Nansemond Parkway Overpass
Public Hearing Design

STORMWATER REPORT

Prepared for:
CITY OF SUFFOLK
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

July 22, 2020

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Nansemond Parkway Overpass
Public Hearing Design Report CN #7354
July 22, 2020

Executive Summary

The purpose of this project is to provide a grade separated crossing on Nansemond Parkway and realign the current intersection to a standard signalized three-way intersection. The project is located approximately 0.26 miles south of Wilroy Road. Increased traffic volume has led to greater delays caused by the at grade railroad crossing. The intent of the project is to eliminate the at grade railroad crossing to reduce delays and improve safety for pedestrians and vehicles alike. Nansemond Parkway is being realigned to the southeast and being connected to Wilroy Road at a new three-way signalized intersection. Wilroy Road is being realigned to the west. It will be constructed as a 2-lane roadway with intent to widen to a 4-lane roadway in the future. Wilroy Road is classified as a minor arterial roadway and Nansemond Parkway is classified as a major collector roadway. Both have posted speed limits of 45 MPH.

The total disturbed area for this project is approximately 20.79 acres. This is comprised of the new roadway alignments that will be constructed through existing pasture land and obscuring existing roadway to green space as well as additional area within existing and proposed right-of-way which will be used by the contractor for construction staging.

The objective of the stormwater management design for this project is to efficiently convey stormwater away from the roadway by using a new underground storm drainage system and to control the stormwater quantity and quality prior to outfalling into natural drainage ways.

Existing Conditions

The entire project is part of the Hampton Roads Hydrologic Unit Code (02080208). Generally, the site consists of agricultural fields, single family homes on large parcels, and existing two-lane roadways, divided east from west by a railroad. The project is located in Zone X (Area of Minimal Flood Hazard) of the FEMA Flood Hazard Map, a copy of the FEMA mapping is provided in Appendix A.

The NRCS Web Soil Survey indicates the soils in the vicity of the project to be comprised primarily of Dragston fine sandy loam, Nansemond laomy fine sand, Nansemond fine sand, Tomotley loam, and Weston fine sandy loam. A soils map is provided in Appendix B.

The topographic survey discovered multiple pipes that are buried on one end, especially in the area of the railroad grade crossing on Nansemond Parkway. As a result, some assumptions had to be made about the drainage boundaries around the railroad. Based on the limitations of the data available to be collected in the field relative to runoff flow paths, we have divided the site into areas draining to five natural outfalls, each of which eventually flow to the Nansemond River. Drainage Area Maps are provided in Appendix C.

The Outfall 1 is at the northern end of the project area. North of Bridlewood Lane, an existing swale carries runoff west from Nansemond Parkway under high-tension power lines at

approximate Station 133+00. The area draining to this outfall includes the existing roadway, pasture land, and wooded wetlands east of existing Nansemond Parkway.

The Outfall 2 is at approximate Station 117+50, where the headwaters of a creek flow to a small reservoir southwest of the Bridlewood Estates neighborhood. The streambed has an elevation approximately 10 feet below the rest of the project area, creating a significant gully and well-defined channel. Outfall 2 drains much of the lightly developed residential area west of the railroad tracks as well as a large area of wooded wetlands east of the existing Nansemond Parkway and north of the railroad tracks.

Outfall 3 is located adjacent to Station 13+00 on Nansemond Parkway, east of the railroad tracks. A brush-covered ditch conveys runoff from the surrounding agricultural fields as well as forested wetlands on the north side of Nansemond Parkway.

Outfall 4 is located on the west side of Wilroy Road at the southern limit of the project. Runoff reaching this point continues south in a roadside ditch. The area draining to this point includes the southbound lane of Wilroy Road and an agricultural field on the west.

Outfall 5 is located on the east side of Wilroy Road at the southern limit of the project. Runoff reaching this point also continues south in the roadside ditch. The area drainng to this point includes the northbound lane of Wilroy Road and the area between Wilroy Road and the railroad tracks.

Design Methodology

Hydrology

Both TR-55 Method and Rational Method hydrology were used on this project. All drainage areas within the project limits are under 200 acres in size, justifying the rational method, however outfall hydrology was completed using the TR-55 Method to accurately model runoff volume and pond routing.

Several different methods are used to determine the Time of Concentration (Tc), including Seelye method and Kirpich nomograph. All methods used to find Tc are consistent with Chapter 6 of the VDOT Drainage Manual. The minimum Tc used for any calculation is 5 minutes.

Ditch, Inlet, and Pipe/Culvert Design

Wilroy Road is classified as minor arterial and Nansemond Parkway is classified as a major collector. Both roads have posted speed limits of 45 MPH with curb and gutter. Due to this classification, the storm conveyance system is sized for a 10-year recurrent storm based on NOAA Atlas-14 rainfall data based on Chapter 9 of the VDOT Drainage Manual. Additionally, culverts will be designed for the 25-year storm based on Chapter 8 of the VDOT Drainage Manual. Preliminary culvert sizing calculations for the proposed 54” culvert beneath Nansemond Parkway are provided in Appendix D.

Curb inlets in the roadway are sized for a 4 inch-per-hour rainfall intensity, allowing a spread no greater than the gutter pan plus one-half the thru lane width. The design lane width is 12 feet and VDOT standard CG-6, 6-inch curb and gutter will be used with a two-foot gutter pan. Therefore, the allowable spread is generally 8 feet for both Nansemond Parkway and Wilroy Road. An intensity of 6.5 inches-per-hour will be used to check that the inlets contain and collect all runoff in the roadway and the curb is not overtopped in sags.

Proposed Drainage System

The proposed storm sewer system on this project was designed with two major goals. First, the system is designed to allow the project to meet stormwater quantity requirements. Second, runoff is collected in advantageous locations for structural BMPs to provide nutrient removal. Runoff is collected near where Nansemond Parkway crosses the unnamed creek at Pond A to the north and Pond B to the south. These locations allow for detention and treatment of stormwater prior to releasing it to Outfall 2. Runoff is also collected from the eastern bridge approach on Nansemond Parkway and piped to Pond C where it is detained and treated before it ultimately flows to Outfall 3. Routing calculations for the ponds can be found in Appendix D. The nutrient removal calculations for the ponds can be found in Appendix E.

Inlet and Pipe Design

The goal of this design is, to the greatest extend possible, route impervious runoff through the BMP's. To that end, the storm sewer system generally must maintain a minimal grade and depth, particularly for the far reaches of the systems draining to Pond A and Pond B. As discussed above in the Design Methodology, all inlets and pipes are designed per Chapter 9 of the VDOT Drainage Manual. The computations for inlet sizing for spread criteria are depicted on LD-204 in Appendix F, conduit computations on LD-229 in Appendix G, and HGL computation on LD-347's in Appendix H.

Outfalls and Energy Balance Equation Analysis

Stormwater quantity was addressed by analyzing the pre-development and post-development peak flow and runoff volumes at each of the five outfalls discussed above. The project areas flowing to Outfalls 1, 4, and 5 were reduced in the post-development condition, allowing these outfalls to achieve water quantity compliance without detention or other structural stormwater management. The pond routing model in Appendix D and Energy Balance Calculations in Table 1 show that Outfall 2 and Outfall 3 each meet the Energy Balance criteria set forth in *9VAC25-870-66.3*.

The contributing drainage areas at the outfall points on this project are not large enough to qualify for the 1% rule. Therefore, each outfall was analyzed in detail for compliance with the

energy balance equation. A summary of each outfall is below. Maps of the outfalls can be seen in Appendix C. Pond Pack calculations are provided in Appendix D.

Table 1: Summary of Energy Balance Calculations

	Pre-Development			Post-Development				
Outfall #	Peak Flow (CFS)	Hydrograph Volume (AC-FT)	Hydrograph Volume (CF)	Hydrograph Volume (AC-FT)	Hydrograph Volume (CF)	Improvement Factor	Allowable Peak Flow (CFS)	Actual Peak Flow (CFS)
1	3.15	0.195	8494	0.137	1873	0.8	11.4	2.36
2	7.51	0.732	31886	1.814	79018	0.8	2.4	2.15
3	6.64	0.59	25700	0.665	28967	0.8	4.7	4.55
4	3.83	0.44	19166	0.031	1350	0.8	43.5	0.02
5	1.41	0.161	7013	0.046	2004	0.8	3.9	0.58

*Energy balance calculations are based on improvement factor applied to the product of pre-development and post-development peak flow and hydrograph volume. By reducing the drainage area, the hydrograph volumes are reduced for Outfalls 1, 4, and 5, resulting in allowable post-development peak flows greater than pre-development conditions.

Table 2: Summary Peak Flow During 10-Year Storm Event at Each Outfall

	Q10 Peak Flow (CFS)	
Outfall	Pre-Development	Post-Development
1	7.6	6.1
2	28.1	23.0
3	17.8	16.6
4	10.2	1.7
5	3.5	1.7

Outfall 1

Outfall 1 accounts for a small area from Bridlewood Lane, north. Due to runoff being collected at Pond A for detention and treatment for phosphorus removal, the area flowing to Outfall 1 in the post-development condition was reduced from 1.47 acres to 1.44 acres. This reduction enabled Outfall 1 to meet energy balance criteria with an improvement factor of 0.8.

Outfall 2

The majority of new roadway on the west side of the railroad is designed to drain to Outfall 2. Two wet ponds are used to reduce nutrient loading at the outfall as well as to provide detention. Pond A collects runoff from Nansemond Parkway north of the stream crossing. Pond B collects runoff from Wilroy Road south of the stream crossing. Each of these ponds has an outlet control structure designed to control outflow from the 1-year storm event to meet energy balance criteria. Both ponds contribute to Outfall 2, so they have been modeled in parallel in *Bentley PondPack*, ensuring that their combined outflow hydrographs result in a peak flow which meets the required improvement factor.

Outfall 3

Outfall 3 encompasses an agricultural field and the eastern approach to the railroad overpass bridge. To control outflow from this drainage area another wet pond is proposed. The pond will provide nutrient removal as well as detention to meet the improvement factor required by the Energy Balance equation. The pond collects roadway runoff, providing detention and reducing the peak flow to the outfall point.

Outfall 4

Outfall 4 accounts for a small area of and adjacent to the southbound lanes of Wilroy Road. Much of the pre-development area draining to Outfall 4 is directed to Pond B, so Outfall 4 meets Energy Balance requirements without structural stormwater management.

Outfall 5

Outfall 5 is an area of the northbound lanes of Wilroy Road as well as the area between Wilroy Road and the railroad tracks. As with Outfall 4, much of the area draining to Outfall 5 is directed to Pond B in the post-construction condition, so Outfall 5 meets Energy Balance criteria without structural stormwater management.

Water Quality Analysis

A water quality analysis was performed in accordance with 9VAC25-870-63 by use of the Virginia Runoff Reduction Method Spreadsheet for Redevelopment. The disturbed area for pusposes of stormwater management was calculated as 13.96 acres per VDOT IIM-195.12. The site was analyzed in the pre-development and post-development conditions for land cover and hydrologic soil group to determine the nutrient treatment requirements.

Table 2: Project Area Land Use in Pre- and Post-Construction Conditions

Project Land Use		
Land Cover Type	**Pre-Development Condition**	**Post-Development Condition**
Forest/Open Space	1.10	0.00
Managed Turf	11.96	7.23
Impervious Cover	0.90	6.72
Total Area	13.96	13.96

The site area was established and pre-construction and post-construction land uses were defined and entered into the Virginia Runoff Reduction Method Spreadsheet to determine the project's nutrient removal requirements. The total phosphorus removal requirement is 11.41 pounds per year. To address nutrient removal, three structural BMPs are proposed. One Wet Pond designed to the Level 2 specifications drain a total of 9.33 acres of roadway, sidewalk, and adjacent turf prior to being release at Outfall 2. Two other BMPs are designed to Level 1 wet pond

specifications. They collectively drain a total of 6.87 acres of roadway, sidewalks, and turf. Pond C will be located at the toe of the northern fill slope for Nansemond Road on the eastern approach the railroad overpass. The total phosphorus removal achieved by the three BMPs is 11.70 pounds per year. All BMPs will be designed in accordance with Virginia DEQ standards for non-proprietary, post-construction BMPs.

See Appendix E for Runoff Reduction Water Quality worksheets.

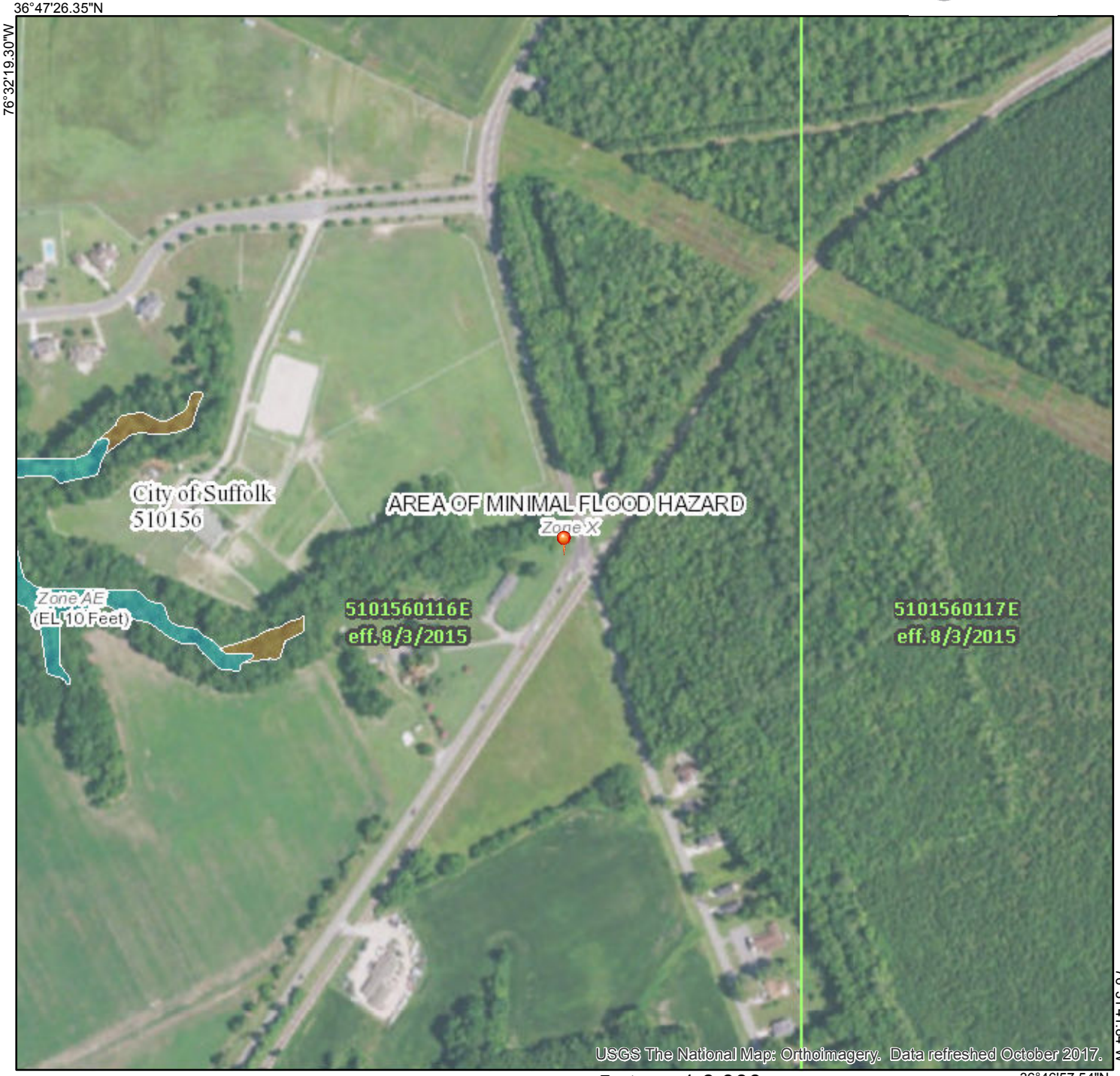
Appendix A: FIRM Map

National Flood Hazard Layer FIRMette

FEMA

36°47'26.35"N

76°32'19.30"W



76°31'41.84"W

36°46'57.54"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

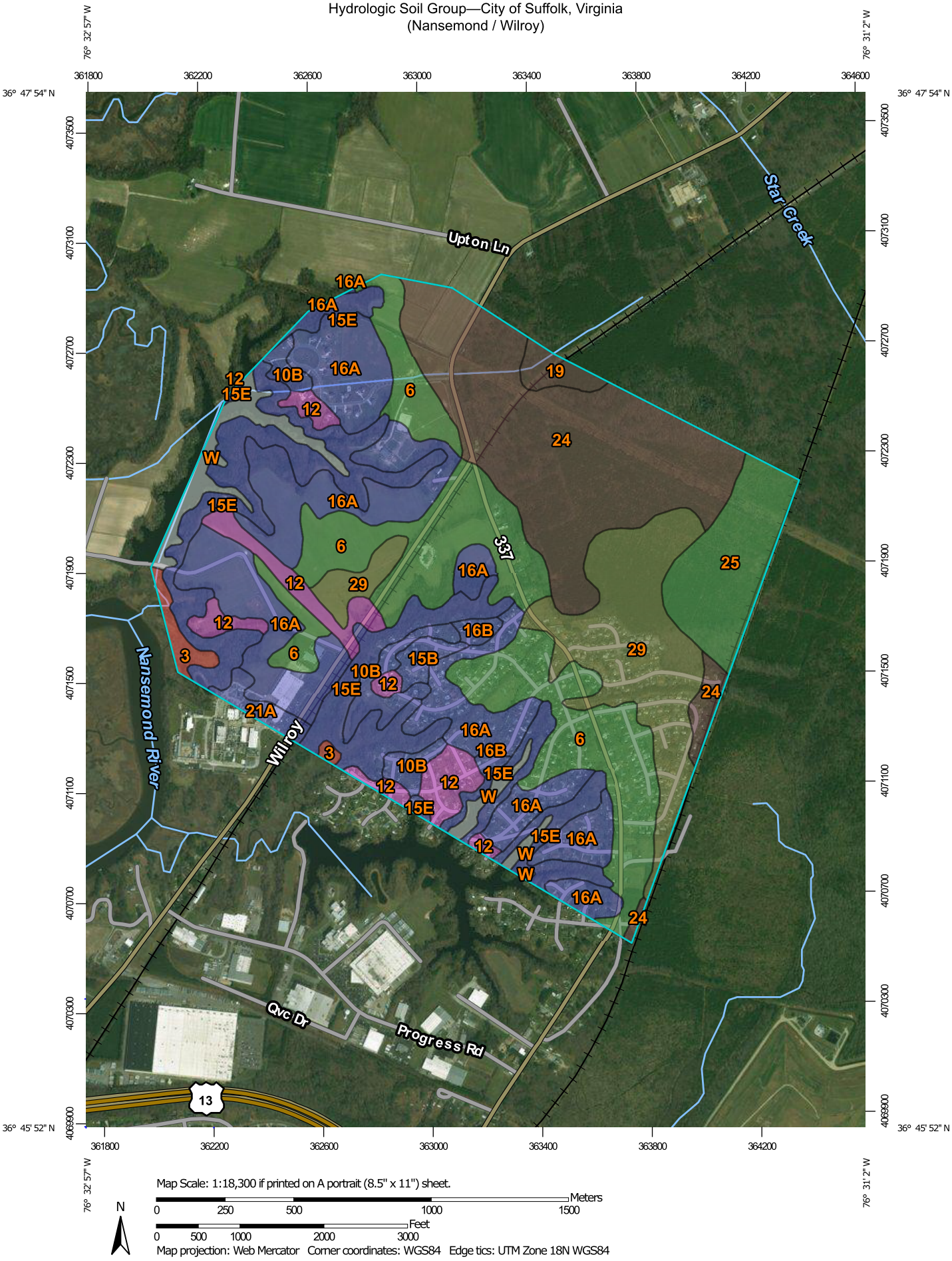
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/25/2018 at 10:01:43 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix B: NRCS Soil Maps

Hydrologic Soil Group—City of Suffolk, Virginia
(Nansemond / Wilroy)



Map Scale: 1:18,300 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 250 500 1000 1500

Feet: 0 500 1000 2000 3000

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 1:15,800.

