STORMWATER IMPACT ANALYSIS

ARDEN SENIOR LIVING CENTER / SPEC-23422 / DECEMBER 2023

McAdams

ARDEN SENIOR LIVING CENTER

ROLESVILLE, NORTH CAROLINA

PRELIMINARY STORMWATER IMPACT ANALYSIS

SITE PLAN

PLANNING #: TBD

PROJECT NUMBER:	SPEC-23422
DESIGNED BY:	ASHLEY ABBOTT, PE
DATE:	DECEMBER 2023

MCADAMS

2905 MERIDIAN PARKWAY
DURHAM, NORTH CAROLINA 27713
NC LIC. # C-0293

ARDEN SENIOR LIVING CENTER

Stormwater Impact Analysis

GENERAL DESCRIPTION

Arden Senior Living Center is a proposed residential development in Rolesville, North Carolina, located between Burlington Mills Road and S Main Street. The development is approximately 10 acres. The proposed development on this site consists of the construction of 28 townhome units, 136 apartment units, along with roadways, sidewalks and trails, utilities, one stormwater control measure, and other supporting infrastructure.

The project site is located in the Neuse River Basin, and drains to Milburnie Lake (Milburnie Creek) (BIMS # 27-31) and is classified as C;NSW. Per Town of Rolesville regulations, stormwater management on this site shall meet the stormwater management performance standards for development set forth in the Rolesville Unified Development Ordinance Article 7, Section 7.5.4 – Standards.

The regulations are as follows:

(A) Standards Based on Project Density

(1) **Development Standards for High-Density Projects** High-Density Projects shall implement stormwater control measures that comply with each of the following standards, in addition to the General Standards found in subsection B of this Section:

(a) The measures shall control and treat runoff from the first inch of rain. Runoff volume drawdown time shall be a minimum of 48 hours, but not more than 120 hours.

(b) All structural stormwater treatment systems used to meet these requirements shall be designed to have a minimum of 85 percent average annual removal for Total Suspended Solids (TSS).

(c) All Development and Redevelopment projects required to manage storm water shall provide permanent on-site BMPs to lower the nitrogen export amounts as part of the storm water management plan. BMPs are to be in accordance with and as specified in the Design Manual.

(d) Structural and Non-structural BMPs shall be used to ensure there is no net increase in peak flow leaving the site from the pre-Development conditions for the one-year, 24-hour storm. Runoff volume drawdown time shall be a minimum of 48 hours, but not more than 120 hours.

(e) General engineering design criteria for all projects shall be in accordance with 15A NCAC 2H .1008(c), as explained in the Design Manual;

(f) All Development and Redevelopment shall be located outside the Riparian Buffer Zone and the Flood Protection Zone. These Zones shall be in accordance with the following provisions:

i. Except where other applicable buffer standards are more restrictive, the Riparian Buffer Zone shall extend a minimum of 50 feet landward of all Perennial and Intermittent Surface Waters. The most restrictive standards shall apply.

ii. The Riparian Buffer Zone shall remain undisturbed unless otherwise permitted by this section.

iii. The Flood Protection Zone shall extend throughout the FEMA 100-year floodplain as identified on the current Flood Insurance Rate Map (FIRM) published by FEMA. The Flood Protection Zone shall remain undisturbed unless otherwise permitted by this section.

iv. No Development or Redevelopment is permitted within the Riparian Buffer Zone or the Flood Protection Zone except for stream bank or shoreline restoration or stabilization, water dependent structures, and public or private projects such as road crossings and installations, utility crossings and installations, and greenways, where no practical alternatives exist.

v. Permitted activities within the Riparian Buffer Zone and the Flood Protection Zone shall minimize impervious coverage, direct runoff away from surface waters to achieve diffuse flow, and maximize the utilization of Non-structural BMPs.

vi. Where the Riparian Buffer Zone and the Flood Protection Zone both are present adjacent to surface waters, the more restrictive shall apply.

(g) The approval of the stormwater permit shall require an enforceable restriction on property usage that runs with the land, such as recorded deed restrictions or protective covenants, to ensure that future Development and Redevelopment maintains the site consistent with the approved project plans. Buffer widths and locations shall be clearly delineated on all plans, final plat, and as-builts.

(B) General Standards

(1) Downstream Impact Analysis The downstream impact analysis must be performed in accordance with the "ten percent rule," and a copy of the analysis must be provided with the permit application. The purpose of the downstream impact analysis is to determine if the project will cause any impacts on flooding or channel degradation downstream of the project site. The analysis must include the assumptions, results and supporting calculations to show safe passage of post-Development design flows downstream. This analysis shall be performed at the outlet(s) of the site, and downstream at each tributary junction to the point(s) in the conveyance system where the area of the portion of the site draining into the system is less than or equal to ten percent of the total drainage area above that point.

(2) Standards for Stormwater Control Measures

(a) Evaluation According to Contents of Design Manual All stormwater control measures and stormwater treatment practices (or BMPs) required under this ordinance shall be evaluated by the Stormwater Administrator according to the policies, criteria, and information, including technical specifications and standards and the specific design criteria for each stormwater practice, in the Design Manual. The Stormwater Administrator shall determine whether proposed BMPs will be adequate to meet the requirements of this ordinance.

(b) Determination of Adequacy; Presumptions and Alternatives Stormwater treatment practices that are designed, constructed, and maintained in accordance with the criteria and specifications in the Design Manual will be presumed to meet the minimum water quality and quantity performance standards of this ordinance. Whenever an applicant proposes to utilize a practice or practices not designed and constructed in accordance with the criteria and specifications in the Design Manual, the applicant shall have the burden of demonstrating that the practice(s) will satisfy the minimum water quality and quantity performance standards of this ordinance. The Stormwater Administrator may require the applicant to provide the documentation, calculations, and examples necessary for the Stormwater Administrator to determine whether such an affirmative showing is made.

(c) Separation from Seasonal High Water Table For BMPs that require a separation from the seasonal high-water table, the separation shall be provided by at least 12 inches of naturally occurring soil above the seasonal high-water table.

To meet the above Town of Rolesville standards, one stormwater control measure (SCM) has been proposed.

CALCULATION METHODOLOGY

- Rainfall data for this area in the Rolesville, NC region is from NOAA Atlas 14. This data contains a depth-duration-frequency (DDF) table describing rainfall depth versus time for varying return periods in the area. These rainfall depths are input into the meteorological model within PondPack for peak flow rate calculations. Please reference the precipitation information within the Miscellaneous Site Information section of this report for additional information.

- Using Web Soil Survey, the on-site soils were determined to be hydrologic soil group (HSG) 'B' and 'C' soils. Since the method chosen to compute pre- and post-development peak flow rates and runoff volumes is dependent upon the soil type, care was taken when selecting the appropriate Soil Conservation Service Curve Number (SCS CN).

- Soil Conservation Service Curve Numbers (SCS CN) were selected from Table 2 of the USDA TR-55 for the land use that is most similar to the zoning type or cover condition.

- Land cover conditions for the pre-development condition were taken from aerial imagery for the site and survey information from Pennoni on October 6th, 2022. Land cover conditions for the post-development condition were taken from the proposed layout. Offsite cover conditions were based on aerial imagery.

- The time of concentration was calculated using SCS TR-55 (Segmental Approach, 1986). The Tc flow path can be divided into three segments: overland flow, concentrated flow, and channel flow. The travel time was then computed for each segment, from which the overall time of concentration was determined by taking the sum of each segmental time.

- Existing topographic information used in this analysis is from best available GIS sources and survey information from Pennoni on October 6th, 2022.

- PondPack Version 10.02 was used in determining the pre- & post-development peak flow rates for the 1-, 10- and 100-year storm events, as well as routing calculations for the proposed stormwater control measures.

To meet the above Town of Rolesville standards, one stormwater control measure (SCM) has been proposed.

DISCUSSION OF RESULTS

PEAK RUNOFF CONTROL REQUIREMENTS

As shown in the Summary of Results section of this SIA, the proposed stormwater control measures provide the necessary peak runoff control for the proposed build-out condition of the development such that there are no calculated increases in the 1- and 10-year storm events at any point of analysis leaving the site.

POLLUTANT AND NUTRIENT CONTROL REQUIREMENTS

The proposed SCM is designed to meet 85% TSS removal and therefore, the proposed development is designed to meet TSS removal requirements.

CONCLUSION

If the development on this tract is built as proposed within this report, then the requirements set forth in Town of Rolesville regulations will be met without additional stormwater management facilities. However, modifications to the proposed development may require that this analysis be revised. Some modifications that would require this analysis to be revised include:

1. The proposed site impervious surface exceeds the amount accounted for in this report.
2. The post-development watershed breaks change significantly from those used to prepare this report.

The above modifications may result in the assumptions within this report becoming invalid. The computations within this report will need to be revisited if any of the above conditions become apparent as development of the proposed site moves forward.

RELEASE RATE MANAGEMENT RESULTS

POINT OF ANALYSIS #1			
Return Period	**Pre-Dev** [cfs]	**Post-Dev** [cfs]	**% Increase** [%]
1-Year	3.81	1.89	-50%
10-Year	12.04	11.46	-5%

SUMMARY OF RESULTS

Wet Pond A

STORMWATER CONTROL MEASURE 'A' SUMMARY

Design Drainage Area =	10.96	ac
Design Impervious Area =	6.33	ac
% Impervious =	57.7%	
Top of Dam =	382.00	ft
NWSE =	375.50	ft
Average Depth =	3.92	ft
WQv Ponding Elevation =	377.25	ft
Required Main Pool Surface Area =	8,287	sf
Provided Main Pool Surface Area =	8,539	sf
WQv Orifice Diameter =	2.50	in
WQv Orifice Invert Elevation =	375.50	ft
Riser Size =	5' x 5'	
Riser Crest =	380.20	ft
Number of Orifices =	1	
Orifice Invert Elevation =	379.00	ft
Orifice Dimensions =	3.5'H x 0.5'V	
Barrel Diameter =	30	in
# of Barrels =	1	
Upstream Invert =	374.50	ft
Downstream Invert =	374.00	ft
Length =	80	ft
Slope =	0.0063	ft/ft

STORMWATER CONTROL MEASURE ROUTING RESULTS

Return Period	Inflow [cfs]	Outflow [cfs]	Max. WSE [ft]	Freeboard [ft]
1-Year	28.86	0.29	378.82	3.18
10-Year	56.51	9.63	380.24	1.76
100-Year	79.96	49.28	380.98	1.02

1	MISCELLANEOUS SITE INFORMATION
2	PRE-DEVELOPMENT HYDROLOGIC CALCULATIONS
3	POST-DEVELOPMENT HYDROLOGIC CALCULATIONS
4	STORMWATER CONTROL MEASURE 'A' DESIGN CALCULATIONS
5	NUTRIENT LOADING CALCULATIONS

MISCELLANEOUS SITE INFORMATION

N

0 500 1,000 2,000 Feet

1" = 1,000'

ARDEN SENIOR LIVING CENTER

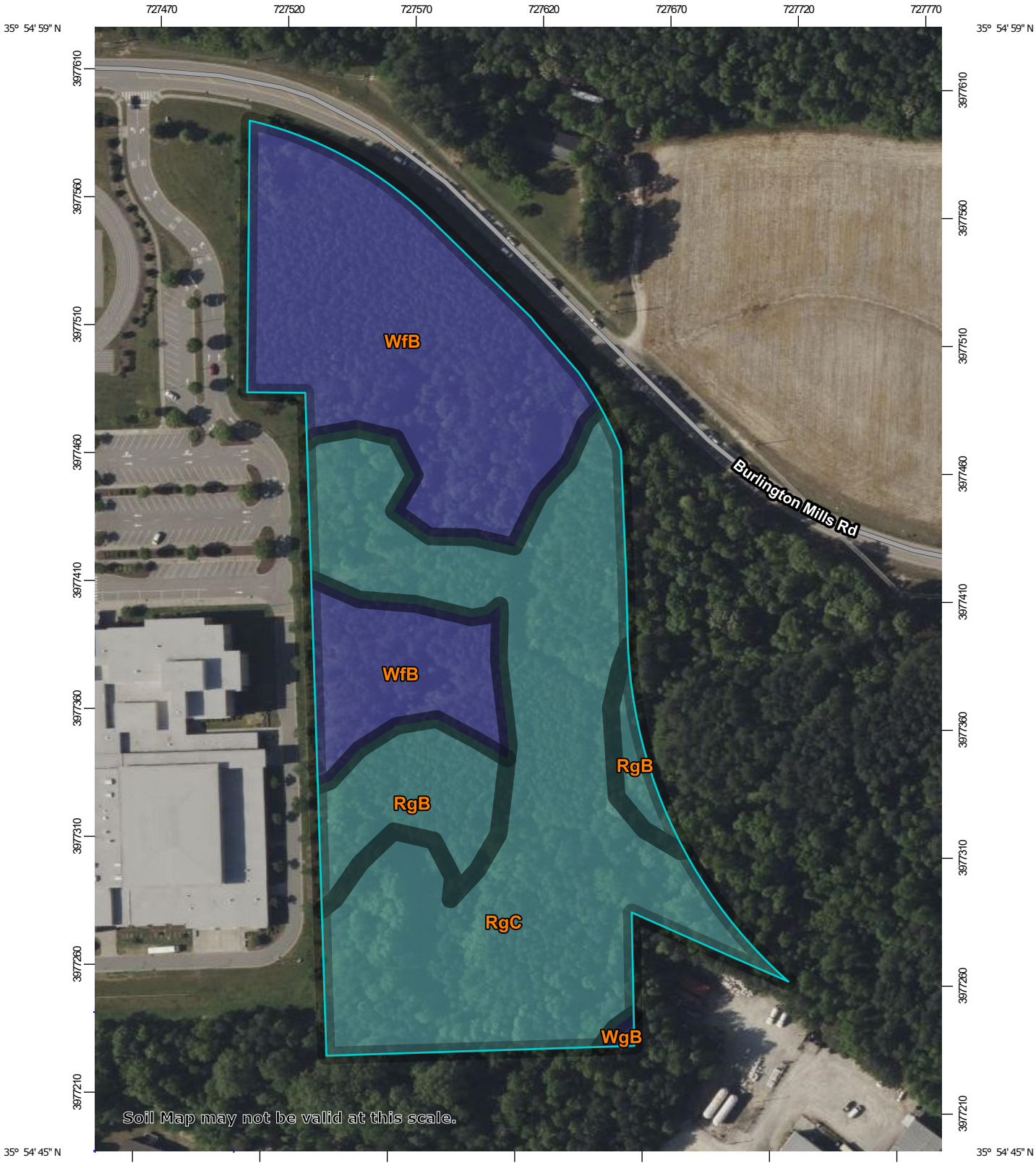
SITE AERIAL MAP

PROJECT #: SPEC-23422

TOWN OF ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

McADAMS

Hydrologic Soil Group—Wake County, North Carolina
(Soils-Property)



