

CAROLINAS COLLISION CENTER

WILMINGTON, NORTH CAROLINA

STORMWATER AND EROSION CONTROL NARRATIVE

Prepared for:

Carolinas Collision Center of Wilmington, LLC
4900 Leigh Drive
Raleigh, NC 27616

Prepared by:

PARAMOUNTTE
ENGINEERING, INC.

122 Cinema Drive
Wilmington, NC 28403
(910) 791-6707
NC License #: C-2846

Project No. 16296.PE

January 2017
Last Revised June 2017



Final SW Calcs
SWP 2017027 & 2017028
7/6/2017
rac

CAROLINAS COLLISION CENTER

WILMINGTON, NORTH CAROLINA

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PROJECT NARRATIVE

Carolinas Collision Center is proposing to construct a 14,484 sq. ft. collision center behind the Fountain Tire Store located at 4400 Oleander Drive (US Hwy 76) near the College Road (NC Hwy 132) Intersection. It is further identified by New Hanover County PIN #s: R06106-003-003-000, R06106-006-020-000, R06106-003-021-000 (2.71 ac), and coordinates: Lat 34°12'34.24"N Long: 78° 53'22.18"W. The site is surrounded by existing commercial and car dealership property.

The current site consists of 0-2% sloped terrain and wooded with City of Wilmington regulated trees that will require mitigation and/or tree protection. The existing soils on the site are predominantly Torhunta loamy fine sand loam (To) according to the Web Soil Survey of NRCS. According to the attached USGS map, the site drains to Hewlett's Creek, which is classified as SA;HQW in the Cape Fear River Basin. The site is outside of a 0.5 mile distance from the SA waters according to the NCDEQ Stormwater Permitting Interactive Map.

The seasonal high water table for the project was determined using good engineering judgment as referenced on pages 10-9 and 10-10 of the NCDENR Stormwater BMP Manual. Therefore, by field conditions, the proposed pond permanent pool elevation is set to be controlled by adjacent storm drainage collection outfalls maintained by the City in the Spirea Drive ROW.

No jurisdictional wetlands, ditches or streams will be impacted as part of the proposed project.

PROPOSED EROSION CONTROL MEASURES

- A. TEMPORARY CONSTRUCTION ENTRANCE (DENR PRACTICE 6.06)** One temporary gravel construction entrances is installed on a proposed driveway.
- B. TEMPORARY SILT (SEDIMENT) FENCE (DENR PRACTICE 6.62)** Temporary silt fence will be used to control sediment runoff from fill areas, prevent any construction sediment or trash from leaving the site.
- C. RIP-RAP OUTLET PROTECTION (DENR PRACTICE 6.41)** Outlet protections are shown on pipe outfalls in ponds, ditches, and sheet flow discharges on site. The rip-rap will prevent scour and erosion from washing bottoms and slopes of earthwork.
- D. TEMPORARY SKIMMER SEDIMENT BASIN (DENR PRACTICE 6.64)** One sediment basin will be used to control all disturbed area runoff with a skimmer dewatering device attached to the outlet for the wet pond. ***Note baffles are not included since water will be retained within the basin therefore submerging the baffles.
- E. TEMPORARY INLET PROTECTION (DENR PRACTICE 6.51)** Inlet protections are shown throughout final grading/phase 2 of the erosion control to control most of the sediment-runoff from clogging the storm drain inlets and pipes and reduce sediment into the future wet pond.
- F. TEMPORARY TREE PROTECTION FENCING (DENR PRACTICE 6.05)** Temporary tree protection fencing is shown on selected trees and areas to remain undisturbed.

PROPOSED STORMWATER CONTROL MEASURES

One wet retention pond will be used to treat the required 1.5-inch rainfall-runoff and provide peak discharge control to at or below pre-developed peak discharge in the 2, 10, and 25-yr design storms as required by NC State Coastal Stormwater Rules and the City of Wilmington Stormwater Ordinance, respectively. The wet pond was calculated utilizing SCS TR-20 hydrograph routing through the HydroCAD software. The retention requirements for the 1.5-inch rainfall runoff were calculated using the Simple Method and the 90% TSS removal requirements. The pond will be used to treat the project as proposed and some future allocation of imperviousness.

Due to the existing nature / topography of the site, and the existing buildings roof drainage configuration. We are proposing to collect and treat some of the impervious area from the Ford dealership next door in order to allow the existing runoff from a portion of the existing roof and driveway to remain in the current configuration / condition.

Storm conveyance calculations have been performed utilizing the Rational Method for the 10-yr and 50-yr design storms to check for flood control within the pipe system in accordance with the City of Wilmington Stormwater Ordinance. The hydraulic grade line (HGL) calculations were performed through the Carlson Civil Storm Sewers Software utilizing the FHWA HEC-22 Energy-Loss Method. The published City of Wilmington IDF Tables have been used for the 10-yr and 50-yr HGL calculations.

Routing calculations for peak attenuation were performed utilizing a free discharge to obtain a more conservative outlet structure that ensures that pre/post requirements are met regardless of tail water conditions downstream. The 100-year storm was also routed with a tail water elevation slightly above the top of the 42" discharge pipe to ensure 6" of freeboard in the pond for this condition.

RESULTS SUMMARY

Storm	Pre-Dev	Post-Dev (W/ BMP)	BMP MAX WSEL
2-Year	2.26 cfs	1.91 cfs	38.88'
10-Year	7.15 cfs	6.94 cfs	39.45'
25-Year	9.54 cfs	9.32 cfs	39.64'
100-Year (Free)	14.27 cfs	15.99 cfs	39.88'
100-Year (TW)	14.27 cfs	14.20 cfs	40.50'

Storm Networks to Wet Pond

- Min. Tc = 5 min to each inlet. (Tc was adjusted higher depending on Inlet Drainage)
- Rational C Value = Varies with Site
- 10-yr HGL < Rim Elevation for all structures

4
26
650-RS



FOR REGISTRATION REGISTER OF DEED
TAMMY THEUSCH BEASLEY
NEW HANOVER COUNTY, NC
2012 DEC 31 01 58 17 PM
BK 5700 PG 2408-2412 FEE \$26 00
NC REV STAMP \$650 00
INSTRUMENT # 2012045532

SPECIAL WARRANTY DEED

WE PREPARED THE DEED IN THIS TRANSACTION BUT WE MADE NO EXAMINATION OF TITLE AND WE EXPRESS NO OPINION ON TITLE TO THE PROPERTY.

Prepared by: MURCHISON, TAYLOR, & GIBSON, PLLC
16 North Fifth Avenue, Wilmington, NC 28401

Rob106-003-029-000 Rob106-003-023-000
Rob106-003-020-000
Rob106-003-011-000

NORTH CAROLINA

PARCEL: _____

NEW HANOVER COUNTY

REVENUE STAMPS: \$650.00

THIS SPECIAL WARRANTY DEED, made this 28th day of December, 2012 by and between **Spirea Drive, LLC**, a North Carolina limited liability company with a mailing address of P O Box 4188, Wilmington, NC 28403, herein called ("GRANTOR"), and **Capital Investment Properties of Wilmington, LLC**, a North Carolina limited liability company with a mailing address of 4222 Oleander Drive, Wilmington, NC 28403, herein called ("GRANTEE")

WITNESSETH:

The GRANTOR, for and in consideration of the sum of Ten Dollars (\$10 00) and other valuable considerations to it in hand paid by the GRANTEE, the receipt whereof is hereby acknowledged, has bargained and sold, and by these presents does hereby bargain, sell and convey unto GRANTEE, its successors and assigns forever, all that certain real property located in New Hanover County, North Carolina, and more particularly described in Exhibit A attached hereto and incorporated herein by reference

SUBJECT TO the following exceptions: (i) ad valorem taxes for the current and subsequent years; (ii) all easements, rights of way, agreements and restrictions, and (iii) all governmental land use statutes, ordinances and regulations, including zoning, subdivision and building regulations

Return to:
Blanco Tackabery
Attn: GEH
P O Box 25008
Winston-Salem, NC 27114-5008

TO HAVE AND TO HOLD the above granted and described property, together with all and singular, the rights, privileges, easements, tenements and appurtenances thereunto belonging, or in anywise appertaining unto the said GRANTEE, its successors and assigns, in fee simple, forever

And the GRANTOR, for itself, its successors and assigns, does covenant to and with the said GRANTEE, its successors and assigns, that GRANTOR has done nothing to impair such title to the property described herein as GRANTOR received, and GRANTOR will warrant and defend the title to the same against the lawful claims of all persons claiming by, under or through GRANTOR or its successors or assigns

Per N C Gen Stat § 105-317.2, none of the property described herein includes the primary residence of Grantor

IN TESTIMONY WHEREOF, the said GRANTOR has caused this instrument to be executed the day and year first above written

SPIREA DRIVE, LLC
a North Carolina limited liability company

BY: W.N. Smith, Sr. (SEAL)
NAME: W.N. Smith, Sr.
ITS: Manager

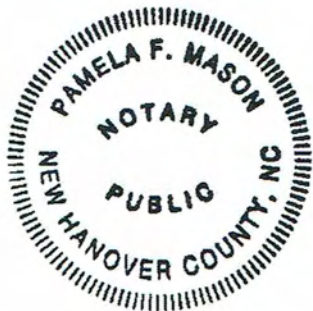
STATE OF NORTH CAROLINA
COUNTY OF NEW HANOVER

I certify that the following person personally appeared before me this day, acknowledging to me that he or she signed the foregoing document W. N. Smith, Sr.
[Name of person signing]

Today's Date December 28, 2012 Pamela F. Mason
[Notary's signature as name appears on seal]

Pamela F. Mason
[Notary's printed name as name appears on seal]

My commission expires 10-26-16



[Affix Notary Seal in Space Above]

EXHIBIT A

Tract 1:

BEGINNING at a point in the Northern line of Greenfield Avenue (33 feet in width) as the same is shown on map of Winter Park Gardens recorded in Map Book 3 at Page 38 and Map Book 14 at Page 44 in the New Hanover County Registry (said Greenfield Avenue now being known as Spirea Drive), said point of beginning being the Southeastern corner of that tract of land described in deed to T N Talbot and wife recorded in Book 290 at Page 139 in the New Hanover County Registry, said point of beginning being also located 726 feet Westwardly as measured along said Northern line of Greenfield Avenue from its intersection with the Western line of Third Street as shown on the above mentioned maps and running thence from said beginning point Northwardly and parallel with Third Street 186 5 feet, thence Westwardly and parallel with Greenfield Avenue 132 feet, thence Southwardly and parallel with Third Street 186 5 feet to the Northern line of Greenfield Avenue, thence Eastwardly along the Northern line of Greenfield Avenue 132 feet to the point of Beginning, the same being a part of Farm 27 of Winter Park Gardens and being the same lands described in deed to T N Talbot and wife recorded in Book 290 at Page 139 in the New Hanover County Registry with the exception of that portion thereof conveyed to A R Threath by deed recorded in Book 815 at Page 58 in the New Hanover County Registry

Tract 2:

BEGINNING at a point in the Northern line of Spirea Drive (formerly Greenfield Street) (30 feet from the center line thereof) where said Northern line intersects the dividing line between Farms 27 and 28 of Winter Park Gardens and from said beginning point running thence Northwardly along the dividing line between Farms 27 and 28, 109 feet to a point, thence Westwardly and parallel with Spirea Drive 63 feet to a point, thence Southwardly and parallel with the dividing line between Farms 27 and 28, 109 feet to a point in the Northern line of Spirea Drive, thence Eastwardly along the Northern line of Spirea Drive 63 feet to the point of Beginning, the same being a part of Farm #28 of Winter Park Gardens as the said Winter Park Gardens is shown on a map recorded in L & D "A" Page 509, according to the records of the New Hanover County Registry, and being a portion of those lands conveyed to Earl W Hobbs and wife, May L Hobbs by deed recorded in Book 688 at Page 146 in the New Hanover County Registry

Tract 3:

BEGINNING at a point in the northern right of way line of Greenfield Avenue, said point being North 80 degrees 00 minutes West 1,086 feet from the intersection of said northern right of way line of Greenfield Avenue with the center line of 46th Street (formerly Third Street, as shown on a plat of Winter Park Gardens recorded in Map Book 3, Page 38, New Hanover County Registry), running thence from said beginning point, North 80 degrees 00 minutes West, with

the northern right of way line of Greenfield Avenue, 69 feet to the southeast corner of that certain tract of land conveyed to H W Wallace, et ux, by deed recorded in Book 351 at Page 440, New Hanover County Registry, running thence North 10 degrees 00 minutes East, with the eastern line of said Wallace Tract, and parallel to Anderson Street, 100 feet to a point, thence South 80 degrees 00 minutes East 69 feet to a point; thence South 10 degrees 00 minutes West, with the western line of the Hobbs Tract 100 feet to the point of beginning, said beginning point being the southwest corner of Hobbs Tract

Tract 4:

BEGINNING at the Southwest corner of Lot 40 as the same is shown on a subdivision of Farm 29, Winter Park Gardens, on a map prepared by J L Becton, C E , in December, 1927, and which is duly recorded in the Map Book No 2 at Page #127 of the New Hanover County Registry, and running thence eastwardly along the southern line of said Lot 40, 75 feet, thence northwardly 10 degrees east and parallel with Seventh Avenue 100 feet to a point in the southern line of Lot 32 according to the map above referenced to, thence westwardly along the northern line of Lot 34 according to the map above referred to, 75 feet to the eastern line of Seventh Avenue thence southwardly along the eastern line of Seventh Avenue 100 feet to the point of beginning, the same being the western parts of Lots 34, 36, 38 and 40 according to the map above referred to and the same being a part of that property conveyed by Harry O Thomas and wife to Thomas B Wood and wife, Mary M Wood, by deed recorded June 24, 1960 in Book 638 at Page 142 of the New Hanover County Registry

Tract 5:

All of Lots 41, 42 and 43 of a subdivision of Farm 29 of Winter Park Gardens, as shown on the map of said subdivision, prepared by J L Becton, C E , in December, 1927 and recorded in Map Book 2, Page 127, in the New Hanover County Registry, reference to which map is hereby made for a more particular description, and being the same property conveyed to Marilyn A Moore by deed recorded in Book 664 at Page 448 of the New Hanover County Registry



TAMMY THEUSCH BEASLEY
REGISTER OF DEEDS, NEW HANOVER
216 NORTH SECOND STREET

WILMINGTON, NC 28401

Filed For Registration. 12/31/2012 01 58 17 PM
Book RE 5700 Page. 2408-2412
Document No. 2012045532
5 PGS \$26.00
NC REAL ESTATE EXCISE TAX \$650 00
Recorder JOHNSON, CAROLYN

State of North Carolina, County of New Hanover

PLEASE RETAIN YELLOW TRAILER PAGE WITH ORIGINAL DOCUMENT.

2012045532

2012045532

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182-25



FOR REGISTRATION REGISTER OF DEED
TAMMY THEUSCH BEASLEY
NEW HANOVER COUNTY, NC
2013 OCT 08 02:48:28 PM
BK. 5775 PG 353-356 FEE \$26 00
NC REV STAMP: \$182.00
INSTRUMENT # 2013036314

WARRANTY DEED

Prepared by: **MURCHISON, TAYLOR, & GIBSON, PLLC**
16 North Fifth Avenue, Wilmington, NC 28401

NORTH CAROLINA

PARCEL ID #:R06106-003-021-000

NEW HANOVER COUNTY

REVENUE STAMPS: \$182.00

THIS WARRANTY DEED, made this 7th day of October, 2013 by and between **Louise V. Renn, widow**, whose mailing address is 817 Shelton Court, Wilmington, NC 28412 (herein, whether one or more, called "**GRANTOR**"), and **Capital Properties of Wilmington, LLC**, whose mailing address is 4222 Oleander Drive, Wilmington, NC 28403 (herein, whether one or more, called "**GRANTEE**").

WITNESSETH:

THE GRANTOR, for and in consideration of the sum of Ten Dollars (\$10.00) and other valuable considerations to her in hand paid by the GRANTEE, the receipt whereof is hereby acknowledged, has bargained and sold, and by these presents does hereby bargain, sell and convey unto GRANTEE, and her heirs and assigns forever, all of that certain real property located in New Hanover County, North Carolina, described in **Exhibit A attached hereto**.

SUBJECT TO (i) all easements, rights of way and restrictions of record and any amendments thereto in the New Hanover County Registry (ii) all governmental land use statutes, ordinances and regulations, including zoning, subdivision and building regulations; (iii) and ad valorem taxes for the current and subsequent years.

TO HAVE AND TO HOLD the above granted and described property, together with all and singular, the rights, privileges, easements, tenements and appurtenances thereunto belonging, or in anywise appertaining unto the said GRANTEE, her heirs and assigns in fee simple, forever.

AND THE GRANTOR, for itself, its successors and assigns, does covenant to and with the said GRANTEE, her successors and assigns, that it is seized in fee of the above granted and described property; that it has good right to sell and convey the same in fee simple; that the same is free and clear from any and all restrictions, easements or encumbrances, except

IN TESTIMONY WHEREOF, the said GRANTOR has hereunto caused this instrument to be executed the day and year first above written.

