BRIAR CHAPEL - TRANSECT ZONE
Frontage by Zone/Area

T3 Zone	Phase 6 N	Ph 7	Ph 8	Cumulative (LF)	Cumulative (%)
50,500 LF	5,000 LF	2,355 LF	1,110 LF	8,465 LF	17%
T4a Zone	**Phase 6 N**	**Ph 7**	**Ph 8**	**Cumulative (LF)**	**Cumulative (%)**
30,000 LF	600 LF	3,440 LF	4,150 LF	8,190 LF	27%
T4b Zone	**Phase 6 N**	**Ph 7**	**Ph 8**	**Cumulative (LF)**	**Cumulative (%)**
5,500 LF	00 LF	780 LF	64 LF	844 LF	15%

McKIM & CREED

LETTER OF TRANSMITTAL

TO: NCDENR – DWQ 401 Unit 512 N Salisbury Street Archdale Building -9th Floor Raleigh, NC 27604	DATE: May 21, 2013 PROJECT NO: 2735-0092 / TASK NO: EXP RE: Briar Chapel – Phase 8
ATTENTION: Ms. Annette Lucas	TRANSMITTAL NO: 1 / PAGE 1 OF 1

WE ARE SENDING: ☐ Originals ☒ Prints ☐ Shop Drawings ☐ Samples
☐ Specifications ☒ Calculations ☐ Other -

Quantity	Drawing No.	Rev.	Description	Status
2			Stormwater Design Plans	G
2			Narrative & Supporting Calculations	G
2			Wet Pond #13 O&M Agreement (1 Original, 1 copy)	G
2			Wet Pond #13 Design Supplements	G

Issue Status Code: A. Preliminary B. Fabrication Only C. For Information D. Bid
E. Construction F. For Review & Comments G. For Approval H. See Remarks

REMARKS:

Annette,

Please find the enclosed documents for your review. Please let us know if you have any questions or comments. Thank you.

1730 Varsity Drive, Suite 500 Raleigh, NC 27606 919/233-8091 Fax 919/233-8031

Cc:

McKIM & CREED, INC.

Signed Gareth Avant

Gareth Avant, PE

401 NARRATIVE & SUPPORTING CALCULATIONS

Briar Chapel Development
Phase 8

Chatham County, North Carolina
May 21, 2013

Prepared for:

BRIAR CHAPEL™
by
Newland COMMUNITIES

NNP Briar Chapel, LLC
16 Windy Knoll Circle
Chapel Hill, North Carolina 27516

Prepared By:

McKIM&CREED
1730 Varsity Drive, Suite 500
Raleigh, North Carolina 27606
Phone: (919) 233.8091
Fax: (919) 233.8031

M&C Project No. 02735-0092

PROJECT DESCRIPITON

The purpose of the project is to construct water, sewer and roadway infrastructure to support 110 residential lots within the Briar Chapel development. This will be the second of several phases of construction in this proximity.

Based on the conditions of the approved 401 Water Quality Certification, NCDENR-DWQ will require runoff from the roads to be captured and treated for 85% TSS removal before being discharged into existing stream buffers. To meet this requirement, the runoff from the northern portion of this phase of construction will be directed to Wet Detention Pond #12 as approved under the Great Ridge Parkway Extension project (DWQ Project # 05-0732v25). The runoff from the southern portion of this phase will be directed to a new BMP, Wet Detention Pond #13. Calculations for this new facility are included in this package.

Upon completion of the project's construction, the proposed public roads will be turned over to and maintained by NCDOT.

SITE DESCRIPTION

The project area is approximately 24.7 acres of disturbed area located within the BC South development area, adjacent to Great Ridge Parkway and near the Margaret B Pollard Middle School.

This portion of the development generally takes place on the north side of a ridge that bisects the site from north to south. The slopes in the site range from 5-20% in localized areas.

SOILS

According to the Chatham County Generalized Soil Survey, the soils located on the site are classified as Wedowee sandy loam, 2% to 15% slopes (WeB, WeC, WeD) and Vance sandy loam, 2% to 6% slopes (VaB).

The following soil descriptions are associated with the soils found on the site:

> We(X) – Wedowee sandy loam soils are often found in piedmont uplands, along ridges and side slopes. Permeability is moderate and the soils are well drained. Soils have a low shrink/swell potential. The seasonal high water is generally more than 6.0 feet below the surface.
>
> Va (X) - Vance sandy loam soils are often found in piedmont uplands along ridges, and side slopes. Permeability is slow and the soils are well drained. The seasonal high water is generally more than 6 feet below the surface.

WET DETENTION DESIGN

The wet detention pond on this site has been designed to remove 90% of the total suspended solids entering from the surrounding impervious drainage areas before discharging into the adjacent stream. The calculations provided with this package include all projected future drainage areas that might be captured by the pond. Treated runoff will be dissipated by a riprap outlet protection device before entering any stream buffers.

Design parameters were taken from the BMP manual and from DWQ's design supplement forms.

MAINTENANCE CONSIDERATIONS

The property owner shall be responsible for periodic inspection and maintenance of all temporary erosion control measures devices. Any measure that fails to function as intended shall be repaired immediately.

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

CHAPEL HILL 2 W, NORTH CAROLINA (31-1677) 35.9086 N 79.0794 W 462 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 3
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Wed Jan 20 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State Map

Precipitation Intensity Estimates (in/hr)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	4.93	3.94	3.28	2.25	1.40	0.84	0.60	0.36	0.21	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
2	5.81	4.64	3.89	2.69	1.69	1.01	0.72	0.43	0.25	0.15	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01
5	6.70	5.36	4.52	3.21	2.06	1.25	0.89	0.53	0.32	0.19	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
10	7.38	5.90	4.98	3.61	2.35	1.43	1.03	0.62	0.37	0.22	0.12	0.07	0.04	0.03	0.02	0.02	0.01	0.01
25	8.11	6.46	5.46	4.04	2.69	1.66	1.20	0.73	0.44	0.25	0.15	0.08	0.05	0.04	0.03	0.02	0.02	0.01
50	8.62	6.86	5.79	4.36	2.95	1.85	1.34	0.82	0.50	0.29	0.16	0.09	0.06	0.04	0.03	0.02	0.02	0.02
100	9.07	7.21	6.07	4.65	3.20	2.02	1.48	0.91	0.56	0.32	0.18	0.10	0.06	0.05	0.03	0.02	0.02	0.02
200	9.44	7.49	6.30	4.90	3.44	2.20	1.63	1.01	0.62	0.35	0.20	0.11	0.07	0.05	0.03	0.03	0.02	0.02
500	9.85	7.79	6.54	5.21	3.73	2.43	1.82	1.14	0.71	0.40	0.22	0.12	0.08	0.06	0.04	0.03	0.02	0.02
1000	10.19	8.02	6.71	5.43	3.96	2.62	1.98	1.24	0.78	0.43	0.24	0.13	0.08	0.06	0.04	0.03	0.02	0.02

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	5.39	4.31	3.59	2.46	1.53	0.92	0.65	0.39	0.23	0.13	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01
2	6.36	5.08	4.26	2.94	1.85	1.11	0.79	0.47	0.28	0.16	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01
5	7.31	5.86	4.94	3.51	2.25	1.37	0.97	0.58	0.34	0.20	0.12	0.06	0.04	0.03	0.02	0.02	0.01	0.01
10	8.06	6.44	5.43	3.94	2.56	1.57	1.12	0.68	0.40	0.23	0.13	0.07	0.05	0.04	0.02	0.02	0.02	0.01
25	8.83	7.04	5.95	4.41	2.93	1.82	1.31	0.79	0.48	0.27	0.16	0.09	0.05	0.04	0.03	0.02	0.02	0.01
50	9.38	7.48	6.31	4.75	3.22	2.02	1.47	0.89	0.54	0.31	0.17	0.10	0.06	0.05	0.03	0.02	0.02	0.02
100	9.89	7.85	6.62	5.07	3.49	2.22	1.62	0.99	0.60	0.34	0.19	0.11	0.07	0.05	0.03	0.02	0.02	0.02
200	10.32	8.18	6.88	5.35	3.75	2.41	1.78	1.09	0.67	0.38	0.21	0.12	0.07	0.06	0.04	0.03	0.02	0.02
500	10.78	8.52	7.15	5.69	4.08	2.66	1.99	1.23	0.76	0.43	0.24	0.13	0.08	0.06	0.04	0.03	0.02	0.02
1000	11.14	8.77	7.34	5.94	4.34	2.87	2.16	1.36	0.85	0.46	0.26	0.14	0.09	0.07	0.04	0.03	0.02	0.02

* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

* Lower bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

CHAPEL HILL 2 W, NORTH CAROLINA (31-1677) 35.9086 N 79.0794 W 462 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 2, Version 3
G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2004

Extracted: Tue Jan 19 2010

Confidence Limits | Seasonality | Location Maps | Other Info. | GIS data | Maps | Docs | Return to State Map

Precipitation Frequency Estimates (inches)

ARI* (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.41	0.66	0.82	1.12	1.40	1.68	1.79	2.15	2.54	2.96	3.46	3.87	4.44	5.05	6.76	8.39	10.69	12.84
2	0.48	0.77	0.97	1.34	1.69	2.02	2.16	2.59	3.06	3.58	4.17	4.64	5.30	6.00	7.97	9.88	12.52	14.97
5	0.56	0.89	1.13	1.60	2.06	2.49	2.66	3.20	3.80	4.47	5.17	5.71	6.44	7.21	9.41	11.47	14.32	16.89
10	0.61	0.98	1.25	1.80	2.35	2.87	3.08	3.71	4.44	5.17	5.95	6.54	7.34	8.15	10.56	12.72	15.72	18.37
25	0.68	1.08	1.36	2.02	2.69	3.33	3.61	4.37	5.28	6.11	6.99	7.68	8.57	9.42	12.11	14.36	17.55	20.28
50	0.72	1.14	1.45	2.18	2.95	3.70	4.04	4.92	5.99	6.86	7.81	8.57	9.54	10.43	13.34	15.62	18.95	21.72
100	0.76	1.20	1.52	2.33	3.20	4.05	4.46	5.47	6.71	7.62	8.64	9.49	10.53	11.44	14.57	16.87	20.31	23.11
200	0.79	1.25	1.57	2.45	3.44	4.40	4.89	6.03	7.47	8.41	9.49	10.44	11.56	12.47	15.83	18.12	21.67	24.46
500	0.82	1.30	1.64	2.60	3.73	4.86	5.46	6.80	8.53	9.50	10.66	11.73	12.96	13.87	17.55	19.80	23.46	26.21
1000	0.85	1.34	1.68	2.72	3.96	5.23	5.93	7.44	9.43	10.35	11.58	12.76	14.06	14.97	18.89	21.09	24.83	27.53

* These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting forces estimates near zero to appear as zero.