Map Scale: 1:2,140 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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:
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: Wake County, North Carolina
Survey Area Data: Version 25, Oct 2, 2023

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

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	C	1.0	9.9%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	C	5.2	49.5%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	B	4.2	40.3%
WgB	Wedowee-Urban land complex, 2 to 6 percent slopes	B	0.0	0.2%
Totals for Area of Interest			**10.4**	**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

Hydrologic Soil Group—Wake County, North Carolina
(Post DA)

Map Scale: 1:2,160 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

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Area of Interest (AOI)

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Soil Rating Polygons

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B
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C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RgB	Rawlings-Rion complex, 2 to 6 percent slopes	C	2.7	19.5%
RgC	Rawlings-Rion complex, 6 to 10 percent slopes	C	6.0	44.1%
Ur	Urban land		0.1	0.6%
WfB	Wedowee-Saw complex, 2 to 6 percent slopes	B	4.8	35.2%
WgB	Wedowee-Urban land complex, 2 to 6 percent slopes	B	0.1	0.6%
Totals for Area of Interest			**13.7**	**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:

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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

Name of Stream	Subbasin	Stream Index Number	Map Number	Class
Middle Bay	NEU13	27-154	F32SE9	SA;HQW,NSW
Middle Canal	NEU10	27-112-1-1-1-1	H31SW1	C;Sw,NSW
Middle Creek	NEU03	27-43-15-(1)	E23NE8	C;NSW
Middle Creek	NEU02	27-43-15-(4)	E23NE9	C;NSW
Middle Creek	NEU03	27-43-15-(4)	E23NE9	C;NSW
Middle Creek (Sunset Lake)	NEU03	27-43-15-(2)	E23NE8	B;NSW
Middle Swamp	NEU07	27-86-26-5	E28SW3	C;Sw,NSW
Milburnie Creek (Milburnie Lake)	NEU02	27-31	D24SE6	C;NSW
Mill Branch	NEU03	27-43-15-12	E24SE5	C;NSW
Mill Branch	NEU02	27-46-1	F25NE2	C;NSW
Mill Branch	NEU04	27-52-2.5-1	F25SW4	C;NSW
Mill Branch	NEU04	27-52-8	F25SE6	C;NSW
Mill Branch	NEU05	27-72-4	F27SE4	C;Sw,NSW
Mill Branch	NEU05	27-80-8	G28NE3	C;Sw,NSW
Mill Branch	NEU07	27-86-5.5	E26NE3	WS-IV;NSW
Mill Branch	NEU07	27-86-11-7-1	E27NE5	C;Sw,NSW
Mill Branch	NEU07	27-86-14-4	F27NE1	C;Sw,NSW
Mill Branch	NEU08	27-90-2	G29NE2	C;Sw,NSW
Mill Branch	NEU11	27-101-9	G29SW4	C;Sw,NSW
Mill Branch (Cliffs of Neuse Lake)	NEU05	27-69-1	G27NW3	B;NSW
Mill Creek	NEU01	27-13-0.4	C24SE5	WS-IV;NSW
Mill Creek	NEU04	27-52-(8.5)	F26SW1	WS-IV;NSW
Mill Creek	NEU06	27-57-18	E26SW3	C;NSW
Mill Creek	NEU06	27-57-20.7	F26NE3	WS-IV;NSW
Mill Creek	NEU07	27-86-3.4	E26NW3	C;NSW
Mill Creek	NEU11	27-101-26	H30NW2	C;Sw,NSW
Mill Creek	NEU10	27-112-5	H31NW6	SC;Sw,NSW
Mill Creek	NEU10	27-113	G31SE7	SC;Sw,NSW
Mill Creek	NEU10	27-141-9	G32SE1	SA;HQW,NSW
Mill Creek (at Selma)	NEU02	27-40	E25SE5	WS-IV;NSW
Mill Creek (Crystal Lake)	NEU01	27-2-17-1	C23SW5	WS-IV;NSW
Mill Creek (Moorewood Pond)	NEU04	27-52-(1)	F25SW7	C;NSW
Mill Creek (near Clayton)	NEU02	27-39	E25NE7	WS-IV;NSW
Mill Run	NEU05	27-72-1	F27NE9	C;Sw,NSW
Mill Run	NEU07	27-86-9-3.5	E27SW3	C;Sw,NSW
Mill Run	NEU07	27-86-16	E28SW8	C;Sw,NSW
Mill Run	NEU08	27-91-1	G30NW2	C;Sw,NSW
Mill Run	NEU11	27-101-23	G29SE8	C;Sw,NSW
Mill Swamp	NEU10	27-106-3	G30NE9	C;Sw,NSW
Mills Branch	NEU03	27-43-15-7	E24NW7	C;NSW
Mills Branch	NEU10	27-99.5	G30NE5	SC;Sw,NSW
Millstone Creek	NEU07	27-86-6-1	D26SE8	C;NSW
Mine Creek	NEU02	27-33-14	D24SW3	C;NSW
Mink Point Branch	NEU07	27-86-17-1.5	F28NW4	C;Sw,NSW
Mira (Mill Branch)	NEU05	27-68-1	F27SE4	C;NSW
Miry Branch	NEU02	27-47	F25NW6	C;NSW
Miry Branch	NEU10	27-112-6-3-1	H31NW5	SC;Sw,NSW
Miry Gut	NEU10	27-135-3	H32NE9	SA;HQW,NSW
Miry Hole Branch	NEU11	27-101-34	G30SW6	B;Sw,NSW
Mitchell Creek	NEU10	27-123-4	H31NE9	SA;HQW,NSW
Moccasin Creek	NEU12	27-53-(2)	F26NW5	WS-IV;NSW
Moccasin Creek (Bunn Lake)	NEU07	27-86-2	D25SE3	C;NSW
Moccasin Creek (Holts Pond)	NEU12	27-53-(0.5)	F26NW2	C;NSW
Moccasin Run	NEU07	27-86-14-1-2	F27NW2	C;Sw,NSW

NOAA Atlas 14, Volume 2, Version 3
Location name: Rolesville, North Carolina, USA*
Latitude: 35.9146°, Longitude: -78.4774°
Elevation: 390 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.403** (0.369-0.441)	**0.468** (0.429-0.512)	**0.534** (0.490-0.583)	**0.599** (0.548-0.654)	**0.665** (0.605-0.724)	**0.717** (0.650-0.781)	**0.763** (0.687-0.831)	**0.803** (0.720-0.877)	**0.848** (0.754-0.926)	**0.888** (0.783-0.972)
10-min	**0.644** (0.590-0.704)	**0.749** (0.687-0.818)	**0.855** (0.784-0.933)	**0.958** (0.877-1.04)	**1.06** (0.965-1.15)	**1.14** (1.04-1.24)	**1.21** (1.09-1.32)	**1.27** (1.14-1.39)	**1.34** (1.19-1.46)	**1.40** (1.23-1.53)
15-min	**0.804** (0.738-0.880)	**0.942** (0.863-1.03)	**1.08** (0.992-1.18)	**1.21** (1.11-1.32)	**1.34** (1.22-1.46)	**1.44** (1.31-1.57)	**1.53** (1.38-1.67)	**1.61** (1.44-1.75)	**1.69** (1.50-1.84)	**1.76** (1.55-1.92)
30-min	**1.10** (1.01-1.21)	**1.30** (1.19-1.42)	**1.54** (1.41-1.68)	**1.76** (1.61-1.92)	**1.99** (1.81-2.17)	**2.18** (1.97-2.37)	**2.35** (2.12-2.56)	**2.50** (2.24-2.73)	**2.69** (2.39-2.93)	**2.84** (2.51-3.11)
60-min	**1.38** (1.26-1.50)	**1.63** (1.50-1.78)	**1.97** (1.81-2.15)	**2.29** (2.09-2.50)	**2.65** (2.41-2.89)	**2.95** (2.67-3.21)	**3.23** (2.91-3.52)	**3.51** (3.14-3.83)	**3.86** (3.43-4.21)	**4.15** (3.66-4.54)
2-hr	**1.61** (1.46-1.77)	**1.91** (1.75-2.10)	**2.34** (2.13-2.56)	**2.74** (2.49-3.00)	**3.22** (2.90-3.52)	**3.64** (3.27-3.98)	**4.04** (3.61-4.42)	**4.46** (3.95-4.87)	**4.99** (4.38-5.45)	**5.46** (4.75-5.98)
3-hr	**1.70** (1.55-1.89)	**2.03** (1.85-2.24)	**2.49** (2.26-2.74)	**2.94** (2.67-3.23)	**3.49** (3.14-3.83)	**3.98** (3.56-4.36)	**4.46** (3.96-4.89)	**4.96** (4.38-5.44)	**5.64** (4.92-6.18)	**6.25** (5.39-6.86)
6-hr	**2.04** (1.87-2.26)	**2.44** (2.23-2.68)	**2.99** (2.72-3.28)	**3.53** (3.22-3.88)	**4.21** (3.81-4.61)	**4.82** (4.33-5.27)	**5.43** (4.84-5.93)	**6.07** (5.35-6.62)	**6.94** (6.04-7.56)	**7.73** (6.64-8.45)
12-hr	**2.41** (2.21-2.66)	**2.88** (2.64-3.15)	**3.54** (3.24-3.88)	**4.21** (3.84-4.61)	**5.06** (4.58-5.52)	**5.83** (5.24-6.34)	**6.60** (5.88-7.18)	**7.44** (6.55-8.08)	**8.59** (7.44-9.32)	**9.66** (8.24-10.5)
24-hr	**2.86** (2.66-3.08)	**3.45** (3.22-3.72)	**4.34** (4.04-4.67)	**5.04** (4.68-5.42)	**5.99** (5.55-6.44)	**6.75** (6.23-7.26)	**7.53** (6.93-8.10)	**8.34** (7.64-8.98)	**9.44** (8.62-10.2)	**10.3** (9.38-11.1)
2-day	**3.32** (3.09-3.57)	**3.99** (3.72-4.30)	**4.97** (4.63-5.36)	**5.75** (5.34-6.19)	**6.80** (6.30-7.32)	**7.63** (7.05-8.22)	**8.49** (7.82-9.14)	**9.37** (8.59-10.1)	**10.6** (9.65-11.4)	**11.5** (10.5-12.5)
3-day	**3.52** (3.28-3.77)	**4.22** (3.95-4.53)	**5.24** (4.89-5.62)	**6.04** (5.62-6.48)	**7.13** (6.62-7.65)	**8.00** (7.40-8.58)	**8.89** (8.20-9.54)	**9.80** (9.01-10.5)	**11.1** (10.1-11.9)	**12.0** (11.0-13.0)
4-day	**3.72** (3.48-3.97)	**4.46** (4.17-4.76)	**5.51** (5.14-5.88)	**6.33** (5.91-6.76)	**7.47** (6.94-7.98)	**8.37** (7.76-8.95)	**9.29** (8.58-9.94)	**10.2** (9.42-11.0)	**11.5** (10.6-12.4)	**12.6** (11.5-13.5)
7-day	**4.31** (4.04-4.60)	**5.14** (4.82-5.49)	**6.27** (5.87-6.69)	**7.17** (6.70-7.65)	**8.40** (7.82-8.96)	**9.37** (8.71-10.0)	**10.4** (9.61-11.1)	**11.4** (10.5-12.2)	**12.8** (11.8-13.7)	**13.9** (12.7-15.0)
10-day	**4.90** (4.60-5.23)	**5.84** (5.48-6.22)	**7.03** (6.59-7.48)	**7.96** (7.45-8.48)	**9.22** (8.60-9.82)	**10.2** (9.51-10.9)	**11.2** (10.4-12.0)	**12.2** (11.3-13.1)	**13.6** (12.6-14.6)	**14.7** (13.5-15.8)
20-day	**6.58** (6.19-7.01)	**7.77** (7.32-8.27)	**9.20** (8.65-9.78)	**10.3** (9.70-11.0)	**11.9** (11.1-12.6)	**13.1** (12.2-13.9)	**14.3** (13.3-15.2)	**15.5** (14.4-16.5)	**17.2** (15.9-18.3)	**18.5** (17.0-19.8)
30-day	**8.17** (7.71-8.68)	**9.61** (9.07-10.2)	**11.2** (10.5-11.9)	**12.4** (11.7-13.2)	**14.0** (13.2-14.9)	**15.3** (14.3-16.3)	**16.5** (15.4-17.6)	**17.8** (16.6-18.9)	**19.4** (18.0-20.7)	**20.7** (19.1-22.1)
45-day	**10.4** (9.88-11.0)	**12.2** (11.6-12.9)	**14.0** (13.3-14.7)	**15.4** (14.5-16.2)	**17.1** (16.2-18.1)	**18.5** (17.5-19.5)	**19.8** (18.7-20.9)	**21.1** (19.8-22.3)	**22.8** (21.4-24.2)	**24.1** (22.5-25.6)
60-day	**12.5** (11.9-13.1)	**14.6** (13.9-15.3)	**16.5** (15.7-17.4)	**18.0** (17.1-18.9)	**19.9** (18.9-20.9)	**21.4** (20.2-22.5)	**22.7** (21.5-24.0)	**24.1** (22.7-25.4)	**25.8** (24.3-27.3)	**27.2** (25.5-28.7)