Louise V. Renn
Louise V. Renn

STATE OF North Carolina

COUNTY OF New Hanover
(County where acknowledgment taken)

I, Myra Y. Hewett, a Notary Public in and for New Hanover County, North Carolina, do certify that the undersigned personally appeared before me this day and acknowledged the due execution of the foregoing instrument in the capacity stated above: Louise V. Renn (name of person signing)

WITNESS my hand and official seal this 17th day of October, 2013

Myra Y. Hewett
Notary Public

My Commission Expires
7-4-2015



Exhibit A

BEGINNING at a point in the Northern line of Spirea Drive (formerly Greenfield Avenue), said point being the Southeast corner of Farm 27 of Winter Park Gardens Subdivision, as shown on a map in Map Book 3, at Page 38, of the New Hanover County Registry, the same being the Southeast corner tract of land conveyed to Fern E Reams by the Deed recorded in Book 472, at Page 638, of the New Hanover County Registry; running thence westwardly in the Northern line of Spirea Drive, 66 feet to a point; thence northwardly and parallel with the Eastern line of Farm 27 of Winter Park Gardens, 200 feet to a point, said point being the Southwest corner of a tract of land conveyed by Fern E. Reams to A R. Threatt by a Deed recorded in Book 815, at page 396, of the New Hanover County Registry; thence eastwardly and parallel with Spirea Drive, 66 feet to a point in the Eastern line of Farm 27, Winter Park Gardens Subdivision, thence southwardly along the Eastern line of Farm 27 of Winter Park Gardens Subdivision, 200 feet to the point of BEGINNING; same being part of that certain tract conveyed by E. W. Freshwater and wife, to Fern E. Reams by a Deed recorded in Book 472, at Page 638, of the New Hanover County Registry, a portion of said tract having been conveyed to A R. Threatt by Fern E Reams by a Deed recorded in Book 815, at Page 396, of the New Hanover County Registry.



TAMMY THEUSCH BEASLEY
REGISTER OF DEEDS, NEW HANOVER
216 NORTH SECOND STREET

WILMINGTON, NC 28401

Filed For Registration: 10/08/2013 02:48:28 PM

Book: RE 5775 Page: 353-356

Document No.: 2013036314

4 PGS \$26.00

NC REAL ESTATE EXCISE TAX: \$182.00

Recorder: JOHNSON, CAROLYN

State of North Carolina, County of New Hanover

PLEASE RETAIN YELLOW TRAILER PAGE WITH ORIGINAL DOCUMENT.

2013036314

2013036314

3
26
3250-RS

BK: RB 5991
PG: 462-465
RECORDED:
08-04-2016
10:39:00 AM
BY: CAROLYN JOHNSON
DEPUTY



2016024559
NEW HANOVER COUNTY, NC
TAMMY THEUSCH BEASLEY
REGISTER OF DEEDS

NC FEE \$26.00
STATE OF NC
REAL ESTATE
EXTX \$3250.00

NORTH CAROLINA GENERAL WARRANTY DEED

Excise Tax: \$3,250.00

Parcel #R06106-003-003-000

Prepared by: John C. Wessell, III, Attorney at Law, P.O. Box 1049, Wilmington, NC 28402. The preparer has not examined the title to the property described hereinbelow.

Return to: _____

**NORTH CAROLINA
NEW HANOVER COUNTY**

DATE: August 3, 2016

GRANTOR: JEFF FOUNTAIN TIRE SALES AND SERVICE, INC., a North Carolina Corporation

ADDRESS: 9000 St. Stephens Place
Wilmington, NC 28412

GRANTEE: CAROLINAS COLLISION OF WILMINGTON, LLC, a North Carolina Limited Liability Company

ADDRESS: 4222 Oleander Drive
Wilmington, NC 28403

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

RETURN TO MTG

WITNESSETH:

THAT the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple all of that certain lot or parcel of land situated in the City of Wilmington, New Hanover County, North Carolina, and being more particularly described as follows:

BEGINNING at a point in the southern line of Strawberry Avenue (now Oleander Drive) 672 feet westwardly from its intersection with the western line of Third Street (now N.C. Highway #132) as Strawberry Avenue and Third Street are shown upon the map of Winter Park Gardens recorded in the New Hanover County Registry in Book L&DA, Page 509; running westwardly along the southern line of Strawberry Avenue 186 feet; thence southwardly at right angles to Oleander Drive 460 feet; thence easterly and parallel with Oleander Drive 198 feet; thence northwardly at right angles to Oleander Drive 130 feet; thence westwardly parallel to Oleander Drive 12 feet; thence northwardly at right angles to Oleander Drive 330 feet to the BEGINNING, subject, however, to the present right-of-way of Oleander Drive.

Being also the same property conveyed by Warranty Deed to W. Jeffrey Fountain dated December 31, 1995, and recorded March 11, 1996, in Book 1999 at Page 283 of the New Hanover County Registry.

The property hereinabove described was acquired by Grantor by instrument recorded in Book 1999 at Page 285, New Hanover County Registry.

All or a portion of the property herein conveyed ____ includes or X does not include the primary residence of a Grantor.

TO HAVE AND TO HOLD the aforesaid lot or parcel of land and all privileges and appurtenances thereto belonging to the Grantee in fee simple.

AND the Grantor covenants with the Grantee that Grantor is seized of the premises in fee simple, has the right to convey the same in fee simple, that title is marketable and free and clear of all encumbrances, and that Grantor will warrant and defend the title against the lawful claims of all persons whomsoever, other than the following exceptions: the lien of applicable ad valorem taxes for the current year and subsequent years; easements and restrictions of record; and any local, county, state, or federal laws, ordinances, or regulations relating to zoning, environment, subdivision, occupancy, use, construction, or development of the subject property.

IN WITNESS WHEREOF, the Grantor has duly executed the foregoing as of the day and year first above written.

JEFF FOUNTAIN TIRE SALES AND SERVICE, INC.

By: W. Jeffrey Fountain
W. Jeffrey Fountain, President

NORTH CAROLINA
NEW HANOVER COUNTY

I, the undersigned Notary Public of the County of New Hanover and State aforesaid, certify that W. JEFFREY FOUNTAIN personally came before me this day and acknowledged that he is the President of JEFF FOUNTAIN TIRE SALES AND SERVICE, INC., a North Carolina corporation, and that by authority duly given and as the act of such entity, he signed the foregoing instrument in its name on its behalf as its act and deed.

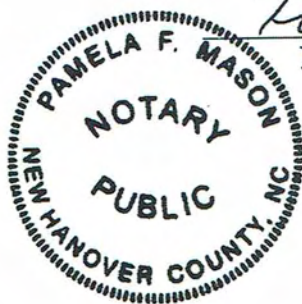
WITNESS my hand and Notarial stamp or seal this 3rd day of August, 2016.

Pamela F. Mason
Notary Public

My commission expires:

10-26-16

(AFFIX STAMP OR SEAL)



Pamela F. Mason
Notary's Printed or Typed Name

TAMMY THEUSCH
BEASLEY
Register of Deeds

New Hanover County Register of Deeds

320 CHESTNUT ST SUITE 102 • WILMINGTON, NORTH CAROLINA 28401
Telephone 910-798-4530 • Fax 910-798-7751



State of North Carolina, County of NEW HANOVER
Filed For Registration: 08/04/2016 10:39:00 AM
Book: RB 5991 Page: 462-465
4 PGS \$3,276.00
Real Property \$26.00
Excise Tax \$3,250.00
Recorder: CAROLYN JOHNSON
Document No: 2016024559

DO NOT REMOVE!

This certification sheet is a vital part of your recorded document. Please retain with original document and submit when re-recording.

Hydrologic Soil Group—New Hanover County, North Carolina
(Carolina Collision)



Warning: Soil Map may not be valid at this scale.

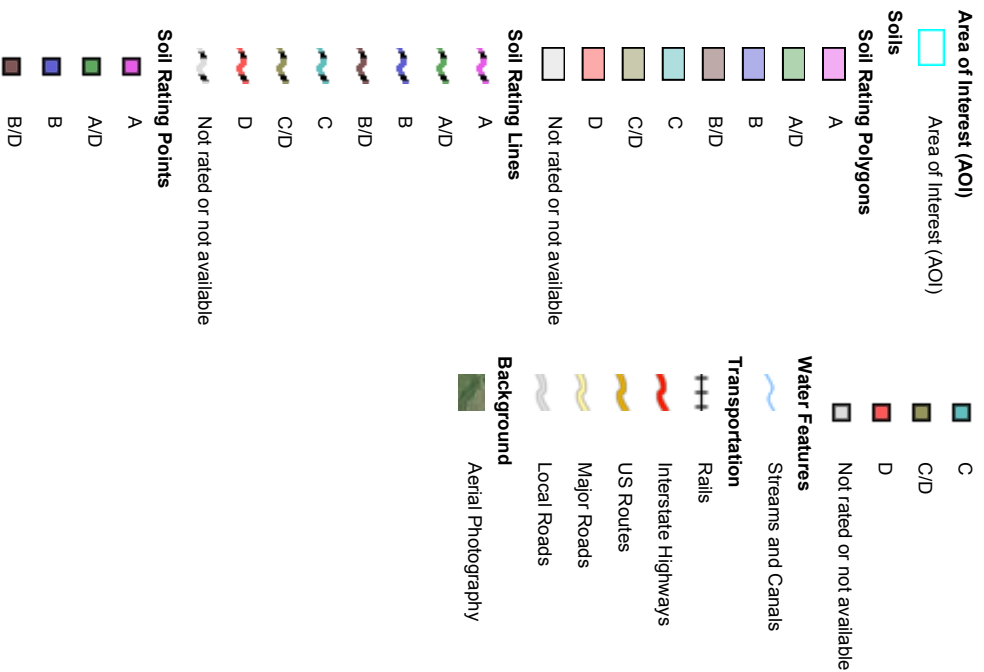
Map Scale: 1:3,000 if printed on A portrait (8.5" x 11") sheet.



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



MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websolisurvey.nrcs.usda.gov>
 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: New Hanover County, North Carolina
 Survey Area Data: Version 16, Sep 29, 2015

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

Date(s) aerial images were photographed: Data not available.

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

Hydrologic Soil Group— Summary by Map Unit — New Hanover County, North Carolina (NC129)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Sh	Seagate-Urban land complex	B	0.4	14.4%
To	Torhunta loamy fine sand	A/D	1.9	71.2%
Ur	Urban land		0.4	14.3%
Totals for Area of Interest			2.7	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.

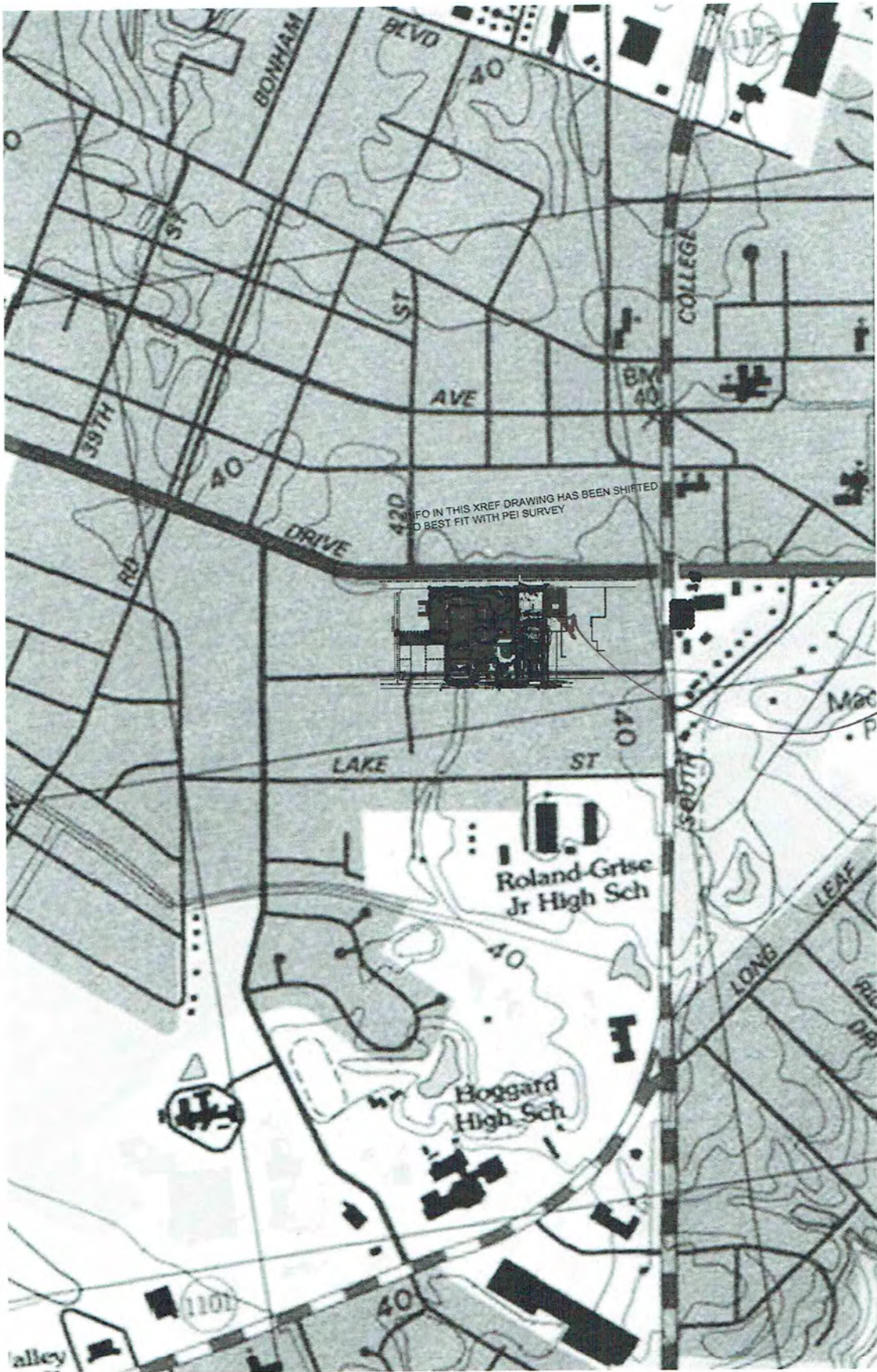
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



1" = 1000'

SITE

Project Name: Carolinas Collision
 Client: McKinley
 Project Number: 16296.PE
 Prepared By: DJF
 Date: 2/28/17



Basin: DA #1 [POST]

Drainage area= 2.799 acres = 0.004 mi²

Area Calculations		
Land Use	Area (Ac.)	% of Basin
Existing Impervious	0.984	
Ex to be Removed / Demolished	-0.090	
Existing (follows existing drainage)	-0.165	
Buildings/Lots	0.333	
Pavement	0.371	
Sidewalks	0.017	
Offsite (swap for existing)	0.307	
Misc. / Future	0.338	
Impervious (Total) =	2.094	74.8%
Open Space - Good	0.437	15.6%
Permanent Pool - Pervious	0.268	9.6%
	Sum:	100.0%
	2.799	

Carolinas Collision - Wet Pond #1

NC DEQ Retention Requirements

Objective: design a wet detention basin with the following characteristics: a permanent water pool depth between 3- and 6-feet, a surface area that meets TSS removal requirements (values set by NC DENR and included here), a forebay that is approximately 20% of the total pond volume, a temporary water pool sized to detain the initial 1.5 inch of rainfall runoff, an outlet device that drains the temporary water pool within 2-5 days, and a length-to-width ratio of approximately 3:1.

Step 1: Determine the surface area required for 90% TSS removal

Post-Development Conditions

Total Drainage Area	2.799	ACRE	Value from CAD
Impervious Drainage Area	2.094	ACRE	Value from CAD
Impervious Cover	74.81%		$Impervious\ Cover = (Impervious\ Drainage\ Area) / (Total\ Drainage\ Area) * 100\%$
Elevation of Permanent Pool Surface	37.30	FT	Value selected by designer
Depth of Permanent Pool	6.00	FT	Value selected by designer
Elevation of Wet Detention Pond Bottom	31.3	FT	$(Bottom\ Elevation) = (Permanent\ Pool\ Surface\ Elevation) - (Depth\ of\ Permanent\ Pool)$
Approximate Pond Length	142	FT	Value from CAD
Approximate Pond Width	82	FT	Value from CAD
Length:Width Ratio	1.7:1		$Ratio = (Length) / (Width) : 1$
Required SA/DA Ratio for 90% TSS Removal	8.75		Value from chart. Reference: "90% TSS Removal"
Required Permanent Pool Surface Area	10,669	SF	$Required\ Surface\ Area = (Required\ SA/DA\ Ratio) * (Total\ Drainage\ Area)$
Provided Permanent Pool Surface Area	11,675	SF	Interpolated value from stage-storage calculations

Step 2: Determine the 1.5-inch runoff elevation within the wet detention pond

Runoff Coefficient, Rv	0.723	IN/IN	$Rv = 0.05 + 0.009 * (\% \text{ Impervious})$
Required 1.5" Runoff Volume (Volume of Temporary Pool)	11,025	CF	$1.5" \text{ Runoff Volume} = 1.5 \text{ inch} * Rv * 1 \text{ foot} / 12 \text{ inch} * (Total\ Drainage\ Area)$
Volume Below Permanent Pool	34,693	CF	Value from stage-storage calculations (cumulative pond volume at permanent pool elevation)
Total Volume to be Controlled	45,718	CF	$Total\ Volume\ to\ be\ Controlled = (Volume\ Below\ Permanent\ Pool) + (1.5" \text{ Runoff Volume})$
Storage Elevation at Required Volume	38.19	FT	Value is interpolation based upon stage-storage values. See stage-storage calculations

Step 3: Calculate the required forebay volume (18-22% of total pond volume) and compare to the forebay volume provided

Total Pond Volume	34,693	CF	Value from stage-storage calculations
Required Total Forebay Volume	6,245	CF	$Forebay\ Volume = (Total\ Pond\ Volume) * 18\%$
Provided Total Forebay Volume	6,990	CF	Value from stage-storage calculations
Provided Forebay Volume:Total Pond Volume	20.1%		$(Provided\ Forebay\ Volume) / (Total\ Pond\ Volume) * 100\%$

Step 4: Verify that time required to drawdown the 1.5-inch runoff volume is within 2 to 5 days

