Appendix A:

Hydrologic Analysis

APPENDIX A
HYDROLOGIC ANALYSIS

Two different models were used to develop design flows for the primary and secondary systems. For each system analyzed, the hydrologic model(s) was selected based on the complexity of the stormwater conveyance system.

The US Army Corps of Engineers (USACE) HEC-HMS model was selected to model the primary systems defined as the main stems of Swift Creek, SCUT1, and Gum Swamp. HEC-HMS simulates the surface runoff response to precipitation for an interconnected system of surfaces, channels, and ponds. Input data for the HEC-HMS model was developed using topographic, land use, and soils maps in GIS to delineate and calculate the basin areas and SCS hydrologic parameters. The HEC-HMS model offers a variety of methods for simulating the rainfall-runoff response, hydrograph development, channel and pond routing. The selection of methods for the analyses is based on the study objectives, data availability, and watershed characteristics. The precipitation data for the 24-hour duration, NRCS Type III storm was used to represent the synthetic rainfall event. The NRCS curve number approach was selected to calculate runoff volumes from the precipitation data, and the sub-basin unit hydrographs for these flood volumes were developed using the NRCS lag times. Where appropriate, reservoir routing was selected to model attenuation behind culvert embankments.

For the secondary systems that may: (a) have significant backwater effects from rising water surface elevations within the Primary Systems, (b) have attenuation within drainage ditches or behind roadways, and (c) show a sensitivity to the timing response of runoff to rainfall, the Storm Water Management Model (SWMM) developed by the Environmental Protection Agency (EPA) was selected as the hydrologic and hydraulic model. The NRCS curve number approach was selected to calculate runoff volumes from the precipitation data, and the sub-basin unit hydrographs for these flood volumes were developed using the watershed width parameter. SWMM simulates the surface runoff response to precipitation for an interconnected system of surfaces, channels, and ponds. Input data for the SWMM model was developed using topographic data, land use data, and soils maps in GIS to delineate and calculate the basin areas and NRCS hydrologic parameters. The SWMM model offers a variety of methods for simulating the rainfall-runoff response, hydrograph development, and channel routing. One advantage to using SWMM to model both hydrology and hydraulics is that channel routing is modeled in the EXTRAN (hydraulics) block automatically based on the geometry and nature of the conveyance system. This eliminates the need to iterate between a hydrologic model and a hydraulic model to produce reasonable flows.

Table A-1 lists the different systems and the modeling methodology applied to each system.

Table A-1: Project Area Model Selection

Project Area	Model Selection
Swift Creek Primary System	HEC-HMS
SCUT1 Primary System	HEC-HMS
Gum Swamp Primary System	HEC-HMS
Davenport Farm Road System	SWMM

Watershed Delineation and Connectivity

Watersheds were delineated for the Primary Systems and the secondary system utilizing digital LiDAR data available from the State of North Carolina and the stormwater inventory. The preliminary watersheds were created using automated procedures in a GIS platform and then adjusted as necessary based on the conveyance system and known ridge lines. Each flood control project watershed for the Primary Systems was subdivided into sub-watersheds selected at hydrologically and hydraulically significant points, such as major roadway crossings, stream convergences, known problem areas, etc. Each sub-watershed for the secondary systems was selected as the area that drained to each inlet modeled on the secondary system. Forty-three (43) sub-watersheds were delineated for the Primary Systems ranging in size from 14 to 876 acres. Sub-watersheds were delineated as necessary for the secondary systems to accurately model the hydraulics of the system. The watershed maps included in Appendix C illustrate the sub-watershed and hydrologic connectivity for the primary system.

Soils

The NRCS curve number method uses basin characteristics, such as soil types and land use, to compute the runoff response. The infiltration rate of a soil influences the volume of surface runoff that results from given storm events. Soils with high infiltration rates produce lower runoff than soils with lower infiltration rates. The Soil Conservation Service has prepared soil maps for Pitt County that identify four primary soil groups. This data is available digitally and was obtained for the City of Greenville.

The groups (A, B, C, and D) correspond to decreasing rates of infiltration. A general description of the four soil groups taken from the USDA, SCS, NEH-4 (1972) is presented in Table A-2.

Table A-2: Hydrologic Soils Groups

Soil Group	Description
A	Group A soils have high infiltration rates even when thoroughly wetted and consist chiefly of deep, well to excessively drained sand or gravels. These soils have a high rate of water transmission (greater than 0.3 inches per hour).
B	Group B soils have moderate infiltration rates even when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission (0.15 to 0.3 inches per hour).
C	Group C soils have slow infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission (0.5 to 0.15 inches per hour).
D	Group D soils have a very slow infiltration rate when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission (0 to 0.05 inches per hour).
A/D B/D	The first letter applies to the drained condition and the second to the undrained condition. For the purpose of hydrologic soil group, adequately drained means that the seasonal high water table is kept at least 60 centimeters (24 inches) below the surface.

Soils within the watershed are predominantly NRCS hydrologic soil groups C soils, although seven (6) different hydrologic soil groups are represented in some quantity in the Swift Creek watershed (See Table A-3 and Appendix C).

Table A-3: Area Distribution of Hydrologic Soil Groups

Soil Group	Total Area (acre)	Percent of Total Area
A	78	2%
B	954	23%
C	1,734	42%
D	970	24%
A/D	12	< 1%
B/D	345	8%

Water cover makes up the remaining one (1) acre of the Swift Creek Watershed.

Land Use

Land use is the watershed cover condition as it relates to the actual type of development and zoning within the watershed. Land use influences the runoff characteristics of a watershed, and combined with other basin characteristics, is used to determine the SCS curve number for the basin.

The existing zoned land uses for the Swift Creek Watershed were provided by the City of Greenville. These zoning maps were used to develop peak flows for the watershed. Twelve (12) land use categories were delineated within the Swift Creek Watershed based on the information provided and field observation of the current uses (See Appendix C).

In its entirety, the Swift Creek Watershed covers an area of approximately 4,100 acres (6.4square miles). Land use in the watershed is about 55 percent built out as shown on the Existing Conditions Land Use Map included in Appendix C. Percentages of each existing and future land use groups and the correlating acreage are listed in Table A-4 below.

Table A-4: Swift Creek Watershed Land Use

	Existing		Future	
Land Use Category	**Area (acres)**	**Percent of Basin Area**	**Area (acres)**	**Percent of Basin Area**
Right-of-Way	289	7%	289	7%
Industrial	4	< 1%	4	< 1%
Commercial	151	4%	303	7%
Mixed Use/Office/Institutional	425	10%	411	10%
Office/Institutional/Medical	22	1%	20	< 1%
Office/Institutional/Multi-Family	100	2%	100	2%
High Density Residential	142	3%	252	6%
Medium Density Residential	374	9%	488	12%
Low Density Residential	553	14%	482	12%
Very Low Density Residential	243	6%	1,521	37%
Conservation/Open Space	584	14%	224	5%
Agricultural/Cropland	1,207	29%	-	-

NRCS Curve Numbers

The NRCS curve number approach was used in computing the runoff response. Runoff curve numbers (RCNs) were generated by using the NRCS document entitled Urban Hydrology for Small Watersheds, dated June 1986 and commonly referred to as TR-55. This method relates the drainage characteristics of the hydrologic soil group, land use category, and antecedent moisture conditions (AMC) to a runoff curve number. The runoff curve number and an estimate of the initial surface moisture storage capacity are used to calculate a total runoff depth for a storm in a basin.

The AMC refers to the total rainfall in a 5-day period preceding a storm and relates to the soil moisture condition at the beginning of the storm event. The AMC value can be used as a calibration tool in the hydrologic computations where AMC-1 represents "dry" conditions and AMC-3 represents "wet" conditions. The average antecedent moisture conditions (AMC-2) are generally considered most representative for the humid southeastern portion of the country and were used for the hydrologic calculations in this study.

Runoff curve numbers were determined for each sub-basin based on the soil group, land use, and average antecedent moisture condition for the area. The curve numbers calculated for this study are listed in Table A-5 below.

Table A-5: Curve Numbers Based on Land Use and Soil Groups

Land Use Category	Soil Group			
	A	B	C	D
Commercial	89	92	94	95
Conservation/Open Space/Agricultural*	49	69	79	84
Open Space, Good Condition	39	61	74	80
Very Low Residential	49	69	79	84
Low Density Residential	51	68	79	84
Medium Density Residential	54	70	80	85
High Density Residential	61	75	83	87
Office/Institutional/Multifamily	77	85	90	92
Right-of-Way	83	89	92	93

*Assumed fair condition

For each sub-basin, the curve number was determined and weighted by area to calculate the composite curve number for each sub-basin. A summary of the hydrologic input data for the Primary Systems, including the runoff curve numbers, is shown in Table A-6. The detailed calculations are included in Appendix E (runoff curve numbers) and Appendix F (times of concentration).

Table A-6: Summary of Hydrologic Input Data

Drainage Basin ID	Drainage Area (acre)	Existing RCN	Future RCN	Lag Time* (minutes)
GS-1A	102.5	71	77	90
GS-1B	152.0	72	81	225
GS-1C	321.8	76	81	300
GS-1D	64.3	78	78	20
GS-2A	292.1	77	80	210
GS-2B	43.9	82	85	30
GS-2C	36.8	77	78	20
GS-3	82.4	80	80	55
GS-4A	48.3	82	82	30
GS-4B	74.3	82	82	120
GS-4C	63.3	80	80	120
GS-4D	84.9	78	78	150
GS-4E	33.5	79	79	60
GS-5A	97.2	73	76	150
GS-5B	30.5	81	81	20
GS-5C	26.0	83	83	15
GS-5D	86.5	81	81	120
GS-6	106.7	74	76	120
SC-1A	98.6	84	85	240
SC-1B	65.1	74	78	60
SC-1C	129.2	74	92	150
SC-1D	100.1	75	80	240
SC-1E	111.5	82	82	120
SC-2A	102.3	75	90	180
SC-2B	58.2	81	81	20
SC-3A	55.5**	66	73	180
SC-3B	62.0	78	79	50
SC-3C	34.8	79	80	40
SC-4	107.6	77	77	45
SC-5A	22.5	82	82	27
SC-5B	49.2	80	76	65
SC-6	876.5	80	80	125
SCUT-1A	46.0	80	80	46
SCUT-1B	47.0	71	76	92
SCUT-1C	35.1	79	79	24
SCUT-1D	41.2	76	88	113
SCUT-2	29.1	86	86	90
SCUT-3	59.8	84	84	51
SCUT-4A	166.0	89	88	86
SCUT-4B	31.0	89	91	10
SCUT-4C	34.4	84	91	30
SCUT-4D	26.3	87	87	18
SCUT-5	39.5	87	87	35

Rainfall

Rainfall distributions for Greenville are derived using the NRCS Type III standard distribution. Total rainfall volumes for the modeled frequency storms were based on data published on the NOAA website, http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html. Table A-7 shows the total rainfall volumes used for this study based on precipitation data collected in Greenville, North Carolina

Table A-7: Design Storm Rainfall Depths

Design Storm	Rainfall Depth (in)
2-year, 24-hour	3.76
10-year, 24-hour	5.81
25-year, 24-hour	7.23
50-year, 24-hour	8.47
100-year, 24-hour	9.84

While the depth-duration-frequency curves are calculated based on real rainfall data, the rainfall data used for the SWMM and HEC-HMS models represent the Type III synthetic rainfall distribution. Actual runoff is based on several factors including rainfall intensity, duration and the antecedent moisture conditions of the watershed.

Hydrograph Translation

The lag time, as defined by the NRCS for use in the NRCS dimensionless unit hydrograph method, is the time, or lag, between the center of mass of rainfall excess and the peak of the unit hydrograph. The lag time is based on the sub-watershed time of concentration, or travel time, and is a function of the sub-watershed size, shape, slope, cover, and other basin characteristics. For the NRCS method, the sub-watershed lag time is calculated to be 0.6 times the time of concentration for each sub-watershed.

The times of concentration for the sub-watersheds were calculated from the methodology described in TR-55. A summary of the calculations is shown in Appendix F. The longest flow path is divided into three types of flow; overland flow, shallow concentrated flow, and channel flow. A spreadsheet was developed to tabulate the incremental travel times for each type of flow for each sub-basin. The incremental travel times were totaled and multiplied by 0.6 to compute the lag time for each sub-basin. The equation detailing the travel time for sheet flow is as follows:

$$T_t = \frac{.007\,(nL)^{0.8}}{(P_2)^{0.5}\, s^{0.4}}$$

T_t = Travel Time in hours
n = Manning Roughness Coefficient (Paved=0.011, Unpaved=0.24)

L = flow length in feet
P_2 = 2-year, 24 hour rainfall = 3.76 inches
S = slope of hydraulic grade line (land slope in ft/ft)

For shallow concentrated flow, the velocity (V) is calculated for either paved or unpaved sections by using the following equations:

$$\text{Unpaved } V = 16.1345\ (S)^{1/2}$$
$$\text{Paved } V = 20.3282\ (S)^{1/2}$$

The travel time for shallow flow is then calculated by dividing the flow length (L in feet) by velocity as follows:

T_t = Travel Time = L / (3600*V)

The open channel travel times are determined by a modified version of the Manning equation, which is as follows:

$$V = \frac{1.49\ R^{2/3}\ S^{0.5}}{n}$$

V = Average full-flow velocity (ft/s)
R = Hydraulic radius (ft)
S = Slope of hydraulic grade line (ft/ft)
n = Manning roughness coefficient

Instead of a time of concentration parameter, the SWMM model uses a watershed width parameter to create the unit hydrograph used in the model that will translate the rainfall into runoff. The watershed width is a parameter unique to SWMM that typically represents the watershed area divided by the longest flow path. The width parameter is typically calibrated to flow gauge data, if available. The Swift Creek Watershed lacks flow gauge data, so the peak flows from SWMM were compared to flows developed using the Rational Method. Based on the flow comparison, the watershed widths for each basin were increased in some instances to produce reasonable flows. Increasing the watershed width parameters is not an uncommon practice for calibrating models for areas with gradual slopes and moderate conveyance systems.

Channel Elements

Flood peaks attenuate, or reduce, as they travel downstream due to the storage characteristic of the stream reach. The Muskingum-Cunge routing method in HEC-HMS was selected to define the storage characteristic of selected stream reaches in the Swift Creek Watershed. It can be described as a hydrologic routing method based on physical parameters of the channel and floodplain. Input data for this method consists of representative channel/floodplain sections, reach length, Manning's roughness coefficient, and channel bed slope. This method provides advantages over other hydrologic techniques based on the relative size and slope of the channels and floodplains in the watershed.

Structure and Pond Routing

Reservoir storage routing was used for routing hydrographs through the storage areas upstream from undersized structures (culverts). HEC-HMS is able to model the effects of an undersized culvert through inputs defining the relationship between water volume or area and elevation and the relationship between outflow and water surface elevations. The relationship between outflow and water surface elevations is developed using an iterative process between HEC-HMS and HEC-RAS. A rating curve generated using HEC-RAS defines the outflow of the water leaving this system.

Structures having fill heights greater than or equal to 50% of the height of the structure were assumed to provide significant peak flow attenuation and, therefore, were routed in the HEC-HMS model. In addition, any structure which exhibited significant upstream floodplain storage or significant backwater from the HEC-RAS model output would be analyzed for providing peak flow attenuation.

For each structure, the cutoff point in the backwater pool was determined where the structure routing ends and upstream channel routing begins. This determination was necessary so that available storage areas calculated for channel and structure routing did not overlap. The following procedure was used for this determination:

- The approximate limit of the 100-year frequency flood backwater pool was delineated in the topographic map.
- The distance from the upstream face of the structure to the upstream limit of the pool was measured.
- From the upstream end of the backwater pool, a distance equal to 20% of the total pool length was measured in the downstream direction and the point marked on the topographic map.
- Through this point a line was drawn perpendicular to the contour lines.
- This line was then designated as the cutoff point to be used as the upstream limit of the channel routing.

For each structure, the elevation-storage relation for the Modified Puls method was derived by calculating the surface area of the topographic contours from the upstream face of the structure to the routing cutoff point associated with the structure. A pair of "SA" (storage area) – "SE" (elevation) records, the elevation-storage relation for each structure was input from the delineated information. To avoid interpolating storage areas for each stage-discharge point, a separate stage-discharge relation was entered into the HEC-HMS model on a pair of "SQ" (discharge) – "SE" (elevation) records based on the HEC-RAS model output.

However, the method described in the previous paragraph does not account for the reduction in tailwater on the structure due to the attenuation effects of the upstream storage, which in turn can affect the stage-discharge relation of the structure. Therefore, an iterative process for storage structures was followed with an objective to obtain a set of peak discharge values, runoff volumes, and water surface elevations that are "balanced" between the two models. The process was initiated by inputting a set of discharges into the HEC-RAS model to develop a set of discharge-storage relations for each reach. This initial set of relations was input into the HEC-HMS model. These values were supplemented by the depth-storage relation for each structure.

The HEC-HMS model was run with these values to derive new discharges at downstream locations. These new values were input into the HEC-RAS model and it was recomputed. The new discharges and water surface elevations listed in the HEC-HMS summary output were compared with the discharges listed in the previous HEC-RAS run. When the values stabilized, the model was considered "balanced". If not then additional iterations were performed. Typically, three iterations are adequate to derive a balanced model.

Summary of Hydrologic Model Results

The HEC-HMS model was used to compute peak runoff for the 2-, 10-, 25-, 50- and 100- year design storms for the existing conditions.

The results of the hydrologic model are summarized in Table A-8. The HEC-HMS input and output are included in Appendix H. Additionally, a CD is included in Appendix J and contains the digital files for the HEC-HMS model.

Table A-8: Existing Conditions Flows from HEC-HMS for Swift Creek Watershed

HEC-HMS Node	Road Name / Location	HEC-RAS Station	Storm Event				
			2-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
SWIFT CREEK							
U/S Limit SC	Upstream Limit of Swift Creek	241994	122	249	342	426	520
Thomas Langston – SC	Thomas Langston Road	239601	173	358	496	620	754
Sterling Trace Drive	Sterling Trace Drive	237845	189	416	628	805	993
SWIFT CREEK UT1							
U/S Limit SCUT	Upstream Limit of SCUT1	4495	67	138	190	236	288
Thomas Langston – SCUT	Thomas Langston Road	3997	68	145	203	253	309
Belfair Drive	Belfair Drive	3015	84	163	220	283	351
Sterling Pointe Drive	Sterling Pointe Drive	1635	123	239	315	412	514
GUM SWAMP							
U/S Limit GS	Upstream Limit of Gum Swamp	9293	76	160	223	280	345
Frog Level Road	Frog Level Road	7759	172	368	513	660	825

Comparison of Peak Flows

For comparison purposes, flood peaks were estimated using the U.S. Geological Survey (USGS) publication entitled "The National Flood-Frequency Program – Methods for Estimating Flood Magnitude and Frequency in Rural and Urban Areas in North Carolina – USGS Fact Sheet 007-00" (2001) at key locations within the watershed. Table A-9 compares the peak flows determined from the USGS regional regression equations the Coastal-Plain region versus the peak flows from HEC-HMS. Additional, the peak flows from HEC-HMS were also compared to available FEMA flows.

Table A-9: Comparison of Existing Conditions Peak Flows

Methodology	Location	2-Year (cfs)	10-Year (cfs)	25-Year (cfs)	50-Year (cfs)	100-Year (cfs)
SWIFT CREEK						
HEC-HMS	Thomas Langston Drive	173	358	496	620	754
	Sterling Trace Drive	189	416	628	805	993
USGS – Regional Regression Equations: Urban Coastal Plains (2001)	Thomas Langston Drive	331	733	1,060	1,236	1,404
	Sterling Trace Drive	363	792	1,138	1,325	1,503
FEMA Flows	Thomas Langston Drive	-	314	-	594	750
	Sterling Trace Drive	-	433	-	806	1,010
SCUT1						
HEC-HMS	Thomas Langston Drive	68	145	203	253	309
	Belfair Drive	84	163	220	283	351
	Sterling Pointe Drive	123	239	315	412	514
USGS – Regional Regression Equations: Urban Coastal Plains (2001)	Thomas Langston Drive	54	161	272	333	397
	Belfair Drive	90	245	396	477	559
	Sterling Pointe Drive	126	323	504	601	696
GUM SWAMP						
HEC-HMS	Frog Level Road	172	368	513	660	825
USGS – Regional Regression Equations: Urban Coastal Plains (2001)	Frog Level Road	311	716	1,051	1,241	1,427
FEMA Flows	Frog Level Road	-	-	-	-	841

Appendix B:

Hydraulic Analysis

APPENDIX B
HYDRAULIC ANALYSIS

The purpose of the hydraulic modeling analysis is to determine an existing level of flooding for the stormwater drainage network and to develop proposed solutions to mitigate flooding, on both the primary systems and the secondary systems. Three different modeling methodologies were used depending on the complexity and location of the conveyance system. For the primary systems comprised of Swift Creek, SCUT1, and Gum Swamp, the Hydrologic Engineering Center River Analysis System (HEC-RAS) was used for hydraulic modeling. For the secondary system, SWMM was the selected model due to the complex nature of the system. Table B-1 lists the project areas that were modeled using each approach.

Table B-1: Project Area Model Selection

Project Area	Model Selection
Swift Creek Primary System	HEC-RAS
SCUT1 Primary System	HEC-RAS
Gum Swamp Primary System	HEC-RAS
Davenport Farm Road System	SWMM

HEC-RAS Model

The HEC-RAS model calculates water surface profiles for steady, gradually varied flow, both sub-critical and supercritical, for user-specified discharges. The standard step backwater analysis for sub-critical flow was modeled for the Swift Creek, SCUT1, and Gum Swamp Primary System. The model calculates the effect of obstructions, such as culverts, and building structures in the channel and floodplain on the water surface profile. The hydraulic computations are based on the solution of a one-dimensional energy equation with energy loss due to friction evaluated by Manning's equation.

Input data for the HEC-RAS computer model includes the following:

- Cross-section geometry of the channel and floodplain.
- Roughness coefficients to describe the characteristics of the channel and floodplain.
- Size, shape, and characteristics of culverts and roadways along the stream reach.
- Energy loss coefficients for flow in the channel and at roadway crossings.

Primary System Study Limits

As discussed with City of Greenville stormwater staff, study limits for the hydraulic evaluation of the primary systems include the segment of Swift Creek from approximately 2,400 feet upstream of Thomas Langston Road crossing at the upstream end to its confluence with an unnamed tributary to Swift Creek (referred to as SCUT1); Swift Creek UT1 from approximately 650 feet upstream of Thomas Langston Road crossing at the upstream end to its confluence with Swift Creek at the downstream end; and Gum Swamp from to approximately 1,600 feet upstream of the Frog Level Road crossing at the upstream end to approximately 1,500 feet upstream of its confluence with Swift Creek at the downstream end.

Stormwater Inventory

For the Swift Creek Watershed Master Plan, stormwater utility infrastructure throughout the watershed was collected by WK Dickson personnel to compile a Geographic Information System (GIS) stormwater inventory database for the City. This was accomplished by using Global Positioning Systems (GPS) as the primary means of data capture. WK Dickson employed survey grade GPS to locate the x, y, and z coordinates of each visible stormwater system structure and conventional surveying techniques to obtain other attributes including but not limited to size, material, slope, and length. Additionally, attributes were also collected for select streams and open channel. Data was obtained for those streams and open channels required to complete connectivity for modeling purposed. The data was collected using horizontal datum NAD 1983 and vertical datum NAVD 1988

Attributes collected as part of the inventory were used to populate the various models. Field visits and digital photographs for each structure and channel were used to estimate the roughness coefficients and energy loss coefficients. The topographic data used for the Swift Creek Watershed Master Plan was the State of North Carolina's LiDAR data.

Cross Sections

Cross sections utilized in the HEC-RAS model were based on the existing FEMA cross sections (where available). These surveyed cross sections were augmented with additional cross sections surveyed by WK Dickson. The surveyed cross section points were than merged with the digital elevation model based on the LiDAR data. Cross sections were located perpendicular to the flow and at intervals along the stream to characterize the flow capacity of the channel and floodplain for the primary system. Along stream reaches where the shape, size, and geometry of the cross-section are varying, cross sections were cut at closer intervals than for reaches having little change in channel characteristic. Additional sections were cut as required by the HEC-RAS program to sufficiently model structures such as culverts.

Surveyed cross sections are identified by station number, which for the HEC-RAS model, refers to the approximate linear distance upstream from a reference point on the main channel or tributary reach. The cross sections depict the locations of cut sections from field topographic surveys. Similarly, the cross section at each road crossing represents the top-of-road cross section. The cross sections just upstream and just downstream of highest point of roadway (commonly referred to as the weir) represent the locations of the upstream and downstream faces, respectively, of the bridge or culvert in an area not impacted by roadway fill.