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

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

Please refer to NOAA Atlas 14 document for more information.

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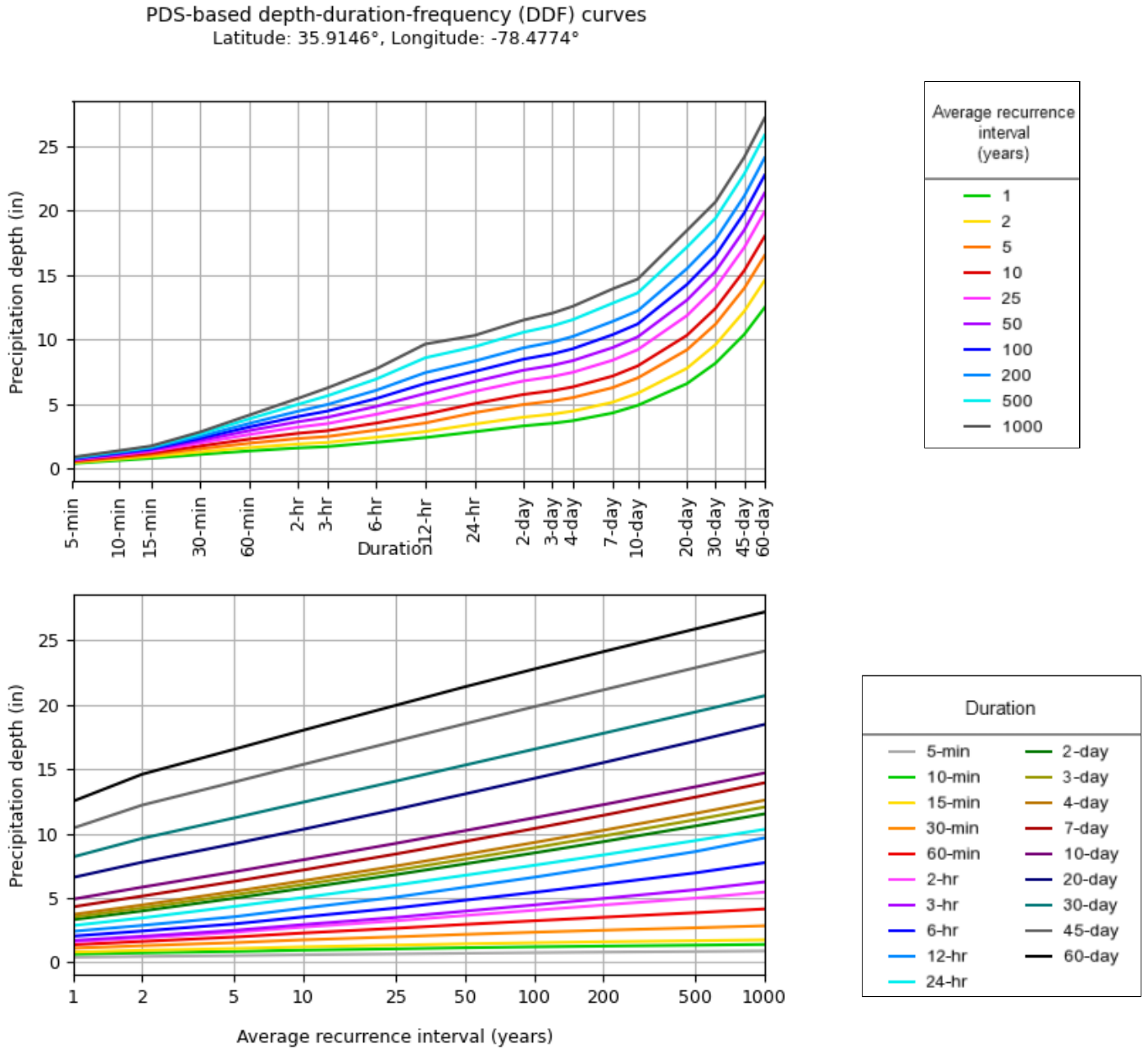
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Wed Nov 29 19:02:36 2023

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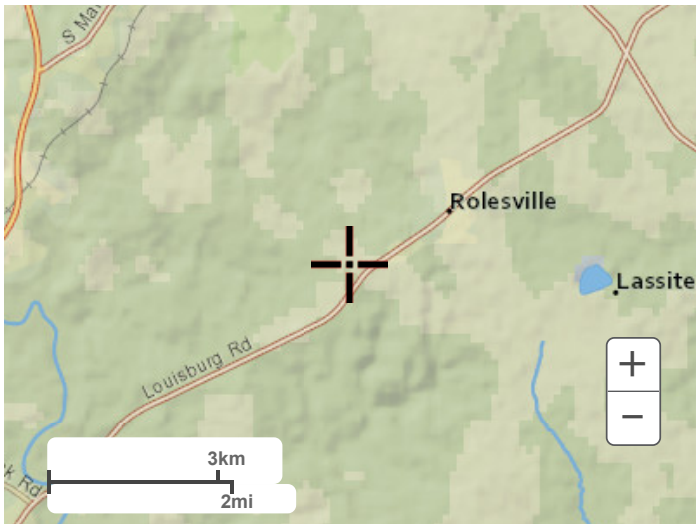
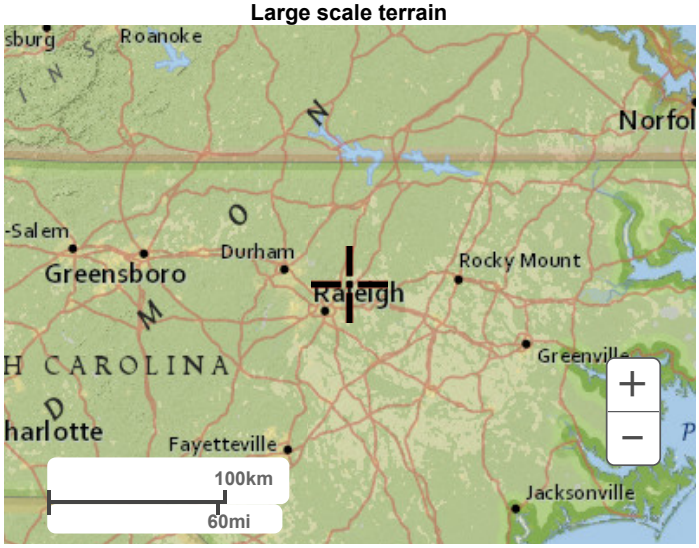
Maps & aerials

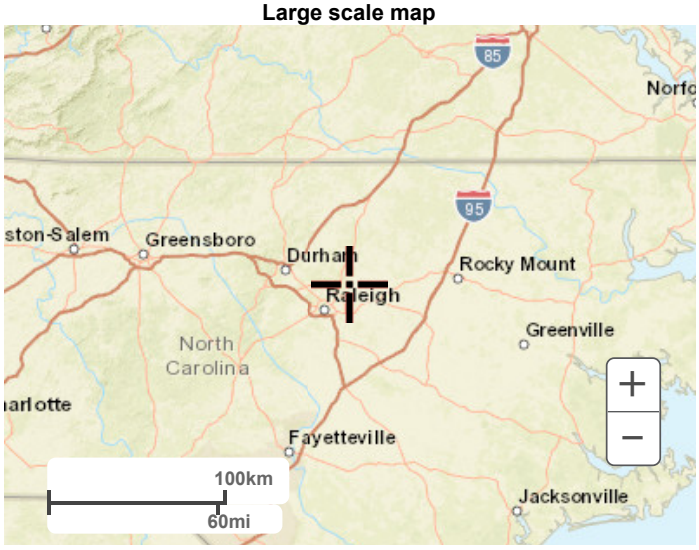
Small scale terrain



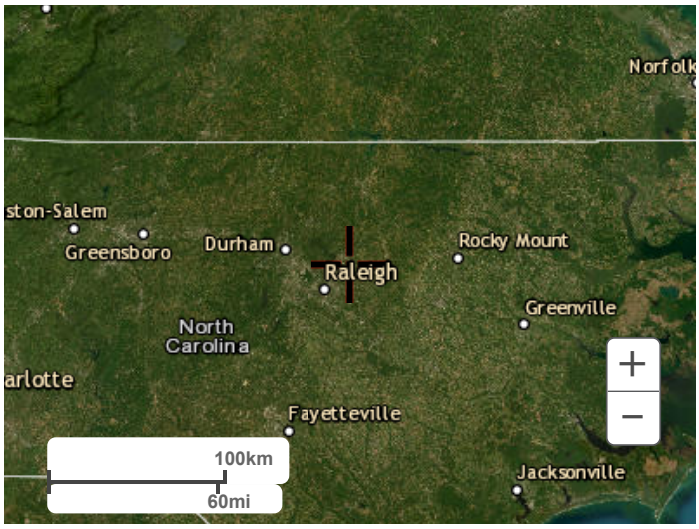
Large scale terrain



Large scale map



Large scale aerial



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

Disclaimer

FLOOD HAZARD INFORMATION

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

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://FRIS.NC.GOV/FRIS
HTTPS://MSC.FEMA.GOV

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

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average Depth Less Than One Foot or With Drainage Areas of Less Than One Square Mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*

OTHER AREAS
- Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall
- 012 — 18.2 — Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

OTHER FEATURES
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital format by the NCFMP. The source of this information can be determined from the metadata available in the digital FLOOD database and in the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

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

- Limit of Moderate Wave Action (LiMWA)