Diameter of Proposed Low-flow Orifice	2.00	IN	Value chosen by designer
Elevation of 1.5" Volume	38.19	FT	Value chosen by designer
Total Elevation Head Above Orifice	0.89	FT	(Total Elevation Head Above Orifice)=(Weir Elevation)-(Elevation of Permanent Pool Surface)
Average Elevation Head Above Orifice	0.30	FT	(Average Elevation Head Above Orifice)=[(Storage Elevation at Required Volume)+(Elevation of Permanent Pool Surface)]/3-(Storage Elevation at Required Volume)
Cd, Coefficient of Discharge	0.60		Value chosen by designer
Q, Flowrate Through Low-flow Orifice	0.06	CFS	$Q=Cd*(\pi)*[(\text{Diameter of Orifice})*(1 \text{ ft}/12 \text{ in})]^2/4*[2*32.2*(\text{Average Head})]^{1/2}$
Drawdown Time for 1.5-inch Runoff	2.23	DAYS	(Drawdown Time)=(1.5" Runoff Volume)/Q*(1 day/86400 seconds)

Step 5: Verify that time required to drawdown the provided runoff volume is within 2 to 5 days

Diameter of Proposed Low-flow Orifice	2.00	IN	Value chosen by designer
Elevation of Outlet Structure	38.20	FT	Value chosen by designer
Total Elevation Head Above Orifice	0.90	FT	(Total Elevation Head Above Orifice)=(Weir Elevation)-(Elevation of Permanent Pool Surface)
Average Elevation Head Above Orifice	0.30	FT	(Average Elevation Head Above Orifice)=[(Storage Elevation at Required Volume)+(Elevation of Permanent Pool Surface)]/3-(Storage Elevation at Required Volume)
Cd, Coefficient of Discharge	0.60		Value chosen by designer
Q, Flowrate Through Low-flow Orifice	0.06	CFS	$Q=Cd*(\pi)*[(\text{Diameter of Orifice})*(1 \text{ ft}/12 \text{ in})]^2/4*[2*32.2*(\text{Average Head})]^{1/2}$
Drawdown Time for Provided WQV	2.24	DAYS	(Drawdown Time)=(Provided Runoff Volume)/Q*(1 day/86400 seconds)

Carolinas Collision - Wet Pond #1

Stage-Storage Calculations for Proposed Wet Detention Pond

Stage/Storage Above Permanent Pool (Including Forebay)

Contour	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume, S (CF)	
37.30	11,675	0	0	←Permanent Pool
38.00	12,600	8,496	8,496	
38.20	12,871	2,547	11,043	
39.00	13,940	13,270	21,766	
40.00	15,320	14,630	36,396	
41.00	16,750	16,035	52,431	

Stage/Storage Total Pond (Including Forebay)

Contour	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume, S (CF)	
31.0	2,320	0	0	←Bottom Elev.
32.0	3,130	0	0	←Sediment Storage
33.0	4,195	6,515	6,515	
34.0	5,405	8,535	8,535	
35.0	6,750	6,078	14,613	
36.0	8,225	7,488	22,100	
36.30	8,690	2,537	24,637	←Bottom of Shelf
37.0	10,525	6,725	31,363	
37.30	11,675	3,330	34,693	←Permanent Pool

Forebay #1

Contour	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume, S (CF)	
32.0	185	0	0	←Bottom Elev.
33.0	550	0	0	←Sediment Storage
34.0	990	770	770	
35.0	1,495	1,243	2,013	
36.0	2,060	1,778	3,790	
36.30	2,240	645	4,435	
37.0	2,680	1,722	6,157	
37.30	2,875	833	6,990	←Forebay Volume

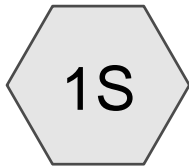
Project Name: Carolinas Collision
Client: McKinley
Project Number: 16296.PE
Prepared By: DJF
Date: 2/28/17



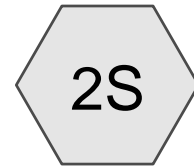
Average Depth Calculation: (Option 2 per Errata)

Pond #1

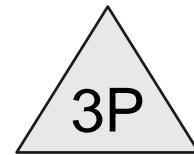
$A_{\text{Bottom Shelf}} =$	8,690	sf
$A_{\text{Bottom Pond}} =$	2,945	sf
$A_{\text{Perm Pool}} =$	11,675	sf
Depth =	4.30	ft
$d_{\text{avg}} =$	3.31	ft



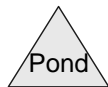
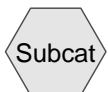
Pre (Undeveloped)



Post



Wet Pond



Summary for Subcatchment 1S: Pre (Undeveloped)

Runoff = 2.26 cfs @ 12.12 hrs, Volume= 8,897 cf, Depth= 0.90"

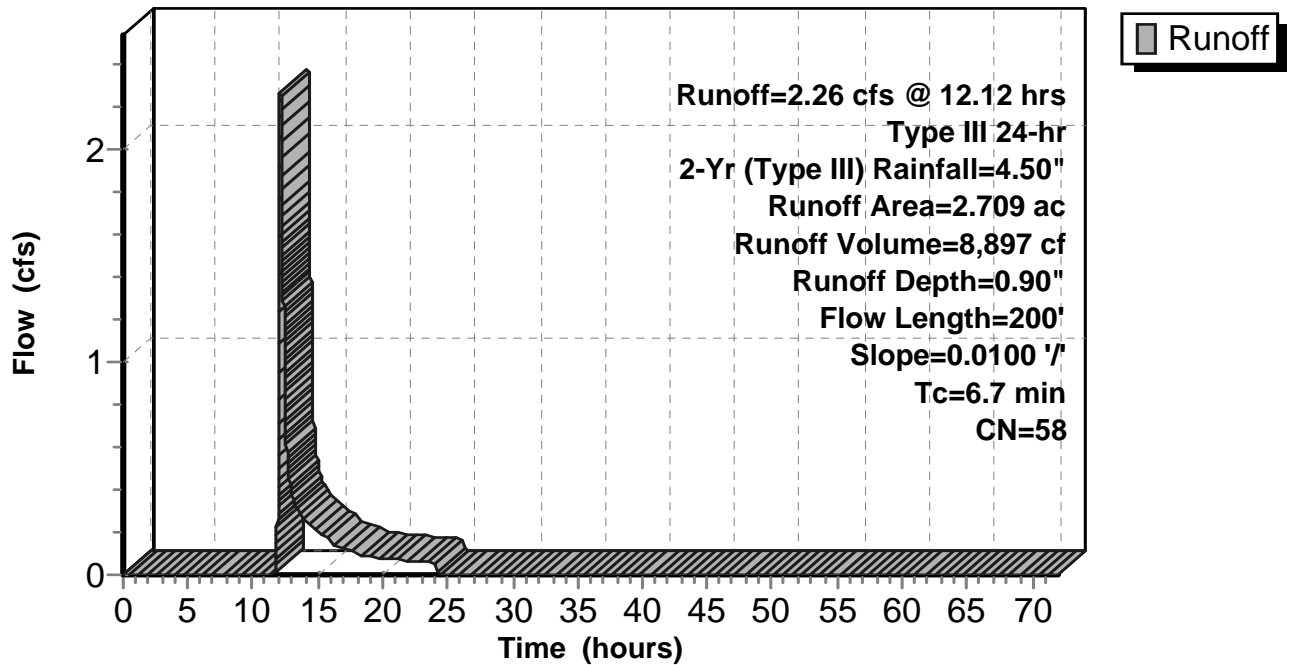
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Yr (Type III) Rainfall=4.50"

Area (ac)	CN	Description
* 1.152	39	Woods, Good, HSG A
* 1.151	77	Woods, Good, HSG D
* 0.406	55	Woods, Good, HSG B
2.709	58	Weighted Average
2.709		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	200	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps

Subcatchment 1S: Pre (Undeveloped)

Hydrograph



Summary for Subcatchment 2S: Post

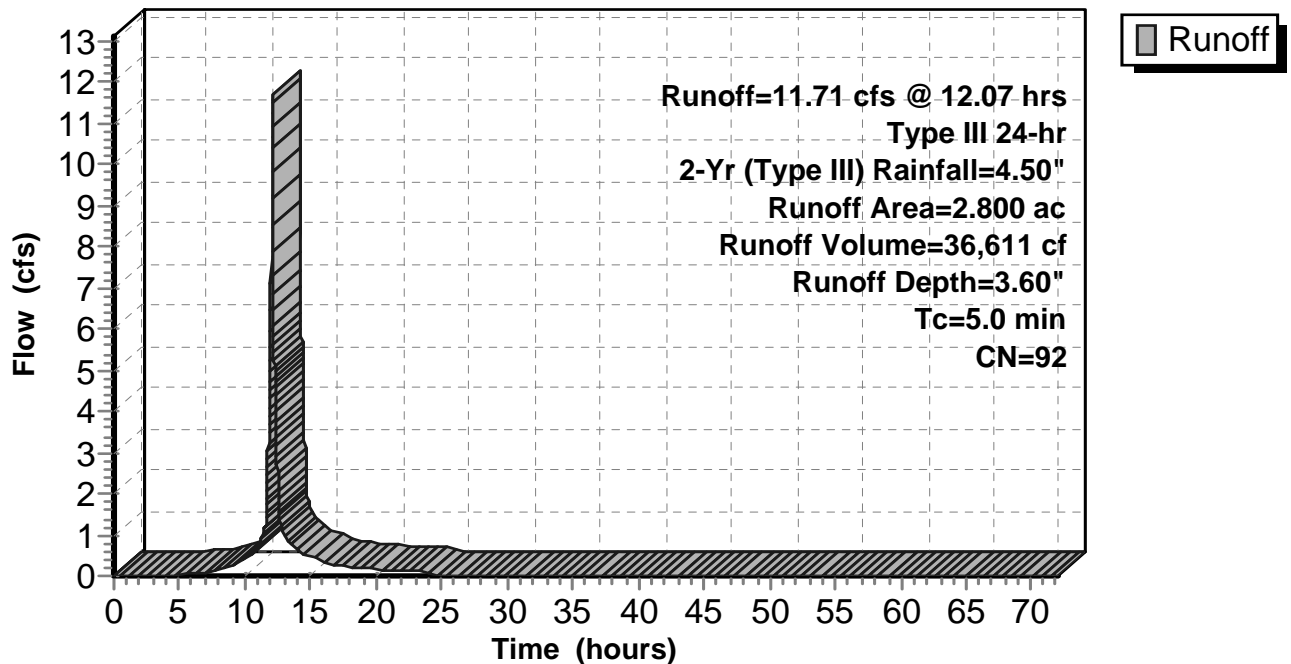
Runoff = 11.71 cfs @ 12.07 hrs, Volume= 36,611 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 2-Yr (Type III) Rainfall=4.50"

Area (ac)	CN	Description
* 2.094	98	Impervious
* 0.268	98	Water Surface, 0% imp
0.185	39	>75% Grass cover, Good, HSG A
0.186	80	>75% Grass cover, Good, HSG D
0.067	61	>75% Grass cover, Good, HSG B
2.800	92	Weighted Average
0.706		25.21% Pervious Area
2.094		74.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 2S: Post
 Hydrograph**



Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 3.60" for 2-Yr (Type III) event
 Inflow = 11.71 cfs @ 12.07 hrs, Volume= 36,611 cf
 Outflow = 1.91 cfs @ 12.53 hrs, Volume= 35,190 cf, Atten= 84%, Lag= 27.7 min
 Primary = 1.91 cfs @ 12.53 hrs, Volume= 35,190 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 38.88' @ 12.53 hrs Surf.Area= 13,775 sf Storage= 20,054 cf

Plug-Flow detention time= 641.3 min calculated for 35,186 cf (96% of inflow)
 Center-of-Mass det. time= 619.0 min (1,404.2 - 785.2)

Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,433 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,600	8,496	8,496
38.20	12,871	2,547	11,043
39.00	13,940	10,724	21,768
40.00	15,320	14,630	36,398
41.00	16,750	16,035	52,433

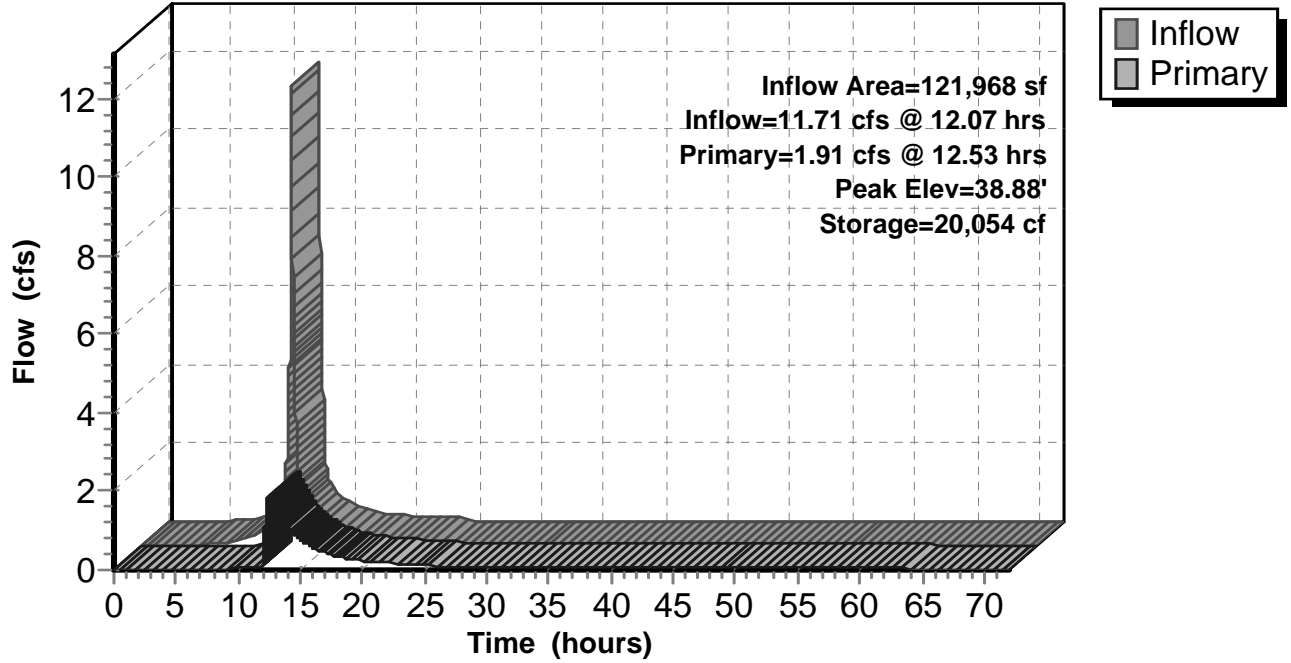
Device	Routing	Invert	Outlet Devices
#1	Primary	37.30'	24.0" Round 24" Barrel L= 14.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 37.30' / 37.10' S= 0.0143 1/8" Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	37.30'	2.0" Vert. Low Flow C= 0.600
#3	Device 1	38.20'	12.0" W x 9.0" H Vert. Primary C= 0.600
#4	Device 1	38.95'	36.0" W x 9.0" H Vert. Secondary C= 0.600
#5	Device 1	39.70'	48.0" x 48.0" Horiz. Emergency (Top of Box) C= 0.600 Limited to weir flow at low heads
#6	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=1.91 cfs @ 12.53 hrs HW=38.88' (Free Discharge)

- 1=24" Barrel (Passes 1.91 cfs of 9.36 cfs potential flow)
- 2=Low Flow (Orifice Controls 0.13 cfs @ 5.88 fps)
- 3=Primary (Orifice Controls 1.79 cfs @ 2.64 fps)
- 4=Secondary (Controls 0.00 cfs)
- 5=Emergency (Top of Box) (Controls 0.00 cfs)
- 6=Emergency Spillway (Controls 0.00 cfs)

Pond 3P: Wet Pond

Hydrograph



Summary for Subcatchment 1S: Pre (Undeveloped)

Runoff = 7.15 cfs @ 12.10 hrs, Volume= 23,692 cf, Depth= 2.41"

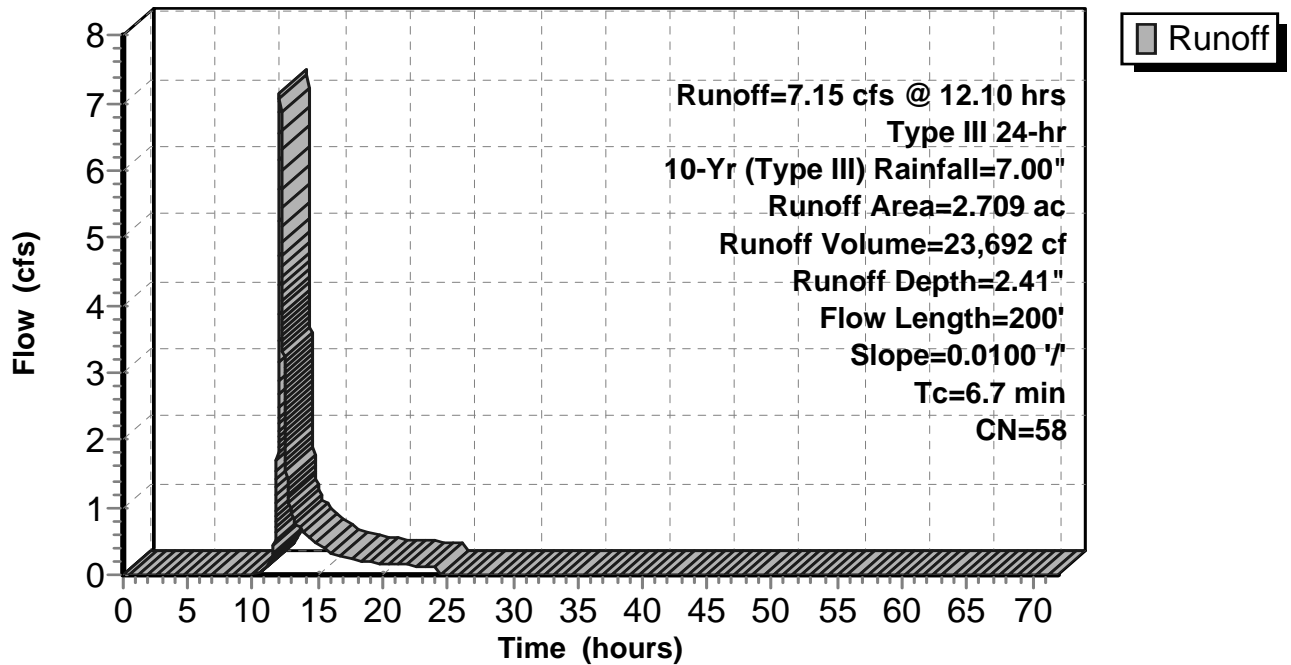
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-Yr (Type III) Rainfall=7.00"