Roughness Coefficients

Manning's roughness coefficients, or 'n' values, represent the resistance to flow and influence the flow capacity of channels and floodplains. The HEC-RAS model uses these coefficients to compute friction loss longitudinally in the channel and floodplain. The roughness value is a function of the type and density of the vegetation, channel bottom and stream bank material, degree of channel meandering, and depth of flow.

Roughness coefficients were determined for all stream reaches for which hydraulic analyses were performed. The "horizontal variation in n-values" option was enabled to allow for correct modeling of the widely varied surfaces on a given cross-section. The right or left bank of the stream is referenced facing downstream. Roughness coefficients used in this study are listed in Table B-2.

Table B-2: Roughness Coefficients

Location	Range of 'n' values
Main Channel	0.04 - 0.06
Left Overbank	0.045 - 0.15
Right Overbank	0.06- 0.15

All roughness coefficients were estimated through field observation and by referencing standard engineering manuals.

Culvert and Roadway Data

Culverts generally have different characteristics than the channel and floodplains away from roadway crossings. Often culverts constrict flood flows in the channel and floodplain, which may create backwater effects upstream of the structure. The constriction can produce increased velocities and result in localized scour.

For culvert analysis, the HEC-RAS model utilizes the concepts of "inlet" control and "outlet" control to simplify complicated culvert hydraulics. Inlet control flow occurs when the flow carrying capacity of the culvert entrance is less than the flow capacity of the culvert barrel. Outlet control flow occurs when the culvert carrying capacity is limited by downstream conditions or by the flow capacity of the culvert barrel.

During inlet control computations, the culvert inlet acts as either a weir or an orifice, and the resulting headwater is computed. The equations used by HEC-RAS are the same as those developed by the Federal Highway Administration during extensive laboratory testing, which describe the inlet control headwater under various conditions.

For outlet control flow conditions, the required headwater is computed considering various conditions. For culverts flowing full, a form of the Bernoulli Equation, which considers

friction losses, entrance losses and exit losses is utilized. Friction losses are based on Manning's equation. Entrance losses are computed as a coefficient times the velocity head in the culvert at the upstream end. Exit losses are computed as a coefficient times the change in velocity head from just inside the culvert (at the downstream end) to outside the culvert.

When the culvert is not flowing full, the direct step backwater procedure is used to calculate the profile through the culvert up to the culvert inlet. An entrance loss is then computed and added to the energy inside the culvert to obtain the upstream headwater. Culvert input data for the HEC-RAS model include:

- Shape and dimensions of the structure openings;
- Culvert length;
- Entrance loss coefficient, exit loss coefficient and coefficient of discharge for weir flow during roadway overtopping;
- Upstream and downstream invert elevations;
- Federal Highway Administration chart number for the culvert type;
- Top-of-road elevations to describe the weir during roadway overtopping and the weir crest length; and
- Four cross sections are required; one cross section sufficiently downstream of the culvert that flow is not affected by the culvert, one at the downstream end of the culvert, one at the upstream end of the culvert, and one located far enough upstream that the culvert has no effect on flow.

Energy Loss Coefficients

Contraction and expansion of flow produces energy losses caused by the transition. The magnitude of these losses is related to the velocity and the estimated loss coefficient. Where the transitions are gradual, the losses are small. At abrupt changes in cross-sectional area, the losses are higher. Energy losses resulting from expansion are greater than losses associated with contraction. Energy loss coefficients used for the Swift Creek Watershed hydraulic models are presented in Table B-3.

Table B-3: Energy Loss Coefficients

Type of Transition	Expansion	Contraction
None	0	0
Gradual	0.3	0.1
Culvert sections	0.5	0.3

Starting Water Surface Elevation
The starting water surface elevations for the Swift Creek, SCUT1, and Gum Swamp HEC-RAS models were calculated using the slope-area method, which is based on normal depth. The calculated slopes are as follows:

- 0.003 feet/feet for Swift Creek Main Branch
- 0.004 feet/feet for Swift Creek UT1
- 0.0026 for feet/feet for Gum Swamp

Model Run Descriptions and Assumptions
The HEC-RAS model was used to compute flood elevations at each cross-section for the Swift Creek, SCUT1, and Gum Swamp Primary Systems for the 2-, 10-, 25-, 50- and 100-year floods. A hard copy of the HEC-RAS input and output is included in Appendix H, while a digital copy of the input and output is located on the CD in Appendix J.

The hydraulic analysis for this study is based only on the condition of unobstructed flow. Therefore, flood elevations shown on the profiles are considered valid only if hydraulic structures remain unobstructed and do not fail. Flood elevations may be raised by debris blockage of the culvert, channel, or floodplain.

Model Validation
Efforts were made to verify the models for various storm events. Feedback obtained from the questionnaires was reviewed for relevant information that could be used to verify the model. The comments and responses received were not specific enough to verify the model. Likewise, the information received during the public meetings was not useful for the purposes of verifying the models. The City Staff was able to provide some feedback that was useful during the model validation process.

During the validation process, the flows and water surface elevations initially calculated were determined to be significantly higher than the FEMA flow and base flood elevations. Furthermore, the results from the initial existing conditions model were not aligned with some of the feedback received from the City. The flows were calibrated to get results to more closely match FEMA flows, USGS Regional Regression flows, and City feedback.

Open Channel Systems and Roadway Flooding
Six (6) roadway crossings were analyzed for flooding potential in the Swift Creek Watershed Master Plan. All roadway crossings that were analyzed in this study are listed in Tables B-4a-B-4c along with the minimum top-of-road elevations and the 2-, 10-, 25-, 50- and 100-year flood elevations at the crossing for existing and proposed conditions.

Table B-4a: Overtopping Analysis of Roadway Crossings – Existing Conditions

Location	Minimum Elevation at Top of Road (feet NAVD)	Desired Level of Service (Year)	Calculated Water Surface Elevations (feet NAVD)				
			2-year flood	10-year flood	25-year flood	50-year flood	100-year flood
SWIFT CREEK							
Thomas Langston Road (Culvert)	67.48	25-year	64.13	**67.61**	**68.16**	**68.43**	**68.65**
Sterling Trace Drive (Culvert)	62.53	25-year	62.28	**63.25**	**63.57**	**63.80**	**63.95**
SWIFT CREEK UT1							
Thomas Langston Road (Culvert)	66.81	25-year	65.97	**67.36**	**67.53**	**67.66**	**67.76**
Belfair Drive (Culvert)	64.81	25-year	62.59	64.50	**65.33**	**65.79**	**66.04**
Sterling Pointe Drive (Culvert)	60.71	25-year	60.47	**61.74**	**62.07**	**62.26**	**62.40**
GUM SWAMP							
Frog Level Road (Culvert)	65.11	25-year	62.70	64.96	**65.31**	**65.46**	**65.63**

*Bold text indicates the existing water surface has exceeded the crest or low point in the road thereby causing flooding.
** Green shade indicates crossing meets desired level of service. Red shade indicates crossing does not meet desired level of service.

Table B-4b: Overtopping Analysis of Roadway Crossings – Alternative #1

Location	Minimum Elevation at Top of Road (feet NAVD)	Desired Level of Service (Year)	Calculated Water Surface Elevations (feet NAVD)				
			2-year flood	10-year flood	25-year flood	50-year flood	100-year flood
SWIFT CREEK							
Thomas Langston Road (Proposed 10′ x 6′ RCBC with Floodplain Benching)	67.48	25-year	63.12	65.90	66.44	**67.78**	**68.19**
Sterling Trace Drive (Proposed Twin 10′ x 6′ RCBCs with Floodplain Benching)	62.53	25-year	60.09	61.30	62.17	**62.84**	**63.19**
SWIFT CREEK UT1							
Thomas Langston Road (Existing 42″ RCP and Proposed Twin 42″ Floodplain Culverts and Benching)	66.81	25-year	63.65	64.94	66.03	**67.08**	**67.36**
Belfair Drive (Proposed Twin 6′ x 4′ RCBC)	64.81	25-year	62.41	63.63	64.59	**65.17**	**65.61**

Location	Minimum Elevation at Top of Road (feet NAVD)	Desired Level of Service (Year)	Calculated Water Surface Elevations (feet NAVD)				
			2-year flood	10-year flood	25-year flood	50-year flood	100-year flood
Sterling Pointe Drive (Proposed Twin 11′ x 4′ RCBCs with Floodplain Benching)	60.71	25-year	58.85	59.90	60.54	**61.04**	**61.46**
GUM SWAMP							
Frog Level Road (Proposed Twin 7′ x 6′ RCBC with Floodplain Benching)	65.11	25-year	62.04	63.64	64.56	**65.18**	**65.41**

*Bold text indicates the existing water surface has exceeded the crest or low point in the road thereby causing flooding.
** Green shade indicates crossing meets desired level of service. Red shade indicates crossing does not meet desired level of service.

Table B-4c: Overtopping Analysis of Roadway Crossings – Alternative #2

Location	Minimum Elevation at Top of Road (feet NAVD)	Desired Level of Service (Year)	Calculated Water Surface Elevations (feet NAVD)				
			2-year flood	10-year flood	25-year flood	50-year flood	100-year flood
SWIFT CREEK							
Thomas Langston Road (Proposed 10′ x 6′ RCBCs with Detention Ponds)	67.48	25-year	62.56	64.73	66.46	**67.76**	**68.17**
Sterling Trace Drive (Proposed Twin 10′ x 6′ RCBCs with Reduced Floodplain Benching and Detention Ponds)	62.53	25-year	60.10	61.41	62.21	**62.90**	**63.24**
SWIFT CREEK UT1							
Thomas Langston Road (Existing 42″ RCP with Detention Pond)	66.81	25-year	64.24	65.20	65.81	66.44	**67.05**
Belfair Drive (Existing Twin 48″ RCPs with Detention Pond)	64.81	25-year	61.52	62.42	62.95	63.39	64.02
Sterling Pointe Drive (Proposed Twin 10′ x 4′ RCBCs with Detention Pond)	60.71	25-year	59.27	60.18	60.68	**61.02**	**61.35**
GUM SWAMP – NO ALTERNATIVE #2							

*Bold text indicates the existing water surface has exceeded the crest or low point in the road thereby causing flooding.
** Green shade indicates crossing meets desired level of service. Red shade indicates crossing does not meet desired level of service.

SWMM

SWMM is a dynamic rainfall-runoff model capable of modeling the hydrologic response of a watershed and hydraulic routing throughout a stormwater conveyance system. The model calculates the effect of backwater, flat or negative slopes, energy losses, and minor headlosses associated with bends, entrances and exits.

Input data for the EPA SWMM (hydraulics) computer model include the following:

- Conveyance pipes including structure inverts, pipe sizes and lengths;
- Open channel cross section geometries;
- Roughness coefficients for pipes and channels;
- Energy loss coefficients for flow in the pipes and channels;
- Storage rating curves; and
- Overland flow characteristics.

SWMM provides an accurate evaluation of the existing and proposed conditions because it combines hydrology and hydraulics while accounting for the routing effects of the channel and overbank storage areas. Because hydrology and hydraulics are combined, changes to peak flows or water surface elevations resulting from proposed modifications to the existing channels or culverts are calculated in the model in one step. Additionally, changes to flows from proposed pipes and channel improvements are seen both upstream and downstream, reducing the potential for a stormwater system having increased flooding downstream.

Energy Loss Coefficients

Contraction and expansion of flow produces energy losses caused by the transition. The magnitude of these losses is related to the velocity and the estimated loss coefficient. Where the transitions are gradual, the losses are small. At abrupt changes in cross-sectional area, the losses are higher. Energy losses resulting from expansion are greater than losses associated with contraction. Energy loss coefficients used for the hydraulic SWMM models are presented in Table B-5 below:

Table B-5: Energy Loss Coefficients for SWMM Models

Type of Transition	Expansion	Contraction
None	0	0
Manhole/Inlet	0.7	0.5
Open Channel	1	0.5–Headwall/ 0.9 - Projecting

Additional energy losses for structures having bends were divided between the two joining pipes. The bend losses used for this project are based on NCDOT values, and are shown below in Table B-6.

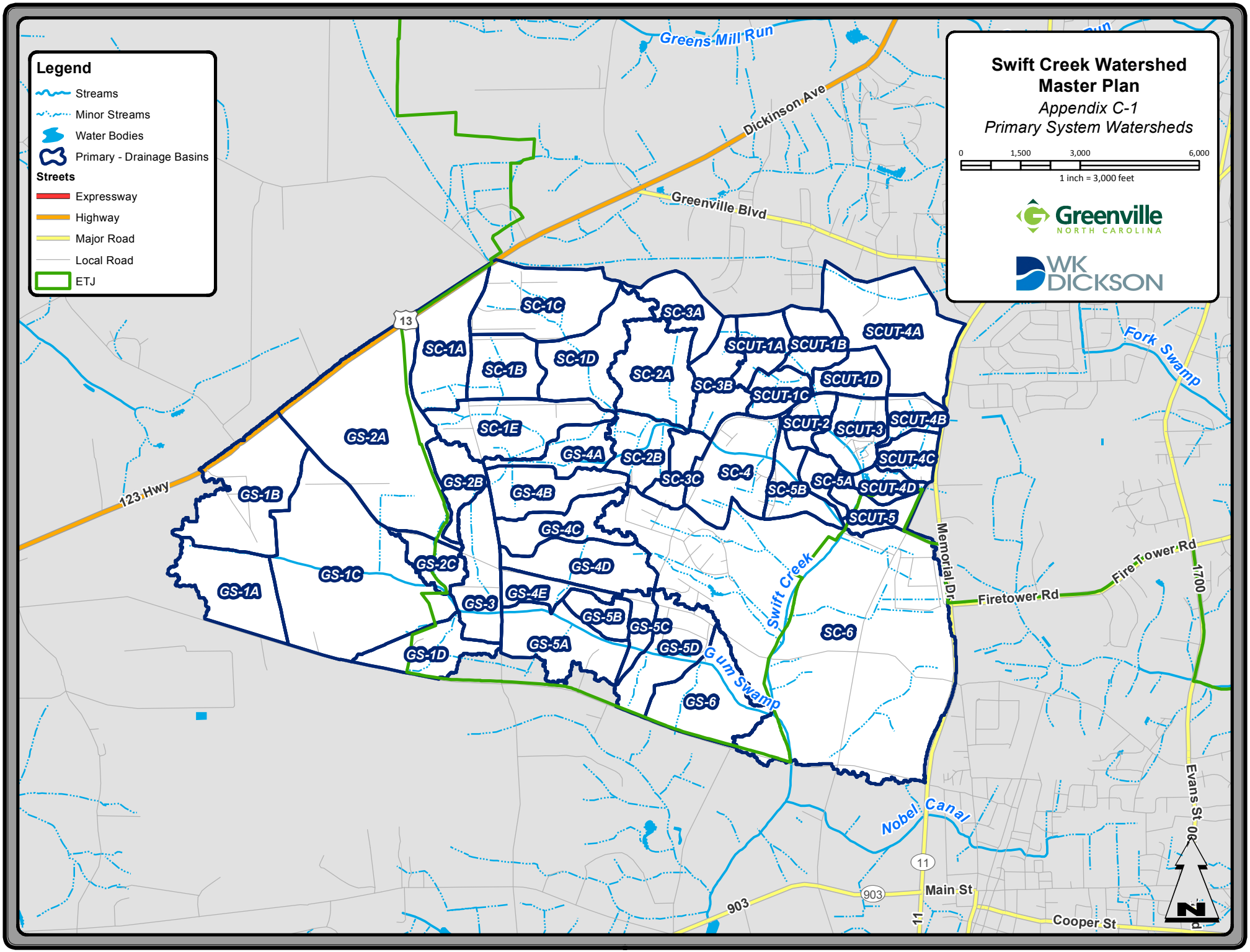
Table B-6: Bend Loss Coefficients

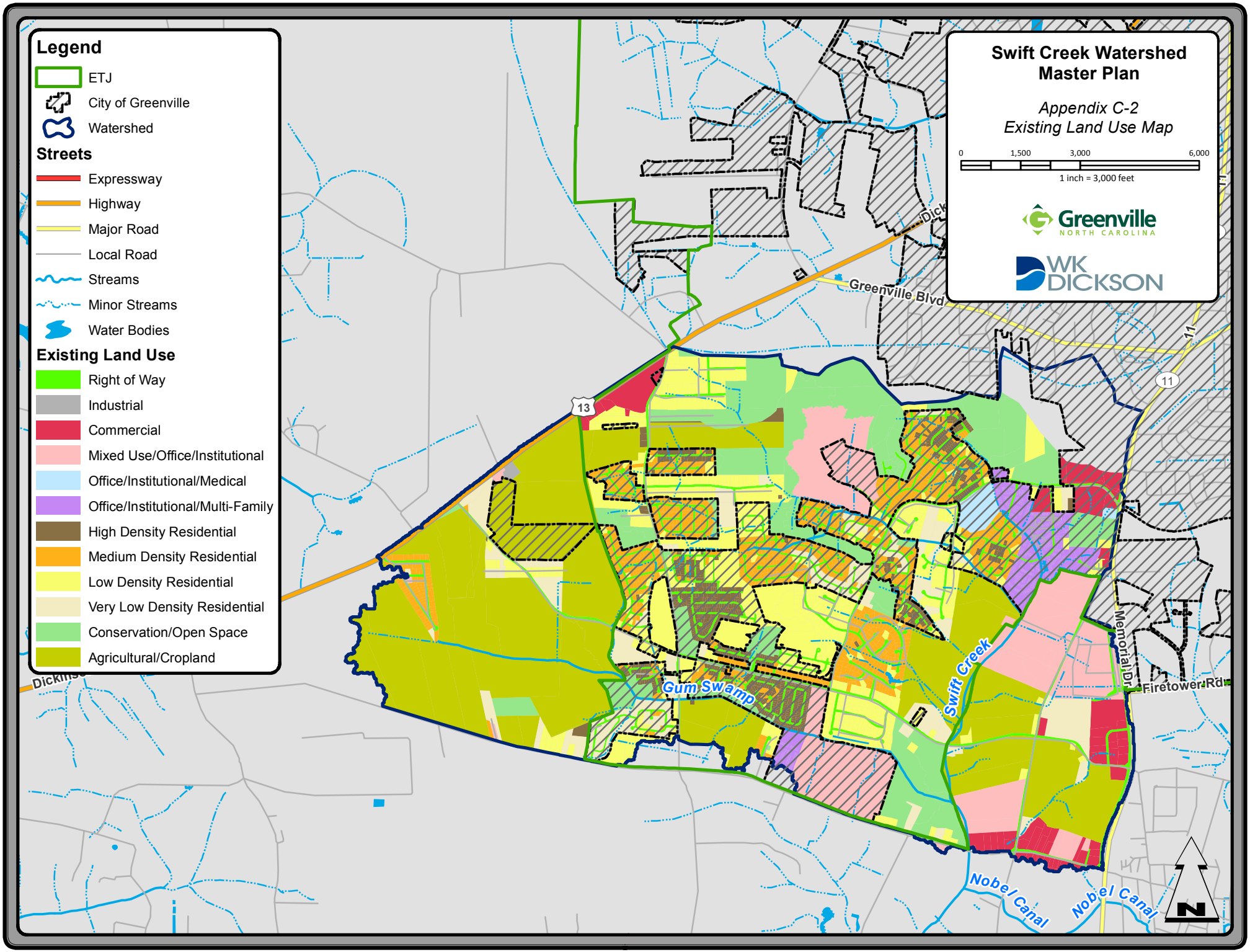
Angle (°)	Loss Coefficient	Angle (°)	Loss Coefficient
90	0.70	40	0.38
80	0.66	30	0.28
70	0.61	25	0.22
60	0.55	20	0.16
50	0.47	15	0.10

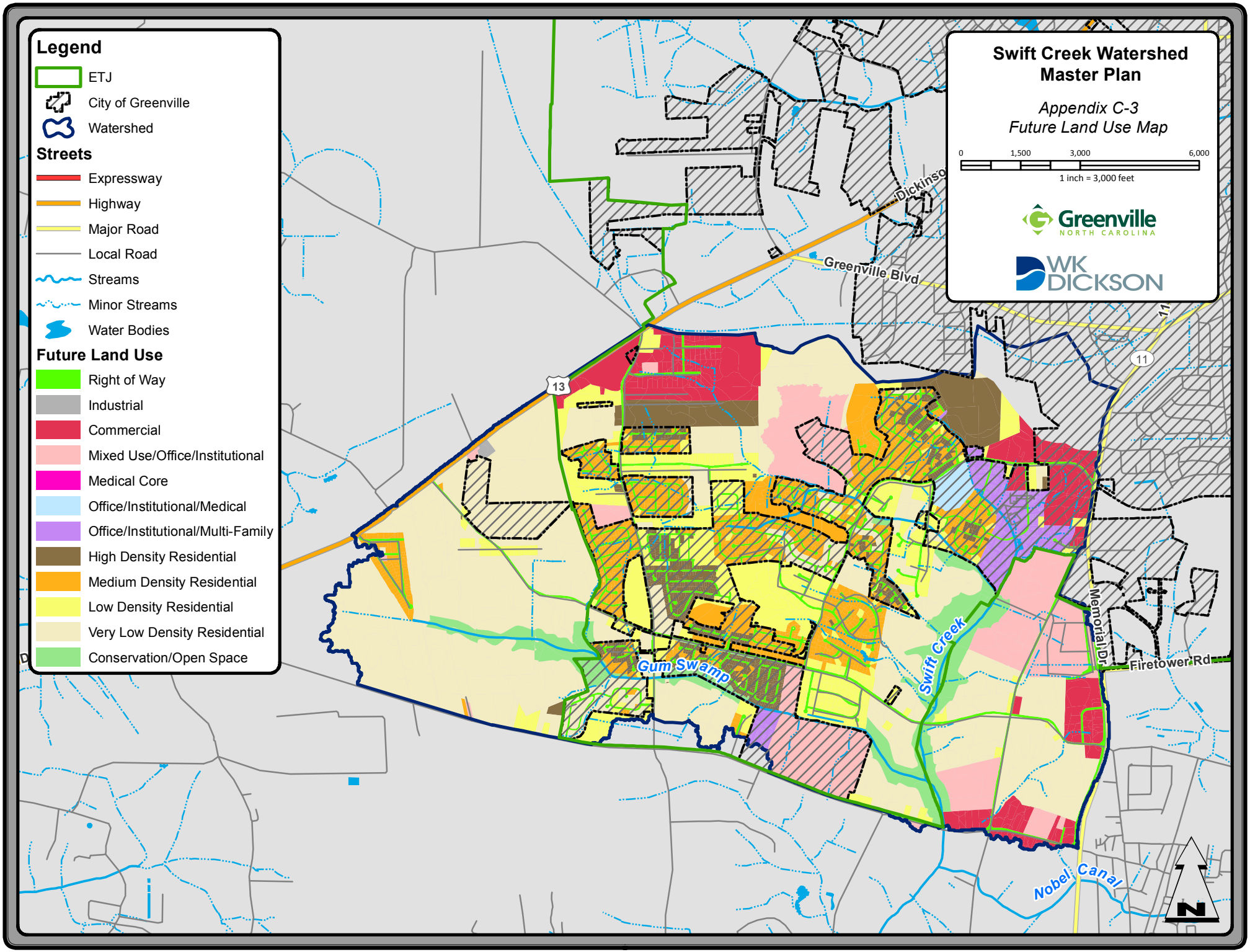
Appendix C:

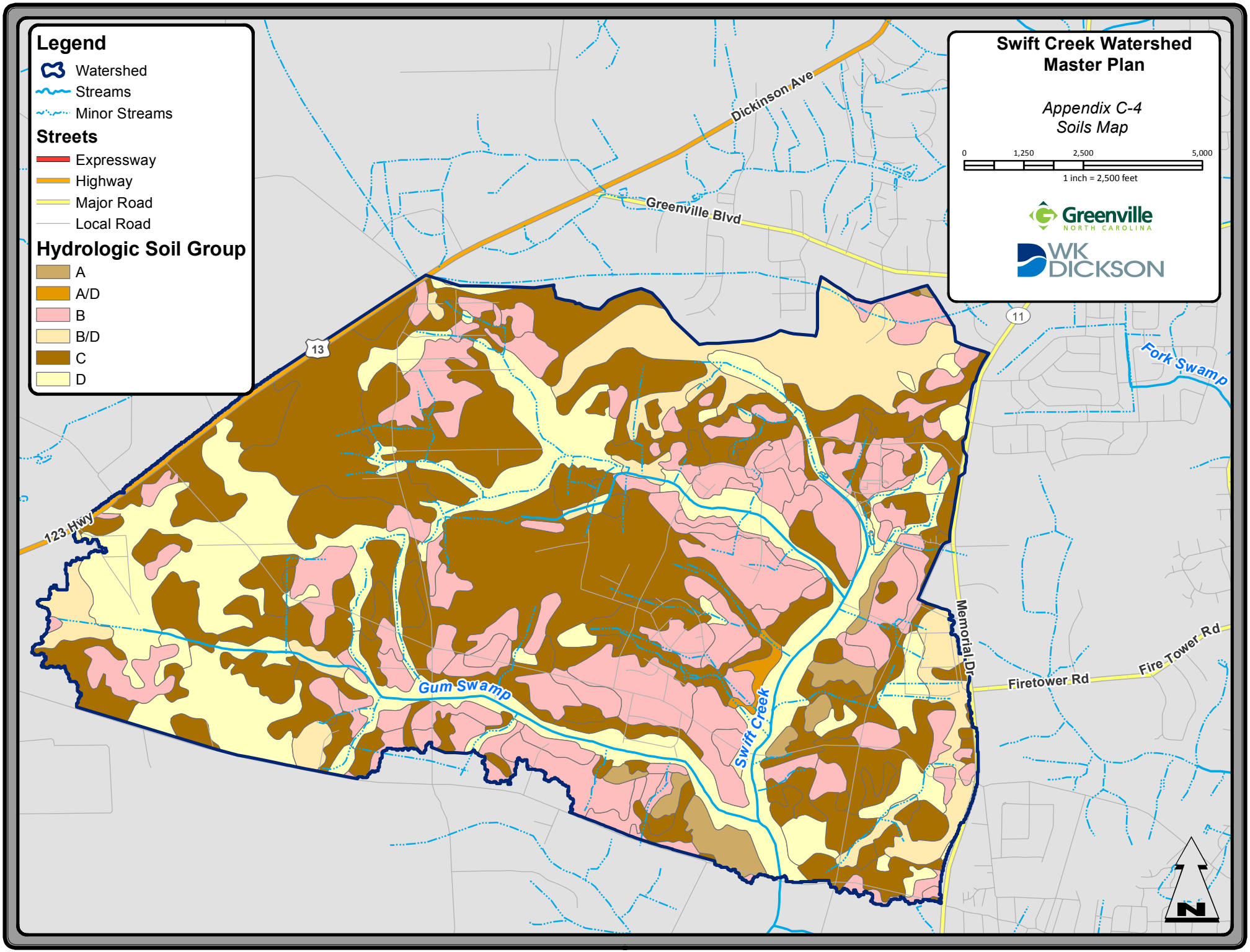
Watershed, Landuse, and Soils Maps

List of Contents:


Legend
Streams
Minor Streams
Water Bodies
Primary - Drainage Basins
Streets
Expressway
Highway
Major Road
Local Road
ETJ
Swift Creek Watershed Master Plan
Appendix C-1
Primary System Watersheds
0
1,500
3,000
6,000
1 inch = 3,000 feet
Greenville
NORTH CAROLINA
WK DICKSON
Greens Mill Run
Dickinson Ave
Greenville Blvd
13
123 Hwy
SC-1A
SC-1B
SC-1C
SC-1D
SC-1E
SC-2A
SC-2B
SC-3A
SC-3B
SC-3C
SC-4
SC-5A
SC-5B
SC-6
SCUT-1A
SCUT-1B
SCUT-1C
SCUT-1D
SCUT-2
SCUT-3
SCUT-4A
SCUT-4B
SCUT-4C
SCUT-4D
SCUT-5
GS-1A
GS-1B
GS-1C
GS-1D
GS-2A
GS-2B
GS-2C
GS-3
GS-4A
GS-4B
GS-4C
GS-4D
GS-4E
GS-5A
GS-5B
GS-5C
GS-5D
GS-6
Swift Creek
Gum Swamp
Fork Swamp
Memorial Dr
Firetower Rd
Fire Tower Rd
1700
Nobel Canal
Evans St
11
903
Main St
Cooper St


Legend
ETJ
City of Greenville
Watershed
Streets
Expressway
Highway
Major Road
Local Road
Streams
Minor Streams
Water Bodies
Existing Land Use
Right of Way
Industrial
Commercial
Mixed Use/Office/Institutional
Office/Institutional/Medical
Office/Institutional/Multi-Family
High Density Residential
Medium Density Residential
Low Density Residential
Very Low Density Residential
Conservation/Open Space
Agricultural/Cropland
Swift Creek Watershed Master Plan
Appendix C-2
Existing Land Use Map
0
1,500
3,000
6,000
1 inch = 3,000 feet
Greenville
NORTH CAROLINA
WK DICKSON
Greenville Blvd
13
11
Gum Swamp
Swift Creek
Memorial Dr
Firetower Rd
Nobel Canal
Nobel Canal
N


Legend
ETJ
City of Greenville
Watershed
Streets
Expressway
Highway
Major Road
Local Road
Streams
Minor Streams
Water Bodies
Future Land Use
Right of Way
Industrial
Commercial
Mixed Use/Office/Institutional
Medical Core
Office/Institutional/Medical
Office/Institutional/Multi-Family
High Density Residential
Medium Density Residential
Low Density Residential
Very Low Density Residential
Conservation/Open Space
Swift Creek Watershed Master Plan
Appendix C-3
Future Land Use Map
0
1,500
3,000
6,000
1 inch = 3,000 feet
Greenville
NORTH CAROLINA
WK DICKSON
Greenville Blvd
13
11
Memorial Dr
Firetower Rd
Gum Swamp
Swift Creek
Nobel Canal
N


Legend
Watershed
Streams
Minor Streams
Streets
Expressway
Highway
Major Road
Local Road
Hydrologic Soil Group
A
A/D
B
B/D
C
D
Swift Creek Watershed Master Plan
Appendix C-4
Soils Map
0
1,250
2,500
5,000
1 inch = 2,500 feet
Greenville
NORTH CAROLINA
WK DICKSON
Dickinson Ave
Greenville Blvd
13
11
123 Hwy
Fork Swamp
Memorial Dr
Fire Tower Rd
Firetower Rd
Gum Swamp
Swift Creek
N

Appendix D:

Citizen Input

List of Contents:

1. General Survey Results (Table D-1)
2. Frequency and Location of Flooding Question Responses (Table D-2)
3. Impacted/Threatened by Erosion (Table D-3)
4. City Funds Utilization (Table D-4)
5. Greenville Watershed Master Plans Questionnaire
6. Swift Creek Public Meeting Minutes

Table D-1: General Survey Results

Survey Question Number	Question	Survey Response		
		Yes	No	Maybe
1	Have you ever experienced flooding on your system property during a (non-Hurricane) storm?	2	3	-
4	Have you ever noticed flooded streets in your neighborhood?	2	3	-
5	Has flooding increased on your property due to changes on nearby properties or drainage systems?	2	3	-
6	Have you had any erosion on your property associated with a stream or drainage ditch?	2	3	-
8	Are you aware that the City of Greenville is currently analyzing and looking for possible solutions to erosion, flooding and water quality issues throughout the City with a watershed master planning process?	3	2	-
9	If a cost-sharing program was made available along with training, would you be willing to install a project such as a rain garden, cistern, backyard wetland, etc. to help improve water quality in your area?	1	-	4
10	Are you aware of how the City of Greenville currently spends or utilizes its stormwater utility fee?	-	4	-

Table D-2: Frequency and Location of Flooding Question Responses (Question 2)

Frequency of Flooding	Flooding Location						
	Storage Building	AC Unit	Crawl Space	Living Space	Yard flooding from stream/ditch	Yard flooding from street runoff	Yard flooding from adjacent property
Never	-	-	-	-	-	-	-
Less than once per year	-	-	-	-	-	-	-
Once per year	1	-	1	-	1	-	-
2-3 times per year	-	-	-	-	-	-	-
More than 3 times per year	-	-	1	-	1	-	1
Every time it rains	-	-	-	-	-	-	-

Table D-3: Impacted/Threatened by Erosion (Question 7)

Item	Number of Responses
Street	-
Yard	1
Garage	-
Fence	-
Other	-

Table D-4: How should City utilize funds to address stormwater runoff, erosion and flooding issues? (Question 11)

Item	Number of Responses
Develop cost-share program for installation of water projects to reduce stormwater flows	2
Develop incentives for replanting riparian areas	3
Develop program to address erosion on private property	-
Construct and maintain water quality control practices on private property	2
Stream restoration	4
Buyout of flood-prone properties	1
Other	-

Greenville
NORTH CAROLINA
Find yourself in good company

GREENVILLE WATERSHED MASTER PLANS
QUESTIONNAIRE

The City of Greenville's Stormwater Management Program is conducing a citywide study to identify flooding, erosion, and water quality concerns. Your answers will help us target our efforts. Please take this brief survey to let us know what you are experiencing. Thank you for your participation!

1. Have you ever experienced flooding on your property during a (non-Hurricane) storm? ❑ Yes ❑ No
   If yes, please provide the address where this flooding is occurring.
   _____

2. If yes, which of the following would apply and what is the frequency?

   ❑ Water in storage building _____
   ❑ Water on air condition units_____
   ❑ Water in crawl space _____
   ❑ Water up to, or in the living space _____
   ❑ Yard flooding from stream/ditch _____
   ❑ Yard flooding from street runoff _____
   ❑ Yard flooding from adjacent property _____

   FREQUENCY
   A Less than once a year
   B Once a year
   C 2-3 times a year
   D More than 3 times a year

3. List dates, locations, and depth of water *(ex: On May 10, 2014, at my mailbox it was 2 feet deep)*
   _____
   _____
   _____

4. Have you ever noticed flooded streets in your neighborhood? ❑ Yes ❑ No
   If yes, tell us when, the locations, and depth of water.
   _____
   _____

5. Has flooding increased on your property due to any changes on nearby properties or drainage systems? If yes, what were those changes and the approximate timeframe?
   ❑ Yes ❑ No
   _____

6. Have you had any erosion on your property associated with a stream or drainage ditch? ❑ Yes ❑ No

7. If yes, which of the following are impacted or threatened by erosion ❑ Street ❑ Yard
   ❑ Building/House ❑ Fence
   ❑ Other _____

Over To Continue

8. Are you aware that the City of Greenville is currently analyzing and looking for possible solutions to flooding, erosion, and water quality issues throughout the City with a watershed master planning process?
   ❑ Yes ❑ No

9. If a cost-sharing program was made available along with training, would you be willing to install a project such as a rain garden, cistern, backyard wetland, etc. to help improve water quality in your area?
   ❑ Yes ❑ No ❑ Maybe

10. Are you aware of how the City of Greenville currently spends or utilizes its stormwater utility fee?
    ❑ Yes ❑ No

11. In what ways should the City of Greenville utilize funds to address excessive stormwater runoff, erosion and flooding issues throughout the City? (Check all that apply)

    Examples include the following:
    - ❑ Develop cost-sharing program for installation of projects to reduce stormwater flows
    - ❑ Develop incentives for replanting areas adjacent to streams
    - ❑ Construct and maintain regional detention facilities on public properties
    - ❑ Construct and maintain water quality facilities on public properties
    - ❑ Stream restoration
    - ❑ Buyout of flood prone properties
    - ❑ Other _____

12. Is there anything else you would like for us to know about water quality issues in your area?
    _____
    _____

May we contact you if we need additional information about flooding and erosion in your area?

Name: _____

Property Address: _____

Primary Residence or Business (if different from Property Address): _____

Phone # (if needed for a response by the City): _____

How long have you been at this location?_____

To Send This Comment Form

Direct Mail:
Greenville Watershed Master Plans
c/o The Wooten Company
301 West 14th Street
Greenville, NC 27834
FAX: 252-757-3221
E-Mail:wsmp@greenvillenc.gov

City of Greenville, Dept. of Public Works **Swift Creek Watershed**

Division of Stormwater Management **November 3, 2014**

Watershed Master Plan Public Meeting **Location: South Central High School**

City of Greenville and Consultant Attendees

Lisa Kirby, Project Manager, City of Greenville	Tom Murray, W.K. Dickson
Amanda Boone, City of Greenville	Stefani Barlow, W.K. Dickson
Victor Long, City of Greenville	Scott Sigmon, W.K. Dickson
Marla Hill, PEQ	Inga Kennedy, PEQ

Meeting Summary

1. Welcome and Purpose of Meeting

    - Residents of Greenville's Swift Creek watershed were invited to learn more about the Watershed Master Plan process and to give their input on stormwater issues and challenges they have experienced.
    - The meeting began with an open house where attendees could view watershed maps to mark the location of their property, identify areas of flooding and other stormwater issues, and speak with staff and consultants of the City's Stormwater Division about their problems and observations.
    - Attendees were then invited to hear a short presentation on the Watershed Master Plan. Project manager Lisa Kirby explained the overall purpose of the master planning process and then invited consultant Tom Murray of W.K. Dickson to describe the findings to date from the field assessment of the watershed. Inga Kennedy of PEQ shared information about the City's public involvement commitment and activities. Lisa Kirby ended the presentation with a description of next steps and then the open house resumed.

2. Questions/Comments by Participants
    - Observed city workers overcutting and killing vegetation around city-maintained ditches
    - Ditch along the street floods, fills up and could one day overflow onto the highway; also large holes are developing in ditches and getting larger. Could the street be in danger of collapsing?

3. Participant Feedback at Stations
    - 3904 Frog Level Road – Faye Barefoot
        - Erosion in the back
        - Water has come up to the air conditioning unit

- Too shallow – could this be deeper or wider?

- 3903 Frog Level Road (and lot beside) – Della Harrell
  - Erosion on the road front
  - Sinkholes in roadside swale
  - Swales fill up and flood the edge of the travel lane

- 3400 Saybrook Ct – Charles Klahn
  - City maintained walking area around pond is mowed too closely and grasses in the swale die

- 745 Seneca Ct – Mike Howell
  - Debris clogging culvert from drainage area from Masters Lane and Nicklaus Drive

Appendix E:

SCS Hydrology Calculations

List of Contents:

SCS Runoff Curve Number - Primary System

Project: City of Greenville - Swift Creek Watershed

Conditions: Existing

Prepared by: SMB

Checked by: TLM

Date: August 11, 2015

Subbasin: GS - 1A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right of Way	D	85.000	0.033	0.000	3
Right of Way	D	84.000	0.003	0.000	0
Medium Density Residential	B	61.000	26.115	0.041	1593
Very Low Density Residential	B/D	61.000	13.191	0.021	805
Open Space, Good Condition	C	74.000	32.672	0.051	2418
Open Space, Good Condition	D	80.000	29.598	0.046	2368
Open Space, Good Condition	C	92.000	0.440	0.001	40
Open Space, Good Condition	D	93.000	0.473	0.001	44
		Totals =	102.5	0.160	7270.7

Total (weighted) RCN = total product/total area = 70.92

RCN used = 71

Subbasin: GS - 1B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right of Way	D	92	0.5	0.001	47
Right of Way	B/D	70	0.3	0.000	22
Right of Way	C	80	3.5	0.005	280
Right of Way	D	85	6.4	0.010	548
Mixed Use/Office/Institutional	D	84	0.6	0.001	47
Medium Density Residential	B	61	0.1	0.000	6
Medium Density Residential	B/D	61	3.0	0.005	186
Medium Density Residential	C	74	21.3	0.033	1576
Very Low Density Residential	D	80	1.1	0.002	88
Open Space, Good Condition	B/D	61	0.0	0.000	1
Open Space, Good Condition	C	74	2.5	0.004	187
Open Space, Good Condition	B	89	12.8	0.020	1135
Open Space, Good Condition	B/D	89	18.2	0.028	1619
Open Space, Good Condition	C	92	29.4	0.046	2709
Open Space, Good Condition	D	93	52.2	0.082	4852
		Totals =	152.0	0.237	13303.6

Total (weighted) RCN = total product/total area = 87.53

RCN used = 72

Subbasin: GS - 1C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	7
Right-Of-Way	C	92	1.5	0.002	134
Right-Of-Way	D	93	1.4	0.002	130
Mixed Use/Office/Institutional	C	90	0.7	0.001	61
Mixed Use/Office/Institutional	D	92	0.4	0.001	39
High Density Residential	C	83	0.1	0.000	8
Medium Density Residential	C	80	1.0	0.001	76
Low Density Residential	C	79	1.1	0.002	88
Low Density Residential	D	84	7.1	0.011	597
Very Low Density Residential	C	79	1.2	0.002	95
Very Low Density Residential	D	84	12.2	0.019	1021
Agricultural/Cropland	B	61	2.8	0.004	170
Agricultural/Cropland	B/D	61	0.1	0.000	6
Agricultural/Cropland	C	74	2.3	0.004	170
Agricultural/Cropland	D	80	15.6	0.024	1246
Open Space, Good Condition	B	61	16.6	0.026	1012
Open Space, Good Condition	B/D	61	11.4	0.018	698
Open Space, Good Condition	C	74	119.2	0.186	8824
Open Space, Good Condition	D	80	127.1	0.199	10172
		Totals =	321.8	0.503	24553.8

Total (weighted) RCN = total product/total area = 76.29

RCN used = 76

Subbasin: GS - 1D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.1	0.003	187
Right-Of-Way	B/D	89	0.4	0.001	34
Right-Of-Way	C	92	2.6	0.004	236
Right-Of-Way	D	93	1.4	0.002	127
High Density Residential	B/D	75	2.8	0.004	212
Medium Density Residential	B	70	0.7	0.001	47
Medium Density Residential	C	80	0.1	0.000	7
Low Density Residential	B	68	7.1	0.011	480
Low Density Residential	B/D	68	1.5	0.002	101
Low Density Residential	C	79	7.8	0.012	616
Low Density Residential	D	84	6.7	0.011	565
Very Low Density Residential	B	69	3.2	0.005	222
Very Low Density Residential	B/D	69	8.0	0.013	553
Very Low Density Residential	C	79	9.1	0.014	722
Very Low Density Residential	D	84	8.3	0.013	697
Agricultural/Cropland	B	69	0.2	0.000	12
Agricultural/Cropland	B/D	69	0.9	0.001	65
Agricultural/Cropland	C	79	0.0	0.000	3
Agricultural/Cropland	D	84	0.5	0.001	43
Conservation/Open Space	B	69	0.5	0.001	37
Conservation/Open Space	D	84	0.3	0.001	28
		Totals =	64.3	0.100	4993.6

Total (weighted) RCN = total product/total area = 77.70

RCN used = 78

Subbasin: GS - 2A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.6	0.001	52
Right-Of-Way	C	92	7.6	0.012	702
Right-Of-Way	D	93	1.4	0.002	134
Industrial	C	91	1.8	0.003	166
Industrial	D	93	1.6	0.003	149
Commercial	C	94	4.3	0.007	402
Mixed Use/Office/Institutional	C	90	1.1	0.002	102
Mixed Use/Office/Institutional	D	92	1.2	0.002	111
Medium Density Residential	C	80	2.2	0.003	176
Medium Density Residential	D	85	2.2	0.003	185
Low Density Residential	B	68	0.2	0.000	17
Low Density Residential	C	79	5.4	0.008	429
Low Density Residential	D	84	6.2	0.010	520
Very Low Density Residential	B	69	0.1	0.000	7
Very Low Density Residential	C	79	21.1	0.033	1664
Very Low Density Residential	D	84	7.3	0.011	617
Open Space, Good Condition	C	79	4.2	0.007	329
Agricultural/Cropland	B	74	21.9	0.034	1624
Agricultural/Cropland	C	80	140.4	0.219	11232
Agricultural/Cropland	D	61	61.1	0.096	3729
		Totals =	292.13	0.456	22350.0

Total (weighted) RCN = total product/total area = 76.51

RCN used = 77

Subbasin: GS - 2B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.9	0.001	81
Right-Of-Way	C	92	4.8	0.007	437
Right-Of-Way	D	93	3.0	0.005	284
High Density Residential	C	83	0.1	0.000	7
Medium Density Residential	B	70	3.0	0.005	210
Medium Density Residential	C	80	14.5	0.023	1163
Medium Density Residential	D	85	8.0	0.012	678
Low Density Residential	B	68	0.2	0.000	11
Low Density Residential	C	79	2.4	0.004	190
Low Density Residential	D	84	0.3	0.000	22
Very Low Density Residential	C	79	0.1	0.000	10
Conservation/Open Space	B	69	0.1	0.000	5
Conservation/Open Space	C	79	6.6	0.010	522
		Totals =	43.9	0.069	3618.8

Total (weighted) RCN = total product/total area = 82.37

RCN used = 82

Subbasin: GS - 2C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.7	0.001	63
Right-Of-Way	C	92	1.2	0.002	110
Right-Of-Way	D	93	0.4	0.001	35
High Density Residential	B	75	0.7	0.001	52
High Density Residential	C	83	0.5	0.001	40
High Density Residential	D	87	0.7	0.001	62
Medium Density Residential	C	80	0.3	0.001	28
Medium Density Residential	D	85	0.5	0.001	39
Low Density Residential	B	68	1.1	0.002	78
Low Density Residential	C	79	0.1	0.000	6
Very Low Density Residential	B	69	1.6	0.003	111
Very Low Density Residential	C	79	6.7	0.010	530
Very Low Density Residential	D	84	3.7	0.006	310
Conservation/Open Space	B	69	0.0	0.000	3
Conservation/Open Space	B/D	69	0.1	0.000	9
Conservation/Open Space	C	79	7.3	0.011	574
Conservation/Open Space	D	84	0.1	0.000	6
Conservation/Open Space	B	69	9.8	0.015	676
Conservation/Open Space	D	84	1.3	0.002	112
		Totals =	36.8	0.058	2843.8

Total (weighted) RCN = total product/total area = 77.18

RCN used = 77

Subbasin: GS -3

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	5.0	0.008	442
Right-Of-Way	C	92	4.1	0.006	378
Right-Of-Way	D	93	1.0	0.002	97
High Density Residential	B	75	4.7	0.007	352
High Density Residential	C	83	0.6	0.001	51
High Density Residential	D	87	0.7	0.001	65
Medium Density Residential	B	70	1.3	0.002	91
Medium Density Residential	C	80	2.2	0.003	173
Medium Density Residential	D	85	1.8	0.003	150
Low Density Residential	B	68	4.7	0.007	317
Low Density Residential	C	79	23.4	0.037	1847
Low Density Residential	D	84	6.5	0.010	549
Very Low Density Residential	B	69	5.8	0.009	397
Very Low Density Residential	C	79	7.2	0.011	568
Very Low Density Residential	D	84	8.2	0.013	685
Conservation/Open Space	B	69	1.0	0.002	68
Conservation/Open Space	C	79	1.5	0.002	115
Conservation/Open Space	D	84	2.8	0.004	238
		Totals =	82.35	0.129	6583.2

Total (weighted) RCN = total product/total area = 79.94

RCN used = 80

Subbasin: GS - 4A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	83	0.6	0.001	51
Right-Of-Way	C	92	2.8	0.004	258
Right-Of-Way	D	93	1.9	0.003	175
High Density Residential	B	75	0.003	0.000	0
High Density Residential	B/D	75	0.04	0.000	3
High Density Residential	C	83	0.7	0.001	60
High Density Residential	D	87	0.2	0.000	21
Medium Density Residential	B	70	1.6	0.003	115
Medium Density Residential	B/D	70	0.2	0.000	14
Medium Density Residential	C	80	11.2	0.017	896
Medium Density Residential	D	85	0.2	0.000	19
Low Density Residential	B	68	0.0	0.000	1
Low Density Residential	C	79	6.8	0.011	539
Low Density Residential	D	84	12.4	0.019	1042
Very Low Density Residential	B	69	0.2	0.000	11
Very Low Density Residential	C	79	1.0	0.002	82
Very Low Density Residential	D	84	0.2	0.000	13
Conservation/Open Space	B	69	0.6	0.001	43
Conservation/Open Space	C	79	5.2	0.008	410
Conservation/Open Space	D	84	2.3	0.004	195
		Totals =	48.31	0.075	3948.4

Total (weighted) RCN = total product/total area = 81.74

RCN used = 82

Subbasin: GS - 4B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.2	0.005	282
Right-Of-Way	C	93	9.6	0.015	888
Right-Of-Way	D	92	0.9	0.001	79
High Density Residential	B	75	6.6	0.010	493
High Density Residential	C	83	12.7	0.020	1053
High Density Residential	D	87	1.4	0.002	120
Medium Density Residential	B	70	1.6	0.003	115
Medium Density Residential	C	80	17.8	0.028	1423
Medium Density Residential	D	85	0.2	0.000	15
Low Density Residential	B	68	1.8	0.003	122
Low Density Residential	C	79	16.9	0.026	1334
Low Density Residential	D	84	1.4	0.002	116
Conservation/Open Space	B	69	0.4	0.001	27
		Totals =	74.3	0.116	6066.9

Total (weighted) RCN = total product/total area = 81.68

RCN used = 82

Subbasin: GS - 4C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.7	0.001	64
Right-Of-Way	C	92	5.5	0.009	503
High Density Residential	B	75	3.0	0.005	228
High Density Residential	C	87	14.8	0.023	1289
Medium Density Residential	C	80	2.1	0.003	171
Low Density Residential	B	68	2.9	0.005	199
Low Density Residential	C	79	27.9	0.044	2202
Very Low Density Residential	C	79	0.1	0.000	6
Conservation/Open Space	B	69	3.3	0.005	226
Conservation/Open Space	C	79	2.9	0.005	232
		Totals =	63.28	0.099	5120.9