* Upper bound of the 90% confidence interval Precipitation Frequency Estimates (inches)

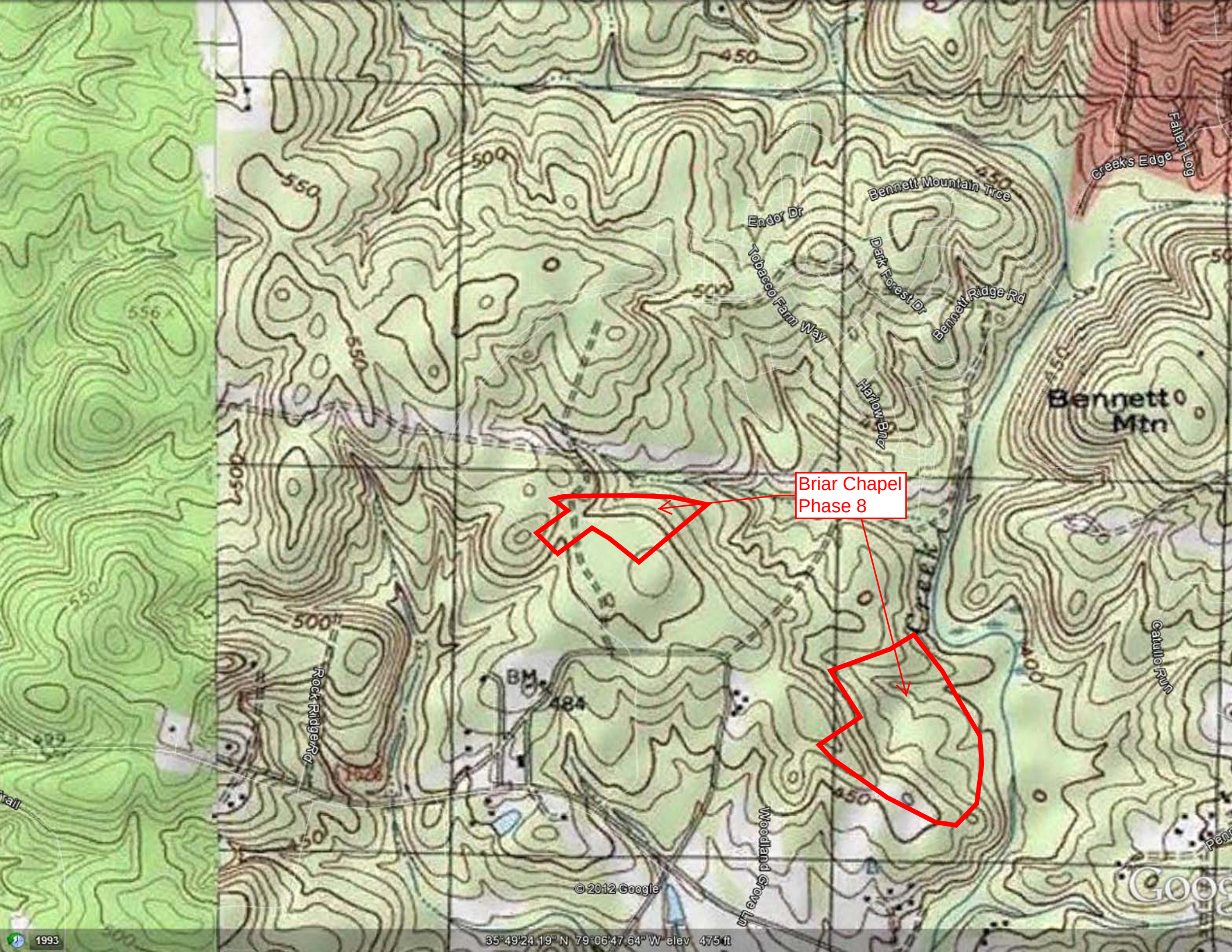
ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
1	0.45	0.72	0.90	1.23	1.53	1.84	1.96	2.35	2.77	3.16	3.70	4.14	4.73	5.37	7.14	8.87	11.24	13.44
2	0.53	0.85	1.06	1.47	1.85	2.22	2.37	2.83	3.34	3.82	4.46	4.96	5.64	6.38	8.43	10.42	13.15	15.68
5	0.61	0.98	1.23	1.75	2.25	2.73	2.92	3.50	4.15	4.77	5.53	6.09	6.86	7.66	9.95	12.10	15.04	17.69
10	0.67	1.07	1.36	1.97	2.56	3.14	3.37	4.05	4.83	5.51	6.36	6.99	7.82	8.66	11.17	13.41	16.51	19.25
25	0.74	1.17	1.49	2.20	2.93	3.64	3.94	4.76	5.73	6.54	7.47	8.22	9.14	10.02	12.82	15.15	18.44	21.26
50	0.78	1.25	1.58	2.38	3.22	4.04	4.41	5.35	6.47	7.34	8.35	9.19	10.19	11.11	14.14	16.50	19.92	22.80
100	0.82	1.31	1.66	2.53	3.49	4.43	4.87	5.94	7.25	8.17	9.27	10.19	11.26	12.21	15.48	17.85	21.39	24.28
200	0.86	1.36	1.72	2.68	3.75	4.82	5.34	6.56	8.06	9.03	10.19	11.22	12.38	13.33	16.86	19.21	22.85	25.73
500	0.90	1.42	1.79	2.84	4.08	5.32	5.96	7.39	9.20	10.21	11.47	12.65	13.91	14.86	18.72	21.04	24.81	27.63
1000	0.93	1.46	1.83	2.97	4.34	5.74	6.50	8.11	10.19	11.15	12.49	13.79	15.14	16.07	20.20	22.46	26.31	29.07

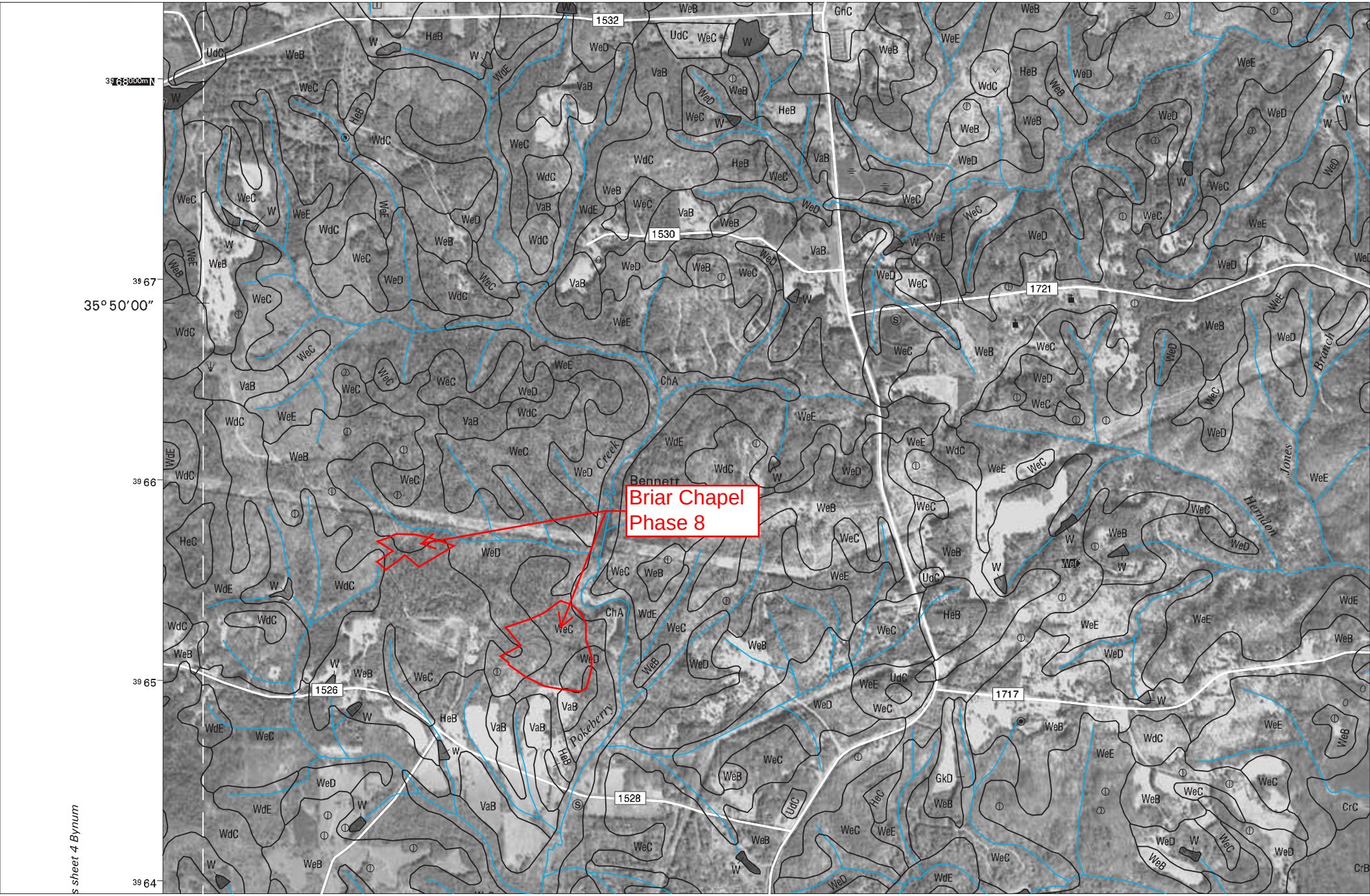
* The upper bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are greater than.
** These precipitation frequency estimates are based on a partial duration series. ARI is the Average Recurrence Interval.
Please refer to NOAA Atlas 14 Document for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

