CN	0.2 S	1.571	56	Standard (483.4)
80	SWDI0186	4.778	16.42	SCS CN	0.2 S	1.226	62	Standard (483.4)
81	SWMH0096	10.925	44.07	SCS CN	0.2 S	1.571	56	Standard (483.4)
82	J64	10.13	57.39	SCS CN	0.2 S	1.571	56	Standard (483.4)
83	J19	5.939	30.55	SCS CN	0.2 S	3	40	Standard (483.4)
84	CP0306	0.342	11.21	SCS CN	0.2 S	2.762	42	Standard (483.4)
85	SWDI0228	0.73	9.32	SCS CN	0.2 S	0.817	71	Standard (483.4)
86	CP0160	1.758	16.63	SCS CN	0.2 S	0.703	74	Standard (483.4)
87	SWDI0466	0.706	10.23	SCS CN	0.2 S	0.899	69	Standard (483.4)
88	J20	8.379	45.82	SCS CN	0.2 S	1.636	55	Standard (483.4)
89	SWDI0465	0.329	7.04	SCS CN	0.2 S	1.226	62	Standard (483.4)
90	SWDI0151	0.247	7.82	SCS CN	0.2 S	0.899	69	Standard (483.4)
91	SWDI0224	0.579	14.38	SCS CN	0.2 S	0.778	72	Standard (483.4)
92	SWDI0223	0.663	14.76	SCS CN	0.2 S	1.125	64	Standard (483.4)
93	J25	28.041	59.82	SCS CN	0.2 S	1.571	56	Standard (483.4)
94	J12	5.142	15.7	SCS CN	0.2 S	1.704	54	Standard (483.4)
95	SWDI0152	0.275	9.54	SCS CN	0.2 S	0.941	68	Standard (483.4)
96	J8	5.626	39.15	SCS CN	0.2 S	3.405	37	Standard (483.4)
97	J37	5.73	23.03	SCS CN	0.2 S	1.636	55	Standard (483.4)
98	J36	6.943	35.38	SCS CN	0.2 S	1.846	52	Standard (483.4)
99	J2	12.032	16.98	SCS CN	0.2 S	1.125	64	Standard (483.4)
100	J41	30.924	68	SCS CN	0.2 S	2.082	49	Standard (483.4)
101	J365	6.453	22.66	SCS CN	0.2 S	1.39	59	Standard (483.4)

Existing ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
102	J78	0.369	5	SCS CN	0.2 S	0.817	71	Standard (483.4)
103	J563	2.482	5.93	SCS CN	0.2 S	0.703	74	Standard (483.4)
104	J797	2.086	12.94	SCS CN	0.2 S	1.509	57	Standard (483.4)
105	J27	0.845	10.22	SCS CN	0.2 S	0.941	68	Standard (483.4)
106	CP0023	4.313	15.25	SCS CN	0.2 S	0.817	71	Standard (483.4)
107	J29	6.882	26.36	SCS CN	0.2 S	1.922	51	Standard (483.4)
108	J31	21.14	63.34	SCS CN	0.2 S	1.922	51	Standard (483.4)
109	CP0025	67.608	125.57	SCS CN	0.2 S	3.556	36	Standard (483.4)
110	SWDI0266	0.704	6.65	SCS CN	0.2 S	0.222	90	Standard (483.4)
111	J38	3.745	21.14	SCS CN	0.2 S	1.226	62	Standard (483.4)
112	CP0173	2.392	9.89	SCS CN	0.2 S	0.381	84	Standard (483.4)
113	CP0171	0.879	5.85	SCS CN	0.2 S	0.273	88	Standard (483.4)
114	CP0148	14.681	39.71	SCS CN	0.2 S	0.899	69	Standard (483.4)
115	J40	6.477	26.55	SCS CN	0.2 S	1.175	63	Standard (483.4)
116	DP0173	13.97	64.53	SCS CN	0.2 S	2.444	45	Standard (483.4)
117	J17	11.31	37.8	SCS CN	0.2 S	2.348	46	Standard (483.4)
118	DP0142	1.923	13.08	SCS CN	0.2 S	2.651	43	Standard (483.4)
119	J9	8.958	40.42	SCS CN	0.2 S	2.651	43	Standard (483.4)
120	DP0152	3.183	5	SCS CN	0.2 S	0.381	84	Standard (483.4)
121	SWDI0260	0.254	5.32	SCS CN	0.2 S	0.128	94	Standard (483.4)
122	SWDI0259	0.188	5	SCS CN	0.2 S	0.128	94	Standard (483.4)
123	SWDI0258	0.247	5	SCS CN	0.2 S	0.083	96	Standard (483.4)
124	SWDI0517	3.151	10.72	SCS CN	0.2 S	0.198	91	Standard (483.4)
125	SWMH0078	0.189	5	SCS CN	0.2 S	0.105	95	Standard (483.4)
126	SWDI0442	0.508	5	SCS CN	0.2 S	0.41	83	Standard (483.4)
127	SWDI0032	1.028	6.14	SCS CN	0.2 S	0.632	76	Standard (483.4)
128	SWDI0049	0.587	5	SCS CN	0.2 S	0.198	91	Standard (483.4)
129	SWMH0059	0.424	5	SCS CN	0.2 S	0.299	87	Standard (483.4)
130	SWDI0030	0.903	5	SCS CN	0.2 S	0.5	80	Standard (483.4)
131	SWDI0306	0.02	5	SCS CN	0.2 S	1.774	53	Standard (483.4)
132	J480	0.644	5	SCS CN	0.2 S	0.597	77	Standard (483.4)
133	SWMH0007	1.052	5	SCS CN	0.2 S	0.353	85	Standard (483.4)
134	SWDI0023	0.757	10.68	SCS CN	0.2 S	1.333	60	Standard (483.4)
135	DP0248	4.648	10.7	SCS CN	0.2 S	0.817	71	Standard (483.4)
136	J5086	4.206	28.97	SCS CN	0.2 S	2.082	49	Standard (483.4)
137	SWDI0396	18.912	65.14	SCS CN	0.2 S	1.636	55	Standard (483.4)
138	SWDI0399	5.912	51.67	SCS CN	0.2 S	2.082	49	Standard (483.4)
139	J798	1.608	11.95	SCS CN	0.2 S	1.922	51	Standard (483.4)
140	J796	2.526	20.19	SCS CN	0.2 S	1.333	60	Standard (483.4)
141	SWDI0038	3.69	21.13	SCS CN	0.2 S	1.03	66	Standard (483.4)
142	SWDI0036	1.285	6.74	SCS CN	0.2 S	0.941	68	Standard (483.4)
143	SWDI0619	1.962	9.21	SCS CN	0.2 S	1.077	65	Standard (483.4)
144	SWDI0616	1.111	8.03	SCS CN	0.2 S	1.175	63	Standard (483.4)
145	SWDI0040	1.158	7.39	SCS CN	0.2 S	0.778	72	Standard (483.4)
146	SWDI0614	0.288	5	SCS CN	0.2 S	0.985	67	Standard (483.4)
147	SWDI0610	0.81	6.4	SCS CN	0.2 S	1.125	64	Standard (483.4)
148	SWDI0618	0.128	5	SCS CN	0.2 S	3.263	38	Standard (483.4)
149	SWDI0611	0.297	5	SCS CN	0.2 S	1.39	59	Standard (483.4)
150	SWDI0612	0.417	5.26	SCS CN	0.2 S	1.279	61	Standard (483.4)
151	SWDI0609	0.763	7.03	SCS CN	0.2 S	0.899	69	Standard (483.4)
152	SWDI0596	0.19	5	SCS CN	0.2 S	0.597	77	Standard (483.4)

Existing Conduit SWMM Input Parameters

Name	Inlet Node	Outlet Node	Description	Tag	Length (ft)	Roughness	Inlet Elev. (ft)	Outlet Elev. (ft)	Entry Loss Coeff.	Exit Loss Coeff.	Cross-Section	Geom 1 (ft)	Geom 2 (ft)	Geom 3 (ft)	Geom 4 (ft)	Barrels	Slope (ft/ft)
139018380_2	J9	J6	Data source = NHD flowlines	DITCH	896.32	0.035	10	3.468	0	0	IRREGULAR	0	0	0	0	1	0.00729
139018380_3	CP0024	J12	Data source = NHD flowlines	DITCH	159.47	0.035	17.752	13	0	0	IRREGULAR	0	0	0	0	1	0.02981
139018380_4	J12	J9	Data source = NHD flowlines	DITCH	319.01	0.035	13	10	0	0	IRREGULAR	0	0	0	0	1	0.0094
C1	CP0175	J40		DITCH	160.57	0.035	26.575	25.744	0	0	IRREGULAR	0	0	0	0	1	0.00518
C1_1	J17	J21		DITCH	588.09	0.035	8.371	6.651	0	0	IRREGULAR	0	0	0	0	1	0.00292
C1_10	J15	J13		DITCH	298.5	0.035	6.375	5.482	0	0	IRREGULAR	0	0	0	0	1	0.00299
C1_11	J21	J64		DITCH	13.184	0.035	6.651	6.612	0	0	IRREGULAR	0	0	0	0	1	0.00296
C1_12	J19	J17		DITCH	355.68	0.035	9.458	8.371	0	0	IRREGULAR	0	0	0	0	1	0.00306
C1_13	J64	J15		DITCH	81.059	0.035	6.612	6.375	0	0	IRREGULAR	0	0	0	0	1	0.00292
C1_14	J39	CP0148		DITCH	183.68	0.035	25.548	24.147	0	0.6	IRREGULAR	0	0	0	0	1	0.00763
C1_15	CP0169	J40			275.04	0.035	25.951	25.744	0	0	IRREGULAR	0	0	0	0	1	0.00075
C1_16	J40	J39			260.69	0.035	25.744	25.548	0	0	IRREGULAR	0	0	0	0	1	0.00075
C1_17	J6	J41		DITCH	1016.2	0.035	3.468	-0.1217	0	0	IRREGULAR	0	0	0	0	1	0.00353
C1_18	J41	J4		DITCH	508.64	0.035	-0.1217	-1.7455	0	0	IRREGULAR	0	0	0	0	1	0.00319
C1_2	J2	CP0026		DITCH	252.75	0.035	-2.1451	-2.936	0	0	IRREGULAR	0	0	0	0	1	0.00313
C1_20	J2472	J19		DITCH	670.57	0.035	14.671	9.458	0	0	IRREGULAR	0	0	0	0	1	0.00777
C1_3	CP0157	J39		DITCH	195.26	0.035	27.037	25.548	0.5	0	IRREGULAR	0	0	0	0	1	0.00763
C1_4	J4	J2		DITCH	315.01	0.035	-1.7455	-2.1451	0	0	IRREGULAR	0	0	0	0	1	0.00127
C1_5	DP0248	J2472		DITCH	345.24	0.035	12.539	14.671	0	0	IRREGULAR	0	0	0	0	1	-0.0062
C1_6	J8	J6		DITCH	166.51	0.035	3.979	3.468	0	0	IRREGULAR	0	0	0	0	1	0.00307
C1_7	J10	J8		DITCH	318.59	0.035	4.93	3.979	0	0	IRREGULAR	0	0	0	0	1	0.00299
C1_8	J11	J10		DITCH	120.69	0.035	4.989	4.93	0	0	IRREGULAR	0	0	0	0	1	0.00049
C1_9	J13	J11		DITCH	40.377	0.035	5.482	4.989	0	0	IRREGULAR	0	0	0	0	1	0.01221
C10	J850	J78			15.17	0.01	11.14	11.13	0	0	CIRCULAR	1.25	0	0	0	1	0.00066
C10116	SWDI0172	J41			564.44	0.01	15.117	7.678	0	0	TRAPEZ.	0.167	20	2	2	1	0.01318
C10238	SWDI0173	J41			437.32	0.01	15.085	7.678	0	0	TRAPEZ.	0.167	20	2	2	1	0.01694
C10609	SWDI0396	DP0097		OL	131.2	0.01	23.526	19.812	0	0	IRREGULAR	0	0	0	0	1	0.02832
C10609_2	J5084	J2472		DITCH	185.3	0.035	26.313	14.671	0	0	IRREGULAR	0	0	0	0	1	0.06295
C10609_4	J5085	J5084			17.351	0.013	26.373	26.313	0	0	CIRCULAR	1.25	0	0	0	1	0.00346
C10609_5	J5086	J5085		DITCH	31.368	0.035	30.447	26.373	0	0	TRAPEZ.	2	4	2	2	1	0.13099
C10621	J20	SWDI0466		OL	121	0.01	19.64	23.285	0	0	IRREGULAR	0	0	0	0	1	-0.0301
C11	CP0256	CP0254			327.99	0.035	26.255	26.305	0	0	IRREGULAR	0	0	0	0	1	-0.0002
C11653	J5085	J5084			48.866	0.01	29.673	29.613	0	0	IRREGULAR	0	0	0	0	1	0.00123
C12	DP0160	J41			458.91	0.035	8.728	-0.1217	0	0	IRREGULAR	0	0	0	0	1	0.01929
C13	J78	J27			29.05	0.01	11.03	10.604	0	0	CIRCULAR	1.25	0	0	0	1	0.01467
C14	DP0172	SWDI0654			3.579	0.01	13.992	13.954	0	0	IRREGULAR	0	0	0	0	1	0.01062
C1590	J27	OF2			238.06	0.01	10.454	1.87	0	0	CIRCULAR	1.25	0	0	0	1	0.03608
C2	SWMH0074	SWMH0105			307.41	0.01	11.99	11	0	0	CIRCULAR	4	0	0	0	1	0.00322
C2262	J798	J797			31.449	0.01	13.521	12.14	0	0	CIRCULAR	1.25	0	0	0	1	0.04395
C2281	J797	J732			154.58	0.01	8.89	3.89	0	0	CIRCULAR	1.25	0	0	0	1	0.03236
C2407	J732	J662			155.17	0.01	3.84	1.405	0	0	CIRCULAR	1.25	0	0	0	1	0.01569
C2408	J662	J560			57.864	0.01	1.205	0.75	0	0	CIRCULAR	1.25	0	0	0	1	0.00786
C2409	J560	J500			68.513	0.01	0.75	-0.969	0	0	CIRCULAR	1.25	0	0	0	1	0.0251

Existing Conduit SWMM Input Parameters

C2410	J500	J455			26.047	0.01	-0.969	0.72	0	0	CIRCULAR	1.5	0	0	0	1	-0.065
C2514	J455	OF3			10.88	0.01	0.72	0	0	0	CIRCULAR	1.5	0	0	0	1	0.06632
C2896	J563	J560			25.736	0.01	2.53	2.4	0	0	CIRCULAR	1.25	0	0	0	1	0.00505
C30	DP0140	J12		DITCH	134.82	0.035	23.27	13	0	0	IRREGULAR	0	0	0	0	1	0.0764
C3240	J796	J732			28.959	0.01	5.306	5.34	0	0	CIRCULAR	1.25	0	0	0	1	-0.0012
C4	J365	J111			7.617	0.01	14.1	13.94	0	0	CIRCULAR	1.25	0	0	0	1	2.10E-02
C4345	CP0156	CP0168			48.131	0.01	26.981	26.076	0	0	TRIANG.	2	2	0	0	1	0.01881
C4603	CP0168	CP0169		OL	48.007	0.01	29.076	28.951	0	0	IRREGULAR	0	0	0	0	1	0.0026
C5	CP0025	J35		DITCH	338.47	0.035	-3.721	-3.8	0	0	IRREGULAR	0	0	0	0	1	0.00023
C5108	CP0173	CP0172		OL	64.179	0.01	29.71	29.7	0	0	IRREGULAR	0	0	0	0	1	0.00016
C5302	SWDI0265	SWDI0465			202.14	0.01	28.176	28.039	0	0	STREET	0	0	0	0	1	0.00068
C5847	SWDI0147	SWDI0148			362.6	0.01	28.767	25.891	0	0	STREET	0	0	0	0	1	0.00793
C6	J35	OF1		DITCH	70.253	0.035	-3.8	-5.8	0	0	IRREGULAR	0	0	0	0	1	0.02848
C6054	SWDI0430	DP0248		OL	234.59	0.01	28.029	12.539	0	0	TRAPEZ.	0.5	50	1	1	1	0.06618
C6107	CP0048	CP0049		OL	50.09	0.01	31.95	29.495	0	0	IRREGULAR	0	0	0	0	1	0.04907
C6861	CP0283	CP0282		OL	88.134	0.01	20.008	18.883	0	0	IRREGULAR	0	0	0	0	1	0.01277
C7	J111	J850			19.665	0.01	13.58	13.19	0	0	CIRCULAR	1.25	0	0	0	1	0.01984
C7519	CP0148	CP0145		OL	48.068	0.01	28.662	28.498	0	0	IRREGULAR	0	0	0	0	1	0.00341
C8	CP0170	CP0169			136.22	0.035	27.012	25.951	0	0	IRREGULAR	0	0	0	0	1	0.00779
C8300	CP0273	J33		OL	37.436	0.01	26.723	24.785	0	0	IRREGULAR	0	0	0	0	1	0.05184
C8526	CP0281	CP0286		OL	58.771	0.01	26.491	25.064	0	0	IRREGULAR	0	0	0	0	1	0.02429
C9	CP0172	CP0168			332.03	0.035	27.2	26.076	0	0	IRREGULAR	0	0	0	0	1	0.00339
C9208	CP0166	J20		OL	50	0.01	26.03	24.14	0	0	IRREGULAR	0	0	0	0	1	0.03783
C9259	CP0163	CP0160		OL	40.502	0.01	26.652	26.377	0	0	IRREGULAR	0	0	0	0	1	0.00679
C9418	CP0167	J20		OL	221.38	0.01	25.507	24.64	0	0	IRREGULAR	0	0	0	0	1	0.00392
C9655	CP0174	CP0175		OL	44.136	0.01	29.569	29.575	0	0	IRREGULAR	0	0	0	0	1	-0.0001
C9835	CP0254	CP0253		OL	44.674	0.01	29.305	28.921	0	0	IRREGULAR	0	0	0	0	1	0.0086
CULV0017	CP0173	CP0172			64.149	0.013	27.21	27.2	0.5	0	CIRCULAR	1.5	0	0	0	1	0.00016
CULV0018	CP0171	CP0170			64.188	0.013	27.185	27.012	0.5	0	CIRCULAR	1.5	0	0	0	1	0.0027
CULV0019	CP0168	CP0169			47.995	0.013	26.076	25.951	0.5	0	CIRCULAR	1.5	0	0	0	1	0.0026
CULV0020	CP0174	CP0175	Negative slope < -0.5		44.125	0.013	26.569	26.575	0.5	0	CIRCULAR	1.5	0	0	0	1	-0.0001
CULV0021	CP0156	CP0157	Negative slope < -0.5		48.133	0.013	26.981	27.037	0.5	0.5	CIRCULAR	1.5	0	0	0	1	-0.0012
CULV0067	CP0254	CP0253			41.064	0.013	26.305	25.721	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.01422
CULV0076	CP0163	CP0160			40.474	0.013	22.252	21.677	0.5	0.5	CIRCULAR	2	0	0	0	2	0.01421
CULV0080	CP0167	J20	Negative slope < -0.5		190.51	0.012	21.007	19.64	0.5	0.8	CIRCULAR	4	0	0	0	1	0.00718
CULV0081	CP0166	J20			153.08	0.012	21.53	19.64	0.5	0.5	CIRCULAR	4	0	0	0	1	0.01235
CULV0085	CP0148	CP0145			40.589	0.013	24.232	23.869	0.5	0.8	CIRCULAR	2.5	0	0	0	1	0.00894
CULV0086	CP0148	CP0145			41.022	0.013	24.147	23.951	0.5	0.8	CIRCULAR	2.5	0	0	0	1	0.00478
CULV0087	CP0148	CP0145			40.61	0.013	24.062	23.798	0.5	0.8	CIRCULAR	2.5	0	0	0	1	0.0065
CULV0093	CP0076	CP0075			23.844	0.013	20.743	20.6	0.5	0.5	CIRCULAR	3	0	0	0	1	0.006
CULV0100	CP0023	CP0024			69.418	0.013	18.229	17.752	0.5	0.5	CIRCULAR	5	0	0	0	1	0.00687
CULV0101	CP0026	CP0025	Arch pipe ; 7.4' x 10.0'		51.861	0.022	-2.936	-3.721	0.5	0.5	ARCH	7.4	10	0	0	1	0.01514
CULV0102	CP0027	CP0028			20.29	0.012	26.942	26.25	0.5	0.5	CIRCULAR	2	0	0	0	1	0.03413
CULV0147	CP0015	CP0014			67.64	0.022	14.06	13.912	0.5	0.6	CIRCULAR	3	0	0	0	1	0.00219
CULV0151	CP0048	CP0049			45.92	0.022	27.05	26.495	0.5	0.5	CIRCULAR	3	0	0	0	2	0.01209
CULV0154	CP0305	CP0304			80.979	0.013	29.469	28.85	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00764
CULV0155	CP0273	J33	Negative slope < -0.5		23.762	0.013	21.223	21.334	0.5	0.5	CIRCULAR	3	0	0	0	1	-0.0047
CULV0159	CP0281	CP0286			52.862	0.013	22.491	21.064	0.5	0.5	CIRCULAR	2	0	0	0	1	0.027
CULV0160	CP0306	CP0307			80.175	0.013	17.473	15.193	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.02845

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CULV0166	CP0293	CP0286		78.498	0.013	25.888	23.513	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.03027
CULV0167	CP0309	DP0158		79.972	0.013	7.87	7.61	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00325
CULV0173	CP0283	CP0282		80.49	0.013	10.508	9.633	0.5	0.5	CIRCULAR	3	0	0	0	1	0.01087
SWGM0035	SWDI0175	DP0063		14.302	0.013	17.573	17.266	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.02147
SWGM0036	SWDI0177	DP0064		23.473	0.013	15.938	15.46	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.02037
SWGM0038	SWDI0224	DP0114		36.956	0.013	31.124	30.919	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00555
SWGM0040	SWDI0151	DP0048		20.714	0.013	27.53	27.204	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.01574
SWGM0071	SWDI0654	SWDI0184		37.148	0.012	13.954	11.828	0.5	0.5	CIRCULAR	2	0	0	0	1	0.05732
SWGM0083	SWDI0149	DP0047	Negative slope < -0.5	40.457	0.013	23.399	23.454	0.5	0.5	CIRCULAR	1.5	0	0	0	1	-0.0014
SWGM0084	SWDI0140	DP0130		37.9	0.013	28.232	27.863	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00974
SWGM0090	WEIR0001	DP0096		26.069	0.022	16.95	16.678	0.5	0.7	CIRCULAR	1.5	0	0	0	1	0.01043
SWGM0189	SWDI0658	SWDI0258		21.058	0.013	26.832	26.506	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.01548
SWGM0190	SWDI0258	SWDI0262		68.037	0.013	26.406	26.077	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00484
SWGM0191	SWDI0262	DP0209		11.954	0.013	25.977	25.717	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.02176
SWGM0194	SWDI0259	SWDI0264	Negative slope < -0.5	67.944	0.013	26.323	26.335	0.5	0.8	CIRCULAR	1.25	0	0	0	1	-0.0002
SWGM0195	SWDI0659	SWDI0259		20.792	0.013	26.835	26.323	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.02463
SWGM0196	SWDI0263	SWDI0264	Negative slope < -0.5	298.62	0.013	26.115	26.335	0.5	0.8	CIRCULAR	1.25	0	0	0	1	-0.0007
SWGM0197	SWDI0260	SWDI0263	Negative slope < -0.5	67.764	0.013	26.15	26.165	0.5	0.8	CIRCULAR	1.25	0	0	0	1	-0.0002
SWGM0203	SWDI0265	SWDI0429		67.119	0.013	24.876	24.795	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00121
SWGM0204	SWDI0264	SWDI0262		203.06	0.013	26.335	25.977	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00176
SWGM0207	SWDI0270	SWDI0289	Downstream end not assessed due to traffic control	67.91	0.013	26.177	26.062	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00169
SWGM0279	SWDI0306	SWDI0025		89.149	0.013	22.62	21.202	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.01591
SWGM0285	SWDI0025	SWDI0027		39.54	0.013	11.352	9.204	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.05441
SWGM0286	SWDI0027	SWMH0004		7.888	0.013	9.204	8.882	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.04086
SWGM0287	SWDI0029	SWDI0030		15.99	0.013	7.718	7.545	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.01082
SWGM0288	SWMH0009	DP0011	Upstream end not assessed; needs traffic control	95.139	0.013	4.937	-0.741	0.5	0	CIRCULAR	1.5	0	0	0	1	0.05979
SWGM0289	SWDI0308	SWMH0059	Downstream end not accessible	66.17	0.013	8.722	7.1	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.02452
SWGM0353	SWDI0305	SWDI0023		40.872	0.012	23.096	22.643	0.5	0.6	CIRCULAR	1.25	0	0	0	1	0.01108
SWGM0354	SWDI0023	SWMH0002	Downstream end not assessed; needs traffic control	28.874	0.013	22.343	22.102	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00835
SWGM0355	SWDI0024	SWMH0002	Downstream end not assessed; needs traffic control	40.288	0.013	22.717	20.002	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.06754
SWGM0357	SWMH0002	SWMH0007	Upstream and downstream ends not assessed; needs traffic control	33.161	0.013	19.902	17.166	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.08279
SWGM0358	SWDI0028	SWMH0008	Downstream end not assessed; needs traffic control	12.429	0.013	23.564	22.535	0.5	0.8	CIRCULAR	1	0	0	0	1	0.08308
SWGM0359	SWMH0008	SWMH0007	Upstream and downstream ends not assessed; needs traffic control	118.49	0.013	22.435	16.666	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.04875

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SWGM0360	SWMH0007	SWMH0006	Upstream and downstream ends not assessed; traffic control needed	132.56	0.013	16.366	9.538	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.05158
SWGM0361	SWDI0307	SWMH0005	Downstream end was not assessed; traffic control needed	18.821	0.013	4.971	4.765	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.01095
SWGM0362	SWDI0026	SWMH0003	Downstream end was not assessed; traffic control needed	16.296	0.013	7.597	7.473	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00761
SWGM0364	SWMH0006	SWMH0005	Upstream and Downstream structures require traffic control to assess	61.166	0.013	9.388	7.165	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.03637
SWGM0366	SWMH0003	SWMH0114	Upstream and downstream ends not assessed; needs traffic control	132.86	0.013	7.373	6.8	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00431
SWGM0366A	SWMH0114	SWMH0009	Upstream and downstream ends not assessed; needs traffic control	14.667	0.013	6.8	6.637	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.01111
SWGM0368	SWDI0032	SWDI0308		43.312	0.013	9.132	8.722	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00947
SWGM0403	SWDI0428	SWDI0429	Negative slope < -0.5	69.88	0.013	24.794	24.845	0.5	0.5	CIRCULAR	1.25	0	0	0	1	-0.0007
SWGM0404	SWDI0429	SWDI0290		206.2	0.013	24.745	21.778	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.01439
SWGM0405	SWDI0466	SWDI0465		106.03	0.012	23.285	20.439	0.5	0.5	CIRCULAR	3	0	0	0	1	0.02685
SWGM0406	SWDI0430	SWDI0429	Negative slope < -0.5	151.03	0.013	24.929	24.945	0.5	0.8	CIRCULAR	1.25	0	0	0	1	-0.0001
SWGM0408	SWMH0078	SWDI0290	Upstream end not assessed; traffic control needed	139.33	0.013	24.5	20.678	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.02744
SWGM0409	SWDI0290	DP0248	Negative slope; See pipe end for dimensions	23.542	0.022	12.078	12.539	0.5	0.5	CIRCULAR	5	0	0	0	1	-0.0196
SWGM0446	SWDI0172	SWDI0173		25.486	0.013	13.117	12.585	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.02088
SWGM0449	SWDI0174	SWDI0175		33.737	0.013	18.052	17.873	0.5	0.6	CIRCULAR	1.5	0	0	0	1	0.00531
SWGM0450	SWDI0229	SWDI0230		33.742	0.013	8.576	8.308	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00794
SWGM0452	SWDI0139	SWDI0140	Negative slope < -0.5	29.397	0.013	28.274	28.332	0.5	0.5	CIRCULAR	1.25	0	0	0	1	-0.002
SWGM0453	SWDI0142	SWDI0141	Negative slope < -0.5	30.197	0.013	27.211	27.22	0.5	0.7	CIRCULAR	1.25	0	0	0	1	-0.0003
SWGM0454	SWDI0141	DP0138		61.87	0.013	27.12	26.625	0.5	0.6	CIRCULAR	1.25	0	0	0	1	0.008
SWGM0455	SWDI0143	DP0139		40.454	0.013	26.367	26.242	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00309
SWGM0456	SWDI0144	SWDI0145		29.828	0.013	23.779	23.634	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00486
SWGM0457	SWDI0145	DP0140	Negative slope < -0.5	35.547	0.013	23.234	23.27	0.5	0.6	CIRCULAR	1.25	0	0	0	1	-0.001
SWGM0458	SWDI0146	DP0141		40.276	0.013	26.581	26.181	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00993
SWGM0459	SWDI0147	SWDI0146		29.901	0.013	26.767	26.681	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00288
SWGM0460	SWDI0148	DP0142	Negative slope	40.578	0.013	23.591	23.983	0.5	0.5	CIRCULAR	1.25	0	0	0	1	-0.0097
SWGM0461	SWDI0150	SWDI0149		30.043	0.013	24.118	23.699	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.01395
SWGM0463	SWDI0187	DP0219		80.665	0.012	25.7	24.207	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.01851
SWGM0464	SWDI0188	SWDI0187		23.098	0.013	25.728	25.7	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00121
SWGM0465	SWDI0170	DP0143		25.417	0.012	12.75	12.68	0.5	0.6	CIRCULAR	1	0	0	0	1	0.00275
SWGM0466	SWDI0171	SWDI0170		22.807	0.013	12.95	12.75	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00877
SWGM0467	SWMH0070	DP0152	Upstream end not accessible	158.37	0.013	1.5	-1.858	0.5	0	CIRCULAR	0.667	0	0	0	1	0.02121
SWGM0469	SWDI0396	SWDI0395		23.065	0.013	23.526	23.251	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.01192
SWGM0474	SWDI0293	SWDI0294	Negative slope < -0.5	24.021	0.013	21.643	21.681	0.5	0.7	CIRCULAR	1.5	0	0	0	1	-0.0016

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SWGM0475	SWDI0046	SWDI0047	Negative slope < -0.5	6.293	0.013	4.403	4.414	0.5	0.8	CIRCULAR	1.25	0	0	0	1	-0.0018
SWGM0476	SWDI0049	SWDI0314		24.579	0.013	6.178	5.578	0.5	0.6	CIRCULAR	1.25	0	0	0	1	0.02442
SWGM0477	SWDI0314	SWMH0015		24.265	0.013	5.578	4.243	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.0551
SWGM0479	SWMH0015	SWMH0071	Downstream end not accessible	17.311	0.013	3.543	3	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.03138
SWGM0481	SWMH0071	SWDI0031	Upstream and downstream ends not assessed; traffic control needed	209.36	0.013	3	7.444	0.5	0.6	CIRCULAR	1.25	0	0	0	1	-0.0212
SWGM0481A	SWDI0031	SWMH0009	Upstream and downstream ends not assessed; traffic control needed	18.57	0.013	6.944	6.637	0.5	0.7	CIRCULAR	1.25	0	0	0	1	0.01653
SWGM0483	SWDI0030	SWMH0059	Downstream end not accessible	17.56	0.013	7.545	7.1	0.5	0.6	CIRCULAR	1.25	0	0	0	1	0.02535
SWGM0484	SWDI0037	SWMH0011		12.734	0.014	21.781	20.785	0.5	0.6	CIRCULAR	0.833	0	0	0	1	0.07846
SWGM0485	SWDI0038	SWMH0011		16.139	0.014	21.874	20.785	0.5	0.7	CIRCULAR	0.833	0	0	0	1	0.06763
SWGM0486	SWMH0011	SWMH0010		208.88	0.013	18.285	11.191	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.03398
SWGM0487	SWDI0311	SWDI0312		17.942	0.013	11.502	11.074	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.02386
SWGM0488	SWDI0310	SWMH0072	Downstream end not accessible	18.703	0.014	13.423	12	0.5	0.8	CIRCULAR	0.667	0	0	0	1	0.07631
SWGM0489	SWMH0072	SWDI0311	Upstream end not accessible	4.848	0.013	12	11.502	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.10327
SWGM0491	SWDI0312	SWMH0010		131.52	0.013	11.074	9.791	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.00976
SWGM0492	SWDI0034	SWMH0010		21.77	0.01	14.32	13.091	0.5	0.6	CIRCULAR	0.667	0	0	0	1	0.05654
SWGM0493	SWDI0035	SWMH0010		22.876	0.01	14.184	13.191	0.5	0.6	CIRCULAR	0.667	0	0	0	1	0.04345
SWGM0494	SWDI0036	SWMH0010		16.697	0.012	13.232	12.191	0.5	0.8	CIRCULAR	0.667	0	0	0	1	0.06247
SWGM0495	SWMH0010	SWMH0012		215.79	0.013	9.441	1.218	0.5	0.8	CIRCULAR	2	0	0	0	1	0.03814
SWGM0503	SWDI0395	DP0097		121.12	0.012	23.151	19.812	0.5	0.6	CIRCULAR	1.25	0	0	0	1	0.02758
SWGM0505_1	SWDI0185	SWMH0074	Downstream end not accessible	12.81	0.022	11.756	11.99	0.5	0	CIRCULAR	3	0	0	0	1	-0.0183
SWGM0505_2	SWDI0655	SWMH0074	Downstream end not accessible	10.597	0.022	12.187	11.99	0	0.8	CIRCULAR	3	0	0	0	1	0.01859
SWGM0507	SWDI0184	SWDI0185	Negative slope < -0.5	27.324	0.022	11.828	11.856	0.5	0.5	CIRCULAR	3	0	0	0	1	-0.001
SWGM0508	SWDI0488	SWDI0186	Upstream end not accessible	96.648	0.022	20	11.56	0.5	0.7	CIRCULAR	1.25	0	0	0	1	0.08766
SWGM0510	J20	SWDI0465	Negative slope < -0.5	225.22	0.012	20.14	20.439	0.5	0.5	CIRCULAR	3.5	0	0	0	1	-0.0013
SWGM0511	J20	SWDI0465	Negative slope	224.99	0.012	19.64	23.439	0.5	0.5	CIRCULAR	3.5	0	0	0	1	-0.0169
SWGM0512	SWDI0189	SWDI0190		64.795	0.022	24.903	24.873	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00046
SWGM0513	SWDI0465	SWDI0266		28.825	0.022	20.439	18.8	0.5	0.5	CATENARY	5	0	0	0	1	0.05695
SWGM0514	SWDI0266	SWDI0290		68.415	0.022	18.8	18.378	0.5	0.5	CATENARY	5	0	0	0	1	0.00617
SWGM0515	SWDI0400	SWMH0096	Upstream end not accessible	186.09	0.013	23.08	23.5	0.5	0.5	CIRCULAR	2	0	0	0	1	-0.0023
SWGM0516	SWDI0399	SWDI0400		25.951	0.013	22.907	23.08	0.5	0.5	CIRCULAR	2	0	0	0	1	-0.0067
SWGM0517	SWDI0291	SWDI0440	Downstream end not assessed; traffic control needed	67.054	0.013	27.406	26.07	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.01993
SWGM0518	SWDI0223	SWDI0224	Negative slope < -0.5	33.513	0.013	31.276	31.324	0.5	0.5	CIRCULAR	1.5	0	0	0	1	-0.0014
SWGM0519	SWDI0439	SWMH0046	Downstream end not assessed; traffic control needed	18.054	0.012	27.966	26.066	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.10583
SWGM0521	SWDI0040	SWMH0012		14.056	0.01	3.253	1.468	0.5	0.7	CIRCULAR	0.667	0	0	0	1	0.12803
SWGM0522	SWDI0039	SWMH0012		13.332	0.01	3.898	2.418	0.5	0.7	CIRCULAR	0.667	0	0	0	1	0.1117
SWGM0523	SWDI0041	SWMH0013		12.903	0.014	2.95	2.424	0.5	0.8	CIRCULAR	0.667	0	0	0	1	0.0408

Existing Conduit SWMM Input Parameters

SWGM0525	SWMH0012	SWMH0013		15.565	0.013	1.018	0.874	0.5	0.5	CIRCULAR	2	0	0	0	1	0.00925
SWGM0526	SWMH0013	SWMH0014		227.52	0.013	0.874	-1.455	0.5	0.6	CIRCULAR	2	0	0	0	1	0.01024
SWGM0527	SWDI0441	SWDI0289	Downstream end not assessed; traffic control needed	13.184	0.013	26.519	26.062	0.5	0.8	CIRCULAR	1	0	0	0	1	0.03468
SWGM0528	SWDI0442	SWMH0078	Downstream end not assessed; traffic control needed	16.684	0.012	24.928	24.5	0.5	0.8	CIRCULAR	1	0	0	0	1	0.02566
SWGM0529	SWDI0313	DP0012		88.584	0.013	-0.858	-1.044	0.5	0	CIRCULAR	2	0	0	0	1	0.0021
SWGM0530	SWMH0014	SWDI0313	Negative slope; Pipe changes size	14.85	0.013	-1.705	-0.858	0.5	0.7	CIRCULAR	3	0	0	0	1	-0.0571
SWGM0532	SWDI0042	SWMH0014		22.131	0.013	-0.152	-1.455	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.05898
SWGM0534	SWDI0152	SWDI0151		24.791	0.013	27.487	27.43	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.0023
SWGM0568	SWDI0009	WEIR0002	Upstream and downstream ends not accessible	25.637	0.013	3	2.5	0.5	0	CIRCULAR	1.5	0	0	0	1	0.01951
SWGM0569	SWDI0008	SWDI0009	Downstream end not accessible	32.33	0.013	3.568	3	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.01757
SWGM0608	SWDI0228	DP0156	Negative slope	32.98	0.013	13.737	14.16	0.5	0.5	CIRCULAR	1.5	0	0	0	1	-0.0128
SWGM0609	SWDI0388	DP0157		78.052	0.013	20.184	18.298	0.5	0.5	CIRCULAR	2.5	0	0	0	1	0.02417
SWGM0610	SWDI0497	SWDI0388	Upstream end not accessible; in locked yard	62.093	0.013	20.8	20.484	0.5	0.6	CIRCULAR	2.5	0	0	0	1	0.00509
SWGM0611	SWDI0230	DP0158	Downstream end not accessible	56.724	0.013	7.908	7.61	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.00525
SWGM0612	SWDI0173	DP0160	Downstream end inaccessible (fenced yard)	119.77	0.013	12.485	8.728	0.5	0	CIRCULAR	1.5	0	0	0	1	0.03139
SWGM0613	SWMH0077	DP0013		107.43	0.013	1.878	-0.923	0.5	0	CIRCULAR	1.5	0	0	0	1	0.02608
SWGM0614	WEIR0002	SWMH0077		33.234	0.013	4.89	2.128	0.5	0.7	CIRCULAR	1.5	0	0	0	1	0.0834
SWGM0615	SWDI0047	SWMH0077		74.533	0.013	4.364	1.878	0.5	0.5	CIRCULAR	1.5	0	0	0	1	0.03337
SWGM0616	SWDI0186	SWDI0498	Negative slope < -0.5	33.552	0.022	11.56	11.702	0.5	0.6	CIRCULAR	1.25	0	0	0	1	-0.0042
SWGM0655	SWDI0190	SWMH0092	Downstream end not accessible	99.728	0.022	24.773	23	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.01778
SWGM0656	SWMH0092	DP0172	Upstream end not accessible	430.03	0.012	22	13.992	0.5	0	CIRCULAR	2	0	0	0	1	0.01863
SWGM0657	SWDI0653	DP0173		237.52	0.012	26.315	24.991	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00557
SWGM0661	SWDI0044	SWMH0087		22.918	0.014	5.665	5.09	0.5	0.8	CIRCULAR	0.667	0	0	0	1	0.0251
SWGM0662	SWDI0043	SWMH0087		21.049	0.014	6.375	5.39	0.5	0.7	CIRCULAR	0.667	0	0	0	1	0.04685
SWGM0663	SWDI0045	SWMH0087		30.862	0.014	6.382	5.59	0.5	0.6	CIRCULAR	0.667	0	0	0	1	0.02567
SWGM0664	SWMH0087	SWMH0014		327.63	0.013	4.09	-1.455	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.01693
SWGM0675	SWDI0660	SWDI0260		21.054	0.013	26.808	26.25	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.02651
SWGM0678	SWDI0517	SWDI0440	Downstream end not assessed; traffic control needed	134.19	0.013	27.456	26.07	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.01033
SWGM0679	SWDI0289	SWMH0078	Downstream end not assessed; traffic control needed	205.01	0.02	26.062	24.5	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.00762
SWGM0680	SWDI0440	SWMH0046	Downstream end not assessed; traffic control needed	36.762	0.013	26.07	26.066	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00011
SWGM0681	SWMH0046	SWDI0289	Upstream and downstream ends not assessed; traffic control needed	171.42	0.013	26.066	26.062	0.5	0.5	CIRCULAR	1.25	0	0	0	1	2.00E-05

Existing Conduit SWMM Input Parameters

SWGM0783	SWDI0033	SWMH0082			39.856	0.013	9.47	7.962	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.03786
SWGM0784	SWMH0082	SWDI0029	Negative slope		6.861	0.013	7.762	7.968	0.5	0.5	CIRCULAR	1.25	0	0	0	1	-0.03
SWGM0785	SWMH0004	SWMH0082			113.19	0.013	8.882	7.962	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00813
SWGM0786	SWDI0048	SWDI0541			9.946	0.013	5.514	5.45	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.00643
SWGM0795	SWDI0619	SWDI0618			98.244	0.013	12.65	4.331	0.5	0.5	CIRCULAR	1	0	0	0	1	0.08498
SWGM0796	SWDI0618	SWDI0617			95.982	0.013	3.331	1.285	0.5	0.5	CIRCULAR	1	0	0	0	1	0.02132
SWGM0797	SWDI0614	SWDI0615			81.862	0.013	1.926	1.441	0.5	0.5	CIRCULAR	0.833	0	0	0	1	0.00592
SWGM0798	SWDI0615	SWDI0616			67.598	0.013	1.391	1.379	0.5	0.5	CIRCULAR	1	0	0	0	1	0.00018
SWGM0799	SWDI0617	SWDI0616			22.447	0.013	1.185	1.179	0.5	0.8	CIRCULAR	1	0	0	0	1	0.00027
SWGM0801	SWDI0612	SWDI0613			25.694	0.013	1.801	1.001	0.5	0.5	CIRCULAR	0.833	0	0	0	1	0.03115
SWGM0802	SWDI0616	SWDI0613			74.166	0.013	1.179	0.401	0.5	0.8	CIRCULAR	1	0	0	0	1	0.01049
SWGM0805	SWDI0613	DP0221			237.49	0.013	0.201	-1.197	0.5	0	CIRCULAR	1.25	0	0	0	1	0.00589
SWGM0806	SWDI0611	SWDI0612			44.871	0.014	2.729	2.351	0.5	0.8	CIRCULAR	0.667	0	0	0	1	0.00842
SWGM0807	SWDI0596	SWDI0608			87.619	0.01	2.39	2.213	0.5	0.6	CIRCULAR	0.333	0	0	0	1	0.00202
SWGM0808	SWDI0609	SWDI0595			65.069	0.013	3.058	2.692	0.5	0.8	CIRCULAR	0.667	0	0	0	1	0.00562
SWGM0810	SWDI0595	SWMH0070	Downstream end not accessible		61.112	0.013	2.592	1.5	0.5	0.5	CIRCULAR	1	0	0	0	1	0.01787
SWGM0811	SWDI0608	SWMH0070	Downstream end not accessible		88.853	0.01	2.063	1.5	0.5	0.7	CIRCULAR	0.667	0	0	0	1	0.00634
SWGM0815	SWDI0610	SWDI0611			60.438	0.022	3.388	2.729	0.5	0.5	CIRCULAR	0.667	0	0	0	1	0.0109
SWGM0828	SWMH0094	SWDI0008	Upstream end not accessible		72.507	0.013	4.5	3.668	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.01148
SWGM0832	SWDI0541	SWMH0094	Downstream end not accessible		17.574	0.013	5.35	4.5	0.5	0.8	CIRCULAR	1.5	0	0	0	1	0.04842
SWGM0838	SWDI0498	SWMH0105	Downstream end not accessible		17.472	0.022	11.402	11	0.5	0.5	CIRCULAR	1.25	0	0	0	1	0.02301
SWGM0873	SWDI0294	J33			191.43	0.013	21.681	19.785	0.5	0.6	CIRCULAR	2	0	0	0	1	0.0099
SWGM0874	WEIR0022	DP0236			40.079	0.022	23.47	23.31	0.5	0.7	CIRCULAR	3	0	0	0	1	0.00399
SWGM0877	SWMH0105	DP0146	Upstream end not accessible		120.47	0.022	11	9.626	0.5	0.5	CIRCULAR	4	0	0	0	1	0.01141
SWGM0895	SWMH0096	SWMH0092	Upstream and downstream ends not accessible		89.067	0.012	23.5	22	0.5	0.5	CIRCULAR	2	0	0	0	1	0.01684
SWGM0913	SWMH0005	DP0249	Downstream end not found		82.029	0.013	3.865	0	0.5	0	CIRCULAR	2	0	0	0	1	0.04717
SWGM0914	SWMH0059	SWMH0114	Upstream and downstream ends not accessible		27.806	0.013	7.1	6.8	0.5	0.8	CIRCULAR	1.25	0	0	0	1	0.01079
SWOD0012_1	DP0156	J2	added in office from aerial imagery for connectivity	DITCH	402.43	0.035	14.16	-0.0001	0.5	0.8	IRREGULAR	0	0	0	0	1	0.03521
SWOD0012_2	J32	CP0026	added in office from aerial imagery for connectivity	DITCH	224.45	0.035	8.614	-2.936	0.5	0.8	IRREGULAR	0	0	0	0	1	0.05153
SWOD0013	DP0157	J2	added in office from aerial imagery for connectivity	DITCH	562.96	0.035	18.298	-0.0001	0	0	IRREGULAR	0	0	0	0	1	0.03252
SWOD0014	J5	J4	added in office from aerial imagery for connectivity	DITCH	359.21	0.035	6.886	-0.0005	0	0	IRREGULAR	0	0	0	0	1	0.01917
SWOD0014_3	DP0063	J5	added in office from aerial imagery for connectivity	DITCH	226.91	0.035	17.266	6.886	0	0	IRREGULAR	0	0	0	0	1	0.04579