Total (weighted) RCN = total product/total area = 80.92

RCN used = 81

Subbasin: GS - 4D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	4.7	0.007	419
Right-Of-Way	C	92	4.4	0.007	406
Right-Of-Way	D	93	1.0	0.002	95
High Density Residential	B	75	4.3	0.007	324
High Density Residential	C	83	2.1	0.003	174
High Density Residential	D	87	0.5	0.001	48
Medium Density Residential	B	70	5.4	0.008	378
Medium Density Residential	C	80	3.2	0.005	259
Medium Density Residential	D	85	1.3	0.002	108
Low Density Residential	B	68	12.6	0.020	854
Low Density Residential	C	79	20.5	0.032	1623
Low Density Residential	D	84	6.3	0.010	529
Very Low Density Residential	B	69	0.0	0.000	0
Very Low Density Residential	C	79	1.8	0.003	141
Conservation/Open Space	B	69	8.2	0.013	563
Conservation/Open Space	C	79	7.9	0.012	622
Conservation/Open Space	D	84	0.7	0.001	57
		Totals =	84.90	0.133	6598.5

Total (weighted) RCN = total product/total area = 77.72

RCN used = 78

Subbasin: GS - 4E

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.5	0.006	315
Right-Of-Way	C	92	3.3	0.005	302
Right-Of-Way	D	93	0.1	0.000	13
High Density Residential	B	75	5.0	0.008	375
High Density Residential	C	83	2.7	0.004	227
High Density Residential	D	87	0.4	0.001	38
Medium Density Residential	B	70	4.4	0.007	307
Medium Density Residential	C	80	2.3	0.004	183
Medium Density Residential	D	85	0.3	0.000	23
Low Density Residential	B	68	5.1	0.008	346
Low Density Residential	C	79	0.8	0.001	63
Low Density Residential	D	84	0.00003	0.000	0
Very Low Density Residential	C	79	0.2	0.000	14
Very Low Density Residential	D	84	1.3	0.002	106
Agricultural/Cropland	D	84	0.9	0.001	79
Conservation/Open Space	B	69	1.0	0.002	71
Conservation/Open Space	C	79	2.2	0.003	171
Conservation/Open Space	D	84	0.002	0.000	0
		Totals =	33.5	0.052	2633.2

Total (weighted) RCN = total product/total area = 78.51

RCN used = 78.5

Subbasin: GS - 5A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.5	0.002	138
Right-Of-Way	C	92	0.004	0.000	0
Right-Of-Way	D	93	0.1	0.000	12
Mixed Use/Office/Institutional	C	90	0.01	0.000	1
Mixed Use/Office/Institutional	D	92	0.2	0.000	23
Office/Institutional/Multi-Family	B	85	11.7	0.018	996
Office/Institutional/Multi-Family	D	92	1.4	0.002	128
High Density Residential	B	75	0.03	0.000	2
High Density Residential	C	83	1.0	0.002	84
High Density Residential	D	87	3.3	0.005	291
Medium Density Residential	B	70	2.7	0.004	187
Medium Density Residential	C	80	0.1	0.000	9
Low Density Residential	B	68	5.0	0.008	343
Low Density Residential	D	84	1.8	0.003	151
Very Low Density Residential	D	84	0.5	0.001	42
Open Space, Good Condition	B	61	0.3	0.000	19
Open Space, Good Condition	C	74	0.2	0.000	12
Open Space, Good Condition	D	80	9.0	0.014	722
Open Space, Good Condition	B	61	34.6	0.054	2112
Open Space, Good Condition	C	74	10.3	0.016	760
Open Space, Good Condition	D	80	13.2	0.021	1056
		Totals =	97.2	0.152	7090.3

Total (weighted) RCN = total product/total area = 72.96

RCN used = 73

Subbasin: GS - 5B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.1	0.005	279
Right-Of-Way	C	92	3.6	0.006	334
Right-Of-Way	D	93	0.2	0.000	20
Mixed Use/Office/Institutional	C	90	0.1	0.000	9
High Density Residential	B	75	12.4	0.019	927
High Density Residential	C	83	8.1	0.013	674
High Density Residential	D	87	0.8	0.001	68
Medium Density Residential	B	70	1.6	0.003	112
Medium Density Residential	C	80	0.4	0.001	28
Low Density Residential	B	68	0.1	0.000	8
Low Density Residential	C	79	0.1	0.000	5
Conservation/Open Space	C	79	0.04	0.000	3
		Totals =	30.5	0.048	2468.0

Total (weighted) RCN = total product/total area = 80.86

RCN used = 81

Subbasin: GS - 5C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.5	0.002	133
Mixed Use/Office/Institutional	B	85	8.5	0.013	723
Mixed Use/Office/Institutional	C	90	4.6	0.007	414
Mixed Use/Office/Institutional	D	92	3.3	0.005	302
Office/Institutional/Multi-Family	B	85	0.01	0.000	1
Office/Institutional/Multi-Family	D	92	0.004	0.000	0
High Density Residential	B	75	1.0	0.002	78
High Density Residential	C	83	0.2	0.000	20
Medium Density Residential	B	70	1.9	0.003	136
Low Density Residential	B	68	2.7	0.004	185
Low Density Residential	C	79	1.0	0.002	79
Low Density Residential	D	84	1.2	0.002	100
		Totals =	26.03	0.041	2170.9

Total (weighted) RCN = total product/total area = 83.41

RCN used = 83

Subbasin: GS - 5D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	5.5	0.009	488
Right-Of-Way	C	92	1.4	0.002	128
Right-Of-Way	D	93	2.3	0.004	211
Mixed Use/Office/Institutional	A	77	5.0	0.008	383
Mixed Use/Office/Institutional	B	85	20.6	0.032	1754
Mixed Use/Office/Institutional	C	90	5.0	0.008	449
Mixed Use/Office/Institutional	D	92	7.0	0.011	640
Medium Density Residential	B	70	1.3	0.002	94
Low Density Residential	B	68	21.5	0.034	1464
Low Density Residential	C	79	6.2	0.010	490
Low Density Residential	D	84	10.7	0.017	901
		Totals =	86.52	0.135	7003.6

Total (weighted) RCN = total product/total area = 80.95

RCN used = 81

Subbasin: GS - 6

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.3	0.002	115
Right-Of-Way	C	92	0.2	0.000	20
Right-Of-Way	D	93	0.1	0.000	6
Mixed Use/Office/Institutional	A	77	7.7	0.012	594
Mixed Use/Office/Institutional	B	85	25.8	0.040	2190
Mixed Use/Office/Institutional	C	90	11.8	0.018	1063
Mixed Use/Office/Institutional	D	92	1.3	0.002	116
Low Density Residential	A	51	0.03	0.000	1
Low Density Residential	B	68	3.7	0.006	248
Low Density Residential	C	79	1.2	0.002	95
Low Density Residential	D	84	2.4	0.004	206
Very Low Density Residential	A	49	3.0	0.005	149
Very Low Density Residential	B	69	0.9	0.001	62
Very Low Density Residential	C	79	0.3	0.000	22
Very Low Density Residential	D	84	0.3	0.000	25
Open Space, Good Condition	A	39	13.3	0.021	521
Open Space, Good Condition	B	61	7.3	0.011	444
Open Space, Good Condition	C	74	6.3	0.010	464
Open Space, Good Condition	D	80	19.8	0.031	1588
		Totals =	106.70	0.167	7927.8

Total (weighted) RCN = total product/total area = 74.30

RCN used = 74

Subbasin: SC - 1A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	28
Right-Of-Way	C	92	4.7	0.007	430
Right-Of-Way	D	93	3.5	0.005	326
Commercial	C	94	28.2	0.044	2651
Commercial	D	95	0.3	0.000	29
High Density Residential	C	83	2.2	0.003	179
Medium Density Residential	B	70	0.5	0.001	37
Medium Density Residential	C	80	12.1	0.019	972
Medium Density Residential	D	85	0.5	0.001	39
Low Density Residential	B	68	1.2	0.002	79
Low Density Residential	C	79	14.3	0.022	1128
Low Density Residential	D	84	4.6	0.007	385
Conservation/Open Space	B	61	0.0	0.000	1
Conservation/Open Space	C	74	23.9	0.037	1771
Conservation/Open Space	D	80	2.1	0.003	169
		Totals =	98.38	0.154	8223.4

Total (weighted) RCN = total product/total area = 83.59

RCN used = 84

Subbasin: SC - 1B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.5	0.004	224
Right-Of-Way	C	92	3.7	0.006	342
High Density Residential	B	75	5.5	0.009	411
High Density Residential	C	83	2.7	0.004	221
High Density Residential	D	87	0.3	0.000	23
Medium Density Residential	B	70	7.0	0.011	489
Medium Density Residential	C	80	4.9	0.008	394
Low Density Residential	B	68	1.8	0.003	120
Low Density Residential	C	79	10.8	0.017	850
Open Space, Good Condition	B	61	17.4	0.027	1063
Open Space, Good Condition	C	74	6.0	0.009	447
Open Space, Good Condition	D	80	0.7	0.001	56
Conservation/Open Space	C	79	1.8	0.003	146
		Totals =	65.07	0.102	4784.2

Total (weighted) RCN = total product/total area = 73.53

RCN used = 74

Subbasin: SC - 1C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.3	0.004	200
Right-Of-Way	B/D	89	0.2	0.000	22
Right-Of-Way	C	92	2.3	0.004	216
Right-Of-Way	D	93	2.0	0.003	182
Low Density Residential	B	68	17.9	0.028	1220
Low Density Residential	B/D	68	3.0	0.005	207
Low Density Residential	C	79	25.2	0.039	1994
Low Density Residential	D	84	12.2	0.019	1026
Open Space, Good Condition	B	61	23.9	0.037	1457
Open Space, Good Condition	C	74	27.3	0.043	2022
Open Space, Good Condition	D	80	12.9	0.020	1034
		Totals =	129.35	0.202	9578.3

Total (weighted) RCN = total product/total area = 74.05

RCN used = 74

Subbasin: SC - 1D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	C	92	0.8	0.001	75
Right-Of-Way	D	93	0.2	0.000	22
High Density Residential	B	75	2.3	0.004	169
High Density Residential	C	83	0.5	0.001	40
High Density Residential	D	87	0.1	0.000	8
Low Density Residential	C	79	7.2	0.011	566
Low Density Residential	D	84	3.9	0.006	329
Very Low Density Residential	C	79	0.6	0.001	49
Very Low Density Residential	D	84	1.0	0.002	87
Open Space, Good Condition	B	61	2.4	0.004	144
Open Space, Good Condition	B/D	61	14.5	0.023	883
Open Space, Good Condition	C	74	35.6	0.056	2632
Open Space, Good Condition	D	80	31.1	0.049	2488
		Totals =	100.11	0.156	7491.4

Total (weighted) RCN = total product/total area = 74.83

RCN used = 75

Subbasin: SC - 1E

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.2	0.000	20
Right-Of-Way	C	92	8.9	0.014	818
Right-Of-Way	D	93	3.0	0.005	277
High Density Residential	C	83	0.1	0.000	12
High Density Residential	D	87	1.0	0.002	85
Medium Density Residential	B	70	0.4	0.001	29
Medium Density Residential	C	80	21.3	0.033	1707
Medium Density Residential	D	85	8.9	0.014	758
Low Density Residential	B	68	0.4	0.001	29
Low Density Residential	C	79	30.4	0.047	2399
Low Density Residential	D	84	13.3	0.021	1117
Very Low Density Residential	B	69	0.0	0.000	1
Very Low Density Residential	C	79	8.6	0.013	681
Very Low Density Residential	D	84	2.1	0.003	175
Conservation/Open Space	B	69	0.5	0.001	32
Conservation/Open Space	C	79	8.9	0.014	705
Conservation/Open Space	D	84	3.4	0.005	287
		Totals =	111.50	0.174	9132.3

Total (weighted) RCN = total product/total area = 81.90

RCN used = 82

Subbasin: SC - 2A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Mixed Use/Office/Institutional	C	90	30.0	0.047	2700
Open Space, Good Condition	B/D	61	42.8	0.067	2610
Open Space, Good Condition	D	80	29.5	0.046	2362
		Totals =	102.31	0.160	7671.8

Total (weighted) RCN = total product/total area = 74.99

RCN used = 75

Subbasin: SC - 2B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.6	0.001	57
Right-Of-Way	B/D	89	0.3	0.001	30
Right-Of-Way	C	92	6.4	0.010	590
Right-Of-Way	D	93	0.3	0.001	30
Medium Density Residential	B	70	2.2	0.003	155
Medium Density Residential	B/D	70	2.4	0.004	167
Medium Density Residential	C	80	19.9	0.031	1591
Medium Density Residential	D	85	3.9	0.006	333
Low Density Residential	B	68	0.1	0.000	10
Low Density Residential	B/D	68	0.3	0.001	23
Low Density Residential	C	79	1.0	0.002	79
Low Density Residential	D	84	0.1	0.000	8
Very Low Density Residential	B	69	0.6	0.001	44
Very Low Density Residential	B/D	69	0.7	0.001	50
Very Low Density Residential	C	79	4.3	0.007	338
Conservation/Open Space	B/D	69	0.4	0.001	28
Conservation/Open Space	C	79	11.4	0.018	904
Conservation/Open Space	D	84	3.0	0.005	253
		Totals =	58.20	0.091	4690.1

Total (weighted) RCN = total product/total area = 80.58

RCN used = 80.5

Subbasin: SC - 3A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Low Density Residential	B/D	69	0.1	0.0001	6
Conservation/Open Space	B/D	61	33.7	0.0526	2054
Conservation/Open Space	C	74	21.7	0.034	1608
		Totals =	55.49	0.087	3668.1

Total (weighted) RCN = total product/total area = 66.10

RCN used = 66

Subbasin: SC - 3B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.2	0.003	194
Right-Of-Way	B/D	89	0.9	0.001	84
Right-Of-Way	C	92	4.4	0.007	407
Right-Of-Way	D	93	1.5	0.002	138
Mixed Use/Office/Institutional	B	85	0.7	0.001	63
Mixed Use/Office/Institutional	B/D	85	1.9	0.003	162
Mixed Use/Office/Institutional	C	90	0.9	0.001	78
Mixed Use/Office/Institutional	D	92	0.01	0.000	1
High Density Residential	B/D	75	0.02	0.000	1
High Density Residential	C	83	0.1	0.000	5
Medium Density Residential	B	70	7.2	0.011	507
Medium Density Residential	B/D	70	2.7	0.004	188
Medium Density Residential	C	80	14.1	0.022	1125
Medium Density Residential	D	85	1.0	0.002	89
Low Density Residential	B	68	0.2	0.000	14
Low Density Residential	B/D	68	1.8	0.003	121
Low Density Residential	C	79	0.4	0.001	32
Low Density Residential	D	84	1.9	0.003	162
Conservation/Open Space	B	69	2.6	0.004	178
Conservation/Open Space	B/D	69	7.1	0.011	489
Conservation/Open Space	C	79	9.3	0.014	732
Conservation/Open Space	D	84	1.1	0.002	93
		Totals =	62.02	0.097	4862.7

Total (weighted) RCN = total product/total area = 78.40

RCN used = 78

Subbasin: SC - 3C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.5	0.002	138
Right-Of-Way	C	92	3.3	0.005	308
Right-Of-Way	D	93	0.4	0.001	33
Medium Density Residential	B	70	3.5	0.006	246
Medium Density Residential	B/D	70	0.3	0.000	20
Medium Density Residential	C	80	5.3	0.008	425
Medium Density Residential	D	85	1.2	0.002	105
Low Density Residential	B	68	1.6	0.003	110
Low Density Residential	B/D	68	0.0004	0.000	0
Low Density Residential	C	79	2.0	0.003	158
Low Density Residential	D	84	0.3	0.000	22
Very Low Density Residential	B	69	1.4	0.002	96
Very Low Density Residential	C	79	8.7	0.014	686
Conservation/Open Space	C	79	5.2	0.008	413
		Totals =	34.78	0.054	2759.8

Total (weighted) RCN = total product/total area = 79.35

RCN used = 79

Subbasin: SC - 4

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	9.3	0.015	828
Right-Of-Way	C	92	4.0	0.006	364
Right-Of-Way	D	93	1.1	0.002	102
High Density Residential	B	75	2.1	0.003	160
High Density Residential	C	83	1.5	0.002	129
Medium Density Residential	B	70	8.4	0.013	589
Medium Density Residential	C	80	4.9	0.008	392
Medium Density Residential	D	85	0.9	0.001	79
Low Density Residential	B	68	25.1	0.039	1707
Low Density Residential	C	79	0.3	0.000	25
Low Density Residential	D	84	8.8	0.014	740
Very Low Density Residential	B	69	15.1	0.024	1045
Very Low Density Residential	C	79	2.6	0.004	203
Very Low Density Residential	D	84	10.0	0.016	839
Conservation/Open Space	B	69	1.4	0.002	96
Conservation/Open Space	C	79	9.4	0.015	745
Conservation/Open Space	D	84	2.6	0.004	219
		Totals =	107.63	0.168	8260.9

Total (weighted) RCN = total product/total area = 76.75

RCN used = 77

Subbasin: SC - 5A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.8	0.003	156
Right-Of-Way	C	92	2.5	0.004	228
Right-Of-Way	D	93	0.1	0.000	10
Office/Institutional/Multi-Family	B	85	0.3	0.000	27
Office/Institutional/Multi-Family	C	90	2.5	0.004	225
Office/Institutional/Multi-Family	D	92	0.5	0.001	43
High Density Residential	B	75	1.6	0.003	120
High Density Residential	C	83	2.3	0.004	194
Medium Density Residential	B	70	2.8	0.004	199
Medium Density Residential	C	80	6.2	0.010	497
Medium Density Residential	D	85	0.7	0.001	56
Low Density Residential	B	68	0.1	0.000	7
Low Density Residential	C	79	0.8	0.001	63
Low Density Residential	D	84	0.3	0.001	29
		Totals =	22.51	0.035	1853.0

Total (weighted) RCN = total product/total area = 82.32

RCN used = 82

Subbasin: SC - 5B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.9	0.005	261
Right-Of-Way	D	93	0.8	0.001	78
Office/Institutional/Medical	B	85	2.0	0.003	168
Office/Institutional/Multi-Family	C	90	0.0	0.000	0
Office/Institutional/Multi-Family	D	92	1.1	0.002	105
High Density Residential	B	75	0.2	0.000	17
Medium Density Residential	B	70	2.9	0.004	200
Medium Density Residential	C	80	0.0	0.000	0
Medium Density Residential	D	85	2.1	0.003	176
Low Density Residential	B	68	8.4	0.013	569
Low Density Residential	D	84	5.7	0.009	478
Very Low Density Residential	D	84	2.3	0.004	196
Agricultural/Cropland	B	78	15.1	0.024	1175
Agricultural/Cropland	C	85	1.1	0.002	94
Agricultural/Cropland	D	89	4.6	0.007	410
		Totals =	49.21	0.077	3926.8

Total (weighted) RCN = total product/total area = 79.80

RCN used = 80

Subbasin: SC - 6

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	A	83	2.0	0.003	168
Right-Of-Way	B	89	17.7	0.028	1579
Right-Of-Way	B/D	89	10.6	0.017	944
Right-Of-Way	C	92	29.8	0.047	2739
Right-Of-Way	D	93	2.9	0.005	269
Commercial	B	92	24.3	0.038	2237
Commercial	B/D	92	15.1	0.024	1388
Commercial	C	94	27.1	0.042	2549
Commercial	D	95	11.4	0.018	1080
Mixed Use/Office/Institutional	A	77	14.3	0.022	1100
Mixed Use/Office/Institutional	B	85	29.4	0.046	2502
Mixed Use/Office/Institutional	B/D	85	25.5	0.040	2170
Mixed Use/Office/Institutional	C	90	48.0	0.075	4316
Mixed Use/Office/Institutional	D	92	62.4	0.097	5739
Office/Institutional/Multi-Family	D	92	0.0	0.000	4
High Density Residential	B	75	3.1	0.005	231
High Density Residential	C	83	2.1	0.003	173
High Density Residential	D	87	0.6	0.001	52
Medium Density Residential	B	70	24.9	0.039	1741
Medium Density Residential	C	80	30.8	0.048	2463
Medium Density Residential	D	85	1.3	0.002	107
Low Density Residential	A	51	4.8	0.008	246
Low Density Residential	B	68	14.9	0.023	1014
Low Density Residential	B/D	68	0.3	0.000	21
Low Density Residential	C	79	47.5	0.074	3751
Low Density Residential	D	84	0.8	0.001	71
Very Low Density Residential	A	49	1.8	0.003	88
Very Low Density Residential	A/D	49	0.3	0.000	13
Very Low Density Residential	B	69	18.0	0.028	1240
Very Low Density Residential	B/D	69	1.8	0.003	125
Very Low Density Residential	C	79	26.1	0.041	2061
Very Low Density Residential	D	84	17.0	0.027	1429
Agricultural/Cropland	A	49	6.9	0.011	340
Agricultural/Cropland	A/D	49	12.7	0.020	624
Agricultural/Cropland	B	69	2.6	0.004	181
Agricultural/Cropland	B/D	69	2.1	0.003	147
Agricultural/Cropland	C	79	13.0	0.020	1025
Agricultural/Cropland	D	84	14.2	0.022	1194
Conservation/Open Space	A	49	11.9	0.019	585
Conservation/Open Space	B	69	68.6	0.107	4736
Conservation/Open Space	B/D	69	24.9	0.039	1715
Conservation/Open Space	C	79	133.4	0.208	10542
Conservation/Open Space	D	84	69.5	0.109	5840
		Totals =	876.52	1.370	70536.2

Total (weighted) RCN = total product/total area = 80.47

RCN used = 80

Subbasin: SCUT - 1A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	22
Right-Of-Way	B/D	89	2.3	0.004	206
Right-Of-Way	C	92	2.0	0.003	183
Right-Of-Way	D	93	2.8	0.004	256
High Density Residential	B	75	0.3	0.000	20
High Density Residential	B/D	75	6.2	0.010	463
High Density Residential	C	83	2.1	0.003	172
High Density Residential	D	87	3.8	0.006	331
Medium Density Residential	B	70	1.4	0.002	99
Medium Density Residential	B/D	70	4.4	0.007	307
Medium Density Residential	C	80	3.3	0.005	267
Medium Density Residential	D	85	6.4	0.010	541
Low Density Residential	B/D	68	1.2	0.002	81
Low Density Residential	C	79	0.2	0.000	15
Low Density Residential	D	84	0.3	0.000	22
Very Low Density Residential	B/D	69	0.6	0.001	39
Very Low Density Residential	D	84	1.4	0.002	117
Conservation/Open Space	B	69	0.2	0.000	13
Conservation/Open Space	B/D	69	5.7	0.009	391
Conservation/Open Space	C	79	0.4	0.001	34
Conservation/Open Space	D	84	1.0	0.002	82
		Totals =	45.97	0.072	3660.4

Total (weighted) RCN = total product/total area = 79.62

RCN used = 80

Subbasin: SCUT - 1B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	7
Right-Of-Way	C	92	0.0	0.000	4
Office/Institutional/Multi-Family	B/D	85	0.0	0.000	3
High Density Residential	B/D	75	0.1	0.000	8
Medium Density Residential	B	70	0.1	0.000	6
Medium Density Residential	C	80	0.7	0.001	55
Medium Density Residential	D	85	0.7	0.001	64
Low Density Residential	B/D	68	1.3	0.002	91
Low Density Residential	C	79	0.3	0.001	25
Low Density Residential	D	84	0.5	0.001	43
Conservation/Open Space	B/D	69	44.4	0.069	3064
Conservation/Open Space	C	79	3.6	0.006	285
Conservation/Open Space	D	84	2.2	0.003	187
		Totals =	54.21	0.085	3843.2

Total (weighted) RCN = total product/total area = 70.89

RCN used = 71

Subbasin: SCUT - 1C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.8	0.006	339
Right-Of-Way	B/D	89	0.4	0.001	40
Right-Of-Way	C	92	2.7	0.004	249
Right-Of-Way	D	93	0.0	0.000	2
High Density Residential	B	75	4.1	0.006	304
High Density Residential	B/D	75	0.1	0.000	5
High Density Residential	C	83	3.1	0.005	259
Medium Density Residential	B	70	7.5	0.012	528
Medium Density Residential	B/D	70	1.0	0.002	73
Medium Density Residential	C	80	9.5	0.015	758
Medium Density Residential	D	85	0.9	0.001	79
Low Density Residential	B	68	0.4	0.001	26
Low Density Residential	C	79	1.4	0.002	110
Low Density Residential	D	84	0.1	0.000	8
		Totals =	35.06	0.055	2777.9