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: City of Suffolk, Virginia
Survey Area Data: Version 12, Aug 29, 2018

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—Mar 8, 2017

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
3	Bohicket silty clay loam	D	7.4	0.9%
6	Dragston fine sandy loam	A/D	159.3	18.6%
10B	Kalmia fine sandy loam, wet substratum, 2 to 6 percent slopes	B	21.5	2.5%
12	Kenansville loamy sand, wet substratum, 0 to 4 percent slopes	A	39.4	4.6%
15B	Nansemond loamy fine sand, 0 to 6 percent slopes	B	6.0	0.7%
15E	Nansemond loamy fine sand, 15 to 30 percent slopes	B	116.6	13.6%
16A	Nansemond fine sandy loam, 0 to 2 percent slopes	B	164.5	19.2%
16B	Nansemond fine sandy loam, 2 to 6 percent slopes	B	4.9	0.6%
19	Rains fine sandy loam	B/D	8.1	0.9%
21A	State fine sandy loam, 0 to 2 percent slopes	B	7.5	0.9%
24	Tomotley loam	B/D	158.3	18.5%
25	Torhunta loam	A/D	48.0	5.6%
29	Weston fine sandy loam	C/D	94.2	11.0%
W	Water		22.3	2.6%
Totals for Area of Interest			**858.0**	**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.

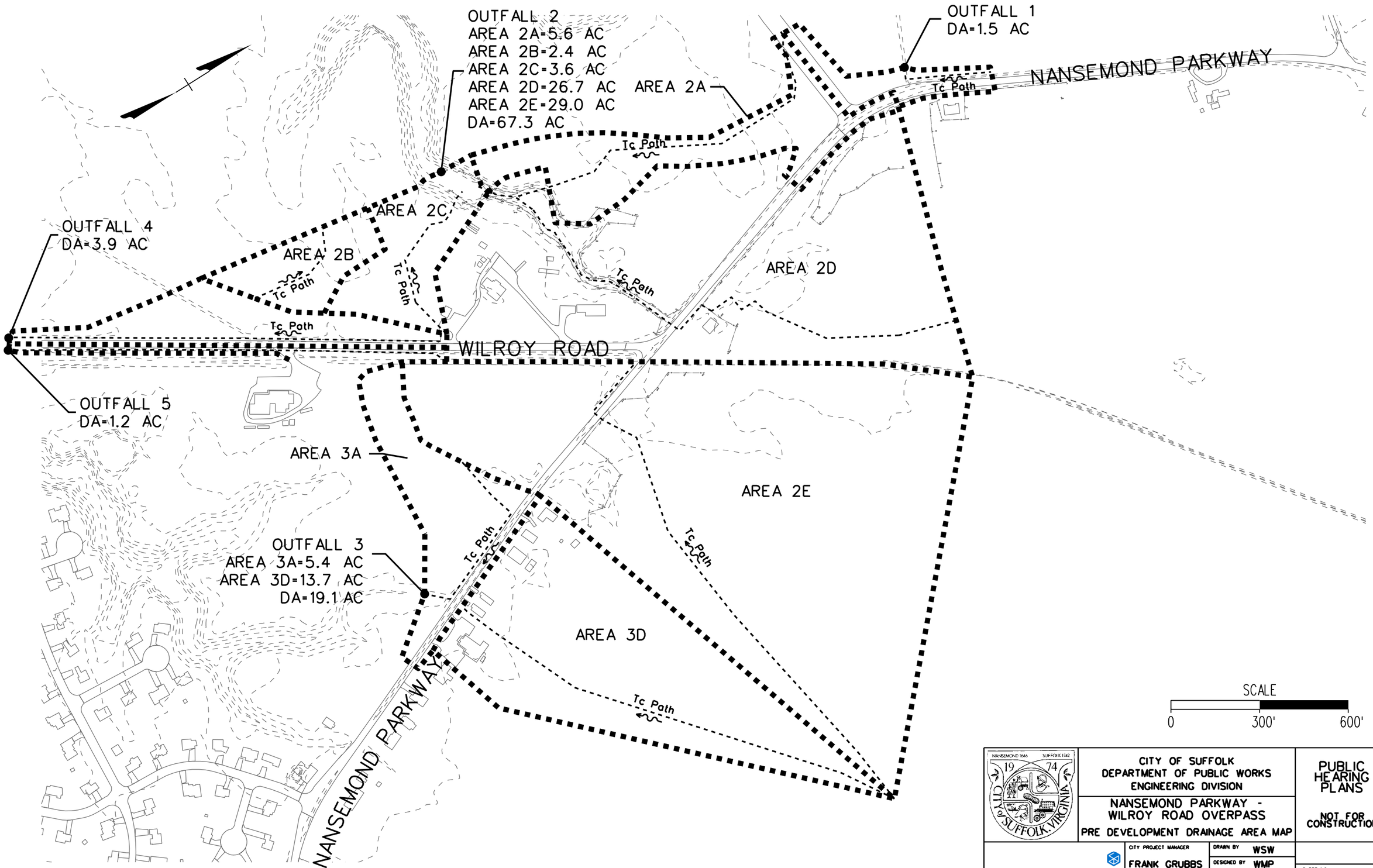
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix C: Drainage Area Maps



CITY OF SUFFOLK
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

NANSEMOND PARKWAY -
WILROY ROAD OVERPASS

PRE DEVELOPMENT DRAINAGE AREA MAP

PUBLIC HEARING PLANS

NOT FOR CONSTRUCTION

CLARKNEXSEN

CITY PROJECT MANAGER	DRAWN BY	WSW	
FRANK GRUBBS	DESIGNED BY	WMP	SHEET NO. DA-1
DATE 7/22/2020	APPROVED BY	IDJ	

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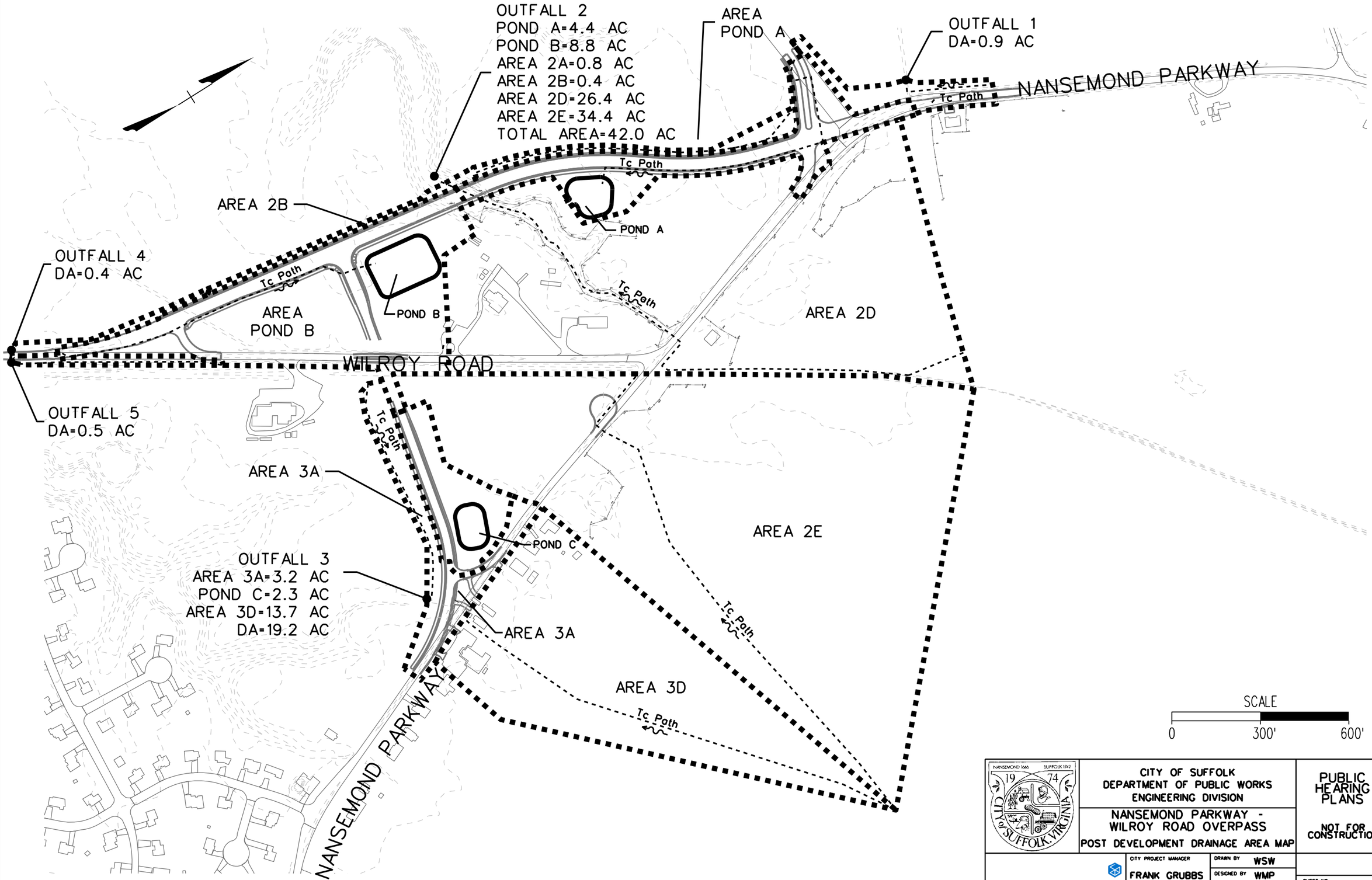

NANSEMOND 1660 SUFFOLK 1742 19 74 CITY of SUFFOLK, VIRGINIA

CITY OF SUFFOLK
DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

NANSEMOND PARKWAY -
WILROY ROAD OVERPASS
POST DEVELOPMENT DRAINAGE AREA MAP

PUBLIC HEARING PLANS

NOT FOR CONSTRUCTION

CLARKNEXSEN

CITY PROJECT MANAGER FRANK GRUBBS	DRAWN BY WSW	
	DESIGNED BY WMP	SHEET NO. DA-2
DATE 7/22/2020	APPROVED BY IDJ	

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Appendix D: Pond Routing & Culvert Calculations

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Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Area 1 Post	Post-Development 1-Year	1	0.137	11.950	2.36
Area 1 Post	Post-Development 2-Year	2	0.188	11.950	3.26
Area 1 Post	Post-Development 10-Year	10	0.353	11.950	6.05
Area 1 Post	Post-Development 100-Year	100	0.686	11.950	11.41
Pond A Post	Post-Development 1-Year	1	0.683	12.050	9.63
Pond A Post	Post-Development 2-Year	2	0.900	12.050	12.58
Pond A Post	Post-Development 10-Year	10	1.575	12.050	21.47
Pond A Post	Post-Development 100-Year	100	2.894	12.050	38.11
Pond B	Post-Development 1-Year	1	1.052	12.200	10.81
Pond B	Post-Development 2-Year	2	1.446	12.200	14.93
Pond B	Post-Development 10-Year	10	2.715	12.200	27.83
Pond B	Post-Development 100-Year	100	5.275	12.150	52.85
Area 1 Pre	Pre-Development 1-Year	1	0.195	12.000	3.15
Area 1 Pre	Pre-Development 2-Year	2	0.264	12.000	4.24
Area 1 Pre	Pre-Development 10-Year	10	0.482	12.000	7.58
Area 1 Pre	Pre-Development 100-Year	100	0.917	12.000	13.90
Area 4	Post-Development 1-Year	1	0.031	11.950	0.56
Area 4	Pre-Development 1-Year	1	0.440	12.300	3.83
Area 4	Pre-Development 2-Year	2	0.609	12.300	5.34
Area 4	Post-Development 2-Year	2	0.046	11.950	0.82
Area 4	Pre-Development 10-Year	10	1.158	12.250	10.16
Area 4	Post-Development 10-Year	10	0.094	11.900	1.70
Area 4	Pre-Development 100-Year	100	2.270	12.250	19.58
Area 4	Post-Development 100-Year	100	0.196	11.900	3.54

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Areal 2B Pre	Pre-Development 1-Year	1	0.189	12.100	2.20
Areal 2B Pre	Pre-Development 2-Year	2	0.278	12.100	3.35
Areal 2B Pre	Pre-Development 10-Year	10	0.583	12.100	7.22
Areal 2B Pre	Pre-Development 100-Year	100	1.236	12.100	15.18
Outfall 5 Catchment Pre	Post-Development 1-Year	1	0.046	12.100	0.58
Outfall 5 Catchment Pre	Pre-Development 1-Year	1	0.161	12.250	1.41
Outfall 5 Catchment Pre	Pre-Development 2-Year	2	0.218	12.250	1.92
Outfall 5 Catchment Pre	Post-Development 2-Year	2	0.066	12.100	0.83
Outfall 5 Catchment Pre	Pre-Development 10-Year	10	0.399	12.250	3.49
Outfall 5 Catchment Pre	Post-Development 10-Year	10	0.130	12.100	1.65
Outfall 5 Catchment Pre	Pre-Development 100-Year	100	0.760	12.250	6.51
Outfall 5 Catchment Pre	Post-Development 100-Year	100	0.263	12.100	3.27
Area 2B Post	Post-Development 1-Year	1	0.022	12.150	0.23
Area 2B Post	Post-Development 2-Year	2	0.035	12.150	0.39
Area 2B Post	Post-Development 10-Year	10	0.082	12.100	0.99
Area 2B Post	Post-Development 100-Year	100	0.189	12.100	2.32
Area 2A Pre	Pre-Development 1-Year	1	0.414	12.150	4.27
Area 2A Pre	Pre-Development 2-Year	2	0.617	12.150	6.63
Area 2A Pre	Pre-Development 10-Year	10	1.318	12.150	14.69
Area 2A Pre	Pre-Development 100-Year	100	2.836	12.150	31.50
Area 2C Pre	Pre-Development 1-Year	1	0.128	12.150	1.06
Area 2C Pre	Pre-Development 2-Year	2	0.218	12.150	2.17
Area 2C Pre	Pre-Development 10-Year	10	0.565	12.150	6.48
Area 2C Pre	Pre-Development 100-Year	100	1.402	12.100	16.91

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Area 3A	Post-Development 1-Year	1	0.376	12.150	4.17
Area 3A	Pre-Development 1-Year	1	0.590	12.150	6.64
Area 3A	Pre-Development 2-Year	2	0.823	12.150	9.32
Area 3A	Post-Development 2-Year	2	0.516	12.150	5.77
Area 3A	Pre-Development 10-Year	10	1.579	12.150	17.84
Area 3A	Post-Development 10 -Year	10	0.971	12.150	10.76
Area 3A	Pre-Development 100 -Year	100	3.124	12.100	34.55
Area 3A	Post-Development 100-Year	100	1.887	12.150	20.39
Area 3C	Post-Development 1-Year	1	0.539	12.250	4.96
Area 3C	Post-Development 2-Year	2	0.755	12.250	7.03
Area 3C	Post-Development 10 -Year	10	1.463	12.250	13.65
Area 3C	Post-Development 100-Year	100	2.913	12.200	26.66
Area Pond C	Post-Development 1-Year	1	0.332	11.900	6.04
Area Pond C	Post-Development 2-Year	2	0.444	11.900	8.05
Area Pond C	Post-Development 10 -Year	10	0.793	11.900	14.17
Area Pond C	Post-Development 100-Year	100	1.483	11.900	25.71
Area 3C Pre	Pre-Development 1-Year	1	0.598	12.200	5.83
Area 3C Pre	Pre-Development 2-Year	2	0.837	12.200	8.27
Area 3C Pre	Pre-Development 10-Year	10	1.619	12.200	16.07
Area 3C Pre	Pre-Development 100 -Year	100	3.222	12.200	31.41
Area 2A	Post-Development 1-Year	1	0.057	12.200	0.53
Area 2A	Post-Development 2-Year	2	0.085	12.200	0.83
Area 2A	Post-Development 10 -Year	10	0.182	12.200	1.86
Area 2A	Post-Development 100-Year	100	0.394	12.150	4.03

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Outfall 1	Post-Development 1-Year	1	0.137	11.950	2.36
Outfall 1	Post-Development 2-Year	2	0.188	11.950	3.26
Outfall 1	Post-Development 10-Year	10	0.353	11.950	6.05
Outfall 1	Post-Development 100-Year	100	0.686	11.950	11.41
Outfall 2	Post-Development 1-Year	1	1.379	13.500	2.15
Outfall 2	Post-Development 2-Year	2	1.978	12.650	5.75
Outfall 2	Post-Development 10-Year	10	3.939	12.350	22.99
Outfall 2	Post-Development 100-Year	100	7.986	12.200	71.73
Outfall 1	Pre-Development 1-Year	1	0.195	12.000	3.15
Outfall 1	Pre-Development 2-Year	2	0.264	12.000	4.24
Outfall 1	Pre-Development 10-Year	10	0.482	12.000	7.58
Outfall 1	Pre-Development 100-Year	100	0.917	12.000	13.90
Outfall 2	Pre-Development 1-Year	1	0.732	12.150	7.51
Outfall 2	Pre-Development 2-Year	2	1.113	12.150	12.08
Outfall 2	Pre-Development 10-Year	10	2.467	12.150	28.13
Outfall 2	Pre-Development 100-Year	100	5.475	12.100	63.11
Outfall 4	Post-Development 1-Year	1	0.031	11.950	0.56
Outfall 4	Pre-Development 1-Year	1	0.440	12.300	3.83
Outfall 4	Pre-Development 2-Year	2	0.609	12.300	5.34
Outfall 4	Post-Development 2-Year	2	0.046	11.950	0.82
Outfall 4	Pre-Development 10-Year	10	1.158	12.250	10.16
Outfall 4	Post-Development 10-Year	10	0.094	11.900	1.70
Outfall 4	Pre-Development 100-Year	100	2.270	12.250	19.58
Outfall 4	Post-Development 100-Year	100	0.196	11.900	3.54

Subsection: Master Network Summary

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Outfall 5	Post-Development 1-Year	1	0.046	12.100	0.58
Outfall 5	Pre-Development 1-Year	1	0.161	12.250	1.41
Outfall 5	Pre-Development 2-Year	2	0.218	12.250	1.92
Outfall 5	Post-Development 2-Year	2	0.066	12.100	0.83
Outfall 5	Pre-Development 10-Year	10	0.399	12.250	3.49
Outfall 5	Post-Development 10 -Year	10	0.130	12.100	1.65
Outfall 5	Pre-Development 100 -Year	100	0.760	12.250	6.51
Outfall 5	Post-Development 100-Year	100	0.263	12.100	3.27
Outfall 3	Post-Development 1-Year	1	0.665	12.150	4.55
Outfall 3	Pre-Development 1-Year	1	0.590	12.150	6.64
Outfall 3	Pre-Development 2-Year	2	0.823	12.150	9.32
Outfall 3	Post-Development 2-Year	2	0.906	12.150	6.89
Outfall 3	Pre-Development 10-Year	10	1.579	12.150	17.84
Outfall 3	Post-Development 10 -Year	10	1.678	12.100	16.65
Outfall 3	Pre-Development 100 -Year	100	3.124	12.100	34.55
Outfall 3	Post-Development 100-Year	100	3.231	12.050	38.16
Outfall 3C	Post-Development 1-Year	1	0.539	12.250	4.96
Outfall 3C	Pre-Development 1-Year	1	0.598	12.200	5.83
Outfall 3C	Pre-Development 2-Year	2	0.837	12.200	8.27
Outfall 3C	Post-Development 2-Year	2	0.755	12.250	7.03
Outfall 3C	Pre-Development 10-Year	10	1.619	12.200	16.07
Outfall 3C	Post-Development 10 -Year	10	1.463	12.250	13.65
Outfall 3C	Pre-Development 100 -Year	100	3.222	12.200	31.41
Outfall 3C	Post-Development 100-Year	100	2.913	12.200	26.66