Area (ac)	CN	Description
* 1.152	39	Woods, Good, HSG A
* 1.151	77	Woods, Good, HSG D
* 0.406	55	Woods, Good, HSG B
2.709	58	Weighted Average
2.709		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	200	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps

Subcatchment 1S: Pre (Undeveloped)

Hydrograph



Summary for Subcatchment 2S: Post

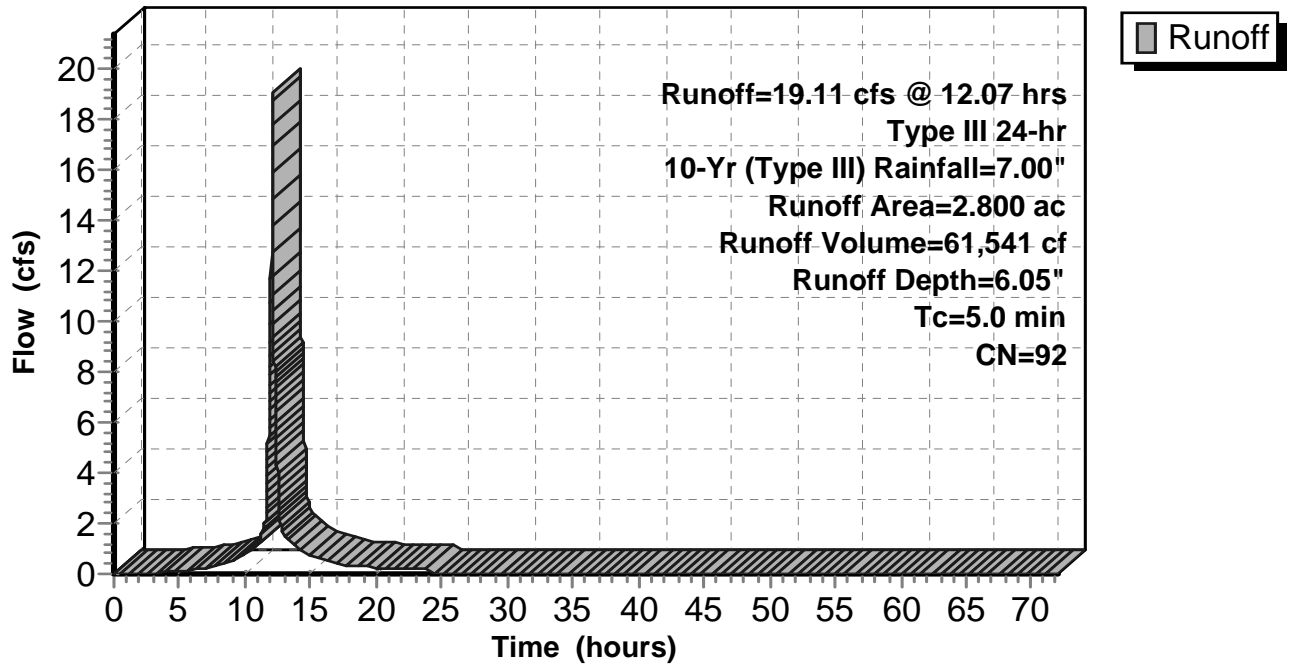
Runoff = 19.11 cfs @ 12.07 hrs, Volume= 61,541 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 10-Yr (Type III) Rainfall=7.00"

Area (ac)	CN	Description
* 2.094	98	Impervious
* 0.268	98	Water Surface, 0% imp
0.185	39	>75% Grass cover, Good, HSG A
0.186	80	>75% Grass cover, Good, HSG D
0.067	61	>75% Grass cover, Good, HSG B
2.800	92	Weighted Average
0.706		25.21% Pervious Area
2.094		74.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 2S: Post
 Hydrograph**



Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 6.05" for 10-Yr (Type III) event
 Inflow = 19.11 cfs @ 12.07 hrs, Volume= 61,541 cf
 Outflow = 6.94 cfs @ 12.30 hrs, Volume= 60,049 cf, Atten= 64%, Lag= 14.0 min
 Primary = 6.94 cfs @ 12.30 hrs, Volume= 60,049 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 39.45' @ 12.30 hrs Surf.Area= 14,564 sf Storage= 28,216 cf

Plug-Flow detention time= 420.5 min calculated for 60,040 cf (98% of inflow)
 Center-of-Mass det. time= 405.9 min (1,177.7 - 771.8)

Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,433 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,600	8,496	8,496
38.20	12,871	2,547	11,043
39.00	13,940	10,724	21,768
40.00	15,320	14,630	36,398
41.00	16,750	16,035	52,433

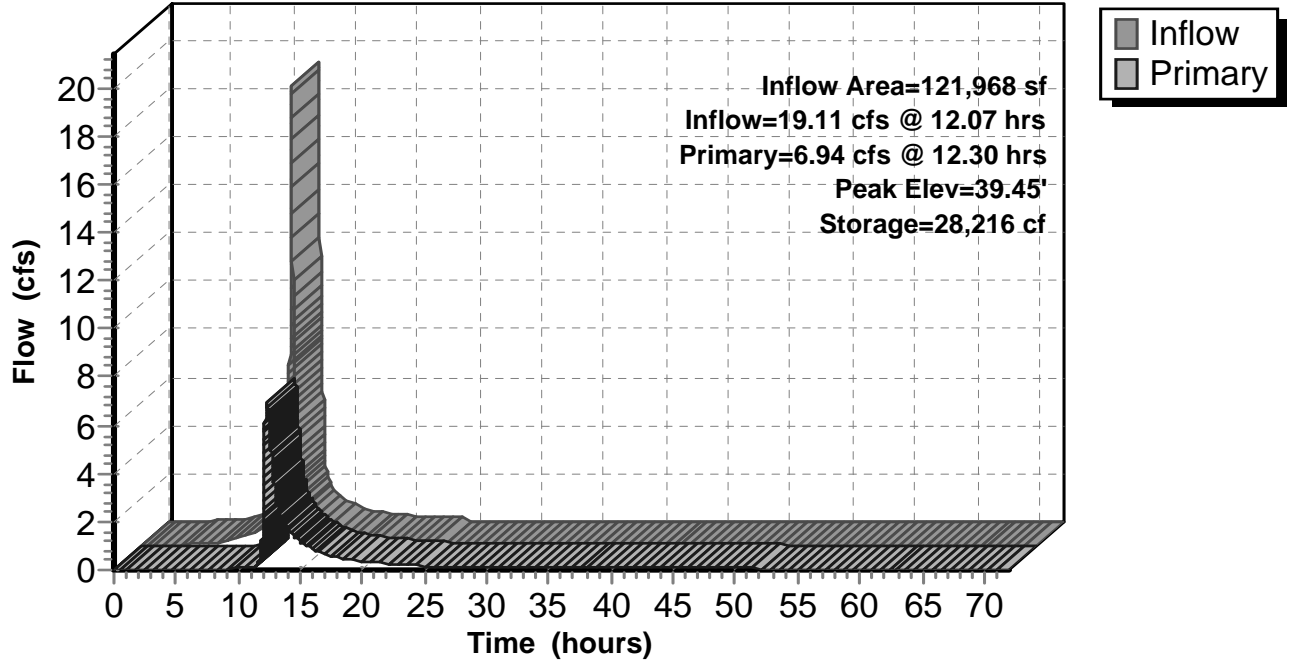
Device	Routing	Invert	Outlet Devices
#1	Primary	37.30'	24.0" Round 24" Barrel L= 14.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 37.30' / 37.10' S= 0.0143 1/8" Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	37.30'	2.0" Vert. Low Flow C= 0.600
#3	Device 1	38.20'	12.0" W x 9.0" H Vert. Primary C= 0.600
#4	Device 1	38.95'	36.0" W x 9.0" H Vert. Secondary C= 0.600
#5	Device 1	39.70'	48.0" x 48.0" Horiz. Emergency (Top of Box) C= 0.600 Limited to weir flow at low heads
#6	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=6.94 cfs @ 12.30 hrs HW=39.45' (Free Discharge)

- 1=24" Barrel (Passes 6.94 cfs of 14.74 cfs potential flow)
- 2=Low Flow (Orifice Controls 0.15 cfs @ 6.93 fps)
- 3=Primary (Orifice Controls 3.36 cfs @ 4.47 fps)
- 4=Secondary (Orifice Controls 3.43 cfs @ 2.28 fps)
- 5=Emergency (Top of Box) (Controls 0.00 cfs)
- 6=Emergency Spillway (Controls 0.00 cfs)

Pond 3P: Wet Pond

Hydrograph



Summary for Subcatchment 1S: Pre (Undeveloped)

Runoff = 9.54 cfs @ 12.10 hrs, Volume= 30,960 cf, Depth= 3.15"

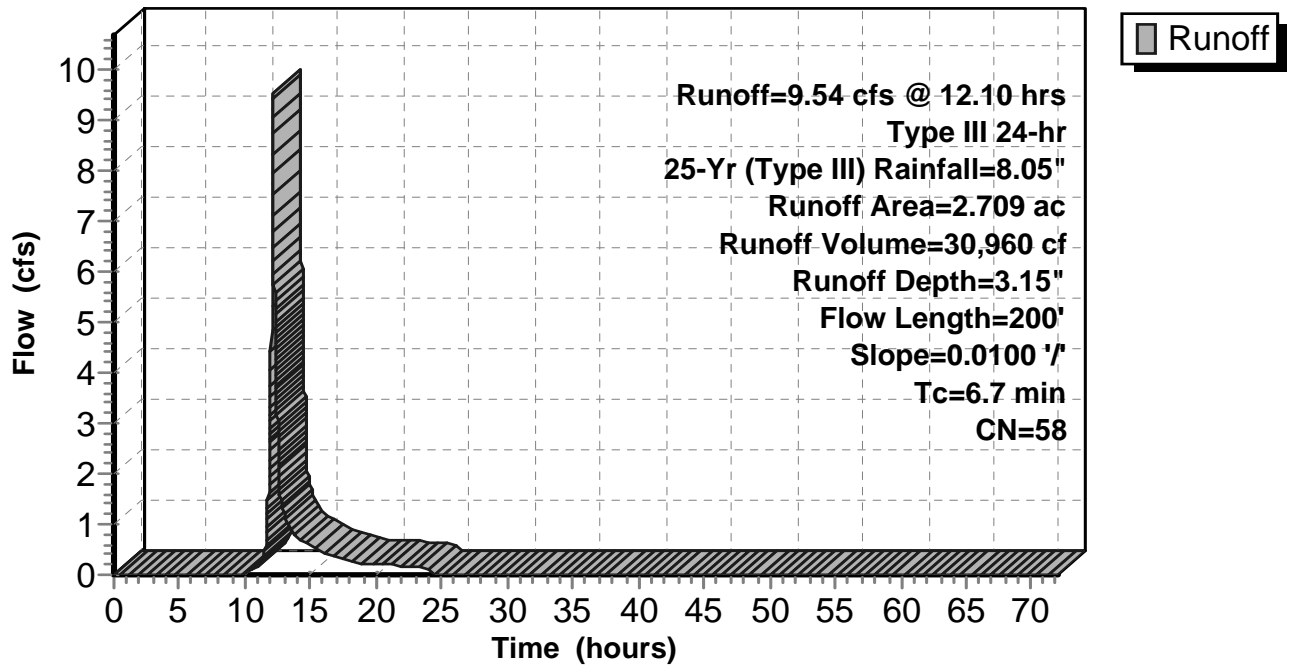
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-Yr (Type III) Rainfall=8.05"

Area (ac)	CN	Description
* 1.152	39	Woods, Good, HSG A
* 1.151	77	Woods, Good, HSG D
* 0.406	55	Woods, Good, HSG B
2.709	58	Weighted Average
2.709		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	200	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps

Subcatchment 1S: Pre (Undeveloped)

Hydrograph



Summary for Subcatchment 2S: Post

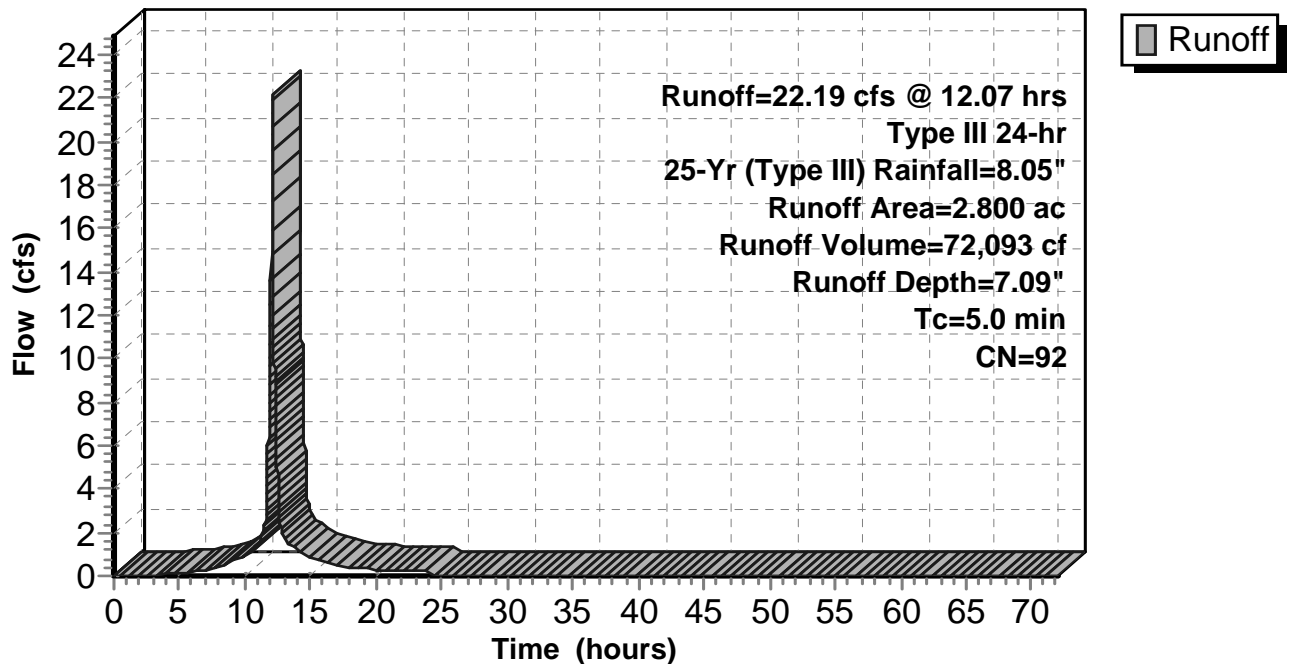
Runoff = 22.19 cfs @ 12.07 hrs, Volume= 72,093 cf, Depth= 7.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 25-Yr (Type III) Rainfall=8.05"

Area (ac)	CN	Description
* 2.094	98	Impervious
* 0.268	98	Water Surface, 0% imp
0.185	39	>75% Grass cover, Good, HSG A
0.186	80	>75% Grass cover, Good, HSG D
0.067	61	>75% Grass cover, Good, HSG B
2.800	92	Weighted Average
0.706		25.21% Pervious Area
2.094		74.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 2S: Post
 Hydrograph**



Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 7.09" for 25-Yr (Type III) event
 Inflow = 22.19 cfs @ 12.07 hrs, Volume= 72,093 cf
 Outflow = 9.32 cfs @ 12.25 hrs, Volume= 70,580 cf, Atten= 58%, Lag= 10.6 min
 Primary = 9.32 cfs @ 12.25 hrs, Volume= 70,580 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 39.64' @ 12.25 hrs Surf.Area= 14,817 sf Storage= 30,906 cf

Plug-Flow detention time= 371.3 min calculated for 70,570 cf (98% of inflow)
 Center-of-Mass det. time= 358.4 min (1,126.4 - 768.0)

Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,433 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,600	8,496	8,496
38.20	12,871	2,547	11,043
39.00	13,940	10,724	21,768
40.00	15,320	14,630	36,398
41.00	16,750	16,035	52,433