Existing Conduit SWMM Input Parameters

SWOD0015_1	DP0064	J7	added in office from aerial imagery for connectivity	DITCH	189.12	0.035	15.46	10.595	0	0	IRREGULAR	0	0	0	0	1	0.02573
SWOD0015_2	J7	J5	added in office from aerial imagery for connectivity	DITCH	200.2	0.035	10.595	6.886	0	0	IRREGULAR	0	0	0	0	1	0.01853
SWOD0016	DP0158	CP0026	added in office from aerial imagery for connectivity	DITCH	294.58	0.035	7.61	-2.936	0	0	IRREGULAR	0	0	0	0	1	0.03582
SWOD0019	DP0143	J13	added in office from aerial imagery for connectivity	DITCH	164.63	0.035	12.68	5.482	0.5	0.7	IRREGULAR	0	0	0	0	1	0.04376
SWOD0020	DP0146	J17	added in office from aerial imagery for connectivity	DITCH	52.716	0.035	9.626	8.371	0	0	IRREGULAR	0	0	0	0	1	0.02381
SWOD0106_1	DP0209	J1	added in office from aerial imagery for connectivity	DITCH	458.04	0.035	25.717	24.53	0.5	0	IRREGULAR	0	0	0	0	1	0.00259
SWOD0106_3	J1	J28	added in office from aerial imagery for connectivity	DITCH	601.56	0.035	24.53	22.973	0	0	IRREGULAR	0	0	0	0	1	0.00259
SWOD0106_4	J26	CP0166	added in office from aerial imagery for connectivity	DITCH	405.31	0.035	22.58	21.53	0	0.5	IRREGULAR	0	0	0	0	1	0.00259
SWOD0106_5	J28	J26	added in office from aerial imagery for connectivity	DITCH	151.8	0.035	22.973	22.58	0	0	IRREGULAR	0	0	0	0	1	0.00259
SWOD0110_1	CP0160	CP0167	added in office from aerial imagery for connectivity	DITCH	18.751	0.035	21.677	21.007	0.5	0.5	TRAPEZ.	3	10	1	1	1	0.03575
SWOD0115	CP0145	J26	added in office from aerial imagery for connectivity	DITCH	654.51	0.035	23.798	22.58	0.5	0.5	IRREGULAR	0	0	0	0	1	0.00186
SWOD0127_1	CP0028	J34	added in office from aerial imagery for connectivity	DITCH	214.91	0.035	26.25	25.35	0.5	0.8	TRIANG.	2	7.5	0	0	1	0.00419
SWOD0129	J34	J1	added in office from aerial imagery for connectivity	DITCH	194.24	0.035	25.35	24.53	0.5	0.7	IRREGULAR	0	0	0	0	1	0.00422
SWOD0153	CP0014	SWDI0655	added in office from aerial imagery for connectivity	DITCH	187.48	0.035	13.912	12.187	0	0	IRREGULAR	0	0	0	0	1	0.0092
SWOD0154	DP0096	CP0015	added in office from aerial imagery for connectivity	DITCH	400	0.035	16.678	14.06	0.5	0.5	TRIANG.	7	45	0	0	1	0.00655
SWOD0157	DP0097	DP0096	added in office from aerial imagery for connectivity	DITCH	74.177	0.035	19.812	16.678	0.5	0.7	TRIANG.	7	45	0	0	1	0.04229
SWOD0159	DP0173	J64	added in office from aerial imagery for connectivity	DITCH	809.26	0.035	24.991	6.612	0	0	IRREGULAR	0	0	0	0	1	0.02272
SWOD0160	DP0047	J11	added in office from aerial imagery for connectivity	DITCH	299.92	0.035	23.454	4.989	0	0	IRREGULAR	0	0	0	0	1	0.06168
SWOD0161	DP0142	J8	added in office from aerial imagery for connectivity	DITCH	372.33	0.035	23.983	3.979	0	0	IRREGULAR	0	0	0	0	1	0.0538

Existing Conduit SWMM Input Parameters

SWOD0162	DP0141	J9	added in office from aerial imagery for connectivity	DITCH	397.91	0.035	26.181	10	0	0	IRREGULAR	0	0	0	0	1	0.0407
SWOD0163	DP0139	J9	added in office from aerial imagery for connectivity	DITCH	166.26	0.035	26.242	10	0	0	IRREGULAR	0	0	0	0	1	0.09816
SWOD0167_2	DP0114	J38	added in office from aerial imagery for connectivity	DITCH	329.89	0.035	30.919	29.015	0	0	IRREGULAR	0	0	0	0	1	0.00577
SWOD0167_3	J36	J37	added in office from aerial imagery for connectivity	DITCH	550.47	0.035	26.682	20.28	0	0	IRREGULAR	0	0	0	0	1	0.01163
SWOD0167_4	J37	J35	added in office from aerial imagery for connectivity	DITCH	580.06	0.035	20.28	-3.8	0	0	IRREGULAR	0	0	0	0	1	0.04155
SWOD0167_5	J38	J36	added in office from aerial imagery for connectivity	DITCH	672.52	0.035	29.015	26.682	0	0	IRREGULAR	0	0	0	0	1	0.00347
SWOD0168	DP0048	J36	added in office from aerial imagery for connectivity	DITCH	431.69	0.035	27.204	26.682	0	0	IRREGULAR	0	0	0	0	1	0.00121
SWOD0183	CP0075	DP0097	added in office from aerial imagery for connectivity	DITCH	120.57	0.035	20.6	19.812	0.5	0.6	TRIANG.	2	20	0	0	1	0.00654
SWOD0184	J33	CP0076	added in office from aerial imagery for connectivity	DITCH	134.69	0.035	19.785	20.743	0.5	0.5	TRIANG.	1	11	0	0	1	-0.0071
SWOD0185_2	J18	J19	added in office from aerial imagery for connectivity	DITCH	284.83	0.035	27.525	9.458	0	0	IRREGULAR	0	0	0	0	1	0.06356
SWOD0195	CP0253	CP0163	added in office from aerial imagery for connectivity	DITCH	466.17	0.035	25.721	22.252	0.5	0.8	TRAPEZ.	1	10	0.24	0.17	1	0.00744
SWOD0264_1	CP0049	J25	added in office from aerial imagery for connectivity	DITCH	1013.7	0.035	26.495	24.098	0	0	IRREGULAR	0	0	0	0	1	0.00236
SWOD0264_2	J25	J31	added in office from aerial imagery for connectivity	DITCH	191.11	0.035	24.098	23.394	0	0	IRREGULAR	0	0	0	0	1	0.00368
SWOD0264_4	J29	CP0023	added in office from aerial imagery for connectivity	DITCH	156.52	0.035	20.445	18.229	0	0	IRREGULAR	0	0	0	0	1	0.01416
SWOD0264_5	J31	J29	added in office from aerial imagery for connectivity	DITCH	575.48	0.035	23.394	20.445	0	0	IRREGULAR	0	0	0	0	1	0.00512
SWOD0266_2	J30	CP0048	added in office from aerial imagery for connectivity	DITCH	927.62	0.035	29.5	27.05	0	0	IRREGULAR	0	0	0	0	1	0.00264
SWOD0296	DP0219	J10	added in office from aerial imagery for connectivity	DITCH	563.45	0.035	24.207	4.93	0	0	IRREGULAR	0	0	0	0	1	0.03423
SWOD0304_1	DP0130	J23	added in office from aerial imagery for connectivity	DITCH	138.87	0.035	27.863	27.807	0	0	IRREGULAR	0	0	0	0	1	0.0004
SWOD0304_3	J23	J3	added in office from aerial imagery for connectivity	DITCH	417.68	0.035	27.807	23.544	0	0	IRREGULAR	0	0	0	0	1	0.01021

Existing Conduit SWMM Input Parameters

SWOD0304_4	J3	CP0023	added in office from aerial imagery for connectivity	DITCH	237.81	0.035	23.544	18.229	0	0	IRREGULAR	0	0	0	0	1	0.02235
SWOD0313	DP0138	J3	added in office from aerial imagery for connectivity	DITCH	188.21	0.035	26.625	23.544	0	0	IRREGULAR	0	0	0	0	1	0.01637
SWOD0332	CP0286	CP0283	added in office from aerial imagery for connectivity	DITCH	394.36	0.035	21.064	10.508	0	0	IRREGULAR	0	0	0	0	1	0.02678
SWOD0333	DP0236	CP0273	added in office from aerial imagery for connectivity	DITCH	294.14	0.035	23.31	21.223	0.5	0.5	IRREGULAR	0	0	0	0	1	0.0071
SWOD0343	CP0307	J32	added in office from aerial imagery for connectivity	DITCH	338.16	0.035	15.193	8.614	0.5	0.5	IRREGULAR	0	0	0	0	1	0.01946
SWOD0351	CP0282	J7	added in office from aerial imagery for connectivity	DITCH	99.782	0.035	9.633	10.595	0	0	IRREGULAR	0	0	0	0	1	-0.0096
SWOD0353	CP0304	J23	added in office from aerial imagery for connectivity	DITCH	630.37	0.035	28.85	27.807	0	0	IRREGULAR	0	0	0	0	1	0.00165

Existing Junction SWMM Input Parameters

Name	Description	Tag	Invert Elev. (ft)	Rim Elev. (ft)	Depth (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)
CP0014		Pipe_End	13.912	16.912	3	0	0
CP0015		Pipe_End	14.06	17.06	3	0	0
CP0023		Pipe_End	18.229	25.129	6.9	0	0
CP0024		Pipe_End	17.752	24.802	7.05	0	0
CP0025		Pipe_End	-3.721	3.679	7.4	0	0
CP0026	Arch pipe; 7.4' x 10.0'	Pipe_End	-2.936	9.064	12	0	0
CP0027		Pipe_End	26.942	29.092	2.15	0	0
CP0028		Pipe_End	26.25	28.35	2.1	0	0
CP0048		Pipe_End	27.05	31.95	4.9	0	0
CP0049		Pipe_End	26.495	29.495	3	0	0
CP0075		Pipe_End	20.6	23.85	3.25	0	0
CP0076	needs clearing	Pipe_End	20.743	25.243	4.5	0	240
CP0145		Pipe_End	23.798	28.498	4.7	0	0
CP0148		Pipe_End	24.062	28.662	4.6	0	0
CP0156	some mowing would help	Pipe_End	26.981	30.981	4	0	0
CP0157		Pipe_End	27.037	28.787	1.75	0	0
CP0160	some water and sediment	Pipe_End	21.677	26.377	4.7	0	0
CP0163		Pipe_End	22.252	26.652	4.4	0	0
CP0166		Pipe_End	21.53	26.03	4.5	0	0
CP0167		Pipe_End	21.007	25.507	4.5	0	0
CP0168	some rocks in mouth	Pipe_End	26.076	29.076	3	0	0
CP0169		Pipe_End	25.951	28.951	3	0	0
CP0170		Pipe_End	27.012	29.812	2.8	0	0
CP0171		Pipe_End	27.185	31	3.815	0	0
CP0172		Pipe_End	27.2	30.2	3	0	0
CP0173		Pipe_End	27.21	30.21	3	0	0
CP0174		Pipe_End	26.569	29.569	3	0	0
CP0175		Pipe_End	26.575	29.575	3	0	0
CP0253		Pipe_End	25.721	28.921	3.2	0	0
CP0254		Pipe_End	26.305	29.305	3	0	0
CP0256		Pipe_End	26.255	34	7.745	0	0
CP0273		Pipe_End	21.223	26.723	5.5	0	0
CP0281		Pipe_End	22.491	26.491	4	0	0
CP0282		Pipe_End	9.633	19.633	10	0	0
CP0283		Pipe_End	10.508	20.508	10	0	0
CP0286		Pipe_End	21.064	25.2	4.136	0	0
CP0293		Pipe_End	25.888	27.638	1.75	0	0
CP0304		Pipe_End	28.85	30.55	1.7	0	0
CP0305		Pipe_End	29.469	31.219	1.75	0	0
CP0306		Pipe_End	17.473	19.323	1.85	0	0
CP0307		Pipe_End	15.193	16.943	1.75	0	0
CP0309		Pipe_End	7.87	10.37	2.5	0	0
DP0047		Discharge_Point	23.454	24.954	1.5	0	0
DP0048		Discharge_Point	27.204	28.704	1.5	0	0
DP0063	clean condition	Discharge_Point	17.266	19.016	1.75	0	0
DP0064		Discharge_Point	15.46	17.06	1.6	0	0
DP0096		Discharge_Point	16.678	18.178	1.5	0	0
DP0097		Discharge_Point	19.812	22.012	2.2	0	0

Existing Junction SWMM Input Parameters

DP0114		Discharge_Point	30.919	32.569	1.65	0	0
DP0130	could use cleaning beyond lip	Discharge_Point	27.863	29.313	1.45	0	0
DP0138		Discharge_Point	26.625	28.075	1.45	0	0
DP0139		Discharge_Point	26.242	27.692	1.45	0	0
DP0140		Pipe_End	23.27	24.77	1.5	0	0
DP0141		Discharge_Point	26.181	27.581	1.4	0	0
DP0142		Discharge_Point	23.983	25.433	1.45	0	0
DP0143		Discharge_Point	12.68	13.88	1.2	0	0
DP0146	Line out of box likely ties to existing culvert	Discharge_Point	9.626	13.626	4	0	0
DP0156		Discharge_Point	14.16	15.81	1.65	0	0
DP0157	some debris	Discharge_Point	18.298	20.798	2.5	0	0
DP0158	Likely buried in the ditch	Discharge_Point	7.61	9.61	2	0	0
DP0160	No access; fenced in yard	Discharge_Point	8.728	12.489	3.761	0	0
DP0172		Discharge_Point	13.992	19.992	6	0	0
DP0173	<Null>	Discharge_Point	24.991	26.791	1.8	0	0
DP0209	Needs excavator for ditch, shovel out debris in pipe	Discharge_Point	25.717	31.717	6	0	0
DP0219		Discharge_Point	24.207	25.807	1.6	0	0
DP0236		Discharge_Point	23.31	28.31	5	0	0
DP0248		Discharge_Point	12.539	22.139	9.6	0	0
J1			24.53	29.53	5	0	0
J10		Discharge_point	4.93	13.446	8.516	0	0
J11		Discharge_point	4.989	13.513	8.524	0	0
J111	Inlet	Connect2D	13.58	16.04	2.46	30	0
J12			13	23.011	10.011	0	0
J13		Discharge_point	5.482	14.076	8.594	0	0
J15		Discharge_point	6.375	15.096	8.721	0	0
J17		Discharge_point	8.371	17.377	9.006	0	0
J18			27.525	32.525	5	0	0
J19		Discharge_point	9.458	18.619	9.161	0	0
J2		Discharge_point	-2.1451305	5.367	7.512	0	0
J21		Discharge_point	6.651	15.411	8.76	0	0
J23			27.807	56.528	28.721	0	0
J2472			14.671	20.943	6.272	0	0
J25			24.098	55.405	31.307	0	0
J26			22.58	23.665	1.085	0	0
J27	Inlet	Connect2D	10.454	15.254	4.8	30	0
J28			22.973	27.973	5	0	0
J29			20.445	45.895	25.45	0	0
J3			23.544	49.899	26.355	0	0
J30			29.5	39.5	10	0	250
J31			23.394	51.505	28.111	0	0
J32			8.614	17.608	8.994	0	0
J33			19.785	24.634	4.849	0	0
J34			25.35	27.784	2.434	0	0
J35			-3.8	0	3.8	0	0
J3525		Connect2D	30.597	60.597	30	30	0
J36			26.682	43.944	17.262	0	0

Existing Junction SWMM Input Parameters

J365	Inlet	Connect2D	14.1	16	1.9	30	0
J37			20.28	29.137	8.857	0	0
J38			29.015	56.546	27.531	0	0
J39			25.548	180.185	154.637	0	0
J4		Discharge_point	-1.7454613	5.823	7.568	0	0
J40			25.744	105.985	80.241	0	0
J41			-0.121677	7.677	7.799	0	0
J455	Inlet	Connect2D	0.72	4.57	3.85	30	0
J480		Connect2D	15.595	45.595	30	30	0
J5			6.886	22.542	15.656	0	0
J500	Inlet	Connect2D	-0.969	3.9	4.869	30	0
J5084			26.313	29.7	3.387	0	0
J5085			26.373	29.7	3.327	0	0
J5086			30.447	30.5	0.053	0	0
J560	Inlet	Connect2D	0	3.65	3.65	30	0
J563	Inlet	Connect2D	2.53	5.79	3.26	30	0
J6		Discharge_point	3.468	11.777	8.309	0	0
J64			6.612	15.367	8.755	0	0
J662	Inlet	Connect2D	1.205	6.105	4.9	30	0
J7			10.595	27.01	16.415	0	0
J732	Inlet	Connect2D	3.84	9.54	5.7	30	0
J78	Inlet	Connect2D	11.03	15.68	4.65	30	0
J796	Inlet	Connect2D	5.306	9.45	4.144	30	0
J797	Inlet	Connect2D	8.88	15.43	6.55	30	0
J798	Inlet	Connect2D	13.521	16.271	2.75	30	0
J8		Discharge_point	3.979	12.36	8.381	0	0
J850	Manhole	Connect2D	11.14	16.44	5.3	30	0
J9			10	19.125	9.125	0	0
SWDI0008	DIFFICULT ACCESS;	Connect2D	3.568	8.168	4.6	30	0
SWDI0009	Manhole beneath lid is bolted	Connect2D	3	8.216	5.216	30	0
SWDI0023		Connect2D	22.343	25.443	3.1	30	0
SWDI0024		Connect2D	22.717	25.717	3	30	0
SWDI0025	2 GRATES, 2x7	Connect2D	11.352	25.002	13.65	30	0
SWDI0026		Connect2D	7.597	11.297	3.7	30	0
SWDI0027		Connect2D	9.204	11.954	2.75	30	0
SWDI0028		Connect2D	23.564	26.064	2.5	30	0
SWDI0029		Connect2D	7.718	10.318	2.6	30	0
SWDI0030		Connect2D	7.545	10.295	2.75	30	0
SWDI0031		Connect2D	6.944	10.544	3.6	30	0
SWDI0032		Connect2D	9.132	14.032	4.9	30	0
SWDI0033	Grate dumps into box via a hole the wall	Connect2D	9.47	12.32	2.85	30	0
SWDI0034		Connect2D	14.32	17.02	2.7	30	0
SWDI0035		Connect2D	14.184	16.934	2.75	30	0
SWDI0036		Connect2D	13.232	15.182	1.95	30	0
SWDI0037		Connect2D	21.781	24.431	2.65	30	0
SWDI0038		Connect2D	21.874	24.474	2.6	30	0
SWDI0039		Connect2D	3.898	5.748	1.85	30	0
SWDI0040		Connect2D	3.253	5.703	2.45	30	0
SWDI0041		Connect2D	2.95	5.25	2.3	30	0
SWDI0042		Connect2D	-0.152	2.548	2.7	30	0
SWDI0043		Connect2D	6.375	8.625	2.25	30	0

Existing Junction SWMM Input Parameters

SWDI0044		Connect2D	5.665	7.765	2.1	30	0
SWDI0045		Connect2D	6.382	8.482	2.1	30	0
SWDI0046		Connect2D	4.403	8.803	4.4	30	0
SWDI0047		Connect2D	4.364	8.814	4.45	30	0
SWDI0048		Connect2D	5.514	8.614	3.1	30	0
SWDI0049		Connect2D	6.178	9.278	3.1	30	0
SWDI0139	Is in a french drain from yard	Inlet	28.274	30.574	2.3	0	0
SWDI0140		Inlet	28.232	30.432	2.2	0	0
SWDI0141		Inlet	27.12	29.22	2.1	0	2500
SWDI0142		Inlet	27.211	29.111	1.9	0	2500
SWDI0143		Inlet	26.367	28.267	1.9	0	5000
SWDI0144		Inlet	23.779	26.079	2.3	0	1000
SWDI0145		Inlet	23.234	26.034	2.8	0	1000
SWDI0146		Inlet	26.581	28.781	2.2	0	0
SWDI0147		Inlet	26.767	28.767	2	0	0
SWDI0148		Inlet	23.591	25.891	2.3	0	1000
SWDI0149		Inlet	23.399	25.899	2.5	0	1000
SWDI0150		Inlet	24.118	26.118	2	0	1000
SWDI0151		Inlet	27.43	29.63	2.2	0	0
SWDI0152		Inlet	27.487	29.987	2.5	0	0
SWDI0170		Inlet	12.75	14.75	2	0	250
SWDI0171		Inlet	12.95	14.8	1.85	0	250
SWDI0172		Inlet	13.117	15.117	2	0	1000
SWDI0173		Inlet	12.485	15.085	2.6	0	1000
SWDI0174		Inlet	18.052	20.052	2	0	0
SWDI0175		Inlet	17.573	20.073	2.5	0	0
SWDI0177		Inlet	15.938	18.438	2.5	0	0
SWDI0184		Inlet	11.828	17.828	6	0	1000
SWDI0185		Inlet	11.756	17.856	6.1	0	1000
SWDI0186		Inlet	11.56	15.56	4	0	3000
SWDI0187		Inlet	25.7	27.6	1.9	0	0
SWDI0188		Inlet	25.728	27.628	1.9	0	0
SWDI0189		Inlet	24.903	27.603	2.7	0	0
SWDI0190		Inlet	24.773	27.273	2.5	0	0
SWDI0223		Inlet	31.276	33.276	2	0	0
SWDI0224		Inlet	31.124	33.424	2.3	0	0
SWDI0228		Inlet	13.737	18.837	5.1	0	0
SWDI0229		Inlet	8.576	10.576	2	0	1000
SWDI0230		Inlet	7.908	10.408	2.5	0	1000
SWDI0258		Inlet	26.406	30.506	4.1	0	1000
SWDI0259	In pipe is buried	Inlet	26.323	30.123	3.8	0	0
SWDI0260	in pipe is buried	Inlet	26.15	29.75	3.6	0	1000
SWDI0262		Inlet	25.977	30.477	4.5	0	1000
SWDI0263	BOX IS BACKED UP	Inlet	26.115	29.815	3.7	0	1000
SWDI0264	BOX IS BACKED UP	Inlet	26.335	30.135	3.8	0	0
SWDI0265		Inlet	24.876	28.226	3.35	0	0
SWDI0266	In pipe& Out pipe; Arch 5' x 7'	Connect2D	18.8	27.9	9.1	30	0
SWDI0270	Grate is broken	Connect2D	26.177	29.377	3.2	30	0
SWDI0289	traffic control	Connect2D	26.062	29.262	3.2	30	0

Existing Junction SWMM Input Parameters

SWDI0290	Box is staggered on large pipe	Connect2D	12.078	27.728	15.65	30	0
SWDI0291		Connect2D	27.406	30.306	2.9	30	0
SWDI0293		Inlet	21.643	24.543	2.9	0	10000
SWDI0294		Inlet	21.681	24.681	3	0	5000
SWDI0305		Connect2D	23.096	25.996	2.9	30	0
SWDI0306		Connect2D	22.62	26.27	3.65	30	0
SWDI0307		Connect2D	4.971	12.721	7.75	30	0
SWDI0308		Connect2D	8.722	13.272	4.55	30	0
SWDI0310		Connect2D	13.423	14.923	1.5	30	0
SWDI0311		Connect2D	11.502	14.902	3.4	30	0
SWDI0312		Connect2D	11.074	14.874	3.8	30	0
SWDI0313	Box holds water	Connect2D	-0.858	2.592	3.45	30	0
SWDI0314		Connect2D	5.578	7.728	2.15	30	0
SWDI0388		Inlet	20.184	23.684	3.5	0	0
SWDI0395		Inlet	23.151	25.251	2.1	0	5000
SWDI0396		Inlet	23.526	25.426	1.9	0	0
SWDI0399		Inlet	22.907	28.407	5.5	0	500
SWDI0400		Inlet	23.08	28.48	5.4	0	500
SWDI0428		Inlet	24.794	28.044	3.25	0	10500
SWDI0429		Inlet	24.745	28.395	3.65	0	0
SWDI0430	Box depth is 3.45	Inlet	24.929	28.029	3.1	0	0
SWDI0439		Connect2D	27.966	29.666	1.7	30	0
SWDI0440	traffic control	Inlet	26.07	30.47	4.4	0	0
SWDI0441		Connect2D	26.519	28.519	2	30	0
SWDI0442		Connect2D	24.928	26.728	1.8	0	0
SWDI0465	Box is 4' x 7'	Inlet	20.439	28.039	7.6	0	0
SWDI0466		Inlet	23.285	27.485	4.2	0	0
SWDI0488	fence on top	Inlet	20	24.415	4.415	0	0
SWDI0497	No access; gated yard	Inlet	20.8	23.446	2.646	0	0
SWDI0498		Inlet	11.402	15.702	4.3	0	3000
SWDI0517	grate is cemented	Connect2D	27.456	29.556	2.1	30	0
SWDI0541		Connect2D	5.35	8.45	3.1	30	0
SWDI0595		Connect2D	2.592	4.792	2.2	30	0
SWDI0596	Box catches Bldg. runoff	Connect2D	2.39	3.24	0.85	30	0
SWDI0608	Box is approx. 60' x 1'; Estimated values	Connect2D	2.063	3.213	1.15	30	0
SWDI0609		Connect2D	3.058	4.058	1	30	0
SWDI0610		Connect2D	3.388	4.488	1.1	30	0
SWDI0611	Small box; estimated values	Connect2D	2.729	3.729	1	30	0
SWDI0612		Connect2D	1.801	3.451	1.65	30	0
SWDI0613		Connect2D	0.201	2.701	2.5	30	0
SWDI0614		Connect2D	1.926	3.526	1.6	30	0
SWDI0615		Connect2D	1.391	2.991	1.6	30	0
SWDI0616		Connect2D	1.179	2.929	1.75	30	0
SWDI0617		Connect2D	1.185	3.485	2.3	30	0
SWDI0618	Inlet	Connect2D	3.331	8.031	4.7	30	0
SWDI0619		Connect2D	12.65	19.15	6.5	30	0
SWDI0653		Inlet	26.315	28.215	1.9	0	10000
SWDI0654		Inlet	13.954	18.654	4.7	0	0

Existing Junction SWMM Input Parameters

SWDI0655		Inlet	12.187	15.187	3	0	0
SWDI0658		Inlet	26.832	28.332	1.5	0	1000
SWDI0659		Inlet	26.835	28.835	2	0	800
SWDI0660		Inlet	26.808	28.808	2	0	850
SWMH0002		Connect2D	19.902	24.902	5	30	0
SWMH0003		Connect2D	7.373	11.873	4.5	30	0
SWMH0004		Connect2D	8.882	12.132	3.25	30	0
SWMH0005		Connect2D	3.865	13.365	9.5	30	0
SWMH0006		Manhole	9.388	15.438	6.05	0	0
SWMH0007		Connect2D	16.366	21.166	4.8	30	0
SWMH0008	Inv. 1 is estimated	Connect2D	22.435	26.535	4.1	30	0
SWMH0009		Connect2D	4.937	10.937	6	30	0
SWMH0010	Inv.5 = 6.7' ; 18" RCP	Connect2D	9.441	16.491	7.05	30	0
SWMH0011		Connect2D	18.285	24.835	6.55	30	0
SWMH0012	Water line runs thru box	Connect2D	1.018	5.868	4.85	30	0
SWMH0013		Connect2D	0.874	5.874	5	30	0
SWMH0014	Values are estimated	Connect2D	-1.705	3.345	5.05	30	0
SWMH0015		Connect2D	3.543	10.343	6.8	30	0
SWMH0046	Underground pipe junction	Connect2D	26.066	30.22	4.154	30	0
SWMH0059	Underground pipe junction	Connect2D	7.1	11.8	4.7	30	0
SWMH0070	Underground pipe junction	Connect2D	1.5	3.295	1.795	30	0
SWMH0071	Underground pipe junction	Connect2D	3	10	7	30	0
SWMH0072	Underground pipe junction	Connect2D	12	15.4	3.4	30	0
SWMH0074		Junction	11.99	19.361	7.371	0	0
SWMH0077		Connect2D	1.878	7.178	5.3	30	0
SWMH0078	junction	Connect2D	24.5	28.675	4.175	30	0
SWMH0082	double chambered riser, 8x8	Connect2D	7.762	13.062	5.3	30	0
SWMH0087		Connect2D	4.09	8.69	4.6	30	0
SWMH0092	Underground pipe junction	Manhole	22	25.578	3.578	0	0
SWMH0094	Likely covered by gravel	Connect2D	4.5	10.253	5.753	30	0
SWMH0096	No access	Manhole	23.5	26.08	2.58	0	20000
SWMH0105	Underground pipe junction	Manhole	11	17.127	6.127	0	0
SWMH0114	Underground pipe junction	Connect2D	6.8	11.15	4.35	30	0
WEIR0002		Connect2D	2.5	7.889	5.389	30	0
WEIR0022		Riser	23.47	28.565	5.095	0	0

Proposed ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
1	SWDI0034	0.095	5	SCS CN	0.2 S	0.597	77	Standard (483.4)
2	SWDI0310	0.079	5	SCS CN	0.2 S	1.077	65	Standard (483.4)
3	SWDI0039	1.534	6.67	SCS CN	0.2 S	0.703	74	Standard (483.4)
4	SWDI0042	3.105	10.12	SCS CN	0.2 S	0.564	78	Standard (483.4)
5	SWDI0044	0.258	5.73	SCS CN	0.2 S	0.857	70	Standard (483.4)
6	SWDI0048	1.449	5	SCS CN	0.2 S	0.105	95	Standard (483.4)
7	SWDI0009	0.074	5	SCS CN	0.2 S	0.105	95	Standard (483.4)
8	SWDI0046	0.254	5	SCS CN	0.2 S	0.083	96	Standard (483.4)
9	SWMH0072	1.477	6.31	SCS CN	0.2 S	1.39	59	Standard (483.4)
10	SWDI0653	2.836	19.55	SCS CN	0.2 S	0.817	71	Standard (483.4)
11	CP0156	5.774	14.99	SCS CN	0.2 S	0.532	79	Standard (483.4)
12	CP0174	1.36	9.44	SCS CN	0.2 S	0.817	71	Standard (483.4)
13	CP0163	38.767	58.92	SCS CN	0.2 S	1.175	63	Standard (483.4)
14	SWDI0045	0.09	5	SCS CN	0.2 S	0.222	90	Standard (483.4)
15	CP0254	0.771	8.91	SCS CN	0.2 S	1.175	63	Standard (483.4)
16	SWDI0043	1.631	10.77	SCS CN	0.2 S	0.564	78	Standard (483.4)
17	CP0168	58.52	70.72	SCS CN	0.2 S	1.175	63	Standard (483.4)
18	J10	9.488	50.4	SCS CN	0.2 S	2.762	42	Standard (483.4)
19	SWDI0143	0.637	16.52	SCS CN	0.2 S	0.985	67	Standard (483.4)
20	SWDI0148	1.482	17.05	SCS CN	0.2 S	1.03	66	Standard (483.4)
21	SWDI0595	1.395	8.23	SCS CN	0.2 S	0.899	69	Standard (483.4)
22	SWDI0312	0.223	5	SCS CN	0.2 S	0.941	68	Standard (483.4)
23	SWDI0041	0.192	5	SCS CN	0.2 S	1.175	63	Standard (483.4)
24	J18	6.882	22.01	SCS CN	0.2 S	1.39	59	Standard (483.4)
25	SWDI0028	0.54	6.72	SCS CN	0.2 S	0.817	71	Standard (483.4)
26	SWDI0263	0.614	7.06	SCS CN	0.2 S	0.174	92	Standard (483.4)
27	DP0209	6.357	22.98	SCS CN	0.2 S	0.469	81	Standard (483.4)
28	SWMH0005	0.247	5	SCS CN	0.2 S	0.532	79	Standard (483.4)
29	SWDI0037	1.605	12.04	SCS CN	0.2 S	0.817	71	Standard (483.4)
30	SWDI0172	8.262	35.86	SCS CN	0.2 S	2.348	46	Standard (483.4)
31	SWDI0035	0.196	5	SCS CN	0.2 S	0.667	75	Standard (483.4)
32	J30	124	74.31	SCS CN	0.2 S	1.226	62	Standard (483.4)
33	SWDI0189	0.787	7.09	SCS CN	0.2 S	0.778	72	Standard (483.4)
34	SWDI0190	0.887	14.41	SCS CN	0.2 S	0.985	67	Standard (483.4)
35	SWDI0150	2.298	25.91	SCS CN	0.2 S	1.571	56	Standard (483.4)
36	SWDI0147	2.452	16.48	SCS CN	0.2 S	0.469	81	Standard (483.4)
37	SWDI0141	0.145	5	SCS CN	0.2 S	0.128	94	Standard (483.4)
38	J23	2.434	9.07	SCS CN	0.2 S	0.74	73	Standard (483.4)
39	CP0305	1.556	13.58	SCS CN	0.2 S	0.439	82	Standard (483.4)
40	SWDI0142	1.913	13.52	SCS CN	0.2 S	0.469	81	Standard (483.4)
41	SWDI0139	0.255	5	SCS CN	0.2 S	0.222	90	Standard (483.4)
42	SWDI0144	2.58	7.55	SCS CN	0.2 S	0.299	87	Standard (483.4)
43	CP0160	21.72	59.41	SCS CN	0.2 S	1.125	64	Standard (483.4)
44	J28	5.311	13	SCS CN	0.2 S	0.381	84	Standard (483.4)
45	CP0027	8.007	42.11	SCS CN	0.2 S	1.448	58	Standard (483.4)
46	J34	5.666	37.02	SCS CN	0.2 S	3.556	36	Standard (483.4)
47	SWDI0265	1.163	11.68	SCS CN	0.2 S	0.41	83	Standard (483.4)
48	SWDI0430	1.901	16.99	SCS CN	0.2 S	1.077	65	Standard (483.4)
49	SWDI0428	0.509	5	SCS CN	0.2 S	0.198	91	Standard (483.4)
50	CP0145	5.029	52.29	SCS CN	0.2 S	3.882	34	Standard (483.4)

Proposed ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
51	CP0145	4.703	21.99	SCS CN	0.2 S	0.985	67	Standard (483.4)
52	SWDI0658	0.058	5	SCS CN	0.2 S	1.125	64	Standard (483.4)
53	SWDI0660	0.165	5	SCS CN	0.2 S	3.128	39	Standard (483.4)
54	SWDI0659	0.057	5	SCS CN	0.2 S	2.348	46	Standard (483.4)
55	J33	3.545	18.99	SCS CN	0.2 S	1.704	54	Standard (483.4)
56	WEIR0022	9.108	32.24	SCS CN	0.2 S	1.636	55	Standard (483.4)
57	SWDI0293	1.711	14.29	SCS CN	0.2 S	0.817	71	Standard (483.4)
58	DP0236	11.036	56.72	SCS CN	0.2 S	2.348	46	Standard (483.4)
59	CP0256	10.107	31.53	SCS CN	0.2 S	0.985	67	Standard (483.4)
60	CP0283	4.907	28.13	SCS CN	0.2 S	2.255	47	Standard (483.4)
61	J4	9.096	14.04	SCS CN	0.2 S	0.632	76	Standard (483.4)
62	SWDI0177	2.446	8.14	SCS CN	0.2 S	0.532	79	Standard (483.4)
63	CP0293	0.376	5	SCS CN	0.2 S	0.299	87	Standard (483.4)
64	CP0281	21.886	59.04	SCS CN	0.2 S	1.774	53	Standard (483.4)
65	CP0283	22.22	28.38	SCS CN	0.2 S	0.564	78	Standard (483.4)
66	SWDI0188	2.773	23.63	SCS CN	0.2 S	0.857	70	Standard (483.4)
67	J13	3.202	30.61	SCS CN	0.2 S	3	40	Standard (483.4)
68	SWDI0171	0.942	8.93	SCS CN	0.2 S	0.941	68	Standard (483.4)
69	SWDI0429	0.438	7.72	SCS CN	0.2 S	0.247	89	Standard (483.4)
70	SWDI0290	0.267	5	SCS CN	0.2 S	0.128	94	Standard (483.4)
71	SWDI0174	0.833	11.33	SCS CN	0.2 S	1.125	64	Standard (483.4)
72	SWDI0497	2.96	27.74	SCS CN	0.2 S	1.704	54	Standard (483.4)
73	SWDI0388	0.758	17.18	SCS CN	0.2 S	1.704	54	Standard (483.4)
74	SWDI0229	1.43	17.58	SCS CN	0.2 S	1.571	56	Standard (483.4)
75	CP0309	4.496	28.4	SCS CN	0.2 S	2.444	45	Standard (483.4)
76	CP0015	8.011	32.65	SCS CN	0.2 S	1.571	56	Standard (483.4)
77	SWDI0655	2.24	19.93	SCS CN	0.2 S	2.167	48	Standard (483.4)
78	DP0172	4.632	15.94	SCS CN	0.2 S	1.448	58	Standard (483.4)
79	SWDI0488	0.469	8.12	SCS CN	0.2 S	1.571	56	Standard (483.4)
80	SWDI0186	4.778	16.42	SCS CN	0.2 S	1.226	62	Standard (483.4)
81	SWMH0096	10.925	44.07	SCS CN	0.2 S	1.571	56	Standard (483.4)
82	J64	10.128	57.39	SCS CN	0.2 S	1.571	56	Standard (483.4)
83	J19	5.939	30.55	SCS CN	0.2 S	3	40	Standard (483.4)
84	CP0306	0.342	11.21	SCS CN	0.2 S	2.762	42	Standard (483.4)
85	SWDI0228	0.73	9.32	SCS CN	0.2 S	0.817	71	Standard (483.4)
86	CP0160	1.758	16.63	SCS CN	0.2 S	0.703	74	Standard (483.4)
87	SWDI0466	0.706	10.23	SCS CN	0.2 S	0.899	69	Standard (483.4)
88	J20	8.379	45.82	SCS CN	0.2 S	1.636	55	Standard (483.4)
89	SWDI0465	0.329	7.04	SCS CN	0.2 S	1.226	62	Standard (483.4)
90	SWDI0151	0.247	7.82	SCS CN	0.2 S	0.899	69	Standard (483.4)
91	SWDI0224	0.579	14.38	SCS CN	0.2 S	0.778	72	Standard (483.4)
92	SWDI0223	0.581	14.76	SCS CN	0.2 S	1.125	64	Standard (483.4)
93	J25	28.041	59.82	SCS CN	0.2 S	1.571	56	Standard (483.4)
94	J12	5.142	15.7	SCS CN	0.2 S	1.704	54	Standard (483.4)
95	SWDI0152	0.275	9.54	SCS CN	0.2 S	0.941	68	Standard (483.4)
96	J8	5.626	39.15	SCS CN	0.2 S	3.405	37	Standard (483.4)
97	J37	5.73	23.03	SCS CN	0.2 S	1.636	55	Standard (483.4)
98	J36	6.943	35.38	SCS CN	0.2 S	1.846	52	Standard (483.4)
99	J2	12.032	16.98	SCS CN	0.2 S	1.125	64	Standard (483.4)
100	J41	30.924	68	SCS CN	0.2 S	2.082	49	Standard (483.4)
101	J365	6.453	22.66	SCS CN	0.2 S	1.39	59	Standard (483.4)

Proposed ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
102	J78	0.369	5	SCS CN	0.2 S	0.817	71	Standard (483.4)
103	J563	2.482	5.93	SCS CN	0.2 S	0.703	74	Standard (483.4)
104	J797	2.086	12.94	SCS CN	0.2 S	1.509	57	Standard (483.4)
105	J27	0.845	10.22	SCS CN	0.2 S	0.941	68	Standard (483.4)
106	CP0023	4.313	15.25	SCS CN	0.2 S	0.817	71	Standard (483.4)
107	J29	6.882	26.36	SCS CN	0.2 S	1.922	51	Standard (483.4)
108	J31	21.14	63.34	SCS CN	0.2 S	1.922	51	Standard (483.4)
109	CP0025	67.608	125.57	SCS CN	0.2 S	3.556	36	Standard (483.4)
110	SWDI0266	0.704	6.65	SCS CN	0.2 S	0.222	90	Standard (483.4)
111	J38	3.745	21.14	SCS CN	0.2 S	1.226	62	Standard (483.4)
112	CP0173	2.392	9.89	SCS CN	0.2 S	0.381	84	Standard (483.4)
113	CP0171	0.879	5.85	SCS CN	0.2 S	0.273	88	Standard (483.4)
114	CP0148	14.681	39.71	SCS CN	0.2 S	0.899	69	Standard (483.4)
115	J40	6.478	26.55	SCS CN	0.2 S	1.175	63	Standard (483.4)
116	DP0173	13.97	64.53	SCS CN	0.2 S	2.444	45	Standard (483.4)
117	DP0146	10.924	37.8	SCS CN	0.2 S	2.348	46	Standard (483.4)
118	DP0142	1.923	13.08	SCS CN	0.2 S	2.651	43	Standard (483.4)
119	J9	8.958	40.42	SCS CN	0.2 S	2.651	43	Standard (483.4)
120	DP0152	3.183	5	SCS CN	0.2 S	0.381	84	Standard (483.4)
121	SWDI0260	0.254	5.32	SCS CN	0.2 S	0.128	94	Standard (483.4)
122	SWDI0259	0.188	5	SCS CN	0.2 S	0.128	94	Standard (483.4)
123	SWDI0258	0.247	5	SCS CN	0.2 S	0.083	96	Standard (483.4)
124	SWDI0517	3.15	10.72	SCS CN	0.2 S	0.198	91	Standard (483.4)
125	SWMH0078	0.189	5	SCS CN	0.2 S	0.105	95	Standard (483.4)
126	SWDI0442	0.508	5	SCS CN	0.2 S	0.41	83	Standard (483.4)
127	SWDI0032	1.028	6.14	SCS CN	0.2 S	0.632	76	Standard (483.4)
128	SWDI0049	0.586	5	SCS CN	0.2 S	0.198	91	Standard (483.4)
129	SWMH0059	0.424	5	SCS CN	0.2 S	0.299	87	Standard (483.4)
130	SWDI0030	0.903	5	SCS CN	0.2 S	0.5	80	Standard (483.4)
131	SWDI0306	0.02	5	SCS CN	0.2 S	1.774	53	Standard (483.4)
132	J480	0.644	5	SCS CN	0.2 S	0.597	77	Standard (483.4)
133	SWMH0007	1.052	5	SCS CN	0.2 S	0.353	85	Standard (483.4)
134	SWDI0023	0.756	10.68	SCS CN	0.2 S	1.333	60	Standard (483.4)
135	DP0248	4.648	10.7	SCS CN	0.2 S	0.817	71	Standard (483.4)
136	J5086	4.206	28.97	SCS CN	0.2 S	2.082	49	Standard (483.4)
137	SWDI0396	18.912	65.14	SCS CN	0.2 S	1.636	55	Standard (483.4)
138	SWDI0399	5.912	51.67	SCS CN	0.2 S	2.082	49	Standard (483.4)
139	J798	1.554	11.73	SCS CN	0.2 S	1.846	52	Standard (483.4)
140	YI-1	0.505	6.73	SCS CN	0.2 S	2.082	49	Standard (483.4)
141	SWDI0038	3.632	21.22	SCS CN	0.2 S	1.03	66	Standard (483.4)
142	SWDI0036	1.162	6.75	SCS CN	0.2 S	0.941	68	Standard (483.4)
143	SWDI0619	0.672	7.09	SCS CN	0.2 S	1.571	56	Standard (483.4)
144	SWDI0615	0.648	8.45	SCS CN	0.2 S	1.571	56	Standard (483.4)
145	SWDI0040	1.103	7.59	SCS CN	0.2 S	0.817	71	Standard (483.4)
146	SWDI0614	0.24	5	SCS CN	0.2 S	0.632	76	Standard (483.4)
147	SWDI0617	0.058	5	SCS CN	0.2 S	1.636	55	Standard (483.4)
148	SWDI0618	0.12	5.01	SCS CN	0.2 S	3.128	39	Standard (483.4)
149	SWDI0616	0.134	5	SCS CN	0.2 S	1.077	65	Standard (483.4)
150	SWDI0612	1.022	9.17	SCS CN	0.2 S	1.077	65	Standard (483.4)
151	SWDI0611	0.098	5	SCS CN	0.2 S	0.941	68	Standard (483.4)
152	DI-105C-1	0.058	5	SCS CN	0.2 S	0.469	81	Standard (483.4)

Proposed ARM Subcatchment SWMM Input Parameters

Name	Outlet	Area (ac)	Time of Concentration (min)	Loss Method	IA Method	IA Value (in)	SCS Curve Number	Peak Rate Factor
153	DI-104	0.084	5	SCS CN	0.2 S	1.279	61	Standard (483.4)
154	YI-2	0.453	5	SCS CN	0.2 S	0.439	82	Standard (483.4)
155	SWDI0610	0.194	5.16	SCS CN	0.2 S	1.03	66	Standard (483.4)
156	DI-102	0.182	5.62	SCS CN	0.2 S	1.125	64	Standard (483.4)
157	SWDI0613	1.132	8.21	SCS CN	0.2 S	1.077	65	Standard (483.4)
158	SWDI0596	0.446	6.32	SCS CN	0.2 S	0.985	67	Standard (483.4)
159	J796	1.593	14.94	SCS CN	0.2 S	1.39	59	Standard (483.4)
160	J14	0.415	6.23	SCS CN	0.2 S	1.125	64	Standard (483.4)
161	Terraced_Bio_ Combined	0.442	5.76	SCS CN	0.2 S	0.857	70	Standard (483.4)
162	SWDI0609	0.284	5	SCS CN	0.2 S	0.778	72	Standard (483.4)
163	J16	3.71	14.35	SCS CN	0.2 S	1.125	64	Standard (483.4)
164	J22	0.203	5.03	SCS CN	0.2 S	0.222	90	Standard (483.4)
165	J24	1.806	16.18	SCS CN	0.2 S	0.469	81	Standard (483.4)
166	SWDI0498	0.387	5	SCS CN	0.2 S	2.348	46	Standard (483.4)