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Pond A (IN)	Post-Development 1-Year	1	0.683	12.050	9.63	(N/A)	(N/A)
Pond A (OUT)	Post-Development 1-Year	1	0.624	12.750	1.04	17.45	0.803
Pond A (IN)	Post-Development 2-Year	2	0.900	12.050	12.58	(N/A)	(N/A)
Pond A (OUT)	Post-Development 2-Year	2	0.832	12.400	2.91	17.72	0.880
Pond A (IN)	Post-Development 10-Year	10	1.575	12.050	21.47	(N/A)	(N/A)
Pond A (OUT)	Post-Development 10-Year	10	1.478	12.200	10.98	18.32	1.059
Pond A (IN)	Post-Development 100-Year	100	2.894	12.050	38.11	(N/A)	(N/A)
Pond A (OUT)	Post-Development 100-Year	100	2.719	12.100	35.01	18.78	1.210
Pond B (IN)	Post-Development 1-Year	1	1.052	12.200	10.81	(N/A)	(N/A)
Pond B (OUT)	Post-Development 1-Year	1	0.675	13.700	1.05	16.35	1.285
Pond B (IN)	Post-Development 2-Year	2	1.446	12.200	14.93	(N/A)	(N/A)
Pond B (OUT)	Post-Development 2-Year	2	1.026	12.850	3.12	16.61	1.425
Pond B (IN)	Post-Development 10-Year	10	2.715	12.200	27.83	(N/A)	(N/A)
Pond B (OUT)	Post-Development 10-Year	10	2.196	12.500	12.98	17.29	1.817
Pond B (IN)	Post-Development 100-Year	100	5.275	12.150	52.85	(N/A)	(N/A)

Subsection: Master Network Summary

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Pond B (OUT)	Post-Development 100-Year	100	4.684	12.300	43.73	17.93	2.214
Pond C (IN)	Post-Development 1-Year	1	0.332	11.900	6.04	(N/A)	(N/A)
Pond C (OUT)	Post-Development 1-Year	1	0.289	12.900	0.39	21.03	0.477
Pond C (IN)	Post-Development 2-Year	2	0.444	11.900	8.05	(N/A)	(N/A)
Pond C (OUT)	Post-Development 2-Year	2	0.390	12.250	1.16	21.23	0.520
Pond C (IN)	Post-Development 10-Year	10	0.793	11.900	14.17	(N/A)	(N/A)
Pond C (OUT)	Post-Development 10-Year	10	0.708	12.050	6.13	21.77	0.638
Pond C (IN)	Post-Development 100-Year	100	1.483	11.900	25.71	(N/A)	(N/A)
Pond C (OUT)	Post-Development 100-Year	100	1.344	12.000	20.31	22.21	0.744

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Time-Depth Curve: 100-Year	
Label	100-Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	100 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.1	0.1	0.1	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.2	0.2	0.2	0.2
2.000	0.2	0.2	0.2	0.2	0.2
2.500	0.3	0.3	0.3	0.3	0.3
3.000	0.3	0.3	0.3	0.4	0.4
3.500	0.4	0.4	0.4	0.4	0.4
4.000	0.4	0.5	0.5	0.5	0.5
4.500	0.5	0.5	0.5	0.6	0.6
5.000	0.6	0.6	0.6	0.6	0.6
5.500	0.7	0.7	0.7	0.7	0.7
6.000	0.7	0.8	0.8	0.8	0.8
6.500	0.8	0.8	0.9	0.9	0.9
7.000	0.9	0.9	1.0	1.0	1.0
7.500	1.0	1.0	1.1	1.1	1.1
8.000	1.1	1.1	1.2	1.2	1.2
8.500	1.2	1.3	1.3	1.3	1.3
9.000	1.4	1.4	1.4	1.5	1.5
9.500	1.5	1.5	1.6	1.6	1.6
10.000	1.7	1.7	1.8	1.8	1.8
10.500	1.9	1.9	2.0	2.1	2.1
11.000	2.2	2.3	2.3	2.4	2.5
11.500	2.6	2.8	3.3	4.0	5.3
12.000	6.2	6.3	6.5	6.6	6.7
12.500	6.8	6.9	7.0	7.0	7.1
13.000	7.2	7.2	7.3	7.3	7.4
13.500	7.4	7.5	7.5	7.5	7.6
14.000	7.6	7.6	7.7	7.7	7.7
14.500	7.8	7.8	7.8	7.9	7.9
15.000	7.9	7.9	8.0	8.0	8.0
15.500	8.1	8.1	8.1	8.1	8.1
16.000	8.2	8.2	8.2	8.2	8.2
16.500	8.3	8.3	8.3	8.3	8.3
17.000	8.4	8.4	8.4	8.4	8.4

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	8.5	8.5	8.5	8.5	8.5
18.000	8.5	8.6	8.6	8.6	8.6
18.500	8.6	8.6	8.7	8.7	8.7
19.000	8.7	8.7	8.7	8.7	8.8
19.500	8.8	8.8	8.8	8.8	8.8
20.000	8.8	8.8	8.9	8.9	8.9
20.500	8.9	8.9	8.9	8.9	8.9
21.000	9.0	9.0	9.0	9.0	9.0
21.500	9.0	9.0	9.0	9.0	9.1
22.000	9.1	9.1	9.1	9.1	9.1
22.500	9.1	9.1	9.1	9.2	9.2
23.000	9.2	9.2	9.2	9.2	9.2
23.500	9.2	9.2	9.2	9.3	9.3
24.000	9.3	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 10-Year

Return Event: 10 years
Storm Event: 10-Year

Time-Depth Curve: 10-Year	
Label	10-Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	10 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.1
1.000	0.1	0.1	0.1	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.2	0.2	0.2	0.2	0.2
3.000	0.2	0.2	0.2	0.2	0.2
3.500	0.2	0.2	0.2	0.3	0.3
4.000	0.3	0.3	0.3	0.3	0.3
4.500	0.3	0.3	0.3	0.3	0.3
5.000	0.4	0.4	0.4	0.4	0.4
5.500	0.4	0.4	0.4	0.4	0.4
6.000	0.4	0.5	0.5	0.5	0.5
6.500	0.5	0.5	0.5	0.5	0.5
7.000	0.6	0.6	0.6	0.6	0.6
7.500	0.6	0.6	0.6	0.6	0.7
8.000	0.7	0.7	0.7	0.7	0.7
8.500	0.7	0.8	0.8	0.8	0.8
9.000	0.8	0.8	0.9	0.9	0.9
9.500	0.9	0.9	0.9	1.0	1.0
10.000	1.0	1.0	1.1	1.1	1.1
10.500	1.1	1.2	1.2	1.2	1.3
11.000	1.3	1.4	1.4	1.5	1.5
11.500	1.6	1.7	2.0	2.4	3.2
12.000	3.7	3.8	3.9	4.0	4.0
12.500	4.1	4.1	4.2	4.2	4.3
13.000	4.3	4.3	4.4	4.4	4.4
13.500	4.5	4.5	4.5	4.5	4.6
14.000	4.6	4.6	4.6	4.6	4.7
14.500	4.7	4.7	4.7	4.7	4.7
15.000	4.8	4.8	4.8	4.8	4.8
15.500	4.8	4.9	4.9	4.9	4.9
16.000	4.9	4.9	4.9	4.9	5.0
16.500	5.0	5.0	5.0	5.0	5.0
17.000	5.0	5.0	5.1	5.1	5.1

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 10-Year

Return Event: 10 years
Storm Event: 10-Year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	5.1	5.1	5.1	5.1	5.1
18.000	5.1	5.1	5.2	5.2	5.2
18.500	5.2	5.2	5.2	5.2	5.2
19.000	5.2	5.2	5.2	5.3	5.3
19.500	5.3	5.3	5.3	5.3	5.3
20.000	5.3	5.3	5.3	5.3	5.3
20.500	5.3	5.4	5.4	5.4	5.4
21.000	5.4	5.4	5.4	5.4	5.4
21.500	5.4	5.4	5.4	5.4	5.4
22.000	5.5	5.5	5.5	5.5	5.5
22.500	5.5	5.5	5.5	5.5	5.5
23.000	5.5	5.5	5.5	5.5	5.5
23.500	5.5	5.6	5.6	5.6	5.6
24.000	5.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 1-Year

Return Event: 1 years
Storm Event: 1-Year

Time-Depth Curve: 1-Year	
Label	1-Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	1 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.0	0.0
1.500	0.0	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.1	0.1	0.1	0.1
4.000	0.1	0.1	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.2
5.500	0.2	0.2	0.2	0.2	0.2
6.000	0.2	0.2	0.2	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.3
7.000	0.3	0.3	0.3	0.3	0.3
7.500	0.3	0.3	0.3	0.3	0.4
8.000	0.4	0.4	0.4	0.4	0.4
8.500	0.4	0.4	0.4	0.4	0.4
9.000	0.4	0.4	0.5	0.5	0.5
9.500	0.5	0.5	0.5	0.5	0.5
10.000	0.5	0.6	0.6	0.6	0.6
10.500	0.6	0.6	0.6	0.7	0.7
11.000	0.7	0.7	0.7	0.8	0.8
11.500	0.8	0.9	1.1	1.3	1.7
12.000	2.0	2.0	2.1	2.1	2.2
12.500	2.2	2.2	2.2	2.3	2.3
13.000	2.3	2.3	2.3	2.4	2.4
13.500	2.4	2.4	2.4	2.4	2.4
14.000	2.4	2.5	2.5	2.5	2.5
14.500	2.5	2.5	2.5	2.5	2.5
15.000	2.5	2.6	2.6	2.6	2.6
15.500	2.6	2.6	2.6	2.6	2.6
16.000	2.6	2.6	2.6	2.6	2.6
16.500	2.7	2.7	2.7	2.7	2.7
17.000	2.7	2.7	2.7	2.7	2.7

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 1-Year

Return Event: 1 years
Storm Event: 1-Year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	2.7	2.7	2.7	2.7	2.7
18.000	2.7	2.7	2.8	2.8	2.8
18.500	2.8	2.8	2.8	2.8	2.8
19.000	2.8	2.8	2.8	2.8	2.8
19.500	2.8	2.8	2.8	2.8	2.8
20.000	2.8	2.8	2.8	2.8	2.9
20.500	2.9	2.9	2.9	2.9	2.9
21.000	2.9	2.9	2.9	2.9	2.9
21.500	2.9	2.9	2.9	2.9	2.9
22.000	2.9	2.9	2.9	2.9	2.9
22.500	2.9	2.9	2.9	2.9	2.9
23.000	2.9	2.9	3.0	3.0	3.0
23.500	3.0	3.0	3.0	3.0	3.0
24.000	3.0	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 2-Year

Return Event: 2 years
Storm Event: 2-Year

Time-Depth Curve: 2-Year	
Label	2-Year
Start Time	0.000 hours
Increment	0.100 hours
End Time	24.000 hours
Return Event	2 years

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
0.000	0.0	0.0	0.0	0.0	0.0
0.500	0.0	0.0	0.0	0.0	0.0
1.000	0.0	0.0	0.0	0.1	0.1
1.500	0.1	0.1	0.1	0.1	0.1
2.000	0.1	0.1	0.1	0.1	0.1
2.500	0.1	0.1	0.1	0.1	0.1
3.000	0.1	0.1	0.1	0.1	0.1
3.500	0.1	0.2	0.2	0.2	0.2
4.000	0.2	0.2	0.2	0.2	0.2
4.500	0.2	0.2	0.2	0.2	0.2
5.000	0.2	0.2	0.2	0.2	0.3
5.500	0.3	0.3	0.3	0.3	0.3
6.000	0.3	0.3	0.3	0.3	0.3
6.500	0.3	0.3	0.3	0.3	0.4
7.000	0.4	0.4	0.4	0.4	0.4
7.500	0.4	0.4	0.4	0.4	0.4
8.000	0.4	0.4	0.5	0.5	0.5
8.500	0.5	0.5	0.5	0.5	0.5
9.000	0.5	0.5	0.6	0.6	0.6
9.500	0.6	0.6	0.6	0.6	0.6
10.000	0.7	0.7	0.7	0.7	0.7
10.500	0.7	0.8	0.8	0.8	0.8
11.000	0.9	0.9	0.9	0.9	1.0
11.500	1.0	1.1	1.3	1.6	2.1
12.000	2.4	2.5	2.5	2.6	2.6
12.500	2.7	2.7	2.7	2.8	2.8
13.000	2.8	2.8	2.8	2.9	2.9
13.500	2.9	2.9	2.9	2.9	3.0
14.000	3.0	3.0	3.0	3.0	3.0
14.500	3.0	3.1	3.1	3.1	3.1
15.000	3.1	3.1	3.1	3.1	3.1
15.500	3.1	3.2	3.2	3.2	3.2
16.000	3.2	3.2	3.2	3.2	3.2
16.500	3.2	3.2	3.3	3.3	3.3
17.000	3.3	3.3	3.3	3.3	3.3

Subsection: Time-Depth Curve
Label: Suffolk,VA SCS Ty. II
Scenario: Post-Development 2-Year

Return Event: 2 years
Storm Event: 2-Year

CUMULATIVE RAINFALL (in)
Output Time Increment = 0.100 hours
Time on left represents time for first value in each row.

Time (hours)	Depth (in)	Depth (in)	Depth (in)	Depth (in)	Depth (in)
17.500	3.3	3.3	3.3	3.3	3.3
18.000	3.3	3.3	3.4	3.4	3.4
18.500	3.4	3.4	3.4	3.4	3.4
19.000	3.4	3.4	3.4	3.4	3.4
19.500	3.4	3.4	3.4	3.4	3.5
20.000	3.5	3.5	3.5	3.5	3.5
20.500	3.5	3.5	3.5	3.5	3.5
21.000	3.5	3.5	3.5	3.5	3.5
21.500	3.5	3.5	3.5	3.5	3.5
22.000	3.5	3.6	3.6	3.6	3.6
22.500	3.6	3.6	3.6	3.6	3.6
23.000	3.6	3.6	3.6	3.6	3.6
23.500	3.6	3.6	3.6	3.6	3.6
24.000	3.6	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Outlet Input Data
Label: Pond A Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	12.00 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	20.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Rectangular Weir	Q10 Weir	Forward + Reverse	Culvert - 1	17.45	20.00
Inlet Box	Riser - 1	Forward + Reverse	Culvert - 1	18.40	20.00
Orifice-Circular	Q1 Orifice	Forward + Reverse	Culvert - 1	16.00	20.00
Culvert-Circular	Culvert - 1	Forward + Reverse	TW	15.00	20.00
Rectangular Weir	Spillway	Forward	TW	18.50	20.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: Pond A Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	36.0 in
Length	60.00 ft
Length (Computed Barrel)	60.03 ft
Slope (Computed)	0.033 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.007
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.079
T2 ratio (HW/D)	1.181
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	18.24 ft	T1 Flow	42.85 ft³/s
T2 Elevation	18.54 ft	T2 Flow	48.97 ft³/s

Subsection: Outlet Input Data
Label: Pond A Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Structure ID: Q1 Orifice Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	16.00 ft
Orifice Diameter	6.0 in
Orifice Coefficient	0.600

Structure ID: Q10 Weir Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	17.45 ft
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Spillway Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	18.50 ft
Weir Length	15.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	18.40 ft
Orifice Area	16.0 ft²
Orifice Coefficient	0.600
Weir Length	12.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Subsection: Outlet Input Data
Label: Pond B Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	11.00 ft
Increment (Headwater)	0.25 ft
Maximum (Headwater)	20.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Inlet Box	Riser - 1	Forward + Reverse	Culvert - 1	17.30	20.00
Orifice-Circular	Q1 Orifice	Forward + Reverse	Culvert - 1	15.00	20.00
Culvert-Circular	Culvert - 1	Forward	TW	15.00	20.00
Rectangular Weir	Q10 Weir	Forward + Reverse	TW	16.30	20.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: Pond B Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	36.0 in
Length	150.00 ft
Length (Computed Barrel)	150.01 ft
Slope (Computed)	0.012 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.500
Kb	0.007
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.154
T2 ratio (HW/D)	1.301
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	18.46 ft	T1 Flow	42.85 ft³/s
T2 Elevation	18.90 ft	T2 Flow	48.97 ft³/s

Subsection: Outlet Input Data
Label: Pond B Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Structure ID: Q1 Orifice Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	15.00 ft
Orifice Diameter	6.0 in
Orifice Coefficient	0.600

Structure ID: Q10 Weir Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	16.30 ft
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	17.30 ft
Orifice Area	16.0 ft^2
Orifice Coefficient	0.600
Weir Length	12.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Subsection: Outlet Input Data
Label: Pond C Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	16.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	24.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Rectangular Weir	Q10 Weir	Forward	Culvert - 1	21.05	24.00
Inlet Box	Riser - 1	Forward	Culvert - 1	21.75	24.00
Orifice-Circular	Q1 Orifice	Forward	Culvert - 1	20.00	24.00
Culvert-Circular	Culvert - 1	Forward	TW	19.00	24.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: Pond C Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Structure ID: Culvert - 1
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	24.0 in
Length	130.00 ft
Length (Computed Barrel)	130.00 ft
Slope (Computed)	0.005 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.012
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.093
T2 ratio (HW/D)	1.195
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	21.19 ft	T1 Flow	15.55 ft³/s
T2 Elevation	21.39 ft	T2 Flow	17.77 ft³/s

Structure ID: Q1 Orifice Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	20.00 ft
Orifice Diameter	4.0 in
Orifice Coefficient	0.600

Structure ID: Q10 Weir Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	21.05 ft
Weir Length	3.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	21.75 ft
Orifice Area	12.0 ft²
Orifice Coefficient	0.600
Weir Length	13.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Subsection: Outlet Input Data
Label: Pond C Outlet Structure
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Pond A
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	16.00 ft
Volume (Initial)	0.452 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
12.00	-0.10	0.000	0.062	0.00	-0.10	-0.10
12.25	-0.10	0.016	0.067	0.00	-0.10	7.72
12.50	-0.10	0.034	0.073	0.00	-0.10	16.17
12.75	-0.10	0.052	0.078	0.00	-0.10	25.29
13.00	-0.10	0.073	0.084	0.00	-0.10	35.10
13.25	-0.10	0.094	0.090	0.00	-0.10	45.61
13.50	-0.10	0.118	0.096	0.00	-0.10	56.82
13.75	-0.10	0.142	0.102	0.00	-0.10	68.76
14.00	-0.10	0.168	0.108	0.00	-0.10	81.44
14.25	-0.10	0.196	0.114	0.00	-0.10	94.89
14.50	-0.10	0.226	0.121	0.00	-0.10	109.10
14.75	-0.10	0.257	0.127	0.00	-0.10	124.09
15.00	-0.10	0.289	0.134	0.00	-0.10	139.90
15.25	-0.10	0.324	0.148	0.00	-0.10	156.95
15.50	0.00	0.363	0.163	0.00	0.00	175.83
15.75	0.00	0.406	0.178	0.00	0.00	196.42
16.00	0.00	0.452	0.194	0.00	0.00	218.92
16.25	0.13	0.503	0.210	0.00	0.13	243.51
16.50	0.45	0.558	0.227	0.00	0.45	270.28
16.75	0.67	0.616	0.245	0.00	0.67	299.05
17.00	0.82	0.680	0.263	0.00	0.82	329.91
17.25	0.94	0.747	0.272	0.00	0.94	362.42
17.45	1.03	0.802	0.280	0.00	1.03	389.22
17.50	1.19	0.816	0.282	0.00	1.19	396.18
17.75	3.13	0.888	0.291	0.00	3.13	432.78
18.00	6.14	0.962	0.301	0.00	6.14	471.62
18.25	9.86	1.038	0.311	0.00	9.86	512.35
18.40	12.37	1.085	0.317	0.00	12.37	537.63
18.50	15.26	1.117	0.321	0.00	15.26	555.95
18.75	31.92	1.199	0.331	0.00	31.92	612.02