Total (weighted) RCN = total product/total area = 79.23

RCN used = 79

Subbasin: SCUT - 1D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.8	0.001	67
Right-Of-Way	C	92	0.3	0.000	27
Right-Of-Way	D	93	0.1	0.000	9
Commercial	B	92	0.1	0.000	10
Commercial	B/D	92	0.8	0.001	75
Commercial	C	94	1.9	0.003	181
Office/Institutional/Multi-Family	B	85	0.3	0.000	24
Office/Institutional/Multi-Family	B/D	85	0.0	0.000	2
Office/Institutional/Multi-Family	C	90	2.0	0.003	176
Office/Institutional/Multi-Family	D	92	0.2	0.000	23
Medium Density Residential	D	85	0.0	0.000	1
Low Density Residential	B	68	0.4	0.001	27
Low Density Residential	B/D	68	10.0	0.016	682
Low Density Residential	C	79	3.4	0.005	269
Low Density Residential	D	84	0.0	0.000	2
Conservation/Open Space	B	69	4.8	0.008	334
Conservation/Open Space	B/D	69	7.9	0.012	542
Conservation/Open Space	C	79	4.5	0.007	356
Conservation/Open Space	D	84	3.8	0.006	322
		Totals =	41.39	0.065	3127.4

Total (weighted) RCN = total product/total area = 75.56

RCN used = 76

Subbasin: SCUT - 2

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.7	0.001	59
Right-Of-Way	C	92	0.2	0.000	17
Right-Of-Way	D	93	0.1	0.000	12
Office/Institutional/Medical	B	85	14.7	0.023	1248
Office/Institutional/Medical	C	90	2.1	0.003	193
Office/Institutional/Medical	D	92	1.1	0.002	106
Office/Institutional/Multi-Family	B	85	2.3	0.004	192
Office/Institutional/Multi-Family	C	90	2.0	0.003	179
Office/Institutional/Multi-Family	D	92	2.7	0.004	250
Medium Density Residential	B	70	2.6	0.004	180
Medium Density Residential	C	80	0.2	0.000	18
Medium Density Residential	D	85	0.2	0.000	20
Water	W	100	0.1	0.000	13
		Totals =	29.08	0.045	2486.6

Total (weighted) RCN = total product/total area = 85.51

RCN used = 86

Subbasin: SCUT - 3

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	5.0	0.008	447
Right-Of-Way	C	92	0.8	0.001	71
Right-Of-Way	D	93	0.7	0.001	62
Commercial	B	92	3.7	0.006	336
Commercial	C	94	2.0	0.003	189
Office/Institutional/Medical	B	85	0.0	0.000	0
Office/Institutional/Multi-Family	B	85	19.6	0.031	1669
Office/Institutional/Multi-Family	C	90	6.4	0.010	580
Office/Institutional/Multi-Family	D	92	6.7	0.011	619
High Density Residential	B	75	0.1	0.000	10
Medium Density Residential	B	70	7.0	0.011	491
Medium Density Residential	D	85	0.8	0.001	65
Low Density Residential	B	68	5.1	0.008	345
Low Density Residential	C	79	0.2	0.000	15
Very Low Density Residential	B	69	1.2	0.002	81
Conservation/Open Space	B	69	0.3	0.000	20
Conservation/Open Space	D	84	0.1	0.000	9
Water	W	100	0.1	0.000	10
		Totals =	59.78	0.093	5019.6

Total (weighted) RCN = total product/total area = 83.96

RCN used = 84

Subbasin: SCUT - 4A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	11
Right-Of-Way	B/D	93	1.1	0.002	104
Right-Of-Way	C	92	1.5	0.002	138
Right-Of-Way	D	93	0.5	0.001	49
Commercial	A	89	1.2	0.002	104
Commercial	B	92	28.2	0.044	2593
Commercial	B/D	95	24.4	0.038	2318
Commercial	C	94	23.2	0.036	2177
Commercial	D	95	10.9	0.017	1035
Mixed Use/Office/Institutional	A	77	0.0	0.000	0
Mixed Use/Office/Institutional	B	85	2.5	0.004	213
Mixed Use/Office/Institutional	B/D	92	0.0	0.000	1
Office/Institutional/Medical	C	90	0.4	0.001	38
Office/Institutional/Multi-Family	B	85	3.2	0.005	271
Office/Institutional/Multi-Family	B/D	92	5.8	0.009	531
Low Density Residential	B/D	84	0.9	0.001	75
Conservation/Open Space	B	69	10.2	0.016	701
Conservation/Open Space	B/D	84	32.5	0.051	2728
Conservation/Open Space	C	79	2.0	0.003	155
Water	W	100	1.9	0.003	190
		Totals =	150.38	0.235	13433.2

Total (weighted) RCN = total product/total area = 89.33

RCN used = 89*

Subbasin: SCUT - 4B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	25
Right-Of-Way	C	92	3.7	0.006	341
Right-Of-Way	D	93	0.0	0.000	0
Commercial	B	92	3.5	0.005	323
Commercial	C	94	8.3	0.013	785
Commercial	D	95	4.7	0.007	446
Office/Institutional/Medical	B	85	0.4	0.001	37
Office/Institutional/Medical	C	90	0.9	0.001	79
Office/Institutional/Medical	D	92	0.7	0.001	62
Office/Institutional/Multi-Family	B	85	1.3	0.002	111
Office/Institutional/Multi-Family	C	90	0.3	0.001	31
Office/Institutional/Multi-Family	D	92	0.7	0.001	65
High Density Residential	B	75	0.9	0.001	64
High Density Residential	C	83	0.3	0.000	25
Low Density Residential	C	79	0.0	0.000	1
Very Low Density Residential	B	69	2.2	0.003	152
Very Low Density Residential	C	79	0.0	0.000	0
Conservation/Open Space	B	69	1.0	0.002	68
Conservation/Open Space	C	79	0.1	0.000	10
Conservation/Open Space	D	84	1.6	0.002	134
		Totals =	30.95	0.048	2758.0

Total (weighted) RCN = total product/total area = 89.11

RCN used = 89

Subbasin: SCUT - 4C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	9
Right-Of-Way	C	92	1.8	0.003	165
Right-Of-Way	D	93	0.0	0.000	2
Commercial	C	94	2.4	0.004	223
Commercial	D	95	0.0	0.000	2
Office/Institutional/Multi-Family	B	85	3.7	0.006	315
Office/Institutional/Multi-Family	C	90	4.2	0.007	378
Office/Institutional/Multi-Family	D	92	2.8	0.004	257
Low Density Residential	B	68	0.8	0.001	52
Low Density Residential	C	79	2.5	0.004	194
Low Density Residential	D	84	0.4	0.001	37
Conservation/Open Space	B	69	0.7	0.001	48
Conservation/Open Space	C	79	8.1	0.013	641
Conservation/Open Space	D	84	6.9	0.011	584
		Totals =	34.44	0.054	2907.2

Total (weighted) RCN = total product/total area = 84.42

RCN used = 84

Subbasin: SCUT - 4D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.4	0.001	33
Right-Of-Way	C	92	0.3	0.001	30
Right-Of-Way	D	93	0.4	0.001	36
Mixed Use/Office/Institutional	A	77	1.6	0.002	122
Mixed Use/Office/Institutional	B	85	5.2	0.008	441
Mixed Use/Office/Institutional	C	90	0.4	0.001	39
Mixed Use/Office/Institutional	D	92	1.1	0.002	101
Office/Institutional/Multi-Family	A	77	0.0	0.000	1
Office/Institutional/Multi-Family	B	85	7.2	0.011	613
Office/Institutional/Multi-Family	C	90	0.0	0.000	1
Office/Institutional/Multi-Family	D	92	7.9	0.012	725
Low Density Residential	B	68	0.2	0.000	10
Low Density Residential	C	79	1.2	0.002	98
Water	W	100	0.4	0.001	41
		Totals =	26.33	0.041	2293.6

Total (weighted) RCN = total product/total area = 87.10

RCN used = 87

Subbasin: SCUT - 5

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	27
Right-Of-Way	C	92	0.6	0.001	60
Mixed Use/Office/Institutional	A	77	3.7	0.006	286
Mixed Use/Office/Institutional	B	85	12.3	0.019	1045
Mixed Use/Office/Institutional	C	90	4.1	0.006	372
Mixed Use/Office/Institutional	D	92	7.3	0.011	667
Office/Institutional/Multi-Family	B	85	7.4	0.012	626
Office/Institutional/Multi-Family	C	90	2.1	0.003	186
Office/Institutional/Multi-Family	D	92	1.8	0.003	165
		Totals =	39.55	0.062	3432.0

Total (weighted) RCN = total product/total area = 86.78

RCN used = 87

SCS Runoff Curve Number - Primary System

Project: City of Greenville - Swift Creek Watershed

Conditions: Future

Prepared by: SMB

Checked by: TLM

Date: 9/8/2015

Subbasin: GS - 1A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	C	92	0.4	0.001	40
Right-Of-Way	D	93	0.5	0.001	44
Medium Density Residential	D	85	0.0	0.000	3
Very Low Density Residential	B	69	26.1	0.041	1802
Very Low Density Residential	B/D	69	13.2	0.021	910
Very Low Density Residential	C	79	32.7	0.051	2581
Very Low Density Residential	D	84	29.6	0.046	2486
		Totals =	102.5	0.160	7866.9

Total (weighted) RCN = total product/total area = 76.73

RCN used = 77

Subbasin: GS - 1B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.5	0.001	45
Right-Of-Way	B/D	89	0.3	0.000	28
Right-Of-Way	C	92	3.5	0.005	322
Right-Of-Way	D	93	6.4	0.010	599
Mixed Use/Office/Institutional	D	92	0.6	0.001	52
Medium Density Residential	B/D	70	0.1	0.000	7
Medium Density Residential	C	80	3.0	0.005	244
Medium Density Residential	D	85	22.0	0.034	1867
Very Low Density Residential	B	69	12.8	0.020	880
Very Low Density Residential	B/D	69	18.2	0.028	1256
Very Low Density Residential	C	79	32.0	0.050	2527
Very Low Density Residential	D	84	52.6	0.082	4419
		Totals =	152.0	0.237	12245.8

Total (weighted) RCN = total product/total area = 80.57

RCN used = 81

Subbasin: GS - 1C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	7
Right-Of-Way	C	92	1.5	0.002	134
Right-Of-Way	D	93	1.4	0.002	130
Mixed Use/Office/Institutional	C	90	0.7	0.001	61
Mixed Use/Office/Institutional	D	92	0.4	0.001	39
High Density Residential	C	83	0.1	0.000	8
Medium Density Residential	C	80	1.0	0.001	76
Low Density Residential	C	79	1.1	0.002	88
Low Density Residential	D	84	7.1	0.011	597
Very Low Density Residential	B	69	16.2	0.025	1118
Very Low Density Residential	B/D	69	1.3	0.002	88
Very Low Density Residential	C	79	108.2	0.169	8550
Very Low Density Residential	D	84	133.8	0.209	11238
Conservation/Open Space	B	69	3.2	0.005	218
Conservation/Open Space	B/D	69	10.3	0.016	709
Conservation/Open Space	C	79	14.5	0.023	1146
Conservation/Open Space	D	84	21.1	0.033	1771
		Totals =	321.8	0.503	25979.7

Total (weighted) RCN = total product/total area = 80.72

RCN used = 81

Subbasin: GS - 1D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.1	0.003	187
Right-Of-Way	B/D	89	0.4	0.001	34
Right-Of-Way	C	92	2.6	0.004	236
Right-Of-Way	D	93	1.4	0.002	127
High Density Residential	B/D	75	2.8	0.004	212
Medium Density Residential	B	70	0.7	0.001	47
Medium Density Residential	C	80	0.1	0.000	7
Low Density Residential	B	68	7.1	0.011	480
Low Density Residential	B/D	68	1.5	0.002	101
Low Density Residential	C	79	7.8	0.012	616
Low Density Residential	D	84	6.7	0.011	565
Very Low Density Residential	B	69	3.4	0.005	236
Very Low Density Residential	B/D	69	8.5	0.013	588
Very Low Density Residential	C	79	9.7	0.015	764
Very Low Density Residential	D	84	9.6	0.015	803
		Totals =	64.3	0.100	5005.1

Total (weighted) RCN = total product/total area = 77.88

RCN used = 78

Subbasin: GS - 2A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.6	0.001	52
Right-Of-Way	C	92	7.6	0.012	702
Right-Of-Way	D	93	1.4	0.002	134
Industrial	C	91	1.8	0.003	166
Industrial	D	93	1.6	0.003	149
Commercial	C	94	4.3	0.007	402
Mixed Use/Office/Institutional	C	90	1.1	0.002	102
Mixed Use/Office/Institutional	D	92	1.2	0.002	111
Medium Density Residential	B	70	0.2	0.000	17
Medium Density Residential	C	80	3.4	0.005	271
Medium Density Residential	D	85	2.9	0.005	250
Low Density Residential	C	79	12.5	0.020	988
Low Density Residential	D	84	5.4	0.008	457
Very Low Density Residential	B	69	22.0	0.034	1521
Very Low Density Residential	C	79	157.4	0.246	12432
Very Low Density Residential	D	84	68.5	0.107	5753
		Totals =	292.13	0.456	23508.4

Total (weighted) RCN = total product/total area = 80.47

RCN used = 80

Subbasin: GS - 2B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	92	0.9	0.001	84
Right-Of-Way	C	94	4.8	0.007	447
Right-Of-Way	D	95	3.0	0.005	290
Mixed Use/Office/Institutional	B	85	0.1	0.000	6
Mixed Use/Office/Institutional	C	90	6.5	0.010	584
Medium Density Residential	B	70	3.2	0.005	221
Medium Density Residential	C	80	17.1	0.027	1366
Medium Density Residential	D	85	8.2	0.013	694
Low Density Residential	C	79	0.2	0.000	15
Low Density Residential	D	84	0.1	0.000	7
		Totals =	43.9	0.069	3712.4

Total (weighted) RCN = total product/total area = 84.50

RCN used = 85

Subbasin: GS - 2C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.7	0.001	63
Right-Of-Way	C	95	1.2	0.002	113
Right-Of-Way	D	93	0.4	0.001	35
High Density Residential	B	75	0.7	0.001	52
High Density Residential	C	83	0.5	0.001	40
High Density Residential	D	87	0.8	0.001	72
Medium Density Residential	C	80	0.3	0.001	28
Medium Density Residential	D	85	0.5	0.001	39
Low Density Residential	B	68	1.1	0.002	78
Low Density Residential	C	79	0.1	0.000	6
Very Low Density Residential	B	69	6.3	0.010	434
Very Low Density Residential	C	79	13.2	0.021	1045
Very Low Density Residential	D	84	1.7	0.003	146
Conservation/Open Space	B	69	2.6	0.004	182
Conservation/Open Space	B/D	69	0.1	0.000	5
Conservation/Open Space	C	79	3.3	0.005	258
Conservation/Open Space	D	84	3.2	0.005	271
Agricultural/Cropland	D	89	0.1	0.000	7
		Totals =	36.8	0.058	2874.3

Total (weighted) RCN = total product/total area = 78.01

RCN used = 78

Subbasin: GS - 3

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	5.0	0.008	442
Right-Of-Way	C	92	4.1	0.006	378
Right-Of-Way	D	93	1.0	0.002	97
High Density Residential	B	75	4.7	0.007	352
High Density Residential	C	83	0.4	0.001	37
High Density Residential	D	87	0.7	0.001	65
Medium Density Residential	B	70	2.7	0.004	186
Medium Density Residential	C	80	7.3	0.011	580
Medium Density Residential	D	85	5.3	0.008	453
Low Density Residential	B	68	4.3	0.007	291
Low Density Residential	C	79	21.3	0.033	1679
Low Density Residential	D	84	5.5	0.009	465
Very Low Density Residential	B	69	5.8	0.009	397
Very Low Density Residential	C	79	5.8	0.009	462
Very Low Density Residential	D	84	7.6	0.012	636
Conservation/Open Space	D	84	0.9	0.001	73
		Totals =	82.35	0.129	6592.9

Total (weighted) RCN = total product/total area = 80.06

RCN used = 80

Subbasin: GS - 4A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.6	0.001	55
Right-Of-Way	C	92	2.8	0.004	258
Right-Of-Way	D	93	1.9	0.003	175
High Density Residential	B	75	0.1	0.000	10
High Density Residential	C	83	0.4	0.001	31
High Density Residential	D	87	0.1	0.000	8
Medium Density Residential	B	70	1.5	0.002	105
Medium Density Residential	B/D	70	0.2	0.000	17
Medium Density Residential	C	80	16.7	0.026	1337
Medium Density Residential	D	85	2.7	0.004	229
Low Density Residential	B	68	0.6	0.001	44
Low Density Residential	C	79	6.8	0.011	540
Low Density Residential	D	84	12.4	0.019	1042
Very Low Density Residential	B	69	0.2	0.000	11
Very Low Density Residential	C	79	1.0	0.002	82
Very Low Density Residential	D	84	0.2	0.000	13
		Totals =	48.31	0.075	3958.1

Total (weighted) RCN = total product/total area = 81.94

RCN used = 82

Subbasin: GS - 4B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.2	0.005	282
Right-Of-Way	C	92	9.6	0.015	879
Right-Of-Way	D	93	0.9	0.001	80
High Density Residential	B	75	7.1	0.011	534
High Density Residential	C	83	14.2	0.022	1175
High Density Residential	D	87	1.6	0.002	135
Medium Density Residential	B	70	1.1	0.002	77
Medium Density Residential	C	80	16.3	0.025	1305
Low Density Residential	B	68	2.2	0.003	147
Low Density Residential	C	79	16.9	0.026	1334
Low Density Residential	D	84	1.4	0.002	116
Conservation/Open Space	B	69	0.0	0.000	2
		Totals =	74.3	0.116	6065.3

Total (weighted) RCN = total product/total area = 81.66

RCN used = 82

Subbasin: GS - 4C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.7	0.001	64
Right-Of-Way	C	92	5.5	0.009	503
High Density Residential	B	75	3.0	0.005	228
High Density Residential	C	83	14.8	0.023	1230
Medium Density Residential	C	80	2.1	0.003	171
Low Density Residential	B	68	2.9	0.005	199
Low Density Residential	C	79	27.9	0.044	2202
Very Low Density Residential	B	69	3.3	0.005	226
Very Low Density Residential	C	79	3.0	0.005	238
		Totals =	63.28	0.099	5061.7

Total (weighted) RCN = total product/total area = 79.99

RCN used = 80

Subbasin: GS - 4D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	4.7	0.007	419
Right-Of-Way	C	92	4.4	0.007	406
Right-Of-Way	D	93	1.0	0.002	95
High Density Residential	B	75	4.3	0.007	324
High Density Residential	C	83	2.1	0.003	174
High Density Residential	D	87	0.5	0.001	48
Medium Density Residential	B	70	21.3	0.033	1488
Medium Density Residential	C	80	21.4	0.033	1709
Medium Density Residential	D	85	4.2	0.007	354
Low Density Residential	B	68	1.8	0.003	121
Low Density Residential	C	79	9.0	0.014	709
Low Density Residential	D	84	4.1	0.006	343
Very Low Density Residential	B	69	3.1	0.005	212
Very Low Density Residential	C	79	3.1	0.005	245
		Totals =	84.90	0.133	6646.2

Total (weighted) RCN = total product/total area = 78.28

RCN used = 78

Subbasin: GS - 4E

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.5	0.006	315
Right-Of-Way	C	92	3.3	0.005	302
Right-Of-Way	D	93	0.1	0.000	13
High Density Residential	B	75	5.0	0.008	375
High Density Residential	C	83	2.7	0.004	227
High Density Residential	D	87	0.4	0.001	38
Medium Density Residential	B	70	4.4	0.007	307
Medium Density Residential	C	80	2.3	0.004	183
Medium Density Residential	D	85	0.3	0.000	23
Low Density Residential	B	69	5.1	0.008	351
Low Density Residential	C	79	0.8	0.001	63
Low Density Residential	D	84	0.0	0.000	0
Very Low Density Residential	C	79	0.2	0.000	14
Very Low Density Residential	D	84	1.3	0.002	106
Conservation/Open Space	B	69	0.9	0.001	65
Conservation/Open Space	C	79	1.0	0.002	81
Conservation/Open Space	D	84	2.2	0.003	182
		Totals =	33.5	0.052	2645.2

Total (weighted) RCN = total product/total area = 78.87

RCN used = 79

Subbasin: GS - 5A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.5	0.002	138
Right-Of-Way	C	92	0.0	0.000	0
Right-Of-Way	D	93	0.1	0.000	12
Mixed Use/Office/Institutional	C	85	0.0	0.000	1
Mixed Use/Office/Institutional	D	92	0.2	0.000	23
Office/Institutional/Multi-Family	B	85	11.7	0.018	996
Office/Institutional/Multi-Family	D	92	1.4	0.002	128
High Density Residential	B	75	0.0	0.000	2
High Density Residential	C	83	1.0	0.002	84
High Density Residential	D	87	3.2	0.005	274
Medium Density Residential	B	70	2.7	0.004	187
Medium Density Residential	C	80	0.1	0.000	9
Low Density Residential	B	68	4.3	0.007	293
Low Density Residential	D	84	1.8	0.003	151
Very Low Density Residential	B	69	35.7	0.056	2461
Very Low Density Residential	C	79	10.3	0.016	811
Very Low Density Residential	D	84	5.9	0.009	496
Conservation/Open Space	C	61	0.2	0.000	10
Conservation/Open Space	D	74	17.0	0.027	1260
		Totals =	97.2	0.152	7337.8

Total (weighted) RCN = total product/total area = 75.51

RCN used = 76

Subbasin: GS - 5B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.1	0.005	279
Right-Of-Way	C	92	3.6	0.006	334
Right-Of-Way	D	93	0.2	0.000	20
Mixed Use/Office/Institutional	C	90	0.1	0.000	9
High Density Residential	B	75	12.4	0.019	927
High Density Residential	C	83	8.2	0.013	677
High Density Residential	D	87	0.8	0.001	68
Medium Density Residential	B	70	1.6	0.003	112
Medium Density Residential	C	80	0.4	0.001	28
Low Density Residential	B	68	0.1	0.000	8
Low Density Residential	C	79	0.1	0.000	5
		Totals =	30.5	0.048	2468.2

Total (weighted) RCN = total product/total area = 80.86

RCN used = 81

Subbasin: GS - 5C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.5	0.002	133
Mixed Use/Office/Institutional	B	85	8.5	0.013	723
Mixed Use/Office/Institutional	C	90	4.6	0.007	414
Mixed Use/Office/Institutional	D	92	3.3	0.005	302
Office/Institutional/Multi-Family	B	85	0.0	0.000	1
Office/Institutional/Multi-Family	D	92	0.0	0.000	0
High Density Residential	B	75	1.0	0.002	78
High Density Residential	C	83	0.2	0.000	20
Medium Density Residential	B	70	1.9	0.003	136
Low Density Residential	B	68	2.7	0.004	185
Low Density Residential	C	79	1.0	0.002	79
Low Density Residential	D	84	1.2	0.002	100
		Totals =	26.03	0.041	2170.9

Total (weighted) RCN = total product/total area = 83.41

RCN used = 83

Subbasin: GS - 5D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	5.5	0.009	488
Right-Of-Way	C	92	1.4	0.002	128
Right-Of-Way	D	93	2.3	0.004	211
Mixed Use/Office/Institutional	A	77	5.0	0.008	383
Mixed Use/Office/Institutional	B	85	20.6	0.032	1754
Mixed Use/Office/Institutional	C	90	5.0	0.008	449
Mixed Use/Office/Institutional	D	92	7.0	0.011	640
Medium Density Residential	B	70	1.3	0.002	94
Low Density Residential	B	68	21.5	0.034	1464
Low Density Residential	C	79	6.2	0.010	490
Low Density Residential	D	84	10.7	0.017	901
		Totals =	86.52	0.135	7003.6

Total (weighted) RCN = total product/total area = 80.95

RCN used = 81

Subbasin: GS - 6

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.3	0.002	115
Right-Of-Way	C	92	0.2	0.000	20
Right-Of-Way	D	93	0.1	0.000	6
Mixed Use/Office/Institutional	A	77	7.7	0.012	594
Mixed Use/Office/Institutional	B	85	25.8	0.040	2190
Mixed Use/Office/Institutional	C	90	11.8	0.018	1063
Mixed Use/Office/Institutional	D	92	1.3	0.002	116
Low Density Residential	A	51	0.0	0.000	1
Low Density Residential	B	68	3.7	0.006	248
Low Density Residential	C	79	1.2	0.002	95
Low Density Residential	D	84	2.4	0.004	206
Very Low Density Residential	A	49	16.4	0.026	803
Very Low Density Residential	B	69	8.2	0.013	564
Very Low Density Residential	C	79	6.5	0.010	517
Very Low Density Residential	D	84	0.3	0.000	25
Conservation/Open Space	D	80	19.8	0.031	1588
		Totals =	106.70	0.167	8150.8