Swansboro, NC Tidal Stage Hydrographs

Time (hr)	10-Year Tide + Storm Surge	25-Year Tide + Storm Surge	100-Year Tide + Storm Surge
0	2.23915045	2.561541198	3.5654
0.25	2.239351603	2.567778467	3.5901
0.5	2.225409125	2.560101818	3.6016
0.75	2.197686341	2.538887902	3.6004
1	2.15677293	2.504740769	3.5869
1.25	2.103475912	2.458482966	3.5622
1.5	2.038807203	2.401143201	3.5273
1.75	1.963967936	2.333940803	3.4834
2	1.88032981	2.258267213	3.4320
2.25	1.789413761	2.175664828	3.3748
2.5	1.692866315	2.08780354	3.3134
2.75	1.592434002	1.996455368	3.2497
3	1.489936247	1.90346759	3.1856
3.25	1.387237189	1.810734845	3.1232
3.5	1.286216883	1.720170655	3.0644
3.75	1.188742372	1.633678858	3.0112
4	1.096639095	1.553125441	2.9656
4.25	1.011663115	1.480311258	2.9296
4.5	0.935474636	1.416946104	2.9049
4.75	0.869613263	1.364624634	2.8935
5	0.815475427	1.324804549	2.8968
5.25	0.774294383	1.298787487	2.9163
5.5	0.747123153	1.287703016	2.9535
5.75	0.734820741	1.292496082	3.0095
6	0.73804191	1.313918254	3.0854
6.25	0.757230794	1.352523067	3.1819
6.5	0.792618524	1.408665728	3.2998
6.75	0.844225068	1.482507439	3.4397
7	0.911865408	1.574024558	3.6019
7.25	0.995160158	1.683022834	3.7868
7.5	1.093550707	1.809156921	3.9946
7.75	1.206318957	1.951955433	4.2254
8	1.332611709	2.110851826	4.4795
8.25	1.471469779	2.285221421	4.7570
8.5	1.621861904	2.474424974	5.0584
8.75	1.782723502	2.677859169	5.3843
9	1.953000297	2.895014351	5.7353
9.25	2.131696539	3.125539391	6.1127
9.5	2.317927005	3.369312523	6.5181
9.75	2.510970448	3.626514337	6.9536
10	2.710318786	3.89769297	7.4219
10.25	2.915708504	4.183797437	7.9262
10.5	3.127102867	4.486122692	8.4697
10.75	3.344552002	4.806034937	9.0548

Swansboro, NC Tidal Stage Hydrographs

Time (hr)	10-Year Tide + Storm Surge	25-Year Tide + Storm Surge	100-Year Tide + Storm Surge
11	3.567760185	5.144169032	9.6810
11.25	3.794959371	5.498373491	10.3395
11.5	4.020172387	5.858746472	11.0028
11.75	4.227108173	6.196585829	11.6038
12	4.379571057	6.44704009	12.0147
12.25	4.436142665	6.535639569	12.1357
12.5	4.439191027	6.539191027	12.1392
12.75	4.33946392	6.36869291	11.7814
13	4.193965364	6.127034668	11.3363
13.25	3.960043557	5.736773604	10.6301
13.5	3.678815508	5.271715621	9.7607
13.75	3.386150971	4.796009892	8.8543
14	3.098038276	4.337705856	7.9765
14.25	2.820172055	3.906098494	7.1534
14.5	2.554051207	3.502767547	6.3922
14.75	2.299710836	3.126534078	5.6923
15	2.056845214	2.775510299	5.0499
15.25	1.825237785	2.447898225	4.4606
15.5	1.604898936	2.142261199	3.9203
15.75	1.396082073	1.85757622	3.4251
16	1.199250911	1.593198479	2.9719
16.25	1.015029363	1.34879448	2.5582
16.5	0.84414753	1.124267765	2.1818
16.75	0.687389513	0.919687201	1.8409
17	0.54554532	0.735221611	1.5343
17.25	0.419367728	0.571081907	1.2607
17.5	0.309534288	0.427470786	1.0191
17.75	0.216614465	0.304539675	0.8085
18	0.141041826	0.202352476	0.6280
18.25	0.083091157	0.120855718	0.4767
18.5	0.04286042	0.059854725	0.3536
18.75	0.020257441	0.018995493	0.2576
19	0.014991217	-0.002248019	0.1876
19.25	0.02656774	-0.004581448	0.1423
19.5	0.054290168	0.011107291	0.1202
19.75	0.097263184	0.043749944	0.1199
20	0.154401325	0.092104179	0.1397
20.25	0.224441031	0.154763858	0.1778
20.5	0.305956121	0.230172994	0.2321
20.75	0.397376385	0.316643003	0.3009
21	0.497008901	0.412372877	0.3818
21.25	0.603061707	0.515471842	0.4729
21.5	0.713669386	0.623984056	0.5718
21.75	0.826920121	0.73591488	0.6764
22	0.940883753	0.849258244	0.7843

Swansboro, NC Tidal Stage Hydrographs

Time (hr)	10-Year Tide + Storm Surge	25-Year Tide + Storm Surge	100-Year Tide + Storm Surge
22.25	1.053640362	0.962024606	0.8936
22.5	1.163308897	1.072269034	1.0019
22.75	1.268075357	1.178118895	1.1074
23	1.366220084	1.277800699	1.2079
23.25	1.456143678	1.369665622	1.3019
23.5	1.536391144	1.452213282	1.3876
23.75	1.605673835	1.524113366	1.4637
24	1.662888863	1.584224733	1.5287
24.25	1.707135627	1.631611682	1.5818
24.5	1.737729216	1.665557097	1.6221
24.75	1.754210429	1.685572255	1.6491
25	1.756352286	1.691403115	1.6623
25.25	1.744162875	1.683032993	1.6618
25.5	1.717884526	1.660681545	1.6476
25.75	1.677989287	1.624800099	1.6203
26	1.625170788	1.576063359	1.5803
26.25	1.560332613	1.515357652	1.5285
26.5	1.484573362	1.443765856	1.4660
26.75	1.399168638	1.362549278	1.3941
27	1.305550245	1.27312674	1.3139
27.25	1.205282923	1.177051219	1.2272
27.5	1.100038994	1.075984401	1.1355
27.75	0.991571317	0.97166955	1.0405
28	0.88168499	0.86590313	0.9440
28.25	0.772208231	0.760505617	0.8479
28.5	0.664962929	0.657291979	0.7538
28.75	0.561735304	0.558042275	0.6636
29	0.464247169	0.464472856	0.5790
29.25	0.374128232	0.378208617	0.5015
29.5	0.292889893	0.300756742	0.4327
29.75	0.221900949	0.233482357	0.3739
30	0.162365584	0.177586488	0.3264
30.25	0.115304016	0.134086656	0.2910
30.5	0.081536089	0.103800438	0.2687
30.75	0.061668082	0.087332238	0.2601
31	0.056082942	0.085063489	0.2654
31.25	0.064934095	0.097146434	0.2849
31.5	0.088142936	0.12350159	0.3184
31.75	0.125400038	0.163818923	0.3658
32	0.176170051	0.217562734	0.4263
32.25	0.239700229	0.283980153	0.4993
32.5	0.315032428	0.362113124	0.5838
32.75	0.401018399	0.450813676	0.6787
33	0.496338125	0.548762238	0.7826
33.25	0.599520904	0.654488712	0.8941

Swansboro, NC Tidal Stage Hydrographs

Time (hr)	10-Year Tide + Storm Surge	25-Year Tide + Storm Surge	100-Year Tide + Storm Surge
33.5	0.70896885	0.766395953	1.0116
33.75	0.822982426	0.882785292	1.1334
34	0.93978761	1.001883685	1.2576
34.25	1.057564252	1.121872059	1.3826
34.5	1.17447517	1.240914402	1.5064
34.75	1.288695528	1.357187118	1.6272
35	1.398442011	1.468908203	1.7434
35.25	1.502001342	1.574365751	1.8530
35.5	1.597757682	1.671945343	1.9546
35.75	1.684218475	1.760155885	2.0467
36	1.760038324	1.837653479	2.1278
36.25	1.824040512	1.903262936	2.1969
36.5	1.875235836	1.955996603	2.2530
36.75	1.912838439	1.995070194	2.2952
37	1.936278397	2.019915364	2.3231
37.25	1.94521085	2.030188844	2.3362
37.5	1.939521543	2.025777973	2.3344
37.75	1.919328678	2.006802548	2.3180
38	1.884981053	1.973612957	2.2872
38.25	1.837052513	1.926784631	2.2426
38.5	1.776332808	1.867108894	2.1851
38.75	1.703814998	1.795580369	2.1155
39	1.620679608	1.713381133	2.0351
39.25	1.528275791	1.621861871	1.9453
39.5	1.42809979	1.522520342	1.8476
39.75	1.321771053	1.41697749	1.7435
40	1.211006379	1.306951588	1.6349
40.25	1.097592504	1.194230824	1.5234
40.5	0.983357575	1.080644774	1.4110
40.75	0.870141952	0.968035202	1.2994
41	0.759768828	0.858226681	1.1905
41.25	0.654015112	0.752997472	1.0861
41.5	0.554583057	0.654051152	0.9879
41.75	0.463073074	0.562989435	0.8975
42	0.380958188	0.481286614	0.8164
42.25	0.309560509	0.410266044	0.7458
42.5	0.250030134	0.351079037	0.6870
42.75	0.203326784	0.304686502	0.6410
43	0.17020449	0.271843629	0.6084
43.25	0.151199567	0.253087865	0.5898
43.5	0.146622061	0.248730357	0.5855
43.75	0.156550817	0.258851027	0.5957
44	0.18083224	0.283297326	0.6201
44.25	0.219082772	0.321686716	0.6584
44.5	0.270695042	0.373412818	0.7100

Swansboro, NC Tidal Stage Hydrographs

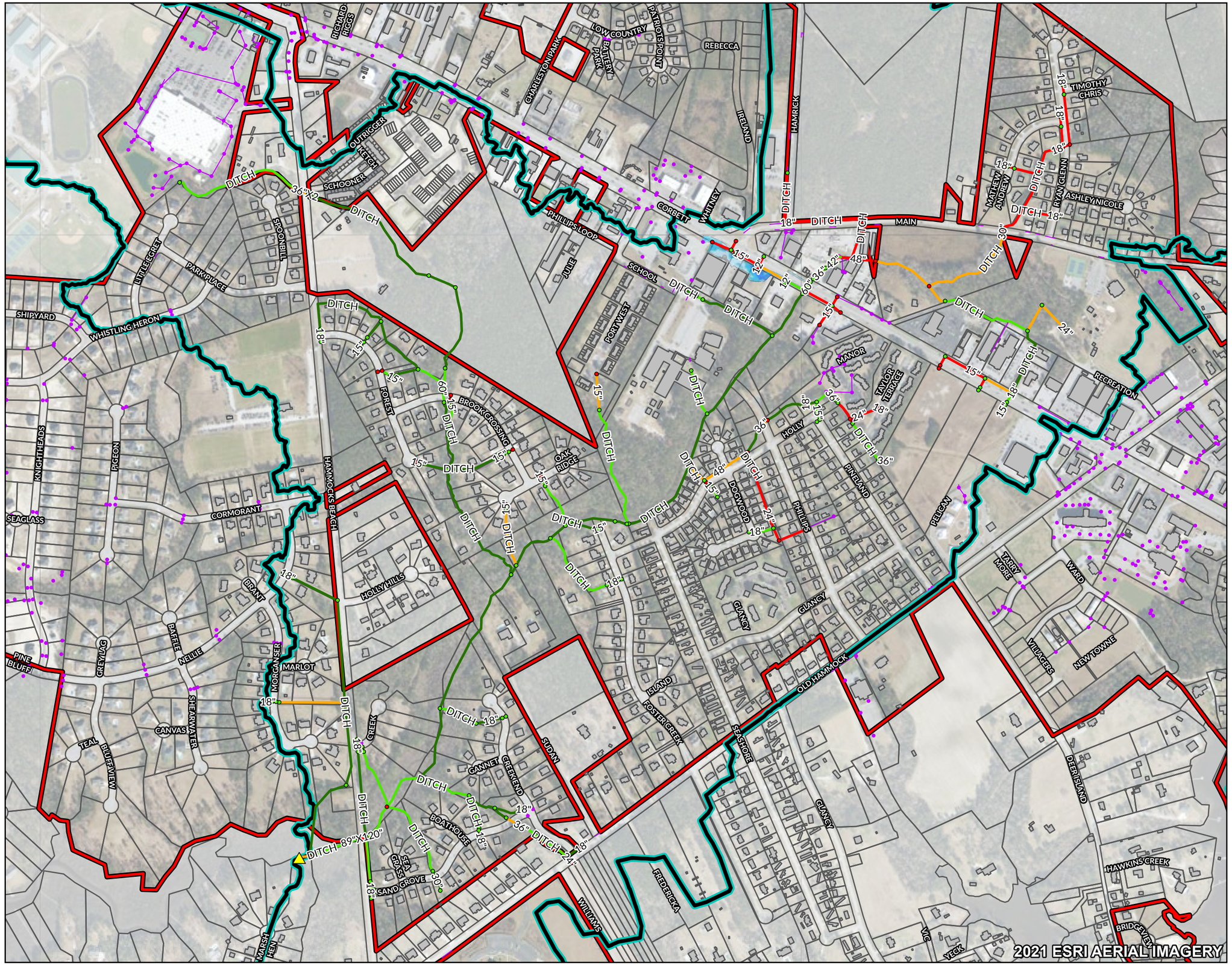
Time (hr)	10-Year Tide + Storm Surge	25-Year Tide + Storm Surge	100-Year Tide + Storm Surge
44.75	0.334847594	0.43765514	0.7740
45	0.410518034	0.513392227	0.8495
45.25	0.496499391	0.59941802	0.9352
45.5	0.591419425	0.694361165	1.0297
45.75	0.69376258	0.796706965	1.1317
46	0.801894219	0.904821619	1.2393
46.25	0.914086774	1.016978368	1.3509
46.5	1.028547367	1.13138512	1.4648
46.75	1.143446486	1.246213124	1.5790
47	1.256947236	1.359626224	1.6918
47.25	1.367234721	1.469810238	1.8013
47.5	1.472545056	1.575001974	1.9058
47.75	1.57119358	1.673517442	2.0036
48	1.661601794	1.763778791	2.0931
48.25	1.742322599	1.844339551	2.1728
48.5	1.812063444	1.913907777	2.2416
48.75	1.869706992	1.971366719	2.2982
49	1.914328992	2.015792694	2.3417
49.25	1.945213063	2.046469871	2.3715
49.5	1.961862157	2.062901729	2.3870
49.75	1.964006511	2.064819017	2.3880
50	1.951607969	2.052184075	2.3744
50.25	1.924860607	2.025191453	2.3464
50.5	1.884187635	1.984264822	2.3044
50.75	1.830234649	1.930050221	2.2492
51	1.763859315	1.863405745	2.1815
51.25	1.686117676	1.785387848	2.1024
51.5	1.598247279	1.697234475	2.0132
51.75	1.501647405	1.60034529	1.9152
52	1.397856715	1.496259321	1.8101
52.25	1.288528661	1.386630376	1.6993
52.5	1.17540507	1.273200625	1.5848
52.75	1.060288313	1.157772766	1.4682
53	0.945012503	1.042181229	1.3515
53.25	0.83141419	0.928262868	1.2364
53.5	0.72130301	0.817827612	1.1248
53.75	0.616432775	0.712629553	1.0185
54	0.518473441	0.614338919	0.9190
54.25	0.428984431	0.524515391	0.8280
54.5	0.349389711	0.444583183	0.7469
54.75	0.280955036	0.375808292	0.6770
55	0.224767731	0.319278271	0.6193
55.25	0.181719313	0.275884857	0.5747
55.5	0.152491245	0.246309725	0.5439
55.75	0.137544056	0.231013604	0.5274

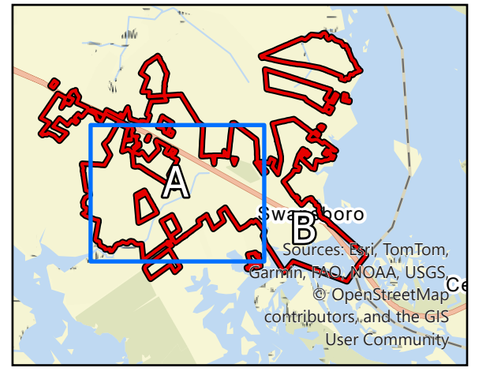
Swansboro, NC Tidal Stage Hydrographs

Time (hr)	10-Year Tide + Storm Surge	25-Year Tide + Storm Surge	100-Year Tide + Storm Surge
56	0.137109976	0.230228921	0.5255
56.25	0.151189236	0.243956092	0.5380
56.5	0.179550064	0.271963523	0.5648
56.75	0.221732396	0.313791319	0.6054
57	0.277055229	0.368758642	0.6592
57.25	0.344627514	0.435974596	0.7252
57.5	0.423362394	0.514352477	0.8024
57.75	0.511994586	0.602627142	0.8895
58	0.609100601	0.699375239	0.9851
58.25	0.7131215	0.803037958	1.0875
58.5	0.822387812	0.911945955	1.1952
58.75	0.935146224	1.024346031	1.3065
59	1.049587597	1.138429164	1.4194
59.25	1.163875895	1.252359423	1.5321
59.5	1.276177521	1.364303315	1.6429
59.75	1.384690633	1.472459096	1.7499
60	1.487673942	1.575085568	1.8513

Appendix 3: Existing Conditions Model Inundation Results

- Existing 10-Year Max Depth Map
- Existing 25-Year Max Depth Map
- Existing 100-Year Max Depth Map





LEGEND

10-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Outfalls

0 300 600 1,200

1 Inch = 600 Feet

N

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10-Year Max Depth Map
Existing Conditions

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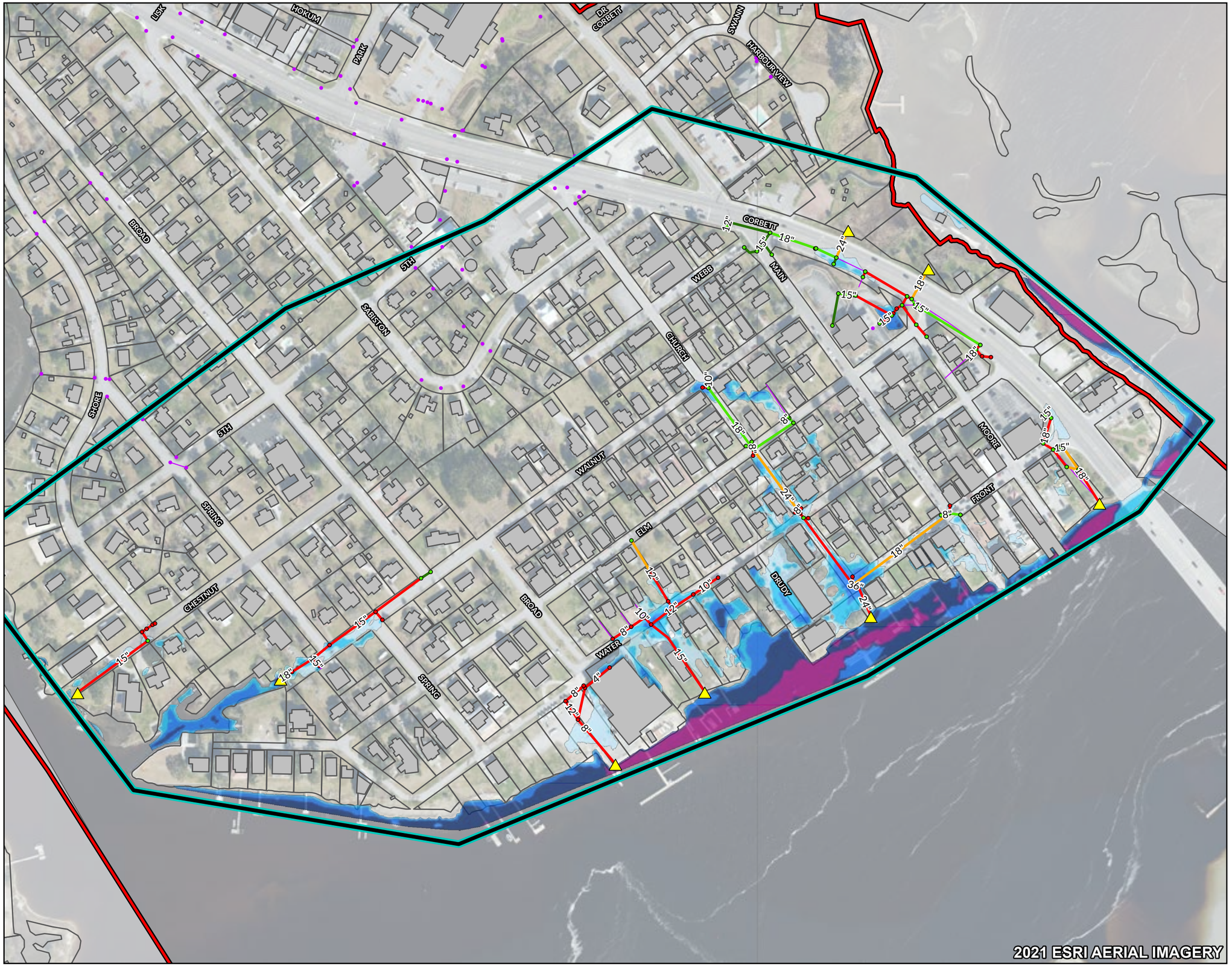
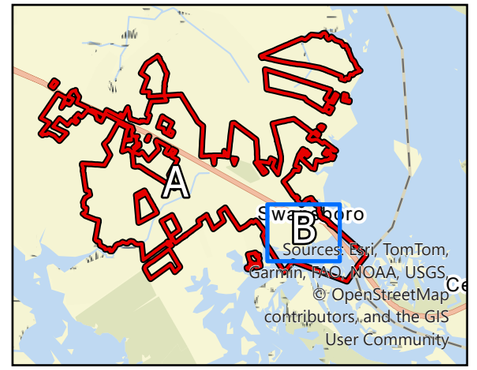
Exhibit A





LEGEND

10-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
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- Outfalls

0 125 250 500

1 Inch = 250 Feet

N

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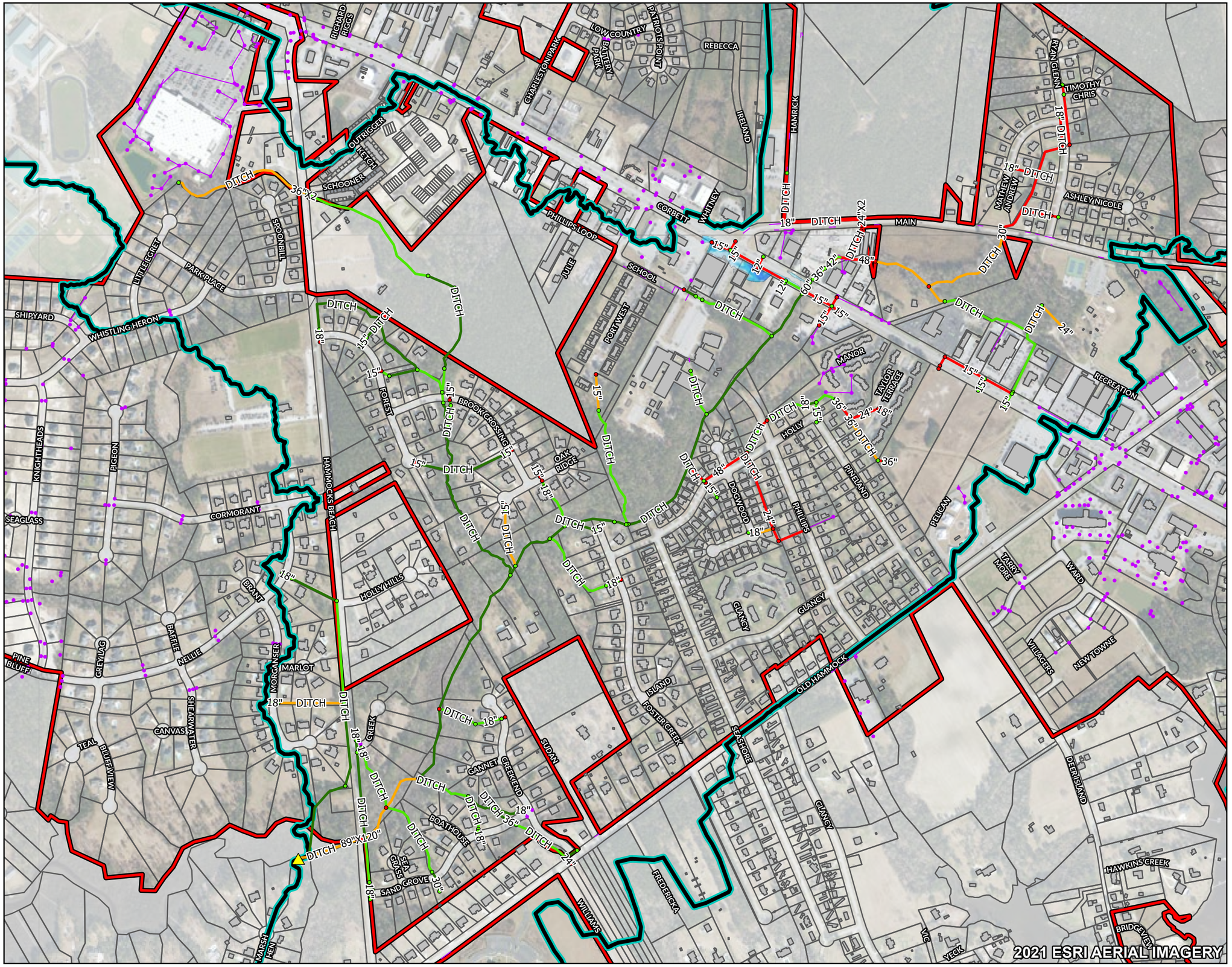
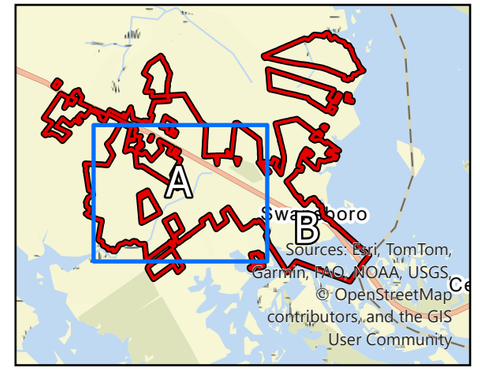
Exhibit B





LEGEND

25-Year Results

Max Depth
- 0" - 2"
- 2" - 6"
- 6" - 12"
- 1' - 2'
- > 2'

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Outfalls

0 300 600 1,200

1 Inch = 600 Feet

N

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25-Year Max Depth Map
Existing Conditions

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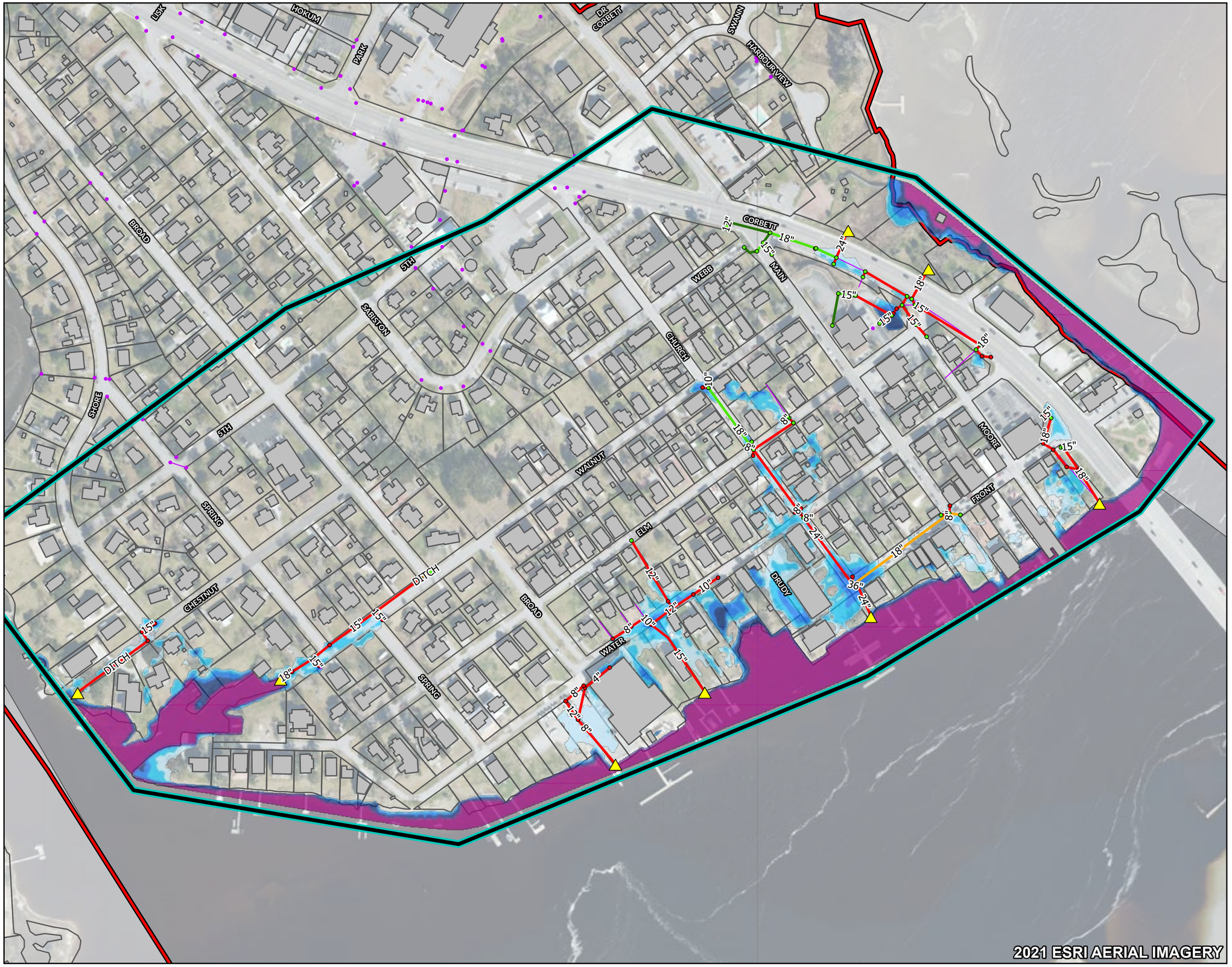

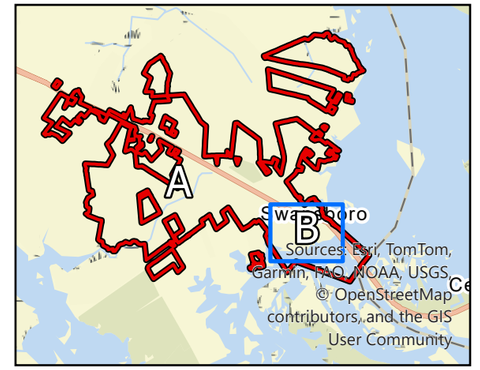

LEGEND

25-Year Results

Max Depth
- 0" - 2"
- 2" - 6"
- 6" - 12"
- 1' - 2'
- > 2'

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Outfalls

0 125 250 500

1 Inch = 250 Feet

N

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25-Year Max Depth Map
Existing Conditions

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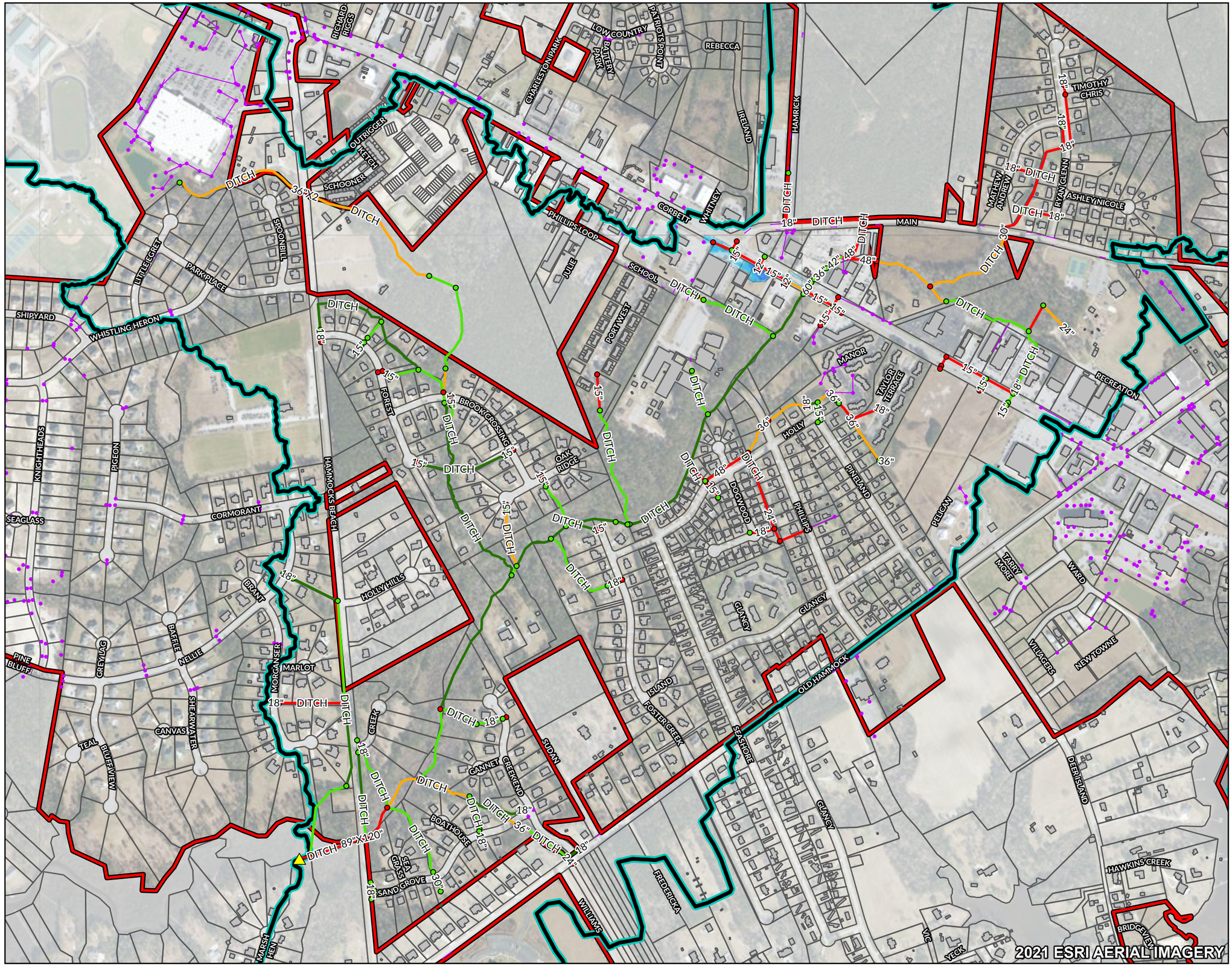

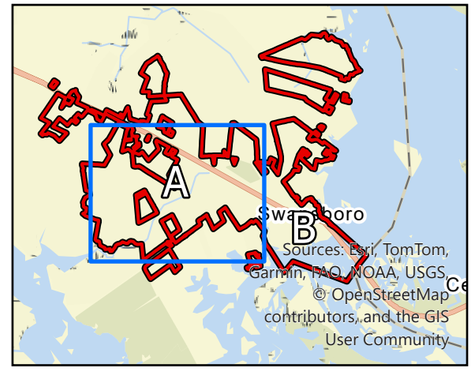

LEGEND

100-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1' - 2'
- > 2'

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Outfalls

*NOTE: 100-YEAR INUNDATION EXTENTS AND RESULTS ARE BASED ON METHODOLOGY ESTABLISHED FOR THIS PROJECT AND DO NOT TAKE THE PLACE OF OR SUPERCEDE ANY FEMA EFFECTIVE FLOODPLAINS OR FIRMS/FIS DATA

0 300 600 1,200 N

1 Inch = 600 Feet

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100-Year Max Depth Map
Existing Conditions

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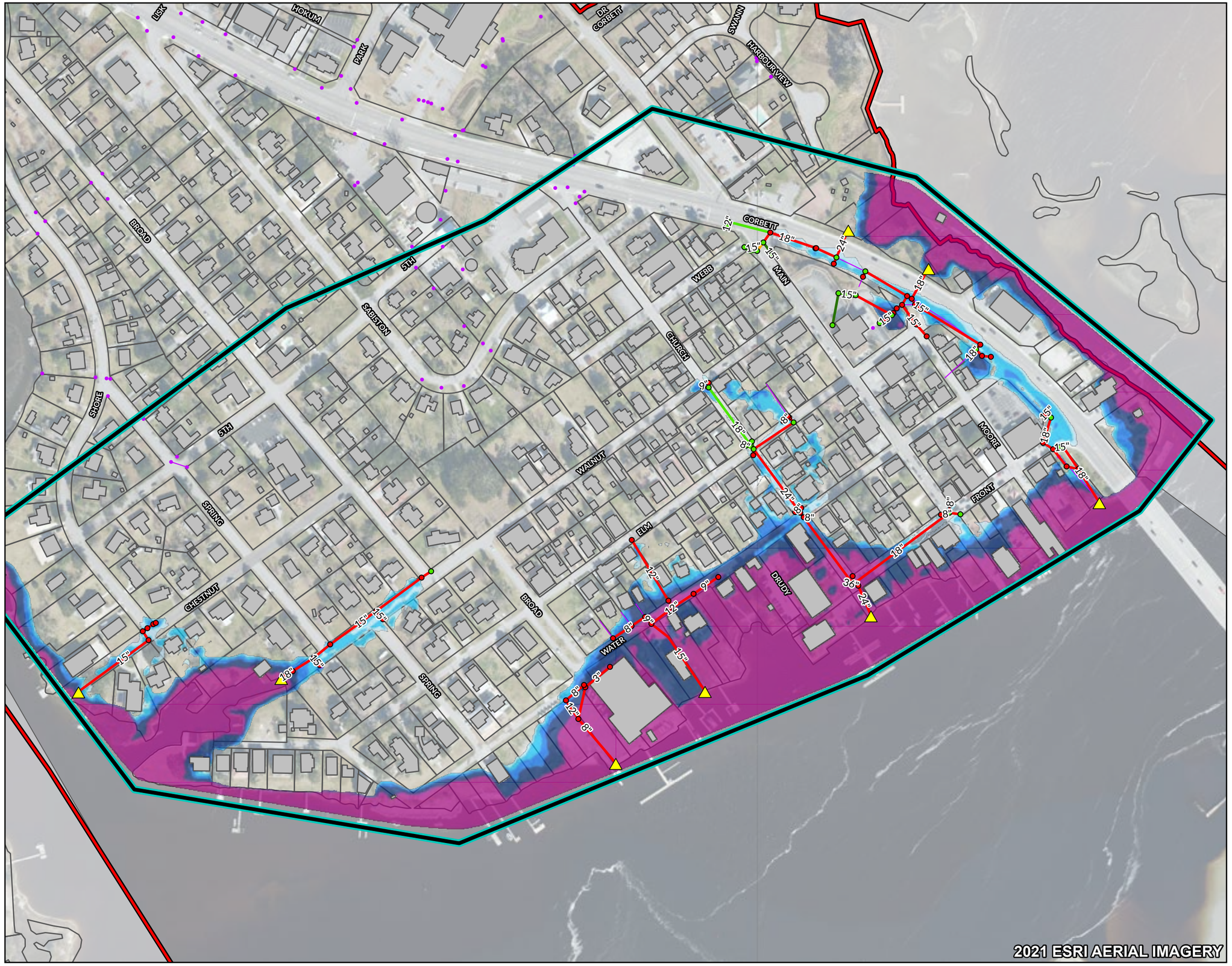
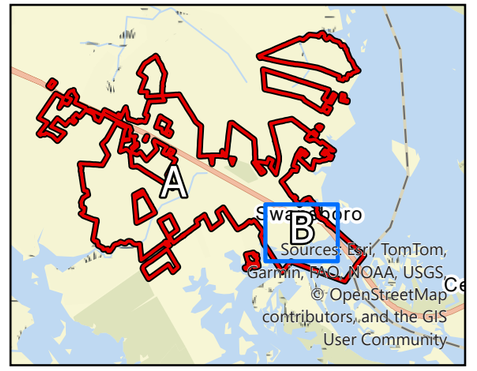
Exhibit A





LEGEND

100-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1' - 2'
- > 2'

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

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0 125 250 500 N

1 Inch = 250 Feet

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Stormwater Master Plan
100-Year Max Depth Map
Existing Conditions

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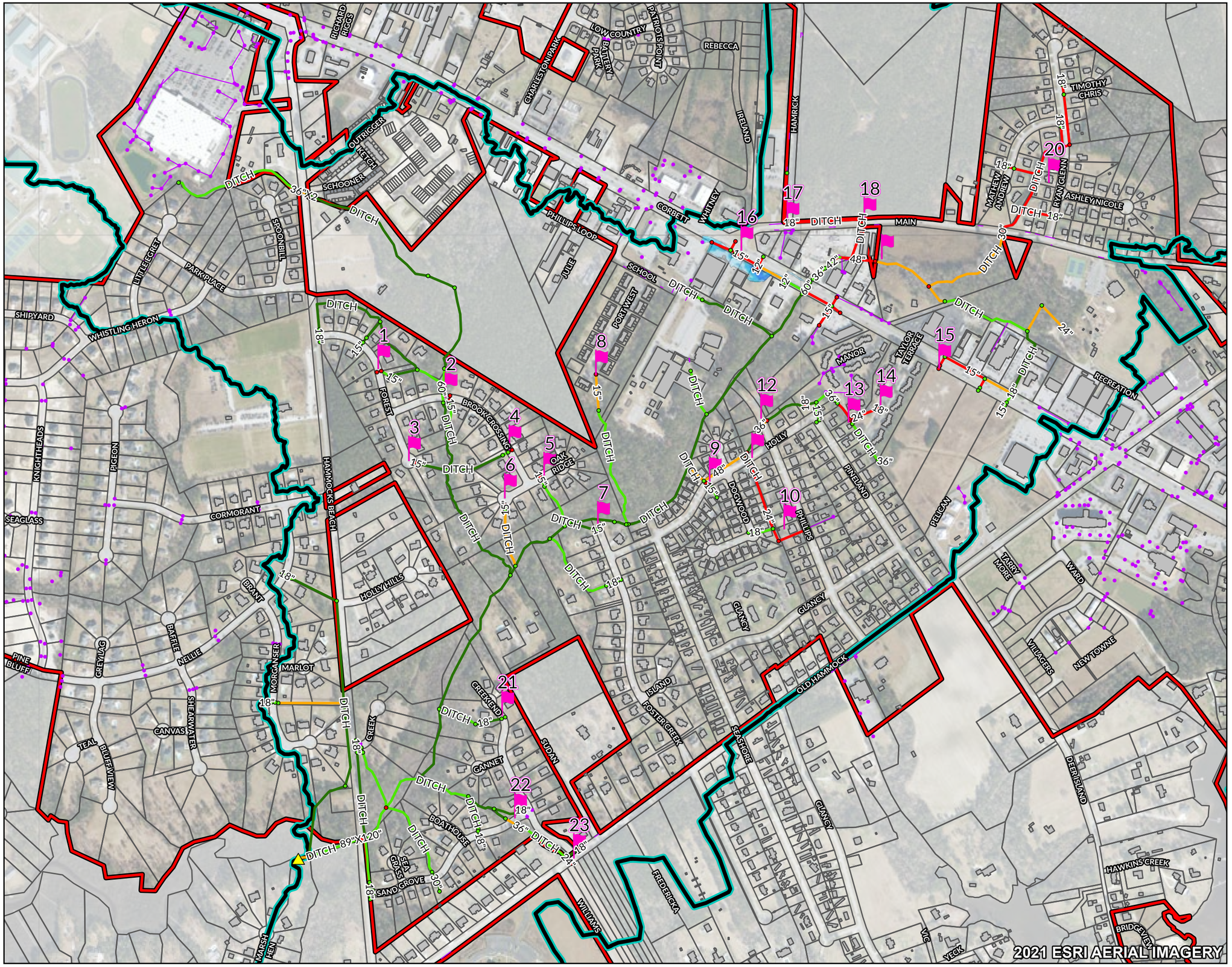
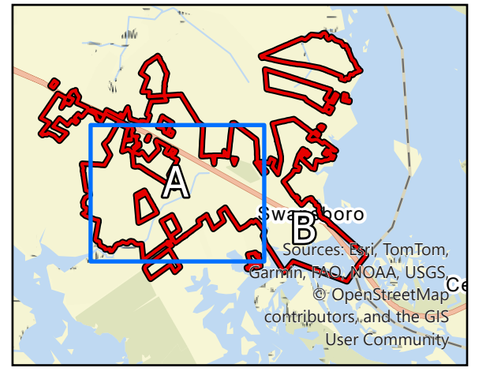
Exhibit B

Appendix 4: Identified Potential Areas of Concern and Proposed Improvements

- Potential Areas of Concern Map
- Concept Design Factsheets
- Water Street Bioretention Plan and Profile Design (as previously designed by WithersRavenel)
- Photo Record





LEGEND

10-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Potential Areas of Concern