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Pond A
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
19.00	54.12	1.283	0.341	0.00	54.12	674.86
19.25	79.25	1.369	0.352	0.00	79.25	741.88
19.50	104.56	1.458	0.362	0.00	104.56	810.37
19.75	128.19	1.550	0.373	0.00	128.19	878.48
20.00	151.22	1.645	0.384	0.00	151.22	947.30

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Pond B
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	15.00 ft
Volume (Initial)	0.684 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
11.00	0.00	0.000	0.063	0.00	0.00	0.00
11.25	0.00	0.016	0.068	0.00	0.00	7.95
11.50	0.00	0.034	0.074	0.00	0.00	16.57
11.75	0.00	0.053	0.080	0.00	0.00	25.88
12.00	0.00	0.074	0.086	0.00	0.00	35.91
12.25	0.00	0.097	0.099	0.00	0.00	47.09
12.50	0.00	0.124	0.113	0.00	0.00	59.88
12.75	0.00	0.154	0.127	0.00	0.00	74.40
13.00	0.00	0.188	0.143	0.00	0.00	90.75
13.25	0.00	0.226	0.167	0.00	0.00	109.46
13.50	0.00	0.271	0.192	0.00	0.00	131.13
13.75	0.00	0.322	0.219	0.00	0.00	155.98
14.00	0.00	0.381	0.248	0.00	0.00	184.21
14.25	0.00	0.446	0.275	0.00	0.00	215.82
14.50	0.00	0.518	0.303	0.00	0.00	250.75
14.75	0.00	0.597	0.332	0.00	0.00	289.15
15.00	0.00	0.684	0.363	0.00	0.00	331.20
15.25	0.00	0.779	0.393	0.00	0.00	376.91
15.50	0.00	0.881	0.424	0.00	0.00	426.29
15.75	0.30	0.991	0.456	0.00	0.30	479.78
16.00	0.56	1.109	0.489	0.00	0.56	537.18
16.25	0.73	1.234	0.513	0.00	0.73	597.95
16.30	0.76	1.260	0.517	0.00	0.76	610.44
16.50	1.94	1.365	0.537	0.00	1.94	662.65
16.75	4.61	1.502	0.562	0.00	4.61	731.78
17.00	8.13	1.646	0.587	0.00	8.13	804.78
17.25	12.31	1.795	0.601	0.00	12.31	880.85
17.30	13.21	1.825	0.604	0.00	13.21	896.34
17.50	20.15	1.947	0.616	0.00	20.15	962.32
17.75	32.80	2.102	0.630	0.00	32.80	1,050.34

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Pond B
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
18.00	48.40	2.262	0.645	0.00	48.40	1,143.09
18.25	66.36	2.425	0.660	0.00	66.36	1,239.99
18.50	79.98	2.592	0.675	0.00	79.98	1,334.33
18.75	91.26	2.762	0.690	0.00	91.26	1,428.16
19.00	102.86	2.937	0.705	0.00	102.86	1,524.14
19.25	114.04	3.115	0.720	0.00	114.04	1,621.56
19.50	124.79	3.297	0.736	0.00	124.79	1,720.44
19.75	135.74	3.483	0.752	0.00	135.74	1,821.42
20.00	146.85	3.673	0.768	0.00	146.85	1,924.48

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Pond C
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	20.00 ft
Volume (Initial)	0.298 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
16.00	0.00	0.000	0.032	0.00	0.00	0.00
16.10	0.00	0.003	0.034	0.00	0.00	1.59
16.20	0.00	0.007	0.035	0.00	0.00	3.26
16.30	0.00	0.010	0.037	0.00	0.00	5.00
16.40	0.00	0.014	0.039	0.00	0.00	6.84
16.50	0.00	0.018	0.040	0.00	0.00	8.75
16.60	0.00	0.022	0.042	0.00	0.00	10.76
16.70	0.00	0.027	0.044	0.00	0.00	12.85
16.80	0.00	0.031	0.046	0.00	0.00	15.03
16.90	0.00	0.036	0.048	0.00	0.00	17.31
17.00	0.00	0.041	0.050	0.00	0.00	19.68
17.10	0.00	0.046	0.052	0.00	0.00	22.15
17.20	0.00	0.051	0.054	0.00	0.00	24.70
17.30	0.00	0.057	0.056	0.00	0.00	27.35
17.40	0.00	0.062	0.058	0.00	0.00	30.09
17.50	0.00	0.068	0.060	0.00	0.00	32.92
17.60	0.00	0.074	0.062	0.00	0.00	35.86
17.70	0.00	0.080	0.064	0.00	0.00	38.89
17.80	0.00	0.087	0.066	0.00	0.00	42.02
17.90	0.00	0.093	0.068	0.00	0.00	45.25
18.00	0.00	0.100	0.070	0.00	0.00	48.59
18.10	0.00	0.107	0.072	0.00	0.00	52.03
18.20	0.00	0.115	0.074	0.00	0.00	55.56
18.30	0.00	0.122	0.076	0.00	0.00	59.20
18.40	0.00	0.130	0.078	0.00	0.00	62.95
18.50	0.00	0.138	0.081	0.00	0.00	66.80
18.60	0.00	0.146	0.083	0.00	0.00	70.75
18.70	0.00	0.155	0.085	0.00	0.00	74.82
18.80	0.00	0.163	0.087	0.00	0.00	78.99
18.90	0.00	0.172	0.090	0.00	0.00	83.27

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 100 years
Label: Pond C Storm Event: 100-Year
Scenario: Post-Development 100-Year

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
19.00	0.00	0.181	0.092	0.00	0.00	87.67
19.10	0.00	0.191	0.097	0.00	0.00	92.24
19.20	0.00	0.200	0.101	0.00	0.00	97.03
19.30	0.00	0.211	0.106	0.00	0.00	102.06
19.40	0.00	0.222	0.111	0.00	0.00	107.33
19.50	0.00	0.233	0.117	0.00	0.00	112.85
19.60	0.00	0.245	0.122	0.00	0.00	118.61
19.70	0.00	0.258	0.127	0.00	0.00	124.64
19.80	0.00	0.271	0.133	0.00	0.00	130.93
19.90	0.00	0.284	0.138	0.00	0.00	137.48
20.00	0.00	0.298	0.144	0.00	0.00	144.31
20.10	0.02	0.313	0.150	0.00	0.02	151.44
20.20	0.07	0.328	0.155	0.00	0.07	158.86
20.30	0.14	0.344	0.161	0.00	0.14	166.57
20.40	0.20	0.360	0.167	0.00	0.20	174.57
20.50	0.24	0.377	0.173	0.00	0.24	182.82
20.60	0.28	0.395	0.179	0.00	0.28	191.36
20.70	0.31	0.413	0.185	0.00	0.31	200.19
20.80	0.33	0.432	0.191	0.00	0.33	209.32
20.90	0.36	0.451	0.198	0.00	0.36	218.75
21.00	0.38	0.471	0.204	0.00	0.38	228.49
21.05	0.39	0.482	0.206	0.00	0.39	233.46
21.10	0.51	0.492	0.207	0.00	0.51	238.57
21.20	0.95	0.513	0.211	0.00	0.95	249.13
21.30	1.57	0.534	0.214	0.00	1.57	260.02
21.40	2.33	0.556	0.217	0.00	2.33	271.21
21.50	3.20	0.577	0.221	0.00	3.20	282.68
21.60	4.17	0.600	0.224	0.00	4.17	294.42
21.70	5.23	0.622	0.228	0.00	5.23	306.41
21.75	5.78	0.634	0.229	0.00	5.78	312.48
21.80	6.78	0.645	0.231	0.00	6.78	319.05
21.90	9.78	0.668	0.234	0.00	9.78	333.31
22.00	13.61	0.692	0.238	0.00	13.61	348.58
22.10	17.36	0.716	0.241	0.00	17.36	363.93
22.20	20.10	0.740	0.245	0.00	20.10	378.44
22.30	21.68	0.765	0.249	0.00	21.68	391.97
22.40	22.56	0.790	0.252	0.00	22.56	404.96
22.50	23.03	0.815	0.256	0.00	23.03	417.72
22.60	23.47	0.841	0.259	0.00	23.47	430.62
22.70	23.90	0.867	0.263	0.00	23.90	443.69
22.80	24.33	0.894	0.267	0.00	24.33	456.94
22.90	24.75	0.921	0.270	0.00	24.75	470.35
23.00	25.17	0.948	0.274	0.00	25.17	483.94
23.10	25.59	0.975	0.278	0.00	25.59	497.71
23.20	26.00	1.003	0.282	0.00	26.00	511.66

Subsection: Elevation-Volume-Flow Table (Pond)
Label: Pond C
Scenario: Post-Development 100-Year

Return Event: 100 years
Storm Event: 100-Year

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
23.30	26.40	1.032	0.285	0.00	26.40	525.79
23.40	26.82	1.061	0.289	0.00	26.82	540.11
23.50	27.22	1.090	0.293	0.00	27.22	554.61
23.60	27.62	1.119	0.297	0.00	27.62	569.29
23.70	28.00	1.149	0.301	0.00	28.00	584.15
23.80	28.38	1.179	0.305	0.00	28.38	599.19
23.90	28.77	1.210	0.309	0.00	28.77	614.44
24.00	29.14	1.241	0.313	0.00	29.14	629.86

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PROJECT	**Nansemond-Wilroy Overpass**		
ROAD	**Wilroy Road**	**COUNTY**	Suffolk (city)
CULVERT	A		VA
NOAA Station	17+50 Suffolk Lake Kilby		

SHEET OF

UNITS **ENGLISH**

CULVERT DESIGN FORM LD-269

DESIGNER: JJK DATE: 7/16/2019

REVIEWER: DATE:

HYDROLOGICAL DATA

Method: INPUT

Drainage Area: 0

Time of Concentration 5

DESIGN FLOWS

R.I. (years)	FLOW (cfs)	
25	Design	79.00
2	Check	16.00
100	Max.	149.00

CULVERT DESCRIPTION:

TYPE: **Single/Multiple Conforming**

Roadway Width 63 ft ROADWAY ELEVATION 21.10 ft Road Length 500 Suface Type PAVED

Freeboard= #VALUE! ft

Shldr. Elev. Rt.= ft

Shldr. Elev. Lt. = ft

ELHWd= 15.24 ft

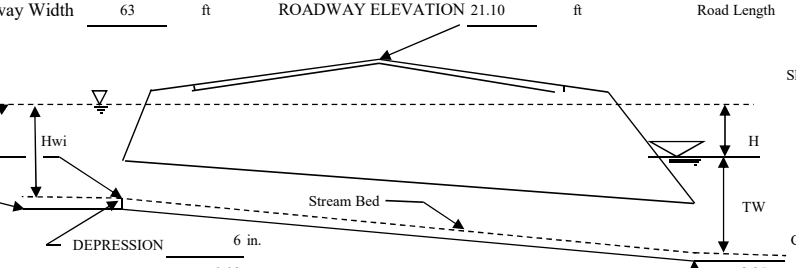
Elsf= 10.91 ft

Eli= 10.40 ft

L= 185 ft

S= 1.16%

SKEW= 43 O



TW DEPTH 4.55 ft

TW VEL. 0.00 fps

Channel Inv.El.. 8.25 ft

Inlet Edge Description:

Square edge w/headwall

Single / Multiple Conforming / Broken Back Culverts

HEADWATER CALCULATIONS

MATERIAL	SHAPE	Size (in)	N	Mannings n	TOTAL FLOW Q cfs	FLOW PER BARREL Q/N cfs	INLET CONTROL HWi/D	HWi ft	FALL ft	ELHWi ft	OUTLET CONTROL TW ft	dc ft	(dc+D)/2 ft	ho ft	ke	H ft	ELHWo ft	CONTROL HEADWATER ELEV ft	OUTLET VEL fps	MINIMUM SHOULDER ELEV. ft	COMMENTS
Concrete	Circular	54	1	0.01	79.00	79.0	1.08	2.99	0.01	13.39	4.55	2.30	3.40	4.55	0.50	1.44	15.24	15.24	9.07		
					16.00	16.0	0.77	0.89	0.01	11.29	4.55	0.89	2.70	4.55	0.50	0.07	13.87	13.87	5.15		
					149.00	149.0	1.79	6.95	0.01	17.35	4.55	3.25	3.88	4.55	0.50	4.64	18.44	18.44	10.86		

Broken Back Culvert

LENGTH	Elev.	SKEW O

TAILWATER DATA:

Channel Shape		
Bottom Width, ft	0.00	"n" = 0.035
Side Slope Lt: (H:1V)	0.00	
Side Slope Rt: (H:1V)	0.00	
Channel Slope, ft/ft	0.0100	

Distance					
Elevation					
"n" =					

TAILWATER RESULTS:

	Discharge cfs	Elevation ft	Flow depth ft	Velocity fps	Shear force PSF
Design	12.80	4.55	0.00	0.00	
Check	12.80	4.55	0.00	0.00	
Max.	12.80	4.55	0.00	0.00	

ROADWAY DATA:

Roadway Width, ft	63
Surface Type	PAVED
Top of Road Elevation, ft	21.1
Length of Road, ft	500

ROADWAY OVERTOPPING:

	Discharge cfs	Overtopping Discharge cfs	Overtopping Elevation ft
Design	0		0.00
Check	0		0.00
Max.	0		0.00

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) HWi/D = HW/D OR HWi/D FROM DESIGN CHARTS

(3) FALL = HWI - (ELHWd - ELsf); FALL IS ZERO FOR CULVERTS ON GRADE

(4) ELhi = HWi + ELi (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWNSTREAM CONTROL OR FLOW DEPTH IN CHANNEL

(6) ho = TW or (dc + D/2) (WHICHEVER IS GREATER)

(7) $H = [1 + ke + (29n^2L)/R^{1.33}]v^2/2g$

SUBSCRIPT DEFINITIONS:

HWd	DESIGN HEADWATER	i	INLET
HWi	HW IN INLET CONTROL	o	OUTLET
HWo	HW IN OUTLET CONTROL	sf	Streambed @ culvert face

COMMENTS / DISCUSSION:

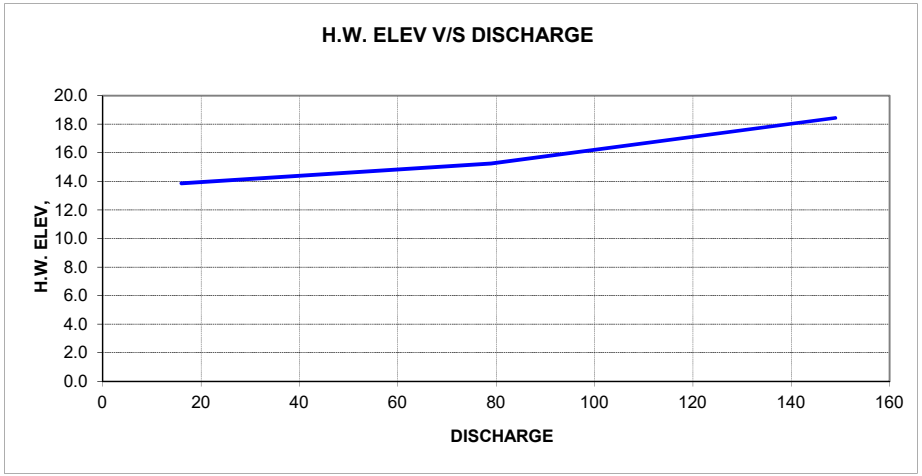
CULVERT BARREL SELECTED

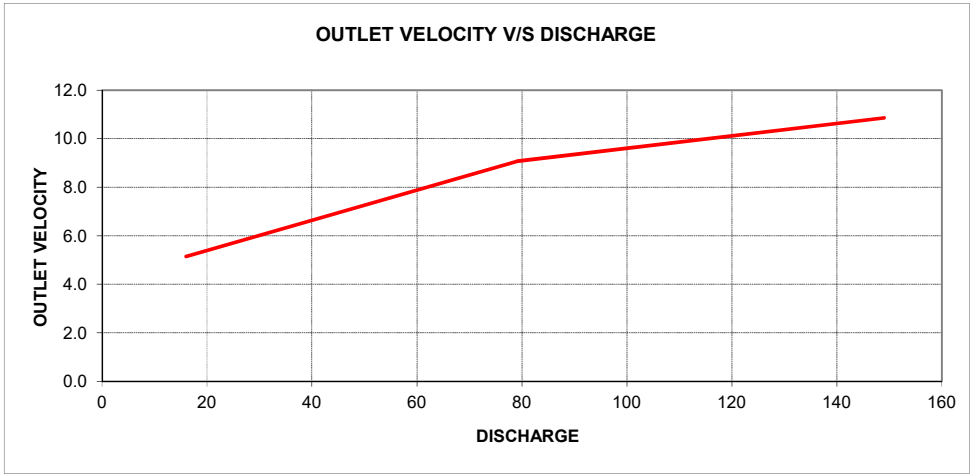
SIZE: n:

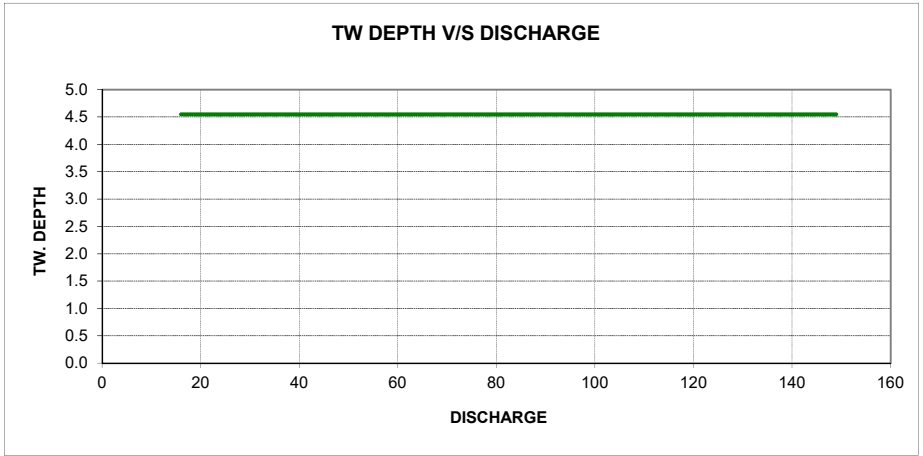
SHAPE: MATERIAL:

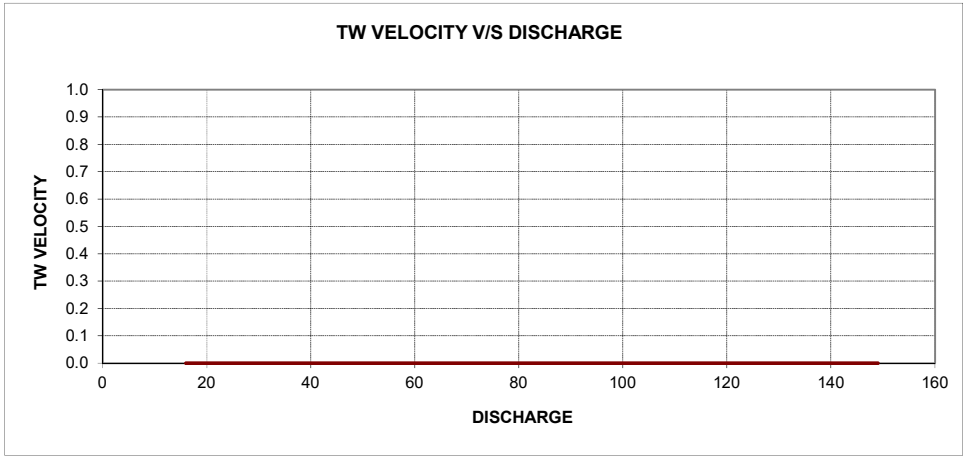
ENTRANCE:

PROJECT	Nansemond-Wilroy Overpass					CULVERT DESIGN FORM LD-269	
ROAD	Wilroy Road	COUNTY	Suffolk (city)	SHEET	OF	DESIGNER: JJK	DATE: 7/16/2019
CULVERT	A		VA	UNITS	ENGLISH	REVIEWER:	DATE:
NOAA Station	17+50 Suffolk Lake Kilby						









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Appendix E: Virginia Runoff Reduction Meethod Spreadsheets

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet – Version 3.0

☐ 2011 BMP Standards and Specifications ☐ 2013 Draft BMP Standards and Specifications

Project Name:	Numerond Wilroy Overpass	CLEAR ALL	data input cells
Date:	7/16/2020		constant values
	Linear Development Project? Yes		calculation cells
Site Information			final results

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* →	13.96	*Check:*	
		BMP Design Specifications List:	2013 Draft Stds & Specs
Maximum reduction required	20%	*Linear project?*	Yes
The site's net increase in impervious cover (acres) is	5.83	*Land cover areas entered correctly?*	✓
Post-Development TP Load Reduction for Site (lb/yr):	11.69	*Total disturbed area entered?*	✓

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) – undisturbed, natural undisturbed		0.91		0.19	1.10
Managed Turf (acres) – disturbed, graded for yards or other turf to be	0.10	3.02		8.84	11.96
Impervious Cover (acres)	0.01			0.89	0.90
					13.96

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) – undisturbed, protected/open space or reforested					0.00
Managed Turf (acres) – disturbed, graded for yards or other turf to be	0.09	1.83		5.31	7.23
Impervious Cover (acres)	0.02	2.10		4.61	6.73
Area Check	OK	OK	OK	OK	13.96

Constants

Annual Rainfall (inches)	42
Target Rainfall Event (inches)	1.00
Total Phosphorus TP9 (MC (mg/L)	0.26
Total Nitrogen (TN) MC (mg/L)	1.85
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre		
Pre-ReDevelopment	**Listed**	**Adjusted[1]**
Forest/Open Space Cover (acres)	1.10	0.00
Weighted Re(forest)	0.03	0.00
% Forest	8%	0%
Managed Turf Cover (acres)	11.96	7.23
Weighted Rv(turf)	0.24	0.24
% Managed Turf	86%	89%
Impervious Cover (acres)	0.90	0.90
Rv(impervious)	0.95	0.95
% Impervious	6%	11%
Total Site Area (acres)	**13.96**	**8.13**
Site Rv	**0.27**	**0.32**

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.1101 / 0.2135
Pre-ReDevelopment Treatment Volume (cubic feet)	12,507 / 9,300
Pre-ReDevelopment TP Load (lb/yr)	**8.49** / **5.84**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	0.61 / 0.72
Baseline TP Load (lb/yr): (0.41 lbs/acre/yr applied to pre-redevelopment area excluding previous land prepared for new impervious cover)	**2.32**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)		
Post ReDev. & New Impervious		
Forest/Open Space Cover (acres)	0.00	
Weighted Re(forest)	0.00	
% Forest	0%	
Managed Turf Cover (acres)	7.23	
Weighted Rv (turf)	0.24	
% Managed Turf	52%	
Impervious Cover (acres)	6.73	
Rv(impervious)	0.95	
% Impervious	48%	
Final Site Area (acres)	**13.96**	
Final Post Dev Site Rv	**0.58**	

Land Cover Summary-Post		
Post-ReDevelopment		
Forest/Open Space Cover (acres)	0.00	
Weighted Re(forest)	0.00	
% Forest	0%	
Managed Turf Cover (acres)	7.23	
Weighted Rv (turf)	0.24	
% Managed Turf	89%	
ReDev. Impervious Cover (acres)	0.90	
Rv(impervious)	0.95	
% Impervious	11%	
Total ReDev. Site Area (acres)	**8.13**	
ReDev Site Rv	**0.32**	

Land Cover Summary-Post	
Post-Development New Impervious	
New Impervious Cover (acres)	5.83
Re(impervious)	0.95

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	0.6750
Final Post-Development Treatment Volume (cubic feet)	29,405
Final Post-Development TP Load (lb/yr)	**18.47**
Final Post-Development TP Load per acre (lb/acre/yr)	1.32

Post-ReDevelopment Treatment Volume (acre-ft)	0.2135
Post-ReDevelopment Treatment Volume (cubic feet)	9,300
Post-ReDevelopment Load (TP) (lb/yr)*	**5.84**
Post-ReDevelopment TP Load per acre (lb/acre/yr)	0.72
Max. Reduction Required (Below Pre-ReDevelopment Load)	**28%**
TP Load Reduction Required for Redeveloped Area (lb/yr)	**1.17**

Post-Development Treatment Volume (acre-ft)	0.4615
Post-Development Treatment Volume (cubic feet)	20,105
Post-Development TP Load (lb/yr)	**12.63**
TP Load Reduction Required for New Impervious Area (lb/yr)	**10.24**

[1] Adjusted Land Cover Summary:
Pre-ReDevelopment land cover minus previous land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requirement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**11.41**
Linear Project TP Load Reduction Required (lb/yr):	**11.69**

Nitrogen Loads (Informational Purposes Only)

	Pre-ReDevelopment TN Load (lb/yr)	60.71			Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	132.17			

Drainage Area A

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)		0.99		0.68	1.67	0.22
Impervious Cover (acres)				2.79	2.79	0.95
				Total	4.46	

Total Phosphorus Available for Removal in D.A. A (lb/yr)	6.88
Post Development Treatment Volume in D.A. A (ft^3)	10,957

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00

8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	

8. Extended Detention Pond (RR)				
10	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00

9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

9. Sheetflow to Filter/Open Space (RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	6.88	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	6.88	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00

11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	

11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00

12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	

12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00

13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	1.61	2.79	0	0	10,909	10,909	45	0.00	6.85	3.08	3.77	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	

13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	48.98	9.80	39.18
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00

14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	2.79	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.61	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	5.13	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	6.88	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	3.08	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	3.08	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	3.80	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	9.80
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	9.80

Drainage Area B

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				5.48	5.48	0.25
Impervious Cover (acres)				3.85	3.85	0.95
				Total	9.33	

Total Phosphorus Available for Removal in D.A. B (lb/yr)	11.47
Post Development Treatment Volume in D.A. B (ft^3)	18,250

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infilration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)					
8.a. ED #1 (Spec #15)	10	0.00	0.00	0.00	0.00
8.b. ED #2 (Spec #15)	10	0.00	0.00	0.00	0.00

9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

9. Sheetflow to Filter/Open Space (RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	11.47	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	11.47	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. B (ft^3)	0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00

11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	

11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00

12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	

12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00

13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0	5.48	3.85	0	0	18,250	18,250	65	0.00	11.45	7.44	4.01	

13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00
40	0.00	0.00	0.00	0.00
30	0.00	81.94	24.58	57.35

14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	3.85	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	5.48	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	5.13	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. B (lb/yr)	11.47	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	7.44	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. B (lb/yr)	7.44	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. B (lb/yr)	4.02	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. B (lb/yr)	24.58
TOTAL NITROGEN REMOVED IN D.A. B (lb/yr)	24.58

Drainage Area C

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				1.72	1.72	0.25
Impervious Cover (acres)				0.75	0.75	0.95
				Total	2.47	

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. C (lb/yr)	2.61
Post Development Treatment Volume in D.A. C (ft^3)	4,147

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
1. Vegetated Roof (RR)													
1.a. Vegetated Roof #1 (Spec #5)	45				0	0	0	0		0.00	0.00	0.00	
1.b. Vegetated Roof #2 (Spec #5)	60				0	0	0	0		0.00	0.00	0.00	
2. Rooftop Disconnection (RR)													
2.a. Simple Disconnection to A/B Soils (Spec #1)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.b. Simple Disconnection to C/D Soils (Spec #1)	25			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
2.h. To Rainwater Harvesting (Spec #6)	0			0	0	0	0	0	0.00	0.00	0.00	0.00	
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
3. Permeable Pavement (RR)													
3.a. Permeable Pavement #1 (Spec #7)	45			0	0	0	0	25	0.00	0.00	0.00	0.00	
3.b. Permeable Pavement #2 (Spec #7)	75				0	0	0	25		0.00	0.00	0.00	
4. Grass Channel (RR)													
4.a. Grass Channel A/B Soils (Spec #3)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.b. Grass Channel C/D Soils (Spec #3)	10			0	0	0	0	15	0.00	0.00	0.00	0.00	
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20			0	0	0	0	15	0.00	0.00	0.00	0.00	
5. Dry Swale (RR)													
5.a. Dry Swale #1 (Spec #10)	40			0	0	0	0	20	0.00	0.00	0.00	0.00	
5.b. Dry Swale #2 (Spec #10)	60			0	0	0	0	40	0.00	0.00	0.00	0.00	
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40			0	0	0	0	25	0.00	0.00	0.00	0.00	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
7. Infiltration (RR)													
7.a. Infiltration #1 (Spec #8)	50			0	0	0	0	25	0.00	0.00	0.00	0.00	
7.b. Infiltration #2 (Spec #8)	90			0	0	0	0	25	0.00	0.00	0.00	0.00	

Practice	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)					
1.a. Vegetated Roof #1 (Spec #5)	0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (Spec #5)	0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)					
2.a. Simple Disconnection to A/B Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (Spec #1)	0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (Spec #4)	0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (Spec #9)	40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (Spec #6)	0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)					
3.a. Permeable Pavement #1 (Spec #7)	25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (Spec #7)	25		0.00	0.00	0.00
4. Grass Channel (RR)					
4.a. Grass Channel A/B Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (Spec #3)	20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (see Spec #4)	20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)					
5.a. Dry Swale #1 (Spec #10)	25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (Spec #10)	35	0.00	0.00	0.00	0.00
6. Bioretention (RR)					
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	60	0.00	0.00	0.00	0.00
7. Infiltration (RR)					
7.a. Infiltration #1 (Spec #8)	15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (Spec #8)	15	0.00	0.00	0.00	0.00

8. Extended Detention Pond (RR)													
8.a. ED #1 (Spec #15)	0			0	0	0	0	15	0.00	0.00	0.00	0.00	
8.b. ED #2 (Spec #15)	15			0	0	0	0	15	0.00	0.00	0.00	0.00	

8. Extended Detention Pond (RR)				
10	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00

9. Sheetflow to Filter/Open Space (RR)													
9.a. Sheetflow to Conservation Area, A/B Soils (Spec #2)	75			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.b. Sheetflow to Conservation Area, C/D Soils (Spec #2)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec #2 & #4)	50			0	0	0	0	0	0.00	0.00	0.00	0.00	

9. Sheetflow to Filter/Open Space (RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. C (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	2.61	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	2.61	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. C (ft^3)	0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

10. Wet Swale (no RR)													
10.a. Wet Swale #1 (Spec #11)	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
10.b. Wet Swale #2 (Spec #11)	0			0	0	0	0	40	0.00	0.00	0.00	0.00	

10. Wet Swale (Coastal Plain) (no RR)				
25	0.00	0.00	0.00	0.00
35	0.00	0.00	0.00	0.00

11. Filtering Practices (no RR)													
11.a.Filtering Practice #1 (Spec #12)	0			0	0	0	0	60	0.00	0.00	0.00	0.00	
11.b. Filtering Practice #2 (Spec #12)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	

11. Filtering Practices (no RR)				
30	0.00	0.00	0.00	0.00
45	0.00	0.00	0.00	0.00

12. Constructed Wetland (no RR)													
12.a.Constructed Wetland #1 (Spec #13)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
12.b. Constructed Wetland #2 (Spec #13)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	

12. Constructed Wetland (no RR)				
25	0.00	0.00	0.00	0.00
55	0.00	0.00	0.00	0.00

13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0			0	0	0	0	50	0.00	0.00	0.00	0.00	
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0	1.72	0.75	0	0	4,147	4,147	45	0.00	2.60	1.17	1.43	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	

13. Wet Ponds (no RR)				
30	0.00	0.00	0.00	0.00
20	0.00	18.62	3.72	14.90
40	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00

14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

14. Manufactured BMP (no RR)				
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00
0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.75	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	1.72	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	5.13	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. C (lb/yr)	2.61	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	1.17	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. C (lb/yr)	1.17	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. C (lb/yr)	1.43	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. C (lb/yr)	3.72
TOTAL NITROGEN REMOVED IN D.A. C (lb/yr)	3.72

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	2.79	3.85	0.75	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	2.79	3.85	0.75	0.00	0.00	OK.
MANAGED TURF AREA (ac)	1.67	5.48	1.72	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	1.61	5.48	1.72	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3) 40,801

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	6.88	11.47	2.61	0.00	0.00	20.96
TP LOAD REDUCTION ACHIEVED (lb/yr)	3.08	7.44	1.17	0.00	0.00	11.70
TP LOAD REMAINING (lb/yr)	3.80	4.02	1.43	0.00	0.00	9.26
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	9.80	24.58	3.72	0.00	0.00	38.10

Total Phosphorus

		LINEAR PROJECT:
FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	--	25.64
TP LOAD REDUCTION REQUIRED (lb/yr)	--	5.13
TP LOAD REDUCTION ACHIEVED (lb/yr)	--	11.70
TP LOAD REMAINING (lb/yr):	--	13.94
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	--	0.00

** TARGET TP REDUCTION EXCEEDED BY 6.57 LB/YEAR **

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	183.39
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	38.10
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	145.29

Appendix F: Inlet Computations (LD-204)

STORMWATER INLET COMPUTATIONS

ROUTE Wilroy-Nansemond **PROJECT** Nansemond/Wilroy Overpass **DESIGNER:** CN **DATE** 7/29/2020

CHECKED: **UNITS:** NGLISH

INLET NUMBER	INLET TYPE	INLET LENGTH (FT; M)	STATION	DRAINAGE AREA (AC; HA)	C	CA	ΣCA	I (IN/HR; mm/HR)	Q INCR. (CFS; CMS)	Qc CARRYOVER (CFS; CMS)	QT GUTTER FLOW (CFS; CMS)	S GUTTER SLOPE (FT/FT; M/M)	Sx CROSS SLOPE (FT/FT; M/M)	T (SPREAD) (FT; M)	W (GUTTER WIDTH) (FT; M)	W/T	Sw (GUTTER SLOPE) (FT/FT; M/M)	Sw/Sx	Eo (App. 9C-8)	a	S'w	Se	COMPUTED LENGTH L_T (FT; M)	L, SPECIFIED LENGTH (FT; M)	L/LT	E (App. 9C-18)	Q INTERCEPTED (CFS; CMS) or d/h	Qb CARRYOVER (CFS; CMS)	Depth at Curb (IN; MM)	Sag Inlets Only: Allowable Ponding Depth d (FT; M)	Sag Inlets Only: Height of Curb Opening h (FT; M)	Sag Inlets Only: d/h	Sag Inlets Only: Depth at Inlet (IN; MM)	Sag Inlets Only: T SPREAD @ SAG (FT; M)	REMARKS
10-1	DI-3B	8.000	17+26.3	0.137	0.90	0.1233																													
			-14.000'LEF	0.043	0.30	0.0129																													
							0.136	4	0.544	0	0.544	0.0700	0.0208	1.598	2.000	1.2516	0.0833	4.0048	1.000	3.50	0.1458	0.1666	7.619	8.000	1.050	1.000	0.544	0.000	1.597						
10-2	DI-3B	8.000	17+24.5	0.111	0.90	0.0999																													
			14.000'RIGH	0.045	0.30	0.0135																													
							0.113	4	0.452	0	0.452	0.0700	0.0208	1.491	2.000	1.3414	0.0833	4.0048	1.000	3.50	0.1458	0.1666	7.049	8.000	1.135	1.000	0.452	0.000	1.490						
3-2	DI-3B	6.000	103+80	0.033	0.90	0.0297																													
			-18.600'LEF	0.010	0.30	0.003																													
							0.033	4	0.132	0	0.132	0.0053	0.0208	1.524	2.000	1.3123	0.0833	4.0048	1.000	3.50	0.1458	0.1666	1.938	6.000	3.096	1.000	0.132	0.000	1.524						
3-3	DI-3B	6.000	103+80	0.038	0.90	0.0342																													
			14.000'RIGH	0.013	0.30	0.0039																													
							0.038	4	0.152	0	0.152	0.0053	0.0208	1.607	2.000	1.2446	0.0833	4.0048	1.000	3.50	0.1458	0.1666	2.056	6.000	2.918	1.000	0.152	0.000	1.606						
3-4	DI-3C	6.000	104+42	0.068	0.90	0.0612																													Back/Lt.
			15.400'RIGH	0.018	0.35	0.0063																													Back/Lt.
							0.068	4	0.272	0																									Back/Lt.
				0.133	0.90	0.1197																													Ahead/Rt.
				0.034	0.30	0.0102																													Ahead/Rt.
							0.13	4	0.52	0		0.0030	0.0208	4.973	2.000	0.4022	0.0833	4.0048		3.50															Ahead/Rt.
											0.792	0.0030												6			0.792		1.304	0.166	0.500	0.332	3.304	5.223	Weir Flow
4-1A	DI-3B	6.000	105+51.9	0.139	0.90	0.1251																													
			26.000'RIGH	0.030	0.30	0.009																													
							0.134	4	0.536	0	0.536	0.0100	0.0208	3.115	2.000	0.6421	0.0833	4.0048	0.986	3.50	0.1458	0.1645	4.256	6.000	1.410	1.000	0.536	0.000	2.277						
4-2	DI-3C	6.000	200+97	0.035	0.90	0.0315																													Back/Lt.
			14.000'RIGH	0.006	0.30	0.0018																													Back/Lt.
							0.033	4	0.132	0																									Back/Lt.