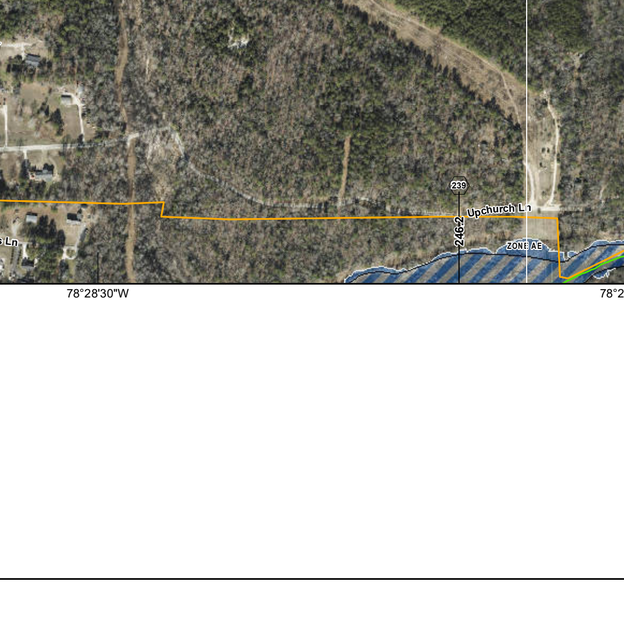
SCALE

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

1 inch = 500 feet 1:6,000

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

PANEL LOCATOR



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

NORTH CAROLINA

PANEL 1758

FEMA

National Flood Insurance Program

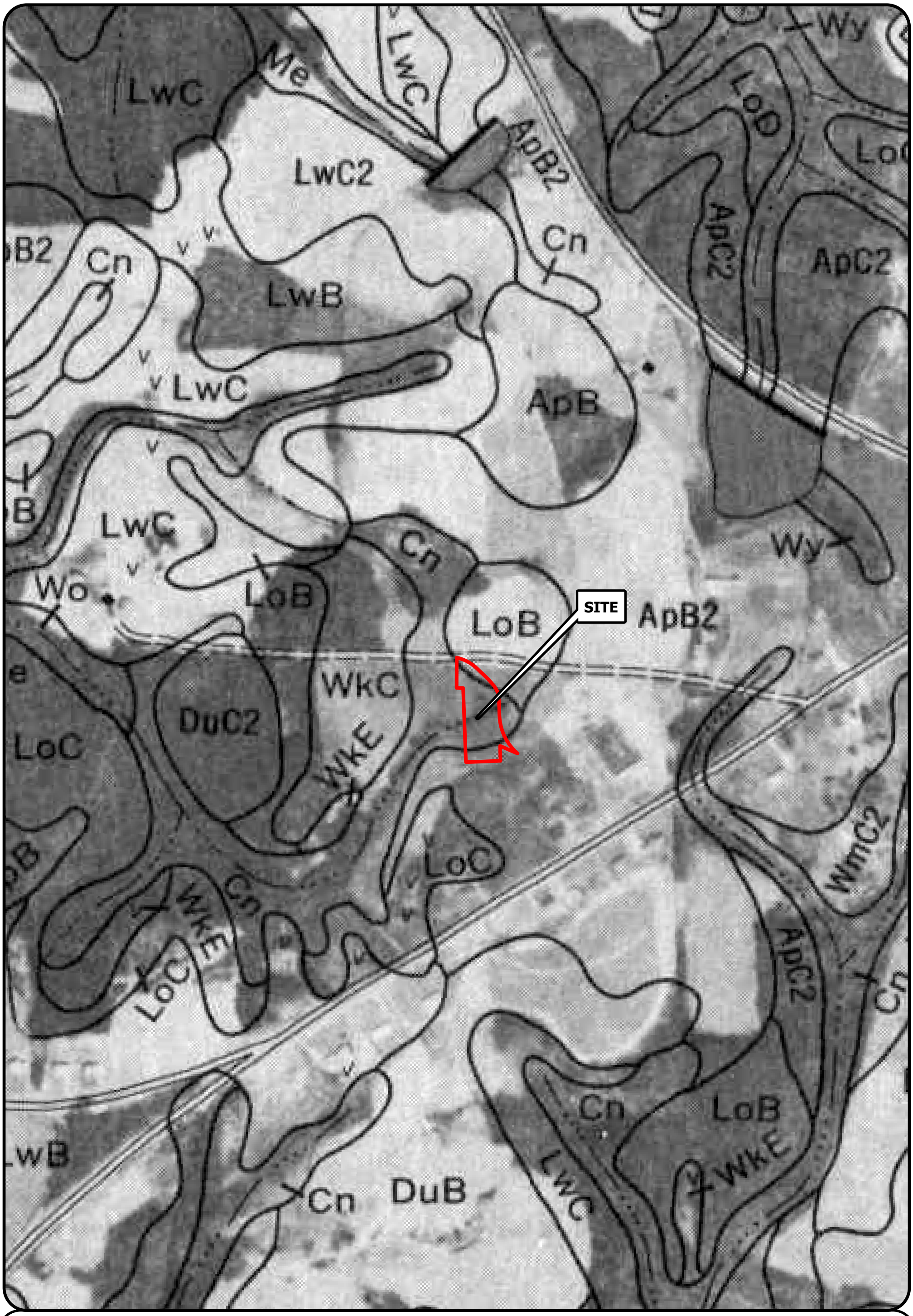
Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
ROLESVILLE, TOWN OF	370468	1758	K
WAKE COUNTY	370368	1758	K

VERSION NUMBER
2.3.3.2

MAP NUMBER
3720175800K

MAP REVISED
July 19, 2022



N

0 500 1,000 2,000 Feet

1" = 1,000'

ARDEN SENIOR LIVING CENTER

HISTORICAL SOIL SURVEY

PROJECT #: SPEC-23422

TOWN OF ROLESVILLE, WAKE COUNTY, NORTH CAROLINA

McADAMS

PRE-DEVELOPMENT HYDROLOGIC CALCULATIONS

Arden Senior Living Center
SPEC-23422

ARDEN SENIOR LIVING CENTER
SPEC-23422

PRE-DEVELOPMENT HYDROLOGY
Summary of Results

A. ABBOTT
12/08/2023

HYDROLOGY INPUT SUMMARY

Sub-basin ID	Onsite Area [acres]					Offsite Area [acres]					Total Area [acres]	SCS CN	Tc [min]
	Impervious	Open	Wooded	Pond	Total	Impervious	Open	Wooded	Pond	Total			
1	0.00	0.00	4.57	0.00	4.57	0.30	0.14	0.58	0.00	1.01	5.59	71	#REF!
2	0.00	0.00	5.29	0.00	5.29	0.35	0.43	1.50	0.00	2.28	7.57	64	0.00
3	0.00	0.00	0.23	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.23	55	0.00
4	0.00	0.00	0.32	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.32	55	0.00
Totals =	0.00	0.00	10.41	0.00	10.41	0.65	0.57	2.08	0.00	3.30	**13.70**		

ARDEN SENIOR LIVING CENTER
SPEC-23422

PRE-DEVELOPMENT HYDROLOGY
Subbasin 1

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

Soils from WebSoilSurvey are only inclusive of indirectly connected areas

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%	
HSG 'B' =	8.1%	
HSG 'C' =	90.5%	
HSG 'D' =	1.5%	*Urban Land

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	73	Assume good condition
Wooded	69	Assume good condition

II. PRE-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roof	0	0.00
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	73	0	0.00	Assume good condition
Onsite wooded	69	199,228	4.57	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	12,879	0.30	-
Offsite open	73	6,144	0.14	Assume good condition
Offsite wooded	69	25,114	0.58	Assume good condition
Offsite pond	100	0	0.00	-

Total Area =	5.59	acres
	243,365	sf
Composite SCS CN =	71	
% Impervious =	5.3%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	404.00	ft
Bot Elev =	398.00	ft
Height =	6	ft
Slope =	0.0601	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	*13.22*	***minutes***

Segment 2: Concentrated Flow

Length =	380	ft
Top Elev =	398.00	ft
Bot Elev =	377.00	ft
Height =	21	ft
Slope =	0.0553	ft/ft
Paved ? =	No	
Velocity =	3.79	ft/sec
Segment Time =	*1.67*	***minutes***

Segment 3: Channel Flow

Length =	142	ft
Top Elev =	377.00	ft
Bot Elev =	372.00	ft
Height =	5	ft
Slope =	0.0352	ft/ft
Manning's n =	0.045	natural channel
Flow Area =	4.00	sf (assume 2'w x 2'h channel)
Wetted Perimeter =	6.00	lf (assume 2' x 2' channel)
Channel Velocity =	4.74	ft/sec
Segment Time =	*0.50*	***minutes***

Time of Concentration =	15.38	minutes
SCS Lag Time =	9.23	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.68	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

PRE-DEVELOPMENT HYDROLOGY
Subbasin 2

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

Soils from WebSoilSurvey are only inclusive of indirectly connected areas

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	51.8%
HSG 'C' =	48.2%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	67	Assume good condition
Wooded	62	Assume good condition

II. PRE-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Roof	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	67	0	0.00	Assume good condition
Onsite wooded	62	230,290	5.29	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	15,364	0.35	-
Offsite open	67	18,521	0.43	Assume good condition
Offsite wooded	62	65,515	1.50	Assume good condition
Offsite pond	100	0	0.00	-

Total Area =	7.57	acres
	329,690	sf
Composite SCS CN =	64	
% Impervious =	4.7%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	402.00	ft
Bot Elev =	396.00	ft
Height =	6	ft
Slope =	0.0601	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***13.22***	***minutes***

Segment 2: Concentrated Flow

Length =	322	ft
Top Elev =	396.00	ft
Bot Elev =	380.00	ft
Height =	16	ft
Slope =	0.0497	ft/ft
Paved ? =	No	
Velocity =	3.60	ft/sec
Segment Time =	***1.49***	***minutes***

Time of Concentration =	14.71	minutes
SCS Lag Time =	8.82	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.56	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

PRE-DEVELOPMENT HYDROLOGY
Subbasin 3

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

Soils from WebSoilSurvey are only inclusive of indirectly connected areas

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	100.0%
HSG 'C' =	0.0%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	61	Assume good condition
Wooded	55	Assume good condition

II. PRE-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Roof	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	61	0	0.00	Assume good condition
Onsite wooded	55	9,953	0.23	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	0	0.00	-
Offsite open	61	0	0.00	Assume good condition
Offsite wooded	55	0	0.00	Assume good condition
Offsite pond	100	0	0.00	-

Total Area =	0.23	acres
	9,953	sf
Composite SCS CN =	55	
% Impervious =	0.0%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	388.00	ft
Bot Elev =	385.00	ft
Height =	3	ft
Slope =	0.0300	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***17.44***	***minutes***

Segment 2: Concentrated Flow

Length =	120	ft
Top Elev =	385.00	ft
Bot Elev =	383.00	ft
Height =	2	ft
Slope =	0.0167	ft/ft
Paved ? =	No	
Velocity =	2.08	ft/sec
Segment Time =	***0.96***	***minutes***

Time of Concentration =	18.40	minutes
SCS Lag Time =	11.04	minutes (SCS Lag = 0.6* Tc)
Time Increment =	3.20	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

PRE-DEVELOPMENT HYDROLOGY
Subbasin 4

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

Soils from WebSoilSurvey are only inclusive of indirectly connected areas

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	100.0%
HSG 'C' =	0.0%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	61	Assume good condition
Wooded	55	Assume good condition

II. PRE-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Roof	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	61	0	0.00	Assume good condition
Onsite wooded	55	13,799	0.32	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	0	0.00	-
Offsite open	61	0	0.00	Assume good condition
Offsite wooded	55	0	0.00	Assume good condition
Offsite pond	100	0	0.00	-

Total Area =	0.32	acres
	13,799	sf
Composite SCS CN =	55	
% Impervious =	0.0%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	388.00	ft
Bot Elev =	384.00	ft
Height =	4	ft
Slope =	0.0400	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***15.54***	***minutes***

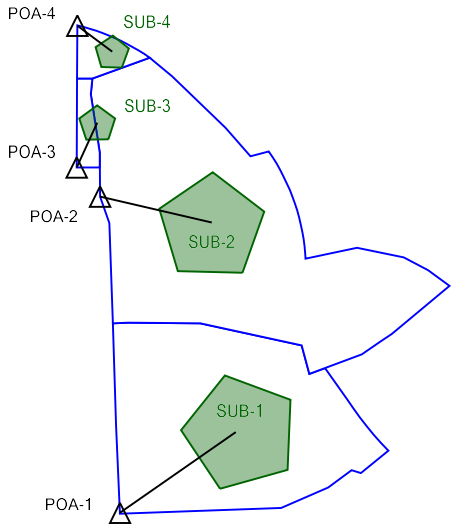
Segment 2: Concentrated Flow

Length =	35	ft
Top Elev =	384.00	ft
Bot Elev =	383.00	ft
Height =	1	ft
Slope =	0.0286	ft/ft
Paved ? =	No	
Velocity =	2.73	ft/sec
Segment Time =	***0.21***	***minutes***

Time of Concentration =	15.76	minutes
SCS Lag Time =	9.45	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.74	minutes (= 0.29*SCS Lag)

MCADAMS

Scenario: Pre- 1 year



MCADAMS

FlexTable: Catchment Table (Arden Senior Living Peak Flow.ppc)