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Outfalls

0 300 600 1,200

1 Inch = 600 Feet

N

Swansboro LASII Stormwater Master Plan Potential Areas of Concern Map

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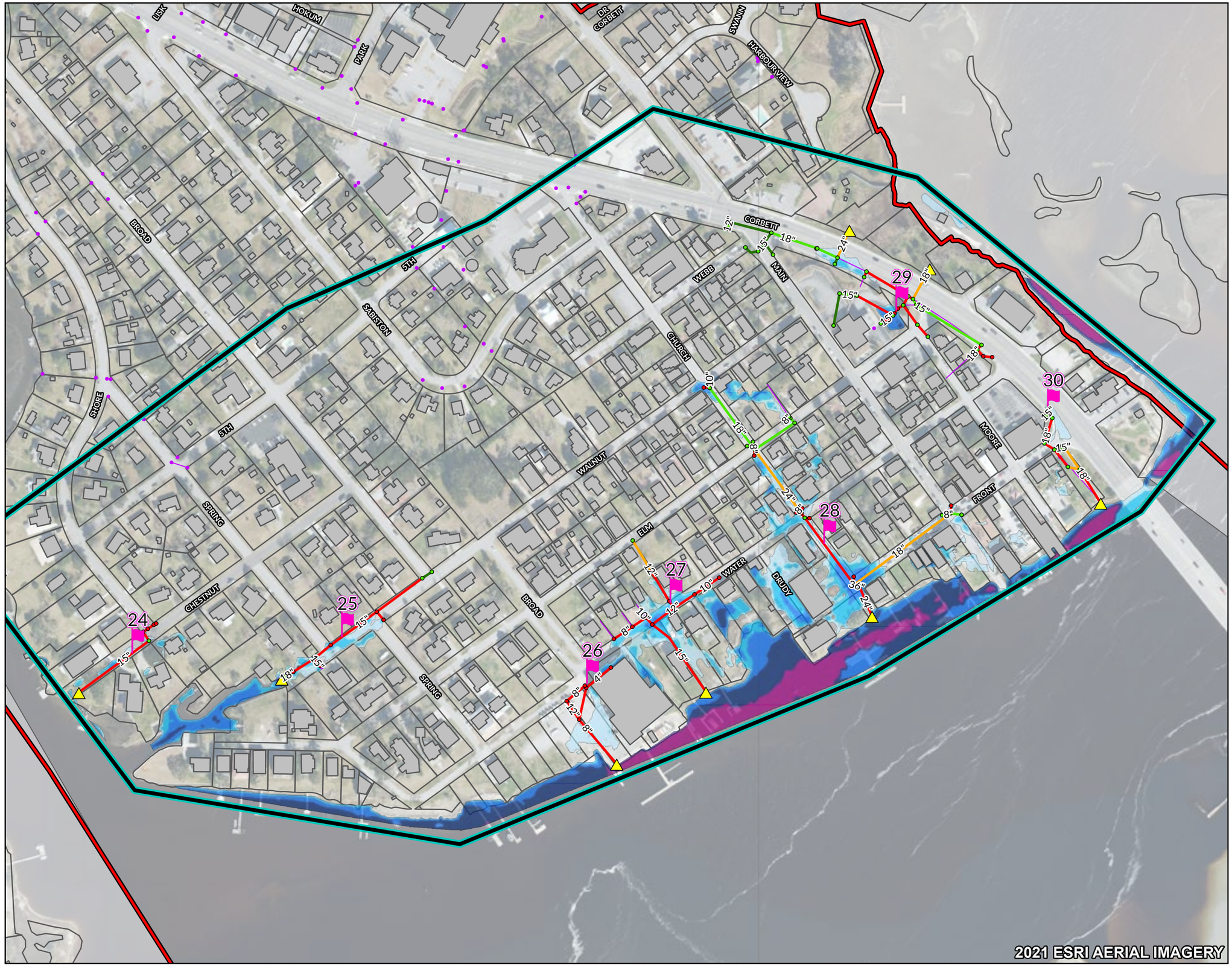

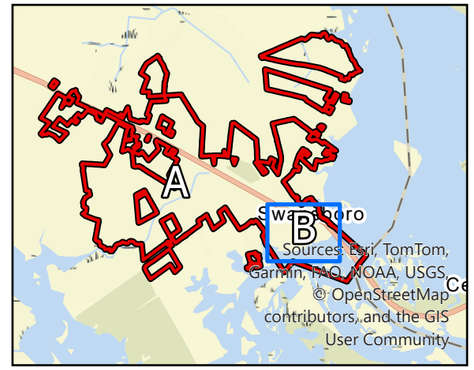

LEGEND

10-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Potential Areas of Concern

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Outfalls

0 125 250 500

1 Inch = 250 Feet

N

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Stormwater Master Plan
Potential Areas of Concern Map

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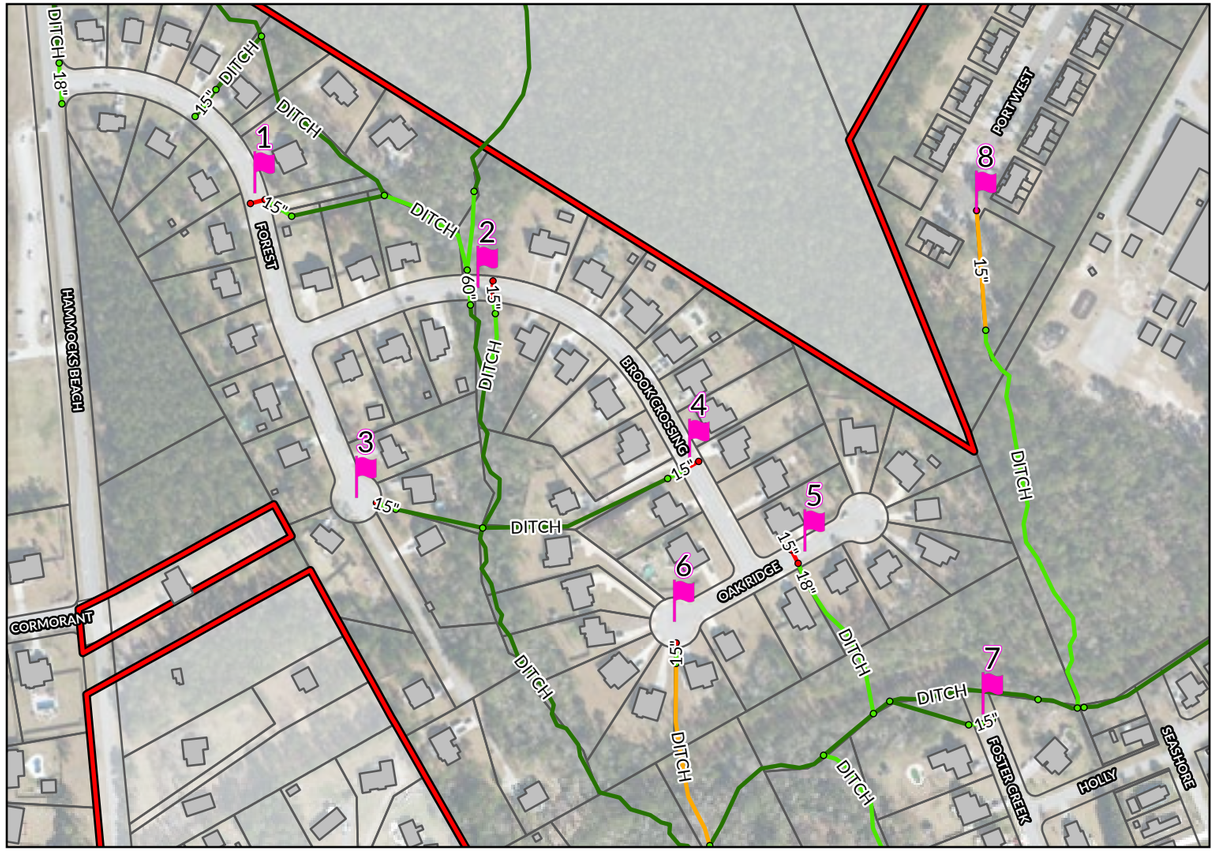
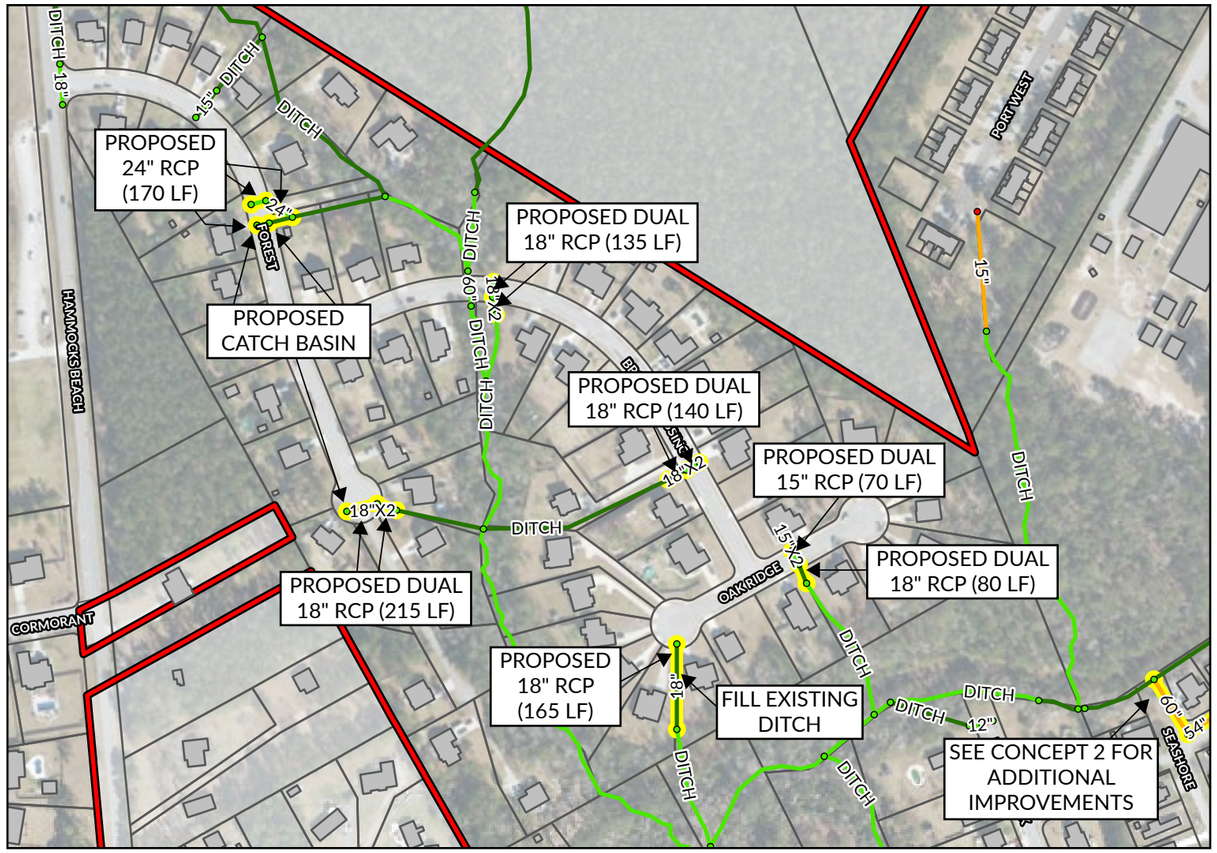
EXISTING CONDITIONS



PROPOSED CONDITIONS



LEGEND

*Modeled Junctions
- Not Flooded
- Flooded
- Outfalls

*10-Year Max Depth Results

*Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%

- Proposed Conduit
- Conduits Not Modeled
- Proposed Structure
- Structures Not Modeled
- Potential Areas of Concern
- Town Boundary
- Parcels
- Buildings
- Outside Town

N

0 300 600 900

1 in = 300 ft

Note: Aerial Imagery obtained from NC OneMap.

PROBLEM

The existing drainage network within the Concept 1 area, featuring 15-in and 18-in pipes, appears to be undersized and lacks the capacity to convey the Design Storm. This results in roadway inundation on Forest Ln, Brook Crossing Rd, and Oak Ridge Ct.

SOLUTION

Proposed improvements for Concept 1 include upsizing the existing 15-in RCPs to 24-in RCPs (95 LF) and installing a 24-in RCP (75 LF) with two catch basins across Forest Ln to discharge to the ditch (AOC 1). Dual-barrel 18-in RCPs will replace the existing 15-in RCPs (275 LF) along Brook Crossing Rd (AOC 2 & 4). A dual-barrel 18-in RCP (215 LF) and one additional catch basin is proposed for the cul-de-sac of Forest Ln (AOC 3). The existing 15-in and 18-in RCP across Oak Ridge Ct (AOC 5) will be replaced with dual-barrel 15-in (60 LF) and 18-in (80 LF) RCP, respectively. Finally, an 18-in RCP (165 LF) is proposed for AOC 6. This pipe will extend through the existing ditch, which will, consequently, be filled. All proposed structures are replaced from existing, unless otherwise noted. It is assumed proposed improvements will be constructed within existing ROW and drainage easements.

BENEFITS

The primary benefit of this project would be to reduce the depth and duration of roadway inundation along Forest Ln, Brook Crossing Rd, and Oak Ridge Ct by increasing the amount of flow the system can carry.

OPINION OF PROBABLE PROJECT COST

Construction:	$435,000
Engineering and Administration:	$257,000
TOTAL (Includes 35% Added Miscellaneous Cost):	$935,000

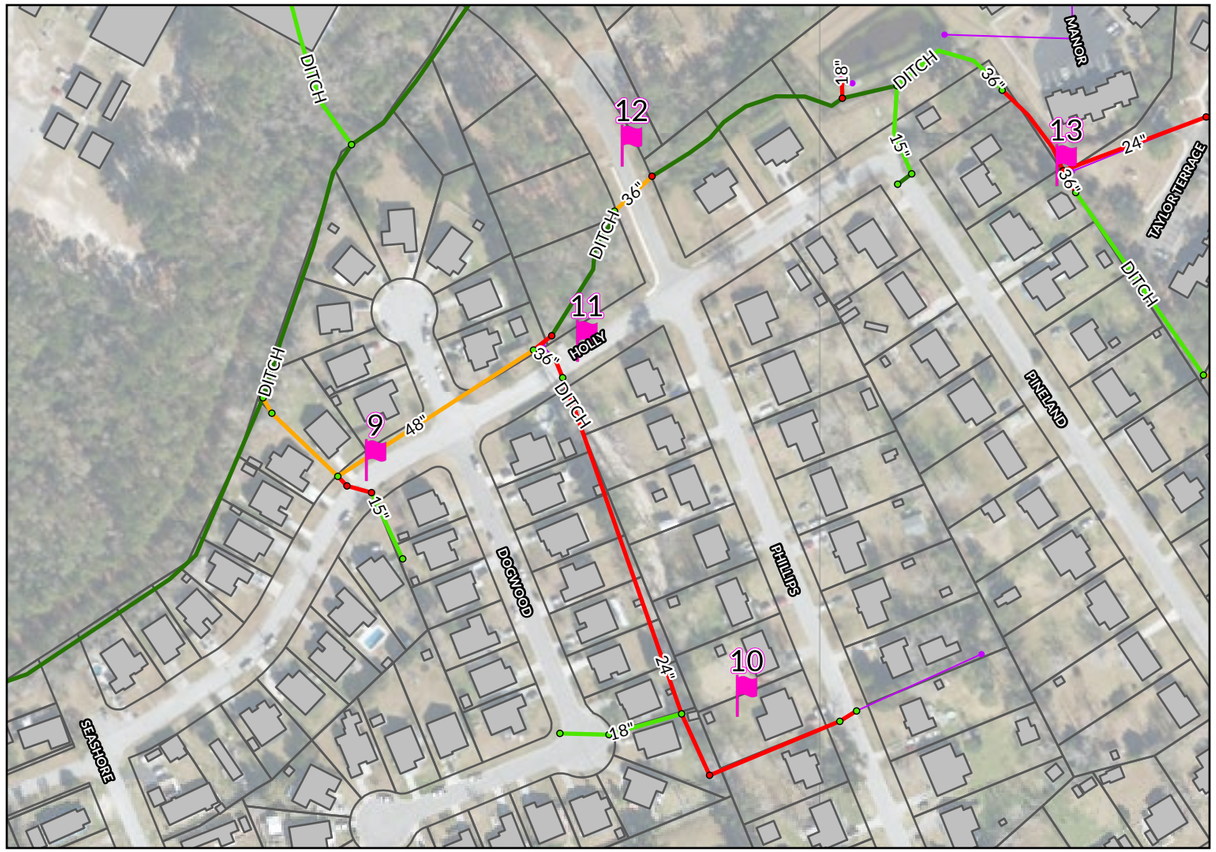
Concept Design 1
Forestbrook Neighborhood (PAOCs 1-6)
Drainage Improvements

Swansboro Stormwater Master Plan

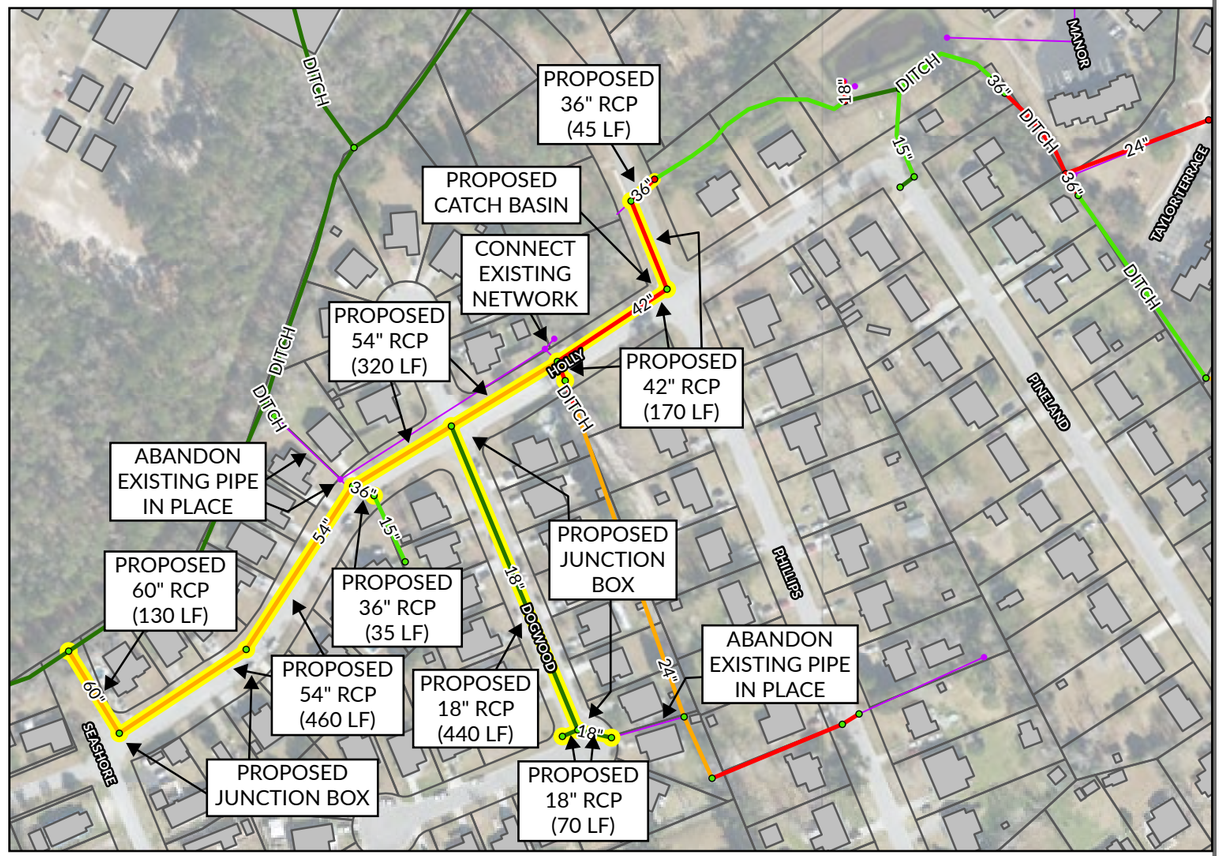
WithersRavenel
Engineers | Planners | Surveyors

2/12/2026

EXISTING CONDITIONS



PROPOSED CONDITIONS



LEGEND

*Modeled Junctions
- Not Flooded
- Flooded
- Outfalls

*10-Year Max Depth Results

*Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%

- Proposed Conduit
- Conduits Not Modeled
- Proposed Structure
- Structures Not Modeled
- Potential Areas of Concern

- Town Boundary
- Parcels
- Buildings
- Outside Town

N

0 200 400 600

1 in = 200 ft

Note: Aerial Imagery obtained from NC OneMap.

PROBLEM

The existing drainage networks between Phillips Dr and Dogwood Ln, and across Holly Ln, appear to be undersized and do not provide the adequate capacity to convey the Design Storm. This results in roadway inundation on Holly Ln.

SOLUTION

Proposed stormwater improvements for Concept 2 include upsizing and extending the existing 48-in trunkline along Holly Ln to a new outfall location on Seashore Dr. This proposed trunkline begins with 140 LF of 42-in RCP on Phillips Dr and Holly Ln, increases to 780 LF of 54-in RCP, then increases to 130 LF of 60-in RCP on Seashore Dr. The existing 15-in RCP across Holly Ln (AOC 9) will be upsized to a 36-in RCP (35 LF). To redirect flow from the existing trunkline between Phillips Dr and Dogwood Ln (AOC 10), 510 LF of 18-in RCP is proposed on Dogwood Ln. Additionally, the existing 36-in pipe across Holly Ln (AOC 11) will be upsized to 30 LF of 42-in RCP. All proposed structures are replaced from existing, unless otherwise noted. It is assumed proposed improvements will be constructed within existing ROW and drainage easements.

BENEFITS

The primary benefit of this project would be to reduce the depth and duration of roadway inundation along Holly Ln by diverting and increasing the amount of flow the system can carry.

OPINION OF PROBABLE PROJECT COST

Construction:	$1,368,000
Engineering and Administration:	$464,000
TOTAL (Includes 35% Added Miscellaneous Cost):	$2,474,000

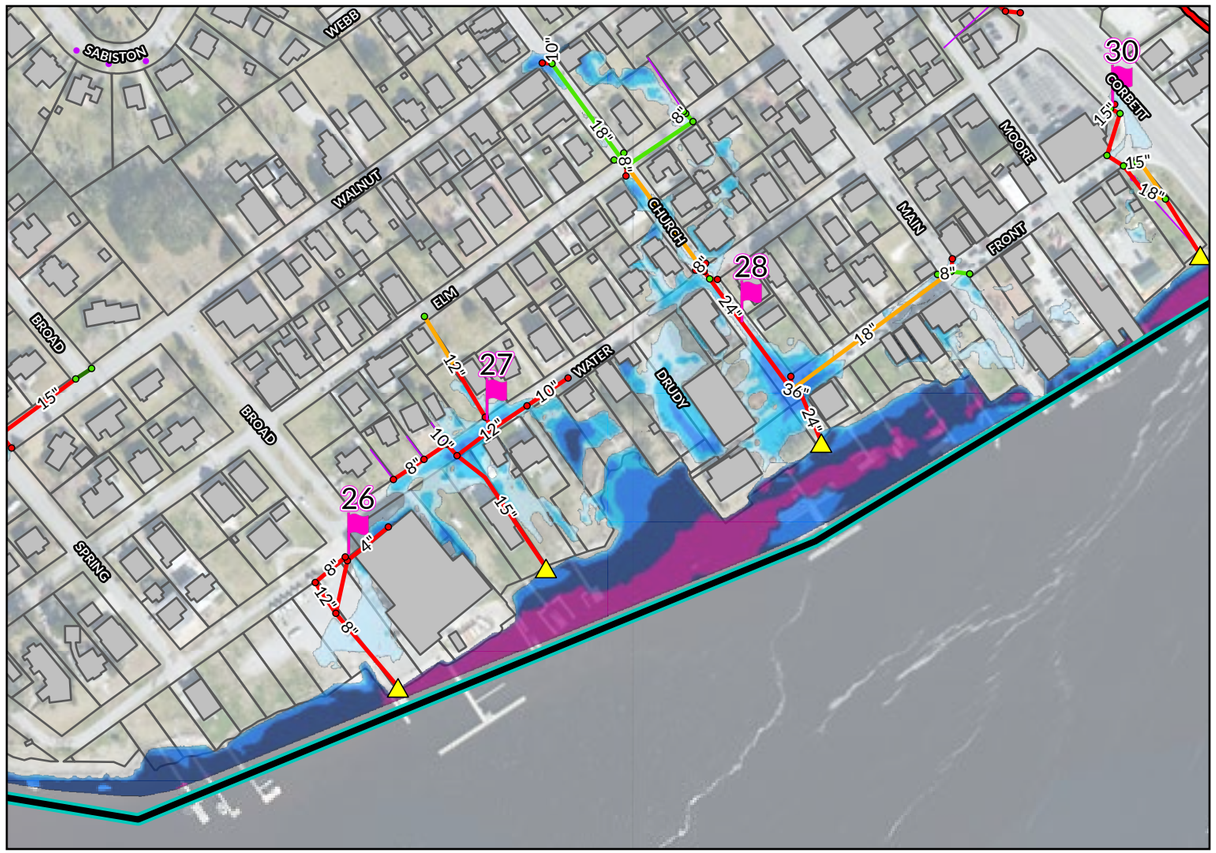
Concept Design 2
Holly Lane (PAOCs 9-11)
Drainage Improvements

Swansboro Stormwater Master Plan

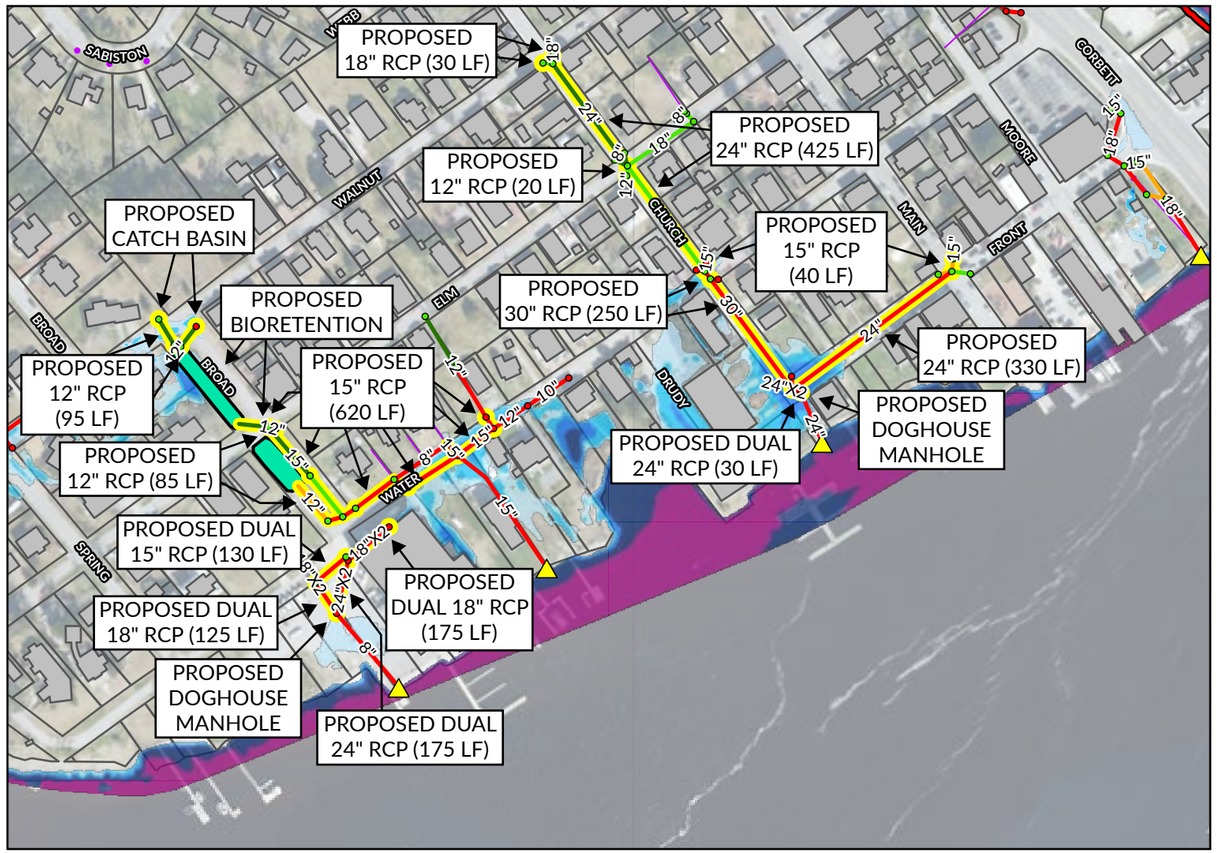
WithersRavenel
Engineers | Planners | Surveyors

2/12/2026

EXISTING CONDITIONS



PROPOSED CONDITIONS



LEGEND

*Modeled Junctions
- Not Flooded
- Flooded
- Outfalls

*10-Year Max Depth Results

*Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%

- Proposed Conduit
- Conduits Not Modeled
- Proposed Structure
- Structures Not Modeled
- Potential Areas of Concern

*Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'

- Town Boundary
- Parcels
- Buildings
- Outside Town
- Proposed Bioretention

N

0 200 400 600

1 in = 200 ft

Note: Aerial Imagery obtained from NC OneMap.

PROBLEM

The existing drainage networks near AOC 26-28 appear to be undersized and do not provide the adequate capacity to convey the Design Storm and tidal surge. This results in roadway and structural inundation along Water St, Front St, and Church St.

SOLUTION

Concept 3 proposed improvements include upsizing existing drainage network in the parking lot of AOC 26 to dual-barrel pipes (130 LF of 15-in RCP, 300 LF of 18-in RCP, and 175 LF of 24-in RCP) before discharging through the existing outfall. Two bioretention cells are proposed along Broad St. Existing network along Water St (AOC 27) will be upsized. The existing Church St trunkline (AOC 28) will be upsized to 425 LF of 24-in RCP, 250 LF of 30-in RCP, and 30 LF of 24-in dual-barrel RCP before discharging through the existing outfall. The existing 18-in pipe along Front St will be upsized to a 24-in RCP (330 LF). Doghouse manholes, proposed for AOC 26 & 28, will flood to relieve surcharging in the system (pumping recommended). Proposed improvements will extend only ~90 ft (minimum) upstream of outfalls due to anticipation of CAMA outfall permitting limitations. All proposed structures are replaced from existing, unless otherwise noted. It is assumed proposed improvements will be constructed within existing ROW and drainage easements.

BENEFITS

The primary benefit of this project would be to reduce the depth and duration of roadway and structural inundation along Water St, Front St, and Church St by increasing the amount of flow the system can carry. Other potential benefits for larger storm events include temporary flood walls and/or emergency pumping plans in combination with described proposed improvements.

OPINION OF PROBABLE PROJECT COST

Construction:	$1,356,000
Engineering and Administration:	$488,000
TOTAL (Includes 35% Added Miscellaneous Cost):	$2,490,000

Concept Design 3
Water St & Church St (PAOCs 26-28)
Drainage Improvements

Swansboro Stormwater Master Plan

WithersRavenel
Engineers | Planners | Surveyors

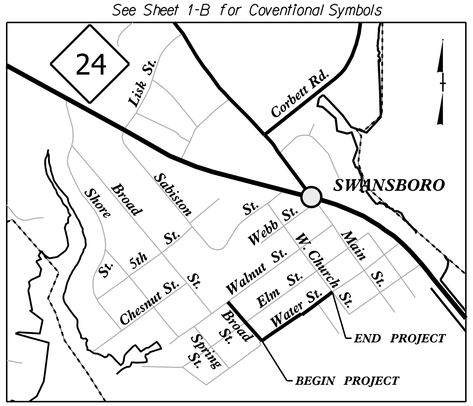
2/12/2026

09/08/99

TIP PROJECT: N/A

CONTRACT: N/A

See Sheet 1-A For Index of Sheets
See Sheet 1-B for Coventional Symbols



VICINITY MAP
(N.T.S.)

TOWN OF SWANSBORO
ONSLOW COUNTY, NORTH CAROLINA

WATER STREET
DRAINAGE IMPROVEMENTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

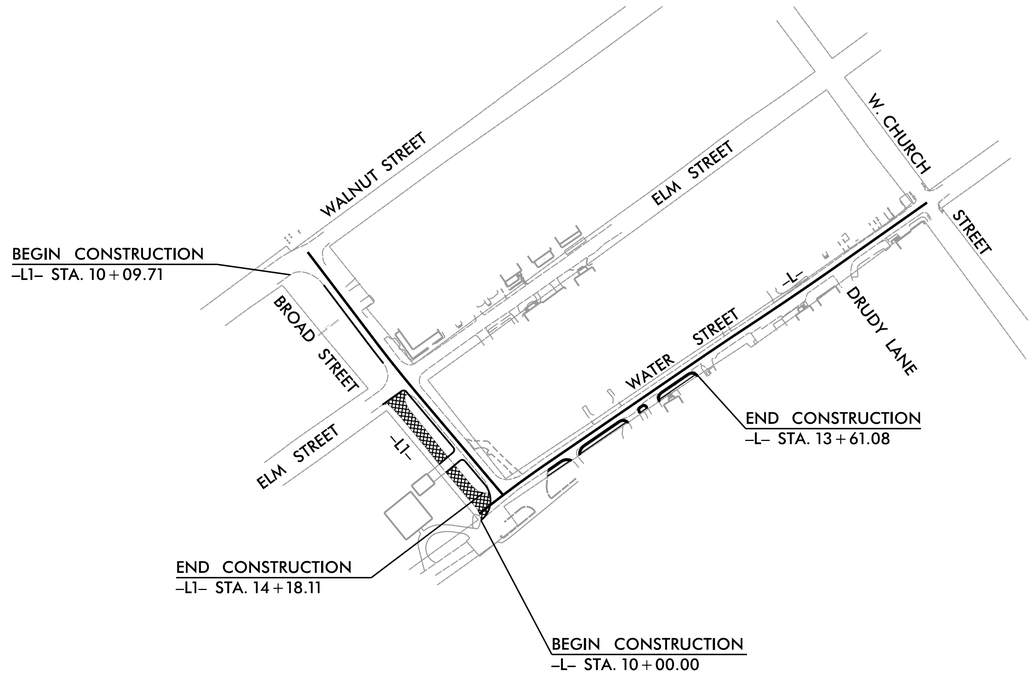
LOCATION: FROM WATER STREET TO W. CHURCH STREET AND BROAD STREET TO WATER STREET

TYPE OF WORK: GRADING, PAVING, DRAINAGE, & EROSION CONTROL

100% PLANS

SUBMITTAL DATE: MAY 31, 2023

NAD 83 NA 2011



THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF SWANSBORO.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

GRAPHIC SCALES

40 20 0 40 80
PLANS

40 20 0 40 80
PROFILE (HORIZONTAL)

4 2 0 4 8
PROFILE (VERTICAL)

DESIGN DATA

V = 40 MPH

PROJECT LENGTH

WATER STREET
= .068 MILES
BROAD STREET
= .078 MILES

TOWN OF SWANSBORO CONTACT:

PAULA WEBB
TOWN MANAGER
PH. 910–326–4428

NCDOT CONTACT:

KATIE HITE, P.E.
DIVISION 3 PROJECT DEVELOPMENT ENGINEER

PREPARED IN THE OFFICE OF:

WithersRavenel
Engineers | Planners | Surveyors
115 MacKenan Drive|Cary, NC 27511|t: 919.469.3340|license #: P-1479|www.withersravenel.com

2018 STANDARD SPECIFICATIONS

LETTING DATE:
?

TED KALLAM, P.E.
PROJECT ENGINEER

DOUGLAS PETRY
PROJECT DESIGNER

PROJECT ENGINEER

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032 TED A. KALLAM
Developed by Ted Kallam EAL 1032
5/[illegible] 102051080401

P.E.

SIGNATURE:

PREPARED FOR:

TOWN OF SWANSBORO
601 W. CORBETT AVENUE
SWANSBORO, NC 28584

2018 NCDOT LIST OF STANDARD DRAWINGS

STD. NO.	STANDARD DRAWING TITLES
200.02	METHOD OF CLEARING – METHOD II
605.01	TEMPORARY SILT FENCE
840.01	BRICK CATCH BASIN – 12" THRU 54" PIPE
840.02	CONCRETE CATCH BASIN – 12" THRU 54' PIPE
840.03	FRAME, GRATES AND HOOD –FOR USE ON STANDARD CATCH BASIN
840.14	CONCRETE DROP INLET – 12" THRU 30" PIPE
840.15	BRICK DROP INLET – 12" THRU 30" PIPE
840.52	PRECAST MANHOLE
840.54	MANHOLE FRAME AND COVER
846.01	CONCRETE CURB, GUTTER AND CURB AND GUTTER
848.01	CONCRETE SIDEWALK

INDEX OF SHEETS

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TOWN OF SWANSBORO
601 W. CORBETT AVENUE
SWANSBORO, NC 28584

CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 TED A. KALLAM

Docusigned by: Ted Kallam
5/31/2023

INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

INDEX OF SHEETS & LIST OF STANDARD DRAWINGS

1-A

K:\22\22-0730\220730-Swansboro Water St Drainage Improvements\CAD\SDK\Border.dgn - DPETRY

STATE OF NORTH CAROLINA, DIVISION OF HIGHWAYS

CONVENTIONAL PLAN SHEET SYMBOLS

Note: Not to Scale

***S.U.E. = Subsurface Utility Engineering*

BOUNDARIES AND PROPERTY:

- State Line
- County Line
- Township Line
- City Line
- Reservation Line
- Property Line
- Existing Iron Pin — EIP
- Computed Property Corner
- Property Monument — ECM
- Parcel/Sequence Number — 123
- Existing Fence Line
- Proposed Woven Wire Fence
- Proposed Chain Link Fence
- Proposed Barbed Wire Fence
- Existing Wetland Boundary — WLB
- Proposed Wetland Boundary — WLB
- Existing Endangered Animal Boundary — EAB
- Existing Endangered Plant Boundary — EPB
- Existing Historic Property Boundary — HPB
- Known Contamination Area: Soil — S
- Potential Contamination Area: Soil — S
- Known Contamination Area: Water — W
- Potential Contamination Area: Water — W
- Contaminated Site: Known or Potential

BUILDINGS AND OTHER CULTURE:

- Gas Pump Vent or U/G Tank Cap
- Sign — S
- Well — W
- Small Mine
- Foundation
- Area Outline
- Cemetery
- Building
- School
- Church
- Dam

HYDROLOGY:

- Stream or Body of Water
- Hydro, Pool or Reservoir
- Jurisdictional Stream — JS
- Buffer Zone 1 — BZ 1
- Buffer Zone 2 — BZ 2
- Flow Arrow
- Disappearing Stream
- Spring
- Wetland
- Proposed Lateral, Tail, Head Ditch — FLOW
- False Sump

RAILROADS:

- Standard Gauge — CSX TRANSPORTATION
- RR Signal Milepost — MILEPOST 35
- Switch — SWITCH
- RR Abandoned
- RR Dismantled

RIGHT OF WAY & PROJECT CONTROL:

- Secondary Horiz and Vert Control Point
- Primary Horiz Control Point
- Primary Horiz and Vert Control Point
- Exist Permanent Easment Pin and Cap
- New Permanent Easement Pin and Cap
- Vertical Benchmark
- Existing Right of Way Marker
- Existing Right of Way Line
- New Right of Way Line — RW
- New Right of Way Line with Pin and Cap — RW
- New Right of Way Line with Concrete or Granite R/W Marker — RW
- New Control of Access Line with Concrete C/A Marker — CA
- Existing Control of Access — CA
- New Control of Access — CA
- Existing Easement Line — E
- New Temporary Construction Easement — E
- New Temporary Drainage Easement — TDE
- New Permanent Drainage Easement — PDE
- New Permanent Drainage / Utility Easement — DUE
- New Permanent Utility Easement — PUE
- New Temporary Utility Easement — TUE
- New Aerial Utility Easement — AUE

ROADS AND RELATED FEATURES:

- Existing Edge of Pavement
- Existing Curb
- Proposed Slope Stakes Cut — C
- Proposed Slope Stakes Fill — F
- Proposed Curb Ramp — CR
- Existing Metal Guardrail
- Proposed Guardrail
- Existing Cable Guiderail
- Proposed Cable Guiderail
- Equality Symbol
- Pavement Removal

VEGETATION:

- Single Tree
- Single Shrub

- Hedge
- Woods Line
- Orchard
- Vineyard — Vineyard

EXISTING STRUCTURES:

MAJOR:

- Bridge, Tunnel or Box Culvert — CONC
- Bridge Wing Wall, Head Wall and End Wall — CONC WW

MINOR:

- Head and End Wall — CONC HW
- Pipe Culvert
- Footbridge
- Drainage Box: Catch Basin, DI or JB — CB
- Paved Ditch Gutter
- Storm Sewer Manhole — S
- Storm Sewer — S

UTILITIES:

POWER:

- Existing Power Pole
- Proposed Power Pole
- Existing Joint Use Pole
- Proposed Joint Use Pole
- Power Manhole — P
- Power Line Tower
- Power Transformer
- U/G Power Cable Hand Hole
- H–Frame Pole
- U/G Power Line LOS B (S.U.E.*) — P
- U/G Power Line LOS C (S.U.E.*) — P
- U/G Power Line LOS D (S.U.E.*) — P

TELEPHONE:

- Existing Telephone Pole
- Proposed Telephone Pole
- Telephone Manhole — T
- Telephone Pedestal — T
- Telephone Cell Tower
- U/G Telephone Cable Hand Hole — TH
- U/G Telephone Cable LOS B (S.U.E.*) — T
- U/G Telephone Cable LOS C (S.U.E.*) — T
- U/G Telephone Cable LOS D (S.U.E.*) — T
- U/G Telephone Conduit LOS B (S.U.E.*) — TC
- U/G Telephone Conduit LOS C (S.U.E.*) — TC
- U/G Telephone Conduit LOS D (S.U.E.*) — TC
- U/G Fiber Optics Cable LOS B (S.U.E.*) — T FO
- U/G Fiber Optics Cable LOS C (S.U.E.*) — T FO
- U/G Fiber Optics Cable LOS D (S.U.E.*) — T FO

WATER:

- Water Manhole — W
- Water Meter
- Water Valve
- Water Hydrant
- U/G Water Line LOS B (S.U.E*) — W
- U/G Water Line LOS C (S.U.E*) — W
- U/G Water Line LOS D (S.U.E*) — W
- Above Ground Water Line — A/G Water

TV:

- TV Pedestal — C
- TV Tower
- U/G TV Cable Hand Hole — TH
- U/G TV Cable LOS B (S.U.E.*) — TV
- U/G TV Cable LOS C (S.U.E.*) — TV
- U/G TV Cable LOS D (S.U.E.*) — TV
- U/G Fiber Optic Cable LOS B (S.U.E.*) — TV FO
- U/G Fiber Optic Cable LOS C (S.U.E.*) — TV FO
- U/G Fiber Optic Cable LOS D (S.U.E.*) — TV FO

GAS:

- Gas Valve
- Gas Meter
- U/G Gas Line LOS B (S.U.E.*) — G
- U/G Gas Line LOS C (S.U.E.*) — G
- U/G Gas Line LOS D (S.U.E.*) — G
- Above Ground Gas Line — A/G Gas

SANITARY SEWER:

- Sanitary Sewer Manhole
- Sanitary Sewer Cleanout
- U/G Sanitary Sewer Line — SS
- Above Ground Sanitary Sewer — A/G Sanitary Sewer
- SS Forced Main Line LOS B (S.U.E.*) — FSS
- SS Forced Main Line LOS C (S.U.E.*) — FSS
- SS Forced Main Line LOS D (S.U.E.*) — FSS

MISCELLANEOUS:

- Utility Pole
- Utility Pole with Base
- Utility Located Object
- Utility Traffic Signal Box — S
- Utility Unknown U/G Line LOS B (S.U.E.*) — ?UTL
- U/G Tank; Water, Gas, Oil
- Underground Storage Tank, Approx. Loc. — UST
- A/G Tank; Water, Gas, Oil
- Geoenvironmental Boring
- U/G Test Hole LOS A (S.U.E.*)
- Abandoned According to Utility Records — AATUR
- End of Information — E.O.I.

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TOWN OF SWANSBORO
601 W. CORBETT AVENUE
SWANSBORO, NC 28584

CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 30321 TED A. KALLAM
DocuSigned by: Ted Kallam 5/31/2023
6FC2CEC1B054AF1...

INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

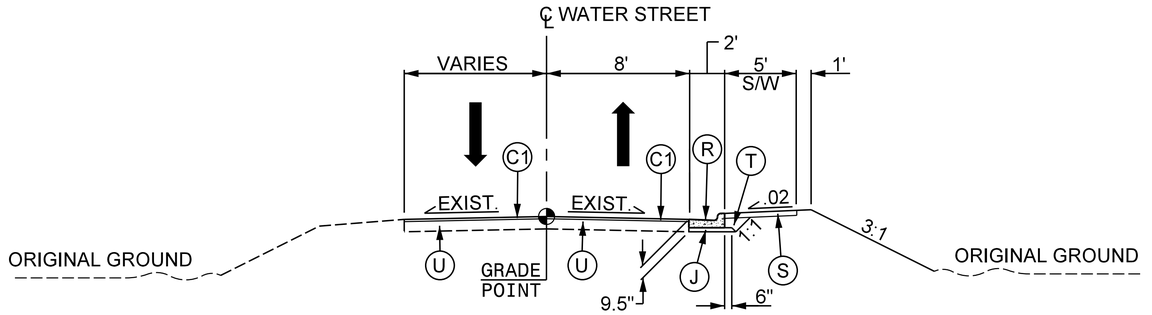
CONVENTIONAL SYMBOLS

1-B

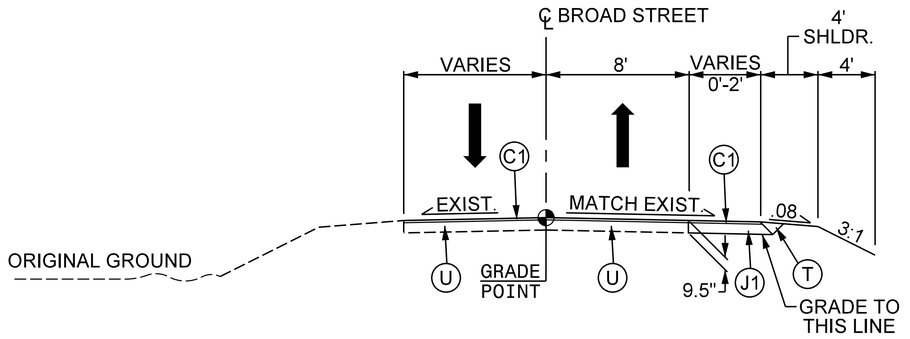
PAVEMENT SCHEDULE

C1	PROP. APPROX. 1.5″ ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5C, AT AN AVERAGE RATE OF 165 LBS. PER SQ. YD.
J	3″ AGGREGATE BASE COURSE
J1	8″ AGGREGATE BASE COURSE
R	2′-0″ CONCRETE CURB & GUTTER
S	5′ CONCRETE SIDEWALK
T	EARTH MATERIAL
U	EXISTING PAVEMENT

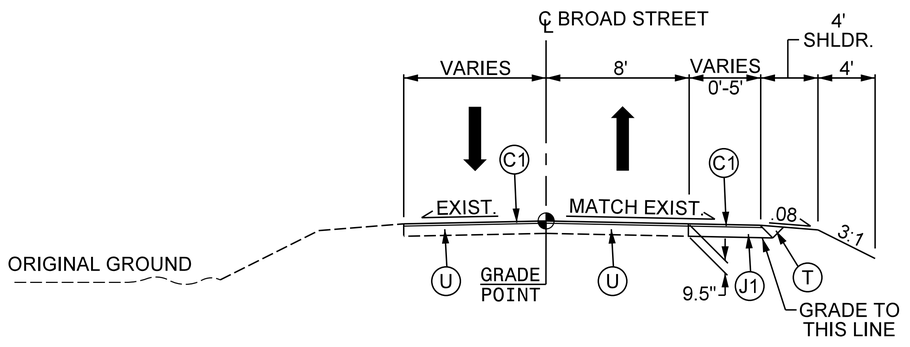
NOTE: 1. PAVEMENT EDGE SLOPES ARE 1:1 UNLESS OTHERWISE SPECIFIED.