Total (weighted) RCN = total product/total area = 76.39

RCN used = 76

Subbasin: SC - 1A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	28
Right-Of-Way	C	92	4.7	0.007	430
Right-Of-Way	D	93	3.5	0.005	323
Commercial	C	94	28.2	0.044	2651
Commercial	D	95	0.3	0.000	29
High Density Residential	C	83	2.2	0.003	179
Medium Density Residential	B	70	0.5	0.001	37
Medium Density Residential	C	80	12.1	0.019	972
Medium Density Residential	D	85	0.5	0.001	39
Low Density Residential	B	68	1.2	0.002	79
Low Density Residential	C	79	14.3	0.022	1128
Low Density Residential	D	84	4.6	0.007	385
Very Low Density Residential	B	69	0.0	0.000	2
Very Low Density Residential	C	79	23.9	0.037	1890
Very Low Density Residential	D	84	2.1	0.003	178
		Totals =	98.34	0.154	8348.8

Total (weighted) RCN = total product/total area = 84.89

RCN used = 85

Subbasin: SC - 1B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.5	0.004	224
Right-Of-Way	C	92	3.7	0.006	342
High Density Residential	B	75	22.9	0.036	1718
High Density Residential	C	83	8.7	0.014	722
High Density Residential	D	87	1.0	0.002	84
Medium Density Residential	B	70	7.0	0.011	489
Medium Density Residential	C	80	4.9	0.008	394
Low Density Residential	B	68	1.8	0.003	120
Low Density Residential	C	79	10.8	0.017	850
Very Low Density Residential	C	79	1.8	0.003	146
		Totals =	65.07	0.102	5087.3

Total (weighted) RCN = total product/total area = 78.19

RCN used = 78

Subbasin: SC - 1C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.3	0.004	200
Right-Of-Way	B/D	89	0.2	0.000	22
Right-Of-Way	C	92	2.3	0.004	216
Right-Of-Way	D	93	2.0	0.003	182
Commercial	B	92	38.8	0.061	3568
Commercial	B/D	92	1.7	0.003	160
Commercial	C	94	44.5	0.070	4185
Commercial	D	95	23.1	0.036	2199
Mixed Use/Office/Institutional	B	85	0.1	0.000	9
Mixed Use/Office/Institutional	C	90	1.9	0.003	167
Mixed Use/Office/Institutional	D	92	0.5	0.001	43
High Density Residential	B	75	0.1	0.000	5
High Density Residential	C	83	1.6	0.003	135
High Density Residential	D	87	1.4	0.002	119
Low Density Residential	B	68	2.9	0.004	195
Low Density Residential	B/D	68	1.3	0.002	89
Low Density Residential	C	79	4.6	0.007	360
Low Density Residential	D	84	0.1	0.000	12
		Totals =	129.35	0.202	11865.8

Total (weighted) RCN = total product/total area = 91.73

RCN used = 92

Subbasin: SC - 1D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	C	92	0.8	0.001	75
Right-Of-Way	D	93	0.2	0.000	22
Commercial	B	92	2.3	0.004	211
Commercial	C	94	1.7	0.003	163
High Density Residential	B	75	2.3	0.004	169
High Density Residential	B/D	75	0.6	0.001	46
High Density Residential	C	83	8.4	0.013	701
High Density Residential	D	87	12.3	0.019	1071
Medium Density Residential	D	85	0.1	0.000	6
Low Density Residential	C	68	7.2	0.011	487
Low Density Residential	D	84	3.9	0.006	329
Very Low Density Residential	B	69	0.1	0.000	4
Very Low Density Residential	B/D	69	13.9	0.022	956
Very Low Density Residential	C	79	26.5	0.041	2093
Very Low Density Residential	D	84	19.9	0.031	1668
		Totals =	100.11	0.156	8000.4

Total (weighted) RCN = total product/total area = 79.92

RCN used = 80

Subbasin: SC - 1E

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.2	0.000	20
Right-Of-Way	C	92	8.9	0.014	818
Right-Of-Way	D	93	3.0	0.005	277
Mixed Use/Office/Institutional	B	85	0.5	0.001	40
Mixed Use/Office/Institutional	C	90	3.1	0.005	277
High Density Residential	C	83	0.1	0.000	12
High Density Residential	D	87	1.0	0.002	85
Medium Density Residential	B	70	0.8	0.001	58
Medium Density Residential	C	80	21.7	0.034	1736
Medium Density Residential	D	85	11.0	0.017	936
Low Density Residential	C	79	34.3	0.054	2711
Low Density Residential	D	84	13.3	0.021	1117
Very Low Density Residential	B	69	0.0	0.000	1
Very Low Density Residential	C	79	10.2	0.016	803
Very Low Density Residential	D	84	3.4	0.005	286
		Totals =	111.50	0.174	9176.9

Total (weighted) RCN = total product/total area = 82.30

RCN used = 82

Subbasin: SC - 2A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	26
Right-Of-Way	B/D	92	0.1	0.000	7
Right-Of-Way	C	93	0.3	0.000	25
Mixed Use/Office/Institutional	B	85	1.5	0.002	126
Mixed Use/Office/Institutional	B/D	85	19.7	0.031	1674
Mixed Use/Office/Institutional	C	90	50.9	0.080	4585
Mixed Use/Office/Institutional	D	92	29.5	0.046	2711
Medium Density Residential	B/D	70	0.0	0.000	2
Medium Density Residential	D	70	0.1	0.000	4
Low Density Residential	B/D	68	0.0	0.000	1
Low Density Residential	D	84	0.0	0.000	0
		Totals =	102.32	0.160	9160.3

Total (weighted) RCN = total product/total area = 89.53

RCN used = 90

Subbasin: SC - 2B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.6	0.001	57
Right-Of-Way	B/D	89	0.3	0.001	30
Right-Of-Way	C	92	6.4	0.010	590
Right-Of-Way	D	93	0.3	0.001	30
Medium Density Residential	B	70	2.2	0.003	155
Medium Density Residential	B/D	70	2.8	0.004	196
Medium Density Residential	C	80	31.3	0.049	2506
Medium Density Residential	D	85	6.9	0.011	589
Low Density Residential	B	68	0.1	0.000	10
Low Density Residential	B/D	68	0.3	0.001	23
Low Density Residential	C	79	1.0	0.002	79
Low Density Residential	D	84	0.1	0.000	8
Very Low Density Residential	B	69	0.6	0.001	44
Very Low Density Residential	B/D	69	0.7	0.001	50
Very Low Density Residential	C	79	4.3	0.007	338
		Totals =	58.20	0.091	4705.0

Total (weighted) RCN = total product/total area = 80.84

RCN used = 81

Subbasin: SC - 3A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
High Density Residential	B/D	75	0.1	0.000	7
Medium Density Residential	B/D	70	3.8	0.006	264
Medium Density Residential	C	80	6.5	0.010	520
Very Low Density Residential	B/D	68	29.9	0.047	2032
Very Low Density Residential	D	79	15.2	0.024	1204
		Totals =	55.49	0.087	4027.0

Total (weighted) RCN = total product/total area = 72.57

RCN used = 73

Subbasin: SC - 3B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.2	0.003	194
Right-Of-Way	B/D	89	0.9	0.001	84
Right-Of-Way	C	92	4.4	0.007	407
Right-Of-Way	D	93	1.5	0.002	138
Mixed Use/Office/Institutional	B	85	0.7	0.001	63
Mixed Use/Office/Institutional	B/D	85	1.9	0.003	162
Mixed Use/Office/Institutional	C	90	0.9	0.001	78
Mixed Use/Office/Institutional	D	92	0.0	0.000	1
High Density Residential	B/D	75	0.0	0.000	1
High Density Residential	C	83	0.1	0.000	5
Medium Density Residential	B	70	9.8	0.015	687
Medium Density Residential	B/D	70	9.8	0.015	684
Medium Density Residential	C	80	23.3	0.036	1866
Medium Density Residential	D	85	2.2	0.003	183
Low Density Residential	B	68	0.2	0.000	14
Low Density Residential	B/D	68	1.8	0.003	121
Low Density Residential	C	79	0.4	0.001	32
Low Density Residential	D	84	1.9	0.003	162
		Totals =	62.02	0.097	4882.7

Total (weighted) RCN = total product/total area = 78.73

RCN used = 79

Subbasin: SC - 3C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.5	0.002	138
Right-Of-Way	C	92	3.3	0.005	308
Right-Of-Way	D	93	0.4	0.001	33
Medium Density Residential	B	70	3.5	0.006	246
Medium Density Residential	B/D	70	0.3	0.000	20
Medium Density Residential	C	80	10.5	0.016	844
Medium Density Residential	D	85	1.2	0.002	105
Low Density Residential	B	68	1.6	0.003	110
Low Density Residential	B/D	68	0.0	0.000	0
Low Density Residential	C	79	2.0	0.003	158
Low Density Residential	D	84	0.3	0.000	22
Very Low Density Residential	B	69	1.4	0.002	96
Very Low Density Residential	C	79	8.7	0.014	686
		Totals =	34.78	0.054	2765.0

Total (weighted) RCN = total product/total area = 79.50

RCN used = 80

Subbasin: SC - 4

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	9.3	0.015	828
Right-Of-Way	C	92	4.0	0.006	364
Right-Of-Way	D	93	1.1	0.002	102
High Density Residential	B	75	2.1	0.003	160
High Density Residential	C	83	1.5	0.002	129
Medium Density Residential	B	70	8.4	0.013	589
Medium Density Residential	C	80	5.5	0.009	440
Medium Density Residential	D	85	0.9	0.001	79
Low Density Residential	B	68	25.1	0.039	1707
Low Density Residential	C	79	0.3	0.000	25
Low Density Residential	D	84	8.8	0.014	740
Very Low Density Residential	B	69	16.5	0.026	1140
Very Low Density Residential	C	79	11.4	0.018	901
Very Low Density Residential	D	84	10.0	0.016	839
Conservation/Open Space	B	69	0.0	0.000	1
Conservation/Open Space	D	84	2.6	0.004	219
		Totals =	107.63	0.168	8261.5

Total (weighted) RCN = total product/total area = 76.76

RCN used = 77

Subbasin: SC - 5A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	1.8	0.003	156
Right-Of-Way	C	92	2.5	0.004	228
Right-Of-Way	D	93	0.1	0.000	10
Office/Institutional/Multi-Family	B	85	0.3	0.000	27
Office/Institutional/Multi-Family	C	90	2.5	0.004	225
Office/Institutional/Multi-Family	D	92	0.5	0.001	43
High Density Residential	B	75	1.6	0.003	120
High Density Residential	C	83	2.3	0.004	194
Medium Density Residential	B	70	2.8	0.004	199
Medium Density Residential	C	80	6.2	0.010	497
Medium Density Residential	D	85	0.7	0.001	56
Low Density Residential	B	68	0.1	0.000	7
Low Density Residential	C	79	0.8	0.001	63
Low Density Residential	D	84	0.3	0.001	29
		Totals =	22.51	0.035	1853.0

Total (weighted) RCN = total product/total area = 82.32

RCN used = 82

Subbasin: SC - 5B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	2.9	0.005	261
Right-Of-Way	D	93	0.8	0.001	78
Office/Institutional/Medical	B	85	2.0	0.003	168
Office/Institutional/Multi-Family	C	90	0.0	0.000	0
Office/Institutional/Multi-Family	D	92	1.1	0.002	105
High Density Residential	B	75	0.2	0.000	17
Medium Density Residential	B	70	2.9	0.004	200
Medium Density Residential	C	80	0.0	0.000	0
Medium Density Residential	D	85	2.1	0.003	176
Low Density Residential	B	68	8.4	0.013	569
Low Density Residential	D	84	5.7	0.009	478
Very Low Density Residential	B	69	11.4	0.018	788
Very Low Density Residential	D	84	2.3	0.004	196
Conservation/Open Space	B	69	3.6	0.006	251
Conservation/Open Space	C	79	1.1	0.002	87
Conservation/Open Space	D	84	4.6	0.007	387
		Totals =	49.21	0.077	3761.5

Total (weighted) RCN = total product/total area = 76.44

RCN used = 76

Subbasin: SC - 6

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	A	83	2.0	0.003	168
Right-Of-Way	B	89	17.7	0.028	1579
Right-Of-Way	B/D	89	10.6	0.017	944
Right-Of-Way	C	92	29.8	0.047	2739
Right-Of-Way	D	93	2.9	0.005	269
Commercial	B	92	24.3	0.038	2237
Commercial	B/D	92	15.1	0.024	1388
Commercial	C	94	27.1	0.042	2549
Commercial	D	95	11.4	0.018	1080
Mixed Use/Office/Institutional	A	77	14.3	0.022	1100
Mixed Use/Office/Institutional	B	85	29.4	0.046	2502
Mixed Use/Office/Institutional	B/D	85	25.5	0.040	2170
Mixed Use/Office/Institutional	C	90	47.1	0.074	4243
Mixed Use/Office/Institutional	D	92	36.3	0.057	3341
Office/Institutional/Multi-Family	D	92	0.0	0.000	4
High Density Residential	B	75	3.1	0.005	231
High Density Residential	C	83	2.1	0.003	173
High Density Residential	D	87	0.6	0.001	52
Medium Density Residential	B	70	24.9	0.039	1741
Medium Density Residential	C	80	30.8	0.048	2463
Medium Density Residential	D	85	1.3	0.002	107
Low Density Residential	A	51	4.8	0.008	246
Low Density Residential	B	68	14.9	0.023	1014
Low Density Residential	B/D	68	0.3	0.000	21
Low Density Residential	C	79	47.5	0.074	3751
Low Density Residential	D	84	0.8	0.001	71
Very Low Density Residential	A	49	22.9	0.036	1124
Very Low Density Residential	A/D	49	0.3	0.000	13
Very Low Density Residential	B	69	99.3	0.155	6855
Very Low Density Residential	B/D	69	29.3	0.046	2021
Very Low Density Residential	C	79	148.5	0.232	11733
Very Low Density Residential	D	84	40.4	0.063	3398
Conservation/Open Space	A/D	49	11.9	0.019	585
Conservation/Open Space	C	79	13.9	0.022	1101
Conservation/Open Space	D	84	85.1	0.133	7151
		Totals =	876.52	1.370	70162.0

Total (weighted) RCN = total product/total area = 80.05

RCN used = 80

Subbasin: SCUT - 1A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	22
Right-Of-Way	B/D	89	2.3	0.004	206
Right-Of-Way	C	92	2.0	0.003	183
Right-Of-Way	D	93	2.8	0.004	256
Office/Institutional/Multi-Family	B/D	85	0.1	0.000	8
Office/Institutional/Multi-Family	D	92	0.5	0.001	42
High Density Residential	B	75	0.3	0.000	20
High Density Residential	B/D	75	11.5	0.018	861
High Density Residential	C	83	2.1	0.003	172
High Density Residential	D	87	3.8	0.006	331
Medium Density Residential	B	70	1.6	0.002	111
Medium Density Residential	B/D	70	4.6	0.007	325
Medium Density Residential	C	80	3.8	0.006	302
Medium Density Residential	D	85	6.9	0.011	585
Low Density Residential	B/D	68	1.2	0.002	81
Low Density Residential	C	79	0.2	0.000	15
Low Density Residential	D	84	0.3	0.000	22
Very Low Density Residential	B/D	69	0.6	0.001	39
Very Low Density Residential	D	84	1.4	0.002	117
		Totals =	45.97	0.072	3698.9

Total (weighted) RCN = total product/total area = 80.46

RCN used = 80

Subbasin: SCUT - 1B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	7
Right-Of-Way	C	92	0.0	0.000	4
Office/Institutional/Multi-Family	B/D	85	0.0	0.000	3
High Density Residential	B/D	75	42.8	0.067	3206
High Density Residential	C	83	3.6	0.006	299
High Density Residential	D	87	2.2	0.003	194
Medium Density Residential	B	70	0.1	0.000	6
Medium Density Residential	B/D	70	0.5	0.001	38
Medium Density Residential	C	80	0.7	0.001	55
Medium Density Residential	D	85	0.7	0.001	64
Low Density Residential	B/D	68	1.3	0.002	91
Low Density Residential	C	79	0.3	0.001	25
Low Density Residential	D	84	0.5	0.001	43
Very Low Density Residential	B/D	69	1.2	0.002	84
		Totals =	54.20	0.085	4120.1

Total (weighted) RCN = total product/total area = 76.02

RCN used = 76

Subbasin: SCUT - 1C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	3.8	0.006	339
Right-Of-Way	B/D	89	0.4	0.001	40
Right-Of-Way	C	92	2.7	0.004	249
Right-Of-Way	D	93	0.0	0.000	2
High Density Residential	B	75	4.1	0.006	304
High Density Residential	B/D	75	0.1	0.000	5
High Density Residential	C	83	3.1	0.005	259
Medium Density Residential	B	70	7.5	0.012	528
Medium Density Residential	B/D	70	1.0	0.002	73
Medium Density Residential	C	80	9.5	0.015	758
Medium Density Residential	D	85	0.9	0.001	79
Low Density Residential	B	68	0.4	0.001	26
Low Density Residential	C	79	1.4	0.002	110
Conservation/Open Space	D	84	0.1	0.000	8
		Totals =	35.06	0.055	2777.9

Total (weighted) RCN = total product/total area = 79.23

RCN used = 79

Subbasin: SCUT - 1D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.8	0.001	67
Right-Of-Way	C	92	0.3	0.000	27
Right-Of-Way	D	93	0.1	0.000	9
Commercial	B	92	5.0	0.008	455
Commercial	B/D	92	5.3	0.008	485
Commercial	C	95	13.1	0.020	1246
Office/Institutional/Multi-Family	B	85	0.3	0.000	24
Office/Institutional/Multi-Family	B/D	85	0.0	0.000	2
Office/Institutional/Multi-Family	C	90	2.0	0.003	176
Office/Institutional/Multi-Family	D	92	0.2	0.000	23
High Density Residential	B/D	75	2.0	0.003	153
High Density Residential	C	83	5.2	0.008	433
High Density Residential	D	87	0.3	0.001	30
Medium Density Residential	D	85	0.0	0.000	1
Low Density Residential	B	68	0.4	0.001	27
Low Density Residential	B/D	68	3.0	0.005	201
Low Density Residential	C	79	3.4	0.005	269
Low Density Residential	D	84	0.0	0.000	2
		Totals =	41.39	0.065	3630.3

Total (weighted) RCN = total product/total area = 87.72

RCN used = 88

Subbasin: SCUT - 2

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.7	0.001	59
Right-Of-Way	C	92	0.2	0.000	17
Right-Of-Way	D	93	0.1	0.000	12
Office/Institutional/Medical	B	85	14.7	0.023	1248
Office/Institutional/Medical	C	90	2.1	0.003	193
Office/Institutional/Medical	D	92	1.1	0.002	106
Office/Institutional/Multi-Family	B	85	2.3	0.004	192
Office/Institutional/Multi-Family	C	90	2.0	0.003	179
Office/Institutional/Multi-Family	D	92	2.7	0.004	250
Medium Density Residential	B	70	2.6	0.004	180
Medium Density Residential	C	80	0.2	0.000	18
Medium Density Residential	D	85	0.2	0.000	20
Water	W	100	0.1	0.000	13
		Totals =	29.08	0.045	2486.6

Total (weighted) RCN = total product/total area = 85.51

RCN used = 86

Subbasin: SCUT - 3

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	5.0	0.008	447
Right-Of-Way	C	92	0.8	0.001	71
Right-Of-Way	D	93	0.7	0.001	62
Commercial	B	92	3.7	0.006	336
Commercial	C	94	2.0	0.003	189
Office/Institutional/Medical	B	85	0.0	0.000	0
Office/Institutional/Multi-Family	B	85	19.6	0.031	1669
Office/Institutional/Multi-Family	C	90	6.4	0.010	580
Office/Institutional/Multi-Family	D	92	6.7	0.011	619
High Density Residential	B	75	0.1	0.000	10
Medium Density Residential	B	70	7.0	0.011	491
Medium Density Residential	D	85	0.8	0.001	65
Low Density Residential	B	68	5.1	0.008	345
Low Density Residential	C	79	0.2	0.000	15
Very Low Density Residential	B	69	1.2	0.002	81
Conservation/Open Space	B	69	0.3	0.000	20
Conservation/Open Space	D	84	0.1	0.000	9
Water	W	100	0.1	0.000	10
		Totals =	59.78	0.093	5019.6

Total (weighted) RCN = total product/total area = 83.96

RCN used = 84

Subbasin: SCUT - 4A

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	11
Right-Of-Way	B/D	89	1.1	0.002	99
Right-Of-Way	C	92	1.5	0.002	138
Right-Of-Way	D	93	0.5	0.001	49
Commercial	A	89	1.2	0.002	104
Commercial	B	92	38.0	0.059	3492
Commercial	B/D	92	40.0	0.063	3680
Commercial	C	94	25.5	0.040	2401
Commercial	D	95	10.9	0.017	1035
Mixed Use/Office/Institutional	A	77	0.0	0.000	0
Mixed Use/Office/Institutional	B	85	2.5	0.004	213
Mixed Use/Office/Institutional	B/D	85	0.0	0.000	1
Office/Institutional/Multi-Family	B	85	3.2	0.005	271
Office/Institutional/Multi-Family	B/D	85	5.8	0.009	494
High Density Residential	B/D	75	5.3	0.008	397
Low Density Residential	B/D	68	9.3	0.015	633
Very Low Density Residential	B	69	0.4	0.001	27
Very Low Density Residential	B/D	69	3.0	0.005	207
Water	W	100	1.9	0.003	190
		Totals =	150.25	0.235	13443.8

Total (weighted) RCN = total product/total area = 89.47

RCN used = 89

Subbasin: SCUT - 4B

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	25
Right-Of-Way	C	92	3.7	0.006	341
Right-Of-Way	D	93	0.0	0.000	0
Commercial	B	92	4.9	0.008	453
Commercial	C	94	9.4	0.015	879
Commercial	D	95	7.0	0.011	662
Office/Institutional/Multi-Family	B	85	1.3	0.002	111
Office/Institutional/Multi-Family	C	90	0.3	0.001	31
Office/Institutional/Multi-Family	D	92	0.7	0.001	65
High Density Residential	B	75	0.9	0.001	64
High Density Residential	C	83	0.3	0.000	25
Low Density Residential	C	79	0.0	0.000	1
Very Low Density Residential	B	69	2.2	0.003	152
Very Low Density Residential	C	79	0.0	0.000	0
		Totals =	30.95	0.048	2808.6

Total (weighted) RCN = total product/total area = 90.74

RCN used = 91

Subbasin: SCUT - 4C

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.1	0.000	9
Right-Of-Way	C	92	1.8	0.003	165
Right-Of-Way	D	93	0.0	0.000	2
Commercial	B	92	0.7	0.001	64
Commercial	C	94	11.5	0.018	1077
Commercial	D	95	7.0	0.011	662
Office/Institutional/Multi-Family	B	85	3.7	0.006	315
Office/Institutional/Multi-Family	C	90	4.2	0.007	378
Office/Institutional/Multi-Family	D	92	2.8	0.004	257
Low Density Residential	B	68	0.8	0.001	52
Low Density Residential	C	79	1.5	0.002	118
Low Density Residential	D	84	0.4	0.001	37
		Totals =	34.44	0.054	3135.9

Total (weighted) RCN = total product/total area = 91.07

RCN used = 91

Subbasin: SCUT - 4D

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.4	0.001	33
Right-Of-Way	C	92	0.3	0.001	30
Right-Of-Way	D	93	0.4	0.001	36
Mixed Use/Office/Institutional	A	77	1.6	0.002	122
Mixed Use/Office/Institutional	B	85	5.2	0.008	441
Mixed Use/Office/Institutional	C	90	0.4	0.001	39
Mixed Use/Office/Institutional	D	92	1.1	0.002	101
Office/Institutional/Multi-Family	A	77	0.0	0.000	1
Office/Institutional/Multi-Family	B	85	7.2	0.011	613
Office/Institutional/Multi-Family	C	90	0.0	0.000	1
Office/Institutional/Multi-Family	D	92	7.9	0.012	725
Low Density Residential	B	68	0.2	0.000	10
Low Density Residential	C	79	1.2	0.002	98
Water	W	100	0.4	0.001	41
		Totals =	26.33	0.041	2293.6

Total (weighted) RCN = total product/total area = 87.10

RCN used = 87

Subbasin: SCUT - 5

Landuse	Soil Group	RCN	Area (Acres)	Area (Sq. Mi.)	Product of RCN and Area
Right-Of-Way	B	89	0.3	0.000	27
Right-Of-Way	C	92	0.6	0.001	60
Mixed Use/Office/Institutional	A	77	3.7	0.006	286
Mixed Use/Office/Institutional	B	85	12.3	0.019	1045
Mixed Use/Office/Institutional	C	90	4.1	0.006	372
Mixed Use/Office/Institutional	D	92	7.3	0.011	667
Office/Institutional/Multi-Family	B	85	7.4	0.012	626
Office/Institutional/Multi-Family	C	90	2.1	0.003	186
Office/Institutional/Multi-Family	D	92	1.8	0.003	165
		Totals =	39.55	0.062	3432.0