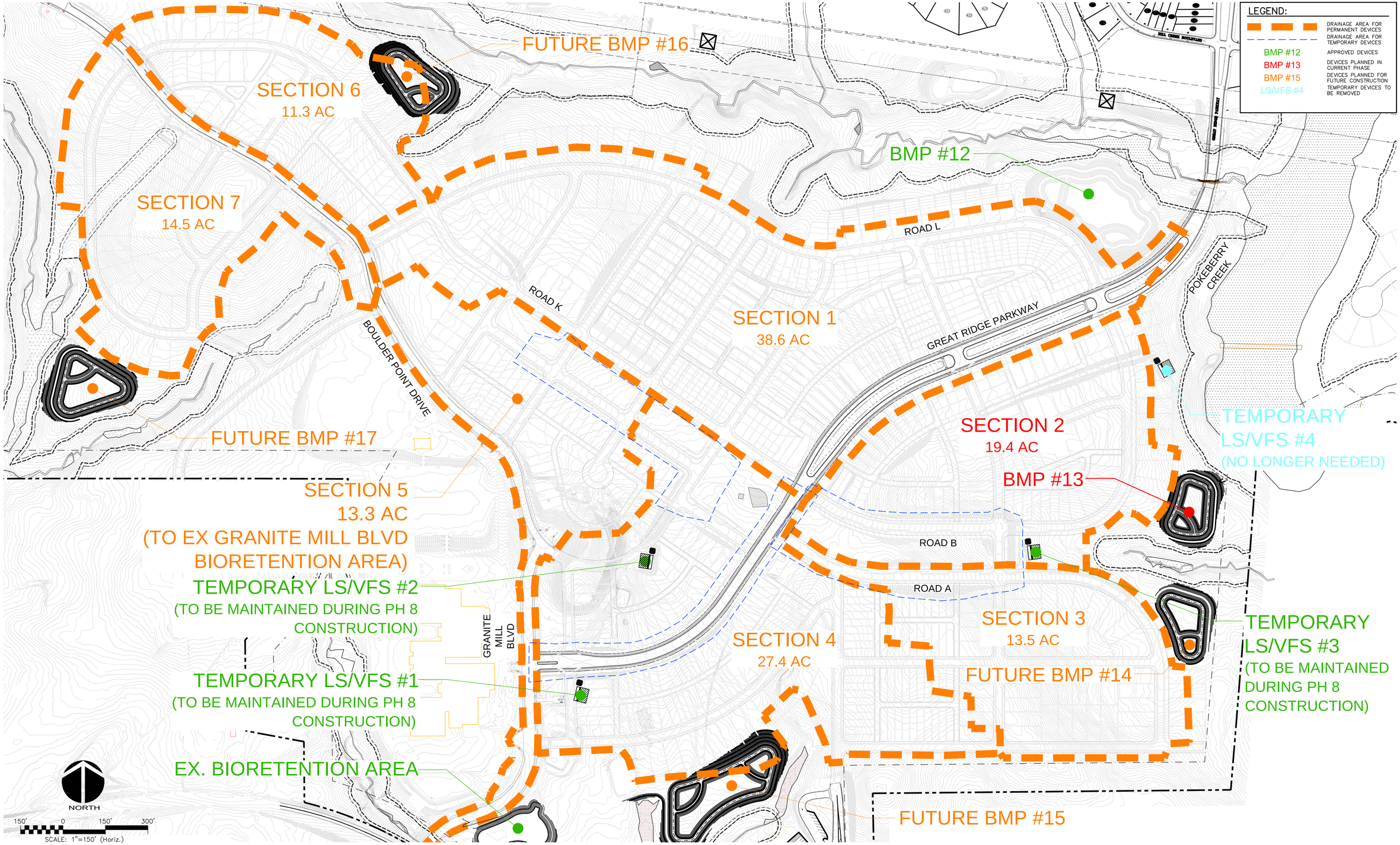
* Lower bound of the 90% confidence interval Precipitation Frequency Estimates (inches)

ARI** (years)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day

MAPS


Briar Chapel
Phase 8
Bennett Mtn
Endor Dr
Tobacco Farm Way
Dark Forest Dr
Bennett Ridge Rd
Bennett Mountain Trce
Creeks Edge
Fallen Log
Harlow Brd
Rock Ridge Rd
Woodland Grove Ln
Catullo Run
BM
484
© 2012 Google
1993
35°49'24.19" N 79°06'47.64" W elev 475 ft


Briar Chapel
Phase 8
1532
1530
1721
1526
1528
1717
Bennett
Creek
Pokeberry
Jones
Branch
Herndon
35°50′00″
39 67
39 66
39 65
39 64



REV.NO.	DESCRIPTIONS	DATE
3	SUBMITTAL TO DWQ 401 UNIT FOR PHASE 8 PROJECT	2013.05.21
2	SUBMITTAL TO DWQ 401 UNIT FOR PHASE 7 PROJECT	2013.01.24
1	SUBMITTAL TO DWQ 401 UNIT FOR GREAT RIDGE PARKWAY EXTENSION PROJECT	2012.12.19

REVISIONS

SEAL

SEAL

McKIM&CREED
1730 Varsity Drive, Suite 500
Raleigh, North Carolina 27606
Phone: (919)233-8091, Fax: (919)233-8031
F-1222

www.mckimcreed.com

BRIAR CHAPEL™
by Newland COMMUNITIES

BRIAR CHAPEL
GREAT RIDGE PARKWAY EXTENSION
CHATHAM COUNTY, NORTH CAROLINA

BC SOUTH DRAINAGE AREA MAP

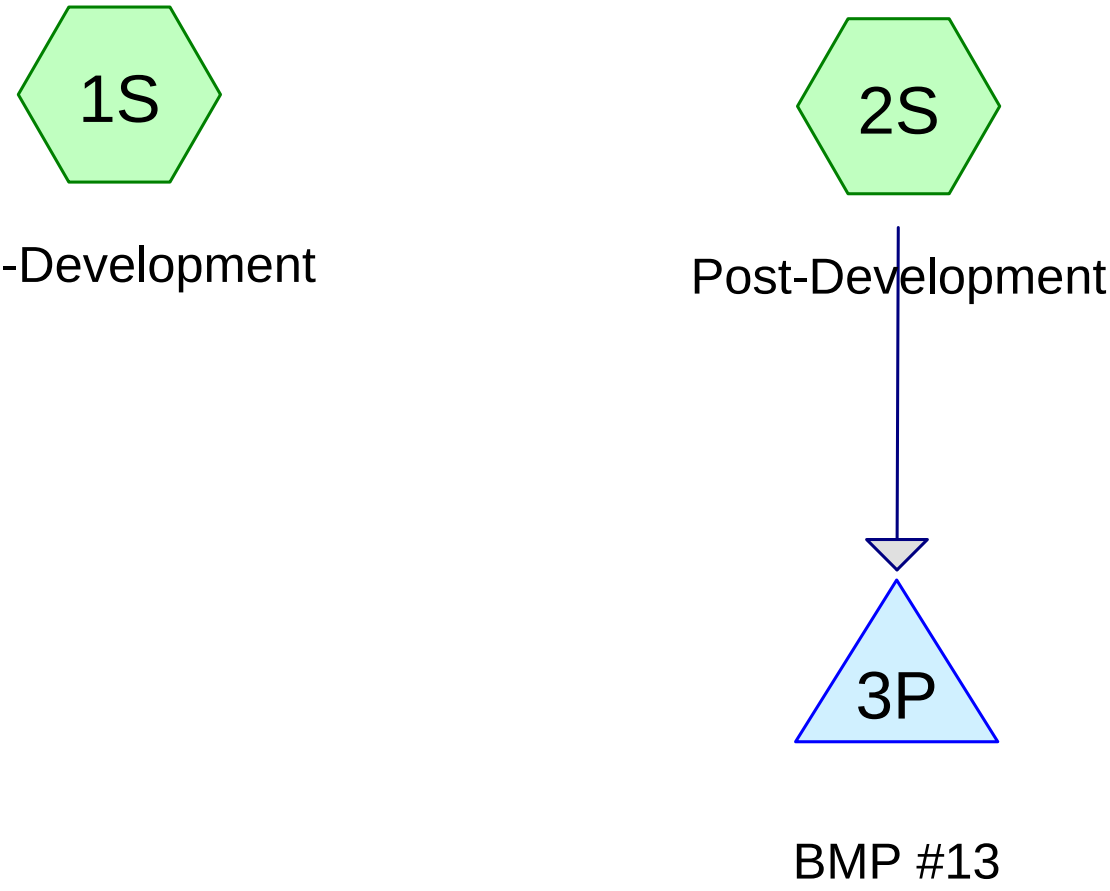
DATE:	DECEMBER 19, 2012
MCE PROJ. #	02735-0080
DRAWN	GCA
DESIGNED	GCA
CHECKED	CHS
PROJ. MGR.	CHS

SCALE
HORIZONTAL: 1" = 150'
VERTICAL: N/A

M&C FILE NUMBER: DA MAP
DRAWING NUMBER: MAP 1

STATUS: FOR PERMIT ONLY
REVISION: 3

WET DETENTION POND #13 DESIGN



Subcat Reach Pond Link

Routing Diagram for 2013.05.13.Pond #13-Revised
Prepared by Microsoft, Printed 5/15/2013

Summary for Subcatchment 1S: Pre-Development

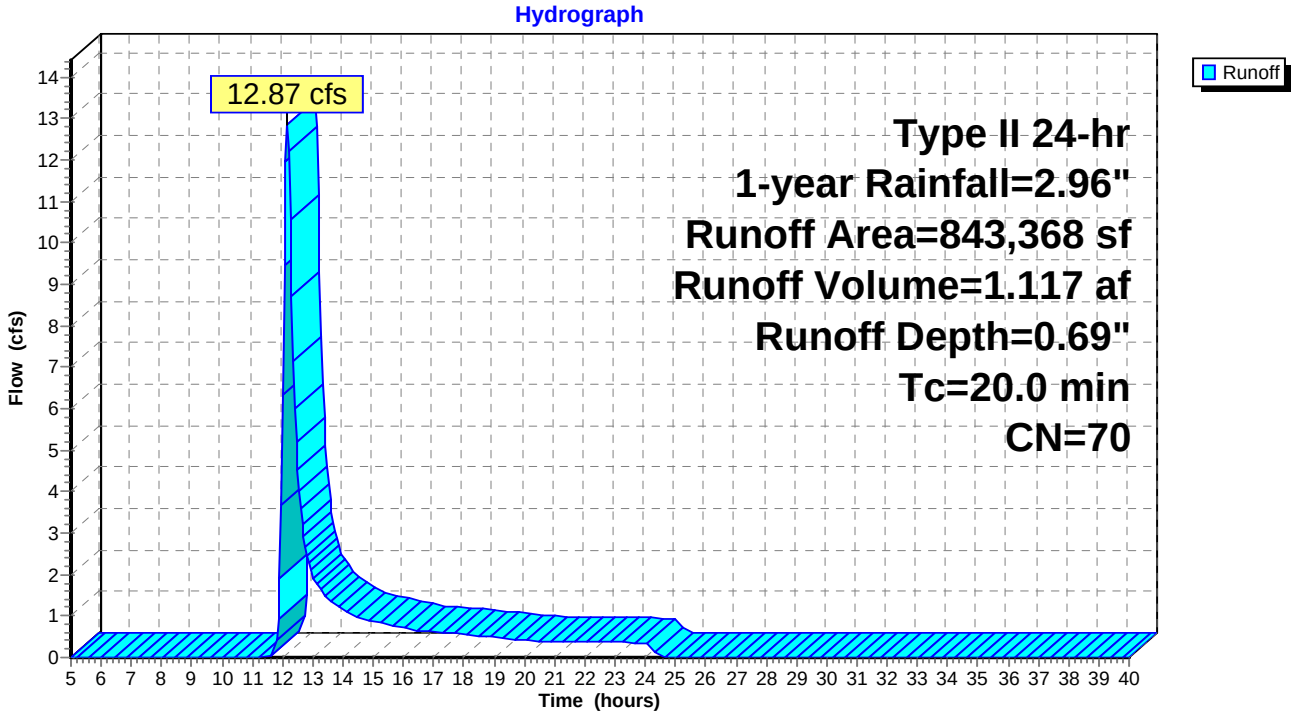
Runoff = 12.87 cfs @ 12.15 hrs, Volume= 1.117 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-year Rainfall=2.96"