TYPICAL SECTION NO. 1
-L- STA.10+00.00 TO -L- STA.13+61.08



TYPICAL SECTION NO. 2
-L1- STA.10+09.71 TO -L1- STA.11+86.27



TYPICAL SECTION NO. 3
-L1- STA.12+41.90 TO -L1- STA.14+18.11

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TOWN OF SWANSBORO
401 W. CORBETT AVENUE
SWANSBORO, NC 28584

CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

TYPICAL SECTIONS

2

COMPUTED BY: DAP DATE: 5/25/2023

CHECKED BY: DATE:

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

PROJECT NO.	SHEET NO.
SWANSBORO	2D-1

Note: Invert Elevations indicated are for Bid Purposes only and shall not be used for project construction stakeout.

LIST OF PIPES, ENDWALLS, ETC. (FOR PIPES 48 INCHES & UNDER)

STATION	LOCATION (LT, RT, OR CL)	STRUCTURE NO. FROM	STRUCTURE NO. TO	TOP ELEVATION	INVERT ELEVATION	INVERT ELEVATION	R.C. PIPE CLASS III 15"	R.C. PIPE CLASS V 12"	R.C. PIPE CLASS V 15"	QUANTITIES FOR DRAINAGE STRUCTURES PER EACH (0' THRU 5.0')	C.B. STD. 840.01 OR STD. 840.02	FRAME, GRATES, AND HOOD STANDARD 840.03 TYPE OF GRATE F	D.I. STD. 840.14 OR STD. 840.15	D.I. FRAME WITH TWO GRATES STD. 840.16	STD. 840.54 MANHOLE FRAME & COVER	PARALLEL PIPE END SECTION STD. 310.02	STD. 840.52 PRECAST MANHOLE	PIPE REMOVAL LIN. FT.	REMARKS
-L- 10+17.61	LT.	DI-104-1		5.50						1			1	1					
	LT.	DI-104-1	MH-105A		2.75	2.65			24										
-L- 10+40.66	LT.	MH-105A		6.20						1					1		1		
	LT.	MH-105A	S-104		2.65	2.55			24										
-L- 10+65.75	LT.	DI-104		5.42						1			1	1					
	LT.	DI-104	DI-103		2.55	2.10			75									39	REMOVE 4" CPP
-L- 11+44.87	LT.	DI-103		4.57						1			1	1					
	LT.	DI-103	DI-102		2.10	1.64			22										
-L- 11+56.71	RT.	DI-102		4.08						1			1	1					
	LT.	DI-102	DI-101		1.64	0.90			92									24	REMOVE 8" RCP AND DI
-L- 12+50.05	RT.	DI-101		2.81						1			1	1					
																1		234	REMOVE15" RCP AND DI
-L- 12+47.72	LT.	DI-101-1		3.59						1			1	1					
-L- 12+47.72	LT.	DI-101-1	DI-101		1.30	1.00			22										
	RT.	DI-101	CB-101-1		0.75	0.40			69									71	REMOVE 12" RCP
-L- 13+28.38	RT.	CB-101-1		3.73						1	1	1							
-L- 13+28.38	RT.	CB-101-1	DI-101-2		1.10	0.75			17									20	REMOVE 12" RCP AND REMOVE DI
-L- 13+28.38	LT.	DI-101-2		3.50						1			1	1					
-L1- 10+00	RT.	YI-1		23.18						1			1	1					
	RT	YI-1	FES-1		20.5	18.50		56								1			
-L1- 10+26.34	LT.	YI-2		24.21						1			1	1					
	LT.	YI-2	FES-2		21.00	18.50		50								1			
-L1- 11+95.85	RT.	RISER-1		20.00						1			1	1					
	RT.	RISER-1	MH-105-C		13.50	13.00	48												
-L1- 12+42.97	LT.	DI-105C-1		20.00						1			1	1					
	LT.	DI-105C-1	MH-105C		16.90	16.00													14 LF 12" RCP CL. IV
-L1- 12+29.98	CL	MH-105C		20.84						1					1		1		
	CL	MH-105C	MH-105B		11.50	7.50	106												
-L1- 13+36.16	CL	MH-105B		12.07						1					1		1		
	CL	MH-105B	MH-105A		7.50	3.50	86												
-L1- 13+36.61	RT.	RISER-2		10.75						1			1	1					
	RT.	RISER-2	DI-104-1		5.00	2.75													75 LF 12" RCP CL. IV
TOTAL SHEET 2D-1							240	106	345	16	1	1	12	12	3	3	3	388	

Other column headings on the sheet, with no entries: SIZE; THICKNESS OR GAUGE; SLOPE CRITICAL; SIDE DRAIN PIPE (RCP, CSP, CAAP, HDPE, or PVC) 12" 15" 18" 24" 30" 36" 42" 48", DO NOT USE RCP, DO NOT USE CSP, DO NOT USE CAAP, DO NOT USE HDPE; C.S. PIPE 12" 15" 18" 24" 30" 36" 42" 48" (.064 .064 .064 .064 .079 .079 .109 .109); R.C. PIPE CLASS III 12" 18" 24" 30" 36" 42" 48"; R.C. PIPE CLASS V 18" 24" 30" 36" 42" 48"; ** " R.C. PIPE (CLASS V); **** RC PIPE CULVERTS, CONTRACTOR DESIGN; **** RC PIPE CULVERTS, CONTRACTOR DESIGN; 15" SIDE DRAIN PIPE; 18" SIDE DRAIN PIPE; ENDWALLS STD. 838.01 838.11 OR STD. 838.80 (UNLESS NOTED OTHERWISE) CU. YARDS R.C.P., C.S.P.; *TOTAL L.F. FOR PAY QUANTITY SHALL BE COL. 'A' + (1.3 X COL.'B') LIN. FT. A 5.0' THRU 10.0', B 10.0' AND ABOVE; TYPE OF GRATE E, G; CONCRETE TRANSITIONAL SECTION DROP INLET, CATCH BASIN; G.D.I. TYPE "A" STD. 840.17 OR 840.26; G.D.I. TYPE "B" STD. 840.18 OR 840.27; G.D.I. TYPE "D" STD. 840.19 OR 840.28; G.D.I. FRAME WITH GRATE STD. 840.20; G.D.I. FRAME WITH TWO GRATES STD. 840.22; G.D.I. (N.S.) FRAME WITH GRATE STD. 840.24; G.D.I. (N.S.) FRAME WITH TWO GRATES STD. 840.24; MODIFIED CONCRETE FLUME; CONVERT EX. DI TO JB; SIDE DRAIN PIPE ELBOWS NO. & SIZE; CONC. & BRICK PIPE PLUG, C.Y. STD. 840.71; CONC. COLLARS CL. "B" C.Y. STD. 840.72.

ABBREVIATIONS

C.B.	CATCH BASIN
N.D.I.	NARROW DROP INLET
D.I.	DROP INLET
G.D.I.	GRATED DROP INLET
G.D.I.(N.S.)	(NARROW SLOT)
J.B.	JUNCTION BOX
M.H.	MANHOLE
T.B.D.I.	TRAFFIC BEARING DROP INLET
T.B.J.B.	TRAFFIC BEARING JUNCTION BOX

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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

DocuSigned by: Ted Kallam 5/31/2023

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 TED A. KALLAM

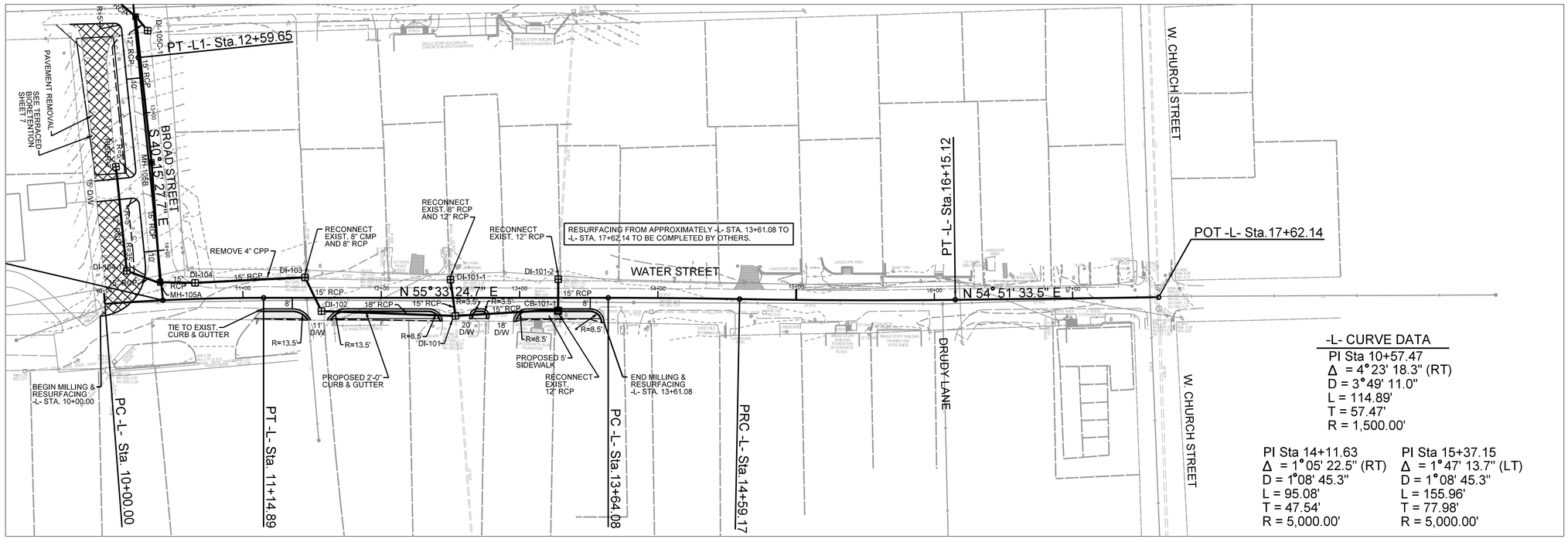
INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023

DRN: WR DGN: WR CKD: WR

DRAINAGE SUMMARY

2D-1

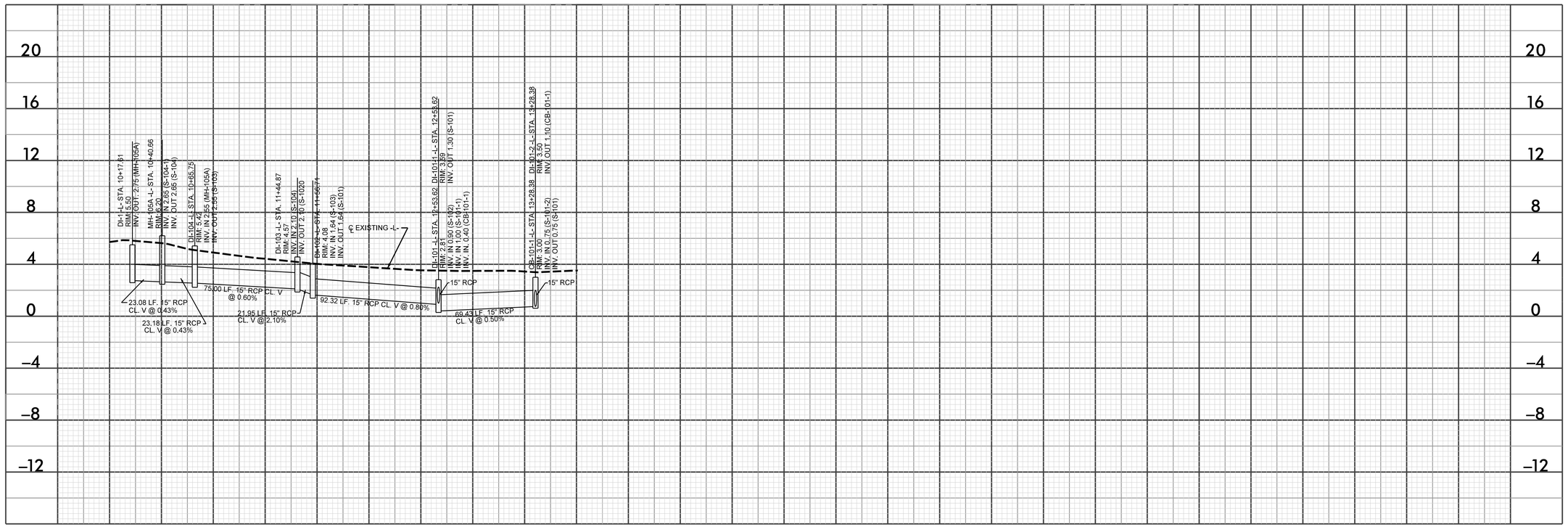


-L- CURVE DATA

PI Sta 10+57.47
Δ = 4°23' 18.3" (RT)
D = 3°49' 11.0"
L = 114.89'
T = 57.47'
R = 1,500.00'

PI Sta 14+11.63
Δ = 1°05' 22.5" (RT)
D = 1°08' 45.3"
L = 95.08'
T = 47.54'
R = 5,000.00'

PI Sta 15+37.15
Δ = 1°47' 13.7" (LT)
D = 1°08' 45.3"
L = 155.96'
T = 77.98'
R = 5,000.00'



Scale: 1" = 40' (HORIZONTAL)
40 20 0 40

Scale: 1" = 4' (VERTICAL)
4 2 0 4

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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 EDWARD A. KALLAM

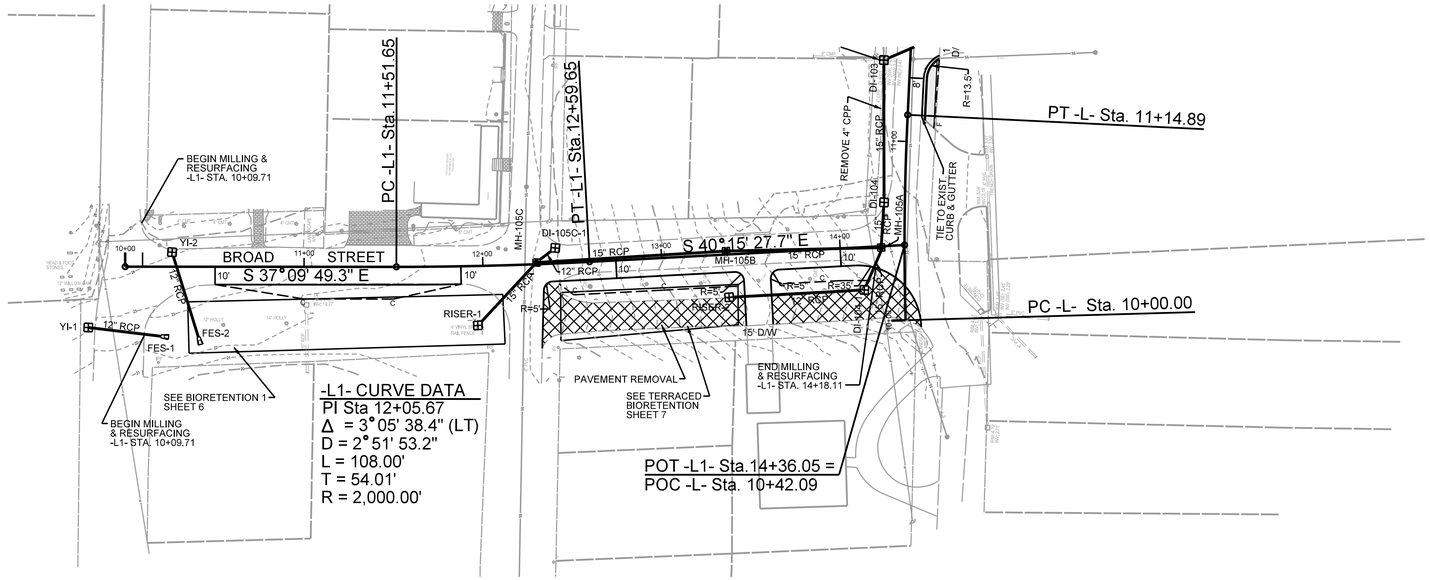
DocuSigned by: Ted Kallam 9CC0FC1C8B044F1...
5/31/2023

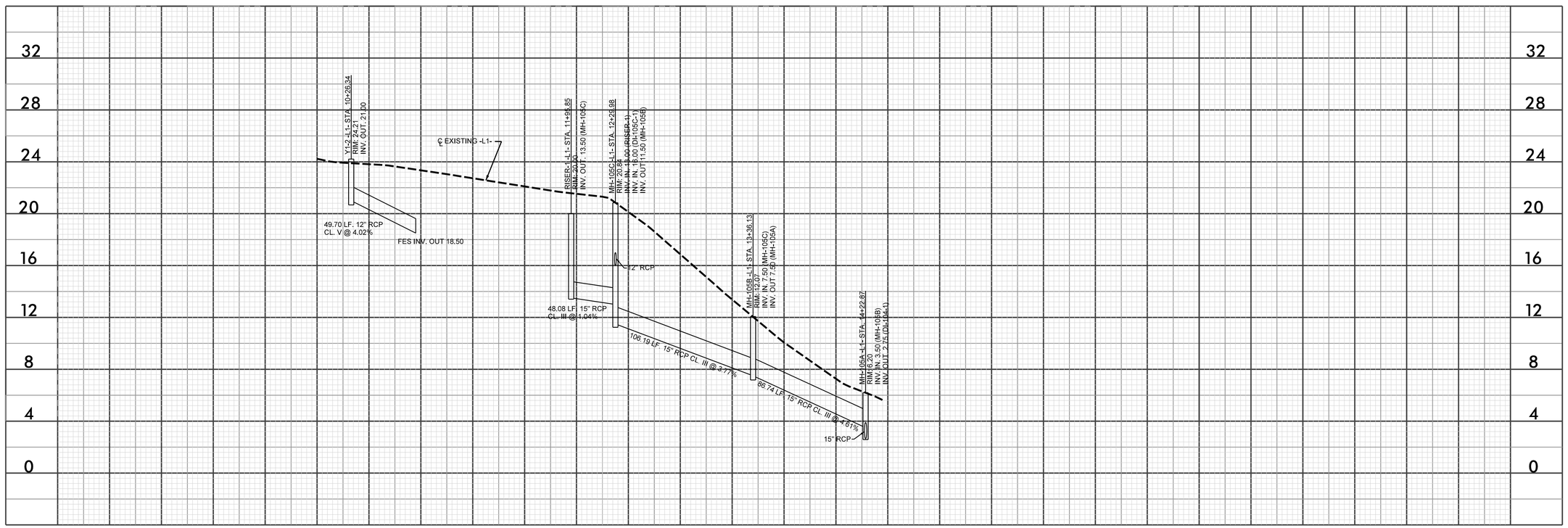
INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

WATER STREET PLAN PROFILE

4





Scale: 1" = 40' (HORIZONTAL)

Scale: 1" = 4' (VERTICAL)

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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 TED A. KALLAM

Digitally Signed By: Ted Kallam
5/31/2023

INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

BROAD STREET PLAN PROFILE

5

GENERAL NOTES

CHANGES MAY BE REQUIRED WHEN PHYSICAL DIMENSIONS IN THE DETAIL DRAWINGS, STANDARD DETAILS, AND ROADWAY DETAILS ARE NOT ATTAINABLE TO MEET FIELD CONDITIONS OR RESULT IN DUPLICATE OR UNDESIRED OVERLAPPING OF DEVICES. MODIFICATION MAY INCLUDE: MOVING, SUPPLEMENTING, COVERING, OR REMOVAL OF DEVICES AS DIRECTED BY THE ENGINEER.

THE FOLLOWING GENERAL NOTES APPLY AT ALL TIMES FOR THE DURATION OF THE CONSTRUCTION PROJECT EXCEPT WHEN OTHERWISE NOTED IN THE PLAN OR DIRECTED BY THE ENGINEER.

TIME RESTRICTIONS

A) DO NOT CLOSE OR NARROW TRAVEL LANES AS FOLLOWS:

ROAD NAME	DAY AND TIME RESTRICTIONS
WATER STREET	MONDAY THROUGH SUNDAY FROM 6:00 A.M. TO 9:00 A.M.
BROAD STREET	

B) DO NOT CLOSE OR NARROW TRAVEL LANES DURING HOLIDAYS AND SPECIAL EVENTS AS FOLLOWS:

ROAD NAME
WATER STREET
BROAD STREET

HOLIDAY

C) FOR ANY UNEXPECTED OCCURENCE THAT CREATES UNUSUALLY HIGH TRAFFIC VOLUMES, AS DIRECTED BY THE ENGINEER.

D) FOR NEW YEAR'S, BETWEEN THE HOURS OF 6:00 A.M. DECEMBER 31st TO 9:00 P.M. JANUARY 2ND. IF NEW YEAR'S DAY IS ON A FRIDAY, SATURDAY, SUNDAY, OR MONDAY THEN UNTIL 9:00 P.M. THE FOLLOWING TUESDAY.

E) FOR EASTER, BETWEEN THE HOURS OF 6:00 A.M. THURSDAY AND 9:00 P.M. MONDAY.

F) FOR MEMORIAL DAY, BETWEEN THE HOURS OF 6:00 A.M. FRIDAY TO 9:00 P.M. TUESDAY.

G) FOR INDEPENDENCE DAY, BETWEEN THE HOURS OF 6:00 A.M. THE DAY BEFORE INDEPENDENCE AND 9:00 P.M. THE DAY AFTER INDEPENDENCE DAY.

IF INDEPENDENCE DAY IS ON A FRIDAY, SATURDAY, SUNDAY OR MONDAY THEN BETWEEN THE HOURS OF 6:00 A.M. THE THURSDAY BEFORE INDEPENDENCE DAY AND 9:00 P.M. THE TUESDAY AFTER INDEPENDENCE DAY.

H) FOR LABOR DAY, BETWEEN THE HOURS OF 6:00 A.M. FRIDAY AND 9:00 P.M. TUESDAY.

I) FOR THANKSGIVING DAY, BETWEEN THE HOURS OF 6;00 A.M. TUESDAY AND 9:00 P.M. MONDAY.

J) FOR CHRISTMAS, BETWEEN THE HOURS OF 6:00 A.M. THE FRIDAY BEFORE THE WEEK OF CHRISTMAS DAY AND 9:00 P.M. THE FOLLOWING TUESDAY AFTER THE WEEK OF CHRISTMAS.

TRAFFIC PATTERN ALTERATIONS

K) NOTIFY THE ENGINEER TWENTY-ONE (21) CALENDAR DAYS PRIOR TO ANY TRAFFIC PATTERN ALTERATION.

SIGNING

L) INSTALL ADVANCE WORK ZONE WARNING SIGNS WHEN WORK IS WITHIN 40 FT FROM THE EDGE OF TRAVEL LANE AND NO MORE THAN THREE (3) DAYS PRIOR TO THE BEGINNING OF CONSTRUCTION.

M) ENSURE ALL NECESSARY SIGNING IS IN PLACE PRIOR TO ALTERING ANY TRAFFIC PATTERN.

N) INSTALL BLACK ON ORANGE "DIP" SIGNS (W8-2) AND/OR "BUMP" SIGNS (W8-1) 500 FT IN ADVANCE OF THE UNEVEN AREA, OR AS DIRECTED BY THE ENGINEER.

LANE AND SHOULDER CLOSURE REQUIREMENTS

O) REMOVE LANE CLOSURE DEVICES FROM THE LANE WHEN WORK IS NOT BEING PERFORMED BEHIND THE LANE CLOSURE OR WHEN A LANE CLOSURE IS NO LONGER NEEDED OR AS DIRECTED BY THE ENGINEER.

P) WHEN PERSONNEL AND/OR EQUIPMENT ARE WORKING WITHIN 15 FT. OF AN OPEN TRAVEL LANE, CLOSE THE NEAREST OPEN SHOULDER USING ROADWAY STANDARD DRAWING NO. 1101.04 UNLESS THE WORK AREA IS PROTECTED BY BARRIER OR GUARDRAIL OR A LANE CLOSURE IS INSTALLED.

Q) WHEN PERSONNEL AND/OR EQUIPMENT ARE WORKING ON THE SHOULDER ADJACENT TO AN UNDIVIDED FACILITY AND WITHIN 5 FT. OF AN OPEN TRAVEL LANE, CLOSE THE NEAREST OPEN TRAVEL LANE USING ROADWAY STANDARD DRAWING NO. 1101.02 UNLESS THE WORK AREA IS PROTECTED BY BARRIER OR GUARDRAIL.

WHEN PERSONNEL AND/OR EQUIPMENT ARE WORKING ON THE SHOULDER ADJACENT TO A DIVIDED FACILITY AND WITHIN 10 FT. OF AN OPEN TRAVEL LANE, CLOSE THE NEAREST OPEN TRAVEL LANE USING ROADWAY STANDARD DRAWING NO. 1101.02 UNLESS THE WORK AREA IS PROTECTED BY BARRIER OR GUARDRAIL.

PAVEMENT EDGE DROP OFF REQUIREMENTS

R) BACKFILL AT A 6:1 SLOPE UP TO THE EDGE AND ELEVATION OF EXISTING PAVEMENT IN AREAS ADJACENT TO AN OPENED TRAVEL LANE THAT HAS AN EDGE OF PAVEMENT DROP-OFF AS FOLLOWS:

BACKFILL DROP-OFFS THAT EXCEED 2 INCHES ON ROADWAYS WITH POSTED SPEED LIMITS OF 45 MPH OR GREATER.

BACKFILL DROP-OFFS THAT EXCEED 3 INCHES ON ROADWAYS WITH POSTED SPEED LIMITS LESS THAN 45 MPH.

BACKFILL WITH SUITABLE COMPACTED MATERIAL, AS APPROVED BY THE ENGINEER, AT NO EXPENSE TO THE DEPARTMENT.

S) DO NOT EXCEED A DIFFERENCE OF 2 INCHES IN ELEVATION BETWEEN OPEN LANES OF TRAFFIC FOR NOMINAL LIFTS OF 1.5 INCHES. INSTALL ADVANCE WARNING "UNEVEN LANES" SIGNS (W8-11) 200 FT. IN ADVANCE AND A MINIMUM OF EVERY HALF MILE THROUGHOUT THE UNEVEN AREA.

TRAFFIC CONTROL DEVICES

T) WHEN LANE CLOSURES ARE NOT IN EFFECT SPACE CHANNELIZING DEVICES IN WORK AREAS NO GREATER IN FEET THAN TWICE THE POSTED SPEED LIMIT (MPH) EXCEPT, 10 FT ON-CENTER IN RADII, AND 3 FT. OFF THE EDGE OF AN OPEN TRAVELWAY, REFER TO "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" SECTIONS 1130 (DRUMS), 1135 (CONES) AND 1180 (SKINNY DRUMS) FOR ADDITIONAL REQUIREMENTS.

ROADWAY STANDARD DRAWINGS

THE FOLLOWING ROADWAY STANDARDS AS SHOWN IN "ROADWAY STANDARD DRAWINGS" - PROJECT SERVICES UNIT - N.C. DEPARTMENT OF TRANSPORTATION - RALEIGH, N.C., DATED JANUARY 2018 ARE APPLICABLE TO THIS PROJECT AND BY REFERENCE HEREBY ARE CONSIDERED A PART OF THESE PLANS:

STD. NO.	STD. DRAWING TITLES
1101.01	WORK ZONE ADVANCE WARNING SIGNS
1101.02	TEMPORARY LANE CLOSURES
1101.04	TEMPORARY SHOULDER CLOSURES
1101.11	TRAFFIC CONTROL DESIGN TABLES
1110.01	STATIONARY WORK ZONE SIGNS
1130.01	DRUM
1150.01	FLAGGERS
1205.01	PAVEMENT MARKINGS - LINE TYPES AND OFFSETS
1205.02	PAVEMENT MARKINGS - TWO-LANE AND MULTI-LANE ROADWAYS
1205.05	PAVEMENT MARKINGS - TURN LANES
1205.06	PAVEMENT MARKING - LANE DROPS
1205.13	PAVEMENT MARKINGS - LANE REDUCTIONS

PHASING NOTES

THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL EXISTING DRIVEWAYS AS DIRECTED BY THE ENGINEER.

PHASE 1: WATER STREET

STEP 1: INSTALL WORK ZONE ADVANCE WARNING SIGNS SEE ROADWAY STANDARD DRAWINGS STD. 1101.01 SHEET 3 OF 3.

STEP 2: USING A FLAGGER, MAINTAIN TRAFFIC ON THE NORTH SIDE OF EXISTING WATER STREET.

STEP 3: CONSTRUCT PROPOSED WIDENING AND SIDEWALK ON THE SOUTH SIDE OF WATER STREET.

STEP 4: PLACE FINAL LAYER OF ASPHALT WEARING SURFACE.

STEP 4: REMOVE TRAFFIC CONTROL DEVICES AND OPEN UP TO FINAL TRAFFIC PATTERN.

THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL EXISTING DRIVEWAYS AS DIRECTED BY THE ENGINEER.

PHASE 2: BROAD STREET

STEP 1: INSTALL WORK ZONE ADVANCE WARNING SIGNS SEE ROADWAY STANDARD DRAWINGS STD. 1101.01 SHEET 3 OF 3.

STEP 2: USING A FLAGGER, MAINTAIN TRAFFIC ON THE NORTH SIDE OF EXISTING BROAD STREET.

STEP 3: CONSTRUCT PROPOSED WIDENING ON THE SOUTH SIDE OF BROAD STREET.

STEP 4: PLACE FINAL LAYER OF ASPHALT WEARING SURFACE.

STEP 5: REMOVE TRAFFIC CONTROL DEVICES AND OPEN UP TO FINAL TRAFFIC PATTERN.

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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 TED A. KALLAM
DocuSigned by: Ted Kallam 5/31/2023

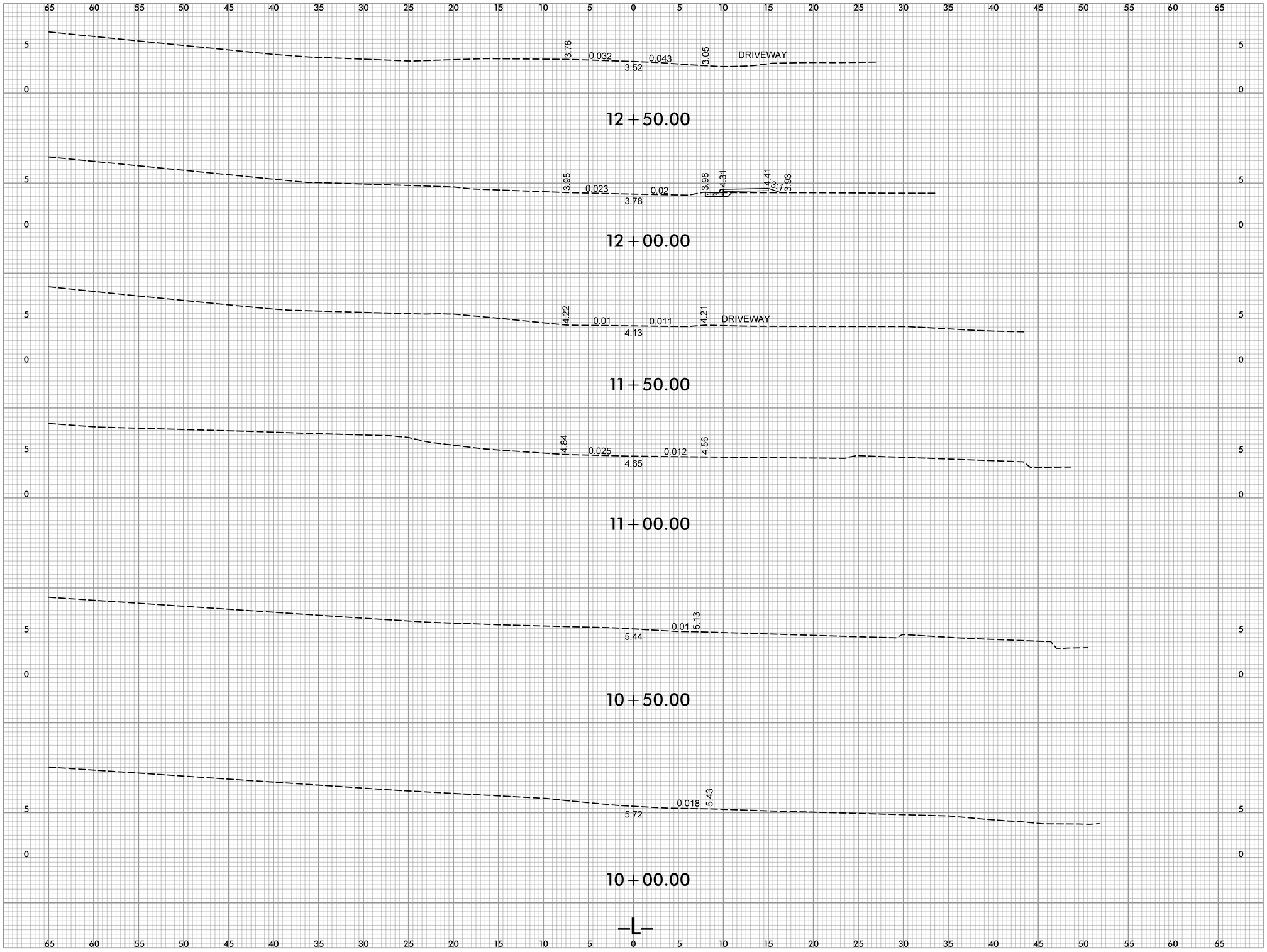
INITIAL PLAN DATE:
REVISIONS:

WR JOB NO.	DATE
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

TRAFFIC CONTROL GENERAL NOTES & STANDARD DRAWINGS

TMP-1

EST. 1963



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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

Docusigned by: Jack Kallam
9CC0FC1C9B044F1...
5/31/2023

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 JACK A. KALLAM

SCALE: 1 inch = 5 ft

INITIAL PLAN DATE:
REVISIONS:

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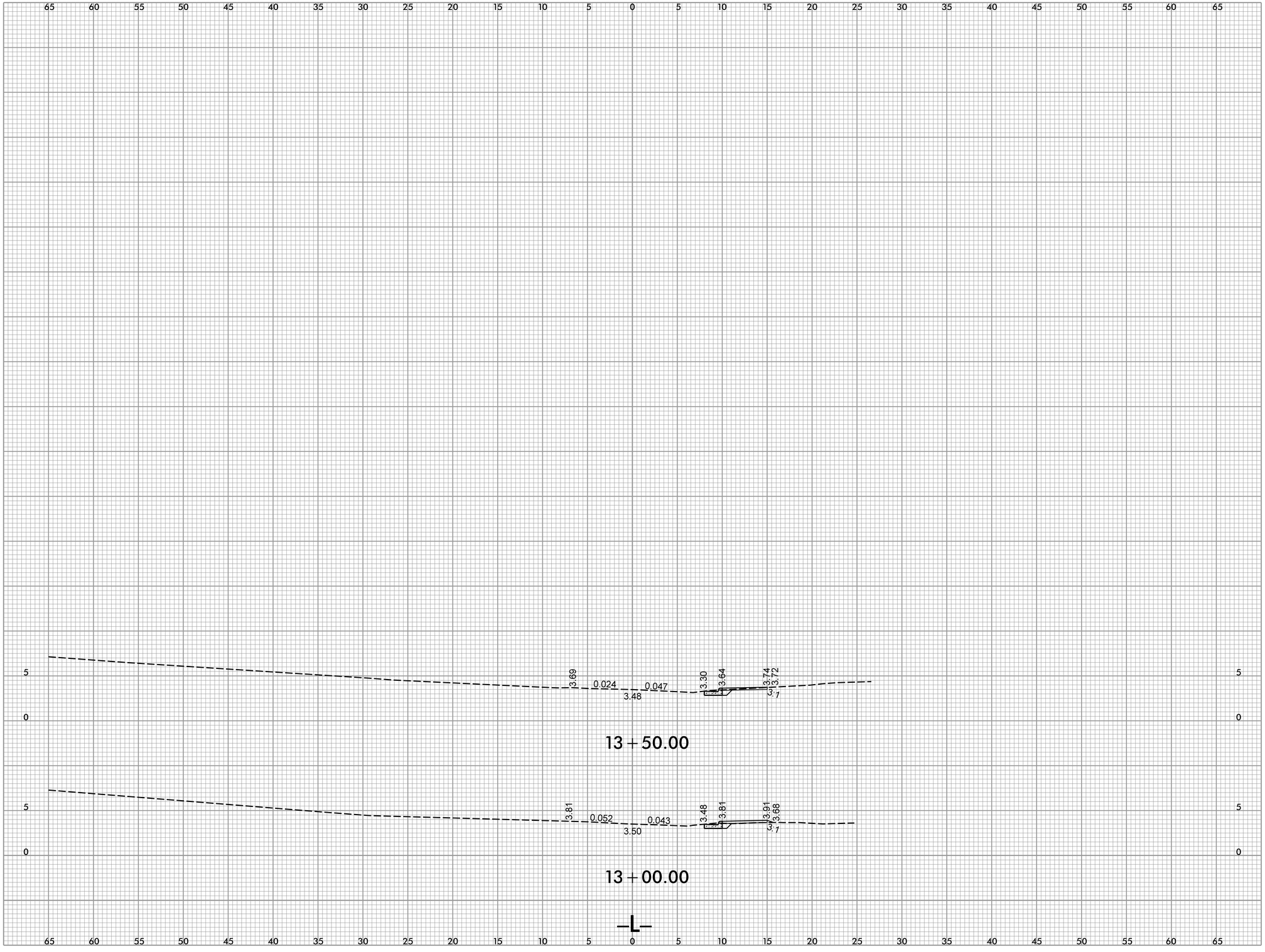
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

WATER STREET CROSS SECTIONS

X-1

K:\220\22-0730\220730-Swansboro Water St Drainage Improvements\CAD\DGN\NCDOT Web Xs Border.dgn -- DPETRY



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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

WATER STREET| SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

Drew/Signed by:
Jack Kallam
SEAL 3032
5/31/2023

SCALE: 1 inch = 5 ft.

INITIAL PLAN DATE:
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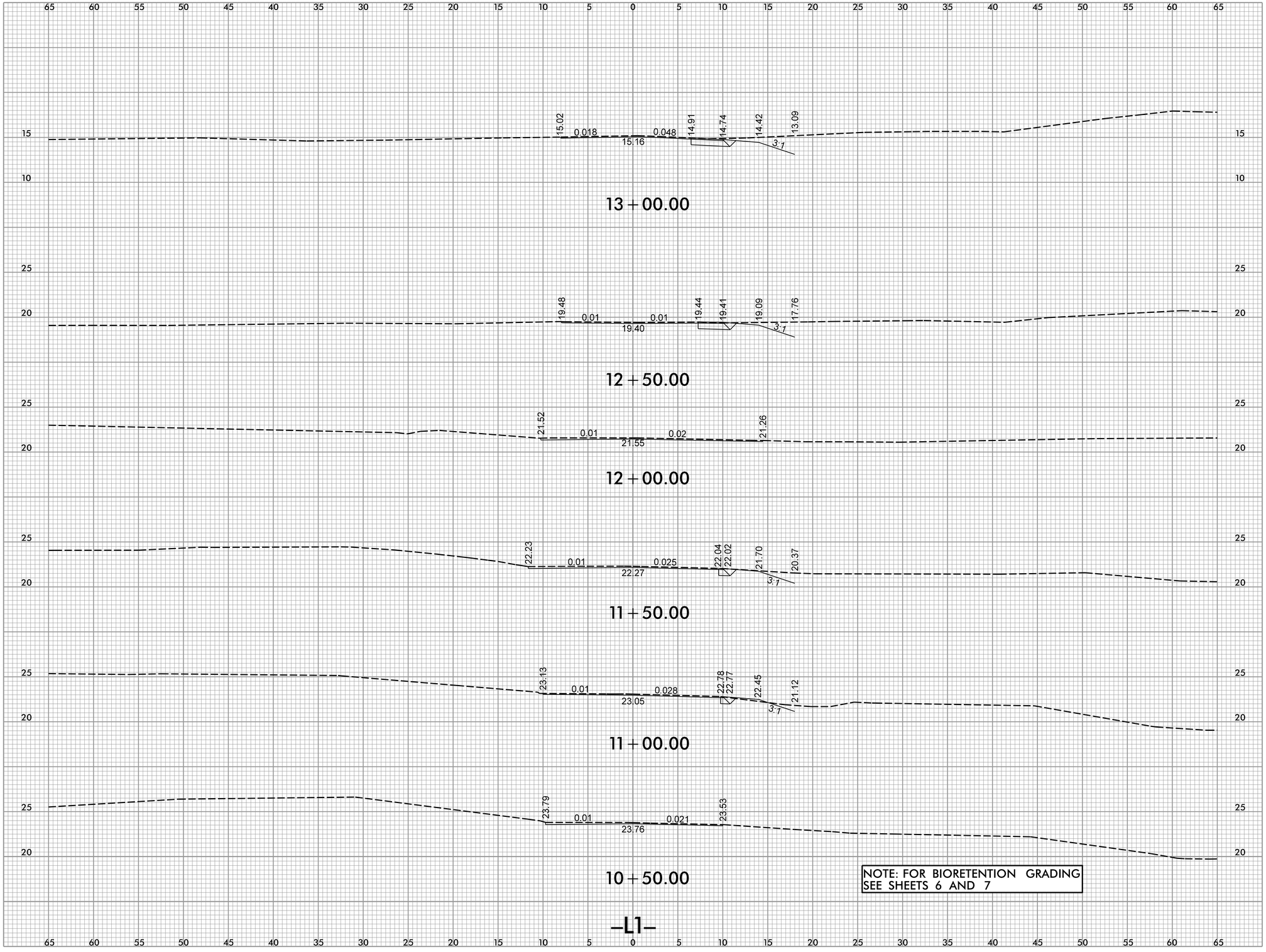
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

WATER STREET CROSS SECTIONS

X-2



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CONSTRUCTION DRAWINGS

WATER STREET DRAINAGE IMPROVEMENTS

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 3032 TED A KALLAM

Drew/Signed by: Ted Kallam
5/31/2023

SCALE: 1 inch = 5 ft.

INITIAL PLAN DATE:
REVISIONS:

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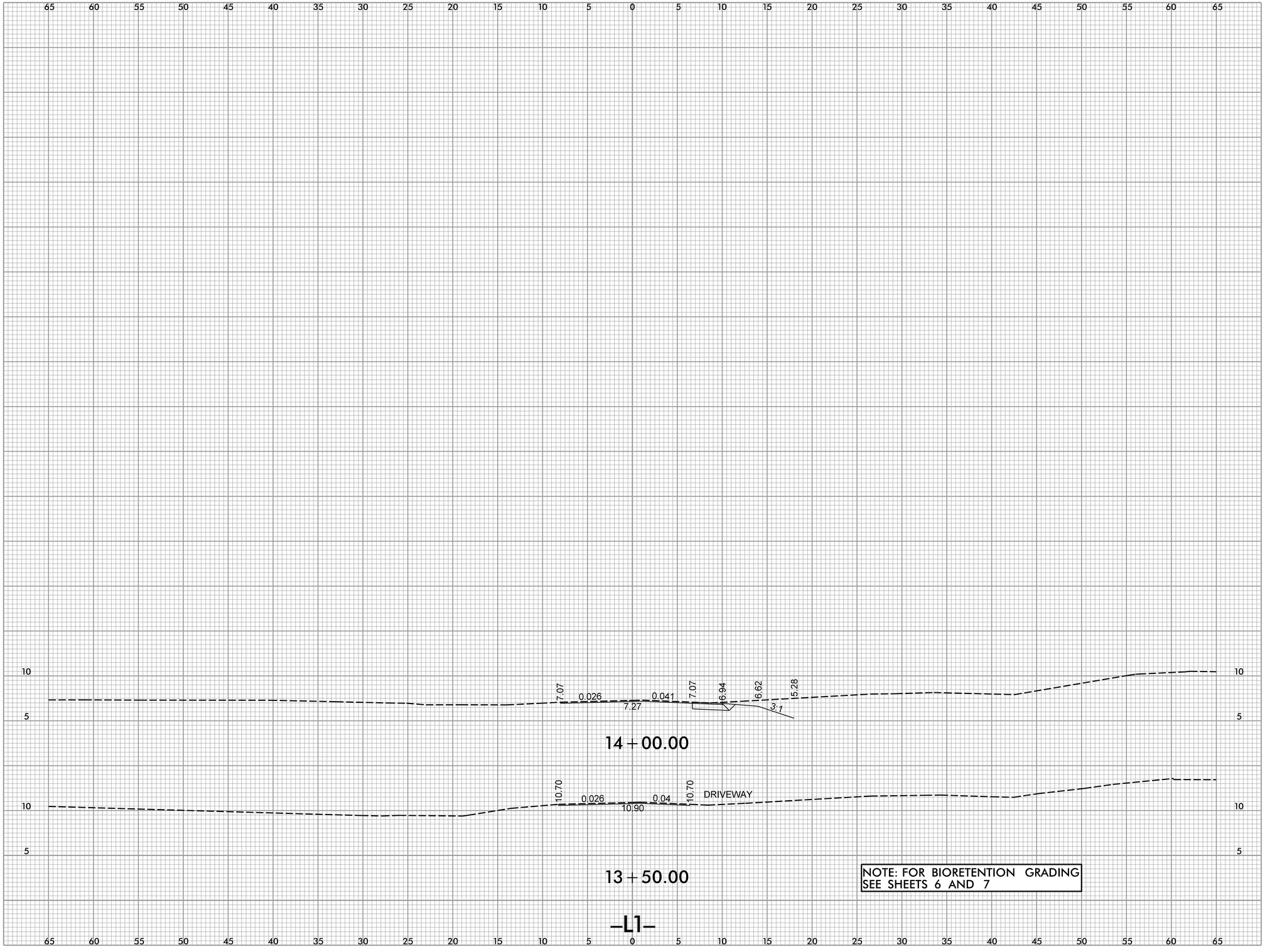
220730.00	05/31/2023
DRN: WR	DGN: WR CKD: WR

BROAD STREET
CROSS SECTIONS

X-3



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WATER STREET DRAINAGE IMPROVEMENTS

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NORTH CAROLINA PROFESSIONAL ENGINEER TED A KALLAM SEAL 3032

Docu Signed by: Ted Kallam
5/31/2023

SCALE: 1 inch = 5 ft.