Total (weighted) RCN = total product/total area = 86.78

RCN used = 87

Appendix F:

Time of Concentration Calculations

Project: Greenville Watershed Master Plan
Prepared by: SMB
Checked by: DJK
Date: 5/5/2015

Time of Concentration - Swift Creek Watershed

Sub-basin	Sheet Flow						Shallow Concentration					Channel Flow									Lag	Calibration
	Description	n	Flow Length	P-2	Land Slope	Tt	Surface Description	Flow Length	Slope	Velocity	Tt	Channel Area	Channel Perimeter	Hydraulic Radius	Slope	n	Velocity	Flow Length	Tt	Tc		
			(ft)	(in)	(ft/ft)	(min)	0--Unpaved/1-Paved	(ft)	(ft/ft)	(ft/s)	(min)	(ft2)	(ft)	(ft)	(ft/ft)		(ft/s)	(ft)	(min)	(min)	(min)	(min)
GS-1A	Woods	0.4	232	3.76	0.002	91.61	0	367	0.003	0.92	6.66	73	22.7	3.22	0.001	0.045	1.96	2719.5	23.08	121.35	72.81	90.00
GS-1B	Woods	0.4	258	3.76	0.001	142.01	0	561	0.000	0.34	27.43	16.5	10.7	1.54	0.001	0.045	1.52	1684.6	18.41	187.86	112.71	225.00
GS-1C	Woods	0.4	195	3.76	0.001	101.15	0	423	0.001	0.39	17.95	16.5	10.7	1.54	0.001	0.03	2.42	3012.5	20.76	146.13	87.68	300.00
												36.5	15.9	2.30	0.004	0.045	3.47	1307.3	6.28			
GS-1D	Grass	0.24	312	3.76	0.005	57.10	0	329	0.005	1.13	4.87	64.4	21.7	2.97	0.004	0.045	4.51	1389.3	5.13	67.11	40.26	20.00
GS-2A	Grass	0.24	217	3.76	0.001	76.60	0	288	0.007	1.37	3.50	47	18.6	2.53	0.002	0.045	2.68	5351.4	33.29	113.38	68.03	210.00
GS-2B	Woods	0.4	180	3.76	0.001	92.35	0	399	0.015	1.96	3.39	Pipe			0.003	0.013	5.00	1045.8	3.49	99.23	59.54	30
GS-2C	Woods	0.4	195	3.76	0.001	135.21	0	468	0.008	1.47	5.31	47	18.6	2.53	0.006	0.045	4.84	1123.4	3.87	144.38	86.63	20
GS-3	Grass	0.24	284	3.76	0.007	46.11	0	529	0.005	1.15	7.66	23.6	12.8	1.84	0.004	0.03	4.92	1543.1	5.22	67.97	40.78	55.00
												73.5	22.7	3.24	0.001	0.045	1.64	883	8.97			
GS-4A	Grass	0.24	250	3.76	0.008	39.54	1	567	0.001	0.60	15.64	Pipe			0.004	0.013	5.00	574	1.91	57.95	34.77	30
												29.6	15.3	1.93	0.002	0.03	3.69	191	0.86			
GS-4B	Grass	0.24	189	3.76	0.001	65.12	0	426	0.004	0.98	7.26	Pipe			0.037	0.013	5.00	247	0.82	78.62	47.17	120
												28	13.9	2.01	0.002	0.03	3.87	1258	5.42			
GS-4C	Grass	0.24	256	3.76	0.006	45.52	0	396	0.004	1.08	6.13	Pipe			0.000	0.013	5.00	247	0.82	56.87	34.12	120
												53.6	19.5	2.75	0.002	0.03	4.76	1258	4.40			
GS-4D	Grass	0.24	234	3.76	0.001	83.72	0	225	0.005	1.16	3.23	Pipe			0.004	0.013	5.00	976	3.25	90.20	54.12	150.00
GS-4E	Grass	0.24	289	3.76	0.003	70.10	0	328	0.006	1.23	4.45	Pipe			0.007	0.013	5.00	1237.6	4.13	80.00	48.00	60.00
												37.4	16.6	2.25	0.003	0.03	4.81	380	1.32			
GS-5A	Grass	0.24	163	3.76	0.002	54.26	0	576	0.003	0.95	10.09	28	13.9	2.01	0.009	0.03	7.41	1148.1	2.58	74.41	44.64	150.00
												91.9	25.3	3.63	0.001	0.045	3.02	1355	7.48			
GS-5B	Grass	0.24	220	3.76	0.004	49.65	1	216	0.002	1.02	3.55	Pipe			0.009	0.013	5.00	1147	3.82	57.02	34.21	20
GS-5C	Grass	0.24	97	3.76	0.003	29.04	0	401	0.001	0.55	12.16	19.6	12.9	1.52	0.445	0.045	29.24	1510	0.86	42.06	25.24	15
GS-5D	Grass	0.24	174	3.76	0.006	33.22	0	321	0.012	1.77	3.03	28	13.9	2.01	0.011	0.03	8.23	1118.3	2.27	43.71	26.23	120
												91.9	25.3	3.63	0.001	0.045	2.15	669	5.19			
GS-6	Grass	0.24	149	3.76	0.009	25.29	0	386	0.004	1.02	6.33	28	13.9	2.01	0.009	0.03	7.56	1452.8	3.20	40.02	24.01	120
												91.9	25.3	3.63	0.001	0.045	2.15	669	5.19			
SC-1A	Grass	0.24	300	3.76	0.002	85.66	0	79	0.003	0.91	1.45	60	23.4	2.56	0.001	0.035	2.53	2007.6	13.23	100.34	60.20	240.00
SC-1B	Grass	0.24	154	3.76	0.003	38.24	0	186	0.010	1.65	1.89	81.6	54.1	1.51	0.003	0.035	3.12	1935.5	10.33	50.46	30.27	60.00
SC-1C	Woods	0.40	170	3.76	0.001	86.16	0	605	0.003	0.93	10.87	60	23.4	2.56	0.001	0.035	2.88	1803.5	10.42	107.45	64.47	150
SC-1D	Woods	0.40	177	3.76	0.001	90.44	0	428	0.005	1.10	6.47	81.6	54.1	1.51	0.002	0.035	2.65	2678.8	16.83	113.74	68.24	240.00
SC-1E	Woods	0.40	300	3.76	0.003	97.69	0	100	0.005	1.14	1.46	41	16.9	2.43	0.002	0.035	3.54	3800	17.91	117.06	70.23	120
SC-2A	Woods	0.40	321	3.76	0.006	80.23	0	494	0.001	0.36	22.70	65.6	21.5	3.05	0.003	0.045	4.02	2753.8	11.42	114.35	68.61	180.00
SC-2B	Grass	0.24	115	3.76	0.009	20.53	0	188	0.008	1.49	2.11	Pipe			0.005	0.013	5.00	864	2.88	31.28	18.77	20
												32.5	15.2	2.14	0.001	0.045	1.71	592	5.76			
SC-3A	Woods	0.40	175	3.76	0.011	38.75	0	307	0.001	0.46	11.14	16.5	10.7	1.54	0.001	0.045	1.30	2325.3	29.86	79.74	47.85	180.00
SC-3B	Woods	0.40	191	3.76	0.003	74.91	0	289	0.004	1.00	4.81	Pipe			0.001	0.013	5.00	1455.9	4.85	87.68	52.61	50.00
												40.6	17.5	2.32	0.004	0.03	5.70	1061	3.10			

Sub-basin	Sheet Flow						Shallow Concentration					Channel Flow									Lag	Calibration
	Description	n	Flow Length	P-2	Land Slope	Tt	Surface Description	Flow Length	Slope	Velocity	Tt	Channel Area	Channel Perimeter	Hydraulic Radius	Slope	n	Velocity	Flow Length	Tt	Tc		
			(ft)	(in)	(ft/ft)	(min)	0--Unpaved/1-Paved	(ft)	(ft/ft)	(ft/s)	(min)	(ft2)	(ft)	(ft)	(ft/ft)		(ft/s)	(ft)	(min)	(min)	(min)	(min)
SC-3C	Grass	0.24	141	3.76	0.004	34.66	0	289	0.005	1.16	4.13	32.5	15.2	2.14	0.004	0.03	5.54	565	1.70	43.17	25.90	40.00
												Pipe			0.006	0.013	5.00	804.01	2.68			
SC-4	Grass	0.24	328	3.76	0.001	126.00	0	585	0.004	0.98	9.91	Pipe			0.007	0.013	5.00	1087.1	3.62	142.98	85.79	45.00
												81	24.6	3.29	0.003	0.03	6.27	1296	3.44			
SC-5A	Grass	0.24	91	3.76	0.003	27.16	1	549	0.011	2.16	4.24	Pipe			0.003	0.013	5.00	1436.5	4.79	36.19	21.71	27.14
SC-5B	Grass	0.24	368	3.76	0.004	67.80	0	315	0.007	1.33	3.94	28	13.9	2.01	0.019	0.03	11.09	589	0.89	86.81	52.09	65.11
												94.1	27.6	3.41	0.000	0.045	1.52	1292	14.18			
SC-6	Grass	0.24	243	3.76	0.001	87.84	0	1465	0.000	0.30	81.94	28	13.9	2.01	0.005	0.03	5.62	3994	11.85	208.77	125.26	125
												94.1	27.6	3.41	0.001	0.045	1.91	3110	27.13			
SCUT-1A	Woods	0.40	216	3.76	0.005	65.80	0	293	0.005	1.09	4.47	Pipe			0.001	0.013	5.00	2059.1	6.86	77.14	46.28	46.00
SCUT-1B	Woods	0.40	300	3.76	0.001	140.94	0	300	0.006	1.27	3.92	16.5	10.7	1.54	0.003	0.035	3.01	1465.5	8.12	152.98	91.79	92.00
SCUT-1C	Grass	0.24	200	3.76	0.010	29.74	0	250	0.003	0.84	4.96	Pipe			0.003	0.013	5.00	1634.6	5.45	40.14	24.09	24
SCUT-1D	Woods	0.40	301	3.76	0.001	170.78	0	214	0.001	0.55	6.47	8	7.7	1.04	0.003	0.03	2.84	1921.7	11.28	188.53	113.12	113.00
SCUT-2	Grass	0.24	300	3.76	0.002	85.66	1	670	0.001	0.68	16.33	47.5	18.5	2.57	0.006	0.03	7.07	810	1.91	103.90	62.34	90.00
SCUT-3	Grass	0.24	75	3.76	0.003	21.46	0	271	0.013	1.83	2.47	Pipe			0.008	0.013	5.00	759	2.53	42.57	25.54	51.09
												55.6	19.7	2.82	0.001	0.035	1.91	1845.1	16.11			
SCUT-4A	Woods	0.40	448	3.76	0.004	119.85	0	289	0.006	1.24	3.89	16.5	10.7	1.54	0.001	0.035	2.20	2479.1	18.78	142.52	85.51	85.51
SCUT-4B	Grass	0.24	50	3.76	0.080	4.34	1	440	0.005	1.37	5.35	59	20.5	2.88	0.004	0.035	5.35	2091	6.52	16.21	9.73	10
SCUT-4C	Grass	0.24	150	3.76	0.004	33.45	0	620	0.003	0.91	11.31	24	12.9	1.86	0.004	0.035	4.04	811	3.34	48.11	28.86	30
SCUT-4D	Grass	0.24	150	3.76	0.013	21.32	0	350	0.006	1.22	4.78	24	12.9	1.86	0.008	0.035	5.75	1270	3.68	29.78	17.87	18
SCUT-5	Grass	0.24	260	3.76	0.008	41.43	0	379	0.001	0.41	15.26	130.8	31.2	4.19	0.011	0.035	11.63	1370.8	1.96	58.65	35.19	35

Appendix G:

Preliminary Opinion of Probable Construction Costs

List of Contents:

Unit Costs - Swift Creek Watershed Master Plan

	Item Description	*Unit*	*Unit Price*
1	Mobilization (10%)	LS	
2	Comprehensive Grading (20%)	LS	
3	Excavation	CY	$ 25.00
4	Hauling	CY	$ 4.00
5	Clearing & Grubbing	AC	$ 5,000.00
6	Channel Grading including seeding	SY	$ 15.00
7	Construction Staking (0-300000)	LS	$ 3,000.00
8	Construction Staking (300000-800000)	LS	$ 6,000.00
9	Construction Staking (Greater than 800000)	LS	$ 10,000.00
10	Select Material	CY	$ 25.00
11	Flowable Fill	CY	$ 500.00
12	8" Perforated PVC Underdrain	LF	$ 10.00
13	8" PVC Pipe, SDR 35	LF	$ 10.00
14	15" PVC Pipe, SDR 35	LF	$ 18.00
15	18" PVC Pipe, SDR 35	LF	$ 25.00
16	24" PVC Pipe, SDR 35	LF	$ 28.00
17	12" R.C. Pipe Culvert, Class III	LF	$ 45.00
18	15" R.C. Pipe Culvert, Class III	LF	$ 50.00
19	18" R.C. Pipe Culvert, Class III	LF	$ 55.00
20	18" R.C. Pipe Culvert, Class IV	LF	$ 60.00
21	24" R.C. Pipe Culvert, Class III	LF	$ 70.00
22	24" R.C. Pipe Culvert, Class IV	LF	$ 75.00
23	30" R.C. Pipe Culvert, Class III	LF	$ 90.00
24	30" R.C. Pipe Culvert, Class IV, 0' - 6' depth	LF	$ 100.00
25	36" R.C. Pipe Culvert, Class III	LF	$ 120.00
26	36" R.C. Pipe Culvert, Class IV	LF	$ 130.00
27	36" Steel Pipe Culvert (Tunnel Installation)	LF	$ 800.00
28	42" R.C. Pipe Culvert, Class III	LF	$ 150.00
29	42" R.C. Pipe Culvert, Class IV	LF	$ 165.00
30	48" R.C. Pipe Culvert, Class III	LF	$ 180.00
31	48" R.C. Pipe Culvert, Class IV	LF	$ 195.00
32	48" Steel Pipe Culvert (Tunnel Installation)	LF	$ 1,100.00
33	54" R.C. Pipe Culvert, Class III	LF	$ 200.00
34	60" R.C. Pipe Culvert, Class III	LF	$ 225.00
35	60" Steel Pipe Culvert (Tunnel Installation)	LF	$ 1,500.00
36	66" R.C. Pipe Culverts, Class III	LF	$ 260.00
37	72" R.C. Pipe Culvert, Class III	LF	$ 320.00
38	72" R.C. Pipe Culvert, Class IV	LF	$ 370.00
39	72" Steel Pipe Culvert (Tunnel Installation)	LF	$ 1,800.00
40	78" R.C. Pipe Culvert, Class III	LF	$ 350.00
41	4' x 4' Precast R.C. Box Culvert	LF	$ 400.00
42	5' x 3' Precast R.C. Box Culvert	LF	$ 450.00
43	5' x 4' Precast R.C. Box Culvert	LF	$ 500.00
44	6' x 3' Precast R.C. Box Culvert	LF	$ 600.00
45	6' x 4' Precast R.C. Box Culvert	LF	$ 650.00
46	6' x 5' Precast R.C. Box Culvert	LF	$ 700.00
47	7' x 5' Precast R.C. Box Culvert	LF	$ 750.00
48	7' x 6' Precast R.C. Box Culvert	LF	$ 850.00
49	7' x 7' Reinforced Concrete Box Culvert	LF	$ 1,200.00
50	8’ x 4’ Precast R.C. Box Culvert	LF	$ 750.00
51	8’ x 5’ Precast R.C. Box Culvert	LF	$ 900.00
52	8' X 6' Reinforced Concrete Box Culvert	LF	$ 1,200.00
53	9' x 5' Precast R.C. Box Culvert	LF	$ 1,100.00
54	9' X 6' Reinforced Concrete Box Culvert	LF	$ 1,400.00
55	10' x 4' Precast R.C. Box Culvert	LF	$ 1,050.00
56	10 x 5' Precast R.C. Box Culvert	LF	$ 1,200.00
57	10' x 6' Precast R.C. Box Culvert	LF	$ 1,450.00
58	11' x 4' Precast R.C. Box Culvert	LF	$ 1,150.00
59	11' x 6' Precast R.C. Box Culvert	LF	$ 1,500.00
60	11’ x 7’ Precast R.C. Box Culvert	LF	$ 1,800.00
61	Drainage Structures, Manhole	EA	$ 3,500.00
62	Drainage Structures, Inlet	EA	$ 3,000.00
63	Drainage Structures, DOT Standard Endwall	EA	$ 6,000.00
64	Drainage Structures, Box Culvert Custom Endwall	EA	$ 15,000.00
65	BMP Outlet Structure	EA	$ 4,000.00
66	Convert Yard Inlet to Junction Box	EA	$ 1,500.00
67	Curb Cut	EA	$ 400.00
68	Flared End Section, 18 inch	EA	$ 1,000.00
69	Flared End Section, 24 inch	EA	$ 2,000.00
70	Flared End Section, 36 inch	EA	$ 2,500.00
71	Flared End Section, 42 inch	EA	$ 2,500.00
72	Flared End Section, 48 inch	EA	$ 3,000.00
73	Custom Junction Box	EA	$ 15,000.00
74	Concrete Curb and Gutter	LF	$ 35.00

	Item Description	*Unit*	*Unit Price*
75	6" Concrete Driveway Replacement	EA	$ 1,500.00
76	4" Concrete Sidewalk	LF	$ 40.00
77	Concrete Pipe Plug	EA	$ 450.00
78	Asphalt Milling/Overlay	SY	$ 30.00
79	Asphalt Replacement (Surface, Base Course, & Milling)	SY	$ 55.00
80	ABC Stone	TN	$ 35.00
81	Rip Rap Stone, Class B	TN	$ 65.00
82	Rip Rap Stone, Class 1	TN	$ 70.00
83	Rip Rap Stone, Class A	TN	$ 65.00
84	#5 stone	TN	$ 50.00
85	#57 stone	TN	$ 65.00
86	Gravel Walkway #78 stone	TN	$ 65.00
87	Stone Boulder	TN	$ 200.00
88	Sand 2S	CY	$ 60.00
89	Rock Grade Control	EA	$ 10,000.00
90	Traffic Control (Single 2-lane road)	LS	$ 10,000.00
91	Traffic Control (4+ lane road or multiple 2-lane roads)	LS	$ 20,000.00
92	Erosion Control (1-2 acre LOD)	LS	$ 15,000.00
93	Erosion Control (2-5 acre LOD)	LS	$ 30,000.00
94	Erosion Control (Greater than 5 acre LOD)	LS	$ 50,000.00
95	Erosion Control Matting	SY	$ 10.00
96	Fence Removal / Replacement	LF	$ 50.00
97	4' Personnel Gates	EA	$ 375.00
98	20' Roadway Gates	EA	$ 400.00
99	Soil Media	CY	$ 50.00
100	BMP Plantings	SF	$ 2.00
101	Riparian Seed Mix	SY	$ 1.50
102	Live Staking	SY	$ 15.00
103	Seeding and Mulching	AC	$ 7,500.00
104	Wood Retaining Wall (4' high)	LF	$ 100.00
105	Log Grade Control Structure	EA	$ 2,000.00
106	Gabion Wall	LF	$ 300.00
107	Foundation Protection	EA	$ 15,000.00
108	Utility Relocations (Minor Water line adjustments)	LS	$ 5,000.00
109	Utility Relocations (Substantial Water line adjustements inclu	LS	$ 15,000.00
110	Utility Relocations (Substantial sanitary sewer and water line	LS	$ 30,000.00
111	Buffer Plantings	SY	$ 4.00
112	PICP (Permeable Pavers), 3.5" thick	SF	$ 20.00
113	Hauling	CY	$ 45.00
114	Cascade Boulder	TN	$ 75.00
115	Cobble	TN	$ 75.00
116	RSC Sand/Wood Chip Mixture	CY	$ 45.00

Frog Level Road (Gum Swamp)

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 19,500.00	$ 19,500.00
2	Comprehensive Grading (20%)*	1	LS	$ 32,600.00	$ 32,600.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	7' x 6' Precast R.C. Box Culvert	128	LF	$ 850.00	$ 108,800.00
5	Asphalt Replacement (Surface, Base Course, & Milling)	50	SY	$ 55.00	$ 2,750.00
6	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
7	Utility Relocations **	1	LS	$ 15,000.00	$ 15,000.00
8	Excavation	5000	CY	$ 25.00	$ 125,000.00
9	Hauling	5000	CY	$ 4.00	$ 20,000.00
10	Clearing & Grubbing	0.7	AC	$ 5,000.00	$ 3,500.00
11	Riparian Seed Mix	3000	SY	$ 1.50	$ 4,500.00
12	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
13	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 417,700.00
				30% Contingency	$125,300.00
				Total	**$ 543,000.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	162,900.00
				Total Opinion of Project Cost	**$ 705,900.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Gum Swamp Floodplain Benching

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 2,500.00	$ 2,500.00
2	Comprehensive Grading (20%)*	1	LS	$ 4,200.00	$ 4,200.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	Utility Relocations **	1	LS	$ 15,000.00	$ 15,000.00
5	Excavation	98000	CY	$ 25.00	$ 2,450,000.00
6	Hauling	98000	CY	$ 4.00	$ 392,000.00
7	Clearing & Grubbing	11	AC	$ 5,000.00	$ 55,000.00
8	Riparian Seed Mix	53742	SY	$ 1.50	$ 80,613.00
9	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
10	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 3,055,300.00
				30% Contingency	$916,600.00
				Total	**$ 3,971,900.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	1,191,600.00
				Total Opinion of Project Cost	**$ 5,163,500.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Thomas Langston Road (Swift Creek Main Branch) - Alternative #1

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 20,400.00	$ 20,400.00
2	Comprehensive Grading (20%)*	1	LS	$ 34,000.00	$ 34,000.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	Select Material	407	CY	$ 25.00	$ 10,175.00
5	10' x 6' Precast R.C. Box Culvert	71	LF	$ 1,450.00	$ 102,950.00
6	Asphalt Replacement (Surface, Base Course, & Milling)	112	SY	$ 55.00	$ 6,160.00
7	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
8	Utility Relocations **	1	LS	$ 15,000.00	$ 15,000.00
9	Excavation	11199	CY	$ 25.00	$ 279,975.00
10	Hauling	11199	CY	$ 4.00	$ 44,796.00
11	Clearing & Grubbing	3.53	AC	$ 5,000.00	$ 17,650.00
12	Riparian Seed Mix	17085	SY	$ 1.50	$ 25,627.80
13	Erosion Control (2-5 acre LOD)	1	LS	$ 30,000.00	$ 30,000.00
14	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 622,700.00
				30% Contingency	$186,800.00
				Total	**$ 809,500.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	242,900.00
				Total Opinion of Project Cost	**$ 1,052,400.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Thomas Langston Road (Swift Creek Main Branch) - Alternative #2

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 20,400.00	$ 20,400.00
2	Comprehensive Grading (20%)*	1	LS	$ 34,000.00	$ 34,000.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	Select Material	407	CY	$ 25.00	$ 10,175.00
5	10' x 6' Precast R.C. Box Culvert	71	LF	$ 1,450.00	$ 102,950.00
6	Asphalt Replacement (Surface, Base Course, & Milling)	112	SY	$ 55.00	$ 6,160.00
7	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
8	Utility Relocations **	1	LS	$ 15,000.00	$ 15,000.00
9	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
10	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 239,700.00
				30% Contingency	$71,900.00
				Total	**$ 311,600.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	93,500.00
				Total Opinion of Project Cost	**$ 405,100.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Megan Drive Detention Pond

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 2,400.00	$ 2,400.00
2	Comprehensive Grading (20%)*	1	LS	$ 4,000.00	$ 4,000.00
3	Construction Staking (Greater than 800000)	1	LS	$ 10,000.00	$ 10,000.00
4	Select Material	407	CY	$ 25.00	$ 10,175.00
5	Excavation	263,262	CY	$ 25.00	$ 6,581,541.67
6	Hauling	263,262	CY	$ 4.00	$ 1,053,046.67
7	Clearing & Grubbing	32.6	AC	$ 5,000.00	$ 163,000.00
8	Riparian Seed Mix	4840	SY	$ 1.50	$ 7,260.00
9	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
10	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 7,881,400.00
				30% Contingency	$2,364,400.00
				Total	**$ 10,245,800.00**
				Land Acquisition	$ 900,000.00
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	3,343,700.00
				Total Opinion of Project Cost	**$ 14,489,500.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Sterling Trace Drive (Swift Creek Main Branch) - Alternative #1