Current Time: 0.000 min

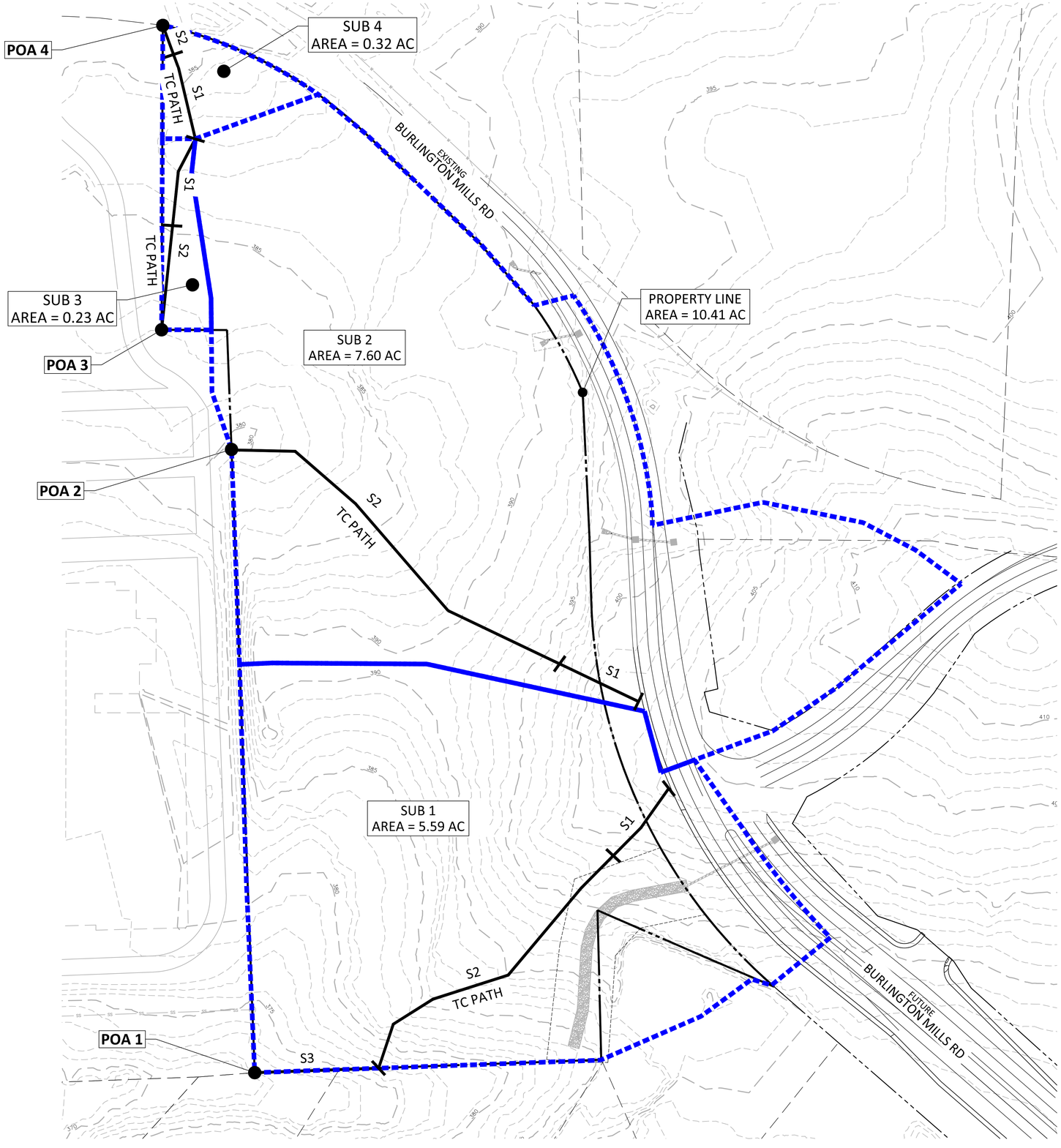
Label	Area (ft²)	SCS CN	Time of Concentration (min)	Notes
SUB-1	243,365.000	71.000	15.380	PRE
SUB-2	329,690.000	64.000	14.710	PRE
~~SUB-TO-SCM-A~~	~~477,293.000~~	~~85.000~~	~~5.000~~	~~POST~~
~~SUB-BYPASS~~	~~82,660.000~~	~~73.000~~	~~12.990~~	~~POST~~
~~SUB-1~~	~~13,053.000~~	~~55.000~~	~~15.760~~	~~POST~~
~~SUB-2~~	~~14,637.000~~	~~65.000~~	~~14.040~~	~~POST~~
SUB-4	13,799.000	55.000	15.760	PRE
SUB-3	9,953.000	55.000	18.400	PRE
~~SUB-3~~	~~9,164.000~~	~~55.000~~	~~18.400~~	~~POST~~

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
SUB-1	Pre- 1 year	1	0.315	730.000	3.81
SUB-1	Pre- 10 year	10	0.995	728.000	12.04
SUB-1	Pre- 100 year	100	1.937	728.000	20.69
SUB-2	Pre- 1 year	1	0.256	731.000	2.32
SUB-2	Pre- 10 year	10	1.008	728.000	11.72
SUB-2	Pre- 100 year	100	2.143	728.000	22.86
SUB-4	Pre- 1 year	1	0.004	754.000	0.02
SUB-4	Pre- 10 year	10	0.026	731.000	0.25
SUB-4	Pre- 100 year	100	0.065	729.000	0.64
SUB-3	Pre- 1 year	1	0.003	755.000	0.01
SUB-3	Pre- 10 year	10	0.019	733.000	0.16
SUB-3	Pre- 100 year	100	0.047	731.000	0.43

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
POA-1	Pre- 1 year	1	0.315	730.000	3.81
POA-1	Pre- 10 year	10	0.995	728.000	12.04
POA-1	Pre- 100 year	100	1.937	728.000	20.69
POA-2	Pre- 1 year	1	0.256	731.000	2.32
POA-2	Pre- 10 year	10	1.008	728.000	11.72
POA-2	Pre- 100 year	100	2.143	728.000	22.86
POA-3	Pre- 1 year	1	0.003	755.000	0.01
POA-3	Pre- 10 year	10	0.019	733.000	0.16
POA-3	Pre- 100 year	100	0.047	731.000	0.43
POA-4	Pre- 1 year	1	0.004	754.000	0.02
POA-4	Pre- 10 year	10	0.026	731.000	0.25
POA-4	Pre- 100 year	100	0.065	729.000	0.64



PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

M:\Projects\1SPEC\SPEC 2023\SPEC23422 Arden Rolesville Senior Living Center\04-Production\Water Resources\Stormwater Management\Site Plan\Current Drawings\SPEC23422-WR-PRE.dwg, 12/20/2023 3:24:48 PM, Ashley Abbott

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ARDEN SENIOR LIVING CENTER

PRELIMINARY PLAT PLAN

ROLESVILLE, NORTH CAROLINA

REVISIONS

NO.	DATE

PLAN INFORMATION

PROJECT NO.	SPEC-23422
FILENAME	SPEC23422-WR-PRE
CHECKED BY	MT
DRAWN BY	AA
SCALE	1"=60'
DATE	01.02.2024

SHEET

PRE-DEVELOPMENT HYDROLOGY MAP

PRE

POST-DEVELOPMENT HYDROLOGIC CALCULATIONS

Arden Senior Living Center
SPEC-23422

ARDEN SENIOR LIVING CENTER
SPEC-23422

POST-DEVELOPMENT HYDROLOGY

Summary of Results

A. ABBOTT
12/08/2023

HYDROLOGY INPUT SUMMARY

Sub-basin ID	Onsite Area [acres]					Offsite Area [acres]					Total Area [acres]	SCS CN	Tc [min]
	Impervious	Open	Wooded	Pond	Total	Impervious	Open	Wooded	Pond	Total			
Sub 1 Bypass	0.00	0.57	0.49	0.00	1.06	0.28	0.14	0.42	0.00	0.84	1.90	73	0.00
Sub 1 to SCM A	5.93	2.02	0.60	0.00	8.55	0.40	0.39	1.62	0.00	2.41	10.96	85	minutes
Sub 2	0.00	0.29	0.00	0.00	0.29	0.00	0.00	0.05	0.00	0.05	0.34	55	0.00
Sub 3	0.00	0.00	0.21	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.21	55	0.00
Sub 4	0.00	0.00	0.30	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.30	55	0.00
Totals =	5.93	2.88	1.60	0.00	10.41	0.68	0.53	2.08	0.00	3.30	**13.70**		

ARDEN SENIOR LIVING CENTER
SPEC-23422

POST-DEVELOPMENT HYDROLOGY
Subbasin 1 to SCM A

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	36.8%
HSG 'C' =	63.2%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	69	Assume good condition
Wooded	64	Assume good condition

II. POST-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roof	92,809	2.13
Roadway Area	0	0.00
Driveway / Parking Lot	98,920	2.27
Sidewalk / Patio	35,710	0.82
Other	30,757	0.71
Totals	258,196	5.93

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	258,196	5.93	-
Onsite open	69	88,144	2.02	Assume good condition
Onsite wooded	64	26,016	0.60	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	17,405	0.40	-
Offsite open	69	17,129	0.39	Assume good condition
Offsite wooded	64	70,403	1.62	Assume good condition
Offsite pond	100	0	0.00	-

Total area =	10.96	acres
	477,293	sf
Composite SCS CN =	85	
% Impervious =	57.7%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is assumed to be 5 minutes

Time of Concentration =	5.00	minutes
SCS Lag Time =	3.00	minutes (SCS Lag = 0.6* Tc)
Time Increment =	0.87	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

POST-DEVELOPMENT HYDROLOGY
Subbasin 1 Bypass

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%	
HSG 'B' =	34.1%	
HSG 'C' =	41.0%	
HSG 'D' =	25.0%	*Urban Land

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	71	Assume good condition
Wooded	67	Assume good condition

II. POST-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roof	0	0.00
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	71	24,684	0.57	Assume good condition
Onsite wooded	67	21,383	0.49	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	12,068	0.28	-
Offsite open	71	6,144	0.14	Assume good condition
Offsite wooded	67	18,381	0.42	Assume good condition
Offsite pond	100	0	0.00	-

Total area =	1.90	acres
	82,660	sf
Composite SCS CN =	73	
% Impervious =	14.6%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	399.00	ft
Bot Elev =	389.00	ft
Height =	10	ft
Slope =	0.1001	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***10.77***	***minutes***

Segment 3: Concentrated Flow

Length =	172	ft
Top Elev =	389.00	ft
Bot Elev =	384.00	ft
Height =	5	ft
Slope =	0.0291	ft/ft
Paved ? =	No	
Velocity =	2.75	ft/sec
Segment Time =	***1.04***	***minutes***

Segment 6: Channel Flow

Length =	376	ft	pre
Top Elev =	384.00	ft	
Bot Elev =	372.00	ft	
Height =	12	ft	
Slope =	0.0319	ft/ft	
Manning's n =	0.045	natural channel	
Flow Area =	6.00	sf (assume 3' x 2'h channel)	
Wetted Perimeter =	7.00	sf (assume 3' x 2'h channel)	
Channel Velocity =	5.34	ft/sec	
Segment Time =	***1.17***	***minutes***	

Time of Concentration =	12.99	minutes
SCS Lag Time =	7.79	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.26	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

POST-DEVELOPMENT HYDROLOGY
Subbasin 2

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	60.8%
HSG 'C' =	39.2%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	66	Assume good condition
Wooded	61	Assume good condition

II. POST-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roof	0	0.00
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	66	12,633	0.29	Assume good condition
Onsite wooded	61	0	0.00	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	0	0.00	-
Offsite open	66	0	0.00	Assume good condition
Offsite wooded	61	2,004	0.05	Assume good condition
Offsite pond	100	0	0.00	-

Total area =	0.34	acres
	14,637	sf
Composite SCS CN =	65	
% Impervious =	0.0%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	390.00	ft
Bot Elev =	384.00	ft
Height =	6	ft
Slope =	0.0601	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***13.22***	***minutes***

Segment 2: Concentrated Flow

Length =	137	ft
Top Elev =	384.00	ft
Bot Elev =	380.00	ft
Height =	4	ft
Slope =	0.0292	ft/ft
Paved ? =	No	
Velocity =	2.76	ft/sec
Segment Time =	***0.83***	***minutes***

Time of Concentration =	14.04	minutes
SCS Lag Time =	8.43	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.44	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

POST-DEVELOPMENT HYDROLOGY
Subbasin 3

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	100.0%
HSG 'C' =	0.0%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	61	Assume good condition
Wooded	55	Assume good condition

II. POST-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roof	0	0.00
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	61	0	0.00	Assume good condition
Onsite wooded	55	9,164	0.21	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	0	0.00	-
Offsite open	61	0	0.00	Assume good condition
Offsite wooded	55	0	0.00	Assume good condition
Offsite pond	100	0	0.00	-

Total area =	0.21	acres
	9,164	sf
Composite SCS CN =	55	
% Impervious =	0.0%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	388.00	ft
Bot Elev =	385.00	ft
Height =	3	ft
Slope =	0.0300	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***17.44***	***minutes***

Segment 2: Concentrated Flow

Length =	120	ft
Top Elev =	385.00	ft
Bot Elev =	383.00	ft
Height =	2	ft
Slope =	0.0167	ft/ft
Paved ? =	No	
Velocity =	2.08	ft/sec
Segment Time =	***0.96***	***minutes***

Time of Concentration =	18.40	minutes
SCS Lag Time =	11.04	minutes (SCS Lag = 0.6* Tc)
Time Increment =	3.20	minutes (= 0.29*SCS Lag)

ARDEN SENIOR LIVING CENTER
SPEC-23422

POST-DEVELOPMENT HYDROLOGY
Subbasin 4

A. ABBOTT
12/08/2023

I. SCS CURVE NUMBERS

HSG	Impervious	Open	Wooded
A	98	39	30
B	98	61	55
C	98	74	70
D	98	80	77

Assume:

HSG 'A' =	0.0%
HSG 'B' =	100.0%
HSG 'C' =	0.0%
HSG 'D' =	0.0%

Cover Condition	SCS CN	Comments
Impervious	98	-
Open	61	Assume good condition
Wooded	55	Assume good condition

II. POST-DEVELOPMENT

A. Onsite Impervious Breakdown

Contributing Area	Area [sf]	Area [ac]
Roof	0	0.00
Roadway Area	0	0.00
Driveway / Parking Lot	0	0.00
Sidewalk / Patio	0	0.00
Other	0	0.00
Totals	0	0.00

B. Watershed Land Use Breakdown

Contributing Area	SCS CN	Area [sf]	Area [acres]	Comments
Onsite impervious	98	0	0.00	-
Onsite open	61	0	0.00	Assume good condition
Onsite wooded	55	13,053	0.30	Assume good condition
Onsite pond	100	0	0.00	-
Offsite impervious	98	0	0.00	-
Offsite open	61	0	0.00	Assume good condition
Offsite wooded	55	0	0.00	Assume good condition
Offsite pond	100	0	0.00	-

Total area =	0.30	acres
	13,053	sf
Composite SCS CN =	55	
% Impervious =	0.0%	

III. TIME OF CONCENTRATION INFORMATION

Time of concentration is calculated using the SCS Segmental Approach (TR-55).