INITIAL PLAN DATE:
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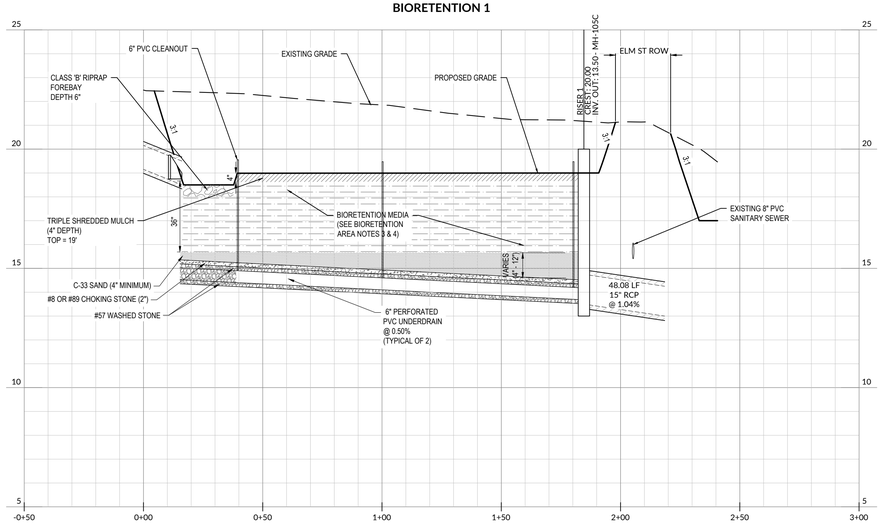
DRN: WR	DGN: WR CKD: WR

BROAD STREET CROSS SECTIONS

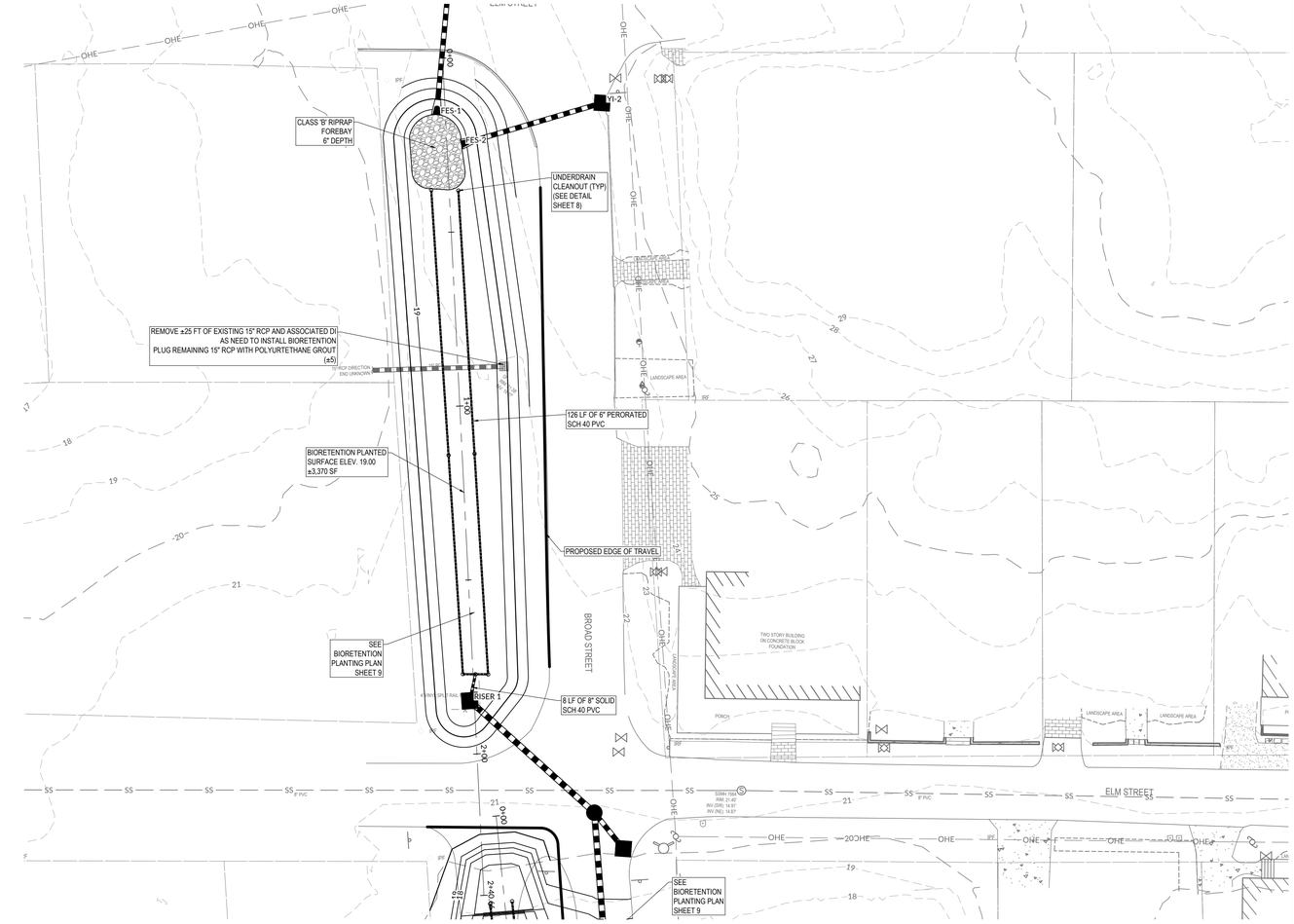
X-4

K:\22\22-0730\220730-Swansboro Water St Drainage Improvements\CAD\SDGN\ACDOT WADI XS Border.dgn – DWTEW



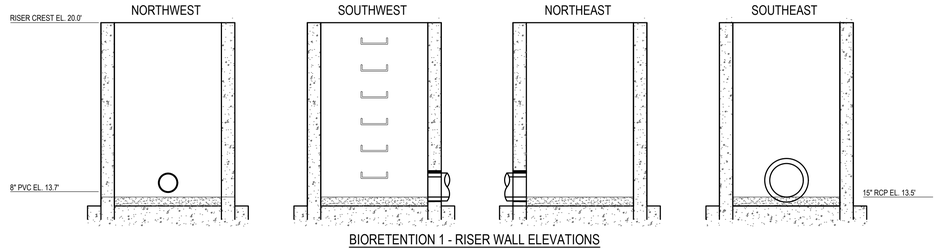
BIORETENTION 1 - PROFILE

PROFILE VIEW
GRAPHIC SCALE
1" = 30' HORZ.
1" = 3' VERT.
0 30 60

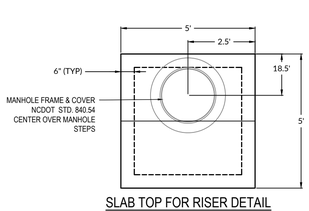


BIORETENTION 1 - PLAN VIEW

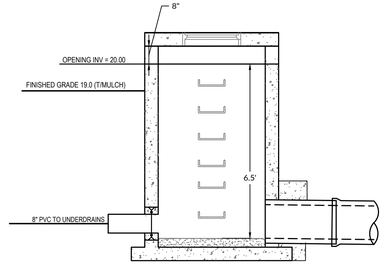
NOTE:
SEE SHEETS 2D-1, 4, AND 5 FOR PROPOSED STORM NETWORK ELEVATION INFORMATION.



BIORETENTION 1 - RISER WALL ELEVATIONS
NOT TO SCALE



SLAB TOP FOR RISER DETAIL
NOT TO SCALE



BIORETENTION 1 - DRAWDOWN DEVICE DETAIL
NOT TO SCALE

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CONSTRUCTION DRAWINGS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049218

Docusigned by:
Amanda Hollingsworth
5/31/2023

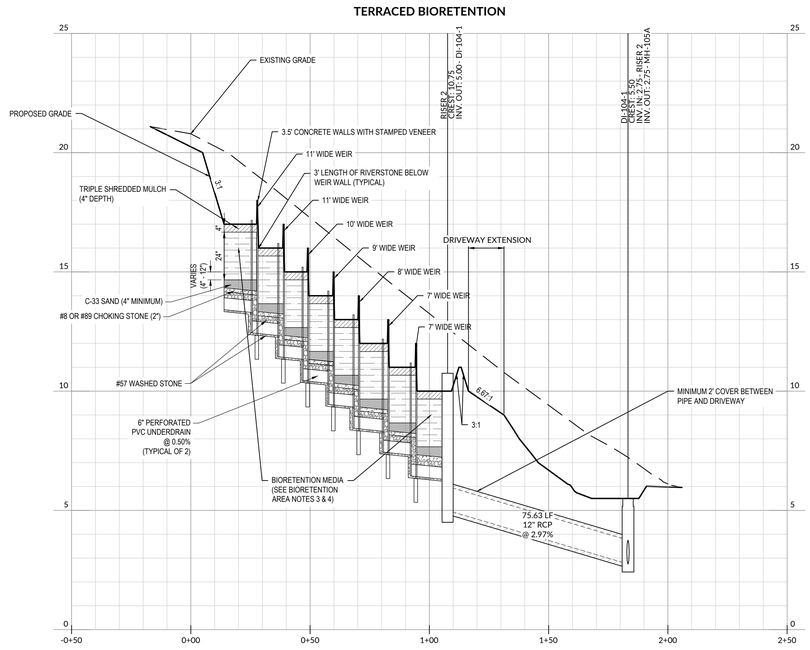
0 10 20
SCALE: 1 inch = 20 ft.

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

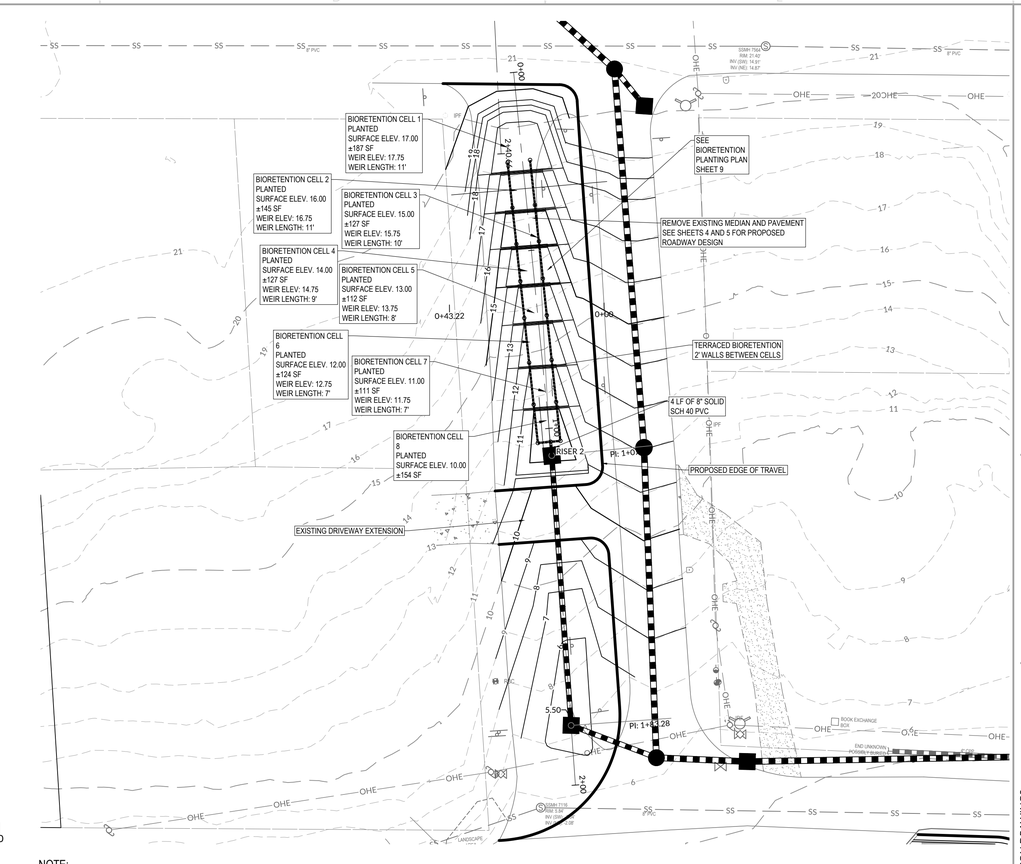
BIORETENTION 1

6



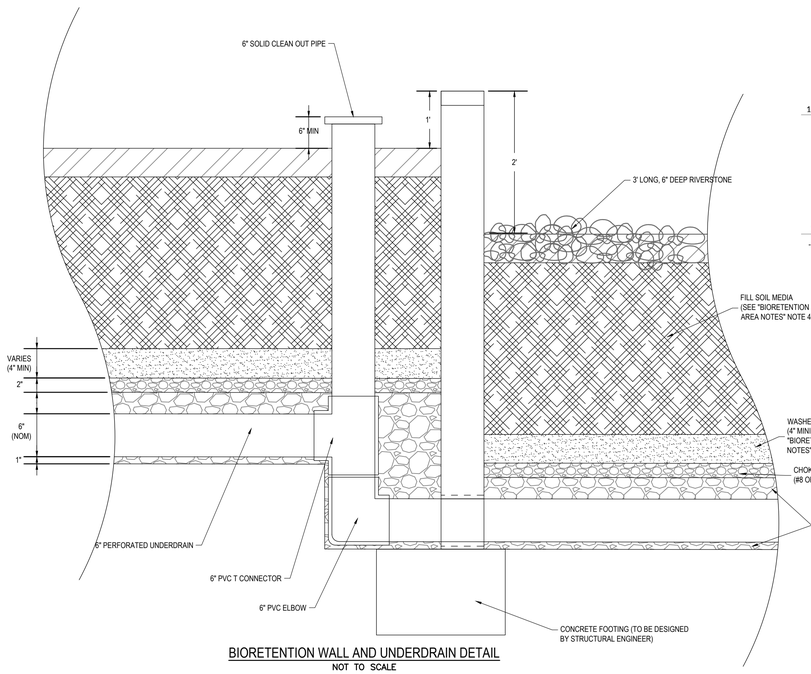
TERRACED BIORETENTION - PROFILE

PROFILE VIEW
GRAPHIC SCALE
1" = 30' HORZ.
1" = 3' VERT.
0 30 60

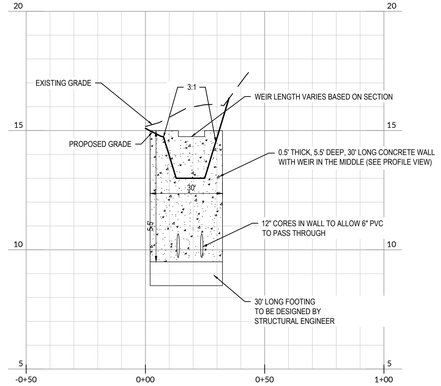


NOTE:
SEE SHEETS 2D-1, 4, AND 5 FOR PROPOSED STORM NETWORK ELEVATION INFORMATION

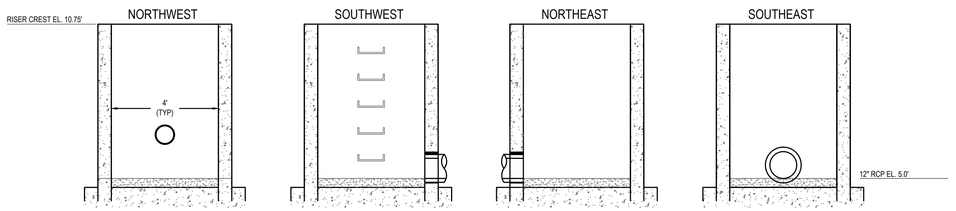
TERRACED BIORETENTION - PLAN VIEW



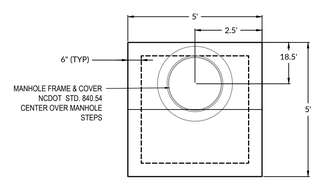
BIORETENTION WALL AND UNDERDRAIN DETAIL
NOT TO SCALE



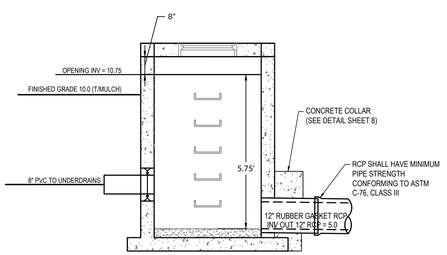
TERRACED BIORETENTION - CROSS SECTION



TERRACE BIORETENTION RISER WALL ELEVATIONS
NOT TO SCALE



SLAB TOP FOR RISER DETAIL
NOT TO SCALE



TERRACED BIORETENTION DRAWDOWN DEVICE DETAIL
NOT TO SCALE

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SWANSBORO, NC 28584

CONSTRUCTION DRAWINGS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049218
DocuSigned by: Amanda Hollingsworth
5/31/2023

0 10 20 40
SCALE: 1 inch = 20 ft.

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

TERRACED BIORETENTION

7

STORMWATER CONTROL MEASURE (SCM) NOTES:

1. PRIOR TO BEGINNING CONSTRUCTION, ANY DISCREPANCIES IN THE PLANS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DESIGN ENGINEER FOR RESOLUTION.
2. ALL CONSTRUCTION TO BE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE (I.E., MINIMUM DESIGN CRITERIA), AND LOCAL STANDARDS AND SPECIFICATIONS HEREBY INCORPORATED BY REFERENCE.
3. STORMWATER CONTROL MEASURES ON THE PROJECT MUST BE LOCATED ON COMMON OPEN SPACE, HAVE AN ACCESS AND MAINTENANCE EASEMENTS LOCATED AROUND THEM AND INCLUDE AN OPERATIONS AND MAINTENANCE MANUAL AND MAINTENANCE AGREEMENT.
4. GEOTECHNICAL ENGINEER SHALL EVALUATE SOILS FOR SUITABILITY OF DAM CONSTRUCTION AND SLOPE STABILITY. PROFESSIONAL CERTIFICATION OF EMBANKMENT CONSTRUCTION IS REQUIRED FOR AS-BUILT CERTIFICATION.
5. EMBANKMENT AND SIDE SLOPES OF THE BASIN SHALL BE STABILIZED PER SEEDING SCHEDULE ON EROSION CONTROL DETAILS SHEET OR SODDED.
6. CONTRACTOR TO PROVIDE STRUCTURAL DRAWINGS TO THE DESIGN ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
7. ONCE THE SITE HAS BEEN STABILIZED, CONTRACTOR SHALL OBTAIN APPROVAL BY EROSION CONTROL INSPECTOR IN ORDER TO REMOVE EROSION CONTROL DEVICES.
8. ONCE ALL SEDIMENT AND EROSION CONTROL DEVICES HAVE BEEN REMOVED, THE SCM SHALL BE CONVERTED TO A PERMANENT SCM.
   - ALL SEDIMENT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
   - INTERIOR GRADING AND VEGETATED AREAS SHALL BE CONSTRUCTED PER THIS PLAN.
   - VEGETATED SHELF SHALL BE PLANTED PER PLANT SCHEDULE ON LANDSCAPE PLAN SHEET
   - FINAL CERTIFICATION OF THE SCM BY A PROFESSIONAL ENGINEER IS REQUIRED.

PRECAST CONCRETE MATERIALS NOTES:

1. ALL PRECAST CONCRETE STRUCTURES SHALL CONFORM TO ASTM C913 (RECTANGULAR) OR C478 (ROUND).
2. ALL REINFORCED CONCRETE PIPE SHALL CONFORM TO ASTM C76, CLASS III (UNLESS OTHERWISE NOTED).
   2.1. O-RING JOINTS SHALL CONFORM TO ASTM C443 & ASTM C361.
   2.2. NON O-RING JOINTS SHALL CONFORM TO ASTM C990.

CAST-IN-PLACE CONCRETE MATERIALS NOTES:

1. CONTRACTOR RESPONSIBLE FOR PROVIDING STRUCTURAL DESIGN OF WEIR WALLS FOR ENGINEERS APPROVAL PRIOR TO INSTALLATION.

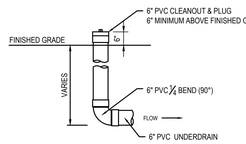
BIORETENTION AREA NOTES:

1. NO MECHANICAL COMPACTION OR HEAVY EQUIPMENT SHALL BE USED DURING MEDIA OR LANDSCAPING INSTALLATION. ALL CONSTRUCTION TO BE DONE WITH MINIMAL COMPACTION.
2. BOTTOM OF BIORETENTION AREA SHALL BE 2 FEET OR MORE FROM SEASONAL HIGH WATER TABLE. IF DURING CONSTRUCTION SEASONAL HIGH WATER TABLE IS FOUND TO BE WITHIN 2' OF BOTTOM OF BIORETENTION AREA, THEN ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR DESIGN MODIFICATIONS.
3. THE SCM SHALL BE CONVERTED TO A BIORETENTION AREA ONLY AFTER THE SITE HAS BEEN STABILIZED.
4. BIORETENTION AREA MEDIA SECTION TO COVER ENTIRE PLANTING SURFACE. BIORETENTION AREA MEDIA TO BE COMPRISED OF THE FOLLOWING:
   - 75% - 85% MEDIUM TO COARSE WASHED SAND (85% PREFERRED).
   - 8% - 10% FINES (CLAY & SILT) (8% PREFERRED).
   - 5% - 10% ORGANIC MATTER (7% PREFERRED)
   - PHOSPHORUS INDEX (P-INDEX) SHALL BE NO GREATER THAN 30.
   - THE MEDIA INFILTRATION RATE SHALL BE MINIMUM 2 IN/HR.
5. THE CHOKING STONE LAYER MAY BE MODIFIED TO USE #78 STONE IN LIEU OF #8 OR #89 STONE. THE CHOKING STONE LAYER SHALL THEN BE COMPRISED OF 3" OF #78 STONE AND THE WASHED SAND LAYER SHALL THEN HAVE A MINIMUM THICKNESS OF 3".
6. CONTRACTOR TO PROVIDE SOIL TEST DATA AND SAMPLES, FROM AN APPROVED TESTING LABORATORY, TO THE ENGINEER PRIOR TO CONSTRUCTION.
7. NO FERTILIZER IS TO BE ADDED.
8. BIORETENTION SHALL BE PLANTED PER LANDSCAPE PLAN ON SHEET L3.00.

UTILITY LOCATIONS SHOWN ARE FROM BEST AVAILABLE DATA SUPPLEMENTED WITH FIELD SURVEY OF MARKED UTILITIES, AND SHALL BE CONSIDERED APPROXIMATE AND POSSIBLY INCOMPLETE.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL EXISTING UTILITIES, AND SHALL NOTIFY THE TOWN OF SWANSBORO AND THE ENGINEER OF ANY POSSIBLE CONFLICTS OR CLEARANCES LESS THAN REQUIRED. DUE CARE AND DILIGENCE SHALL BE TAKEN TO PRESERVE AND PROTECT ALL EXISTING UTILITIES TO ENSURE CONTINUOUS SERVICE.

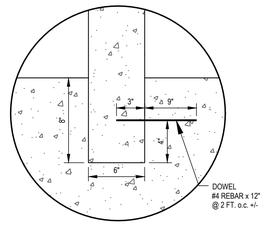
IF RELOCATION OF ANY UTILITIES ARE REQUIRED, TEMPORARY OR PERMANENT, THE CONTRACTOR SHALL COORDINATE ANY SUCH RELOCATION WITH THE CITY AND UTILITY OWNER.

SEE SHEET TMP-1 FOR GENERAL NOTES AND OTHER REQUIREMENTS.

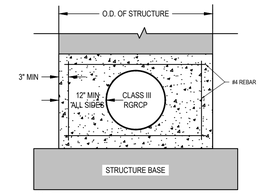


END OF UNDERDRAIN

BIORETENTION UNDERDRAIN CLEANOUT DETAIL
NOT TO SCALE

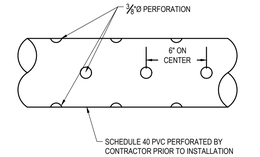


ANCHOR DETAIL (TYPICAL)
NOT TO SCALE

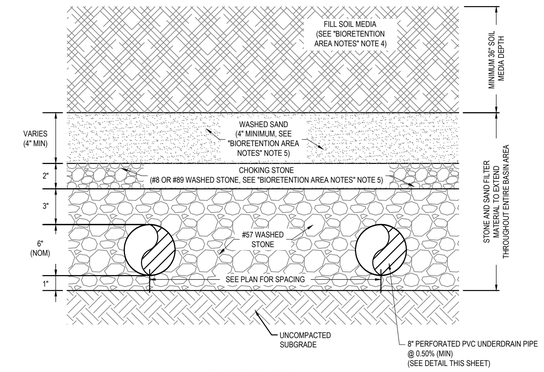


NOTE:
INSTALL VERTICAL DOWELS IN FOUNDATION CONCRETE AS HOLDING BARS FOR CONCRETE COLLAR REBAR.

CONCRETE COLLAR DETAIL
NOT TO SCALE



PERFORATED PVC UNDERDRAIN DETAIL
NOT TO SCALE



SEE BIORETENTION PROFILE
AT LEFT

BIORETENTION CROSS-SECTION DETAIL
NOT TO SCALE

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CONSTRUCTION DRAWINGS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

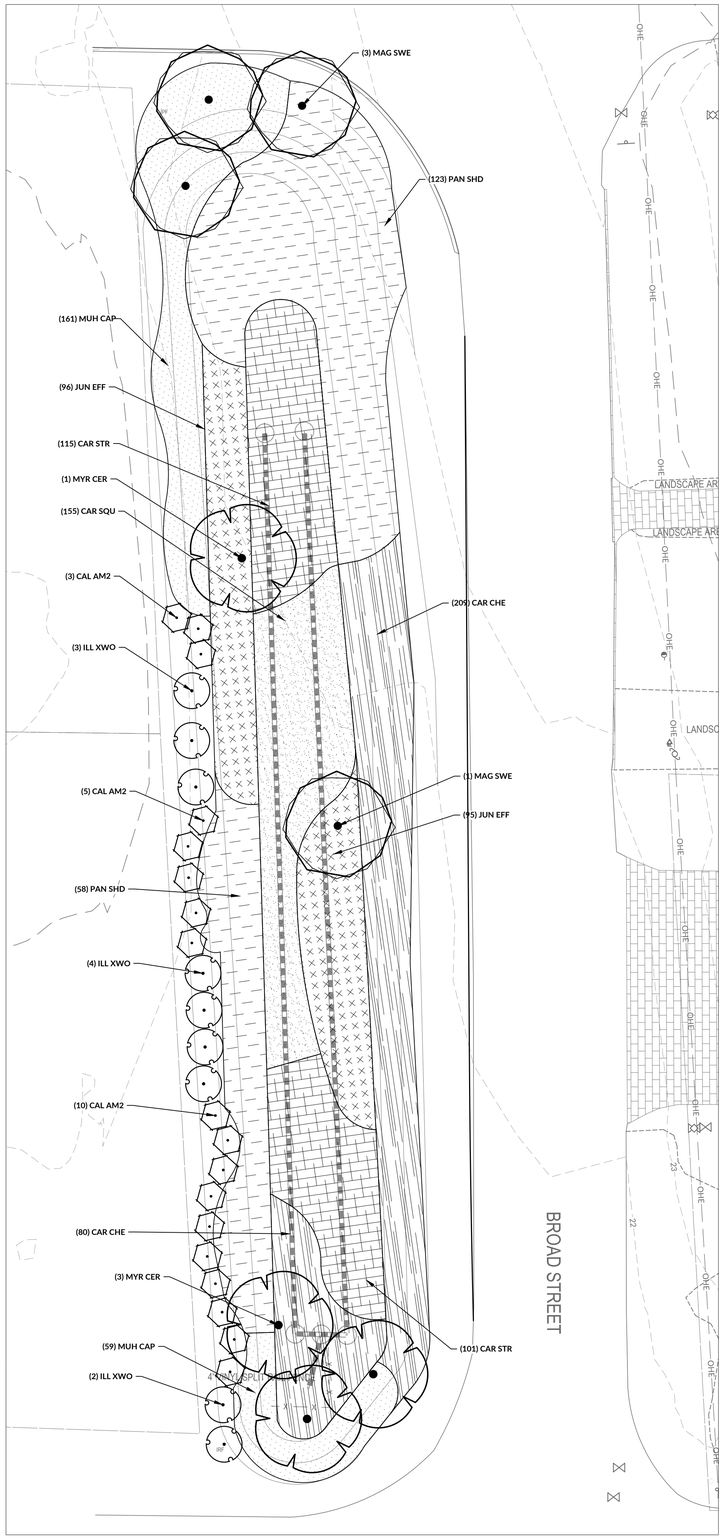
NORTH CAROLINA PROFESSIONAL SEAL 049218 ENGINEER
DocuSigned by: Amanda Hollingsworth
3/31/2023

INITIAL PLAN DATE:
REVISIONS:

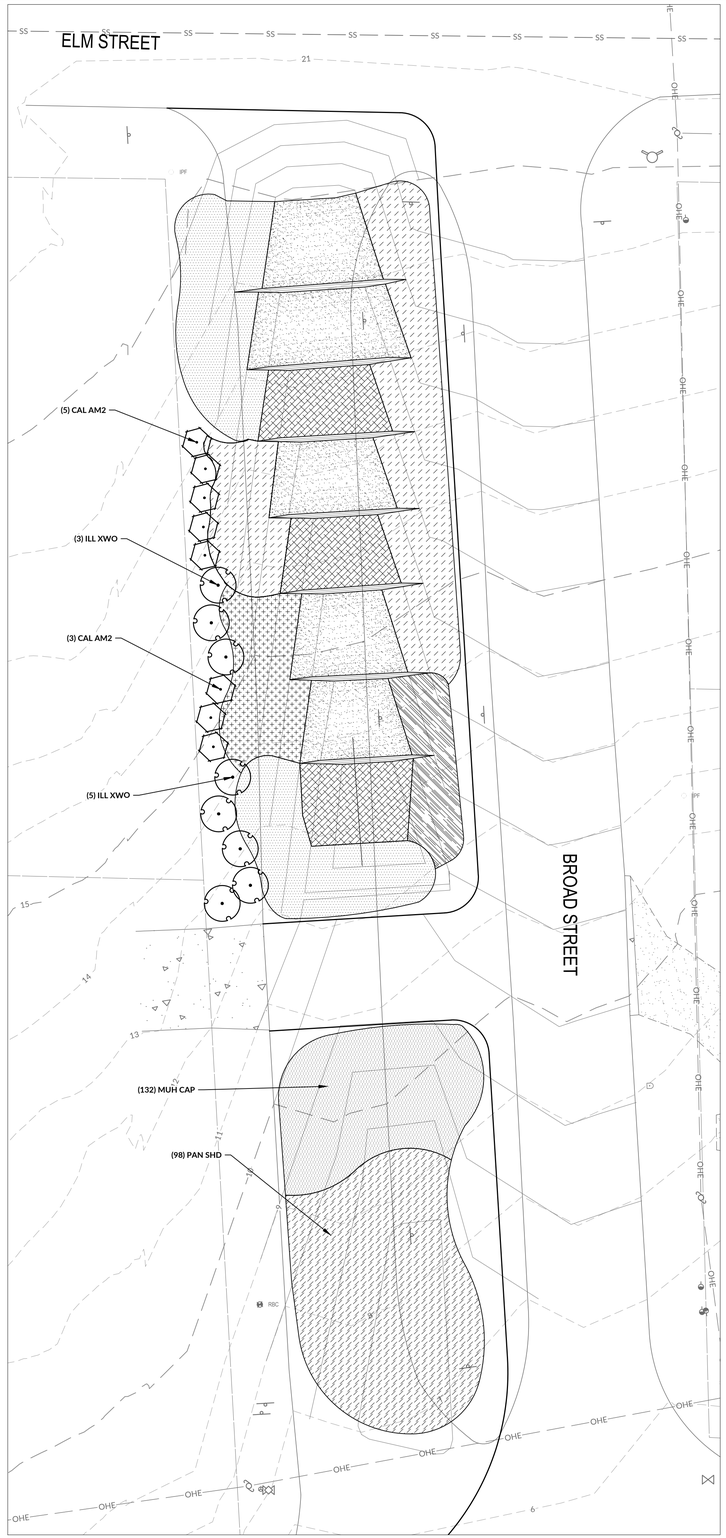
WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

DETAILS

8



BIORETENTION 1 PLANTING PLAN



TERRACED BIORETENTION PLANTING PLAN

PLANT SCHEDULE

TREES	QTY	BOTANICAL NAME	COMMON NAME	ROOT	SIZE	HEIGHT	REMARKS
MAG SWE	4	MAGNOLIA VIRGINIANA	SWEETBAY MAGNOLIA	B&B	2" CAL MIN	8' MIN	MULTI-STEM
MYR CER	4	MYRICA CERIFERA	WAX MYRTLE "TREE FORM"	B&B	2" CAL MIN	6' MIN	MULTI STEM TREE FORM
SHRUBS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**HEIGHT**	**REMARKS**
CAL AM2	26	CALLICARPA AMERICANA	AMERICAN BEAUTYBERRY	3 GAL		2' MIN	
ILL XWO	17	ILLICIUM X 'WOODLAND RUBY'	WOODLAND RUBY ANISE	3 GAL	CONT		
GROUND COVERS	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**CONTAINER**	**SPACING**	
CAR CHE	335	CAREX CHEROKEENSIS	CHEROKEE SEDGE	2.5" POT	POT	24" o.c.	
CAR SQU	376	CAREX SQUARROSA	SQUARROSE SEDGE	2.5" POT	POT	24" o.c.	
CAR STR	339	CAREX STRICTA	TUSSOCK SEDGE	2.5" POT	POT	24" o.c.	
JUN EFF	255	JUNCUS EFFUSUS	SOFT RUSH	2.5" POT	POT	24" o.c.	
MUH CAP	667	MUHLENBERGIA CAPILLARIS	PINK MUHLY GRASS	2.5" POT	POT	24" o.c.	
PAN SHD	466	PANICUM VIRGATUM 'SHENANDOAH'	SHENANDOAH SWITCH GRASS	2.5" POT	POT	36" o.c.	

GENERAL LANDSCAPE NOTES:

1. THE CONTRACTOR SHALL TAKE PROPER PRECAUTIONS NOT TO DAMAGE EXISTING PLANTS, FACILITIES AND STRUCTURES THAT ARE TO REMAIN. THE CONTRACTOR SHALL RESTORE DISTURBED AREAS TO THEIR ORIGINAL CONDITION TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT AND OWNER. ADJACENT STREETS AND SIDEWALKS SHALL BE MAINTAINED IN A CLEAN CONDITION, MUD AND DUST-FREE.
2. ALL CONSTRUCTION IS TO BE IN ACCORDANCE WITH MUNICIPAL STANDARDS AND SPECIFICATIONS, AND NCDOT, STANDARDS AND SPECIFICATIONS IF APPLICABLE.
3. NO CHANGES TO ANY ASPECT OF APPROVED SITE PLAN, INCLUDING BUT NOT LIMITED TO LANDSCAPING, GRADING, BUILDING ELEVATIONS, LIGHTING, OR UTILITIES SHALL BE MADE WITHOUT THE APPROVAL OF THE GOVERNING MUNICIPALITY.
4. ALL PLANTS PROVIDED BY THE CONTRACTOR SHALL MEET OR SURPASS THE SPECIFICATIONS GIVEN IN THE PLANT TABLE AND CONFORM TO THE AMERICAN STANDARD OF NURSERY STOCK, ANSI Z601-1973 IN REGARD TO SIZING, GROWING AND B&B SPECIFICATIONS. PLANTS SHALL BE FULL AND HEAVY, AND IN HEALTHY CONDITION AT THE TIME OF PLANTING. LANDSCAPE ARCHITECT SHALL REJECT ANY PLANT NOT MEETING THESE GUIDELINES AND REQUIRE REPLACEMENT.
5. ALL PLANTS ARE TO BE FULLY GUARANTEED (INCLUDING LABOR AND MATERIALS) FOR A PERIOD OF NOT LESS THAN ONE (1) YEAR FROM FINAL ACCEPTANCE.
6. [PLANTING SHALL FOLLOW NCDOT STANDARD SPECIFICATIONS AS OUTLINED IN SECTION 1670. PLANTING SEASON IS OCTOBER 15 - MARCH 15, UNLESS OTHERWISE NOTED OR APPROVED BY NCDOT ENGINEER.] ALL PLANTS THAT ARE UNABLE TO BE IMMEDIATELY PLANTED SHALL BE STORED IN A PROTECTED AREA OUT OF DIRECT SUN AND WIND. PLANTS SHALL BE EVENLY AND CONSISTENTLY WATERED, AS NEEDED, TO PREVENT DRYING OF ROOTS. ROOT BALLS OF B&B STOCK SHALL BE COVERED WITH AT LEAST 4 INCHES OF HARDWOOD MULCH TO MAINTAIN MOISTURE IN ROOTS.
7. THE CONTRACTOR SHALL VERIFY ALL PLANT QUANTITIES SHOWN ON PLANS AND CLARIFY ANY DISCREPANCIES WITH LANDSCAPE ARCHITECT PRIOR TO PURCHASING PLANTS. CONTRACTOR SHALL TAG ALL TREES (AS DESIGNATED IN THE MASTER PLANT LIST) AT THE NURSERY FOR APPROVAL BY THE LANDSCAPE ARCHITECT PRIOR TO PURCHASING PLANTS.
8. LANDSCAPE ARCHITECT SHALL BE NOTIFIED IN WRITING OF ANY PROPOSED PLANT SUBSTITUTIONS BY THE CONTRACTOR. NO SUBSTITUTIONS SHALL BE MADE UNDER ANY CIRCUMSTANCES WITHOUT PRIOR APPROVAL BY THE LANDSCAPE ARCHITECT OR OWNER'S REPRESENTATIVE.
9. ALL PLANTS AND PLANTING BEDS ARE TO BE LOCATED BY SCALED DIMENSIONS FROM BUILDINGS, CURBS, PAVEMENTS, ETC. SPECIFIC ATTENTION SHALL BE GIVEN TO ENSURE THAT PLANTS INDIVIDUALLY SHOWN ON THE PLAN ARE ACCURATELY LOCATED. LOCATION OF ALL PLANTS SHALL BE REVIEWED IN THE FIELD BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION. CONTRACTOR SHALL PROVIDE 48 HOURS NOTICE FOR REVIEW.
10. A PRE-EMERGENT HERBICIDE SHALL BE APPLIED TO ALL NEW PLANTING BEDS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND ALLOWED TO DISSIPATE PRIOR TO INSTALLATION OF ANY PLANT MATERIAL.
11. ALL LANDSCAPE AREAS ARE TO BE GRADED FOR POSITIVE DRAINAGE AND TO ENSURE NO STANDING WATER. SEE GRADING PLAN FOR SPECIFIC GRADING INFORMATION.
12. ESTABLISH AND MAINTAIN TOP OF GRADE BELOW ADJACENT CURBS, WALKWAYS AND OTHER HARDSCAPE AREAS TO ALLOW FOR INSTALLATION OF MULCH.
13. ALL PLANTING BEDS ARE TO BE COVERED WITH MULCH TO A MINIMUM DEPTH OF 3 INCHES. MULCH SHALL BE DARK BROWN, DESIGNER-GRADE, DOUBLE-SHREDDED HARDWOOD. NO PINE STRAW IS PERMITTED. CONTRACTOR TO SUBMIT A SAMPLE FOR APPROVAL BY LANDSCAPE ARCHITECT PRIOR TO PURCHASE AND DELIVERY TO PROJECT SITE.
14. FINISH OFF 2-4' CLEAR ZONE AROUND TREES WITH A 3" LAYER OF MULCH, BUT DO NOT PLACE UP AGAINST OR MOUND AROUND THE ROOT FLARE.
15. MIXED GROUNDCOVER AND PLANTS SPECIFIED FOR MASS PLANTINGS SHALL BE PLANTED IN GROUPS OF 3-7 AND LOCATED AS REQUIRED TO PROVIDE A GENERAL MIXING OF SPECIES. DO NOT PLANT IN ROWS OR REPETITIVE PATTERNS UNLESS OTHERWISE DIRECTED.
16. ALL TREES ADJACENT TO PEDESTRIAN WALKWAYS AND IN SIGHT TRIANGLES SHALL BE UNDER-TRIMMED SUFFICIENTLY TO ALLOW CLEAR SIGHT AND PEDESTRIAN ACCESS UP TO 6 FEET ABOVE SIDEWALK ELEVATION. ALL PRUNING SHALL BE PERFORMED BY A CERTIFIED ARBORIST, AND ADHERE TO THE ANSI A300 PRUNING STANDARD. PRUNING CUTS ARE TO BE DELIBERATE AND TARGETED ONLY TO THE NECESSARY BRANCHES IN ORDER TO SATISFY SIGHT AND CLEARANCE REQUIREMENTS WHILE MAINTAINING THE INTEGRITY OF THE TREES.
17. CONTRACTOR IS RESPONSIBLE FOR FULLY MAINTAINING ALL PLANTING (INCLUDING, BUT NOT LIMITED TO WATERING, MULCHING, SPRAYING, FERTILIZING, ETC.) OF THE PLANTING AREAS UNTIL FINAL ACCEPTANCE.
18. ANY PLANT WHICH DIES, TURNS BROWN OR DEFOLIATES PRIOR TO FINAL ACCEPTANCE OF THE WORK SHALL BE PROMPTLY REMOVED FROM THE SITE AND REPLACED WITH MATERIAL OF THE SAME SPECIES, IN ACCORDANCE WITH THE APPROPRIATE PLANTING SEASON, QUANTITY AND SIZE TO MEET PLAN SPECIFICATIONS.
19. UTILITIES SHOWN ON THE LANDSCAPE DRAWINGS ARE FOR REFERENCE ONLY. SEE UTILITY DRAWINGS FOR EXISTING AND PROPOSED UTILITY LOCATIONS. THE CONTRACTOR MUST LOCATE AND VERIFY ALL SUCH INFORMATION, INCLUDING INFORMATION NOT SHOWN ON THE PLANS, BY CONTACTING THE INDIVIDUAL UTILITY COMPANY & INVESTIGATING THE SITE TO DETERMINE THE EXACT LOCATION OF UTILITY LINES AND STRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING, AT HIS OWN EXPENSE, AND TO THE SATISFACTION OF THE PROJECT OWNER AND THE UTILITY OWNER, DAMAGE TO ANY UTILITY CAUSED BY HIS WORK. HE SHALL IMMEDIATELY NOTIFY THE OWNER AND THE UTILITY OWNER OF ANY DAMAGE TO ANY UTILITY BY HIS OPERATION.
20. THE SITE SHALL BE STABILIZED AND SEEDED PRIOR TO THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY (CO).
21. ALL ABOVE-GROUND HVAC EQUIPMENT AND UTILITY DEVICES (TO INCLUDE, BUT NOT LIMITED TO TELEPHONE AND CABLE PEDESTALS; ELECTRICAL TRANSFORMERS; BACKFLOW-DEVICE HOTBOX; ETC) SHALL BE SCREENED FROM OFF-SITE VIEW BY EVERGREEN SHRUBS, FENCE, OR WALL.

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CONSTRUCTION DRAWINGS
WATER STREET
STORMWATER
IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

DocuSigned by: Daniel Whitley 2077
5/31/2023
NORTH CAROLINA LANDSCAPE ARCHITECT 2077 DANIEL B. WHITLEY

SCALE: 1 inch = 10 ft.

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

PLANTING PLAN

9

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION A: SELF-INSPECTION

Self-inspections are required during normal business hours in accordance with the table below. When adverse weather or site conditions would cause the safety of the inspection personnel to be in jeopardy, the inspection may be delayed until the next business day on which it is safe to perform the inspection. In addition, when a storm event of equal to or greater than 1.0 inch occurs outside of normal business hours, the self-inspection shall be performed upon the commencement of the next business day. Any time when inspections

[redacted]

NOTE: The rain inspection resets the required 7 calendar day inspection requirement.

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION B: RECORDKEEPING

1. E&SC Plan Documentation

The approved E&SC plan as well as any approved deviation shall be kept on the site. The approved E&SC plan must be kept up-to-date throughout the coverage under this permit. The following items pertaining to the E&SC plan shall be kept on site and available for

[redacted]

in addition to the E&SC plan documents above, the following items shall be kept on the site and available for inspectors at all times during normal business hours, unless the Division provides a site-specific exemption based on unique site conditions that make this requirement not practical:

(a) This General Permit as well as the Certificate of Coverage, after it is received.

(b) Records of inspections made during the previous twelve months. The permittee shall record the required observations on the Inspection Record Form provided by the Division or a similar inspection form that includes all the required elements. Use of electronically-available records in lieu of the required paper copies will be allowed if shown to provide equal access and utility as the hard-copy records.

3. Documentation to be Retained for Three Years

All data used to complete the e-NOI and all inspection records shall be maintained for a period of three years after project completion and made available upon request. [40 CFR 122.41]

PART III
SELF-INSPECTION, RECORDKEEPING AND REPORTING

SECTION C: REPORTING

1. Occurrences that Must be Reported

Permittees shall report the following occurrences:

(a) Visible sediment deposition in a stream or wetland.