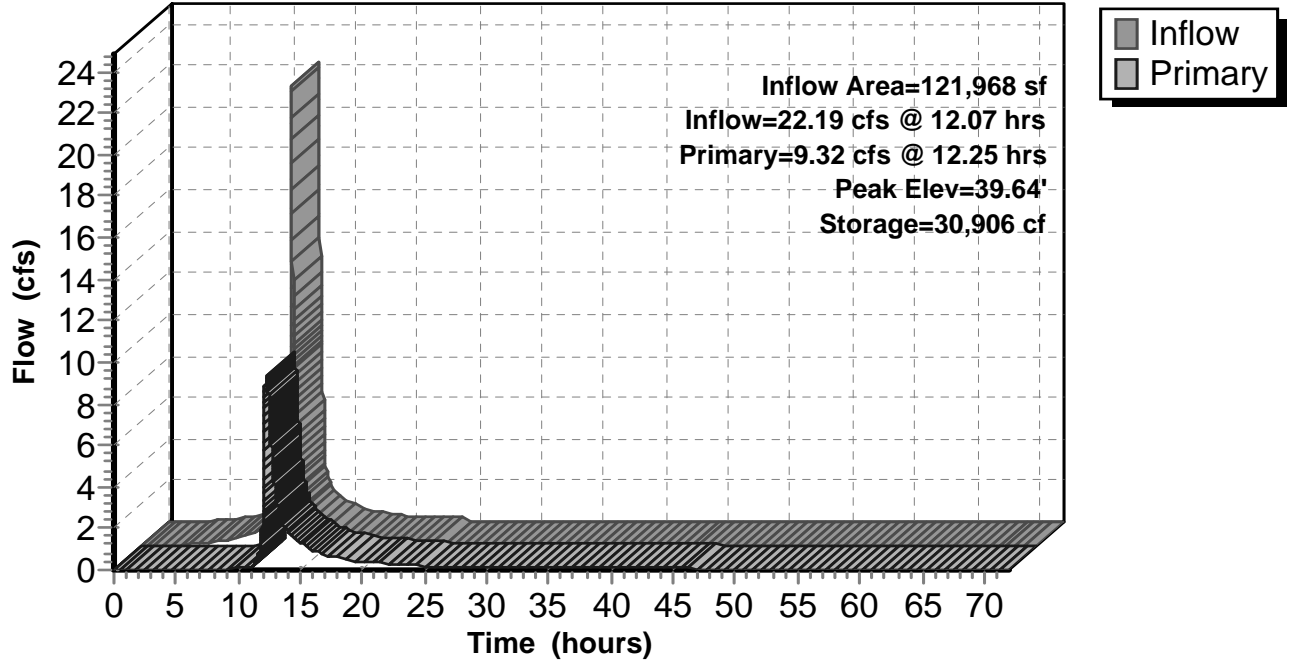
Device	Routing	Invert	Outlet Devices
#1	Primary	37.30'	24.0" Round 24" Barrel L= 14.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 37.30' / 37.10' S= 0.0143 1/8" Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	37.30'	2.0" Vert. Low Flow C= 0.600
#3	Device 1	38.20'	12.0" W x 9.0" H Vert. Primary C= 0.600
#4	Device 1	38.95'	36.0" W x 9.0" H Vert. Secondary C= 0.600
#5	Device 1	39.70'	48.0" x 48.0" Horiz. Emergency (Top of Box) C= 0.600 Limited to weir flow at low heads
#6	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=9.32 cfs @ 12.25 hrs HW=39.64' (Free Discharge)

- 1=24" Barrel (Passes 9.32 cfs of 16.30 cfs potential flow)
- 2=Low Flow (Orifice Controls 0.16 cfs @ 7.23 fps)
- 3=Primary (Orifice Controls 3.70 cfs @ 4.93 fps)
- 4=Secondary (Orifice Controls 5.47 cfs @ 2.66 fps)
- 5=Emergency (Top of Box) (Controls 0.00 cfs)
- 6=Emergency Spillway (Controls 0.00 cfs)

Pond 3P: Wet Pond

Hydrograph



Summary for Subcatchment 1S: Pre (Undeveloped)

Runoff = 11.80 cfs @ 12.10 hrs, Volume= 37,910 cf, Depth= 3.86"

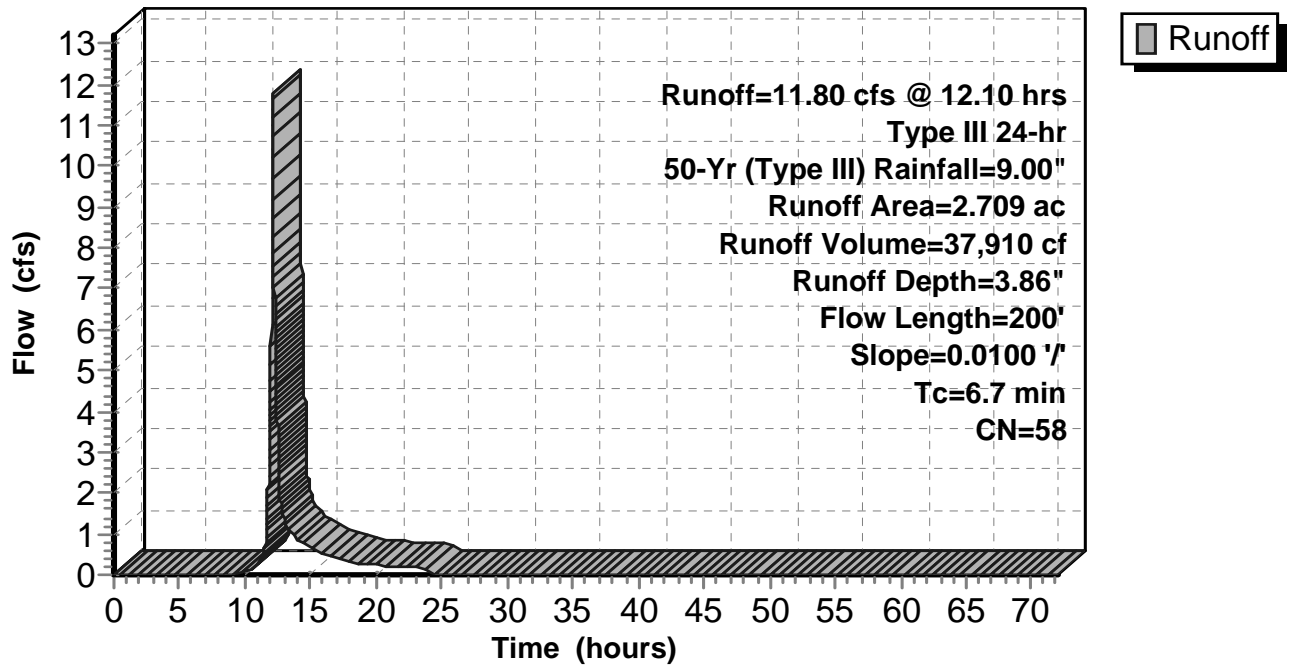
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Yr (Type III) Rainfall=9.00"

Area (ac)	CN	Description
* 1.152	39	Woods, Good, HSG A
* 1.151	77	Woods, Good, HSG D
* 0.406	55	Woods, Good, HSG B
2.709	58	Weighted Average
2.709		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	200	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps

Subcatchment 1S: Pre (Undeveloped)

Hydrograph



Summary for Subcatchment 2S: Post

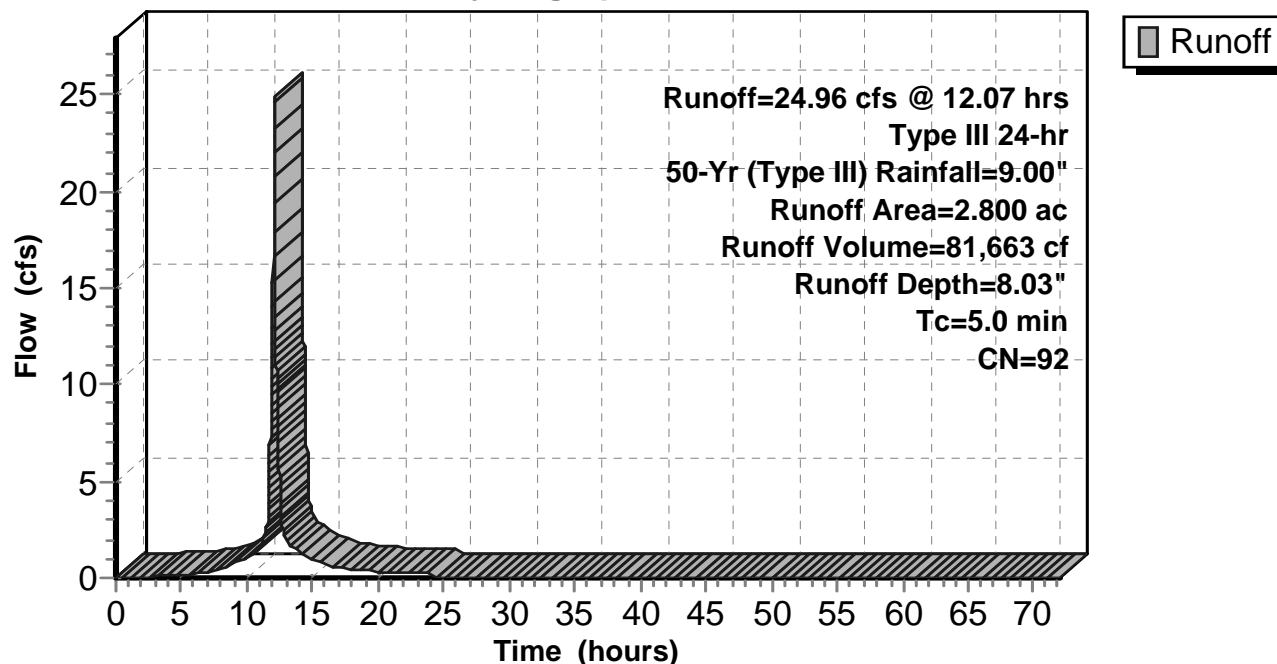
Runoff = 24.96 cfs @ 12.07 hrs, Volume= 81,663 cf, Depth= 8.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Yr (Type III) Rainfall=9.00"

Area (ac)	CN	Description
* 2.094	98	Impervious
* 0.268	98	Water Surface, 0% imp
0.185	39	>75% Grass cover, Good, HSG A
0.186	80	>75% Grass cover, Good, HSG D
0.067	61	>75% Grass cover, Good, HSG B
2.800	92	Weighted Average
0.706		25.21% Pervious Area
2.094		74.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 2S: Post
 Hydrograph**



Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 8.03" for 50-Yr (Type III) event
 Inflow = 24.96 cfs @ 12.07 hrs, Volume= 81,663 cf
 Outflow = 12.11 cfs @ 12.20 hrs, Volume= 80,134 cf, Atten= 51%, Lag= 8.0 min
 Primary = 12.11 cfs @ 12.20 hrs, Volume= 80,134 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 39.77' @ 12.20 hrs Surf.Area= 15,005 sf Storage= 32,939 cf

Plug-Flow detention time= 337.0 min calculated for 80,122 cf (98% of inflow)
 Center-of-Mass det. time= 325.5 min (1,090.6 - 765.1)

Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,433 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,600	8,496	8,496
38.20	12,871	2,547	11,043
39.00	13,940	10,724	21,768
40.00	15,320	14,630	36,398
41.00	16,750	16,035	52,433

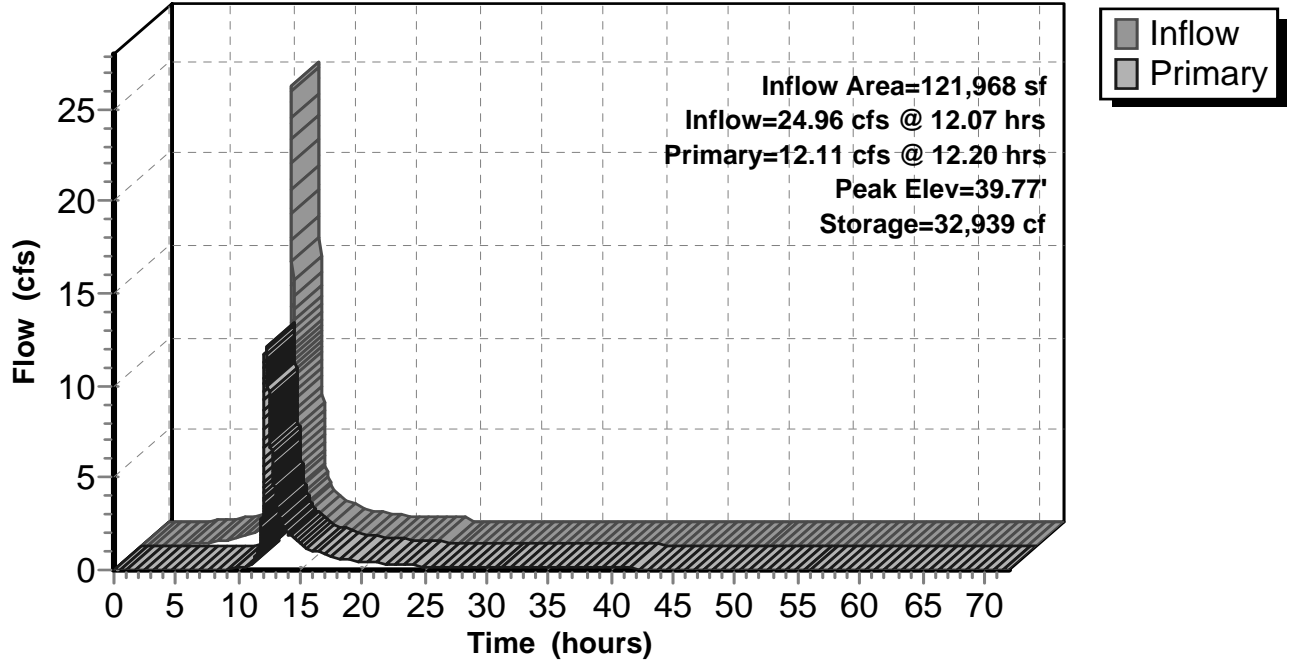
Device	Routing	Invert	Outlet Devices
#1	Primary	37.30'	24.0" Round 24" Barrel L= 14.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 37.30' / 37.10' S= 0.0143 1/8" Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	37.30'	2.0" Vert. Low Flow C= 0.600
#3	Device 1	38.20'	12.0" W x 9.0" H Vert. Primary C= 0.600
#4	Device 1	38.95'	36.0" W x 9.0" H Vert. Secondary C= 0.600
#5	Device 1	39.70'	48.0" x 48.0" Horiz. Emergency (Top of Box) C= 0.600 Limited to weir flow at low heads
#6	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=12.09 cfs @ 12.20 hrs HW=39.77' (Free Discharge)

- 1=24" Barrel (Passes 12.09 cfs of 17.32 cfs potential flow)
- 2=Low Flow (Orifice Controls 0.16 cfs @ 7.44 fps)
- 3=Primary (Orifice Controls 3.93 cfs @ 5.25 fps)
- 4=Secondary (Orifice Controls 6.99 cfs @ 3.11 fps)
- 5=Emergency (Top of Box) (Weir Controls 1.01 cfs @ 0.88 fps)
- 6=Emergency Spillway (Controls 0.00 cfs)

Pond 3P: Wet Pond

Hydrograph



Summary for Subcatchment 1S: Pre (Undeveloped)

Runoff = 14.27 cfs @ 12.10 hrs, Volume= 45,536 cf, Depth= 4.63"

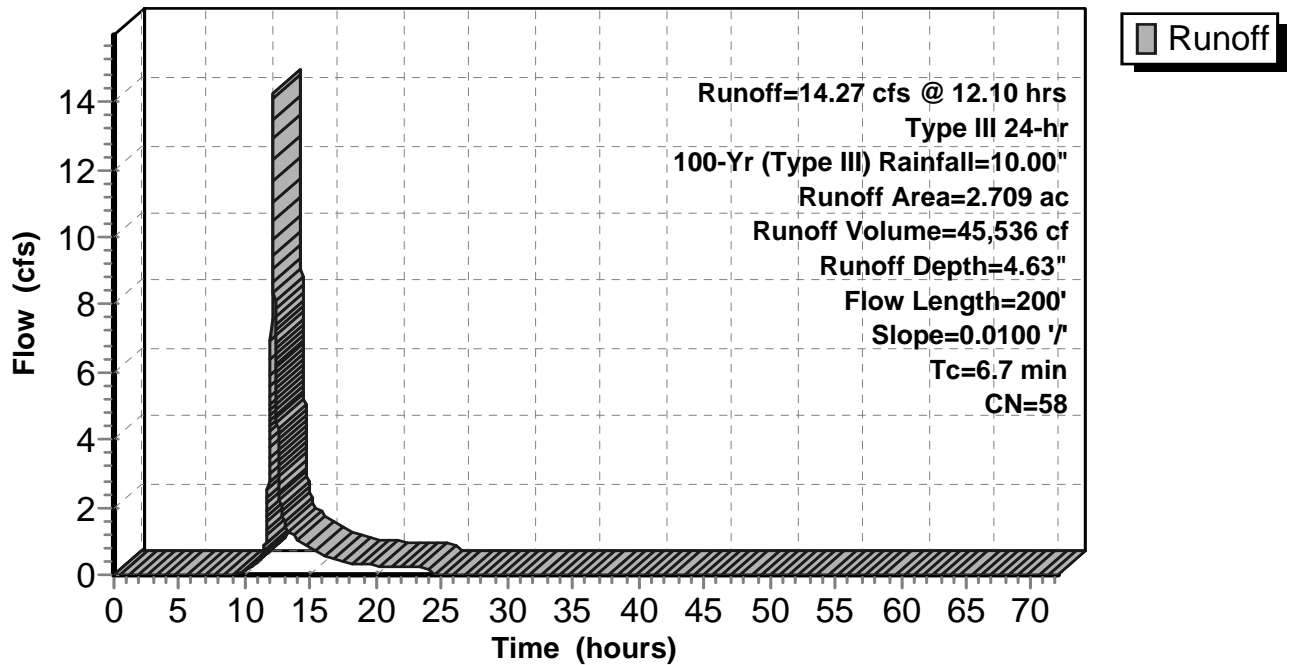
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Yr (Type III) Rainfall=10.00"

Area (ac)	CN	Description
* 1.152	39	Woods, Good, HSG A
* 1.151	77	Woods, Good, HSG D
* 0.406	55	Woods, Good, HSG B
2.709	58	Weighted Average
2.709		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	200	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps

Subcatchment 1S: Pre (Undeveloped)