Segment 1: Overland Flow

Length =	100	ft
Top Elev =	388.00	ft
Bot Elev =	384.00	ft
Height =	4	ft
Slope =	0.0400	ft/ft
Manning's n =	0.40	Wooded
P (2-year/24-hour) =	3.5	inches (Durham, NC)
Segment Time =	***15.54***	***minutes***

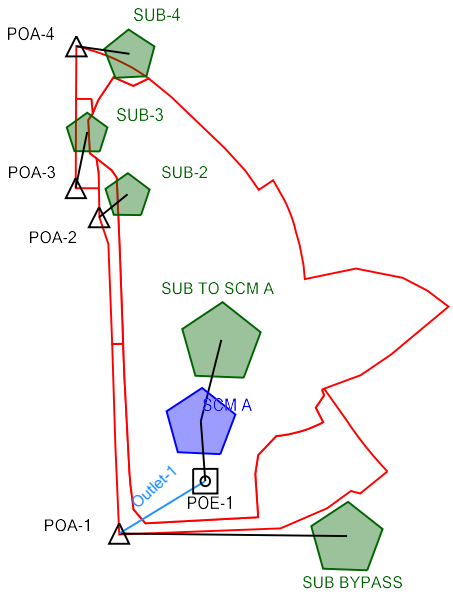
Segment 2: Concentrated Flow

Length =	35	ft
Top Elev =	384.00	ft
Bot Elev =	383.00	ft
Height =	1	ft
Slope =	0.0286	ft/ft
Paved ? =	No	
Velocity =	2.73	ft/sec
Segment Time =	***0.21***	***minutes***

Time of Concentration =	15.76	minutes
SCS Lag Time =	9.45	minutes (SCS Lag = 0.6* Tc)
Time Increment =	2.74	minutes (= 0.29*SCS Lag)

MCADAMS

Scenario: Post- 1 year



MCADAMS

FlexTable: Catchment Table (Arden Senior Living Peak Flow.ppc)

Current Time: 0.000 min

Label	Area (ft²)	SCS CN	Time of Concentration (min)	Notes
~~SUB-1~~	~~243,365.000~~	~~71.000~~	~~15.380~~	~~PRE~~
~~SUB-2~~	~~329,690.000~~	~~64.000~~	~~14.710~~	~~PRE~~
SUB TO SCM A	477,293.000	85.000	5.000	POST
SUB BYPASS	82,660.000	73.000	12.990	POST
SUB-4	13,053.000	55.000	15.760	POST
SUB-2	14,637.000	65.000	14.040	POST
~~SUB-4~~	~~13,799.000~~	~~55.000~~	~~15.760~~	~~PRE~~
~~SUB-3~~	~~9,953.000~~	~~55.000~~	~~18.400~~	~~PRE~~
SUB-3	9,164.000	55.000	18.400	POST

Catchments Summary

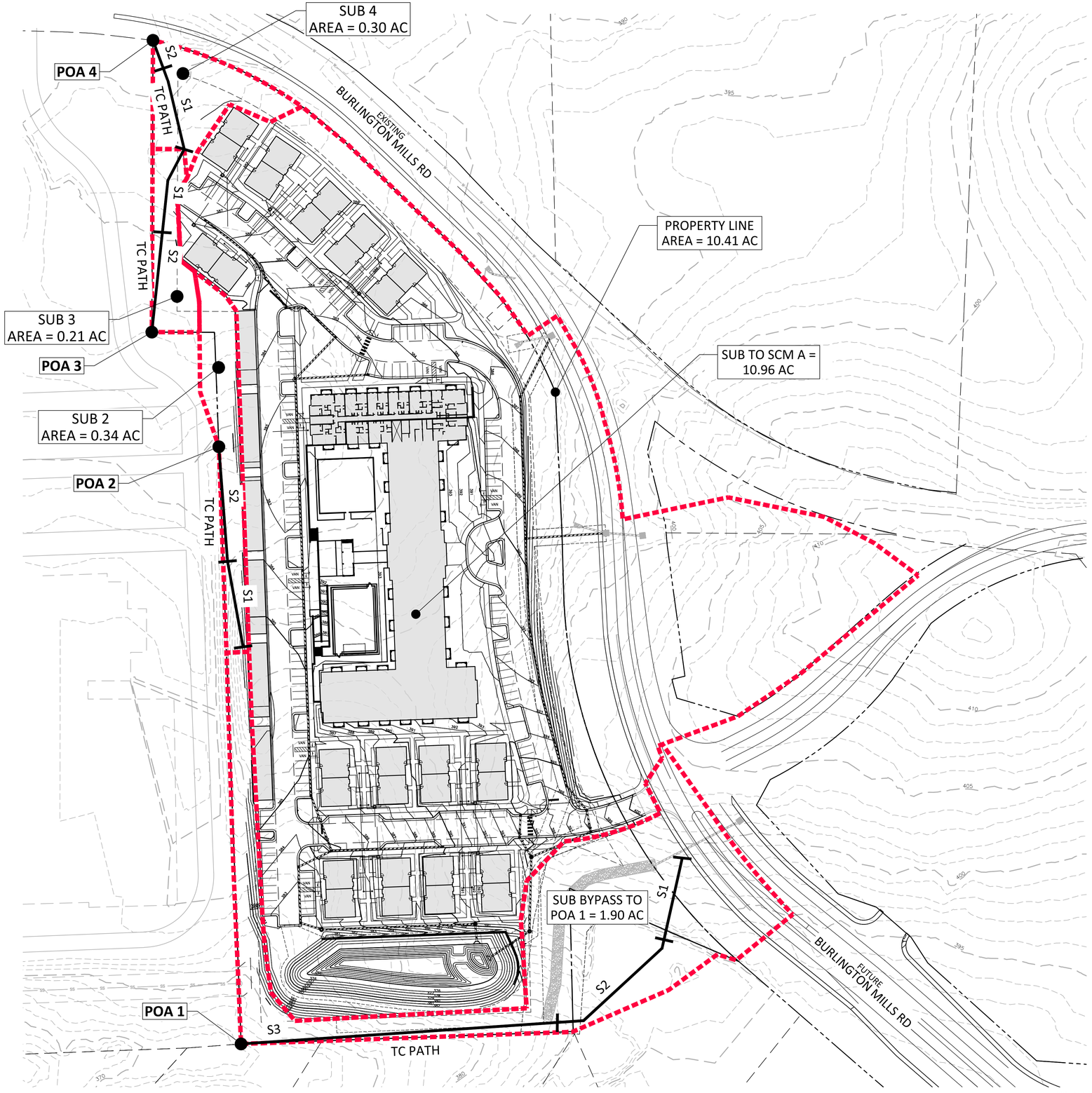
Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)
SUB TO SCM A	Post- 1 year	1	1.342	721.000	28.86
SUB TO SCM A	Post- 10 year	10	3.105	721.000	56.51
SUB TO SCM A	Post- 100 year	100	5.256	721.000	79.96
SUB BYPASS	Post- 1 year	1	0.122	728.000	1.67
SUB BYPASS	Post- 10 year	10	0.364	727.000	4.78
SUB BYPASS	Post- 100 year	100	0.693	726.000	7.91
SUB-4	Post- 1 year	1	0.004	754.000	0.02
SUB-4	Post- 10 year	10	0.025	731.000	0.23
SUB-4	Post- 100 year	100	0.061	729.000	0.60
SUB-2	Post- 1 year	1	0.012	730.000	0.12
SUB-2	Post- 10 year	10	0.047	728.000	0.57
SUB-2	Post- 100 year	100	0.098	728.000	1.07
SUB-3	Post- 1 year	1	0.003	755.000	0.01
SUB-3	Post- 10 year	10	0.017	733.000	0.15
SUB-3	Post- 100 year	100	0.043	731.000	0.39

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)
POA-1	Post- 1 year	1	0.410	728.000	1.89
POA-1	Post- 10 year	10	2.329	753.000	11.46
POA-1	Post- 100 year	100	4.804	726.000	57.19
POA-2	Post- 1 year	1	0.012	730.000	0.12
POA-2	Post- 10 year	10	0.047	728.000	0.57
POA-2	Post- 100 year	100	0.098	728.000	1.07
POA-3	Post- 1 year	1	0.003	755.000	0.01
POA-3	Post- 10 year	10	0.017	733.000	0.15
POA-3	Post- 100 year	100	0.043	731.000	0.39
POA-4	Post- 1 year	1	0.004	754.000	0.02
POA-4	Post- 10 year	10	0.025	731.000	0.23
POA-4	Post- 100 year	100	0.061	729.000	0.60

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
SCM A (IN)	Post- 1 year	1	1.342	721.000	28.86	(N/A)	(N/A)
SCM A (OUT)	Post- 1 year	1	0.288	1,440.000	0.29	378.82	1.053
SCM A (IN)	Post- 10 year	10	3.105	721.000	56.51	(N/A)	(N/A)
SCM A (OUT)	Post- 10 year	10	1.965	753.000	9.63	380.24	1.615
SCM A (IN)	Post- 100 year	100	5.256	721.000	79.96	(N/A)	(N/A)
SCM A (OUT)	Post- 100 year	100	4.111	726.000	49.28	380.98	1.933



GRAPHIC SCALE
0 50 100 200
1 inch = 100 ft.

PRELIMINARY DRAWING - NOT RELEASED FOR CONSTRUCTION

M:\Projects\SPEC\SPEC 2023\SPEC23422 Arden Rolesville Senior Living Center\04-Production\Water Resources\Stormwater Management\Site Plan\Current Drawings\SPEC23422-WR-POST.dwg, 1/3/2024 9:29:50 AM, Ashley Abbott

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CLIENT

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SUITE 925W
BETHESDA, MARYLAND, 20814

ARDEN SENIOR LIVING CENTER
PRELIMINARY PLAT PLAN
ROLESVILLE, NORTH CAROLINA

REVISIONS

NO. DATE

PLAN INFORMATION

PROJECT NO.	SPEC-23422
FILENAME	SPEC23422-WR-POST
CHECKED BY	MT
DRAWN BY	AA
SCALE	1"=60'
DATE	01.02.2024

SHEET

POST-DEVELOPMENT HYDROLOGY MAP

POST

STORMWATER CONTROL MEASURE A DESIGN CALCULATIONS

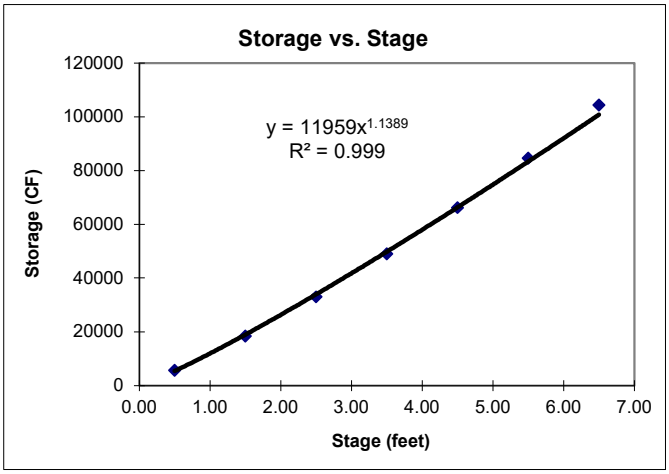
Arden Senior Living Center
SPEC-23422

STORMWATER CONTROL MEASURE A

SSFxn Above NP

STAGE-STORAGE FUNCTION - ABOVE NORMAL POOL

Contour (feet)	Stage (feet)	Contour Area (SF)	Average Contour Area (SF)	Incremental Contour Volume (CF)	Accumulated Contour Volume (CF)	Estimated Stage w/ S-S Fxn (feet)
375.50	0.00	10,420				
376.00	0.50	12,006	11213	5607	5607	0.51
377.00	1.50	13,650	12828	12828	18435	1.46
378.00	2.50	15,352	14501	14501	32936	2.43
379.00	3.50	16,585	15969	15969	48904	3.44
380.00	4.50	17,829	17207	17207	66111	4.49
381.00	5.50	19,099	18464	18464	84575	5.57
382.00	6.50	20,417	19758	19758	104333	6.70