(b) Oil spills if:
- They are 25 gallons or more,
- They are less than 25 gallons but cannot be cleaned up within 24 hours,
- They cause sheen on surface waters (regardless of volume), or
- They are within 100 feet of surface waters (regardless of volume).

(c) Releases of hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (Ref: 40 CFR 110.3 and 40 CFR 117.3) or Section 102 of CERCLA (Ref: 40 CFR 302.4) or G.S. 143-215.85.

(d) Anticipated bypasses and unanticipated bypasses.

(e) Noncompliance with the conditions of this permit that may endanger health or the environment.

2. Reporting Timeframes and Other Requirements

After a permittee becomes aware of an occurrence that must be reported, he shall contact the appropriate Division regional office within the timeframes and in accordance with the other requirements listed below. Occurrences outside normal business hours may also be reported to the Department's Environmental Emergency Center personnel at (800) [redacted]

[redacted]

PART II, SECTION G, ITEM (4)
DRAW DOWN OF SEDIMENT BASINS FOR MAINTENANCE OR CLOSE OUT

Sediment basins and traps that receive runoff from drainage areas of one acre or more shall use outlet structures that withdraw water from the surface when these devices need to be drawn down for maintenance or close out unless this is infeasible. The circumstances in which it is not feasible to withdraw water from the surface shall be rare (for example, times with extended cold weather). Non-surface withdrawals from sediment basins shall be allowed only when all of the following criteria have been met:

(a) The E&SC plan authority has been provided with documentation of the non-surface withdrawal and the specific time periods or conditions in which it will occur. The non-surface withdrawal shall not commence until the E&SC plan authority has approved these items,
(b) The non-surface withdrawal has been reported as an anticipated bypass in accordance with Part III, Section C, Item (2)(c) and (d) of this permit,
(c) Dewatering discharges are treated with controls to minimize discharges of pollutants from stormwater that is removed from the sediment basin. Examples of appropriate controls include properly sited, designed and maintained dewatering tanks, weir tanks, and filtration systems,
(d) Vegetated, upland areas of the sites or a properly designed stone pad is used to the extent feasible at the outlet of the dewatering treatment devices described in Item (c) above,
(e) Velocity dissipation devices such as check dams, sediment traps, and riprap are provided at the discharge points of all dewatering devices, and
(f) Sediment removed from the dewatering treatment devices described in Item (c) above is disposed of in a manner that does not cause deposition of sediment into waters of the United States.

NCG01 SELF-INSPECTION, RECORDKEEPING AND REPORTING

EFFECTIVE: 04/01/19

GROUND STABILIZATION AND MATERIALS HANDLING PRACTICES FOR COMPLIANCE WITH THE NCG01 CONSTRUCTION GENERAL PERMIT

Implementing the details and specifications on this plan sheet will result in the construction activity being considered compliant with the Ground Stabilization and Materials Handling sections of the NCG01 Construction General Permit (Sections E and F, respectively). The permittee shall comply with the Erosion and Sediment Control plan approved by the delegated authority having jurisdiction. All details and specifications shown on this sheet may not apply depending on site conditions and the delegated authority having jurisdiction.

SECTION E: GROUND STABILIZATION

Required Ground Stabilization Timeframes		
Site Area Description	**Stabilize within this many calendar days after ceasing land disturbance**	**Timeframe variations**
(a) Perimeter dikes, swales, ditches, and perimeter slopes	7	None
(b) High Quality Water (HQW) Zones	7	None
(c) Slopes steeper than 3:1	7	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed
(d) Slopes 3:1 to 4:1	14	-7 days for slopes greater than 50' in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed
(e) Areas with slopes flatter than 4:1	14	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones -10 days for Falls Lake Watershed unless there is zero slope

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

GROUND STABILIZATION SPECIFICATION

Stabilize the ground sufficiently so that rain will not dislodge the soil. Use one of the techniques in the table below:

Temporary Stabilization	Permanent Stabilization
• Temporary grass seed covered with straw or other mulches and tackifiers • Hydroseeding • Rolled erosion control products with or without temporary grass seed • Appropriately applied straw or other mulch • Plastic sheeting	• Permanent grass seed covered with straw or other mulches and tackifiers • Geotextile fabrics such as permanent soil reinforcement matting • Hydroseeding • Shrubs or other permanent plantings covered with mulch • Uniform and evenly distributed ground cover sufficient to restrain erosion • Structural methods such as concrete, asphalt or retaining walls • Rolled erosion control products with grass seed

POLYACRYLAMIDES (PAMS) AND FLOCCULANTS

1. Select flocculants that are appropriate for the soils being exposed during construction, selecting from the *NC DWR List of Approved PAMS/Flocculants*.
2. Apply flocculants at or before the inlets to Erosion and Sediment Control Measures.
3. Apply flocculants at the concentrations specified in the *NC DWR List of Approved PAMS/Flocculants* and in accordance with the manufacturer's instructions.
4. Provide ponding area for containment of treated Stormwater before discharging offsite.
5. Store flocculants in leak-proof containers that are kept under storm-resistant cover or surrounded by secondary containment structures.

EQUIPMENT AND VEHICLE MAINTENANCE

1. Maintain vehicles and equipment to prevent discharge of fluids.
2. Provide drip pans under any stored equipment.
3. Identify leaks and repair as soon as feasible, or remove leaking equipment from the project.
4. Collect all spent fluids, store in separate containers and properly dispose as hazardous waste (recycle when possible).
5. Remove leaking vehicles and construction equipment from service until the problem has been corrected.
6. Bring used fuels, lubricants, coolants, hydraulic fluids and other petroleum products to a recycling or disposal center that handles these materials.

LITTER, BUILDING MATERIAL AND LAND CLEARING WASTE

1. Never bury or burn waste. Place litter and debris in approved waste containers.
2. Provide a sufficient number and size of waste containers (e.g dumpster, trash receptacle) on site to contain construction and domestic wastes.
3. Locate waste containers at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
4. Locate waste containers on areas that do not receive substantial amounts of runoff from upland areas and does not drain directly to a storm drain, stream or wetland.
5. Cover waste containers at the end of each workday and before storm events or provide secondary containment. Repair or replace damaged waste containers.
6. Anchor all lightweight items in waste containers during times of high winds.
7. Empty waste containers as needed to prevent overflow. Clean up immediately if containers overflow.
8. Dispose waste off-site at an approved disposal facility.
9. On business days, clean up and dispose of waste in designated waste containers.

PAINT AND OTHER LIQUID WASTE

1. Do not dump paint and other liquid waste into storm drains, streams or wetlands.
2. Locate paint washouts at least 50 feet away from storm drain inlets and surface waters unless no other alternatives are reasonably available.
3. Contain liquid wastes in a controlled area.
4. Containment must be labeled, sized and placed appropriately for the needs of site.
5. Prevent the discharge of soaps, solvents, detergents and other liquid wastes from construction sites.

PORTABLE TOILETS

1. Install portable toilets on level ground, at least 50 feet away from storm drains, streams or wetlands unless there is no alternative reasonably available. If 50 foot offset is not attainable, provide relocation of portable toilet behind silt fence or place on a gravel pad and surround with sand bags.
2. Provide staking or anchoring of portable toilets during periods of high winds or in high foot traffic areas.
3. Monitor portable toilets for leaking and properly dispose of any leaked material. Utilize a licensed sanitary waste hauler to remove leaking portable toilets and replace with properly operating unit.

EARTHEN STOCKPILE MANAGEMENT

1. Show stockpile locations on plans. Locate earthen-material stockpile areas at least 50 feet away from storm drain inlets, sediment basins, perimeter sediment controls and surface waters unless it can be shown no other alternatives are reasonably available.
2. Protect stockpile with silt fence installed along toe of slope with a minimum offset of five feet from the toe of stockpile.
3. Provide stable stone access point when feasible.
4. Stabilize stockpile within the timeframes provided on this sheet and in accordance with the approved plan and any additional requirements. Soil stabilization is defined as vegetative, physical or chemical coverage techniques that will restrain accelerated erosion on disturbed soils for temporary or permanent control needs.

HERBICIDES, PESTICIDES AND RODENTICIDES

1. Store and apply herbicides, pesticides and rodenticides in accordance with label restrictions.
2. Store herbicides, pesticides and rodenticides in their original containers with the label, which lists directions for use, ingredients and first aid steps in case of accidental poisoning.
3. Do not store herbicides, pesticides and rodenticides in areas where flooding is possible or where they may spill or leak into wells, stormwater drains, ground water or surface water. If a spill occurs, clean area immediately.
4. Do not stockpile these materials onsite.

HAZARDOUS AND TOXIC WASTE

1. Create designated hazardous waste collection areas on-site.
2. Place hazardous waste containers under cover or in secondary containment.
3. Do not store hazardous chemicals, drums or bagged materials directly on the ground.

CONCRETE WASHOUTS

1. Do not discharge concrete or cement slurry from the site.
2. Dispose of, or recycle settled, hardened concrete residue in accordance with local and state solid waste regulations and at an approved facility.
3. Manage washout from mortar mixers in accordance with the above item and in addition place the mixer and associated materials on impervious barrier and within lot perimeter silt fence.
4. Install temporary concrete washouts per local requirements, where applicable. If an alternate method or product is to be used, contact your approval authority for review and approval. If local standard details are not available, use one of the two types of temporary concrete washouts provided on this detail.
5. Do not use concrete washouts for dewatering or storing defective curb or sidewalk sections. Stormwater accumulated within the washout may not be pumped into or discharged to the storm drain system or receiving surface waters. Liquid waste must be pumped out and removed from project.
6. Locate washouts at least 50 feet from storm drain inlets and surface waters unless it can be shown that no other alternatives are reasonably available. At a minimum, install protection of storm drain inlet(s) closest to the washout which could receive spills or overflow.
7. Locate washouts in an easily accessible area, on level ground and install a stone entrance pad in front of the washout. Additional controls may be required by the approving authority.
8. Install at least one sign directing concrete trucks to the washout within the project limits. Post signage on the washout itself to identify this location.
9. Remove leavings from the washout when at approximately 75% capacity to limit overflow events. Replace the tarp, sand bags or other temporary structural components when no longer functional. When utilizing alternative or proprietary products, follow manufacturer's instructions.
10. At the completion of the concrete work, remove remaining leavings and dispose of in an approved disposal facility. Fill pit, if applicable, and stabilize any disturbance caused by removal of washout.
11. See detail this sheet.

NCG01 GROUND STABILIZATION AND MATERIALS HANDLING

EFFECTIVE: 04/01/19

STABILIZATION REQUIREMENTS:

Stabilization for this project shall comply with the time frame guidelines as specified by the NCG-010000 general construction permit effective April 1, 2019 issued by the North Carolina Department of Environmental Quality Division of Water Resources. Temporary or permanent ground cover stabilization shall occur within 7 calendar days from the last land-disturbing activity, with the following exceptions in which temporary or permanent ground cover shall be provided in 14 calendar days from the last land-disturbing activity:

- Slopes between 2:1 and 3:1, with a slope length of 10 ft. or less
- Slopes 3:1 or flatter, with a slope of length of 50 ft. or less
- Slopes 4:1 or flatter

The stabilization timeframe for High Quality Water (HQW) Zones shall be 7 calendar days with no exceptions for slope grades or lengths. High Quality Water Zones (HQW) Zones are defined by North Carolina Administrative Code 15A NCAC 04A.0105 (25). Temporary and permanent ground cover stabilization shall be achieved in accordance with the provisions in this contract and as directed.

SEEDING AND MULCHING: (East)
The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

All Roadway Areas

March 1 - August 31		September 1 - February 28	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		September 1 - February 28	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)

500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

06 Dust	Escalade	Justice	Serengeti	2nd Millennium
Essential	Kalahari	Shelby	3rd Millennium	Evergreen 2
Kitty Hawk 2000	Sheridan	Apache III	Falcon IV	Legitimate
Signia	Avenger	Falcon NG	Lexington	Silver Hawk
Barlexas	Falcon V	LSD	Silverstar	
Barlexas II	Faith	Magellan	Shenandoah Elite	Bar Fa
Fat Cat	Matador	Sidewinder	Barrera	Festnova
Millennium SRP	Skyline	Barrington	Fidelity	Monet
Solara	Barrobusto	Finelawn Elite	Mustang 4	Southern Choice II
Barvado	Finelawn Xpress	Ninja 2	Speedway	Biltmore
Finesse II	Ol' Glory	Spyder LS	Bingo	Firebird
Olympic Gold	Sunset Gold	Bizem	Firecracker LS	Padre
Taccoa	Blackwatch	Firenza	Patagonia	Tanzania
Blade Runner II	Five Point	Pedigree	Trio	Bonsai
Focus	Picasso	Tahoe II	Braveheart	Forte
Piedmont	Talladega	Bravo	Garrison	Plantation
Tarheel	Bullseye	Gazelle II	Proseeds 5301	Terrano
Cannavaro	Gold Medallion	Prospect	Titan ltd	Catalyst
Grande 3	Pure Gold	Titanium LS	Cayenne	Greenbrooks
Quest	Tracer	Cessane Rz	Greenkeeper	Raptor II
Traverse SRP	Chipper	Gremlin	Rebel Exeda	Tulsa Time
Cochise IV	Greystone	Rebel Sentry	Turbo	Constitution
Guardian 21	Rebel IV	Turbo RZ	Corgi	Guardian 41
Regiment II	Tuxedo RZ	Corona	Hemi	Regenerate
Ultimate	Coyote	Honky Tonk	Rendition	Venture
Darlington	Hot Rod	Rhambler 2 SRP	Umbrella	Davinci
Hunter	Rembrandt	Van Gogh	Desire	Inferno
Reunion	Watchdog	Dominion	Innovator	Riverside
Wolfpack II	Dynamic	Integrity	RNP	Xtremegreen
Dynasty	Jaguar 3	Rocket	Endeavor	Jamboree
Scorpion				

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis and as directed.

TEMPORARY SEEDING:
Fertilizer shall be the same analysis as specified for Seeding and Mulching and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. Sweet Sudan Grass, German Millet or Browntop Millet shall be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

FERTILIZER TOPDRESSING:
Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis and as directed.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. A different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis and as directed.

SUPPLEMENTAL SEEDING:
The kinds of seed and proportions shall be the same as specified for Seeding and Mulching, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MULCHING:
Mulch and lock shall be in accordance with NCDOT Specification Section 1060-5. mulch shall be applied in accordance with NCDOT Specification 1615. An approved rolled erosion control product (RECP), May be used in lieu of straw mulch.

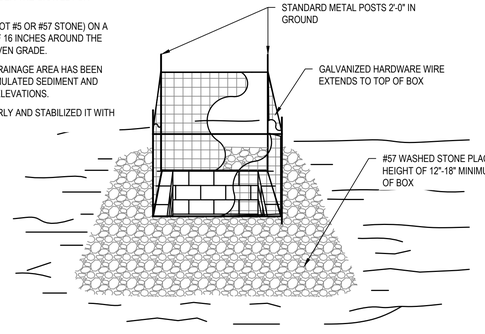
MOWING:
The minimum mowing height on this project shall be 4 inches.

NOTES:

1. UNIFORMLY GRADE A SHALLOW DEPRESSION APPROACHING THE INLET.
2. DRIVE 5-FOOT STEEL POSTS 2 FEET INTO THE GROUND SURROUNDING THE INLET. SPACE POSTS EVENLY AROUND THE PERIMETER OF THE INLET A MAXIMUM OF 4 FEET APART.
3. SURROUND THE POSTS WITH WIRE MESH HARDWARE CLOTH. SECURE THE WIRE MESH TO THE STEEL POSTS AT THE TOP, MIDDLE, AND BOTTOM. PLACE A 2-FOOT FLAP OF THE WIRE MESH UNDER THE GRAVEL FOR ANCHORING.
4. PLACE CLEAN GRAVEL (NC DOT #5 OR #57 STONE) ON A 2:1 SLOPE WITH A HEIGHT OF 16 INCHES AROUND THE WIRE AND SMOOTH TO AN EVEN GRADE.
5. ONCE THE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED, REMOVE ACCUMULATED SEDIMENT AND ESTABLISH FINAL GRADING ELEVATIONS.
6. COMPACT THE AREA PROPERLY AND STABILIZED IT WITH GROUNDCOVER.

MAINTENANCE NOTE:

INSPECT INLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (½ INCH OR GREATER) RAINFALL EVENT. CLEAR THE MESH WIRE OF ANY DEBRIS OR OTHER OBJECTS TO PROVIDE ADEQUATE FLOW FOR SUBSEQUENT RAINS. TAKE CARE NOT TO DAMAGE OR UNDERCUT THE WIRE MESH DURING SEDIMENT REMOVAL. REPLACE STONE AS NEEDED.



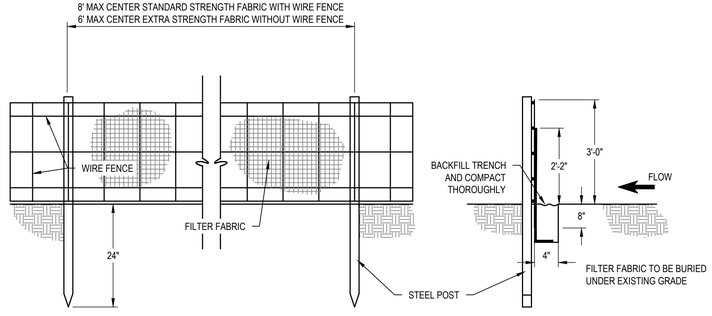
HARDWARE CLOTH & GRAVEL INLET PROTECTION

NOT TO SCALE

SEED BED PREPARATION:

1. CHISEL COMPACTED AREAS AND SPREAD TOPSOIL 3 INCHES DEEP OVER ADVERSE SOIL CONDITIONS, WITH STOCKPILED TOPSOIL. CONTRACTOR SHALL RESERVE SUFFICIENT TOPSOIL FOR SEEDBED PREPARATION.
2. RIP THE ENTIRE AREA TO 6 INCH DEPTH.
3. REMOVE ALL LOOSE ROCK, ROOTS, AND OTHER OBSTRUCTIONS LEAVING SURFACE REASONABLY SMOOTH AND UNIFORM.
4. APPLY AGRICULTURAL LIME, FERTILIZER, AND SUPER-PHOSPHATE UNIFORMLY AND MIX WITH SOIL (SEE BELOW*).
5. CONTINUE TILLAGE UNTIL A WELL-PULVERIZED, FIRM, REASONABLY UNIFORM SEEDBED IS PREPARED 4 TO 6 INCHES DEEP.
6. SEED ON A FRESHLY PREPARED SEEDBED AND COVER SEED LIGHTLY WITH SEEDING EQUIPMENT OR CULTIPACK AFTER SEEDING.
7. MULCH IMMEDIATELY AFTER SEEDING AND ANCHOR MULCH.
8. INSPECT ALL SEEDED AREAS AND MAKE NECESSARY REPAIRS OR RESEEDINGS WITHIN THE PLANTING SEASON, IF POSSIBLE. IF STAND IS LESS THAN 60% ESTABLISHED, THE ENTIRE AREA SHALL BE RESEEDED ACCORDING TO SPECIFICATIONS USING THE ORIGINAL LIME, FERTILIZER AND SEEDING RATES.
9. CONSULT A CONSERVATION INSPECTOR ON MAINTENANCE TREATMENT AND FERTILIZATION AFTER PERMANENT COVER IS ESTABLISHED.

*APPLY: AGRICULTURAL LIMESTONE - 2 TONS/ACRE (3 TONS/ACRE IN CLAY SOILS)
FERTILIZER - 1,000 LB/ACRE - 10-10-10
SUPER-PHOSPHATE - 500 LB/ACRE - 20% ANALYSIS MULCH - 2 TONS/ACRE - SMALL GRAIN STRAW ANCHOR - ASPHALT EMULSION @ 300 GALS/ACRE



MAINTENANCE NOTES:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

SILT FENCE

NOT TO SCALE

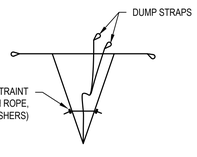
INSPECTION AND MONITORING RECORDS FOR ACTIVITIES UNDER STORMWATER GENERAL PERMIT NCG01000 AND SELF-INSPECTION RECORDS FOR LAND DISTURBING ACTIVITIES PER G.S. 113A-54.1

THE SEDIMENTATION POLLUTION CONTROL ACT WAS AMENDED IN 2006 TO REQUIRE THAT PERSONS RESPONSIBLE FOR LAND-DISTURBING ACTIVITIES INSPECT A PROJECT AFTER EACH PHASE OF THE PROJECT TO MAKE SURE THAT THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN IS BEING FOLLOWED. RULES DETAILING THE DOCUMENTATION OF THESE INSPECTIONS TOOK EFFECT OCTOBER 1, 2010. THE SELF-INSPECTION PROGRAM IS SEPARATE FROM THE WEEKLY SELF-MONITORING PROGRAM OF THE NPDES STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES. THE FOCUS OF THE SELF-INSPECTION REPORT IS THE INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES ACCORDING TO THE APPROVED PLAN. THE INSPECTIONS MUST BE CONDUCTED AFTER EACH PHASE OF THE PROJECT, AND CONTINUED UNTIL PERMANENT GROUND COVER IS ESTABLISHED IN ACCORDANCE WITH NCGS 113A-54.1 AND 15A NCAC 4B.0131.

PLEASE REFER TO THIS SHEET REGARDING SELF-INSPECTION AND REPORTING REQUIREMENTS. FORMS FOR DOCUMENTATION OF SELF INSPECTION AND REPORTING CAN BE FOUND AT *https://www.deq.nc.gov/about/divisions/energy-mineral-and-land-resources/erosion-and-sediment-control/erosion-and-sediment-control-forms*

TOTAL DISTURBED AREA = ~0.9 ACRES

ISTALLATION DETAIL



BAG DETAIL

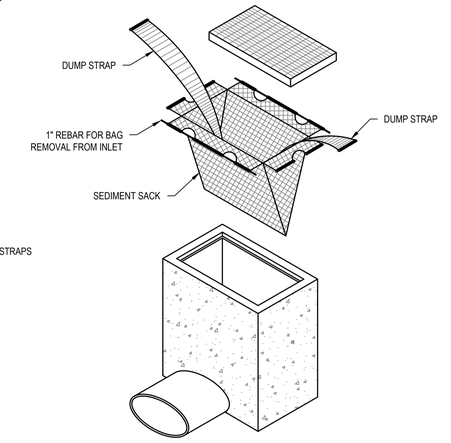
CONSTRUCTION SEQUENCE

1. FLAG THE LIMITS OF CONSTRUCTION AND THE LOCATIONS OF THE TEMPORARY EROSION CONTROL MEASURES AS SHOWN ON THE APPROVED PLAN.
2. INSTALL TEMPORARY EROSION CONTROL MEASURES. THE INSTALLATION OF THE TEMPORARY DEVICES MAY BE PHASED TO COMPLY WITH NOTES BELOW.

TO MINIMIZE POTENTIAL SEDIMENT TRANSPORT, THE AREA OF OPEN EXCAVATION SHALL BE LIMITED TO LENGTH OF PIPE AND NUMBER OF STRUCTURES WHICH CAN BE INSTALLED AND BACKFILLED IN ONE WORKING DAY. ALL TRENCHES MUST BE BACKFILLED AND INLET PROTECTION DEVICES INSTALLED WHERE INDICATED AT THE END OF EACH WORKDAY.

ACCESS TO RESIDENCES MUST BE MAINTAINED TO THE MAXIMUM EXTENT POSSIBLE. ROADWAY CLOSURES SHALL BE LIMITED TO ONE LANE OR TEMPORARY ACCESS PROVIDED.

3. SAW CUT PAVEMENT, CURB AND GUTTER, AND DRIVEWAY APRONS AS NEEDED FOR TRENCHING.
4. BEGIN EXCAVATION FOR STRUCTURES AND PIPE TRENCHES. SUITABLE MATERIAL EXCAVATED SHALL BE USED FOR BACKFILL OF STRUCTURES AND PIPE TRENCHES. ASPHALT, CONCRETE, MATERIAL NOT SUITABLE FOR BACKFILL, AND EXCESS EXCAVATION SHALL BE REMOVED FROM THE SITE (NO STOCKPILES ALLOWED).
5. AS WORK PROGRESSES, INSTALL TEMPORARY INLET PROTECTION AND ADDITIONAL MEASURES AS NEEDED TO PREVENT SEDIMENTATION OF AREAS OUTSIDE OF THE LIMITS OF DISTURBANCE.
6. ALL EROSION CONTROL DEVICES SHALL BE INSPECTED WEEKLY AND AFTER EVERY PRECIPITATION EVENT. NEEDED REPAIRS SHALL BE MADE IMMEDIATELY.
7. AS AREAS ARE BROUGHT TO FINISHED GRADE, STABILIZE WITH ASPHALT, CONCRETE OF SEED AND MUCH AS SHOWN ON THE PLAN. NOTE THE TIMETABLE FOR STABILIZATION REQUIREMENTS ON SHEET 4.2.
8. WHEN ALL AREAS OF THE SITE HAVE BEEN STABILIZED, CONTACT THE EROSION CONTROL SPECIALIST FOR APPROVAL TO REMOVE THE TEMPORARY DEVICES AND STABILIZE ANY RESULTING BARE SOIL AREAS.



MAINTENANCE NOTE:

INSPECT INLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (½ INCH OR GREATER) RAINFALL EVENT. CLEAR THE SEDIMENT SACK OF ANY DEBRIS OR OTHER OBJECTS TO PROVIDE ADEQUATE FLOW FOR SUBSEQUENT RAINS. TAKE CARE NOT TO DAMAGE THE SEDIMENT SACK DURING SEDIMENT REMOVAL. REPLACE DAMAGED SEDIMENT SACKS IMMEDIATELY.

INLET SEDIMENT CONTROL DEVICE

NOT TO SCALE

WithersRavenel
115 MacKenan Drive | Cary, NC 27511
License #: F-1479 | t: 919.469.3340 | www.withersravenel.com

our people • your success

TOWN OF SWANSBORO
401 W CORBETT AVENUE
SWANSBORO, NC 28584

CONSTRUCTION PLANS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL SEAL 049218 ENGINEER ANDREW WORTH
Docusigned by: Amanda Hollingsworth
9/13/2019

0 15 30
SCALE: 1 inch = 30 ft.

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

EROSION CONTROL

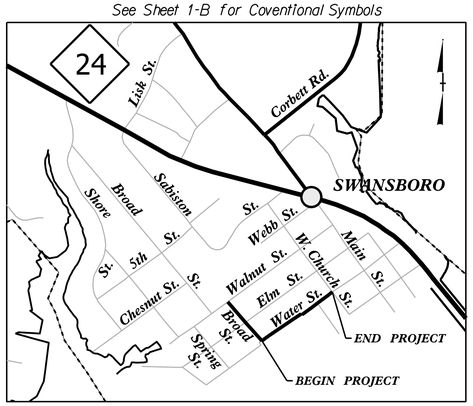
10

09/08/99

TIP PROJECT: N/A

CONTRACT: N/A

See Sheet 1-A For Index of Sheets
See Sheet 1-B for Coventional Symbols



VICINITY MAP
(N.T.S.)

TOWN OF SWANSBORO
ONSLOW COUNTY, NORTH CAROLINA

WATER STREET
DRAINAGE IMPROVEMENTS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	N/A	1	

STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION

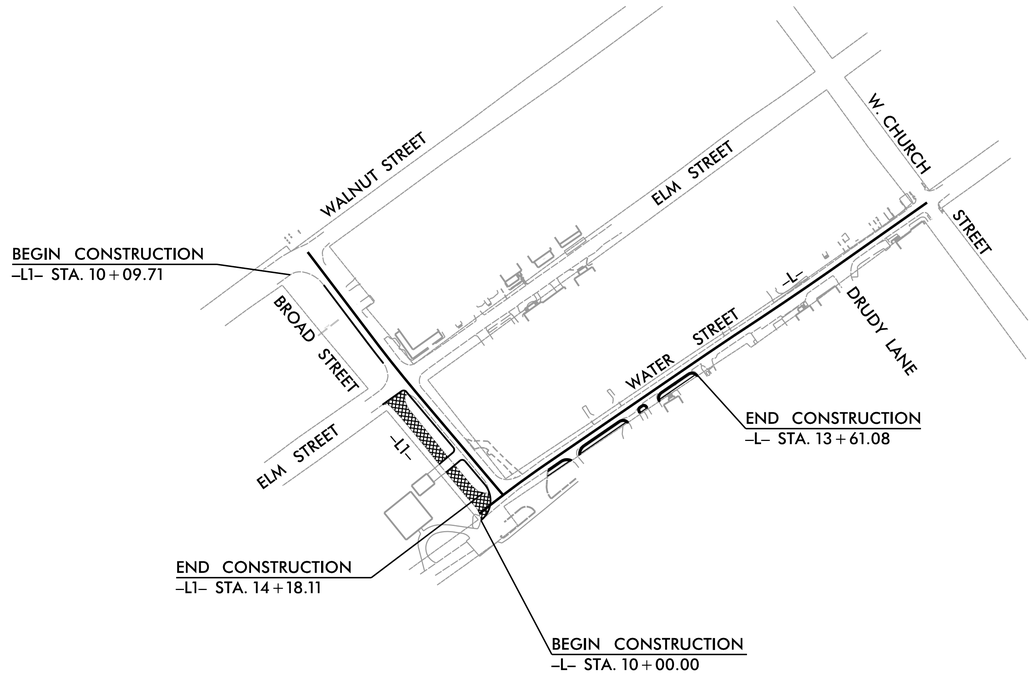
LOCATION: FROM WATER STREET TO W. CHURCH STREET AND BROAD STREET TO WATER STREET

TYPE OF WORK: GRADING, PAVING, DRAINAGE, & EROSION CONTROL

100% PLANS

SUBMITTAL DATE: MAY 31, 2023

NAD 83 NA 2011



THIS PROJECT IS WITHIN THE MUNICIPAL BOUNDARIES OF THE TOWN OF SWANSBORO.
CLEARING ON THIS PROJECT SHALL BE PERFORMED TO THE LIMITS ESTABLISHED BY METHOD II.

GRAPHIC SCALES

40 20 0 40 80
PLANS

40 20 0 40 80
PROFILE (HORIZONTAL)

4 2 0 4 8
PROFILE (VERTICAL)

DESIGN DATA

V = 40 MPH

PROJECT LENGTH

WATER STREET
= .068 MILES
BROAD STREET
= .078 MILES

TOWN OF SWANSBORO CONTACT:

PAULA WEBB
TOWN MANAGER
PH. 910–326–4428

NCDOT CONTACT:

KATIE HITE, P.E.
DIVISION 3 PROJECT DEVELOPMENT ENGINEER

PREPARED IN THE OFFICE OF:

WithersRavenel
Engineers | Planners | Surveyors
115 MacKenan Drive|Cary, NC 27511|t: 919.469.3340|license #: P-1479|www.withersravenel.com

2018 STANDARD SPECIFICATIONS

LETTING DATE:
?

TED KALLAM, P.E.
PROJECT ENGINEER

DOUGLAS PETRY
PROJECT DESIGNER

PROJECT ENGINEER

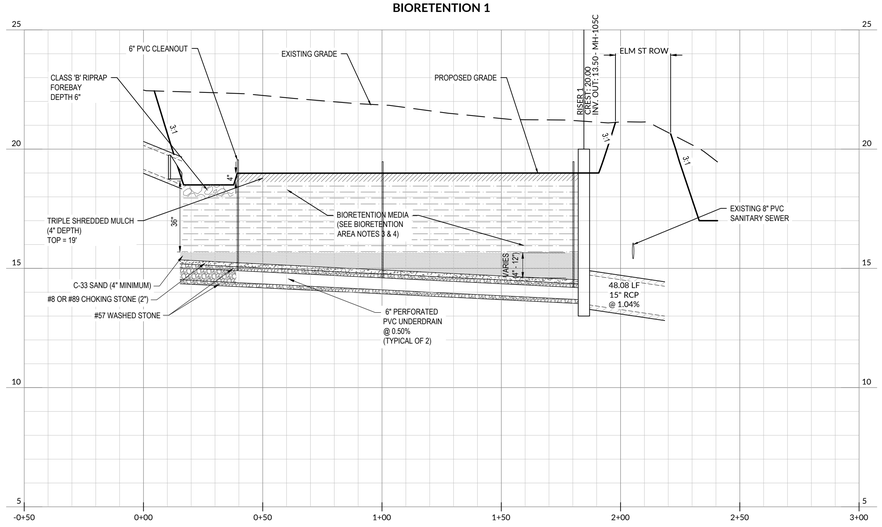
NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 032 TED A. KALLAM
Developed by Ted Kallam EAL 1032
5/[illegible] 102051080401

P.E.

SIGNATURE:

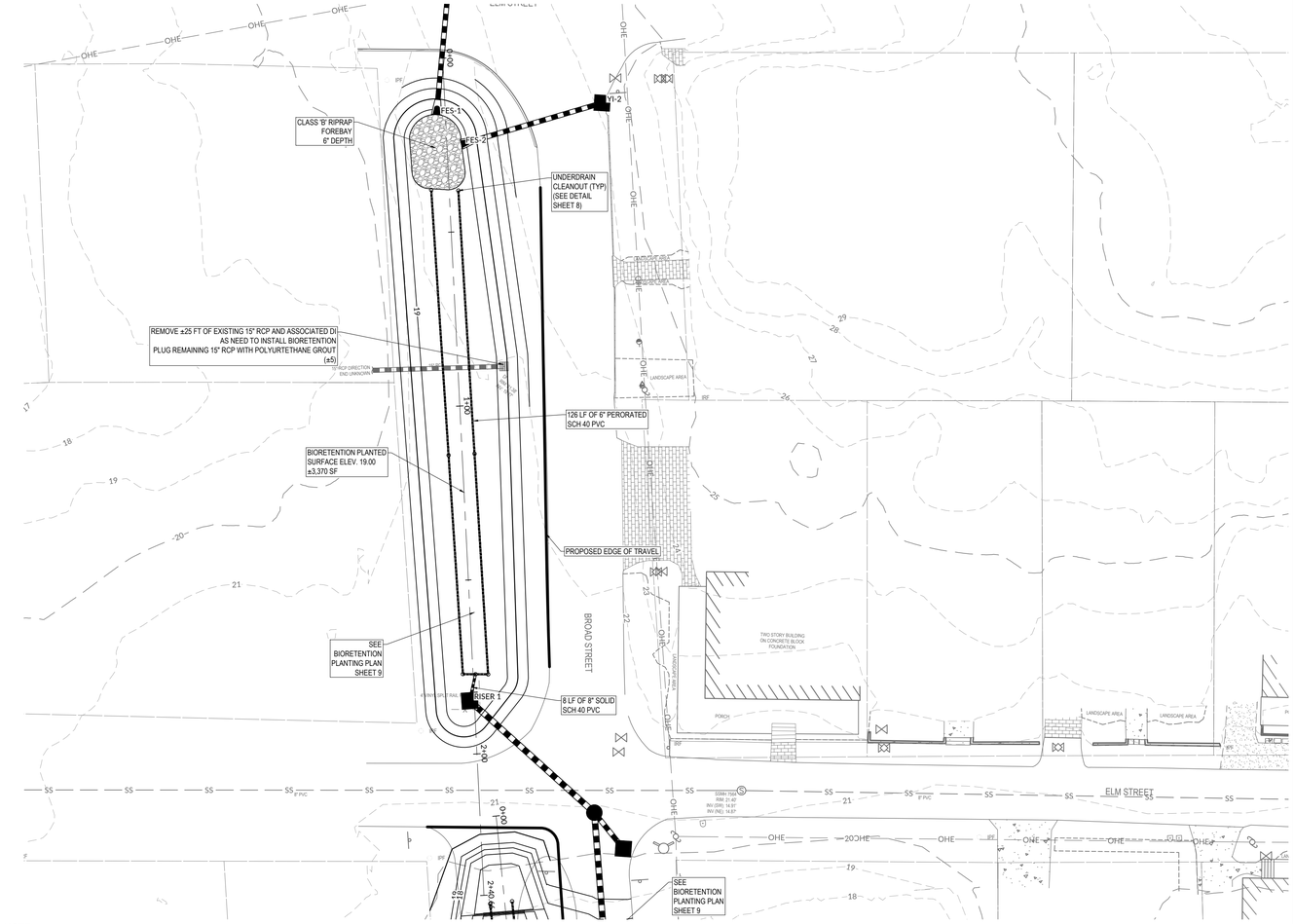
PREPARED FOR:

TOWN OF SWANSBORO
601 W. CORBETT AVENUE
SWANSBORO, NC 28584



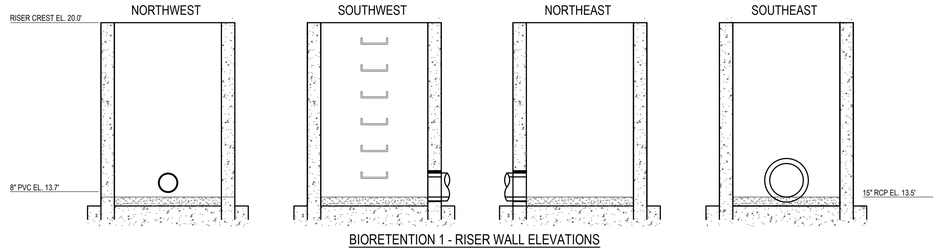
BIORETENTION 1 - PROFILE

PROFILE VIEW
GRAPHIC SCALE
1" = 30' HORZ.
1" = 3' VERT.
0 30 60

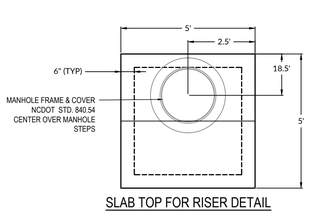


BIORETENTION 1 - PLAN VIEW

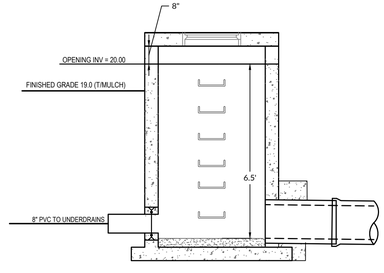
NOTE:
SEE SHEETS 2D-1, 4, AND 5 FOR PROPOSED STORM NETWORK ELEVATION INFORMATION.



BIORETENTION 1 - RISER WALL ELEVATIONS
NOT TO SCALE



SLAB TOP FOR RISER DETAIL
NOT TO SCALE



BIORETENTION 1 - DRAWDOWN DEVICE DETAIL
NOT TO SCALE

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CONSTRUCTION DRAWINGS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049218

Docusigned by:
Amanda Hollingsworth
5/31/2023

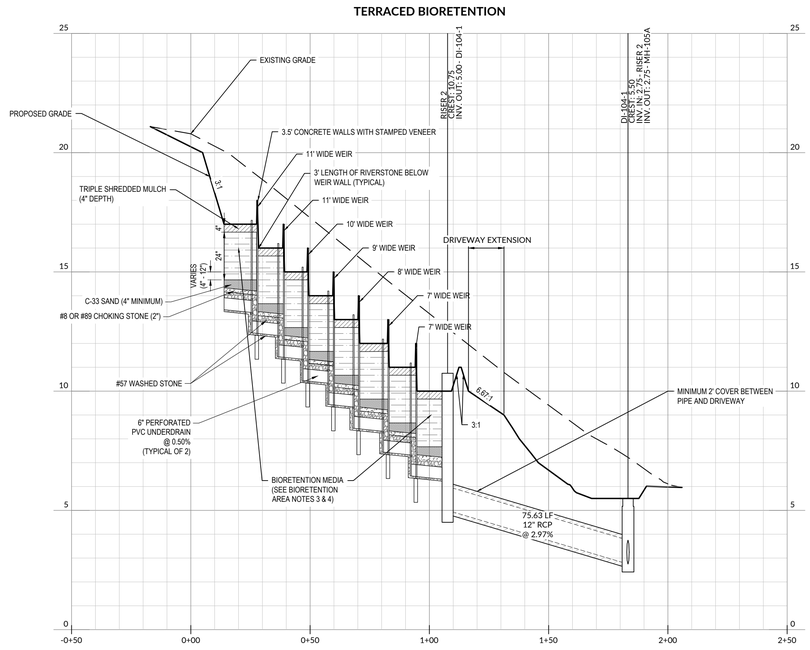
0 10 20
SCALE: 1 inch = 20 ft.

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

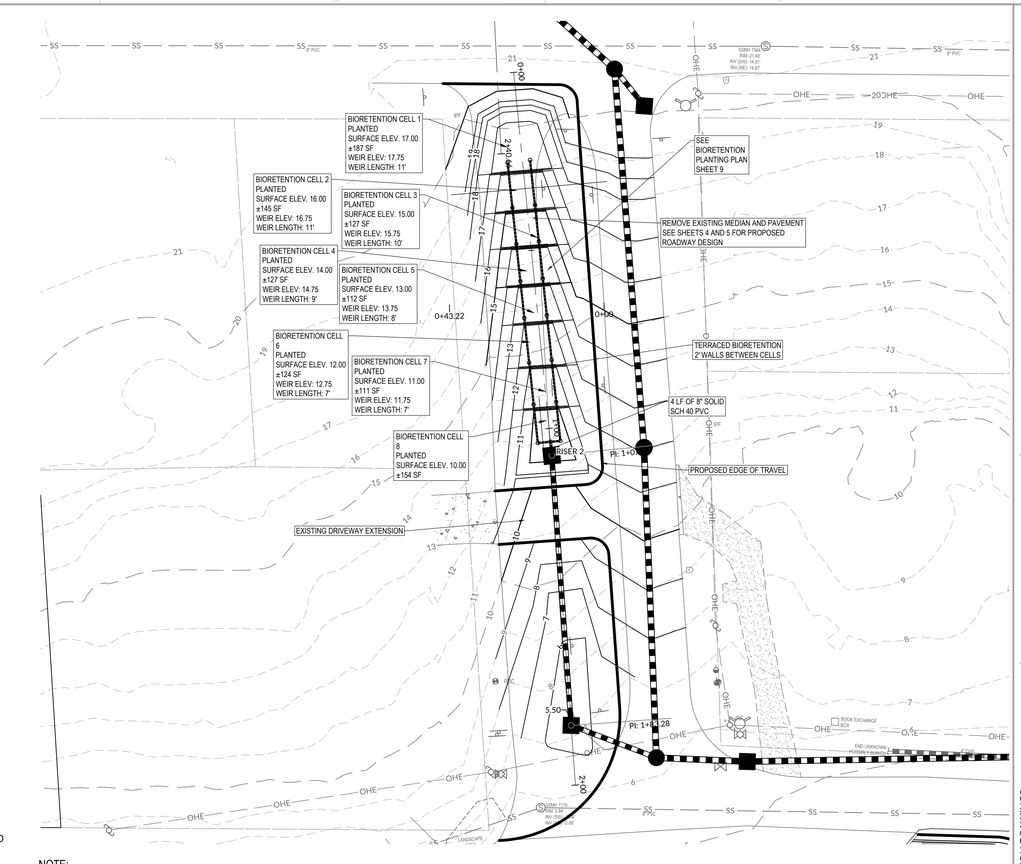
BIORETENTION 1

6



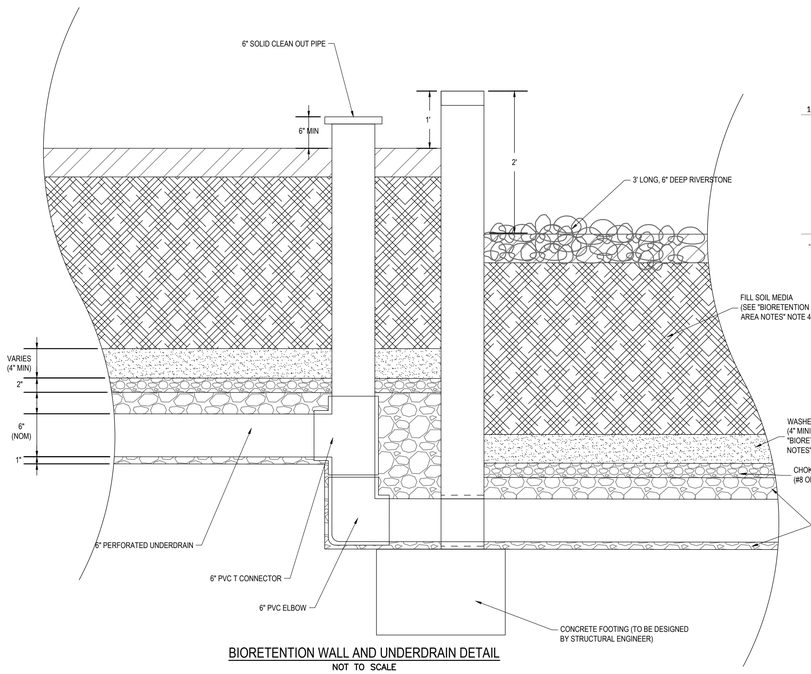
TERRACED BIORETENTION - PROFILE

PROFILE VIEW
GRAPHIC SCALE
1" = 30' HORZ.
1" = 3' VERT.
0 30 60

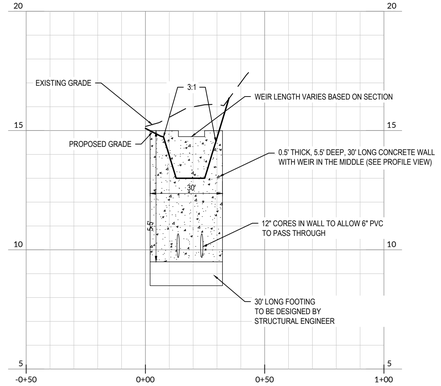


NOTE:
SEE SHEETS 2D-1, 4, AND 5 FOR PROPOSED STORM NETWORK ELEVATION INFORMATION

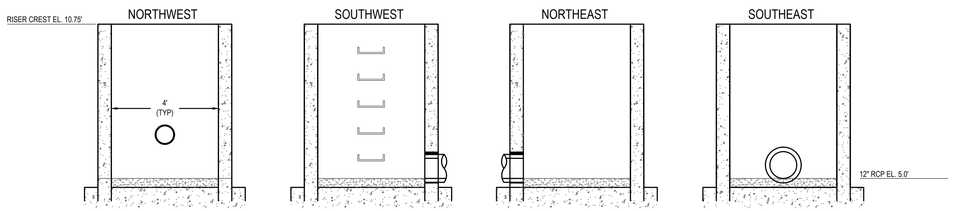
TERRACED BIORETENTION - PLAN VIEW



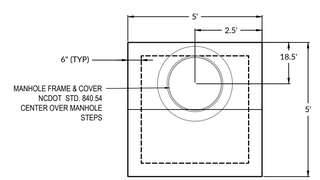
BIORETENTION WALL AND UNDERDRAIN DETAIL
NOT TO SCALE



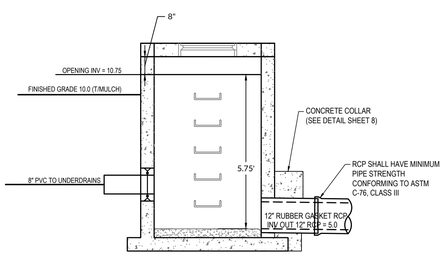
TERRACED BIORETENTION - CROSS SECTION



TERRACE BIORETENTION RISER WALL ELEVATIONS
NOT TO SCALE



SLAB TOP FOR RISER DETAIL
NOT TO SCALE



TERRACED BIORETENTION DRAWDOWN DEVICE DETAIL
NOT TO SCALE

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SWANSBORO, NC 28584

CONSTRUCTION DRAWINGS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 049218
DocuSigned by: Amanda Hollingsworth
5/31/2023

0 10 20 40
SCALE: 1 inch = 20 ft.