Hydrograph



Summary for Subcatchment 2S: Post

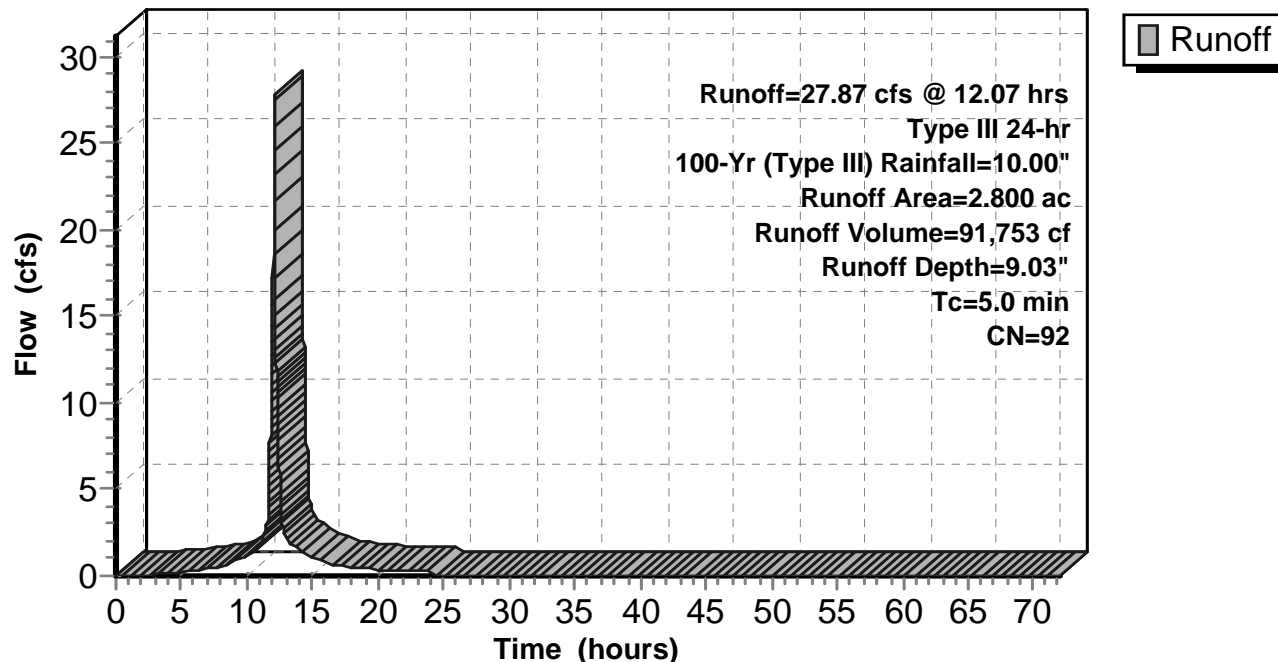
Runoff = 27.87 cfs @ 12.07 hrs, Volume= 91,753 cf, Depth= 9.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Yr (Type III) Rainfall=10.00"

Area (ac)	CN	Description
* 2.094	98	Impervious
* 0.268	98	Water Surface, 0% imp
0.185	39	>75% Grass cover, Good, HSG A
0.186	80	>75% Grass cover, Good, HSG D
0.067	61	>75% Grass cover, Good, HSG B
2.800	92	Weighted Average
0.706		25.21% Pervious Area
2.094		74.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

**Subcatchment 2S: Post
 Hydrograph**



Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 9.03" for 100-Yr (Type III) event
 Inflow = 27.87 cfs @ 12.07 hrs, Volume= 91,753 cf
 Outflow = 15.99 cfs @ 12.17 hrs, Volume= 90,209 cf, Atten= 43%, Lag= 6.1 min
 Primary = 15.99 cfs @ 12.17 hrs, Volume= 90,209 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 39.88' @ 12.17 hrs Surf.Area= 15,148 sf Storage= 34,498 cf

Plug-Flow detention time= 308.3 min calculated for 90,209 cf (98% of inflow)
 Center-of-Mass det. time= 297.5 min (1,060.0 - 762.5)

Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,433 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,600	8,496	8,496
38.20	12,871	2,547	11,043
39.00	13,940	10,724	21,768
40.00	15,320	14,630	36,398
41.00	16,750	16,035	52,433

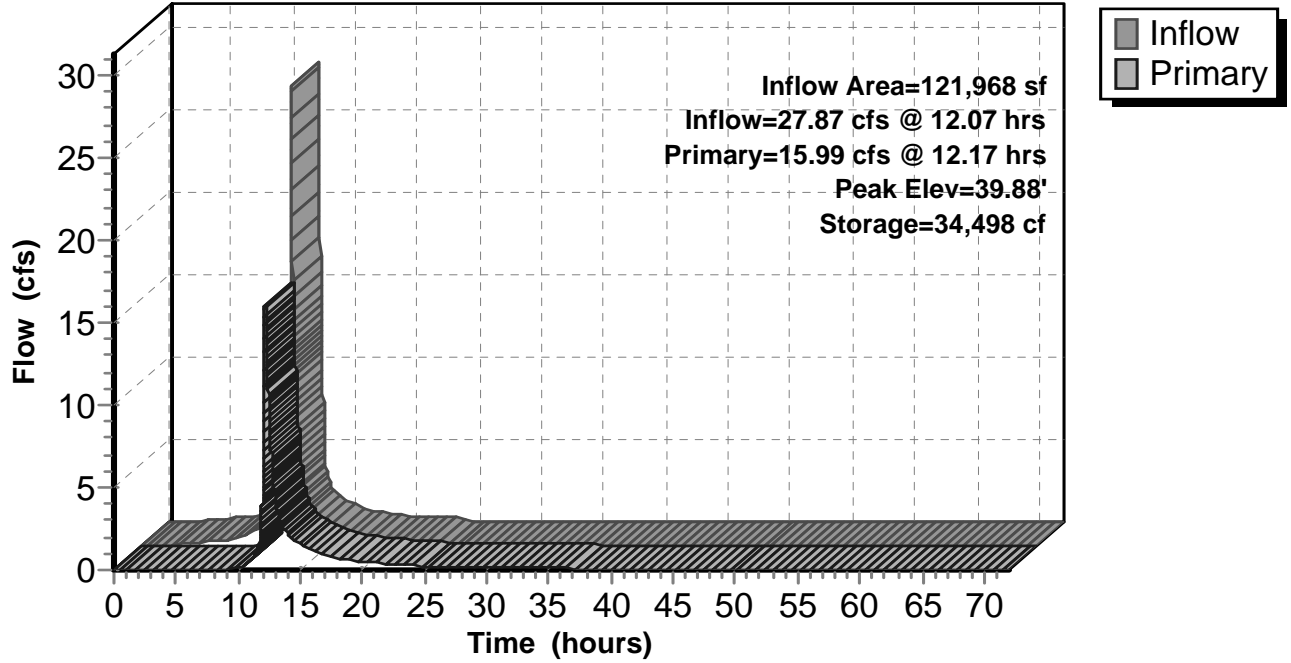
Device	Routing	Invert	Outlet Devices
#1	Primary	37.30'	24.0" Round 24" Barrel L= 14.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 37.30' / 37.10' S= 0.0143 1/8" Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	37.30'	2.0" Vert. Low Flow C= 0.600
#3	Device 1	38.20'	12.0" W x 9.0" H Vert. Primary C= 0.600
#4	Device 1	38.95'	36.0" W x 9.0" H Vert. Secondary C= 0.600
#5	Device 1	39.70'	48.0" x 48.0" Horiz. Emergency (Top of Box) C= 0.600 Limited to weir flow at low heads
#6	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=15.97 cfs @ 12.17 hrs HW=39.88' (Free Discharge)

- 1=24" Barrel (Passes 15.97 cfs of 17.96 cfs potential flow)
- 2=Low Flow (Orifice Controls 0.17 cfs @ 7.60 fps)
- 3=Primary (Orifice Controls 4.10 cfs @ 5.47 fps)
- 4=Secondary (Orifice Controls 7.86 cfs @ 3.49 fps)
- 5=Emergency (Top of Box) (Weir Controls 3.84 cfs @ 1.37 fps)
- 6=Emergency Spillway (Controls 0.00 cfs)

Pond 3P: Wet Pond

Hydrograph



16296.PE Carolina Collision CoW SWM

Type III 24-hr 100-Yr (Type III) Rainfall=10.00"

Prepared by Paramounte Engineering, Inc.

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Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 9.03" for 100-Yr (Type III) event
 Inflow = 27.87 cfs @ 12.07 hrs, Volume= 91,753 cf
 Outflow = 14.20 cfs @ 12.19 hrs, Volume= 55,355 cf, Atten= 49%, Lag= 7.3 min
 Primary = 14.20 cfs @ 12.19 hrs, Volume= 55,355 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 40.50' @ 12.19 hrs Surf.Area= 16,037 sf Storage= 44,261 cf

Plug-Flow detention time= 205.2 min calculated for 55,347 cf (60% of inflow)
 Center-of-Mass det. time= 99.4 min (861.9 - 762.5)

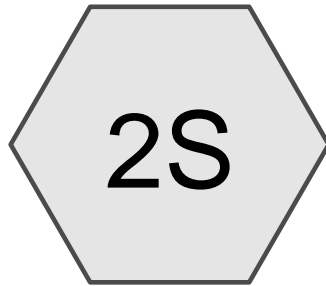
Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,433 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,600	8,496	8,496
38.20	12,871	2,547	11,043
39.00	13,940	10,724	21,768
40.00	15,320	14,630	36,398
41.00	16,750	16,035	52,433

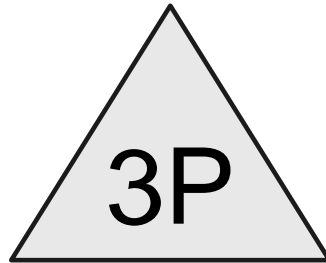
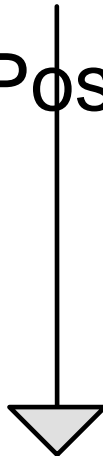
Device	Routing	Invert	Outlet Devices
#1	Primary	37.30'	24.0" Round 24" Barrel L= 14.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 37.30' / 37.10' S= 0.0143 1/8" Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	37.30'	2.0" Vert. Low Flow C= 0.600
#3	Device 1	38.20'	12.0" W x 9.0" H Vert. Primary C= 0.600
#4	Device 1	38.95'	36.0" W x 9.0" H Vert. Secondary C= 0.600
#5	Device 1	39.70'	48.0" x 48.0" Horiz. Emergency (Top of Box) C= 0.600 Limited to weir flow at low heads
#6	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=14.19 cfs @ 12.19 hrs HW=40.50' TW=40.00' (Fixed TW Elev= 40.00')

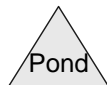
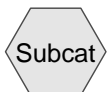
- 1=24" Barrel (Inlet Controls 10.71 cfs @ 3.41 fps)
- 2=Low Flow (Passes < 0.07 cfs potential flow)
- 3=Primary (Passes < 2.56 cfs potential flow)
- 4=Secondary (Passes < 7.67 cfs potential flow)
- 5=Emergency (Top of Box) (Passes < 33.96 cfs potential flow)
- 6=Emergency Spillway (Weir Controls 3.47 cfs @ 1.20 fps)



Post



Wet Pond



Routing Diagram for 16296.PE Carolina Collision CoW SWM Primary Plugged

Prepared by Paramounte Engineering, Inc.

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Summary for Subcatchment 2S: Post

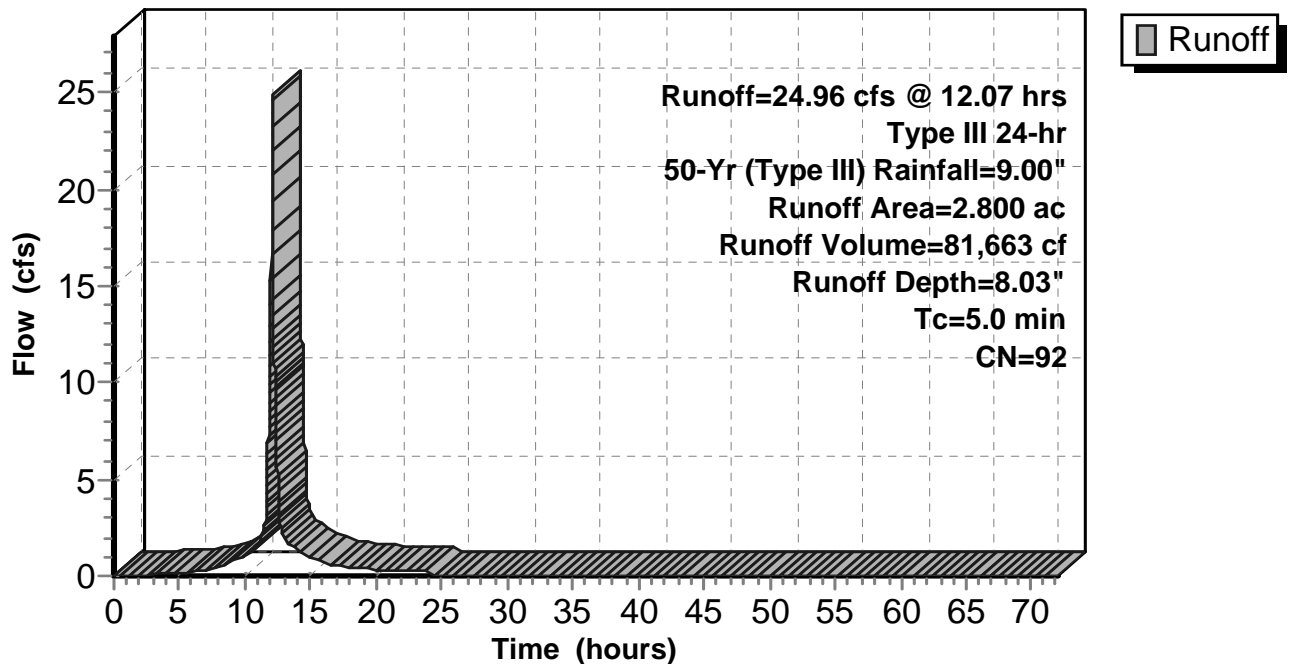
Runoff = 24.96 cfs @ 12.07 hrs, Volume= 81,663 cf, Depth= 8.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Type III 24-hr 50-Yr (Type III) Rainfall=9.00"

Area (ac)	CN	Description
* 2.094	98	Impervious
* 0.268	98	Water Surface, 0% imp
0.185	39	>75% Grass cover, Good, HSG A
0.186	80	>75% Grass cover, Good, HSG D
0.067	61	>75% Grass cover, Good, HSG B
2.800	92	Weighted Average
0.706		25.21% Pervious Area
2.094		74.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 2S: Post Hydrograph



Summary for Pond 3P: Wet Pond

Inflow Area = 121,968 sf, 74.79% Impervious, Inflow Depth = 8.03" for 50-Yr (Type III) event
 Inflow = 24.96 cfs @ 12.07 hrs, Volume= 81,663 cf
 Outflow = 7.14 cfs @ 12.39 hrs, Volume= 41,405 cf, Atten= 71%, Lag= 19.0 min
 Primary = 7.14 cfs @ 12.39 hrs, Volume= 41,405 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 40.65' @ 12.39 hrs Surf.Area= 16,243 sf Storage= 46,598 cf

Plug-Flow detention time= 264.6 min calculated for 41,405 cf (51% of inflow)
 Center-of-Mass det. time= 145.3 min (910.4 - 765.1)

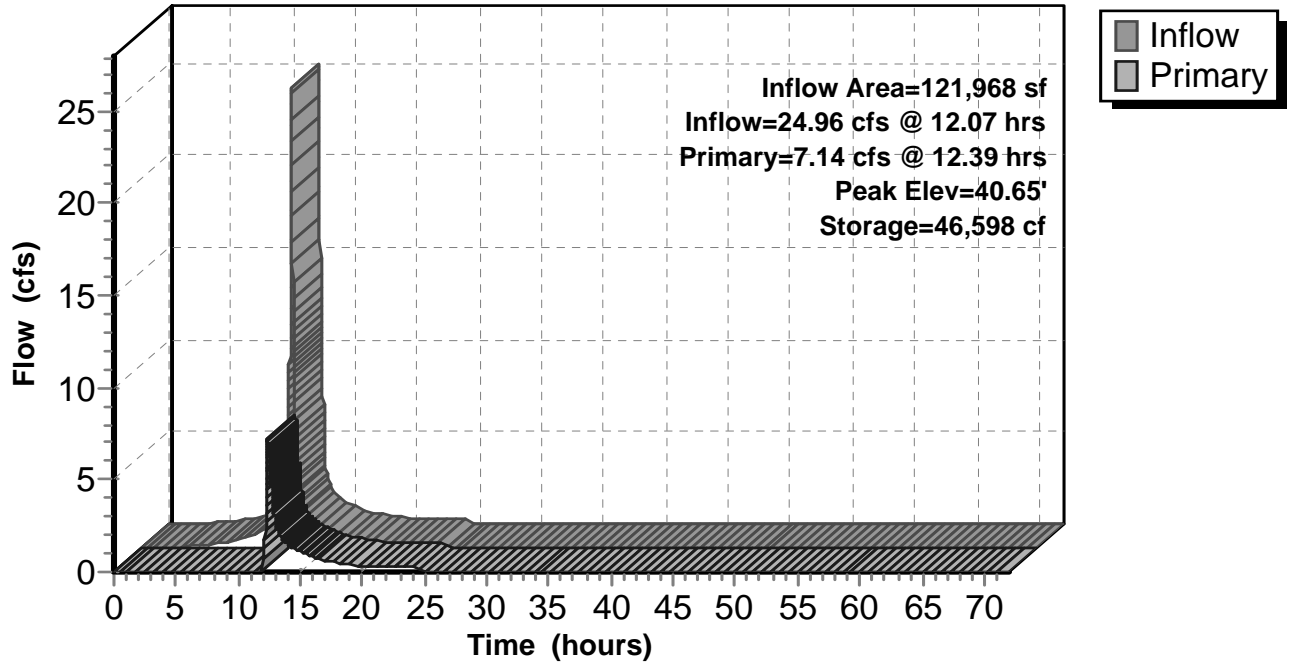
Volume	Invert	Avail.Storage	Storage Description
#1	37.30'	52,416 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
37.30	11,675	0	0
38.00	12,597	8,495	8,495
39.00	13,933	13,265	21,760
40.00	15,315	14,624	36,384
41.00	16,749	16,032	52,416

Device	Routing	Invert	Outlet Devices
#1	Primary	40.25'	Emergency Spillway, C= 2.60 Offset (feet) 0.00 2.25 12.25 14.50 Height (feet) 0.75 0.00 0.00 0.75