ROUTE Wilroy-Nansemond **PROJECT** Nansemond/Wilroy Overpass **DESIGNER:** CN **DATE** **7/29/2020**
CHECKED: **UNITS:** ENGLISH

INLET NUMBER	INLET TYPE	INLET LENGTH (FT; M)	STATION	DRAINAGE AREA (AC; HA)	C	CA	ΣCA	I (IN/HR; mm/HR)	Q INCR. (CFS; CMS)	Qc CARRYOVER (CFS; CMS)	QT GUTTER FLOW (CFS; CMS)	S GUTTER SLOPE (FT/FT; M/M)	Sx CROSS SLOPE (FT/FT; M/M)	T (SPREAD) (FT; M)	W (GUTTER WIDTH) (FT; M)	W/T	Sw (GUTTER SLOPE) (FT/FT; M/M)	Sw/Sx	Eo (App. 9C-8)	a	S'w	Se	COMPUTED LENGTH L_T (FT; M)	L, SPECIFIED LENGTH (FT; M)	L/LT	E (App. 9C-18)	Q INTERCEPTED (CFS; CMS) or d/h	Qb CARRYOVER (CFS; CMS)	Depth at Curb (IN; MM)	Sag Inlets Only: Allowable Ponding Depth d (FT; M)	Sag Inlets Only: Height of Curb Opening h (FT; M)	Sag Inlets Only: d/h	Sag Inlets Only: Depth at Inlet (IN; MM)	Sag Inlets Only: T SPREAD @ SAG (FT; M)	REMARKS
				0.108	0.90	0.0972																													Ahead/Rt.
				0.019	0.30	0.0057																													Ahead/Rt.
							0.103	4	0.412	0		0.0109	0.0208	2.159	2.000	0.9264	0.0833	4.0048		3.50															Ahead/Rt.
											0.544	0.0109												6			0.544		1.015	0.166	0.500	0.332	3.015	4.066	Weir Flow
4-3	DI-3C	6.000	200+97	0.084	0.90	0.0756																													Back/Lt.
			-14.000'LEF	0.024	0.30	0.0072																													Back/Lt.
							0.083	4	0.332	0		0.0100	0.0208	1.912	2.000	1.046	0.0833	4.0048		3.50															Back/Lt.
				0.032	0.90	0.0288																													Ahead/Rt.
				0.005	0.30	0.0015																													Ahead/Rt.
							0.03	4	0.12	0																									Ahead/Rt.
											0.452	0.0100												6			0.452		0.897	0.166	0.500	0.332	2.897	3.593	Weir Flow
4-4	DI-5	2.000	200+49.2	0.055	0.90	0.0495																													
			-37.800'LEF	0.433	0.30	0.1299																													
							0.179	4	0.716	0	0.716	0.0100			2.000									2.000		0.953	0.682	0.034	0.1309						BHt.=0.095'
4-5	DI-3B	6.000	107+50.9	0.290	0.90	0.261																													
			14.000'RIGH	0.089	0.30	0.0267																													
							0.288	4	1.152	0	1.152	0.0030	0.0208	7.847	2.000	0.2549	0.0833	4.0048	0.692	3.50	0.1458	0.1218	4.899	6.000	1.225	1.000	1.152	0.000	3.459						
4-6	DI-3B	6.000	109+80	0.369	0.90	0.3321																													
			16.700'RIGH	0.098	0.30	0.0294																													
							0.362	4	1.448	0	1.448	0.0030	0.0208	8.776	2.000	0.2279	0.0833	4.0048	0.637	3.50	0.1458	0.1137	5.619	6.000	1.068	1.000	1.448	0.000	3.691						
5-2	DI-3A	2.500	25+30.2	0.076	0.90	0.0684																													Back/Lt.
			-18.100'LEF	0.025	0.30	0.0075																													Back/Lt.
							0.076	4	0.304	0.11																									Back/Lt.
				0.123	0.90	0.1107																													Ahead/Rt.
				0.020	0.30	0.006																													Ahead/Rt.
							0.117	4	0.468	0		0.0050	0.0208	3.788	2.000	0.528	0.0833	4.0048		3.50															Ahead/Rt.
											0.882	0.0050												2.5			0.882		1.895	0.166	0.500	0.332	3.895	7.594	Weir Flow

ROUTE Wilroy-Nansemond **PROJECT** Nansemond/Wilroy Overpass **DESIGNER:** CN **DATE** 7/29/2020
CHECKED: **UNITS:** NGLISH

INLET NUMBER	INLET TYPE	INLET LENGTH (FT; M)	STATION	DRAINAGE AREA (AC; HA)	C	CA	ΣCA	I (IN/HR; mm/HR)	Q INCR. (CFS; CMS)	Qc CARRYOVER (CFS; CMS)	QT GUTTER FLOW (CFS; CMS)	S GUTTER SLOPE (FT/FT; M/M)	Sx CROSS SLOPE (FT/FT; M/M)	T (SPREAD) (FT; M)	W (GUTTER WIDTH) (FT; M)	W/T	Sw (GUTTER SLOPE) (FT/FT; M/M)	Sw/Sx	Eo (App. 9C-8)	a	S'w	Se	COMPUTED LENGTH L_T (FT; M)	L, SPECIFIED LENGTH (FT; M)	L/LT	E (App. 9C-18)	Q INTERCEPTED (CFS; CMS) or d/h	Qb CARRYOVER (CFS; CMS)	Depth at Curb (IN; MM)	Sag Inlets Only: Allowable Ponding Depth d (FT; M)	Sag Inlets Only: Height of Curb Opening h (FT; M)	Sag Inlets Only: d/h	Sag Inlets Only: Depth at Inlet (IN; MM)	Sag Inlets Only: T SPREAD @ SAG (FT; M)	REMARKS
5-3	DI-3B	6.000	24+05	0.212	0.90	0.1908																													
			-14.000'LEF	0.012	0.30	0.0036																													
							0.194	4	0.776	0	0.776	0.0760	0.0208	1.797	2.000	1.113	0.0833	4.0048	1.000	3.50	0.1458	0.1666	9.066	6.000	0.662	0.858	0.666	0.110	1.797						
5-4	DI-3B	6.000	24+05.0	0.170	0.90	0.153																													
			24.900'RIGH	0.015	0.30	0.0045																													
							0.158	4	0.632	0	0.632	0.0760	0.0208	1.664	2.000	1.2019	0.0833	4.0048	1.000	3.50	0.1458	0.1666	8.317	6.000	0.721	0.900	0.569	0.063	1.664						
5-5	DI-3A	2.500	25+30	0.136	0.90	0.1224																													Back/Lt.
			26.400'RIGH	0.022	0.30	0.0066																													Back/Lt.
							0.129	4	0.516	0		0.0050	0.0208	4.105	2.000	0.4872	0.0833	4.0048		3.50															Back/Lt.
				0.107	0.90	0.0963																													Ahead/Rt.
				0.023	0.30	0.0069																													Ahead/Rt.
							0.103	4	0.412	0.063																									Ahead/Rt.
											0.991	0.0050												2.5			0.991		2.049	0.208	0.500	0.416	4.049	8.208	Weir Flow
5-7	DI-3B	6.000	115+85	0.215	0.90	0.1935																													
			14.000'RIGH	0.066	0.30	0.0198																													
							0.213	4	0.852	0	0.852	0.0037	0.0208	6.320	2.000	0.3165	0.0833	4.0048	0.794	3.50	0.1458	0.1366	4.290	6.000	1.399	1.000	0.852	0.000	3.077						
5-8	DI-3A	2.500	114+15	0.064	0.90	0.0576																													
			14.000'RIGH	0.020	0.30	0.006																													
							0.064	4	0.256	0	0.256	0.0037	0.0208	2.357	2.000	0.8485	0.0833	4.0048	0.999	3.50	0.1458	0.1665	2.299	2.500	1.087	1.000	0.256	0.000	2.088						
6-3	DI-3B	6.000	117+58	0.218	0.90	0.1962																													
			14.000'RIGH	0.068	0.30	0.0204																													
							0.217	4	0.868	0	0.868	0.0037	0.0208	6.387	2.000	0.3131	0.0833	4.0048	0.789	3.50	0.1458	0.1359	4.337	6.000	1.383	1.000	0.868	0.000	3.094						
6-4	DI-3B	6.000	119+00	0.180	0.90	0.162																													
			14.000'RIGH	0.055	0.30	0.0165																													
							0.179	4	0.716	0	0.716	0.0037	0.0208	5.706	2.000	0.3505	0.0833	4.0048	0.837	3.50	0.1458	0.1429	3.881	6.000	1.546	1.000	0.716	0.000	2.924						
6-5	DI-3B	6.000	120+25	0.157	0.90	0.1413																													
			14.000'RIGH	0.050	0.30	0.015																													
							0.156	4	0.624	0	0.624	0.0037	0.0208	5.234	2.000	0.3821	0.0833	4.0048	0.870	3.50	0.1458	0.1477	3.592	6.000	1.670	1.000	0.624	0.000	2.807						
6-6	DI-4C	8.000	121+25	0.173	0.90	0.1557																													Back/Lt.
			14.000'RIGH	0.055	0.30	0.0165																													Back/Lt.
							0.172	4	0.688	0		0.0010	0.0208	7.981	2.000	0.2506	0.0833	4.0048		3.50															Back/Lt.
				0.129	0.90	0.1161																													Ahead/Rt.
				0.041	0.30	0.0123																													Ahead/Rt.
							0.128	4	0.512	0																									Ahead/Rt.
											1.200	0.0010												8			1.200		1.516	0.166	0.333	0.4985	3.516	6.074	Weir Flow
6-7	DI-3B	6.000	122+60	0.117	0.90	0.1053																													
			14.000'RIGH	0.056	0.30	0.0168																													
							0.122	4	0.488	0	0.488	0.0036	0.0208	4.459	2.000	0.4485	0.0833	4.0048	0.921	3.50	0.1458	0.1551	3.120	6.000	1.923	1.000	0.488	0.000	2.613						

ROUTE Wilroy-Nansemond **PROJECT** Nansemond/Wilroy Overpass **DESIGNER:** CN **DATE** 7/29/2020
CHECKED: **UNITS:** NGLISH

INLET NUMBER	INLET TYPE	INLET LENGTH (FT; M)	STATION	DRAINAGE AREA (AC; HA)	C	CA	ΣCA	I (IN/HR; mm/HR)	Q INCR. (CFS; CMS)	Qc CARRYOVER (CFS; CMS)	QT GUTTER FLOW (CFS; CMS)	S GUTTER SLOPE (FT/FT; M/M)	Sx CROSS SLOPE (FT/FT; M/M)	T (SPREAD) (FT; M)	W (GUTTER WIDTH) (FT; M)	W/T	Sw (GUTTER SLOPE) (FT/FT; M/M)	Sw/Sx	Eo (App. 9C-8)	a	S'w	Se	COMPUTED LENGTH L_T (FT; M)	L, SPECIFIED LENGTH (FT; M)	L/LT	E (App. 9C-18)	Q INTERCEPTED (CFS; CMS) or d/h	Qb CARRYOVER (CFS; CMS)	Depth at Curb (IN; MM)	Sag Inlets Only: Allowable Ponding Depth d (FT; M)	Sag Inlets Only: Height of Curb Opening h (FT; M)	Sag Inlets Only: d/h	Sag Inlets Only: Depth at Inlet (IN; MM)	Sag Inlets Only: T SPREAD @ SAG (FT; M)	REMARKS
6-8	DI-3A	2.500	124+40	0.041	0.90	0.0369																													
			14.000'RIGH	0.026	0.30	0.0078																													
							0.045	4	0.18	0	0.180	0.0036	0.0208	1.841	2.000	1.0864	0.0833	4.0048	1.000	3.50	0.1458	0.1666	1.966	2.500	1.272	1.000	0.180	0.000	1.840						
7-1	DI-3C	6.000	124+60	0.071	0.90	0.0639																													Back/Lt.
			-26.000'LEF	0.013	0.30	0.0039																													Back/Lt.
							0.068	4	0.272	0																									Back/Lt.
				0.130	0.90	0.117																													Ahead/Rt.
				0.024	0.30	0.0072																													Ahead/Rt.
							0.124	4	0.496	0		0.001	0.0208	6.731	2.000	0.2971	0.0833	4.0048		3.50															Ahead/Rt.
											0.768	0.001												6			0.768		1.277	0.166	0.500	0.332	3.277	5.117	Weir Flow
7-10	DI-3C	6.000	400+76.64	0.078	0.90	0.0702																													Back/Lt.
			-14.000'LEF	0.081	0.30	0.0243																													Back/Lt.
							0.095	4	0.38	0		0.001	0.0208	5.778	2.000	0.3461	0.0833	4.0048		3.50															Back/Lt.
				0.039	0.90	0.0351																													Ahead/Rt.
				0.019	0.30	0.0057																													Ahead/Rt.
							0.041	4	0.164	0																									Ahead/Rt.
											0.544	0.001												6			0.544		1.015	0.166	0.500	0.332	3.015	4.066	Weir Flow
7-12	DI-3B	6.000	130+07	0.193	0.90	0.1737																													
			14.000'RIGH	0.029	0.30	0.0087																													
							0.182	4	0.728	0	0.728	0.0036	0.0208	5.811	2.000	0.3442	0.0833	4.0048	0.830	3.50	0.1458	0.1418	3.894	6.000	1.541	1.000	0.728	0.000	2.951						
7-14	DI-3C	6.000	302+12.5	0.031	0.90	0.0279																													Back/Lt.
			28.000'RIGH	0.065	0.30	0.0195																													Back/Lt.
							0.047	4	0.188	0																									Back/Lt.
				0.066	0.90	0.0594																													Ahead/Rt.
				0.340	0.30	0.102																													Ahead/Rt.
							0.161	4	0.644	0		0.001	0.0208	7.721	2.000	0.259	0.0833	4.0048		3.50															Ahead/Rt.
											0.832	0.001												6			0.832		1.347	0.166	0.500	0.332	3.347	5.398	Weir Flow
7-16	DI-3C	6.000	302+12.5	0.077	0.90	0.0693																													Back/Lt.
			-28.000'LEF	0.055	0.30	0.0165																													Back/Lt.
							0.086	4	0.344	0		0.001	0.0208	5.434	2.000	0.3681	0.0833	4.0048		3.50															Back/Lt.
				0.034	0.90	0.0306																													Ahead/Rt.
				0.025	0.30	0.0075																													Ahead/Rt.
							0.038	4	0.152	0																									Ahead/Rt.
											0.496	0.001												6			0.496		0.954	0.166	0.500	0.332	2.954	3.823	Weir Flow
7-18	DI-3B	6.000	131+44.6	0.214	0.90	0.1926																													
			14.000'RIGH	0.032	0.30	0.0096																													
							0.202	4	0.808	0	0.808	0.0036	0.0208	6.179	2.000	0.3237	0.0833	4.0048	0.804	3.50	0.1458	0.1380	4.135	6.000	1.451	1.000	0.808	0.000	3.042						
7-2	DI-3B	6.000	125+90	0.138	0.90	0.1242																													
			-26.000'LEF	0.025	0.30	0.0075																													
							0.132	4	0.528	0	0.528	0.0036	0.0208	4.719	2.000	0.4238	0.0833	4.0048	0.905	3.50	0.1458	0.1527	3.255	6.000	1.843	1.000	0.528	0.000	2.678						

ROUTE Wilroy-Nansemond **PROJECT** Nansemond/Wilroy Overpass **DESIGNER:** CN **DATE** 7/29/2020
CHECKED: **UNITS:** NGLISH

INLET NUMBER	INLET TYPE	INLET LENGTH (FT; M)	STATION	DRAINAGE AREA (AC; HA)	C	CA	ΣCA	I (IN/HR; mm/HR)	Q INCR. (CFS; CMS)	Qc CARRYOVER (CFS; CMS)	QT GUTTER FLOW (CFS; CMS)	S GUTTER SLOPE (FT/FT; M/M)	Sx CROSS SLOPE (FT/FT; M/M)	T (SPREAD) (FT; M)	W (GUTTER WIDTH) (FT; M)	W/T	Sw (GUTTER SLOPE) (FT/FT; M/M)	Sw/Sx	Eo (App. 9C-8)	a	S'w	Se	COMPUTED LENGTH L_T (FT; M)	L, SPECIFIED LENGTH (FT; M)	L/LT	E (App. 9C-18)	Q INTERCEPTED (CFS; CMS) or d/h	Qb CARRYOVER (CFS; CMS)	Depth at Curb (IN; MM)	Sag Inlets Only: Allowable Ponding Depth d (FT; M)	Sag Inlets Only: Height of Curb Opening h (FT; M)	Sag Inlets Only: d/h	Sag Inlets Only: Depth at Inlet (IN; MM)	Sag Inlets Only: T SPREAD @ SAG (FT; M)	REMARKS
7-3	DI-3A	2.500	125+80	0.041	0.90	0.0369																													
			14.000'RIGH	0.026	0.30	0.0078																													
							0.045	4	0.18	0	0.180	0.0036	0.0208	1.841	2.000	1.0864	0.0833	4.0048	1.000	3.50	0.1458	0.1666	1.966	2.500	1.272	1.000	0.180	0.000	1.840						
7-4	DI-3B	6.000	127+30	0.182	0.90	0.1638																													
			-26.000'LEF	0.033	0.30	0.0099																													
							0.174	4	0.696	0	0.696	0.0036	0.0208	5.656	2.000	0.3536	0.0833	4.0048	0.841	3.50	0.1458	0.1434	3.796	6.000	1.581	1.000	0.696	0.000	2.912						
7-5	DI-3A	2.500	127+20	0.048	0.90	0.0432																													
			14.000'RIGH	0.030	0.30	0.009																													
							0.052	4	0.208	0	0.208	0.0036	0.0208	1.943	2.000	1.0293	0.0833	4.0048	1.000	3.50	0.1458	0.1666	2.089	2.500	1.197	1.000	0.208	0.000	1.942						
7-6	DI-3A	2.500	128+85	0.030	0.90	0.027																													
			14.000'RIGH	0.004	0.30	0.0012																													
							0.028	4	0.112	0	0.112	0.0036	0.0208	1.541	2.000	1.2979	0.0833	4.0048	1.000	3.50	0.1458	0.1666	1.611	2.500	1.552	1.000	0.112	0.000	1.540						
7-8	DI-3C	6.000	400+87	0.067	0.90	0.0603																													Back/Lt.
			26.000'RIGH	0.006	0.30	0.0018																													Back/Lt.
							0.062	4	0.248	0																									Back/Lt.
				0.123	0.90	0.1107																													Ahead/Rt.
				0.009	0.30	0.0027																													Ahead/Rt.
							0.113	4	0.452	0		0.001	0.0208	6.393	2.000	0.3128	0.0833	4.0048		3.50															Ahead/Rt.
											0.700	0.001												6			0.700		1.201	0.166	0.500	0.332	3.201	4.810	Weir Flow
9-1	DI-3C	6.000	11+97.8	0.051	0.90	0.0459																													Back/Lt.
			14.000'RIGH	0.017	0.30	0.0051																													Back/Lt.
							0.051	4	0.204	0																									Back/Lt.
				0.051	0.90	0.0459																													Ahead/Rt.
				0.022	0.30	0.0066																													Ahead/Rt.
							0.053	4	0.212	0		0.001	0.0208	3.831	2.000	0.5221	0.0833	4.0048		3.50															Ahead/Rt.
											0.416	0.001												6			0.416		0.849	0.166	0.500	0.332	2.849	3.400	Weir Flow
9-10	DI-3B	6.000	14+68	0.032	0.90	0.0288																													
			14.000'RIGH	0.015	0.30	0.0045																													
							0.033	4	0.132	0.127	0.259	0.0405	0.0208	1.341	2.000	1.4914	0.0833	4.0048	1.000	3.50	0.1458	0.1666	4.734	6.000	1.267	1.000	0.259	0.000	1.340						
9-11	DI-3A	2.500	15+38.5	0.085	0.90	0.0765																													
			14.000'RIGH	0.038	0.30	0.0114																													
							0.088	4	0.352	0	0.352	0.0511	0.0208	1.440	2.000	1.3889	0.0833	4.0048	1.000	3.50	0.1458	0.1666	5.774	2.500	0.433	0.640	0.225	0.127	1.439						
9-2	DI-3C	6.000	11+98	0.072	0.90	0.0648																													Back/Lt.
			-14.000'LEF	0.025	0.30	0.0075																													Back/Lt.
							0.072	4	0.288	0		0.001	0.0208	4.833	2.000	0.4138	0.0833	4.0048		3.50															Back/Lt.
				0.058	0.90	0.0522																													Ahead/Rt.
				0.020	0.30	0.006																													Ahead/Rt.
							0.058	4	0.232	0																									Ahead/Rt.
											0.520	0.001												6			0.520		0.985	0.166	0.500	0.332	2.985	3.945	Weir Flow