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

TERRACED BIORETENTION

7

STORMWATER CONTROL MEASURE (SCM) NOTES:

1. PRIOR TO BEGINNING CONSTRUCTION, ANY DISCREPANCIES IN THE PLANS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DESIGN ENGINEER FOR RESOLUTION.
2. ALL CONSTRUCTION TO BE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE (I.E., MINIMUM DESIGN CRITERIA), AND LOCAL STANDARDS AND SPECIFICATIONS HEREBY INCORPORATED BY REFERENCE.
3. STORMWATER CONTROL MEASURES ON THE PROJECT MUST BE LOCATED ON COMMON OPEN SPACE, HAVE AN ACCESS AND MAINTENANCE EASEMENTS LOCATED AROUND THEM AND INCLUDE AN OPERATIONS AND MAINTENANCE MANUAL AND MAINTENANCE AGREEMENT.
4. GEOTECHNICAL ENGINEER SHALL EVALUATE SOILS FOR SUITABILITY OF DAM CONSTRUCTION AND SLOPE STABILITY. PROFESSIONAL CERTIFICATION OF EMBANKMENT CONSTRUCTION IS REQUIRED FOR AS-BUILT CERTIFICATION.
5. EMBANKMENT AND SIDE SLOPES OF THE BASIN SHALL BE STABILIZED PER SEEDING SCHEDULE ON EROSION CONTROL DETAILS SHEET OR SODDED.
6. CONTRACTOR TO PROVIDE STRUCTURAL DRAWINGS TO THE DESIGN ENGINEER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
7. ONCE THE SITE HAS BEEN STABILIZED, CONTRACTOR SHALL OBTAIN APPROVAL BY EROSION CONTROL INSPECTOR IN ORDER TO REMOVE EROSION CONTROL DEVICES.
8. ONCE ALL SEDIMENT AND EROSION CONTROL DEVICES HAVE BEEN REMOVED, THE SCM SHALL BE CONVERTED TO A PERMANENT SCM.
   - ALL SEDIMENT SHALL BE REMOVED AND DISPOSED OF PROPERLY.
   - INTERIOR GRADING AND VEGETATED AREAS SHALL BE CONSTRUCTED PER THIS PLAN.
   - VEGETATED SHELF SHALL BE PLANTED PER PLANT SCHEDULE ON LANDSCAPE PLAN SHEET
   - FINAL CERTIFICATION OF THE SCM BY A PROFESSIONAL ENGINEER IS REQUIRED.

PRECAST CONCRETE MATERIALS NOTES:

1. ALL PRECAST CONCRETE STRUCTURES SHALL CONFORM TO ASTM C913 (RECTANGULAR) OR C478 (ROUND).
2. ALL REINFORCED CONCRETE PIPE SHALL CONFORM TO ASTM C76, CLASS III (UNLESS OTHERWISE NOTED).
   2.1. O-RING JOINTS SHALL CONFORM TO ASTM C443 & ASTM C361.
   2.2. NON O-RING JOINTS SHALL CONFORM TO ASTM C990.

CAST-IN-PLACE CONCRETE MATERIALS NOTES:

1. CONTRACTOR RESPONSIBLE FOR PROVIDING STRUCTURAL DESIGN OF WEIR WALLS FOR ENGINEERS APPROVAL PRIOR TO INSTALLATION.

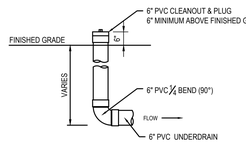
BIORETENTION AREA NOTES:

1. NO MECHANICAL COMPACTION OR HEAVY EQUIPMENT SHALL BE USED DURING MEDIA OR LANDSCAPING INSTALLATION. ALL CONSTRUCTION TO BE DONE WITH MINIMAL COMPACTION.
2. BOTTOM OF BIORETENTION AREA SHALL BE 2 FEET OR MORE FROM SEASONAL HIGH WATER TABLE. IF DURING CONSTRUCTION SEASONAL HIGH WATER TABLE IS FOUND TO BE WITHIN 2' OF BOTTOM OF BIORETENTION AREA, THEN ENGINEER SHALL BE NOTIFIED IMMEDIATELY FOR DESIGN MODIFICATIONS.
3. THE SCM SHALL BE CONVERTED TO A BIORETENTION AREA ONLY AFTER THE SITE HAS BEEN STABILIZED.
4. BIORETENTION AREA MEDIA SECTION TO COVER ENTIRE PLANTING SURFACE. BIORETENTION AREA MEDIA TO BE COMPRISED OF THE FOLLOWING:
   - 75% - 85% MEDIUM TO COARSE WASHED SAND (85% PREFERRED).
   - 8% - 10% FINES (CLAY & SILT) (8% PREFERRED).
   - 5% - 10% ORGANIC MATTER (7% PREFERRED)
   - PHOSPHORUS INDEX (P-INDEX) SHALL BE NO GREATER THAN 30.
   - THE MEDIA INFILTRATION RATE SHALL BE MINIMUM 2 IN/HR.
5. THE CHOKING STONE LAYER MAY BE MODIFIED TO USE #78 STONE IN LIEU OF #8 OR #89 STONE. THE CHOKING STONE LAYER SHALL THEN BE COMPRISED OF 3" OF #78 STONE AND THE WASHED SAND LAYER SHALL THEN HAVE A MINIMUM THICKNESS OF 3".
6. CONTRACTOR TO PROVIDE SOIL TEST DATA AND SAMPLES, FROM AN APPROVED TESTING LABORATORY, TO THE ENGINEER PRIOR TO CONSTRUCTION.
7. NO FERTILIZER IS TO BE ADDED.
8. BIORETENTION SHALL BE PLANTED PER LANDSCAPE PLAN ON SHEET L3.00.

UTILITY LOCATIONS SHOWN ARE FROM BEST AVAILABLE DATA SUPPLEMENTED WITH FIELD SURVEY OF MARKED UTILITIES, AND SHALL BE CONSIDERED APPROXIMATE AND POSSIBLY INCOMPLETE.
THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF ALL EXISTING UTILITIES, AND SHALL NOTIFY THE TOWN OF SWANSBORO AND THE ENGINEER OF ANY POSSIBLE CONFLICTS OR CLEARANCES LESS THAN REQUIRED. DUE CARE AND DILIGENCE SHALL BE TAKEN TO PRESERVE AND PROTECT ALL EXISTING UTILITIES TO ENSURE CONTINUOUS SERVICE.

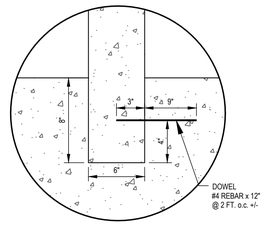
IF RELOCATION OF ANY UTILITIES ARE REQUIRED, TEMPORARY OR PERMANENT, THE CONTRACTOR SHALL COORDINATE ANY SUCH RELOCATION WITH THE CITY AND UTILITY OWNER.

SEE SHEET TMP-1 FOR GENERAL NOTES AND OTHER REQUIREMENTS.

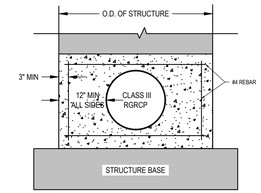


END OF UNDERDRAIN

BIORETENTION UNDERDRAIN CLEANOUT DETAIL
NOT TO SCALE

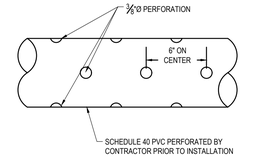


ANCHOR DETAIL (TYPICAL)
NOT TO SCALE

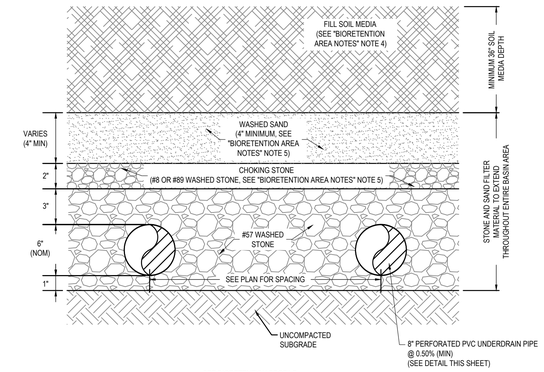


NOTE:
INSTALL VERTICAL DOWELS IN FOUNDATION CONCRETE AS HOLDING BARS FOR CONCRETE COLLAR REBAR.

CONCRETE COLLAR DETAIL
NOT TO SCALE



PERFORATED PVC UNDERDRAIN DETAIL
NOT TO SCALE



SEE BIORETENTION PROFILE
AT LEFT

BIORETENTION CROSS-SECTION DETAIL
NOT TO SCALE

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CONSTRUCTION DRAWINGS
WATER STREET STORMWATER IMPROVEMENTS
WATER STREET | SWANSBORO, NORTH CAROLINA | ONSLOW COUNTY

NORTH CAROLINA PROFESSIONAL SEAL 049218 ENGINEER
DocuSigned by: Amanda Hollingsworth
3/31/2023

INITIAL PLAN DATE:
REVISIONS:

WR JOB NUMBER 02220730
DRN: WR DGN: WR CKD: WR

DETAILS

8

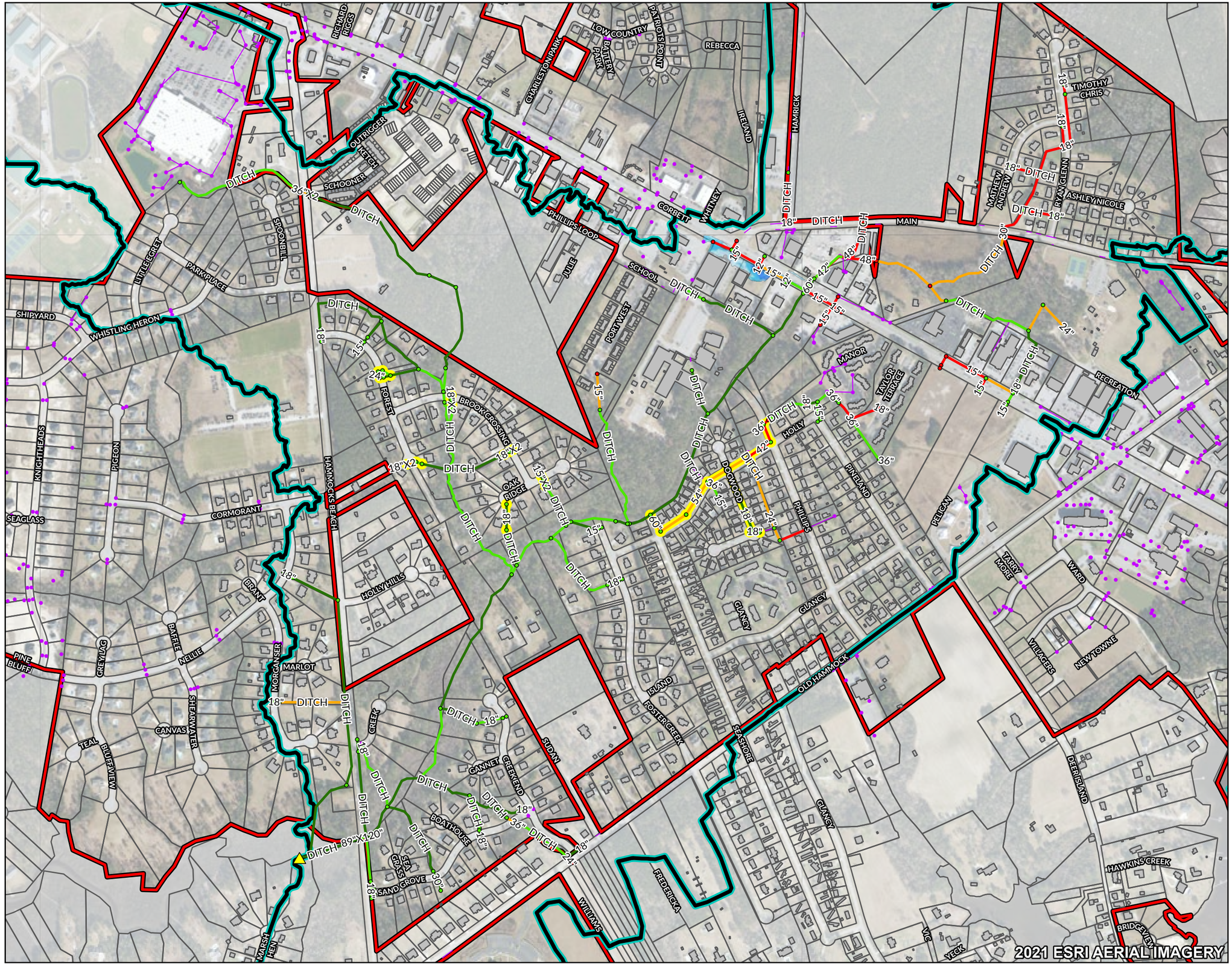
Swansboro Flood Area Photo Log

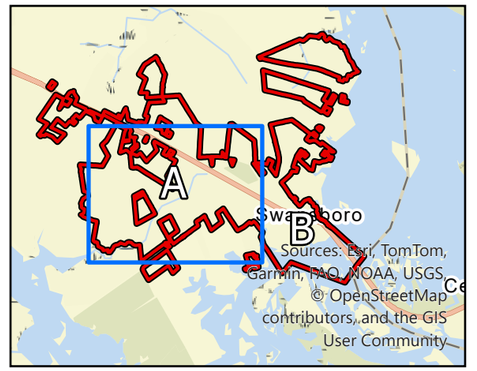
Front Street; November 8, 2021

PAOC 28: Intersection of Front Street and Church Street during Hurricane Florence (Associated Press, 2019)

Appendix 5: Proposed Conditions Model Inundation Results

- Proposed 10-Year Max Depth Map
- Proposed 25-Year Max Depth Map
- Proposed 100-Year Max Depth Map





LEGEND

10-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Proposed Conduit
- Proposed Structure

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Proposed Bioretention
- Outfalls

0 300 600 1,200

1 Inch = 600 Feet

N

Swansboro LASII
Stormwater Master Plan
10-Year Max Depth Map
Proposed Conditions

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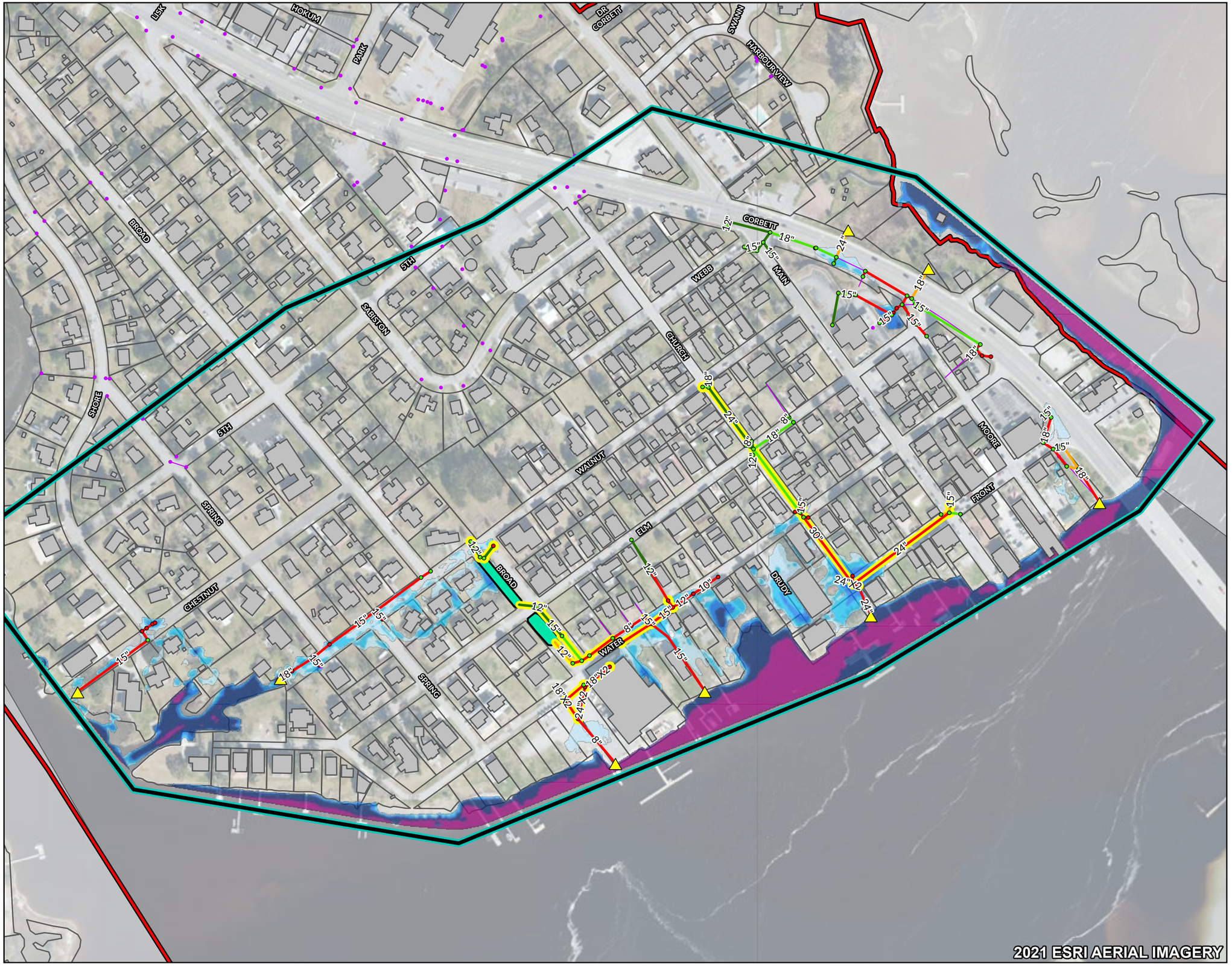
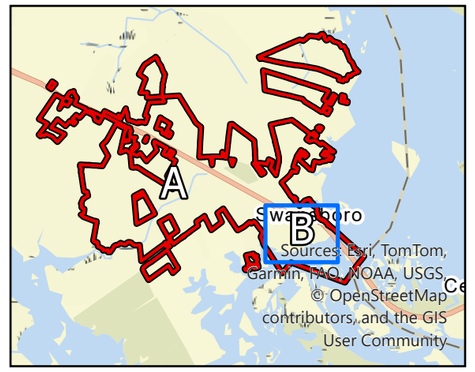
Exhibit A





LEGEND

10-Year Results

Max Depth
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- Outfalls

0 125 250 500

1 Inch = 250 Feet

N

Swansboro LASII
Stormwater Master Plan
10-Year Max Depth Map
Proposed Conditions

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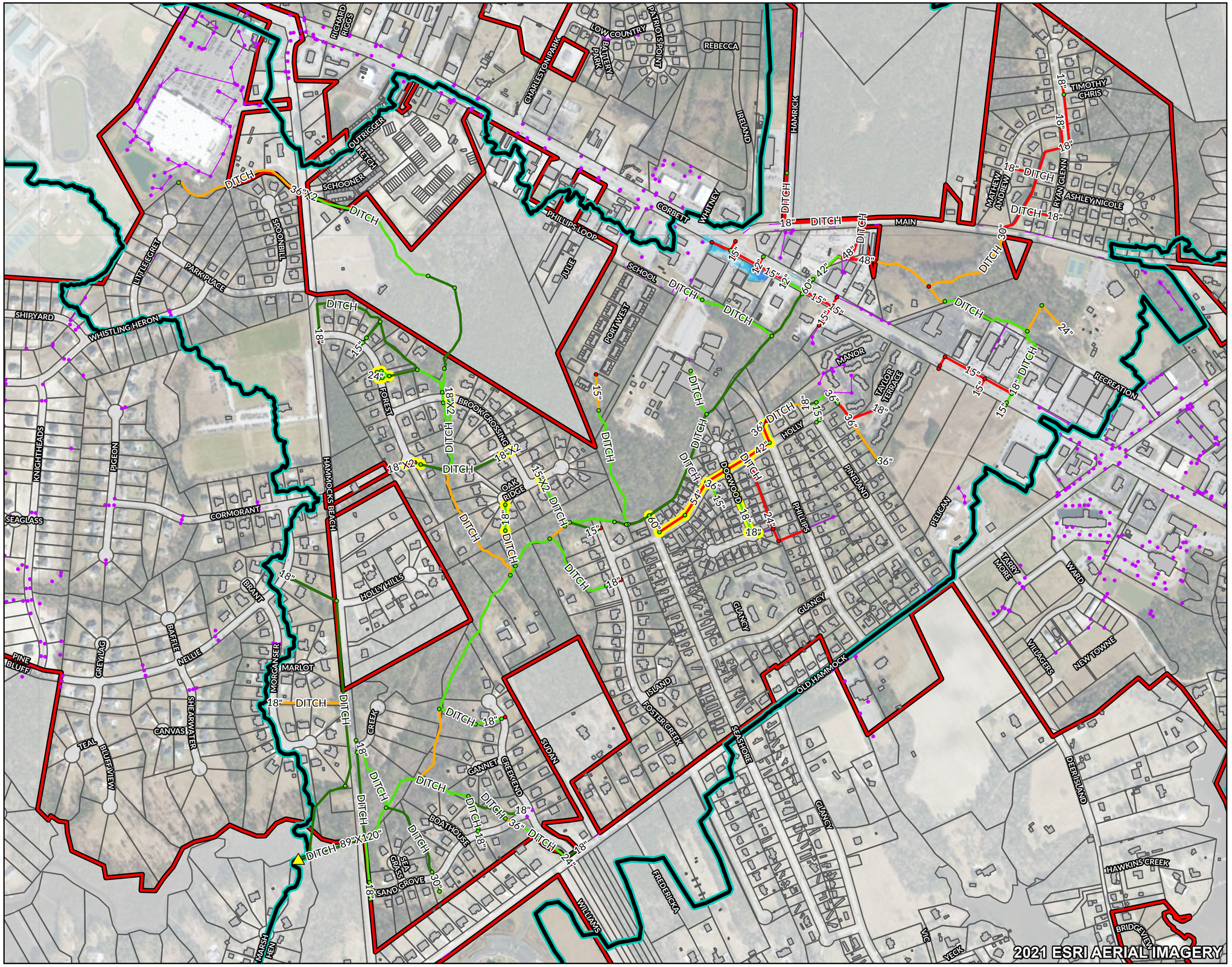
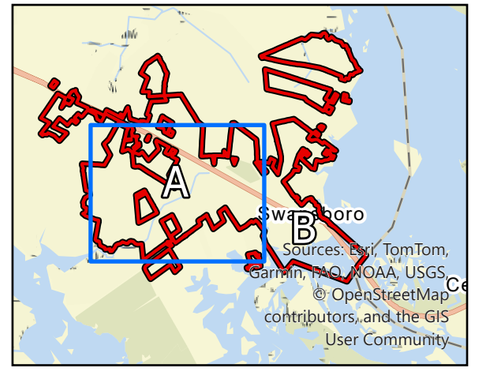
Exhibit B





LEGEND

25-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Proposed Conduit
- Proposed Structure

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Proposed Bioretention
- Outfalls

0 300 600 1,200

1 Inch = 600 Feet

N

Swansboro LASII
Stormwater Master Plan
25-Year Max Depth Map
Proposed Conditions

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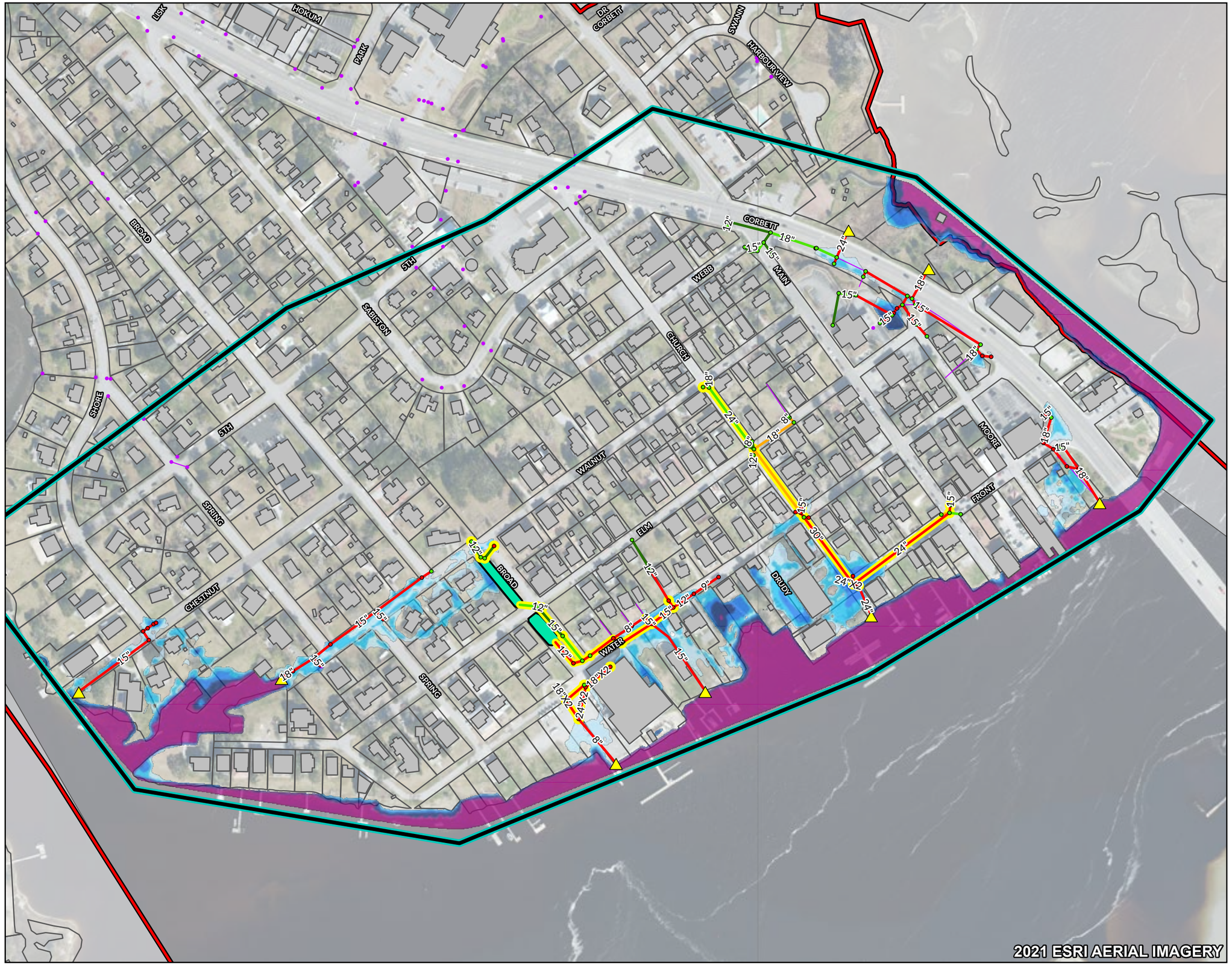
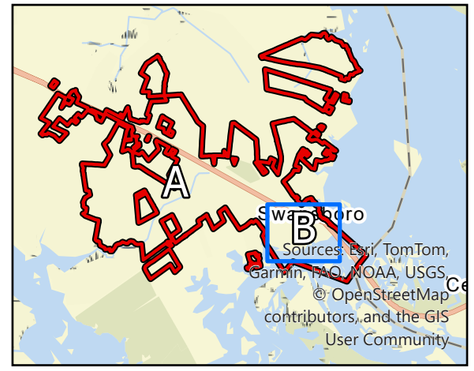
Exhibit A





LEGEND

25-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Proposed Conduit
- Proposed Structure

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Proposed Bioretention
- Outfalls

0 125 250 500

1 Inch = 250 Feet

N

Swansboro LASII
Stormwater Master Plan
25-Year Max Depth Map
Proposed Conditions

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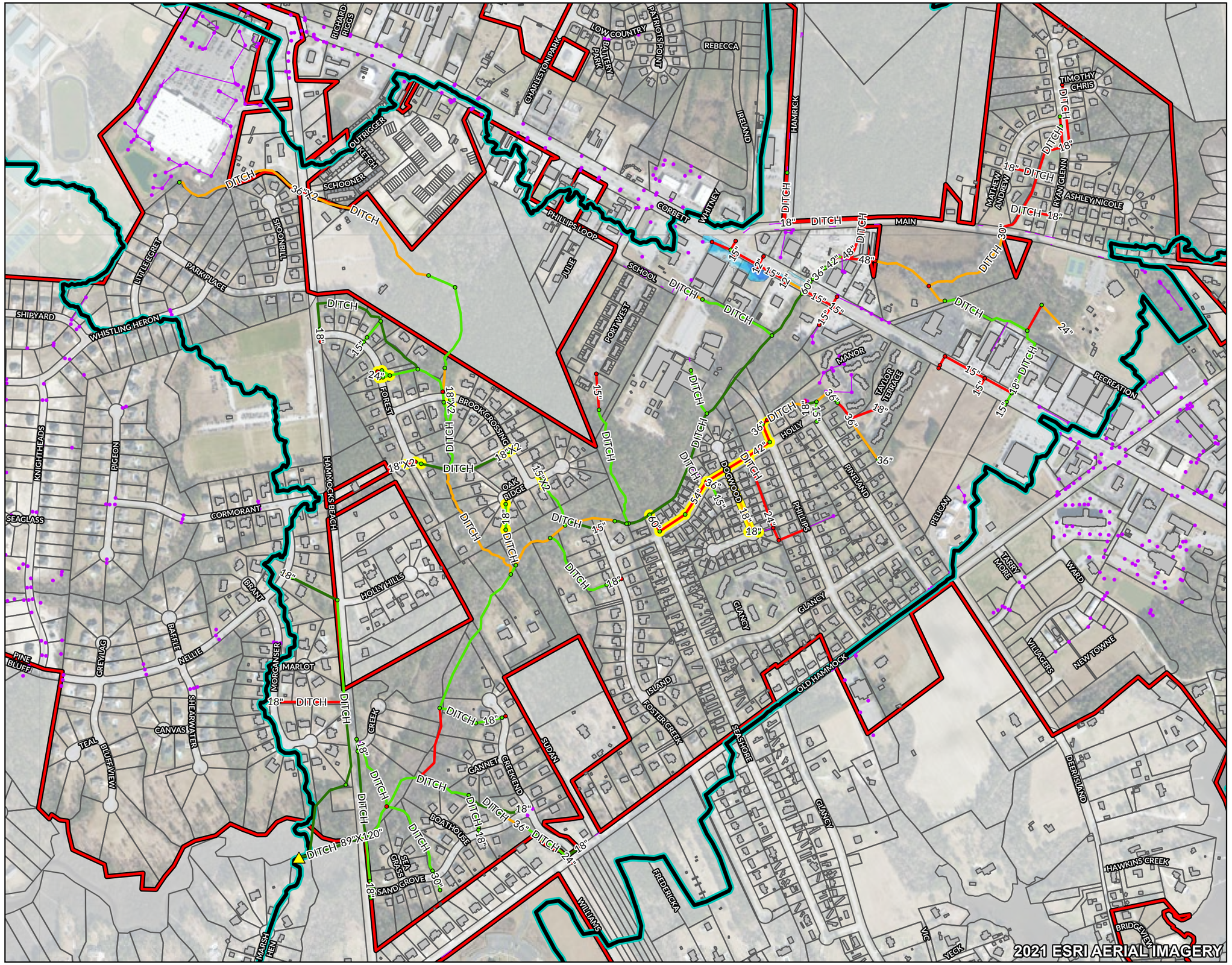
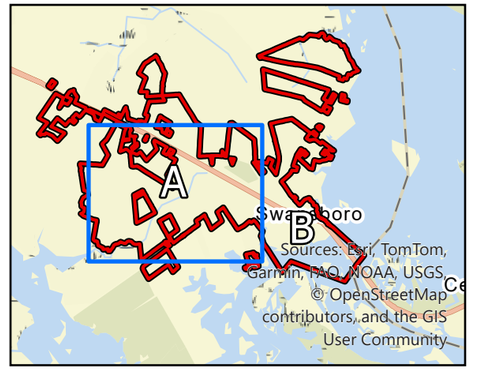
Exhibit B





LEGEND

100-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Proposed Conduit
- Proposed Structure

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Proposed Bioretention
- Flood Wall
- Outfalls

*NOTE: 100-YEAR INUNDATION EXTENTS AND RESULTS ARE BASED ON METHODOLOGY ESTABLISHED FOR THIS PROJECT AND DO NOT TAKE THE PLACE OF OR SUPERCEDE ANY FEMA EFFECTIVE FLOODPLAINS OR FIRMS/FIS DATA

0 300 600 1,200

1 Inch = 600 Feet

N

Swansboro LASII Stormwater Master Plan 100-Year Max Depth Map Proposed Conditions

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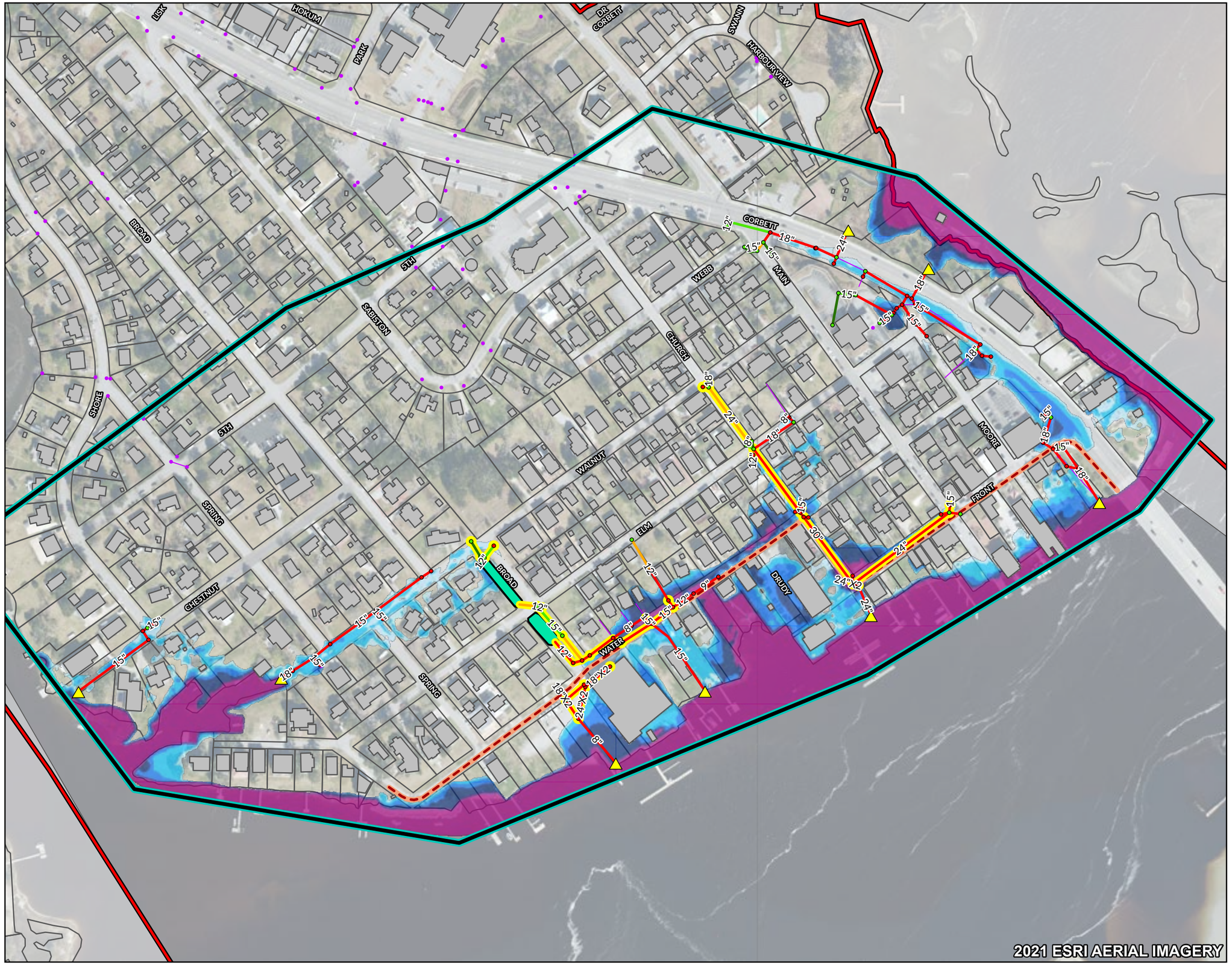
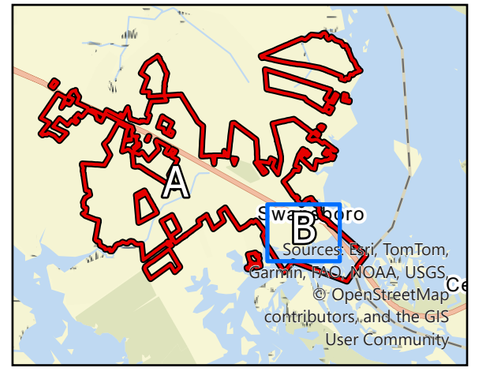
Exhibit A





LEGEND

100-Year Results

Max Depth
- 0 - 2"
- 2" - 6"
- 6" - 12"
- 1 - 2'
- > 2'
- Proposed Conduit
- Proposed Structure

Percent of Conduit Flowing Full
- 0 - 50%
- 50 - 75%
- 75 - 95%
- Above 95%
- Conduits Not Modeled

Modeled Junctions
- Not Flooded
- Flooded
- Structures Not Modeled

- Model Extents
- Town Boundary
- Parcels
- Buildings
- Outside Town
- Proposed Bioretention
- Flood Wall
- Outfalls

*NOTE: 100-YEAR INUNDATION EXTENTS AND RESULTS ARE BASED ON METHODOLOGY ESTABLISHED FOR THIS PROJECT AND DO NOT TAKE THE PLACE OF OR SUPERCEDE ANY FEMA EFFECTIVE FLOODPLAINS OR FIRMS/FIS DATA

0 125 250 500

1 Inch = 250 Feet

N

Swansboro LASII
Stormwater Master Plan
100-Year Max Depth Map
Proposed Conditions

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Exhibit B

Appendix 6: Opinions of Probable Costs

- Concept Design 1: Forestbrook Neighborhood (PAOCs 1 – 6) Drainage Improvements Cost Opinion
- Concept Design 2: Holly Lane (PAOCs 9 – 11) Drainage Improvements Cost Opinion
- Concept Design 3: Water Street and Church Street (PAOCs 26 – 28) Drainage Improvements Cost Opinion

Project Name: Swansboro Stormwater Assessment and Planning Project | Project #: 23-0845
City/State: Swansboro, NC | Date: 2/12/2026

Concept Design 1: Forestbrook Neighborhood (PAOC 1-6)

Proposed Improvements				
CONSTRUCTION COST				
Material Cost				
Structure	Quantity	Unit	Unit Price	Total
15" RCP Class IV	70	LF	$ 120	$ 9,000
18" RCP Class IV	730	LF	$ 170	$ 125,000
24" RCP Class IV	170	LF	$ 190	$ 33,000
Inlets/Manholes	13	EA	$ 4,500	$ 59,000
Headwall/Endwall	2	EA	$ 10,000	$ 20,000
Driveway Apron Replacement	3	EA	$ 6,000	$ 18,000
Pavement Replacement	510	SY	$ 110	$ 57,000
Channel Improvements	100	LF	$ 350	$ 35,000
MATERIALS SUBTOTAL				$ 356,000
SITE WORK COST				
Based on % of Materials Cost				
Mobilization		5%		$ 18,000
Erosion Control		3%		$ 11,000
Construction Survey		LS		$ 10,000
Traffic Control		LS		$ 15,000
Utility Conflicts		LS		$ 15,000
Dewatering		LS		$ 10,000
INITIAL COST SUBTOTAL				$ 79,000
CONSTRUCTION SUBTOTAL (INCLUDES LABOR AND MATERIAL COST)				**$ 435,000**
ENGINEERING AND ADMINISTRATION COST				
Based on % of Construction Cost				
Site Characterization		5%		$ 22,000
Design and Permitting		LS		$ 200,000
Construction Administration		LS		$ 30,000
Closeout		LS		$ 5,000
ENGINEERING & ADMINISTRATION SUBTOTAL				**$ 257,000**
PROJECT TOTAL SUBTOTAL				**$ 692,000**
Contingency		35%		$ 243,000
			PROJECT TOTAL	**$ 935,000**

Assumptions

This estimate of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing of construction, changed condition, labor rate changes, or other factors beyond the control of the estimators.

Project Name: Swansboro Stormwater Assessment and Planning Project
City/State: Swansboro, NC
Project #: 23-0845
Date: 2/12/2026

Concept Design 2: Holly Lane (PAOC 9-11)

Proposed Improvements				
CONSTRUCTION COST				
Material Cost				
Structure	Quantity	Unit	Unit Price	Total
18" RCP Class III	510	LF	$ 150	$ 77,000
36" RCP Class III	80	LF	$ 300	$ 24,000
42" RCP Class III	170	LF	$ 330	$ 57,000
54" RCP Class III	780	LF	$ 580	$ 453,000
60" RCP Class III	130	LF	$ 600	$ 78,000
Inlets/Manholes	11	EA	$ 4,500	$ 50,000
Headwall/Endwall	1	EA	$ 10,000	$ 10,000
Driveway Apron Replacement	14	EA	$ 6,000	$ 84,000
Pavement Replacement	2700	SY	$ 110	$ 297,000
Channel Improvements	100	LF	$ 350	$ 35,000
MATERIALS SUBTOTAL				$ 1,165,000
SITE WORK COST				
Based on % of Materials Cost				
Mobilization		5%		$ 59,000
Erosion Control		3%		$ 35,000
Construction Survey		2%		$ 24,000
Traffic Control		LS		$ 30,000
Utility Conflicts		LS		$ 40,000
Dewatering		LS		$ 15,000
INITIAL COST SUBTOTAL				$ 203,000
CONSTRUCTION SUBTOTAL (INCLUDES LABOR AND MATERIAL COST)				**$ 1,368,000**
ENGINEERING AND ADMINISTRATION COST				
Based on % of Construction Cost				
Site Characterization		5%		$ 69,000
Design and Permitting		LS		$ 350,000
Construction Administration		LS		$ 40,000
Closeout		LS		$ 5,000
ENGINEERING & ADMINISTRATION SUBTOTAL				**$ 464,000**
PROJECT TOTAL SUBTOTAL				**$ 1,832,000**
Contingency		35%		$ 642,000
			PROJECT TOTAL	**$ 2,474,000**

Assumptions
This estimate of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing of construction, changed condition, labor rate changes, or other factors beyond the control of the estimators.

Project Name: Swansboro Stormwater Assessment and Planning Project
City/State: Swansboro, NC
Project #: 23-0845
Date: 2/12/2026

Concept Design 3: Water Street & Church Street (PAOC 26-28)

Proposed Improvements				
CONSTRUCTION COST				
Material Cost				
Structure	Quantity	Unit	Unit Price	Total
12" RCP Class III	200	LF	$ 110	$ 22,000
15" RCP Class III	790	LF	$ 110	$ 87,000
18" RCP Class III	330	LF	$ 150	$ 50,000
24" RCP Class III	960	LF	$ 170	$ 164,000
30" RCP Class III	250	LF	$ 230	$ 58,000
Inlets/Manholes	31	EA	$ 4,500	$ 140,000
Headwall/Endwall	2	EA	$ 10,000	$ 20,000
Driveway Apron Replacement	4	EA	$ 6,000	$ 24,000
Pavement Replacement	4330	SY	$ 110	$ 477,000
Bioretention	8000	SF	$ 10	$ 80,000
MATERIALS SUBTOTAL				$ 1,122,000
SITE WORK COST				
Based on % of Materials Cost				
Mobilization		5%		$ 57,000
Erosion Control		3%		$ 34,000
Construction Survey		2%		$ 23,000
Traffic Control		LS		$ 50,000
Utility Conflicts		LS		$ 45,000
Dewatering		LS		$ 25,000
INITIAL COST SUBTOTAL				$ 234,000
CONSTRUCTION SUBTOTAL (INCLUDES LABOR AND MATERIAL COST)				**$ 1,356,000**
ENGINEERING AND ADMINISTRATION COST				
Based on % of Construction Cost				
Site Characterization (Survey & Geotech)		5%		$ 68,000
Design and Permitting		LS		$ 375,000
Construction Administration		LS		$ 40,000
Closeout		LS		$ 5,000
ENGINEERING & ADMINISTRATION SUBTOTAL				**$ 488,000**
PROJECT TOTAL SUBTOTAL				**$ 1,844,000**
Contingency		35%		$ 646,000
			PROJECT TOTAL	**$ 2,490,000**

Assumptions
This estimate of probable cost is approximate. Actual construction bids may vary significantly from this statement of probable costs due to timing of construction, changed condition, labor rate changes, or other factors beyond the control of the estimators.