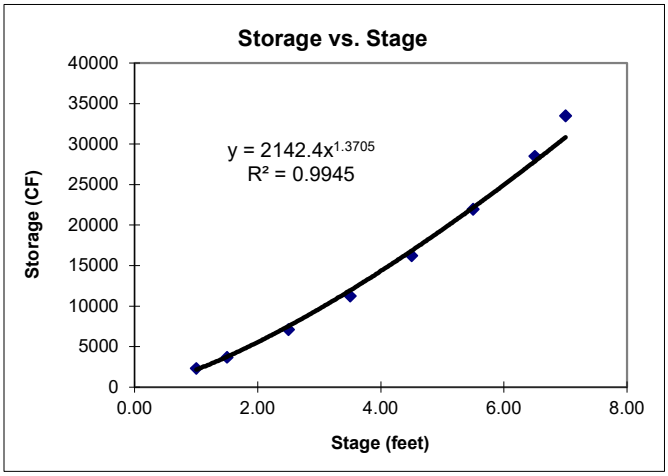
K_S =	11959
b =	1.1389

STORMWATER CONTROL MEASURE A

SSFxn Main Pool

STAGE-STORAGE FUNCTION - MAIN POOL

Contour (feet)	Stage (feet)	Contour Area (SF)	Average Contour Area (SF)	Incremental Contour Volume (CF)	Accumulated Contour Volume (CF)	Estimated Stage w/ S-S Fxn (feet)
368.00	-0.50	1,862	Sediment Storage			
368.50	0.00	2,145				
369.50	1.00	2,452	2299	2299	2299	1.02
370.00	1.50	3,087	2770	1385	3683	1.47
371.00	2.50	3,768	3428	3428	7111	2.44
372.00	3.50	4,497	4133	4133	11243	3.48
373.00	4.50	5,280	4184	12551	16234	4.61
374.00	5.50	6,111	4940	14819	21929	5.81
375.00	6.50	7,003	5750	17250	28493	7.11
375.50	7.00	8,539	6910	17274	33508	8.06



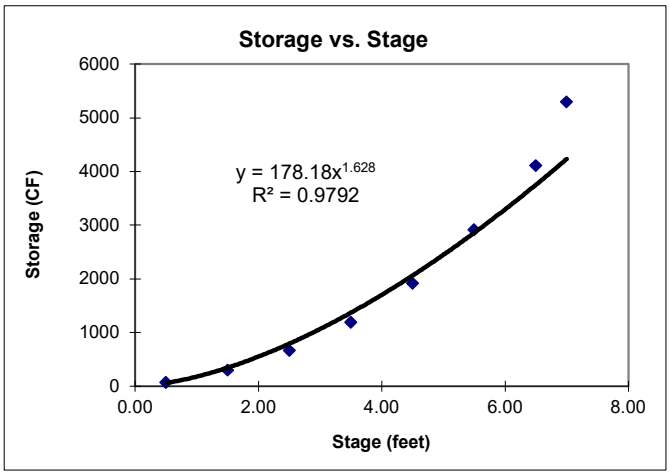
K_S =	2229
b =	1.2989

STORMWATER CONTROL MEASURE A

SSFxn Forebay

STAGE-STORAGE FUNCTION - FOREBAY

Contour (feet)	Stage (feet)	Contour Area (SF)	Average Contour Area (SF)	Incremental Contour Volume (CF)	Accumulated Contour Volume (CF)	Estimated Stage w/ S-S Fxn (feet)
368.00	-0.50	71	Sediment Storage			
368.50	0.00	114				
369.00	0.50	167	141	70	70	0.51
370.00	1.50	289	228	228	298	1.44
371.00	2.50	441	365	365	663	2.57
372.00	3.50	620	531	531	1194	3.93
373.00	4.50	826	723	723	1917	5.54
374.00	5.50	1,061	751	2253	2916	7.50
375.00	6.50	1,324	972	2916	4110	9.61
375.50	7.00	1,878	1352	3380	5297	11.55



K_S =	180.0
b =	1.3824

Arden Senior Living Center
SPEC-23422

STORMWATER CONTROL MEASURE A

Volume Calculation

A. Abbott
12/26/2023

TOTAL VOLUME OF FACILITY

Volume of Main Pool below Normal Pool=	33,508	cf
Volume of Forebay below Normal Pool=	5,297	cf
Total Volume Below Normal Pool =	38,804	cf
Total Volume Above Normal Pool=	104,333	cf
Total Volume of Facility =	143,137	cf

FOREBAY PERCENTAGE OF PERMANENT POOL VOLUME

Per NCDEQ Minimum Design Criteria, the forebay volume should equal approximately 15-20% of the main pool volume.

Total Main Pool Volume =	33,508	cf
Provided Forebay Volume =	5,297	cf
Provided Forebay Volume % =	16%	

AVERAGE DEPTH OF MAIN POOL

Main Pool Volume at Normal Pool =	33,508	cf
Main Pool Area at Normal Pool =	8,539	sf
Average Depth =	3.92	ft

Arden Senior Living Center
SPEC-23422

STORMWATER CONTROL MEASURE A

Surface Area Calculation

A. Abbott
12/26/2023

WET DETENTION BASIN SUMMARY

Enter the drainage area characteristics ==>

Total drainage area to pond =	10.96	acres
Total impervious area to pond =	6.33	acres

Note *The basin must be sized to treat all impervious surface runoff draining into the pond, not just the impervious surface from on-site development.*

Drainage area = **10.96** acres @ **57.7%** impervious

Estimate the surface area required at pond normal pool elevation ==>

Wet Detention Basins are based on an minimum average depth of = 3.92 feet ***(Calculated)***

		3.0	3.92	4.0
Lower Boundary =>	50.0	1.79		1.51
Site % impervious =>	57.7	2.02	***1.74***	1.71
Upper Boundary =>	60.0	2.09		1.77

Therefore, SA/DA required = ***1.74***

Surface area required for main pool at normal pool = 8,287 ft^2

Surface area provided for main pool at normal pool = 8,539 ft^2

STORMWATER CONTROL MEASURE A

WQV Calculation

DETERMINATION OF WATER QUALITY VOLUME

$WQ_V = (P)(R_V)(A)/12$

where,

WQ_V = water quality volume (in acre-ft)
R_V = 0.05+0.009(I) where I is percent impervious cover
A = area in acres
P = rainfall (in inches)

Input data:

Total area, A =	10.96	acres
Impervious area =	6.33	acres
Percent impervious cover, I =	57.7	%
Rainfall, P =	1.00	inches

Calculated values:

R_V =	0.57	
WQ_V =	0.52	acre-ft
=	22659	cf.

ASSOCIATED DEPTH IN POND

WQ_V =	22659	cf.

Stage / Storage Data:

Ks =	11959	
b =	1.139	
Zo =	375.50	
Volume in 1" rainfall =	22659	cf.

Calculated values:

Depth of WQv in Basin =	1.75	ft
=	21.03	inches
Elevation =	377.25	ft

STORMWATER CONTROL MEASURE A

WQV Drawdown Calculation

DRAWDOWN ORIFICE DESIGN

Per NCDEQ "Stormwater Design Manual" Part B. Stormwater Calculations

Orifice Equation for WQv Flow:

$$Q = C_d\ A\ (2\ g\ Ho)^{0.5}$$

C_d orifice =	0.60	
D orifice =	2.5	inch
# orifices =	1	
Area orifice =	0.034	sf
g =	32.2	ft/s^2
Orifice Invert =	375.50	ft
WSEL @ 1" Runoff Volume =	377.25	ft
Ho =	0.550	ft*

**Average head over the orifice (assuming average head is 1/3 the total depth)*

Q = 0.1217 cfs

Drawdown Time = Volume / Flowrate / 86400 (sec/day)

Volume in 1" rainfall = 22,659 cf

Drawdown Time =	2.16 days

MCADAMS

Subsection: Elevation-Area Volume Curve
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Elevation (ft)	Planimeter (ft²)	Area (ft²)	A1+A2+sqr (A1*A2) (ft²)	Volume (ac-ft)	Volume (Total) (ac-ft)
375.50	0.0	10,420.000	0.000	0.000	0.000
376.00	0.0	12,006.000	33,610.924	0.129	0.129
377.00	0.0	13,650.000	38,457.637	0.294	0.423
378.00	0.0	15,352.000	43,478.008	0.333	0.756
379.00	0.0	16,585.000	47,893.595	0.367	1.122
380.00	0.0	17,829.000	51,609.754	0.395	1.517
381.00	0.0	19,099.000	55,381.078	0.424	1.941
382.00	0.0	20,417.000	59,263.007	0.453	2.394

Subsection: Outlet Input Data
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	375.50 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	382.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Area	Orifice - 1	Forward	Culvert - 1	379.00	382.00
Inlet Box	Riser - 1	Forward	Culvert - 1	380.20	382.00
Orifice-Circular	Orifice - WQ	Forward	Culvert - 1	375.50	382.00
Culvert-Circular	Culvert - 1	Forward	TW	374.50	382.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Subsection: Outlet Input Data
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Structure ID: Riser - 1 Structure Type: Inlet Box	
Number of Openings	1
Elevation	380.20 ft
Orifice Area	25.0 ft²
Orifice Coefficient	0.600
Weir Length	20.00 ft
Weir Coefficient	3.00 (ft^0.5)/s
K Reverse	1.000
Manning's n	0.000
Kev, Charged Riser	0.000
Weir Submergence	False
Orifice H to crest	False

Subsection: Outlet Input Data
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Structure ID: Culvert - 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	30.0 in
Length	80.00 ft
Length (Computed Barrel)	80.00 ft
Slope (Computed)	0.006 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.500
Kb	0.009
Kr	0.500
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.157
T2 ratio (HW/D)	1.304
Slope Correction Factor	-0.500

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

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

T1 Elevation	377.39 ft	T1 Flow	27.16 ft³/s
T2 Elevation	377.76 ft	T2 Flow	31.05 ft³/s

Subsection: Outlet Input Data
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Structure ID: Orifice - WQ Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	375.50 ft
Orifice Diameter	2.5 in
Orifice Coefficient	0.600

Structure ID: Orifice - 1 Structure Type: Orifice-Area	
Number of Openings	1
Elevation	379.00 ft
Orifice Area	1.8 ft^2
Top Elevation	379.50 ft
Datum Elevation	379.25 ft
Orifice Coefficient	0.600

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

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Subsection: Composite Rating Curve
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
375.50	0.00	(N/A)	0.00	(no Q: Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1)
375.60	0.01	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
375.70	0.05	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
375.80	0.07	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
375.90	0.09	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.00	0.10	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.10	0.12	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.20	0.13	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.30	0.14	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.40	0.15	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.50	0.15	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.60	0.16	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.70	0.17	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.80	0.18	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
376.90	0.19	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.00	0.19	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.10	0.20	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)

Subsection: Composite Rating Curve
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
377.20	0.21	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.30	0.21	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.40	0.22	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.50	0.23	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.60	0.23	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.70	0.24	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.80	0.24	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
377.90	0.25	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.00	0.25	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.10	0.26	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.20	0.26	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.30	0.27	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.40	0.27	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.50	0.28	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.60	0.28	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.70	0.29	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
378.80	0.29	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)

Subsection: Composite Rating Curve
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
378.90	0.30	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
379.00	0.30	(N/A)	0.00	Orifice - WQ,Culvert - 1 (no Q: Orifice - 1,Riser - 1)
379.10	1.17	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.20	2.04	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.30	2.91	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.40	3.78	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.50	4.66	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.60	5.45	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.70	6.14	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.80	6.75	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
379.90	7.31	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
380.00	7.83	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
380.10	8.31	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
380.20	8.78	(N/A)	0.00	Orifice - 1,Orifice - WQ,Culvert - 1 (no Q: Riser - 1)
380.30	11.11	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
380.40	14.97	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
380.50	19.83	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
380.60	25.54	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
380.70	31.90	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1

Subsection: Composite Rating Curve
Label: SCM A
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)	Contributing Structures
380.80	38.89	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
380.90	45.36	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
381.00	50.18	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
381.10	54.09	(N/A)	0.00	Orifice - 1,Riser - 1,Orifice - WQ,Culvert - 1
381.20	55.19	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.30	55.74	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.40	56.29	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.50	56.82	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.60	57.35	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.70	57.88	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.80	58.40	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
381.90	58.91	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)
382.00	59.43	(N/A)	0.00	Riser - 1,Culvert - 1 (no Q: Orifice - 1,Orifice - WQ)

MCADAMS

Subsection: Level Pool Pond Routing Summary
Label: SCM A (IN)
Scenario: Post- 1 year