Area (sf)	CN	Description
843,368	70	Woods, Good, HSG C
843,368		100.00% Pervious Area

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

Subcatchment 1S: Pre-Development



Summary for Pond 3P: BMP #13

Inflow Area = 19.361 ac, 49.88% Impervious, Inflow Depth = 1.63" for 1-year event
Inflow = 47.65 cfs @ 12.02 hrs, Volume= 2.627 af
Outflow = 12.27 cfs @ 12.23 hrs, Volume= 1.992 af, Atten= 74%, Lag= 13.0 min
Primary = 12.27 cfs @ 12.23 hrs, Volume= 1.992 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 416.63' @ 12.23 hrs Surf.Area= 27,057 sf Storage= 53,091 cf

Plug-Flow detention time= 314.0 min calculated for 1.989 af (76% of inflow)
Center-of-Mass det. time= 223.1 min (1,049.7 - 826.6)

Volume	Invert	Avail.Storage	Storage Description
#1	414.50'	155,196 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

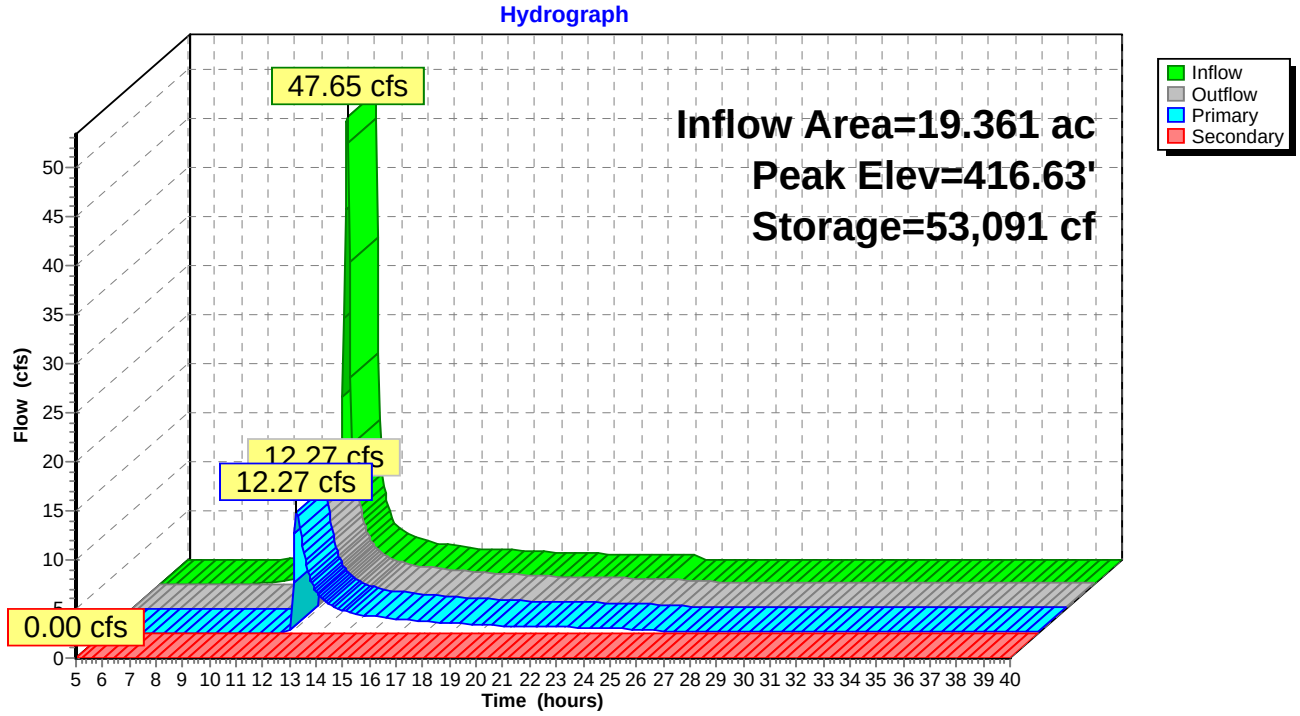
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.50	21,256	0	0
415.00	24,085	11,335	11,335
416.00	25,887	24,986	36,321
417.00	27,734	26,811	63,132
418.00	29,693	28,714	91,845
419.00	31,661	30,677	122,522
420.00	33,686	32,674	155,196

Device	Routing	Invert	Outlet Devices
#1	Primary	410.50'	**24.0" Round Culvert** L= 48.1' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 410.50' / 410.00' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	414.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	416.00'	**36.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.33'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	418.35'	**60.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=12.16 cfs @ 12.23 hrs HW=416.63' (Free Discharge)
└**1=Culvert** (Passes 12.16 cfs of 34.27 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 6.86 fps)
  ├**3=Orifice/Grate** (Orifice Controls 3.26 cfs @ 3.26 fps)
  └**4=Orifice/Grate** (Weir Controls 8.66 cfs @ 1.80 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=414.50' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: BMP #13



Summary for Subcatchment 1S: Pre-Development

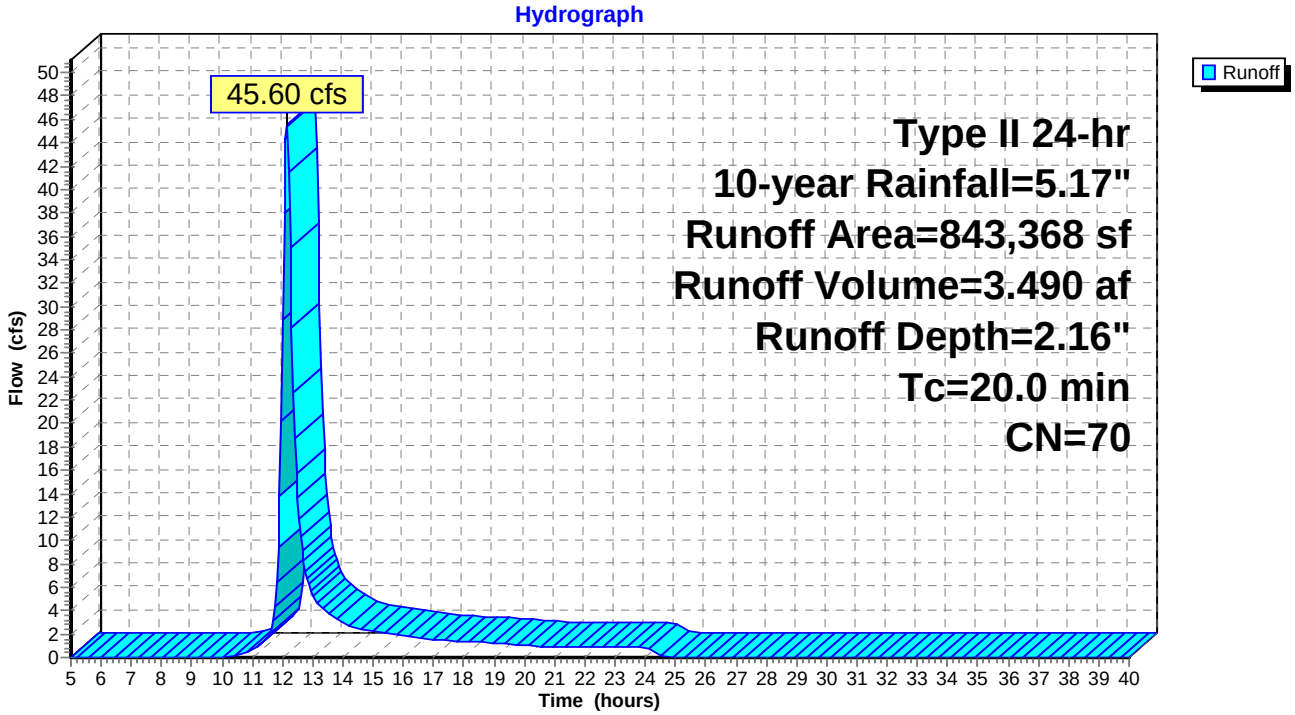
Runoff = 45.60 cfs @ 12.14 hrs, Volume= 3.490 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-year Rainfall=5.17"

Area (sf)	CN	Description
843,368	70	Woods, Good, HSG C
843,368		100.00% Pervious Area

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

Subcatchment 1S: Pre-Development



Summary for Pond 3P: BMP #13

Inflow Area = 19.361 ac, 49.88% Impervious, Inflow Depth = 3.63" for 10-year event
Inflow = 103.36 cfs @ 12.01 hrs, Volume= 5.850 af
Outflow = 39.25 cfs @ 12.17 hrs, Volume= 5.204 af, Atten= 62%, Lag= 9.5 min
Primary = 39.25 cfs @ 12.17 hrs, Volume= 5.204 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 418.23' @ 12.17 hrs Surf.Area= 30,152 sf Storage= 98,832 cf

Plug-Flow detention time= 162.2 min calculated for 5.197 af (89% of inflow)
Center-of-Mass det. time= 108.9 min (912.6 - 803.8)

Volume	Invert	Avail.Storage	Storage Description
#1	414.50'	155,196 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