Primary OutFlow Max=7.13 cfs @ 12.39 hrs HW=40.65' TW=40.00' (Fixed TW Elev= 40.00')
 ↑1=Emergency Spillway (Weir Controls 7.13 cfs @ 1.45 fps)

Pond 3P: Wet Pond Hydrograph



Carolina Collision
10-Year Storm Calculations

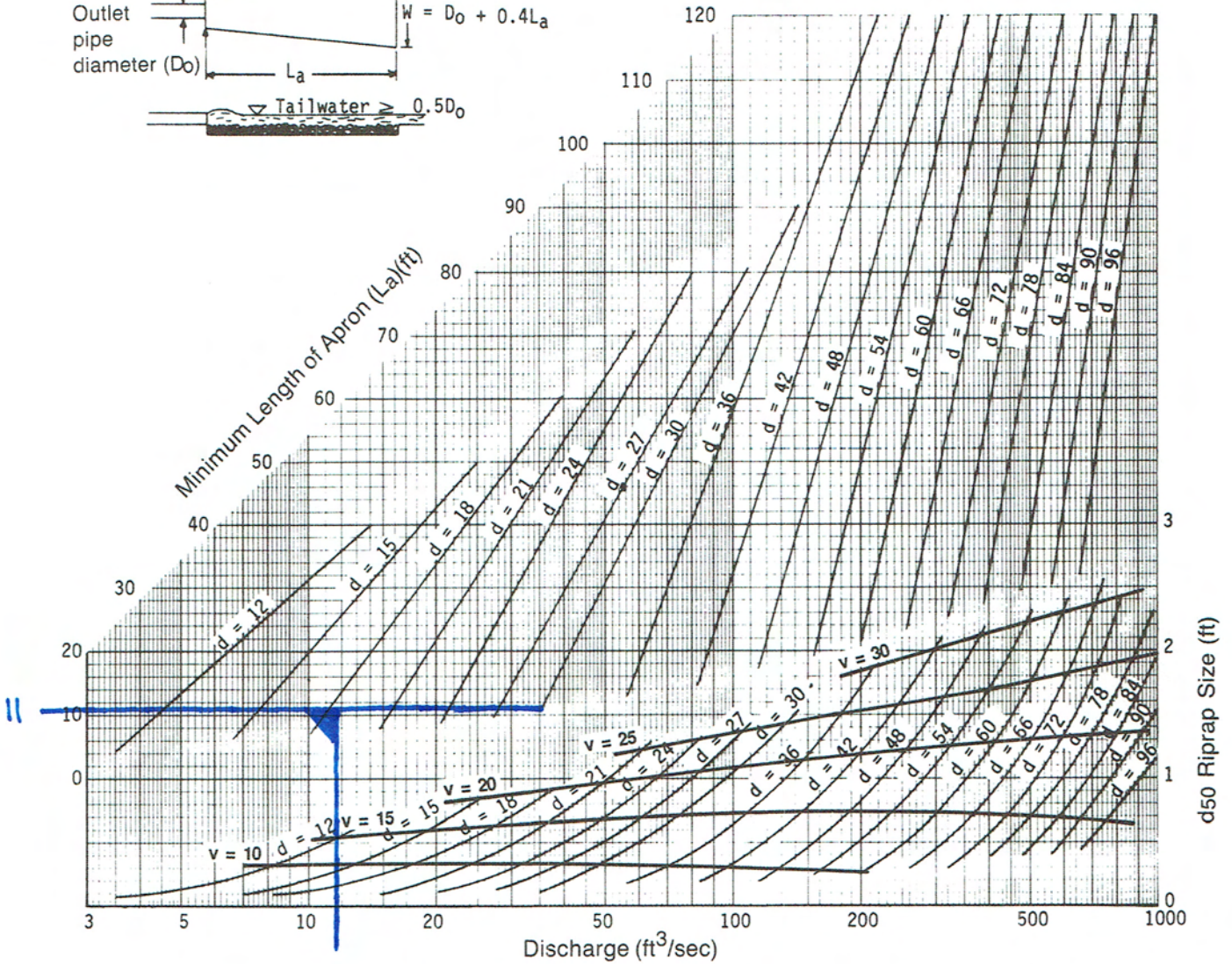
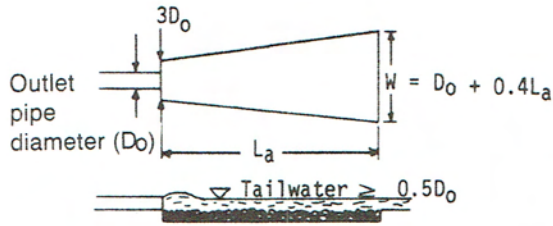
UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SUB DA (AC)	TOTAL AREA (AC)	INLET TIME (MIN)	Tc	INTENSITY	RUNOFF COEF.	COMPOUND RUNOFF COEF.	SUB RUNOFF (CFS)	DISCHARGE (CFS)	SLOPE (%)	DIAMETER (IN)	FULL VEL. (FPS)	AVG. VEL. (FPS)	LENGTH (FT)	SEGMENT TIME (MIN)	UPSTREAM INVERT	DOWNSTREAM INVERT	UPSTREAM RIM/GRATE	DOWNSTREAM RIM/GRATE	UPSTREAM HGL	DOWNSTREAM HGL
MH-101	FES-100	0.00	1.84	6.00	10.82	6.21	0.50	0.92	0.00	10.50	1.00	30	8.38	2.14	65	0.50	33.65	33.00	40.55	-	38.24	38.20
CB-102	MH-101	0.09	0.51	6.00	7.13	6.82	0.90	0.92	0.57	3.18	1.00	15	5.72	2.59	40	0.26	35.20	34.80	40.25	40.55	38.45	38.36
DI-103	MH-101	0.13	1.34	6.00	9.72	6.38	0.80	0.92	0.73	7.81	0.65	30	6.75	1.59	106	1.11	34.66	33.97	40.34	40.55	38.38	38.34
103.1	DI-103	0.00	1.20	0.00	9.58	6.40	0.00	0.93	0.00	7.17	0.64	24	6.28	2.28	19	0.14	34.78	34.66	-	40.34	38.47	38.45
103.2	103.1	0.00	1.18	0.00	9.40	6.43	0.00	0.93	0.00	7.06	0.64	24	6.28	2.25	24	0.18	34.93	34.78	-	-	38.51	38.49
103.3	103.2	0.00	1.15	0.00	9.23	6.46	0.00	0.93	0.00	6.90	0.64	24	6.28	2.20	24	0.18	35.09	34.93	-	-	38.55	38.53
DI-104	103.3	0.10	1.12	6.00	9.15	6.47	0.90	0.93	0.61	6.75	0.64	24	6.28	2.15	10	0.08	35.15	35.09	40.34	-	38.58	38.57
104.1	DI-104	0.00	1.00	0.00	8.85	6.52	0.00	0.93	0.00	6.06	0.66	24	6.34	1.93	34	0.30	35.38	35.15	-	40.34	38.70	38.68
104.2	104.1	0.00	0.96	0.00	8.59	6.56	0.00	0.93	0.00	5.86	0.66	24	6.34	1.86	30	0.27	35.57	35.38	-	-	38.73	38.72
DI-105	104.2	0.19	0.94	6.00	8.46	6.58	0.90	0.93	1.19	5.74	0.66	24	6.34	1.83	13	0.12	35.66	35.57	40.54	-	38.76	38.75
105.1	DI-105	0.00	0.75	0.00	8.42	6.59	0.00	0.94	0.00	4.63	0.65	18	5.21	2.62	7	0.05	35.71	35.66	-	40.54	38.86	38.85
DI-106	105.1	0.23	0.71	6.00	7.63	6.73	0.95	0.94	1.52	4.49	0.65	18	5.21	2.54	121	0.79	36.49	35.71	40.25	-	39.09	38.90
CB-107	DI-106	0.20	0.20	6.00	6.00	7.03	0.90	0.90	1.29	1.29	0.65	15	4.61	1.05	103	1.63	37.20	36.53	40.65	40.25	39.21	39.18
EX DI	DI-106	0.28	0.28	6.00	6.00	7.03	0.95	0.95	1.87	1.87	0.65	12	3.67	2.38	79	0.55	37.00	36.49	39.79	40.25	39.42	39.21
102.1	CB-102	0.00	0.42	0.00	7.05	6.83	0.00	0.92	0.00	2.63	1.00	12	4.93	3.35	17	0.09	35.62	35.45	-	40.25	38.69	38.61
102.2	102.1	0.00	0.40	0.00	6.89	6.86	0.00	0.92	0.00	2.51	1.00	12	4.93	3.19	31	0.16	35.93	35.62	-	-	38.87	38.75
102.3	102.2	0.00	0.36	0.00	6.70	6.90	0.00	0.91	0.00	2.26	1.00	12	4.93	2.87	31	0.18	36.24	35.93	-	-	39.03	38.92
102.4	102.3	0.00	0.32	0.00	6.50	6.94	0.00	0.91	0.00	2.00	1.00	12	4.93	2.55	31	0.21	36.55	36.24	-	-	39.15	39.07
102.5	102.4	0.00	0.28	0.00	6.28	6.98	0.00	0.90	0.00	1.75	1.00	12	4.93	2.23	30	0.22	36.85	36.55	-	-	39.24	39.18
CB-108	102.5	0.26	0.26	6.00	6.00	7.03	0.90	0.90	1.63	1.63	1.00	12	4.93	2.07	15	0.12	37.00	36.85	40.11	-	39.29	39.26
RD-1	103.1	0.02	0.02	6.00	6.00	7.03	0.95	0.95	0.15	0.15	2.02	6	4.41	0.79	9	0.19	36.96	36.78	40.75	-	38.50	38.49
RD-2	103.2	0.03	0.03	6.00	6.00	7.03	0.95	0.95	0.21	0.21	2.05	6	4.45	1.08	9	0.14	37.11	36.93	40.75	-	38.54	38.53
RD-3	103.3	0.03	0.03	6.00	6.00	7.03	0.95	0.95	0.17	0.17	0.96	6	3.04	0.87	9	0.17	37.18	37.09	40.75	-	38.58	38.57
RD-4	DI-104	0.03	0.03	6.00	6.00	7.03	0.95	0.95	0.19	0.19	2.00	6	4.39	0.97	16	0.27	37.47	37.15	40.90	40.34	38.68	38.66
RD-5	104.1	0.04	0.04	6.00	6.00	7.03	0.95	0.95	0.26	0.26	1.97	6	4.36	1.35	16	0.19	37.69	37.38	40.90	-	38.75	38.72
RD-6	104.2	0.02	0.02	6.00	6.00	7.03	0.95	0.95	0.14	0.14	2.01	6	4.40	0.71	16	0.37	37.89	37.57	41.75	-	38.76	38.75
RD-7.1	105.1	0.00	0.04	6.00	6.93	6.85	0.50	0.95	0.00	0.24	3.73	6	6.00	1.24	37	0.49	37.08	35.71	-	-	38.96	38.90
RD-7.2	RD-7.1	0.02	0.04	6.00	6.83	6.87	0.95	0.95	0.12	0.24	1.03	6	3.15	1.24	8	0.11	37.16	37.08	41.30	40.37	39.01	39.00
RD-7.3	RD-7.2	0.02	0.02	6.00	6.00	7.03	0.95	0.95	0.13	0.13	1.00	6	3.10	0.64	32	0.83	37.48	37.16	41.30	41.30	39.04	39.03
RD-8	102.1	0.02	0.02	6.00	6.00	7.03	0.95	0.95	0.14	0.14	7.08	6	8.26	0.71	10	0.23	36.32	35.62	40.60	-	38.75	38.75
RD-9	102.2	0.04	0.04	6.00	6.00	7.03	0.95	0.95	0.27	0.27	6.84	6	8.12	1.36	10	0.13	36.63	35.93	40.60	-	38.94	38.92
RD-10	102.3	0.04	0.04	6.00	6.00	7.03	0.95	0.95	0.27	0.27	6.61	6	7.98	1.38	11	0.13	36.96	36.24	40.80	-	39.09	39.07
RD-11	102.4	0.04	0.04	6.00	6.00	7.03	0.95	0.95	0.26	0.26	6.40	6	7.85	1.35	11	0.14	37.28	36.55	40.75	-	39.20	39.18
RD-12	102.5	0.02	0.02	6.00	6.00	7.03	0.95	0.95	0.14	0.14	6.22	6	7.74	0.71	12	0.28	37.59	36.85	40.70	-	39.27	39.26

UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SUB DA (AC)	TOTAL AREA (AC)	INLET TIME (MIN)	Tc	INTENSITY	RUNOFF COEF.	COMPOUND RUNOFF COEF.	SUB RUNOFF (CFS)	DISCHARGE (CFS)	SLOPE (%)	DIAMETER (IN)	FULL VEL. (FPS)	AVG. VEL. (FPS)	LENGTH (FT)	SEGMENT TIME (MIN)	UPSTREAM INVERT	DOWNSTREAM INVERT	UPSTREAM RIM/GRATE	DOWNSTREAM RIM/GRATE	UPSTREAM HGL	DOWNSTREAM HGL
MH-201	MH-200	0.00	1.11	5.00	8.33	8.17	0.50	0.75	0.00	13.67	0.35	30	4.96	5.30	60	0.19	36.60	36.39	41.00	42.00	37.96	37.63
OS POND	MH-201	0.00	0.00	5.00	5.00	8.87	0.50	0.50	0.00	6.92	1.45	24	8.69	3.42	14	0.07	37.30	37.10	39.70	41.00	38.48	38.48
DI-202	MH-201	0.19	1.11	5.00	7.14	8.41	0.35	0.75	0.60	6.94	0.35	24	4.27	2.73	194	1.19	37.28	36.60	40.25	41.00	38.59	38.45
DI-203	DI-202	0.16	0.91	5.00	6.58	8.53	0.35	0.83	0.51	6.46	0.35	24	4.27	2.83	95	0.56	37.61	37.28	40.25	40.25	38.86	38.80
EX DI 2	DI-203	0.17	0.75	5.00	6.13	8.62	0.90	0.94	1.40	6.04	0.61	18	4.64	3.89	106	0.45	38.25	37.61	40.28	40.25	39.35	39.09
EX DI 3	EX DI 2	0.57	0.57	6.00	6.00	8.65	0.95	0.95	4.70	4.70	0.31	15	2.93	3.83	29	0.13	38.34	38.25	40.10	40.28	40.05	39.90