ROUTE Wilroy-Nansemond **PROJECT** Nansemond/Wilroy Overpass **DESIGNER:** CN **DATE** **7/29/2020**
CHECKED: **UNITS:NGLISH**

INLET																														Sag Inlets Only					
NUMBER	TYPE	LENGTH (FT; M)	STATION	DRAINAGE AREA (AC; HA)	C	CA	ΣCA	I (IN/HR; mm/HR)	Q INCR. (CFS; CMS)	Qc CARRYOVER (CFS; CMS)	QT GUTTER FLOW (CFS; CMS)	S GUTTER SLOPE (FT/FT; M/M)	Sx CROSS SLOPE (FT/FT; M/M)	T (SPREAD) (FT; M)	W (GUTTER WIDTH) (FT; M)	W/T	Sw (GUTTER SLOPE) (FT/FT; M/M)	Sw/Sx	Eo (App. 9C-8)	a	S'w	Se	COMPUTED LENGTH L_T (FT; M)	L, SPECIFIED LENGTH (FT; M)	L/LT	E (App. 9C-18)	Q INTERCEPTED (CFS; CMS) or d/h	Qb CARRYOVER (CFS; CMS)	Depth at Curb (IN; MM)	Allowable Ponding Depth d (FT; M)	Height of Curb Opening h (FT; M)	d/h	Depth at Inlet (IN; MM)	T SPREAD @ SAG (FT; M)	REMARKS
9-4	DI-3B	6.000	12+98.7	0.042	0.90	0.0378																													
			14.000'RIGH	0.014	0.30	0.0042																													
							0.042	4	0.168	0	0.168	0.0252	0.0208	1.246	2.000	1.6051	0.0833	4.0048	1.000	3.50	0.1458	0.1666	3.424	6.000	1.752	1.000	0.168	0.000	1.246						
9-5	DI-3B	6.000	13+00	0.097	0.90	0.0873																													
			-14.000'LEF	0.034	0.30	0.0102																													
							0.098	4	0.392	0	0.392	0.0153	0.0208	1.879	2.000	1.0644	0.0833	4.0048	1.000	3.50	0.1458	0.1666	4.208	6.000	1.426	1.000	0.392	0.000	1.878						
9-9	DI-3B	8.000	14+68	0.145	0.90	0.1305																													
			-14.000'LEF	0.051	0.30	0.0153																													
							0.146	4	0.584	0	0.584	0.0405	0.0208	1.818	2.000	1.1001	0.0833	4.0048	1.000	3.50	0.1458	0.1666	6.661	8.000	1.201	1.000	0.584	0.000	1.817						

Appendix G: Conduit Computations (LD-229)

LD-229
STORM SEWER DESIGN COMPUTATIONS

STORM FREQUENCY **10**

PROJECT: Nansemond/Wilroy Overpass
LOCATION: Suffolk, Virginia
COUNTY: Suffolk Lake Kilby
NOAA STATION:

Designed by: CN
Checked by:

UNITS **ENGLISH**

PIPE NO.	FROM POINT REFERENCE (1)	FROM POINT STA.	TO POINT REFERENCE (2)	TO POINT STA.	DRAIN. AREA "A" Acre (3)	RUNOFF COEFF. "C" (4)	CA INCRE-MENT (5)	CA ACCUM-ULATED (6)	TOTAL INLET TIME Minutes (7)	RAIN FALL In/Hr (8)	RUNOFF Lateral CFS	RUNOFF Total Q CFS (9)	INVERT ELEVATIONS UPPER END (10)	INVERT ELEVATIONS LOWER END (11)	LENGTH of Pipe Ft. (12)	SLOPE Ft./Ft. (13)	SIZE (Dia. Or Span/Rise) In. (14)	SHAPE	Number of Pipes	Capacity CFS (15)	Friction Slope Ft./Ft.	NORMAL FLOW Depth of Flow, dn Ft.	NORMAL FLOW Area of Flow, An SqFt	NORMAL FLOW Hrn Ft.	NORMAL FLOW Vn Ft/Sec (16)	NORMAL FLOW En Ft.	FLOW TIME Sec. (17)	REMARKS (18)
1	3-2	103+80	3-3	103+80	0.04	0.77	0.03	0.03	5.00	8.15	0.00	0.27	18.50	18.40	34.00	0.00294	15	Circular	1	3.50	0.00000	0.23	0.16	0.14	1.69	0.28	20.09	
10	4-6	109+80	5-1	112+30	0.47	0.78	0.36	1.48	8.31	7.05	0.00	10.93	16.60	15.80	247.00	0.00324	24	Circular	1	12.88	0.00240	1.42	2.38	0.59	4.60	1.74	53.69	
11	5-1	112+30	5-2	25+30.2	0.00		0.00	1.48	9.21	6.80	0.00	10.93	15.80	15.70	55.00	0.00182	30	Circular	1	17.50	0.00070	1.43	2.91	0.68	3.76	1.65	14.62	
12	5-2	25+30.2	5-5	25+30	0.24	0.79	0.19	1.67	9.45	6.74	0.00	12.23	15.70	15.50	46.00	0.00435	30	Circular	1	27.05	0.00090	1.18	2.28	0.60	5.37	1.63	8.56	
13	5-3	24+05	5-4	24+05.0	0.22	0.87	0.19	0.19	5.00	8.15	0.00	1.58	26.60	26.30	41.00	0.00732	15	Circular	1	5.53	0.00060	0.46	0.41	0.25	3.89	0.69	10.55	
14	5-4	24+05.0	5-5	25+30	0.19	0.85	0.16	0.35	5.18	8.08	0.00	2.86	26.20	17.60	123.00	0.06992	15	Circular	1	17.08	0.00200	0.35	0.28	0.20	10.33	2.00	11.91	
15	5-5	25+30	5-6	113+97.2	0.29	0.81	0.23	2.26	9.60	6.71	0.00	16.15	15.50	15.30	61.00	0.00328	30	Circular	1	23.49	0.00160	1.52	3.13	0.70	5.16	1.94	11.83	
16	6-3	117+58	5-7	115+85	0.29	0.76	0.22	0.22	5.00	8.15	0.00	1.77	17.90	16.90	171.00	0.00585	15	Circular	1	4.94	0.00080	0.52	0.48	0.27	3.69	0.73	46.30	
17	5-7	115+85	5-8	114+15	0.28	0.76	0.21	0.43	5.77	7.86	0.00	3.44	16.80	15.80	168.00	0.00595	15	Circular	1	4.98	0.00300	0.76	0.79	0.35	4.38	1.06	38.34	
18	5-8	114+15	5-9	114+15	0.08	0.76	0.06	0.49	6.41	7.64	0.00	3.93	15.70	15.30	57.00	0.00702	15	Circular	1	5.41	0.00390	0.79	0.82	0.36	4.81	1.15	11.85	
19	6-4	119+00	6-5	120+25	0.24	0.76	0.18	0.18	5.00	8.15	0.00	1.46	17.40	16.50	121.00	0.00744	15	Circular	1	5.57	0.00050	0.44	0.38	0.24	3.83	0.66	31.64	
2	3-3	103+80	3-4	104+42	0.05	0.75	0.04	0.07	5.34	8.02	0.00	0.57	18.40	18.20	61.00	0.00328	15	Circular	1	3.70	0.00010	0.33	0.26	0.19	2.19	0.41	27.83	
20	6-5	120+25	6-6	121+25	0.21	0.75	0.16	0.34	5.53	7.95	0.00	2.70	16.40	16.00	96.00	0.00417	15	Circular	1	4.17	0.00180	0.73	0.75	0.34	3.62	0.94	26.55	
21	7-17	302+50	7-16	302+12.5	0.00	0.90	0.00	0.00	5.00	8.15	0.00	0.01	19.30	19.20	31.00	0.00323	15	Circular	1	3.67	0.00000	0.04	0.01	0.03	0.65	0.04	48.08	
22	7-16	302+12.5	7-14	302+12.5	0.19	0.65	0.12	0.12	5.80	7.85	0.00	1.02	19.20	19.00	40.00	0.00500	15	Circular	1	4.57	0.00030	0.40	0.34	0.23	3.00	0.54	13.35	
23	7-15	302+50	7-14	302+12.5	0.00	0.90	0.00	0.00	5.00	8.15	0.00	0.01	19.10	19.00	40.00	0.00250	15	Circular	1	3.23	0.00000	0.04	0.01	0.03	0.59	0.05	67.99	
24	7-14	302+12.5	7-13	301+75	0.50	0.41	0.21	0.33	6.13	7.73	0.00	2.61	19.00	18.90	39.00	0.00256	15	Circular	1	3.27	0.00170	0.85	0.88	0.37	2.96	0.98	13.18	
25	7-13	301+75	7-12	130+07	0.00		0.00	0.33	6.35	7.66	0.00	2.61	18.90	18.40	182.00	0.00275	15	Circular	1	3.39	0.00170	0.82	0.86	0.36	3.05	0.97	59.75	
26	7-18	131+44.6	7-12	130+07	0.25	0.82	0.20	0.20	5.00	8.15	0.00	1.65	20.20	18.40	136.00	0.01324	15	Circular	1	7.43	0.00070	0.40	0.34	0.23	4.87	0.77	27.94	
27	7-12	130+07	7-6	128+85	0.22	0.82	0.18	0.72	7.35	7.33	0.00	5.43	18.40	18.00	120.00	0.00333	18	Circular	1	6.06	0.00280	1.11	1.40	0.45	3.88	1.34	30.93	
28	7-11	400+39.5	7-10	400+87	0.00	0.90	0.00	0.00	5.00	8.15	0.00	0.01	18.80	18.40	48.00	0.00833	15	Circular	1	5.90	0.00000	0.03	0.01	0.02	0.89	0.04	53.78	
29	7-10	400+87	7-8	400+87	0.22	0.63	0.14	0.14	5.90	7.82	0.00	1.12	18.40	18.20	42.00	0.00476	15	Circular	1	4.46	0.00030	0.43	0.37	0.24	3.02	0.57	13.90	
3	3-4	104+42	4-1A	105+51.9	0.25	0.78	0.20	0.27	5.80	7.85	0.00	2.13	18.20	17.90	110.00	0.00273	15	Circular	1	3.38	0.00110	0.72	0.73	0.34	2.91	0.85	37.82	
30	7-9	401+40	7-8	400+87	0.00	0.90	0.00	0.00	5.00	8.15	0.00	0.01	18.90	18.20	52.00	0.01346	15	Circular	1	7.49	0.00000	0.03	0.01	0.02	1.05	0.04	49.35	
31	7-8	400+87	7-7	400+50	0.21	0.85	0.18	0.31	6.13	7.73	0.00	2.48	18.20	18.10	30.00	0.00333	15	Circular	1	3.73	0.00150	0.74	0.76	0.35	3.25	0.91	9.23	
32	7-7	400+50	7-6	128+85	0.00		0.00	0.31	6.28	7.68	0.00	2.48	18.10	18.00	44.00	0.00227	15	Circular	1	3.08	0.00150	0.85	0.89	0.37	2.79	0.97	15.77	
33	7-6	128+85	7-5	127+20	0.03	0.82	0.03	1.06	7.87	7.18	0.00	7.87	18.00	17.50	164.00	0.00305	24	Circular	1	12.49	0.00130	1.15	1.87	0.54	4.20	1.43	39.01	
34	7-4	127+30	7-5	127+20	0.22	0.81	0.17	0.17	5.00	8.15	0.00	1.42	18.40	17.50	43.00	0.02093	15	Circular	1	9.35	0.00050	0.33	0.26	0.19	5.50	0.80	7.82	
35	7-5	127+20	7-3	125+80	0.08	0.67	0.05	1.28	8.52	6.99	0.00	9.45	17.50	17.10	140.00	0.00286	24	Circular	1	12.10	0.00180	1.33	2.22	0.58	4.26	1.61	32.86	
36	7-2	125+90	7-3	125+80	0.16	0.81	0.13	0.13	5.00	8.15	0.00	1.08	17.90	17.10	43.00	0.01860	15	Circular	1	8.81	0.00030	0.30	0.22	0.17	4.87	0.66	8.83	
37	7-3	125+80	6-8	124+40	0.07	0.67	0.05	1.46	9.06	6.84	0.00	10.66	17.10	16.60	140.00	0.00357	24	Circular	1	13.52	0.00230	1.34	2.24	0.58	4.77	1.69	29.36	
38	7-1	124+60	6-8	124+40	0.24	0.81	0.19	0.19	5.00	8.15	0.00	1.57	17.50	16.60	46.00	0.01957	15	Circular	1	9.04	0.00060	0.35	0.28	0.20	5.52	0.83	8.33	
39	6-8	124+40	6-7	122+60	0.07	0.67	0.05	1.70	9.55	6.72	0.00	12.26	16.60	16.10	177.00	0.00282	30	Circular	1	21.78	0.00090	1.34	2.68	0.65	4.57	1.67	38.75	
4	4-1A	105+51.9	4-1	106+49.1	0.17	0.79	0.13	0.40	6.43	7.63	0.00	3.15	17.90	17.60	97.00	0.00309	15	Circular	1	3.59	0.00250	0.91	0.95	0.37	3.30	1.08	29.39	
40	6-6	121+25	6-13	121+54	0.40	0.75	0.30	0.64	5.97	7.79	0.00	5.04	16.00	15.80	58.00	0.00345	18	Circular	1	6.17	0.00240	1.03	1.29	0.44	3.89	1.27	14.90	
41	6-7	122+60	6-9	122+60	0.17	0.71	0.12	1.82	10.20	6.56	0.00	13.06	16.10	15.90	50.00	0.00400	30	Circular	1	25.94	0.00110	1.26	2.47	0.63	5.29	1.69	9.45	
42	9-1	11+97.8	9-2	11+98	0.14	0.74	0.10	0.10	5.00	8.15	0.00	0.85	18.10	18.00	30.00	0.00333	15	Circular	1	3.73	0.00020	0.41	0.35	0.23	2.46	0.50	12.19	
43	9-2	11+98	9-5	13+00	0.18	0.74	0.13	0.23	5.20	8.07	0.00	1.90	18.00	17.60	97.00	0.00412	18	Circular	1	6.74	0.00030	0.54	0.58	0.30	3.28	0.71	29.60	
44	9-3	12+98	9-4	12+98.7	2.93	0.39	1.14	1.14	10.00	6.60	0.00	7.54	18.10	18.00	11.00	0.00909	18	Circular	1	10.02	0.00540	0.97	1.21	0.43	6.22	1.57	1.77	
45	9-4	12+98.7	9-5	13+00	0.06	0.75	0.04	1.18	10.03	6.60	0.00	7.82	18.00	17.90	30.00	0.00333	24	Circular	1	13.06	0.00120	1.12	1.80	0.53	4.34	1.41	6.91	
46	9-5	13+00	9-6	13+01.6	0.13	0.75	0.10	1.52	10.14	6.57	0.00	10.00	17.60	17.50	26.00	0.00385	24	Circular	1	14.04	0.00200	1.25	2.06	0.57	4.85	1.61	5.36	
47	10-1	17+26.3	10-2	17+24.5	0.18	0.76	0.14	0.14	5.00	8.15	0.00	1.11	38.60	38.40	30.00	0.00667	15	Circular	1	5.28	0.00030	0.39	0.33	0.22	3.41	0.57	8.81	
48	10-2	17+24.5	9-11	15+38.5	0.16	0.72	0.11	0.25	5.15	8.09	0.00	2.02	38.20	25.20	186.00	0.06989	15	Circular	1	17.08	0.00100	0.29	0.22	0.17	9.35	1.65	19.90	
49	9-9	14+68	9-10	14+68	0.20	0.75	0.15	0.15	5.00	8.15	0.00	1.19	23.50	23.30	30.00	0.00667	15	Circular	1	5.28	0.00040	0.40	0.34	0.23	3.47	0.59	8.64	
5	4-1		4-5	107+50.9	0.00		0.00	0.40	6.92	7.47	0.00	3.15	17.60	17.30	100.00	0.00300	15	Circular	1	3.54	0.00250	0.92	0.97	0.38	3.26	1.08	30.69	
50	9-10	14+68	9-11	15+38.5	0.05	0.70	0.03	0.18	5.14	8.10	0.00	1.46	23.30	22.80	71.00	0.00704	15	Circular	1	5.42	0.00050	0.44	0.39	0.24	3.75	0.66	18.95	

LD-229
STORM SEWER DESIGN COMPUTATIONS

STORM FREQUENCY **10**

PROJECT: Nansemond/Wilroy Overpass
LOCATION: Suffolk, Virginia
COUNTY: Suffolk Lake Kilby
NOAA STATION:

Designed by: CN
Checked by:

UNITS **ENGLISH**

PIPE NO.	FROM POINT REFERENCE (1)	FROM POINT STA.	TO POINT REFERENCE (2)	TO POINT STA.	DRAIN. AREA "A" Acre (3)	RUNOFF COEFF. "C" (4)	CA INCRE-MENT (5)	CA ACCUM-ULATED (6)	TOTAL INLET TIME Minutes (7)	RAIN FALL In/Hr (8)	RUNOFF Lateral CFS	RUNOFF Total Q CFS (9)	INVERT ELEVATIONS UPPER END (10)	INVERT ELEVATIONS LOWER END (11)	LENGTH of Pipe Ft. (12)	SLOPE Ft./Ft. (13)	SIZE (Dia. Or Span/Rise) In. (14)	SHAPE	Number of Pipes	Capacity CFS (15)	Friction Slope Ft./Ft.	NORMAL FLOW Depth of Flow, dn Ft.	NORMAL FLOW Area of Flow, An SqFt	NORMAL FLOW Hrn Ft.	NORMAL FLOW Vn Ft/Sec (16)	NORMAL FLOW En Ft.	FLOW TIME Sec. (17)	REMARKS (18)
51	9-11	15+38.5	9-12	15+40.8	0.12	0.72	0.09	0.52	5.48	7.97	0.00	4.15	22.60	20.40	40.00	0.05500	15	Circular	1	15.15	0.00430	0.45	0.39	0.25	10.53	2.17	3.80	
6	4-2	200+97	4-3	200+97	0.17	0.81	0.14	0.14	5.00	8.15	0.00	1.11	17.60	17.50	30.00	0.00333	15	Circular	1	3.73	0.00030	0.47	0.42	0.25	2.65	0.58	11.32	
7	4-3	200+97	4-4	200+49.2	0.15	0.78	0.11	0.25	5.19	8.08	0.00	2.02	17.50	17.40	43.00	0.00233	15	Circular	1	3.12	0.00100	0.73	0.75	0.34	2.70	0.85	15.90	
8	4-4	200+49.2	4-5	107+50.9	0.49	0.37	0.18	0.43	5.45	7.98	0.00	3.45	17.40	17.30	34.00	0.00294	15	Circular	1	3.50	0.00300	1.01	1.06	0.38	3.25	1.17	10.45	
9	4-5	107+50.9	4-6	109+80	0.38	0.76	0.29	1.12	7.43	7.31	0.00	8.38	17.30	16.60	227.00	0.00308	24	Circular	1	12.56	0.00140	1.20	1.96	0.55	4.28	1.48	53.04	

Appendix H: HGL Computations (LD-347)

LD-347
HYDRAULIC GRADE LINE ANALYSIS

PROJECT: Nansemond/Wilroy Overpass

DESIGNED BY: CN

Checked:

INCIDENCE PROBABILITY **10** **Year**

INLET OR JUNCTION	STA.	INVERT EL. OUTFLOW PIPE	DEPTH OF FLOW OUTFLOW PIPE	OUTLET WATER SURFACE ELEV.	DIA. PIPE Do (In/mm)	DESIGN DISCH. Qo (CFS/CMS)	LENGTH PIPE Lo (Ft/M)	FRICTION SLOPE, Sfo (FT/FT) (M/M)	FRICTION LOSS Hf (Ft/M)	JUNCTION LOSS Vo	Contr. Ho (Ft/M)	Vi	Vi*2/2g	Hi (Expn) 0.35*MAX. (Vi2/2g)	SKEW Angle	K	Bend H (Ft/M)	Sum HL (Ft/M)	SURFACE FLOW	Adj. Ht 1.3 Ht (Ft/M)	Inlet Shaping? Y/N	0.5 Ht (Ft/M)	FINAL H (Ft/M)	Inlet Water Surface Elevation	Top of MH Top of Inlet Elev. APPROX.	Adjustment?
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)		(14)	(15)		(16)		(16)	(17)	(18)	(19)	
5-6																								17.290		
5-5	25+30	15.300	2.50	17.300	30	16.149	61.00	0.00162	0.099	5.158	0.103	5.373	0.448	0.157	100.0	0.68	1.123	1.383	1.556	1.383	YES	0.692	0.790	18.090	23.100	O.K.
5-2	25+30.2	15.500	2.50	18.090	30	12.234	46.00	0.00093	0.043	5.373	0.112	3.761	0.220	0.077	60.0	0.55	0.122	0.311	1.301	0.311	YES	0.155	0.198	18.288	23.270	O.K.
5-1	112+30	15.700	2.50	18.288	30	10.933	55.00	0.00074	0.041	3.761	0.055	4.600	0.329	0.115	30.0	0.33	0.110	0.280	0.000	0.280	YES	0.140	0.181	18.469	23.100	O.K.
4-6	109+80	15.800	2.00	18.469	24	10.933	247.00	0.00244	0.603	4.600	0.082	4.280	0.284	0.100	0.0	0.00	0.000	0.182	2.551	0.236	YES	0.118	0.721	19.190	22.500	O.K.
4-5	107+50.9	16.600	2.00	19.190	24	8.382	227.00	0.00144	0.326	4.280	0.071	3.254	0.164	0.058	60.0	0.55	0.091	0.220	2.104	0.286	YES	0.143	0.469	19.659	21.800	O.K.
4-1		17.300	1.25	19.659	15	3.150	100.00	0.00249	0.249	3.259	0.041	3.301	0.169	0.059	10.0	0.13	0.022	0.122	0.000	0.122	YES	0.061	0.310	19.969	21.300	O.K.
4-1A	105+51.9	17.600	1.25	19.969	15	3.150	97.00	0.00249	0.241	3.301	0.042	2.909	0.131	0.046	10.0	0.13	0.017	0.105	1.022	0.137	YES	0.068	0.310	20.278	21.000	O.K.
3-4	104+42	17.900	1.25	20.278	15	2.128	110.00	0.00113	0.125	2.909	0.033	2.192	0.075	0.026	0.0	0.00	0.000	0.059	1.554	0.077	YES	0.038	0.163	20.441	20.900	O.K.
3-3	103+80	18.200	1.25	20.441	15	0.574	61.00	0.00008	0.005	2.192	0.019	1.693	0.045	0.016	90.0	0.70	0.031	0.065	0.305	0.085	YES	0.043	0.048	20.489	21.100	O.K.
3-2	103+80	18.400	1.25	20.489	15	0.269	34.00	0.00002	0.001	1.693	0.011	0.000	0.000	0.000	0.0	0.00	0.000	0.011	0.269	0.014	YES	0.007	0.008	20.497	21.490	O.K.
5-4	24+05.0	17.600	1.25	18.600	15	2.858	123.00	0.00205	0.252	10.329	0.414	3.887	0.235	0.082	90.0	0.70	0.164	0.661	1.277	0.859	YES	0.429	0.681	26.546	31.400	O.K.
5-3	24+05	26.300	1.25	27.300	15	1.581	41.00	0.00063	0.026	3.887	0.059	0.000	0.000	0.000	0.0	0.00	0.000	0.059	1.581	0.076	YES	0.038	0.064	27.364	31.700	O.K.
4-4	200+49.2	17.300	1.25	19.659	15	3.450	34.00	0.00298	0.101	3.254	0.041	2.704	0.114	0.040	0.0	0.00	0.000	0.081	1.428	0.105	YES	0.053	0.154	19.813	20.300	O.K.
4-3	200+97	17.400	1.25	19.813	15	2.022	43.00	0.00102	0.044	2.704	0.028	2.650	0.109	0.038	45.0	0.46	0.050	0.116	0.913	0.151	YES	0.076	0.120	19.933	20.500	O.K.
4-2	200+97	17.500	1.25	19.933	15	1.109	30.00	0.00031	0.009	2.650	0.027	0.000	0.000	0.000	0.0	0.00	0.000	0.027	1.109	0.035	YES	0.018	0.027	19.960	20.500	O.K.

LD-347
HYDRAULIC GRADE LINE ANALYSIS

PROJECT: Nansemond/Wilroy Overpass

DESIGNED BY: CN

Checked:

INCIDENCE PROBABILITY **10** **Year**

INLET OR JUNCTION	STA.	INVERT EL. OUTFLOW PIPE	DEPTH OF FLOW OUTFLOW PIPE	OUTLET WATER SURFACE ELEV.	DIA. PIPE Do (In/mm)	DESIGN DISCH. Qo (CFS/CMS)	LENGTH PIPE Lo (Ft/M)	FRICTION SLOPE, Sfo (FT/FT) (M/M)	FRICTION LOSS Hf (Ft/M)	JUNCTION LOSS Vo	Contr. Ho (Ft/M)	Vi	Vi*2/2g	Hi (Expn) 0.35*MAX. (Vi2/2g)	SKEW Angle	K	Bend H (Ft/M)	Sum HL (Ft/M)	SURFACE FLOW	Adj. Ht 1.3 Ht (Ft/M)	Inlet Shaping? Y/N	0.5 Ht (Ft/M)	FINAL H (Ft/M)	Inlet Water Surface Elevation	Top of MH Top of Inlet Elev. APPROX.	Adjustment?
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)		(14)	(15)		(16)		(16)	(17)	(18)	(19)	
5-9																								17.290		
5-8	114+15	15.300	1.25	17.290	15	3.932	57.00	0.00387	0.221	4.810	0.090	4.382	0.298	0.104	90.0	0.70	0.209	0.403	0.489	0.403	NO	0.403	0.624	17.914	23.100	O.K.
5-7	115+85	15.800	1.25	17.914	15	3.443	168.00	0.00297	0.499	4.382	0.075	3.693	0.212	0.074	0.0	0.00	0.000	0.149	1.674	0.193	NO	0.193	0.692	18.606	22.400	O.K.
6-3	117+58	16.900	1.25	18.606	15	1.769	171.00	0.00078	0.134	3.693	0.053	0.000	0.000	0.000	0.0	0.00	0.000	0.053	1.769	0.069	NO	0.069	0.203	18.809	21.800	O.K.

LD-347
HYDRAULIC GRADE LINE ANALYSIS

PROJECT: Nansemond/Wilroy Overpass

DESIGNED BY: CN

Checked:

INCIDENCE PROBABILITY **10** **Year**

INLET OR JUNCTION	STA.	INVERT EL. OUTFLOW PIPE	DEPTH OF FLOW OUTFLOW PIPE	OUTLET WATER SURFACE ELEV.	DIA. PIPE Do (In/mm)	DESIGN DISCH. Qo (CFS/CMS)	LENGTH PIPE Lo (Ft/M)	FRICTION SLOPE, Sfo (FT/FT) (M/M)	FRICTION LOSS Hf (Ft/M)	JUNCTION LOSS Vo	Contr. Ho (Ft/M)	Vi	Vi*2/2g	Hi (Expn) 0.35*MAX. (Vi2/2g)	SKEW Angle	K	Bend H (Ft/M)	Sum HL (Ft/M)	SURFACE FLOW	Adj. Ht 1.3 Ht (Ft/M)	Inlet Shaping? Y/N	0.5 Ht (Ft/M)	FINAL H (Ft/M)	Inlet Water Surface Elevation	Top of MH Top of Inlet Elev. APPROX.	Adjustment?
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)		(14)	(15)		(16)		(16)	(17)	(18)	(19)	
6-9																								18.320		
6-7	122+60	15.900	2.50	18.320	30	13.055	50.00	0.00106	0.053	5.293	0.109	4.568	0.324	0.113	0.0	0.00	0.000	0.222	0.800	0.222	YES	0.111	0.164	18.484	20.900	O.K.
6-8	124+40	16.100	2.50	18.484	30	12.255	177.00	0.00093	0.165	4.568	0.081	4.768	0.353	0.124	60.0	0.55	0.262	0.467	0.302	0.467	YES	0.233	0.398	18.882	22.000	O.K.
7-3	125+80	16.600	2.00	18.882	24	10.663	140.00	0.00232	0.325	4.768	0.088	4.260	0.282	0.099	75.0	0.62	0.229	0.416	0.308	0.416	YES	0.208	0.533	19.416	22.600	O.K.
7-5	127+20	17.100	2.00	19.416	24	9.452	140.00	0.00182	0.255	4.260	0.070	4.204	0.274	0.096	75.0	0.62	0.292	0.459	0.363	0.459	YES	0.229	0.485	19.901	23.100	O.K.
7-6	128+85	17.500	2.00	19.901	24	7.872	164.00	0.00127	0.208	4.204	0.069	3.880	0.234	0.082	30.0	0.33	0.040	0.191	0.201	0.191	YES	0.095	0.303	20.204	23.200	O.K.
7-12	130+07	18.000	1.50	20.204	18	5.426	120.00	0.00279	0.335	3.880	0.058	4.868	0.368	0.129	75.0	0.62	0.090	0.277	1.334	0.360	YES	0.180	0.515	20.718	23.600	O.K.
7-13	301+75	18.400	1.25	20.718	15	2.611	182.00	0.00171	0.311	3.046	0.036	2.959	0.136	0.048	0.0	0.00	0.000	0.084	0.000	0.084	NO	0.084	0.394	21.113	22.400	O.K.
7-14	302+12.5	18.900	1.25	21.113	15	2.611	39.00	0.00171	0.067	2.959	0.034	2.997	0.139	0.049	90.0	0.70	0.098	0.180	1.608	0.235	YES	0.117	0.184	21.297	22.200	O.K.
7-16	302+12.5	19.000	1.25	21.297	15	1.017	40.00	0.00026	0.010	2.997	0.035	0.645	0.006	0.002	0.0	0.00	0.000	0.037	0.973	0.048	NO	0.048	0.059	21.355	22.200	O.K.
7-17	302+50	19.200	1.25	21.355	15	0.007	31.00	0.00000	0.000	0.645	0.002	0.000	0.000	0.000	0.0	0.00	0.000	0.002	0.007	0.002	NO	0.002	0.002	21.357	22.300	O.K.
7-1	124+60	16.600	1.25	18.882	15	1.565	46.00	0.00061	0.028	5.520	0.118	0.000	0.000	0.000	0.0	0.00	0.000	0.118	1.565	0.154	NO	0.154	0.182	19.064	21.500	O.K.
7-2	125+90	17.100	1.25	19.416	15	1.076	43.00	0.00029	0.012	4.868	0.092	0.000	0.000	0.000	0.0	0.00	0.000	0.092	1.076	0.120	NO	0.120	0.132	19.548	21.900	O.K.
7-4	127+30	17.500	1.25	19.901	15	1.418	43.00	0.00050	0.022	5.498	0.117	0.000	0.000	0.000	0.0	0.00	0.000	0.117	1.418	0.153	NO	0.153	0.174	20.075	22.400	O.K.
7-7	400+50	18.000	1.25	20.204	15	2.475	44.00	0.00153	0.068	2.790	0.030	3.250	0.164	0.057	45.0	0.46	0.075	0.163	0.000	0.163	NO	0.163	0.230	20.434	22.600	O.K.
7-8	400+87	18.100	1.25	20.434	15	2.475	30.00	0.00153	0.046	3.250	0.041	3.021	0.142	0.050	80.0	0.64	0.091	0.181	1.353	0.236	YES	0.118	0.164	20.598	22.300	O.K.
7-10	400+87	18.200	1.25	20.598	15	1.115	42.00	0.00031	0.013	3.021	0.035	0.892	0.012	0.004	0.0	0.00	0.000	0.040	1.063	0.052	NO	0.052	0.065	20.662	22.500	O.K.
7-11	400+39.5	18.400	1.25	20.662	15	0.007	48.00	0.00000	0.000	0.892	0.003	0.000	0.000	0.000	0.0	0.00	0.000	0.003	0.007	0.004	NO	0.004	0.004	20.666	22.700	O.K.
7-18	131+44.6	18.400	1.25	20.718	15	1.647	136.00	0.00068	0.092	4.868	0.092	0.000	0.000	0.000	0.0	0.00	0.000	0.092	1.647	0.120	NO	0.120	0.212	20.930	24.100	O.K.
7-15	302+50	19.000	1.25	21.297	15	0.007	40.00	0.00000	0.000	0.588	0.001	0.000	0.000	0.000	0.0	0.00	0.000	0.001	0.007	0.002	NO	0.002	0.002	21.298	22.300	O.K.
7-9	401+40	18.200	1.25	20.598	15	0.007	52.00	0.00000	0.000	1.054	0.004	0.000	0.000	0.000	0.0	0.00	0.000	0.004	0.007	0.006	NO	0.006	0.006	20.603	22.800	O.K.

LD-347
HYDRAULIC GRADE LINE ANALYSIS

PROJECT: Nansemond/Wilroy Overpass

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INCIDENCE PROBABILITY **10** **Year**

INLET OR JUNCTION	STA.	INVERT EL. OUTFLOW PIPE	DEPTH OF FLOW OUTFLOW PIPE	OUTLET WATER SURFACE ELEV.	DIA. PIPE Do (In/mm)	DESIGN DISCH. Qo (CFS/CMS)	LENGTH PIPE Lo (Ft/M)	FRICTION SLOPE, Sfo (FT/FT) (M/M)	FRICTION LOSS Hf (Ft/M)	JUNCTION LOSS Vo	Contr. Ho (Ft/M)	Vi	Vi*2/2g	Hi (Expn) 0.35*MAX. (Vi2/2g)	SKEW Angle	K	Bend H (Ft/M)	Sum HL (Ft/M)	SURFACE FLOW	Adj. Ht 1.3 Ht (Ft/M)	Inlet Shaping? Y/N	0.5 Ht (Ft/M)	FINAL H (Ft/M)	Inlet Water Surface Elevation	Top of MH Top of Inlet Elev. APPROX.	Adjustment?
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)		(14)	(15)		(16)		(16)	(17)	(18)	(19)	
6-13																								18.320		
6-6	121+25	15.800	1.50	18.320	18	5.035	58.00	0.00240	0.139	3.893	0.059	3.616	0.203	0.071	90.0	0.70	0.142	0.272	2.336	0.354	YES	0.177	0.316	18.636	20.500	O.K.
6-5	120+25	16.000	1.25	18.636	15	2.699	96.00	0.00182	0.175	3.616	0.051	3.825	0.227	0.080	0.0	0.00	0.000	0.130	1.240	0.169	YES	0.085	0.260	18.896	20.800	O.K.
6-4	119+00	16.500	1.25	18.896	15	1.459	121.00	0.00053	0.065	3.825	0.057	0.000	0.000	0.000	0.0	0.00	0.000	0.057	1.459	0.074	NO	0.074	0.138	19.034	21.300	O.K.

LD-347
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(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)		(14)	(15)		(16)		(16)	(17)	(18)	(19)	
9-6																								19.100		
9-5	13+00	17.500	2.00	19.100	24	9.997	26.00	0.00204	0.053	4.852	0.091	4.341	0.293	0.102	90.0	0.70	0.117	0.311	0.644	0.311	YES	0.155	0.208	19.308	22.800	O.K.
9-2	11+98	17.600	1.50	19.308	18	1.897	97.00	0.00034	0.033	3.278	0.042	2.461	0.094	0.033	90.0	0.70	0.066	0.140	1.049	0.183	NO	0.183	0.216	19.524	21.900	O.K.
9-1	11+97.8	18.000	1.25	19.524	15	0.848	30.00	0.00018	0.005	2.461	0.024	0.000	0.000	0.000	0.0	0.00	0.000	0.024	0.848	0.031	NO	0.031	0.036	19.560	22.000	O.K.
9-4	12+98.7	17.900	2.00	19.500	24	7.815	30.00	0.00125	0.037	4.341	0.073	6.224	0.602	0.211	0.0	0.00	0.000	0.284	0.277	0.284	NO	0.284	0.321	19.821	22.800	O.K.
9-3	12+98	18.000	1.50	19.821	18	7.538	11.00	0.00538	0.059	6.224	0.150	0.000	0.000	0.000	0.0	0.00	0.000	0.150	0.000	0.150	NO	0.150	0.210	20.031	22.800	O.K.

LD-347
HYDRAULIC GRADE LINE ANALYSIS

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INCIDENCE PROBABILITY **10** **Year**

INLET OR JUNCTION	STA.	INVERT EL. OUTFLOW PIPE	DEPTH OF FLOW OUTFLOW PIPE	OUTLET WATER SURFACE ELEV.	DIA. PIPE Do (In/mm)	DESIGN DISCH. Qo (CFS/CMS)	LENGTH PIPE Lo (Ft/M)	FRICTION SLOPE, Sfo (FT/FT) (M/M)	FRICTION LOSS Hf (Ft/M)	JUNCTION LOSS Vo	Contr. Ho (Ft/M)	Vi	Vi*2/2g	Hi (Expn) 0.35*MAX. (Vi2/2g)	SKEW Angle	K	Bend H (Ft/M)	Sum HL (Ft/M)	SURFACE FLOW	Adj. Ht 1.3 Ht (Ft/M)	Inlet Shaping? Y/N	0.5 Ht (Ft/M)	FINAL H (Ft/M)	Inlet Water Surface Elevation	Top of MH Top of Inlet Elev. APPROX.	Adjustment?
(1)	(2)			(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)		(14)	(15)		(16)		(16)	(17)	(18)	(19)	
9-12																								21.770		
9-11	15+38.5	20.400	1.25	21.770	15	4.150	40.00	0.00431	0.173	10.526	0.430	9.349	1.357	0.475	90.0	0.70	0.950	1.855	0.701	1.855	YES	0.928	1.100	23.047	30.700	O.K.
10-2	17+24.5	25.200	1.25	26.200	15	2.023	186.00	0.00103	0.191	9.349	0.339	3.406	0.180	0.063	90.0	0.70	0.126	0.528	0.915	0.687	NO	0.687	0.878	38.490	42.500	O.K.
10-1	17+26.3	38.400	1.25	39.400	15	1.109	30.00	0.00031	0.009	3.406	0.045	0.000	0.000	0.000	0.0	0.00	0.000	0.045	1.109	0.059	NO	0.059	0.068	39.468	42.600	O.K.
9-10	14+68	22.800	1.25	23.800	15	1.457	71.00	0.00053	0.038	3.747	0.055	3.474	0.187	0.066	90.0	0.70	0.131	0.251	0.267	0.251	NO	0.251	0.289	24.089	27.500	O.K.
9-9	14+68	23.300	1.25	24.300	15	1.190	30.00	0.00035	0.011	3.474	0.047	0.000	0.000	0.000	0.0	0.00	0.000	0.047	1.190	0.061	NO	0.061	0.072	24.372	27.400	O.K.