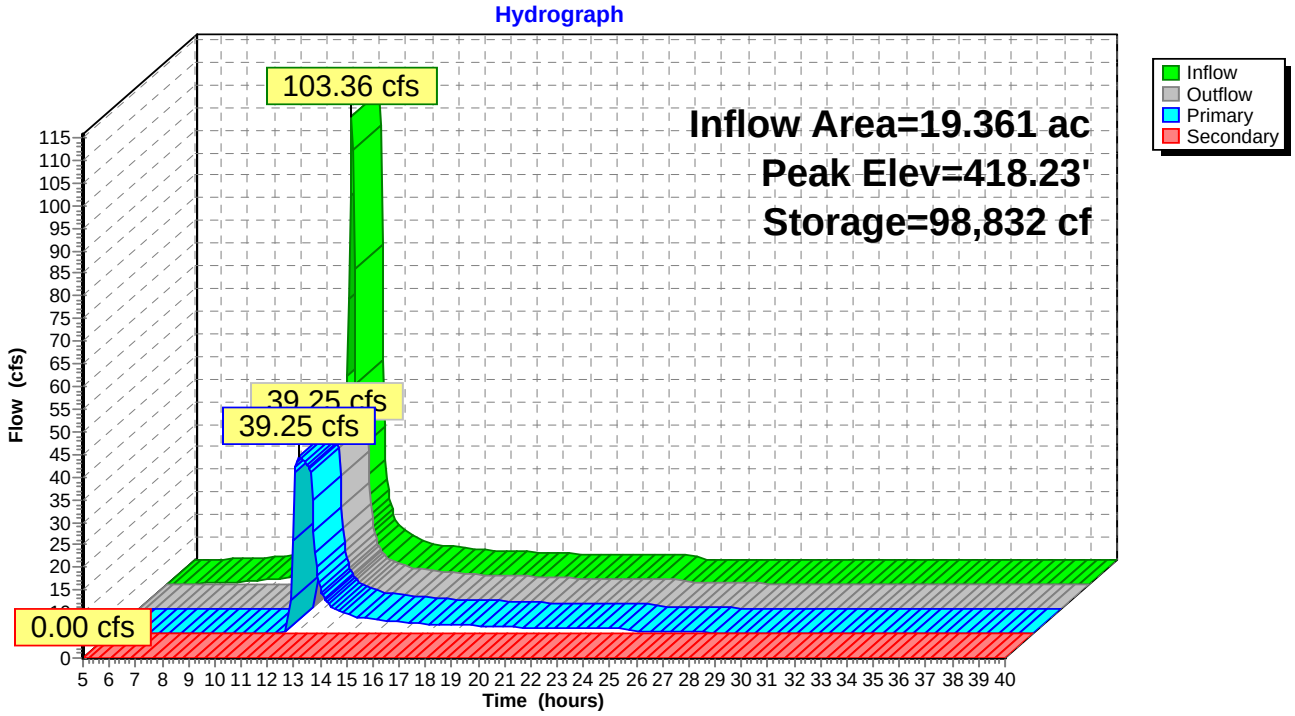
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.50	21,256	0	0
415.00	24,085	11,335	11,335
416.00	25,887	24,986	36,321
417.00	27,734	26,811	63,132
418.00	29,693	28,714	91,845
419.00	31,661	30,677	122,522
420.00	33,686	32,674	155,196

Device	Routing	Invert	Outlet Devices
#1	Primary	410.50'	**24.0" Round Culvert** L= 48.1' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 410.50' / 410.00' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	414.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	416.00'	**36.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.33'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	418.35'	**60.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=39.21 cfs @ 12.17 hrs HW=418.22' (Free Discharge)
└**1=Culvert** (Inlet Controls 39.21 cfs @ 12.48 fps)
  ├**2=Orifice/Grate** (Passes < 0.31 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 6.90 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 105.89 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=414.50' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: BMP #13



Summary for Subcatchment 1S: Pre-Development

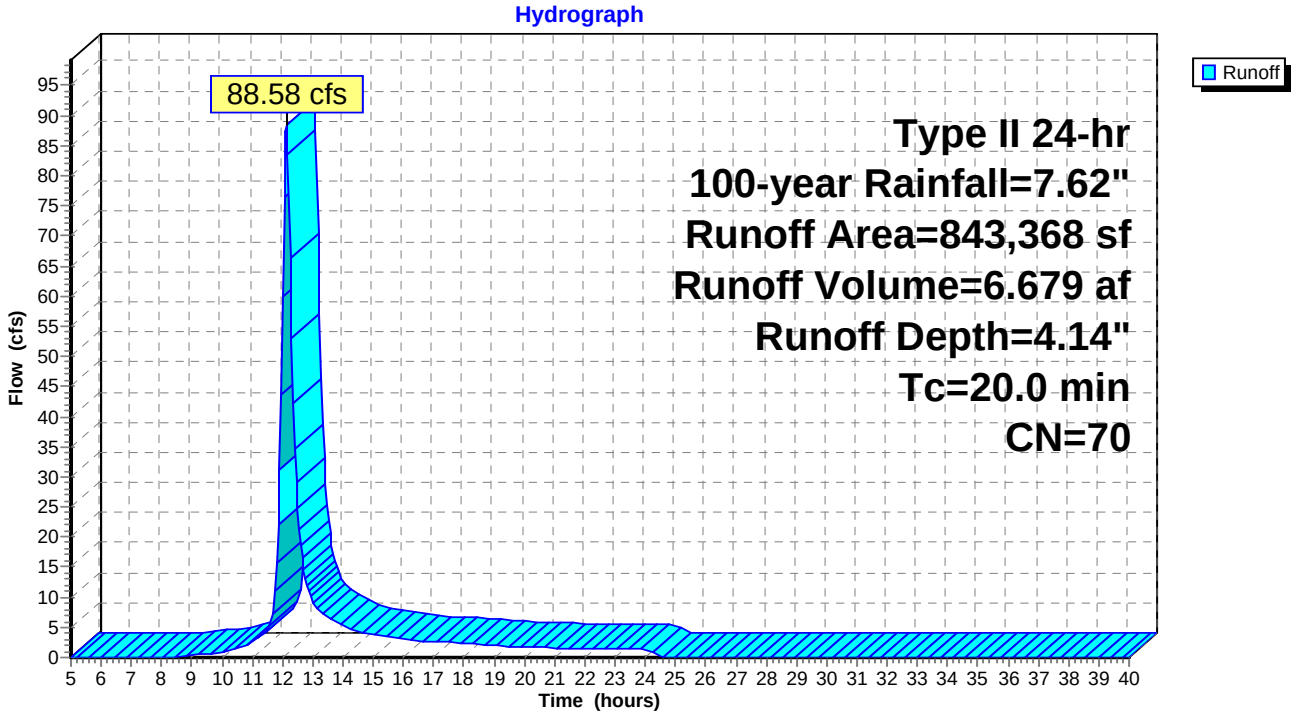
Runoff = 88.58 cfs @ 12.13 hrs, Volume= 6.679 af, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-year Rainfall=7.62"

Area (sf)	CN	Description
843,368	70	Woods, Good, HSG C
843,368		100.00% Pervious Area

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

Subcatchment 1S: Pre-Development



Summary for Pond 3P: BMP #13

[82] Warning: Early inflow requires earlier time span

Inflow Area = 19.361 ac, 49.88% Impervious, Inflow Depth > 5.95" for 100-year event
Inflow = 165.52 cfs @ 12.01 hrs, Volume= 9.605 af
Outflow = 132.44 cfs @ 12.08 hrs, Volume= 8.953 af, Atten= 20%, Lag= 4.3 min
Primary = 41.52 cfs @ 12.08 hrs, Volume= 7.652 af
Secondary = 90.92 cfs @ 12.08 hrs, Volume= 1.301 af

Routing by Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Peak Elev= 419.04' @ 12.08 hrs Surf.Area= 31,732 sf Storage= 123,634 cf

Plug-Flow detention time= 116.4 min calculated for 8.953 af (93% of inflow)
Center-of-Mass det. time= 78.6 min (869.3 - 790.7)

Volume	Invert	Avail.Storage	Storage Description
#1	414.50'	155,196 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

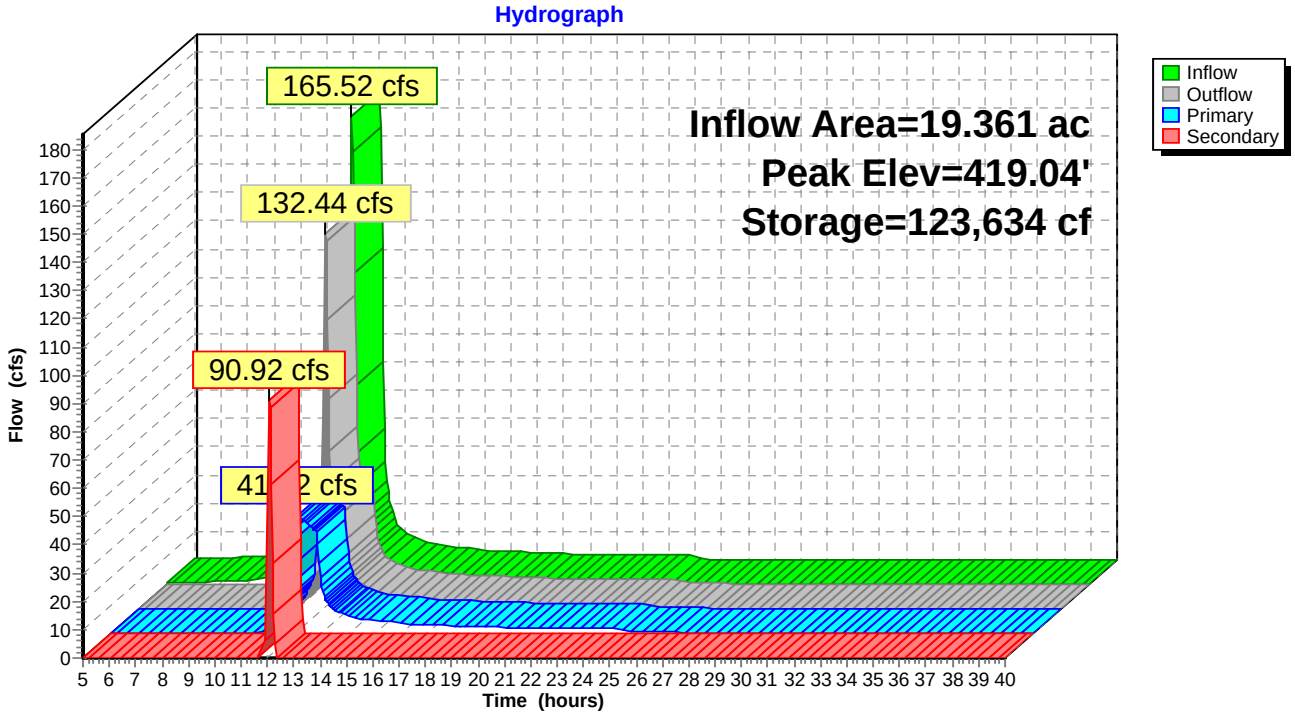
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
414.50	21,256	0	0
415.00	24,085	11,335	11,335
416.00	25,887	24,986	36,321
417.00	27,734	26,811	63,132
418.00	29,693	28,714	91,845
419.00	31,661	30,677	122,522
420.00	33,686	32,674	155,196