Carolina Collision
50-Year Storm Calculations

UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SUB DA (AC)	TOTAL AREA (AC)	INLET TIME (MIN)	Tc	INTENSITY	RUNOFF COEF.	COMPOUND RUNOFF COEF.	SUB RUNOFF (CFS)	DISCHARGE (CFS)	SLOPE (%)	DIAMETER (IN)	FULL VEL. (FPS)	AVG. VEL. (FPS)	LENGTH (FT)	SEGMENT TIME (MIN)	UPSTREAM INVERT	DOWNSTREAM INVERT	UPSTREAM RIM/GRATE	DOWNSTREAM RIM/GRATE	UPSTREAM HGL	DOWNSTREAM HGL
MH-101	FES-100	0.00	1.84	6.00	9.87	7.89	0.50	0.92	0.00	13.33	1.00	30	8.38	2.72	65	0.40	33.65	33.00	40.55	-	38.27	38.20
CB-102	MH-101	0.09	0.51	6.00	6.92	8.45	0.90	0.92	0.70	3.94	1.00	15	5.72	3.21	40	0.21	35.20	34.80	40.25	40.55	38.59	38.46
DI-103	MH-101	0.13	1.34	6.00	8.99	8.05	0.80	0.92	0.90	9.85	0.65	30	6.75	2.01	106	0.88	34.66	33.97	40.34	40.55	38.48	38.42
103.1	DI-103	0.00	1.20	0.00	8.88	8.07	0.00	0.93	0.00	9.04	0.64	24	6.28	2.88	19	0.11	34.78	34.66	-	40.34	38.62	38.60
103.2	103.1	0.00	1.18	0.00	8.75	8.09	0.00	0.93	0.00	8.89	0.64	24	6.28	2.83	24	0.14	34.93	34.78	-	-	38.69	38.66
103.3	103.2	0.00	1.15	0.00	8.60	8.12	0.00	0.93	0.00	8.67	0.64	24	6.28	2.76	24	0.14	35.09	34.93	-	-	38.76	38.73
DI-104	103.3	0.10	1.12	6.00	8.54	8.13	0.90	0.93	0.75	8.49	0.64	24	6.28	2.70	10	0.06	35.15	35.09	40.34	-	38.81	38.80
104.1	DI-104	0.00	1.00	0.00	8.31	8.18	0.00	0.93	0.00	7.60	0.66	24	6.34	2.42	34	0.24	35.38	35.15	-	40.34	38.99	38.96
104.2	104.1	0.00	0.96	0.00	8.09	8.22	0.00	0.93	0.00	7.33	0.66	24	6.34	2.33	30	0.21	35.57	35.38	-	-	39.05	39.02
DI-105	104.2	0.19	0.94	6.00	7.99	8.24	0.90	0.93	1.47	7.19	0.66	24	6.34	2.29	13	0.10	35.66	35.57	40.54	-	39.08	39.07
105.1	DI-105	0.00	0.75	0.00	7.96	8.24	0.00	0.94	0.00	5.79	0.65	18	5.21	3.28	7	0.04	35.71	35.66	-	40.54	39.24	39.23
DI-106	105.1	0.23	0.71	6.00	7.32	8.37	0.95	0.94	1.87	5.58	0.65	18	5.21	3.16	121	0.64	36.49	35.71	40.25	-	39.60	39.31
CB-107	DI-106	0.20	0.20	6.00	6.00	8.65	0.90	0.90	1.59	1.59	0.65	15	4.61	1.30	103	1.32	37.20	36.53	40.65	40.25	39.79	39.74
EX DI	DI-106	0.28	0.28	6.00	6.00	8.65	0.95	0.95	2.30	2.30	0.65	12	3.67	2.93	79	0.45	37.00	36.49	39.79	40.25	40.11	39.78
102.1	CB-102	0.00	0.42	0.00	6.85	8.47	0.00	0.92	0.00	3.26	1.00	12	4.93	4.16	17	0.07	35.62	35.45	-	40.25	38.97	38.85
102.2	102.1	0.00	0.40	0.00	6.72	8.50	0.00	0.92	0.00	3.10	1.00	12	4.93	3.95	31	0.13	35.93	35.62	-	-	39.24	39.05
102.3	102.2	0.00	0.36	0.00	6.57	8.53	0.00	0.91	0.00	2.79	1.00	12	4.93	3.55	31	0.15	36.24	35.93	-	-	39.48	39.31
102.4	102.3	0.00	0.32	0.00	6.41	8.56	0.00	0.91	0.00	2.47	1.00	12	4.93	3.15	31	0.17	36.55	36.24	-	-	39.66	39.54
102.5	102.4	0.00	0.28	0.00	6.22	8.60	0.00	0.90	0.00	2.16	1.00	12	4.93	2.75	30	0.18	36.85	36.55	-	-	39.80	39.71
CB-108	102.5	0.26	0.26	6.00	6.00	8.65	0.90	0.90	2.00	2.00	1.00	12	4.93	2.55	15	0.10	37.00	36.85	40.11	-	39.88	39.84
RD-1	103.1	0.02	0.02	6.00	6.00	8.65	0.95	0.95	0.19	0.19	2.02	6	4.41	0.97	9	0.15	36.96	36.78	40.75	-	38.67	38.66
RD-2	103.2	0.03	0.03	6.00	6.00	8.65	0.95	0.95	0.26	0.26	2.05	6	4.45	1.33	9	0.11	37.11	36.93	40.75	-	38.75	38.73
RD-3	103.3	0.03	0.03	6.00	6.00	8.65	0.95	0.95	0.21	0.21	0.96	6	3.04	1.06	9	0.14	37.18	37.09	40.75	-	38.81	38.80
RD-4	DI-104	0.03	0.03	6.00	6.00	8.65	0.95	0.95	0.24	0.24	2.00	6	4.39	1.20	16	0.22	37.47	37.15	40.90	40.34	38.96	38.93
RD-5	104.1	0.04	0.04	6.00	6.00	8.65	0.95	0.95	0.33	0.33	1.97	6	4.36	1.66	16	0.16	37.69	37.38	40.90	-	39.06	39.02
RD-6	104.2	0.02	0.02	6.00	6.00	8.65	0.95	0.95	0.17	0.17	2.01	6	4.40	0.88	16	0.30	37.89	37.57	41.75	-	39.08	39.07
RD-7.1	105.1	0.00	0.04	6.00	6.76	8.49	0.50	0.95	0.00	0.30	3.73	6	6.00	1.54	37	0.40	37.08	35.71	-	-	39.40	39.31
RD-7.2	RD-7.1	0.02	0.04	6.00	6.67	8.51	0.95	0.95	0.15	0.30	1.03	6	3.15	1.54	8	0.09	37.16	37.08	41.30	40.37	39.48	39.46
RD-7.3	RD-7.2	0.02	0.02	6.00	6.00	8.65	0.95	0.95	0.15	0.15	1.00	6	3.10	0.78	32	0.67	37.48	37.16	41.30	41.30	39.52	39.50
RD-8	102.1	0.02	0.02	6.00	6.00	8.65	0.95	0.95	0.17	0.17	7.08	6	8.26	0.88	10	0.19	36.32	35.62	40.60	-	39.05	39.05
RD-9	102.2	0.04	0.04	6.00	6.00	8.65	0.95	0.95	0.33	0.33	6.84	6	8.12	1.68	10	0.10	36.63	35.93	40.60	-	39.35	39.31
RD-10	102.3	0.04	0.04	6.00	6.00	8.65	0.95	0.95	0.33	0.33	6.61	6	7.98	1.70	11	0.11	36.96	36.24	40.80	-	39.57	39.54
RD-11	102.4	0.04	0.04	6.00	6.00	8.65	0.95	0.95	0.33	0.33	6.40	6	7.85	1.66	11	0.11	37.28	36.55	40.75	-	39.74	39.71
RD-12	102.5	0.02	0.02	6.00	6.00	8.65	0.95	0.95	0.17	0.17	6.22	6	7.74	0.88	12	0.22	37.59	36.85	40.70	-	39.85	39.84

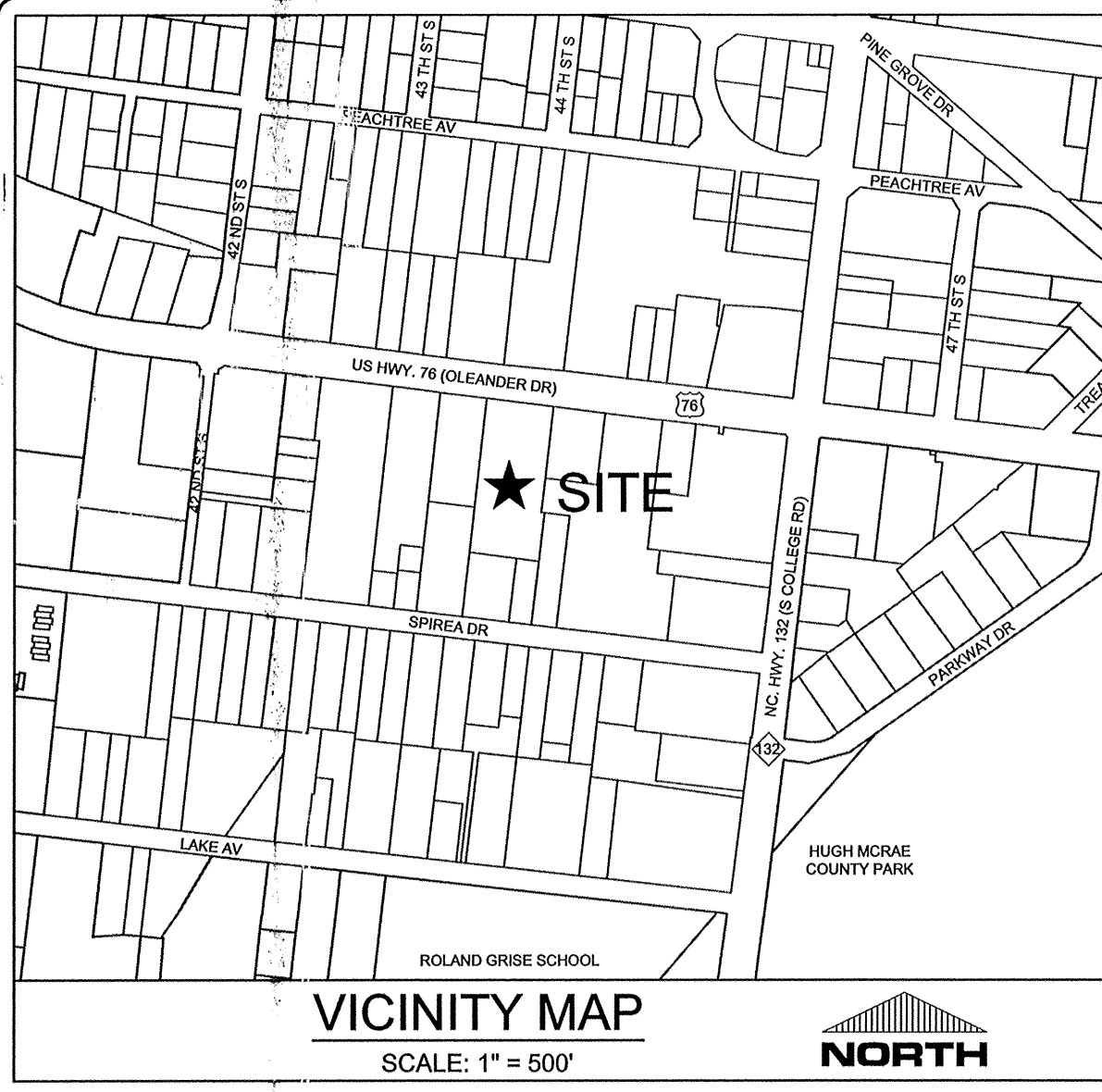
UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	SUB DA (AC)	TOTAL AREA (AC)	INLET TIME (MIN)	Tc	INTENSITY	RUNOFF COEF.	COMPOUND RUNOFF COEF.	SUB RUNOFF (CFS)	DISCHARGE (CFS)	SLOPE (%)	DIAMETER (IN)	FULL VEL. (FPS)	AVG. VEL. (FPS)	LENGTH (FT)	SEGMENT TIME (MIN)	UPSTREAM INVERT	DOWNSTREAM INVERT	UPSTREAM RIM/GRATE	DOWNSTREAM RIM/GRATE	UPSTREAM HGL	DOWNSTREAM HGL
MH-201	MH-200	0.00	1.11	5.00	8.88	8.07	0.50	0.75	0.00	18.73	0.35	30	4.96	5.86	60	0.17	36.60	36.39	41.00	42.00	38.25	37.86
OS POND	MH-201	0.00	0.00	5.00	5.00	8.87	0.50	0.50	0.00	12.07	1.45	24	8.69	3.87	14	0.06	37.30	37.10	39.70	41.00	39.21	39.18
DI-202	MH-201	0.19	1.11	5.00	7.40	8.36	0.35	0.75	0.60	6.90	0.35	24	4.27	2.20	194	1.47	37.28	36.60	40.25	41.00	39.30	39.12
DI-203	DI-202	0.16	0.91	5.00	6.64	8.51	0.35	0.83	0.51	6.45	0.35	24	4.27	2.09	95	0.76	37.61	37.28	40.25	40.25	39.47	39.40
EX DI 2	DI-203	0.17	0.75	5.00	6.13	8.62	0.90	0.94	1.40	6.04	0.61	18	4.64	3.42	106	0.52	38.25	37.61	40.28	40.25	39.96	39.61
EX DI 3	EX DI 2	0.57	0.57	6.00	6.00	8.65	0.95	0.95	4.70	4.70	0.31	15	2.93	3.83	29	0.13	38.34	38.25	40.10	40.28	40.37	40.22



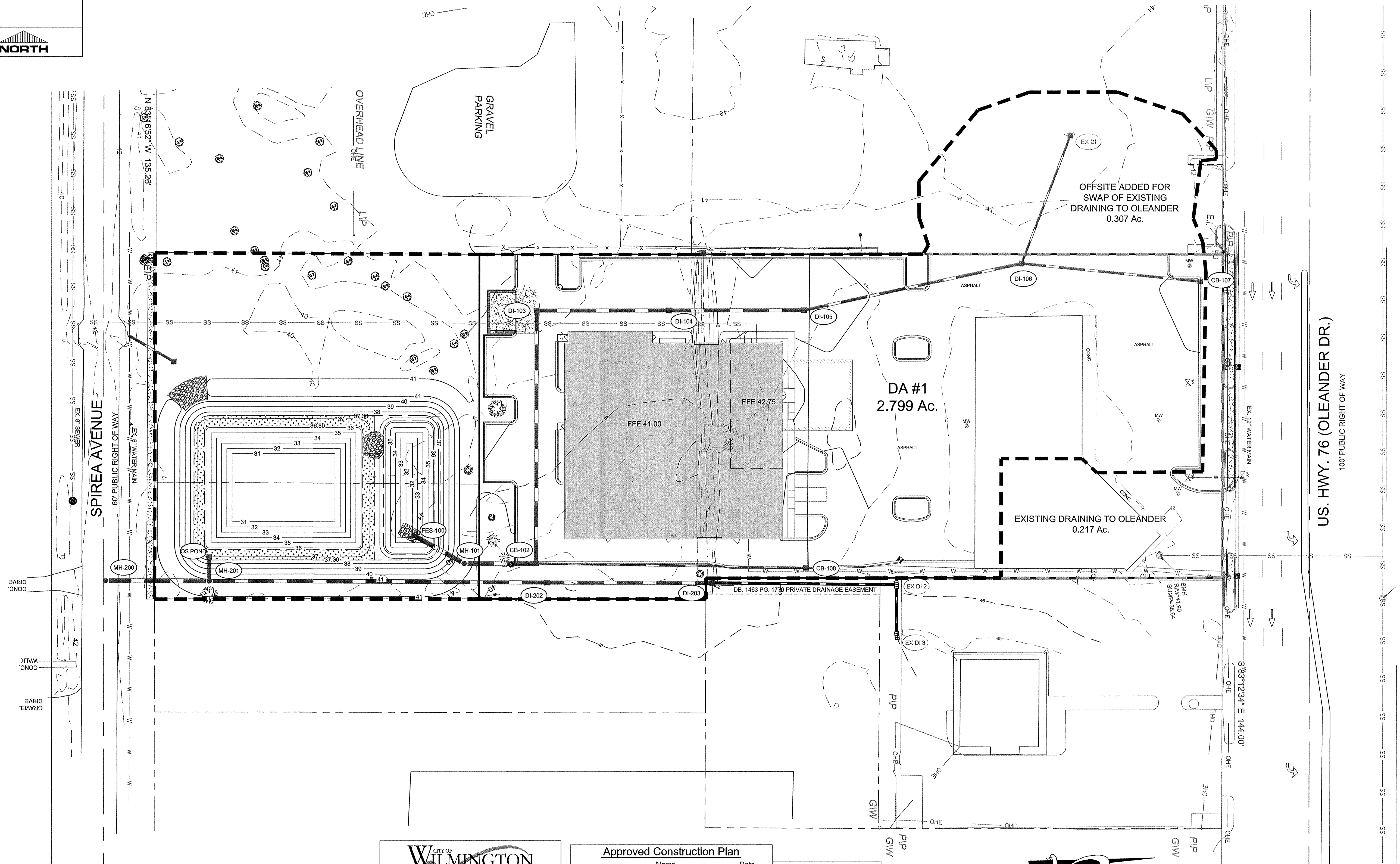
Curves may not be extrapolated.

Figure 8.06b Design of outlet protection from a round pipe flowing full, maximum tailwater condition ($T_w \geq 0.5$ diameter).

FES-100
 $Q_{25} = 12.3$ cfs
 $D_o = 30"$
 $3D_o = 7.5'$
 $L_a = 11'$
 $W = 6.9' \rightarrow$ USE $7.5'$



- LEGEND:**
- LOD — LOD — LIMITS OF DISTURBANCE
 - SF — SF — SILT FENCE
 - ○ — ○ — TREE PROTECTION FENCING
 - — — — STORM DRAIN LINE
 - — — — ROOF DRAIN LINE
 - ▨ GRVEL ENTRANCE
 - ▨ RIP-RAP
 - ▨ POND SHELF PLANTINGS
 - INLET PROTECTION
 - STORM INLET (CURB & DROP)
 - STORM MANHOLE
 - TREE PROTECTION FENCING



REVISIONS:

CLIENT INFORMATION:
CAROLINA COLLISION OF WILMINGTON, LLC
4900 LEIGH DRIVE
RALEIGH, NC 27616

PARAMOUNT ENGINEERING
122 Cinema Drive
Wilmington, North Carolina 28403
(910) 791-6707 (O) (910) 791-6760 (F)
NC License #: C-2846

POST DEVELOPMENT DA MAP
4400 OLEANDER DRIVE
NEW HANOVER COUNTY
WILMINGTON, NORTH CAROLINA

PROJECT STATUS

CONCEPTUAL LAYOUT:	
FINAL DESIGN:	
RELEASED FOR CONSTRUCTION:	

DRAWING INFORMATION

DATE:	01.11.17
SCALE:	1" = 30'
DESIGNED BY:	JRB
CHECKED BY:	DFE

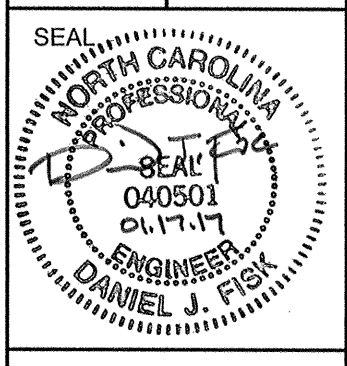


FIG-1
PEI JOB#: 16296.PE

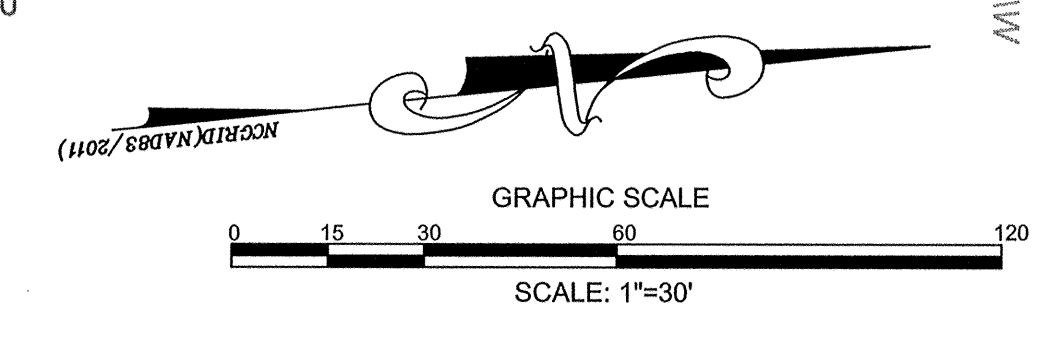


CITY OF WILMINGTON
NORTH CAROLINA
Public Services • Engineering Division
APPROVED STORMWATER MANAGEMENT PLAN
Date: _____ Permit #: _____
Signed: _____

Approved Construction Plan

Name	Date
Planning	_____
Traffic	_____
Fire	_____

For each open utility cut of City streets, a \$325 permit shall be required from the City prior to occupancy and/or project acceptance.



FINAL DESIGN - NOT RELEASED FOR CONSTRUCTION