Return Event: 1 years
Storm Event: 1-Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	375.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	28.86 ft³/s	Time to Peak (Flow, In)	721.000 min
Flow (Peak Outlet)	0.29 ft³/s	Time to Peak (Flow, Outlet)	1,440.000 min

Elevation (Water Surface, Peak)	378.82 ft
Volume (Peak)	1.053 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	1.342 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.288 ac-ft
Volume (Retained)	1.053 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: SCM A (IN)
Scenario: Post- 10 year

Return Event: 10 years
Storm Event: 10-Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	375.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	56.51 ft³/s	Time to Peak (Flow, In)	721.000 min
Flow (Peak Outlet)	9.63 ft³/s	Time to Peak (Flow, Outlet)	753.000 min

Elevation (Water Surface, Peak)	380.24 ft
Volume (Peak)	1.615 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	3.105 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	1.965 ac-ft
Volume (Retained)	1.139 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

Subsection: Level Pool Pond Routing Summary
Label: SCM A (IN)
Scenario: Post- 100 year

Return Event: 100 years
Storm Event: 100-Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	375.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	79.96 ft³/s	Time to Peak (Flow, In)	721.000 min
Flow (Peak Outlet)	49.28 ft³/s	Time to Peak (Flow, Outlet)	726.000 min

Elevation (Water Surface, Peak)	380.98 ft
Volume (Peak)	1.933 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	5.256 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	4.111 ac-ft
Volume (Retained)	1.144 ac-ft
Volume (Unrouted)	-0.001 ac-ft
Error (Mass Balance)	0.0 %

NUTRIENT LOADING CALCULATIONS

Arden Senior Living Center
SPEC-23422

SITE DATA

Project Information		
Project Name:		**Arden Senior Living Center**
Applicant:		Juan Montes
Applicant Contact Name:		Juan Montes
Applicant Contact Number:		919-361-5000
Contact Email:		montes@Mcadamsco.com
Municipal Jurisdiction (Select from dropdown menu):		Rolesville
Last Updated:		Wednesday, January 3, 2024
Site Data:		
Total Site Area (Ac):		10.41
Existing Lake/Pond Area (Ac):		0.00
Proposed Disturbed Area (Ac):		8.26
Impervious Surface Area (acre):		5.93
Type of Development (Select from Dropdown menu):		Residential
Percent Built Upon Area (BUA):		57%
Project Density:		High
Is the proposed project a site expansion?		No
Number of Drainage Areas on Site:		4
NOAA	**1-Year, 24-Hour Storm (inches) (See NOAA Website):**	2.86
	2-Year, 24-Hour Storm (inches) (See NOAA Website):	3.46
	10-Year, 24-Hour Storm (inches) (See NOAA Website):	5.04
Lot Data (if applicable):		
Total Acreage in Lots:		
Number of Lots:		
Average Lot Size (SF):		
Total Impervious Surface Area on Lots (SF):		
Average Impervious Surface Area Per Lot (SF):		

Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):

Arden Senior Living is a proposed subdivision in Rolesville, Wake County of NC. The existing site is an undveloped forrest. This site utilitizes one stormwater control measure. For more detail see the Stormwater Calculations book.

Project Name: Arden Senior Living Center

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	5.59				12.86			
Site Acreage within Drainage=	4.57				9.61			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Fair Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Good Condition	0.00	0.36	4.14	0.07	0.00	0.39	0.58	0.12
Open Space, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Fair condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Good Condition	0.00	0.00	0.00	0.00	0.00	0.94	1.51	0.14
Reforestation (in dedicated OS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connected Impervious	0.00	0.00	0.00	0.00	0.00	2.18	3.75	0.00
Disconnected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				100.00			
Slope (ft/ft)=	0.060				0.035			
Surface Cover:	Woods				Woods			
n-value=	0.400				0.400			
T_t (hrs)=	0.244				0.303			
Shallow Flow								
Length (ft)=	380.00				686.00			
Slope (ft/ft)=	0.055				0.036			
Surface Cover:	Unpaved				Unpaved			
Average Velocity (ft/sec)=	3.78				3.06			
T_t (hrs)=	0.03				0.06			
Channel Flow 1								
Length (ft)=	142.00				103.00			
Slope (ft/ft)=	0.035				0.019			
Cross Sectional Flow Area (ft^2)=	4.00				10.50			
Wetted Perimeter (ft)=	6.00				9.50			
Channel Lining:	Grass				Grass			
n-value=	0.035				0.035			
Hydraulic Radius (ft)=	0.67				1.11			
Average Velocity (ft/sec)=	6.08				6.27			
T_t (hrs)=	0.01				0.00			

Project Name: Arden Senior Living Center

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.28	0.37
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	69	87
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**87**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	21,707	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.59	1.59
Volume of runoff (ft^3) =	9,841	55,507
Volume change (ft^3) =	45,666	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.93	2.12
Volume of runoff (ft^3) =	15,368	73,851
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.98	3.57
Volume of runoff (ft^3) =	32,862	59,217
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name: Arden Senior Living Center

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	7.57				0.34			
Site Acreage within Drainage=	5.29				0.29			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Fair Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Good Condition	0.00	2.74	2.55	0.00	0.00	0.18	0.11	0.00
Open Space, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Fair condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Good Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reforestation (in dedicated OS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disconnected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				100.00			
Slope (ft/ft)=	0.060				0.060			
Surface Cover:	Woods				Woods			
n-value=	0.400				0.400			
T_t (hrs)=	0.244				0.244			
Shallow Flow								
Length (ft)=	322.00				137.00			
Slope (ft/ft)=	0.049				0.029			
Surface Cover:	Unpaved				Unpaved			
Average Velocity (ft/sec)=	3.57				2.75			
T_t (hrs)=	0.03				0.01			
Channel Flow 1								
Length (ft)=	0.00				0.00			
Slope (ft/ft)=	0.000				0.000			
Cross Sectional Flow Area (ft^2)=	0.00				0.00			
Wetted Perimeter (ft)=	0.00				0.00			
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: Arden Senior Living Center

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.27	0.26
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	62	61
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**61**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	62	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.35	0.30
Volume of runoff (ft^3) =	6,744	320
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.61	0.54
Volume of runoff (ft^3) =	11,650	571
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.48	1.37
Volume of runoff (ft^3) =	28,408	26,341
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name: Arden Senior Living Center

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.23				0.21			
Site Acreage within Drainage=	0.23				0.21			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Fair Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Good Condition	0.00	0.23	0.00	0.00	0.00	0.21	0.00	0.00
Open Space, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Fair condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Good Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reforestation (in dedicated OS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disconnected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				100.00			
Slope (ft/ft)=	0.030				0.030			
Surface Cover:	Woods				Woods			
n-value=	0.400				0.400			
T_t (hrs)=	0.322				0.322			
Shallow Flow								
Length (ft)=	120.00				120.00			
Slope (ft/ft)=	0.017				0.017			
Surface Cover:	Unpaved				Unpaved			
Average Velocity (ft/sec)=	2.10				2.10			
T_t (hrs)=	0.02				0.02			
Channel Flow 1								
Length (ft)=	0.00				0.00			
Slope (ft/ft)=	0.000				0.000			
Cross Sectional Flow Area (ft^2)=	0.00				0.00			
Wetted Perimeter (ft)=	0.00				0.00			
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: Arden Senior Living Center

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.34	0.34
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	55	55
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**55**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	38	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.16	0.16
Volume of runoff (ft^3) =	133	121
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.33	0.33
Volume of runoff (ft^3) =	278	253
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.00	1.00
Volume of runoff (ft^3) =	835	835
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name: Arden Senior Living Center

DRAINAGE AREA 4
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.32				0.30			
Site Acreage within Drainage=	0.32				0.30			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.04							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Fair Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woods, Good Condition	0.00	0.32	0.00	0.00	0.00	0.30	0.00	0.00
Open Space, Poor Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Fair condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Open Space, Good Condition	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reforestation (in dedicated OS)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Connected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Disconnected Impervious	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				100.00			
Slope (ft/ft)=	0.040				0.040			
Surface Cover:	Woods				Woods			
n-value=	0.400				0.400			
T_t (hrs)=	0.287				0.287			
Shallow Flow								
Length (ft)=	35.00				35.00			
Slope (ft/ft)=	0.029				0.029			
Surface Cover:	Unpaved				Unpaved			
Average Velocity (ft/sec)=	2.73				2.75			
T_t (hrs)=	0.00				0.00			
Channel Flow 1								
Length (ft)=	0.00				0.00			
Slope (ft/ft)=	0.000				0.000			
Cross Sectional Flow Area (ft^2)=	0.00				0.00			
Wetted Perimeter (ft)=	0.00				0.00			
Channel Lining:								
n-value=								
Hydraulic Radius (ft)=								
Average Velocity (ft/sec)=								
T_t (hrs)=								

Project Name: Arden Senior Living Center

DRAINAGE AREA 4
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=	0.00	0.00
Slope (ft/ft)=	0.000	0.000
Cross Sectional Flow Area (ft^2)=	0.00	0.00
Wetted Perimeter (ft)=	0.00	0.00
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.29	0.29
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	55	55
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**55**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	54	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.16	0.16
Volume of runoff (ft^3) =	185	173
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	0.024	0.022
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.33	0.33
Volume of runoff (ft^3) =	386	362
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	0.050	0.047
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.00	1.00
Volume of runoff (ft^3) =	1,162	1,162
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	0.150	0.140

Project Name: **Arden Senior Living Center**

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY

DRAINAGE AREA SUMMARIES

DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in) = $Q_{pre,1\text{-}year}$ =	0.59	0.35	0.16	0.16						
Peak Flow (cfs)=$Q_{1\text{-}year}$ =				0.024						
Post-Development (1-year, 24-hour storm)										
Proposed Impervious Surface (acre) =	5.93	0.00	0.00	0.00						
Runoff (in)=$Q_{1\text{-}year}$ =	1.59	0.48	0.16	0.16						
Peak Flow (cfs)=$Q_{1\text{-}year}$ =				0.022						
Increase in volume per DA (ft^3)_1-yr storm=	45,666									
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft^3) =	21,707	62	38	54						

TARGET CURVE NUMBER (TCN)

Site Data

SITE \SOIL COMPOSITION

HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	4.20	40%	N/A
C	5.95	57%	N/A
D	0.26	2%	N/A

Total Site Area (acres) =	10.41
Percent BUA (Includes Existing Lakes/Pond Areas) =	57%
Project Density =	High
Target Curve Number (TCN) =	N/A
$CN_{adjusted\ (1\text{-}year)}$=	85
Minimum Volume to be Managed (Total Site) Per TCN Requirement= ft^3 =	N/A

Site Nitrogen Loading Data

HSG	TN export coefficient (lbs/ac/yr)	Site Acreage	N Export
Pasture	1.2	0.00	0.00
Woods, Poor Condition	1.6	0.00	0.00
Woods, Fair Condition	1.2	0.00	0.00
Woods, Good Condition	0.8	1.60	1.28
Open Space, Poor Condition	1.0	0.00	0.00
Open Space, Fair Condition	0.8	0.00	0.00
Open Space, Good Condition	0.6	2.88	1.73
Reforestation (in dedicated OS)	0.6	0.00	0.00
Impervious	21.2	5.93	125.72
SITE NITROGEN LOADING RATE (lbs/ac/yr)=		12.37	
Nitrogen Load (lbs/yr)=		128.72	
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only=		91.25	

Site Nitrogen Loading Data For Expansions Only

	Existing	New
Impervious(acres)=	NA	NA
"Expansion Area" (acres=)		
Nitrogen Load (lbs/yr)=	NA	NA
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	NA	NA
Total Site loading rate (lbs/ac/yr)		
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)=	NA	

WAKE COUNTY
NORTH CAROLINA

Project Name: Arden Senior Living Center

DRAINAGE AREA 1
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA1 Site Acreage=	9.61			
DA1 Off-Site Acreage=	3.25			
Total Required Storage Volume for Site TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA1 1" Rainfall for High Density (ft^3)=	21,707			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA1(a) (Ac)		Sub-DA1(b) (Ac)		Sub-DA1(c) (Ac)		Sub-DA1(d) (Ac)		Sub-DA1(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition	0.60		0.49	0.42						
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	2.02		0.57	0.14						
Reforestation (in dedicated OS)										
Impervious	5.93			0.28						

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
SCM A	Wet Detention Basin	17,403	22,659	25%	127.41	31.85	51.84
				0%	95.56	0.00	
				0%	95.56	0.00	
				0%	95.56	0.00	
				0%	95.56	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**95.56**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
Bypass		511		0%	7.09	0.00	
				0%	7.09	0.00	
				0%	7.09	0.00	
				0%	7.09	0.00	
				0%	7.09	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**7.09**					

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Project Name: **Arden Senior Living Center**

DRAINAGE AREA 1
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA1 BMP SUMMARY	
Total Volume Treated (ft^3)=	#VALUE!
Nitrogen Mitigated(lbs)=	31.85
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-}year)}$=	
Post BMP $CN_{(1\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-}year}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=	
Post BMP $CN_{(2\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-}year)}$=	
Post BMP $CN_{(10\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-}year)}$=	