Device	Routing	Invert	Outlet Devices
#1	Primary	410.50'	**24.0" Round Culvert** L= 48.1' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 410.50' / 410.00' S= 0.0104 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	414.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	416.00'	**36.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	416.33'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	418.35'	**60.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=41.47 cfs @ 12.08 hrs HW=419.02' (Free Discharge)
└**1=Culvert** (Inlet Controls 41.47 cfs @ 13.20 fps)
  ├**2=Orifice/Grate** (Passes < 0.34 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 8.13 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 126.24 cfs potential flow)

Secondary OutFlow Max=87.24 cfs @ 12.08 hrs HW=419.02' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 87.24 cfs @ 2.19 fps)

Pond 3P: BMP #13



WATER QUALITY POND #13 CALCULATIONS

Project Name

Briar Chapel - BC South Pond #13

Project Number

02735-0092

Date
May 17, 2013

3rd revision
2nd revision
1st revision

Water Quality Pond Drainage Area Data

Project: Briar Chapel - BC South Pond #13
Project No.: 02735-0092

Date: May 17, 2013

Total site area: 843,368 square feet = 19.36 acres

Impervious areas	Drainage area to pond			Other Drainage Area	
	Existing [sf]	Proposed [sf]	Change [sf]	Existing [sf]	Proposed [sf]
On-site buildings (BUA)	0	221,275	221,275	0	0
On-site streets	0	87,204	87,204	0	0
On-site alleys	0	19,513	19,513	0	0
On-site sidewalks	0	21,178	21,178	0	0
On-site future (open space)	0	10,202	10,202	0	0
Off-site streets	0	0	0	0	0
5% Contingency	0	17,969	17,969	0	0
Linear Park Impervious	0	43,317	43,317	0	0
Total Impervious	0	420,658	420,658	0	0

Non-impervious areas	Drainage area to pond			Other Drainage Area	
	Existing [sf]	Proposed [sf]	Change [sf]	Existing [sf]	Proposed [sf]
On-site grass/landscape	0	422,710	422,710	0	0
On-site woods	732,077	0	-732,077	0	0
Other undeveloped	0	0	0	0	0
Total off-site non-impervious	0	0	0	0	0
Total non-impervious	732,077	422,710	-309,367	0	0

Total Drainage Area	843,368	843,368	0	3,167,850	3,167,850
Percent Impervious	0.0	49.9	49.9	0.0	0.0

Notes:

Water Quality Pond Surface Area Calculations

Project: Briar Chapel - BC South Pond #13
Project No.: 02735-0092

Date: May 17, 2013

Total on-site drainage area to pond	843,368	square feet
Total impervious area in drainage area	420,658	square feet

Average water depth of basin at normal pool: 4.0 feet

Location of site: Chatham County
Site region: Piedmont

% Impervious cover: 49.9 percent

If the site is in a coastal area, will a vegetative filter be used? n/a

Surface Area/Drainage Area Ratios:

For a site in the Piedmont (85%)	1.7	percent
For a site in the Piedmont (90%)	2.5	percent
For a site in a Coastal County w/ Vegetative Filter	3.3	percent
For a site in a Coastal County w/out Vegetative Filter	4.3	percent

Required surface area of pond:

For a site in the Piedmont (85%)	14,560.0	square feet
For a site in the Piedmont (90%)	21,040.0	square feet
For a site in a Coastal County w/ Vegetative Filter	27,760.0	square feet
For a site in a Coastal County w/out Vegetative Filter	36,190.0	square feet

Notes:

Water Quality Pond Stormwater Runoff Volume Calculations

Project	Briar Chapel - BC South Pond #13	
Project No.	02735-0092	
Date	May 17, 2013	
Drainage area	843,368	square feet
Impervious area	420,658	square feet
Rainfall depth	1.00	inches
Percent Impervious	49.9	percent

R(v)=0.05+0.009*(Percent impervious)

Runoff coefficient - R(v)	0.50	in/in

Runoff volume=(Design rainfall)*(R(v))*(Drainage area)

Runoff volume	35,063.4	cubic feet

Notes:

Water Quality Pond Volume Calculations
Stage-Storage Data for Pond - Temporary Pool

Project: Briar Chapel - BC South Pond #13
Project No.: 02735-0092

Date: May 17, 2013

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
414.5	0	21,256.0	0.488	21,256.0	0.5	0.0	0.0	0.0	0.0
415	0.5	24,084.9	0.553	2,828.9	0.1	11,335.2	0.3	11,335.2	0.3
416	1.5	25,887.0	0.594	1,802.1	0.0	24,985.9	0.6	36,321.2	0.8
417	2.5	27,734.0	0.637	1,847.0	0.0	26,810.5	0.6	63,131.7	1.2
418	3.5	29,693.0	0.682	1,959.0	0.0	28,713.5	0.7	91,845.2	1.3
419	4.5	31,661.0	0.727	1,968.0	0.0	30,677.0	0.7	122,522.2	1.4
420	5.5	33,685.9	0.773	2,024.9	0.0	32,673.4	0.8	155,195.6	1.5

Water Quality Pond Volume Calculations
Stage-Storage Data for Pond - Permanent Pool

Project: Briar Chapel - BC South Pond #13
Project No.: 02735-0092

Date: May 17, 2013

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
408	0	6,973.9	0.160	6,973.9	0.2	0.0	0.0	0.0	0.0
409	1	8,498.0	0.195	1,524.1	0.0	7,736.0	0.2	7,736.0	0.2
410	2	10,117.0	0.232	1,619.0	0.0	9,307.5	0.2	17,043.5	0.4
411	3	11,888.0	0.273	1,771.0	0.0	11,002.5	0.3	28,046.0	0.5
412	4	13,789.0	0.317	1,901.0	0.0	12,838.5	0.3	40,884.5	0.5
413	5	15,820.0	0.363	2,031.0	0.0	14,804.5	0.3	55,689.0	0.6
414	6	17,980.0	0.413	2,160.0	0.0	16,900.0	0.4	72,589.0	0.7
414.5	6.5	21,256.0	0.488	3,276.0	0.1	9,809.0	0.2	82,398.0	0.6

Water Quality Pond Volume Calculations
Stage-Storage Data for Pond - Forebays

Project: Briar Chapel - BC South Pond #13
Project No.: 02735-0092

Date: May 17, 2013

Contour ID	Stage	Area [sq. ft.]	Area [acres]	Incremental Area [sq. ft.]	Incremental Area [acres]	Incremental volume [cu. ft]	Incremental volume [acre-ft]	Cumulative volume [cu. ft]	Cumulative volume [acre-ft]
408	0	844.0	0.019	844.0	0.0	0.0	0.0	0.0	0.0
409	1	1,249.0	0.029	405.0	0.0	1,046.5	0.0	1,046.5	0.0
410	2	1,725.0	0.040	476.0	0.0	1,487.0	0.0	2,533.5	0.1
411	3	2,268.0	0.052	543.0	0.0	1,996.5	0.0	4,530.0	0.1
412	4	2,880.0	0.066	612.0	0.0	2,574.0	0.1	7,104.0	0.1
413	5	3,557.0	0.082	677.0	0.0	3,218.5	0.1	10,322.5	0.1
414	6	4,300.0	0.099	743.0	0.0	3,928.5	0.1	14,251.0	0.2
414.5	6.5	5,680.0	0.130	1,380.0	0.0	2,495.0	0.1	16,746.0	0.1

Water Quality Basin Dewatering Time Calculations

Project	Briar Chapel - BC South Pond #13
Project No.	02735-0092
Date	May 17, 2013

Maximum surface area of basin	25,887	square feet
Maximum head of water above dewatering hole	0.50	feet
Orifice coefficient	0.60	
Diameter of each hole	2.5	inches
Number of holes	1	
Cross sectional area of each hole =	0.034	square feet
Cross sectional area of each hole =	4.9	square inches
Cross sectional area of dewatering hole(s) =	0.034	square feet
Cross sectional area of dewatering hole(s) =	4.9	square inches
Dewatering time for basin =	62.0	hours
Dewatering time for basin =	2.58	days

Notes:

Water Quality Pond Summary Information

Project Briar Chapel - BC South Pond #13
Project No. 02735-0092

Date May 17, 2013

Drainage area to pond	843,368	square feet =	19.36	acres
Impervious area in drainage area	420,658	square feet =	9.66	acres

Bottom of pond elevation	408.00	feet
Normal pool elevation	414.50	feet
Pond volume at normal pool	82,398	cubic feet

Required volume for design rainfall	35,063	cubic feet
Required surface area for pond	21,040	square feet

Volume provided for storage of design rainfall = 36,321 cubic feet at elevation 416

Surface area provided at normal pool 21,256 square feet

OUTLET PROTECTION DESIGN	DATE: 5/17/2013	DESIGNED BY: DJB
PROJECT NAME: Briar Chapel - Phase 8 PROJECT LOCATION: Chatham County, NC	PROJECT NO: 02735-0092	CHECKED BY GCA

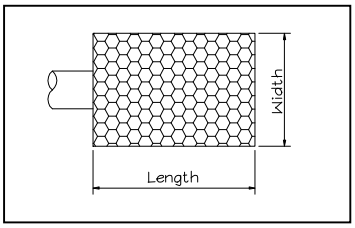
Storm Outlet Structure

Structure=	BMP #13 Out	
Size=	24	in
Q_{10} =	39.25	cfs
Qfull =	23.03	cfs
Vfull =	7.33	fps

Q_{10}/Qfull =	1.70	
V/Vfull =	MAX	
V =	#VALUE!	fps

From Fig. 8.06.b.1:

Zone = 6



D_{50}	=	14	in
D_{MAX}	=	21	in
Riprap Class	=	2	
Apron Thickness	=	36	in
Apron Length	=	20.0	ft
Apron Width = 3 x Dia	=	6.0	ft

ANTI-FLOATATION DESIGN	DATE: 5/17/2013	DESIGNED BY: GCA
PROJECT NAME: Briar Chapel Phase 8 PROJECT LOCATION: Chatham County, NC	PROJECT NO: 02735-0092	CHECKED BY: GML

Pond Name=	BMP #13				
Riser Outer Width =	5	ft	Riser Resisting Force =	8,546	lb
Riser Outer Length =	5	ft	Base Resisting Force =	11,025	lb
Riser Inner Width =	4	ft	Total Resisting Force =	19,571	lb
Riser Inner Length =	4	ft			
Riser Height =	6.33	ft	Riser Buoyant Force =	9,875	lb
			Base Buoyant Force =	4,586	lb
Concrete Base Length =	7	ft	Total Buoyant Force =	14,461	lb
Concrete Base Width =	7	ft			
Concrete Base Depth =	18	in	Factor of Safety	1.35	**Design Acceptable**

Permit No._____
(to be provided by DWQ)

III. REQUIRED ITEMS CHECKLIST

Please indicate the page or plan sheet numbers where the supporting documentation can be found. **An incomplete submittal package will result in a request for additional information. This will delay final review and approval of the project.** Initial in the space provided to indicate the following design requirements have been met. If the applicant has designated an agent, the agent may initial below. **If a requirement has not been met, attach justification.**

Initials	Page/ Plan Sheet No.	
GCA	C3.3-C3.4	1. Plans (1" - 50' or larger) of the entire site showing: - Design at ultimate build-out, - Off-site drainage (if applicable), - Delineated drainage basins (include Rational C coefficient per basin), - Basin dimensions, - Pretreatment system, - High flow bypass system, - Maintenance access, - Proposed drainage easement and public right of way (ROW), - Overflow device, and - Boundaries of drainage easement.
GCA	D4.1-D4.3	2. Partial plan (1" = 30' or larger) and details for the wet detention basin showing: - Outlet structure with trash rack or similar, - Maintenance access, - Permanent pool dimensions, - Forebay and main pond with hardened emergency spillway, - Basin cross-section, - Vegetation specification for planting shelf, and - Filter strip.
GCA	D4.1-D4.3	3. Section view of the wet detention basin (1" = 20' or larger) showing: - Side slopes, 3:1 or lower, - Pretreatment and treatment areas, and - Inlet and outlet structures.
GCA	N/A	4. If the basin is used for sediment and erosion control during construction, clean out of the basin is specified on the plans prior to use as a wet detention basin.
GCA	Calc Booklet	5. A table of elevations, areas, incremental volumes & accumulated volumes for overall pond and for forebay, to verify volume provided.
GCA	C3.1	6. A construction sequence that shows how the wet detention basin will be protected from sediment until the entire drainage area is stabilized.
GCA	Calc Booklet	7. The supporting calculations.
GCA	Included	8. A copy of the signed and notarized operation and maintenance (O&M) agreement.
GCA	Included	9. A copy of the deed restrictions (if required).
_____	N/A	10. A soils report that is based upon an actual field investigation, soil borings, and infiltration tests. County soil maps are not an acceptable source of soils information.

Permit No._____
(to be provided by DWQ)

Red triangles at the upper right hand corner indicate design comments
Please complete the yellow shaded items.

NCDENR

DIVISION OF WATER QUALITY DWQ

STORMWATER MANAGEMENT PERMIT APPLICATION FORM
401 CERTIFICATION APPLICATION FORM

WET DETENTION BASIN SUPPLEMENT

This form must be filled out, printed and submitted.
The Required Items Checklist (Part III) must be printed, filled out and submitted along with all of the required information.

I. PROJECT INFORMATION

Project name	Briar Chapel Development - Great Ridge Parkway Extension
Contact person	Gareth Avant, PE
Phone number	919.233.8091
Date	17-May-2012
Drainage area number	1 - Wet Pond #13

II. DESIGN INFORMATION

Site Characteristics			
Drainage area	843,368	ft^2	
Impervious area, post-development	420,658	ft^2	
% impervious	49.88	%	
Design rainfall depth	1.0	in	
Storage Volume: Non-SA Waters			
Minimum volume required	35,063	ft^3	OK
Volume provided	36,321	ft^3	OK, volume provided is equal to or in excess of volume required.
Storage Volume: SA Waters			
1.5" runoff volume		ft^3	
Pre-development 1-yr, 24-hr runoff		ft^3	
Post-development 1-yr, 24-hr runoff		ft^3	
Minimum volume required		ft^3	
Volume provided		ft^3	
Peak Flow Calculations			
Is the pre/post control of the 1yr 24hr storm peak flow required?	Y	(Y or N)	
1-yr, 24-hr rainfall depth	3.0	in	
Rational C, pre-development	0.40	(unitless)	
Rational C, post-development	0.86	(unitless)	
Rainfall intensity: 1-yr, 24-hr storm	0.12	in/hr	Insufficient. Check intensity calculation.
Pre-development 1-yr, 24-hr peak flow	12.87	ft^3/sec	
Post-development 1-yr, 24-hr peak flow	47.65	ft^3/sec	
Pre/Post 1-yr, 24-hr peak flow control	34.78	ft^3/sec	
Elevations			
Temporary pool elevation	418.00	fmsl	
Permanent pool elevation	414.50	fmsl	
SHWT elevation (approx. at the perm. pool elevation)		fmsl	
Top of 10ft vegetated shelf elevation	415.00	fmsl	
Bottom of 10ft vegetated shelf elevation	414.00	fmsl	Data not needed for calculation option #1, but OK if provided.
Sediment cleanout, top elevation (bottom of pond)	409.00	fmsl	
Sediment cleanout, bottom elevation	408.00	fmsl	Data not needed for calculation option #1, but OK if provided.
Sediment storage provided	1.00	ft	
Is there additional volume stored above the state-required temp. pool?	N	(Y or N)	
Elevation of the top of the additional volume		fmsl	

Permit No._____
(to be provided by DWQ)

II. DESIGN INFORMATION

Surface Areas			
Area, temporary pool	25,887	ft^2	
Area REQUIRED, permanent pool	21,084	ft^2	
SA/DA ratio	2.50	(unitless)	
Area PROVIDED, permanent pool, A_{perm_pool}	21,256	ft^2	OK
Area, bottom of 10ft vegetated shelf, A_{bot_shelf}	17,980	ft^2	
Area, sediment cleanout, top elevation (bottom of pond), A_{bot_pond}	8,498	ft^2	
Volumes			
Volume, temporary pool	36,321	ft^3	OK
Volume, permanent pool, V_{perm_pool}	82,398	ft^3	
Volume, forebay (sum of forebays if more than one forebay)	16,746	ft^3	
Forebay % of permanent pool volume	20.3%	%	OK
SA/DA Table Data			
Design TSS removal	90	%	
Coastal SA/DA Table Used?	N	(Y or N)	
Mountain/Piedmont SA/DA Table Used?	Y	(Y or N)	
SA/DA ratio	2.50	(unitless)	
Average depth (used in SA/DA table):			
Calculation option 1 used? (See Figure 10-2b)	Y	(Y or N)	
Volume, permanent pool, V_{perm_pool}	82,398	ft^3	
Area provided, permanent pool, A_{perm_pool}	21,256	ft^2	
Average depth calculated	3.88	ft	OK
Average depth used in SA/DA, d_{av}, (Round to nearest 0.5ft)	4.0	ft	OK
Calculation option 2 used? (See Figure 10-2b)	N	(Y or N)	
Area provided, permanent pool, A_{perm_pool}	21,256	ft^2	
Area, bottom of 10ft vegetated shelf, A_{bot_shelf}	17,980	ft^2	
Area, sediment cleanout, top elevation (bottom of pond), A_{bot_pond}	8,498	ft^2	
"Depth" (distance b/w bottom of 10ft shelf and top of sediment)	5.00	ft	
Average depth calculated		ft	
Average depth used in SA/DA, d_{av}, (Round to nearest 0.5ft)		ft	
Drawdown Calculations			
Drawdown through orifice?	Y	(Y or N)	
Diameter of orifice (if circular)	2.50	in	
Area of orifice (if-non-circular)		in^2	
Coefficient of discharge (C_D)	0.60	(unitless)	
Driving head (H_o)	0.50	ft	
Drawdown through weir?	N	(Y or N)	
Weir type		(unitless)	
Coefficient of discharge (C_w)		(unitless)	
Length of weir (L)		ft	
Driving head (H)		ft	
Pre-development 1-yr, 24-hr peak flow	12.87	ft^3/sec	
Post-development 1-yr, 24-hr peak flow	12.27	ft^3/sec	
Storage volume discharge rate (through discharge orifice or weir)	0.45	ft^3/sec	
Storage volume drawdown time	2.58	days	OK, draws down in 2-5 days.
Additional Information			
Vegetated side slopes	3	:1	OK
Vegetated shelf slope	10	:1	OK
Vegetated shelf width	10.0	ft	OK
Length of flowpath to width ratio	3	:1	OK
Length to width ratio	1.5	:1	OK
Trash rack for overflow & orifice?	Y	(Y or N)	OK
Freeboard provided	1.0	ft	OK
Vegetated filter provided?	N	(Y or N)	OK
Recorded drainage easement provided?	Y	(Y or N)	OK
Capures all runoff at ultimate build-out?	Y	(Y or N)	OK
Drain mechanism for maintenance or emergencies is:	8" DIP with gate valve		

Permit Number:_____
(to be provided by DWQ)
Drainage Area Number:_____

Wet Detention Basin Operation and Maintenance Agreement

I will keep a maintenance record on this BMP. This maintenance record will be kept in a log in a known set location. Any deficient BMP elements noted in the inspection will be corrected, repaired or replaced immediately. These deficiencies can affect the integrity of structures, safety of the public, and the removal efficiency of the BMP.

The wet detention basin system is defined as the wet detention basin, pretreatment including forebays and the vegetated filter if one is provided.

This system (*check one*):
☐ **does** ☒ **does not** **incorporate a vegetated filter at the outlet.**

This system (*check one*):
☐ **does** ☒ **does not** **incorporate pretreatment other than a forebay.**

Important maintenance procedures:

- Immediately after the wet detention basin is established, the plants on the vegetated shelf and perimeter of the basin should be watered twice weekly if needed, until the plants become established (commonly six weeks).
- No portion of the wet detention pond should be fertilized after the first initial fertilization that is required to establish the plants on the vegetated shelf.
- Stable groundcover should be maintained in the drainage area to reduce the sediment load to the wet detention basin.
- If the basin must be drained for an emergency or to perform maintenance, the flushing of sediment through the emergency drain should be minimized to the maximum extent practical.
- Once a year, a dam safety expert should inspect the embankment.

After the wet detention pond is established, it should be inspected **once a month and within 24 hours after every storm event greater than 1.0 inches (or 1.5 inches if in a Coastal County)**. Records of operation and maintenance should be kept in a known set location and must be available upon request.

Inspection activities shall be performed as follows. Any problems that are found shall be repaired immediately.

BMP element:	Potential problem:	How I will remediate the problem:
The entire BMP	Trash/debris is present.	Remove the trash/debris.
The perimeter of the wet detention basin	Areas of bare soil and/or erosive gullies have formed.	Regrade the soil if necessary to remove the gully, and then plant a ground cover and water until it is established. Provide lime and a one-time fertilizer application.
	Vegetation is too short or too long.	Maintain vegetation at a height of approximately six inches.

Permit Number:_____
(to be provided by DWQ)
Drainage Area Number:_____

BMP element:	Potential problem:	How I will remediate the problem:
The inlet device: pipe or swale	The pipe is clogged.	Unclog the pipe. Dispose of the sediment off-site.
	The pipe is cracked or otherwise damaged.	Replace the pipe.
	Erosion is occurring in the swale.	Regrade the swale if necessary to smooth it over and provide erosion control devices such as reinforced turf matting or riprap to avoid future problems with erosion.
The forebay	Sediment has accumulated to a depth greater than the original design depth for sediment storage.	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
	Erosion has occurred.	Provide additional erosion protection such as reinforced turf matting or riprap if needed to prevent future erosion problems.
	Weeds are present.	Remove the weeds, preferably by hand. If pesticide is used, wipe it on the plants rather than spraying.
The vegetated shelf	Best professional practices show that pruning is needed to maintain optimal plant health.	Prune according to best professional practices
	Plants are dead, diseased or dying.	Determine the source of the problem: soils, hydrology, disease, etc. Remedy the problem and replace plants. Provide a one-time fertilizer application to establish the ground cover if a soil test indicates it is necessary.
	Weeds are present.	Remove the weeds, preferably by hand. If pesticide is used, wipe it on the plants rather than spraying.
The main treatment area	Sediment has accumulated to a depth greater than the original design sediment storage depth.	Search for the source of the sediment and remedy the problem if possible. Remove the sediment and dispose of it in a location where it will not cause impacts to streams or the BMP.
	Algal growth covers over 50% of the area.	Consult a professional to remove and control the algal growth.
	Cattails, phragmites or other invasive plants cover 50% of the basin surface.	Remove the plants by wiping them with pesticide (do not spray).

Permit Number:_____
(to be provided by DWQ)
Drainage Area Number:_____

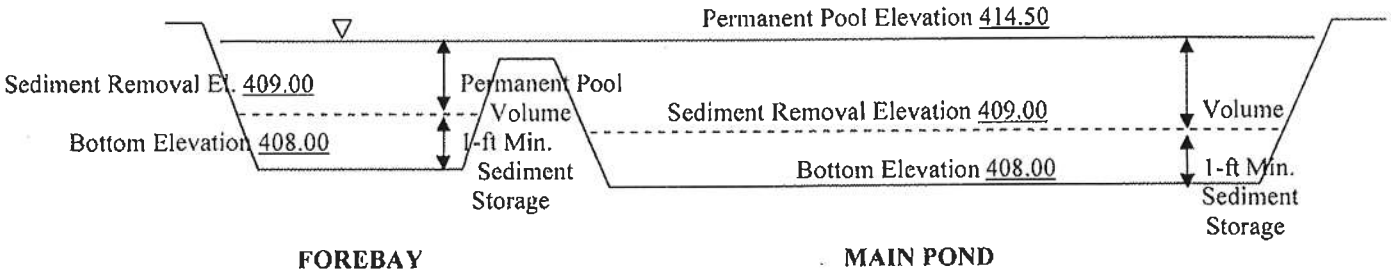
BMP element:	Potential problem:	How I will remediate the problem:
The embankment	Shrubs have started to grow on the embankment.	Remove shrubs immediately.
	Evidence of muskrat or beaver activity is present.	Use traps to remove muskrats and consult a professional to remove beavers.
	A tree has started to grow on the embankment.	Consult a dam safety specialist to remove the tree.
	An annual inspection by an appropriate professional shows that the embankment needs repair. (if applicable)	Make all needed repairs.
The outlet device	Clogging has occurred.	Clean out the outlet device. Dispose of the sediment off-site.
	The outlet device is damaged	Repair or replace the outlet device.
The receiving water	Erosion or other signs of damage have occurred at the outlet.	Contact the local NC Division of Water Quality Regional Office, or the 401 Oversight Unit at 919-733-1786.

The measuring device used to determine the sediment elevation shall be such that it will give an accurate depth reading and not readily penetrate into accumulated sediments.

When the permanent pool depth reads _3.50_ feet in the main pond, the sediment shall be removed.

When the permanent pool depth reads _3.50_ feet in the forebay, the sediment shall be removed.

BASIN DIAGRAM
(fill in the blanks)



Permit Number: _____
(to be provided by DWQ)

I acknowledge and agree by my signature below that I am responsible for the performance of the maintenance procedures listed above. I agree to notify DWQ of any problems with the system or prior to any changes to the system or responsible party.

Project name: Briar Chapel - Phase 8

BMP drainage area number: 1 - Wet Detention Pond #13

Print name: Kevin Graham

Title: Vice President, Operations

Address: 16 Windy Knoll Circle, Chapel Hill, NC 27516

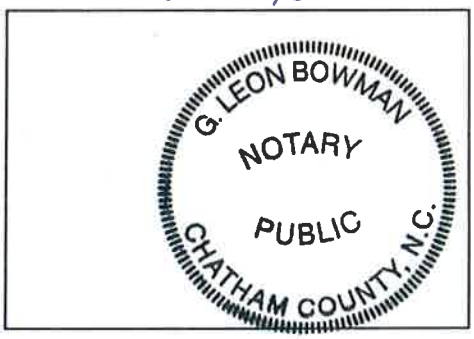
Phone: (919) 951-0709

Signature: Kevin Graham

Date: 5/16/13

Note: The legally responsible party should not be a homeowners association unless more than 50% of the lots have been sold and a resident of the subdivision has been named the president.

I, G. Leon Bowman, a Notary Public for the State of North Carolina, County of Chatham, do hereby certify that Kevin Graham personally appeared before me this 16th day of May, 2013, and acknowledge the due execution of the forgoing wet detention basin maintenance requirements. Witness my hand and official seal, G Leon Bowman



SEAL

My commission expires 9/10/14

North Carolina Department of Environment and Natural Resources
Division of Water Quality
Thomas A. Reeder
Acting Director

Pat McCrory
Governor

John E. Skvarla, III
Secretary

June 27, 2013

DWQ Project # 05-0732v27
Chatham County

Mr. Bill Mumford, Assistant Vice President
NNP – Briar Chapel LLC
16 Windy Knoll Circle
Chapel Hill, NC 27516

Subject Property: **Briar Chapel, Phase 8**

APPROVAL OF MODIFIED STORMWATER PLAN

Dear Mr. Mumford:

On January 11, 2008, the Division of Water Quality (DWQ) issued a revised 401 Water Quality Certification to temporarily impact 339 linear feet of stream and 0.157 acre of 404 wetlands and to permanently impact 1,666 linear feet of stream and 0.159 acre of 404 wetland in order to construct the Briar Chapel Subdivision in Chatham County.

In order to meet Condition 10 of the 401 Certification for this project, a stormwater management plan (SMP) for Phase 8 of Briar Chapel, dated May 21, 2013, was received on May 23, 2013.

This approval is for the purpose and design that you described in your application. If you change your project, you must notify us and you may be required to send us a new SMP. This approval requires to you follow the conditions listed in the General Water Quality Certification for the project and the following additional conditions listed below:

1. The SMP approved by the DWQ consists of one (1) wet detention pond and all associated stormwater conveyances, inlet and outlet structures, and the grading and drainage patterns depicted on plan sheets dated May 21, 2013. The plans and specifications for Phase 8 approved by DWQ are incorporated by reference into this approval and are enforceable by DWQ provided however that any modification of the design for the stormwater management system that is accepted by DWQ shall take precedence over the original plans and specifications.

2. The maximum allowable drainage area for the approved wet detention pond shall be 843,368 square feet and the maximum allowable built-upon area shall be 420,658 square feet. Any changes to these maximum areas shall require the applicant to submit and receive approval for a revised stormwater management plan by the DWQ.

Wetlands, Buffers, Stormwater, Compliance and Permitting unit (WBSCP)
1650 Mail Service Center, Raleigh, North Carolina 27699-1650
Location: 512 N Salisbury Street Floor 9, Raleigh, North Carolina 27604-1170
Phone: 919-807-6300/Fax: 919-807-6494
Internet: www.ncwaterquality.org

3. The footprint of all stormwater management devices as well as an additional 10-foot wide area on all sides of the devices shall be located in either public rights-of-way, dedicated common areas or recorded easement areas. The final plats for the project showing all such rights-of-way, common areas and easement areas shall be in accordance with the approved plans.

4. Maintenance activities for the level spreaders shall be performed in accordance with the notarized O&M agreements signed by Kevin Graham (Vice President, Operations) on May 16, 2013. The O&M agreement must transfer with the sale of the land or transfer of ownership/responsibility for the BMP facility. DWQ must be notified promptly of every transfer.

5. The applicant and/or authorized agent shall provide a completed Certificate of Completion form to the DWQ within thirty (30) days of project completion (available at http://portal.ncdenr.org/web/wq/swp/ws/401/certsandpermits/apply/forms).

Thank you for your attention to this matter. If you have any questions or wish to discuss these matters further, please do not hesitate to contact me at (919) 807-6381.

Sincerely,

Annette Lucas, P.E.
Wetlands, Buffers and Stormwater Compliance and Permitting (Webscape) Unit

AML/aml

Cc: Becky Fox, EPA
USACE, Raleigh
Cherri Smith, DWQ Raleigh Regional Office
Chatham County Public Works Dept., P.O. Box 1550, Pittsboro, NC 27312
File Copy

Filename: 050732v27BriarChapelPhase8(Chatham)_SW_Mod_Approve.doc