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 27,700.00	$ 27,700.00
2	Comprehensive Grading (20%)*	1	LS	$ 46,200.00	$ 46,200.00
3	Construction Staking (Greater than 800000)	1	LS	$ 10,000.00	$ 10,000.00
4	Select Material	211	CY	$ 25.00	$ 5,275.00
5	10' x 6' Precast R.C. Box Culvert	122	LF	$ 1,450.00	$ 176,900.00
6	Asphalt Replacement (Surface, Base Course, & Milling)	68	SY	$ 55.00	$ 3,740.00
7	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
8	Utility Relocations **	1	LS	$ 5,000.00	$ 5,000.00
9	Excavation	33303	CY	$ 25.00	$ 832,575.00
10	Hauling	33303	CY	$ 4.00	$ 133,212.00
11	Clearing & Grubbing	6.64	AC	$ 5,000.00	$ 33,200.00
12	Riparian Seed Mix	32138	SY	$ 1.50	$ 48,206.40
13	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
14	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 1,402,000.00
				30% Contingency	$420,600.00
				Total	**$ 1,822,600.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	546,800.00
				Total Opinion of Project Cost	**$ 2,369,400.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Sterling Trace Drive (Swift Creek Main Branch) - Alternative #2

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 27,700.00	$ 27,700.00
2	Comprehensive Grading (20%)*	1	LS	$ 46,200.00	$ 46,200.00
3	Construction Staking (Greater than 800000)	1	LS	$ 10,000.00	$ 10,000.00
4	Select Material	211	CY	$ 25.00	$ 5,275.00
5	10' x 6' Precast R.C. Box Culvert	122	LF	$ 1,450.00	$ 176,900.00
6	Asphalt Replacement (Surface, Base Course, & Milling)	68	SY	$ 55.00	$ 3,740.00
7	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
8	Utility Relocations **	1	LS	$ 5,000.00	$ 5,000.00
9	Excavation	27876	CY	$ 25.00	$ 696,895.29
10	Hauling	27876	CY	$ 4.00	$ 111,503.25
11	Clearing & Grubbing	6	AC	$ 5,000.00	$ 30,000.00
12	Riparian Seed Mix	29040	SY	$ 1.50	$ 43,560.00
13	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
14	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
				Subtotal	$ 1,236,800.00
				30% Contingency	$371,000.00
				Total	**$ 1,607,800.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	482,300.00
				Total Opinion of Project Cost	**$ 2,090,100.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Thomas Langston Road (SCUT1) - Alternative #1

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 18,500.00	$ 18,500.00
2	Comprehensive Grading (20%)*	1	LS	$ 30,800.00	$ 30,800.00
3	Construction Staking (0-300000)	1	LS	$ 3,000.00	$ 3,000.00
4	Select Material	89	CY	$ 25.00	$ 2,225.00
5	42" R.C. Pipe Culvert, Class IV	114	LF	$ 165.00	$ 18,810.00
6	Drainage Structures, DOT Standard Endwall	2	EA	$ 6,000.00	$ 12,000.00
7	Concrete Curb and Gutter	30	LF	$ 35.00	$ 1,050.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	54	SY	$ 55.00	$ 2,970.00
9	Excavation	2664	CY	$ 25.00	$ 66,600.00
10	Hauling	2664	CY	$ 4.00	$ 10,656.00
11	Clearing & Grubbing	0.96	AC	$ 5,000.00	$ 4,800.00
12	Riparian Seed Mix	4646	SY	$ 1.50	$ 6,969.60
13	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
14	Utility Relocations**	1	LS	$ 15,000.00	$ 15,000.00
15	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 218,400.00
				30% Contingency	$65,500.00
				Total	**$ 283,900.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	85,200.00
				Total Opinion of Project Cost	**$ 369,100.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Thomas Langston Detention Pond

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 382,700.00	$ 382,700.00
2	Comprehensive Grading (20%)*	1	LS	$ 637,800.00	$ 637,800.00
3	Construction Staking (Greater than 800000)	1	LS	$ 10,000.00	$ 10,000.00
4	Excavation	105000	CY	$ 25.00	$ 2,625,000.00
5	Hauling	105000	CY	$ 4.00	$ 420,000.00
6	Clearing & Grubbing	15.00	AC	$ 5,000.00	$ 75,000.00
7	Drainage Structures, DOT Standard Endwall	2	EA	$ 6,000.00	$ 12,000.00
8	Riparian Seed Mix	4840	SY	$ 1.50	$ 7,260.00
9	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
10	Utility Relocations**	1	LS	$ 30,000.00	$ 30,000.00
11	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
				Subtotal	$ 4,259,800.00
				30% Contingency	$1,277,900.00
				Total	**$ 5,537,700.00**
				Land Acquisition	$ 330,000.00
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	1,760,300.00
				Total Opinion of Project Cost	**$ 7,628,000.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Belfair Drive - Alternative #1

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 19,200.00	$ 19,200.00
2	Comprehensive Grading (20%)*	1	LS	$ 32,000.00	$ 32,000.00
3	Construction Staking (0-300000)	1	LS	$ 3,000.00	$ 3,000.00
4	Select Material	143	CY	$ 25.00	$ 3,575.00
5	6' x 4' Precast R.C. Box Culvert	146	LF	$ 650.00	$ 94,900.00
6	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
7	Concrete Curb and Gutter	32	LF	$ 35.00	$ 1,120.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	48	SY	$ 55.00	$ 2,640.00
9	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
10	Utility Relocations**	1	LS	$ 15,000.00	$ 15,000.00
11	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 226,400.00
				30% Contingency	$67,900.00
				Total	**$ 294,300.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	88,300.00
				Total Opinion of Project Cost	**$ 382,600.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Sterling Pointe Drive - Alternative #1

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 61,500.00	$ 61,500.00
2	Comprehensive Grading (20%)*	1	LS	$ 102,600.00	$ 102,600.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	Select Material	128	CY	$ 25.00	$ 3,200.00
5	11' x 4' Precast R.C. Box Culvert	114	LF	$ 1,150.00	$ 131,100.00
6	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
7	Concrete Curb and Gutter	60	LF	$ 35.00	$ 2,100.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	114	SY	$ 55.00	$ 6,270.00
9	Excavation	9323	CY	$ 25.00	$ 233,075.00
10	Hauling	9323	CY	$ 4.00	$ 37,292.00
11	Clearing & Grubbing	1.94	AC	$ 5,000.00	$ 9,700.00
12	Riparian Seed Mix	9390	SY	$ 1.50	$ 14,084.40
13	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
14	Utility Relocations**	1	LS	$ 30,000.00	$ 30,000.00
15	Erosion Control (2-5 acre LOD)	1	LS	$ 30,000.00	$ 30,000.00
				Subtotal	$ 706,900.00
				30% Contingency	$212,100.00
				Total	**$ 919,000.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	275,700.00
				Total Opinion of Project Cost	**$ 1,194,700.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Sterling Pointe Drive - Alternative #2

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 21,500.00	$ 21,500.00
2	Comprehensive Grading (20%)*	1	LS	$ 35,800.00	$ 35,800.00
3	Construction Staking (0-300000)	1	LS	$ 3,000.00	$ 3,000.00
4	Select Material	120	CY	$ 25.00	$ 3,000.00
5	10' x 4' Precast R.C. Box Culvert	114	LF	$ 1,050.00	$ 119,700.00
6	Drainage Structures, Box Culvert Custom Endwall	2	EA	$ 15,000.00	$ 30,000.00
7	Concrete Curb and Gutter	56	LF	$ 35.00	$ 1,960.00
8	Asphalt Replacement (Surface, Base Course, & Milling)	114	SY	$ 55.00	$ 6,270.00
9	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
10	Utility Relocations**	1	LS	$ 5,000.00	$ 5,000.00
11	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 251,200.00
				30% Contingency	$75,400.00
				Total	**$ 326,600.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	98,000.00
				Total Opinion of Project Cost	**$ 424,600.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

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Pitt County Community College Proposed Regional Detention Pond

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 921,400.00	$ 921,400.00
2	Comprehensive Grading (20%)*	1	LS	$ 1,535,600.00	$ 1,535,600.00
3	Construction Staking (Greater than 800000)	1	LS	$ 10,000.00	$ 10,000.00
4	Excavation	258133	CY	$ 25.00	$ 6,453,333.33
5	Hauling	258133	CY	$ 4.00	$ 1,032,533.33
6	Clearing & Grubbing	32.00	AC	$ 5,000.00	$ 160,000.00
7	Riparian Seed Mix	4840	SY	$ 1.50	$ 7,260.00
8	Traffic Control (Single 2-lane road)	1	LS	$ 10,000.00	$ 10,000.00
9	Utility Relocations**	1	LS	$ 5,000.00	$ 5,000.00
10	Erosion Control (Greater than 5 acre LOD)	1	LS	$ 50,000.00	$ 50,000.00
				Subtotal	$ 10,185,100.00
				30% Contingency	$3,055,500.00
				Total	**$ 13,240,600.00**
				Land Acquisition	$ 820,000.00
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	4,218,200.00
				Total Opinion of Project Cost	**$ 18,278,800.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

** Cost for utility conflicts includes all utilities that need to be moved including sanitary sewer and potable water lines. Additional survey may be required to locate pressurized utilities.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Stream Stabilization Project #1 - Thomas Langston Road (Swift Creek Main Branch)

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 43,645.00	$ 43,645.00
2	Comprehensive Grading*	1	LS	$ 72,800.00	$ 72,800.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	Channel Grading	5310	SY	$ 15.00	$ 79,650.00
5	Erosion Control Matting	5310	SY	$ 10.00	$ 53,100.00
6	Live Staking	2070	SY	$ 15.00	$ 31,050.00
7	Riparian Seed Mix	5310	SY	$ 1.50	$ 7,965.00
8	Buffer Plantings	3472	SY	$ 4.00	$ 13,888.89
9	Rip Rap Stone, Class 1	100	TN	$ 70.00	$ 7,000.00
10	Gabion Wall	500	LF	$ 300.00	$ 150,000.00
11	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 480,100.00
				30% Contingency	$144,000.00
				Total	**$ 624,100.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	187,200.00
				Total Opinion of Project Cost	**$ 811,300.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Stream Stabilization Project #2- Thomas Langston Culvert (SCUT1)

Item Number	*Item Description*	*Quantities*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 3,766.00	$ 3,766.00
2	Comprehensive Grading*	1	LS	$ 6,200.00	$ 6,200.00
3	Construction Staking (0-300000)	1	LS	$ 3,000.00	$ 3,000.00
4	Channel Grading	240	SY	$ 15.00	$ 3,600.00
5	Erosion Control Matting	240	SY	$ 10.00	$ 2,400.00
6	Live Staking	240	SY	$ 15.00	$ 3,600.00
7	Riparian Seed Mix	240	SY	$ 1.50	$ 360.00
8	Rip Rap Stone, Class 1	50	TN	$ 70.00	$ 3,500.00
9	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 41,400.00
				30% Contingency	$12,400.00
				Total	**$ 53,800.00**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	16,100.00
				Total Opinion of Project Cost	**$ 69,900.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Ridgewood Elementary School Bioretention
Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 17,590.00	$ 17,590.00
2	Comprehensive Grading (20%)	1	LS	$ 29,400.00	$ 29,400.00
3	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
4	Excavation	1204	CY	$ 25.00	$ 30,092.59
5	Hauling	1204	CY	$ 4.00	$ 4,814.81
6	Soil Media	1204	CY	$ 50.00	$ 60,185.19
7	Construction Staking (0-300000)	1	EA	$ 3,000.00	$ 3,000.00
8	BMP Plantings	6500	SF	$ 2.00	$ 13,000.00
9	Seeding and Mulching	0.15	AC	$ 7,500.00	$ 1,119.15
10	24" R.C. Pipe Culvert, Class III	91	LF	$ 70.00	$ 6,370.00
11	24" R.C. Pipe Culvert, Class IV	26	LF	$ 75.00	$ 1,950.00
12	Flared End Section, 24 inch	1	EA	$ 2,000.00	$ 2,000.00
13	Drainage Structures, Inlet	3	EA	$ 3,000.00	$ 9,000.00
				Subtotal	$ 193,521.74
				30% Contingency	$ 58,100.00
				Total	**$ 251,621.74**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 75,500.00
				Total Opinion of Project Cost	**$ 327,100.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Pinecrest Water Quality Swale

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 2,840.00	$ 2,840.00
2	Comprehensive Grading (20%)	1	LS	$ 4,800.00	$ 4,800.00
3	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
4	Excavation	256	CY	$ 25.00	$ 6,388.89
5	Hauling	256	CY	$ 4.00	$ 1,022.22
6	Seeding and Mulching	0.2	AC	$ 7,500.00	$ 1,188.02
				Subtotal	$ 31,239.13
				30% Contingency	$ 9,400.00
				Total	**$ 40,639.13**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 12,200.00
				Total Opinion of Project Cost	**$ 52,800.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Emerald Park Bioretention

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 12,670.00	$ 12,670.00
2	Comprehensive Grading (20%)	1	LS	$ 20,600.00	$ 20,600.00
3	Construction Staking (0-300000)	1	LS	$ 3,000.00	$ 3,000.00
4	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
5	Excavation	796	CY	$ 25.00	$ 19,907.41
6	Hauling	796	CY	$ 4.00	$ 3,185.19
7	Soil Media	796	CY	$ 50.00	$ 39,814.81
8	BMP Plantings	4300	SF	$ 2.00	$ 8,600.00
9	Seeding and Mulching	0.1	AC	$ 7,500.00	$ 740.36
10	18" R.C. Pipe Culvert, Class III	66	LF	$ 55.00	$ 3,630.00
11	Flared End Section, 18 inch	1	EA	$ 1,000.00	$ 1,000.00
12	Asphalt Replacement (Surface, Base Course, & Milling)	41	SY	$ 55.00	$ 2,245.83
13	Drainage Structures, Inlet	3	EA	$ 3,000.00	$ 9,000.00
				Subtotal	$ 139,393.60
				30% Contingency	$ 41,800.00
				Total	**$ 181,193.60**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 54,400.00
				Total Opinion of Project Cost	**$ 236,000.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Davenport Farm Road Water Quality Swale
Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 5,390.00	$ 5,390.00
2	Comprehensive Grading (20%)	1	LS	$ 9,000.00	$ 9,000.00
3	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
4	Excavation	992	CY	$ 25.00	$ 24,791.67
5	Hauling	992	CY	$ 4.00	$ 3,966.67
6	Seeding and Mulching	0.2	AC	$ 7,500.00	$ 1,188.02
				Subtotal	$ 59,336.35
				30% Contingency	$ 17,800.00
				Total	**$ 77,136.35**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 23,100.00
				Total Opinion of Project Cost	**$ 100,200.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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South Bend Regenerative Stormwater Conveyance

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 9,990.00	$ 9,990.00
2	Excavation	778	CY	$ 25.00	$ 19,444.44
3	Hauling	778	CY	$ 4.00	$ 3,111.11
4	RSC Sand/Wood Chip Mixture	1167	CY	$ 45.00	$ 52,500.00
5	Cascade Boulders	173	TN	$ 75.00	$ 13,000.00
6	Cobble	173	TN	$ 75.00	$ 13,000.00
7	BMP Plantings	3200	SF	$ 2.00	$ 6,400.00
8	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 132,445.56
				30% Contingency	$ 39,700.00
				Total	**$ 172,145.56**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 51,600.00
				Total Opinion of Project Cost	**$ 223,700.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Wells Fargo Wet Pond Retrofit

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 10,760.00	$ 10,760.00
2	Comprehensive Grading (20%)	1	LS	$ 18,000.00	$ 18,000.00
3	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
4	Excavation	1556	CY	$ 25.00	$ 38,888.89
5	Hauling	1556	CY	$ 4.00	$ 6,222.22
6	Construction Staking (0-300000)	1	EA	$ 3,000.00	$ 3,000.00
7	Drainage Structures, Inlet	1	EA	$ 3,000.00	$ 3,000.00
8	36" R.C. Pipe Culvert, Class III	175	LF	$ 120.00	$ 21,000.00
9	Flared End Section, 36 inch	1	EA	$ 2,500.00	$ 2,500.00
				Subtotal	$ 118,371.11
				30% Contingency	$ 35,500.00
				Total	**$ 153,871.11**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 46,200.00
				Total Opinion of Project Cost	**$ 200,100.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Sterling Pointe Apartments Wet Pond Retrofit

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 5,520.00	$ 5,520.00
2	Comprehensive Grading (20%)	1	LS	$ 9,200.00	$ 9,200.00
3	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
4	Excavation	556	CY	$ 25.00	$ 13,888.89
5	Hauling	556	CY	$ 4.00	$ 2,222.22
6	Construction Staking (0-300000)	1	EA	$ 3,000.00	$ 3,000.00
7	Drainage Structures, Inlet	1	EA	$ 3,000.00	$ 3,000.00
8	36" R.C. Pipe Culvert, Class III	53	LF	$ 120.00	$ 6,360.00
9	Flared End Section, 36 inch	1	EA	$ 2,500.00	$ 2,500.00
				Subtotal	$ 60,691.11
				30% Contingency	$ 18,200.00
				Total	**$ 78,891.11**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 23,700.00
				Total Opinion of Project Cost	**$ 102,600.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

South Central High Regenerative Stormwater Conveyance

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 6,740.00	$ 6,740.00
2	Excavation	385	CY	$ 25.00	$ 9,629.63
3	Hauling	385	CY	$ 4.00	$ 1,540.74
4	RSC Sand/Wood Chip Mixture	578	CY	$ 45.00	$ 26,000.00
5	Cascade Boulders	154	TN	$ 75.00	$ 11,555.56
6	Cobble	154	TN	$ 75.00	$ 11,555.56
7	BMP Plantings	1625	SF	$ 2.00	$ 3,250.00
8	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
				Subtotal	$ 85,271.48
				30% Contingency	$ 25,600.00
				Total	**$ 110,871.48**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 33,300.00
				Total Opinion of Project Cost	**$ 144,200.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

South Central High Bioretention
Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 69,570.00	$ 69,570.00
2	Comprehensive Grading (20%)	1	LS	$ 115,400.00	$ 115,400.00
3	Construction Staking (0-300000)	1	LS	$ 3,000.00	$ 3,000.00
4	Erosion Control (1-2 acre LOD)	1	LS	$ 15,000.00	$ 15,000.00
5	Excavation	6111	CY	$ 25.00	$ 152,777.78
6	Hauling	6111	CY	$ 4.00	$ 24,444.44
7	Soil Media	6111	CY	$ 50.00	$ 305,555.56
8	BMP Plantings	33000	SF	$ 2.00	$ 66,000.00
9	Seeding and Mulching	0.8	AC	$ 7,500.00	$ 5,681.82
10	42" R.C. Pipe Culvert, Class III	32	LF	$ 150.00	$ 4,800.00
11	Drainage Structures, Inlet	1	EA	$ 3,000.00	$ 3,000.00
				Subtotal	$ 765,229.60
				30% Contingency	$ 229,600.00
				Total	**$ 994,829.60**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 298,400.00
				Total Opinion of Project Cost	**$ 1,293,200.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

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Dana Brooke Wetland

Preliminary Opinion of Probable Construction Cost

	Item Description	*QUANTITIES*	*Unit*	*Unit Price*	*Amount*
1	Mobilization (10%)	1	LS	$ 49,930.00	$ 49,930.00
2	Comprehensive Grading (20%)	1	LS	$ 82,200.00	$ 82,200.00
3	Construction Staking (300000-800000)	1	LS	$ 6,000.00	$ 6,000.00
4	Erosion Control (2-5 acre LOD)	1	LS	$ 30,000.00	$ 30,000.00
5	Excavation	6963	CY	$ 25.00	$ 174,074.07
6	Hauling	6963	CY	$ 4.00	$ 27,851.85
7	BMP Plantings	70500	SF	$ 2.00	$ 141,000.00
8	Seeding and Mulching	1.6	AC	$ 7,500.00	$ 12,138.43
9	42" R.C. Pipe Culvert, Class III	110	LF	$ 150.00	$ 16,500.00
10	Drainage Structures, DOT Standard Endwall	1	EA	$ 6,000.00	$ 6,000.00
11	Drainage Structures, Manhole	1	EA	$ 3,500.00	$ 3,500.00
				Subtotal	$ 549,194.36
				30% Contingency	$ 164,800.00
				Total	**$ 713,994.36**
				Design, Administration, Fiscal and Legal (30% of Construction Costs)	$ 214,200.00
				Total Opinion of Project Cost	**$ 928,200.00**

* Cost for comprehensive grading includes roadway excavation, saw cutting, compaction of select material, geotechnical recommendations, home owner coordination, tree and structure protection, structure removal and disposal, shoring, and culvert excavation.

The Engineer's opinions of probable construction costs are made on the basis of the Engineer's experience and qualifications and represent the Engineer's best judgment as a professional generally familiar with the construction industry. Since the Engineer has no control over the cost of labor, materials, equipment, or services furnished by others; over the contractors methods of determining prices; or over competitive bidding or marketing conditions, the Engineer's cannot and does not guarantee that proposal, bids or actual construction costs will not vary from opinions of probable construction costs prepared by the Engineer.

Appendix H:

Hydraulic & Hydrologic Input and Output Data

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6. Existing Conditions SWMM Output for Davenport Farm Road (10-Year)

7. Alternative SWMM Output for Davenport Farm Road (10-Year)

PRIMARY SYSTEM EXISTING CONDITIONS: HEC-HMS OUTPUT

2-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	32.6	04Aug2013, 15:55	14.5
SC-1D	0.16	19	04Aug2013, 17:40	10.9
ADD SC-1C-1D	0.36	47.7	04Aug2013, 16:25	25.4
RT SC-1C-1D	0.36	47.7	04Aug2013, 16:30	25.3
SC-1A	0.15	28.1	04Aug2013, 17:30	15.9
RT SC-1A	0.15	28	04Aug2013, 17:40	15.7
SC-1B	0.10	30.9	04Aug2013, 14:10	7.6
ADD SC-1B	0.26	35.3	04Aug2013, 14:15	23.3
SC-1E	0.17	48.2	04Aug2013, 15:15	18
RT SC-1E	0.17	47.8	04Aug2013, 15:25	17.9
U/S Limit SC	0.79	121.5	04Aug2013, 15:55	66.5
RT - Swift Creek 1	0.79	121.2	04Aug2013, 16:05	66.1
SC-2A	0.16	23.9	04Aug2013, 16:30	11.8
SC-2B	0.09	68.4	04Aug2013, 13:25	9.1
ADD SC-2	1.04	151.6	04Aug2013, 16:05	87
SC-3B	0.10	40.4	04Aug2013, 13:55	8.7
SC-3A	0.09	7.7	04Aug2013, 16:45	4
ADD SC-3A-3B	0.18	41.5	04Aug2013, 14:00	12.7
RT SC-3A-3B	0.18	41.3	04Aug2013, 14:05	12.7
SC-3C	0.05	27.1	04Aug2013, 13:45	5.1
ADD SC-3	1.28	173.6	04Aug2013, 16:00	104.7
Thomas Langston - SC	1.28	173.4	04Aug2013, 16:05	104.3
RT - Swift Creek 2	1.28	173.4	04Aug2013, 16:05	102.9
SC-4	0.17	71.2	04Aug2013, 13:50	14.5
Sterling Trace Drive	1.45	188.5	04Aug2013, 16:05	115.1
RT SC-4	1.45	187.2	04Aug2013, 16:30	112.8
SC-5B	0.08	29.6	04Aug2013, 14:15	7.5
SC-5A	0.04	24.5	04Aug2013, 13:30	3.7
ADD SC-5A-5B	1.56	198.9	04Aug2013, 16:00	124
SCUT-1B	0.07	14.1	04Aug2013, 14:50	4.7
SCUT-1A	0.07	34.5	04Aug2013, 13:50	7
ADD SCUT-1A-1B	0.15	42.4	04Aug2013, 14:00	11.7
SCUT-1C	0.05	35.6	04Aug2013, 13:30	5.2
U/S Limit SCUT	0.20	67.4	04Aug2013, 13:40	16.9
RT SCUT-1C	0.20	63.8	04Aug2013, 13:50	16.7
SCUT-1D	0.06	14.1	04Aug2013, 15:10	5.2
Thomas Langston Road - SCUT	0.26	67.9	04Aug2013, 14:10	21.8
RT SCUT-1D	0.26	67.3	04Aug2013, 14:20	21.7
SCUT-2	0.05	18	04Aug2013, 14:40	5.5
Belfair Drive	0.31	83.6	04Aug2013, 14:30	27.1
RT - UT to Swift Creek 1	0.31	83.6	04Aug2013, 14:30	26.7
SCUT-3	0.09	49.7	04Aug2013, 13:55	10.7
Sterling Pointe Drive	0.40	123	04Aug2013, 14:20	36.8
RT - UT to Swift Creek 2	0.40	122.6	04Aug2013, 14:20	36.7
SCUT-4C	0.05	38.7	04Aug2013, 13:35	6.2
SCUT-4B	0.05	63.5	04Aug2013, 13:10	6.7
SCUT-4A	0.00	0	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	63.5	04Aug2013, 13:10	6.7
ADD SCUT-4C	0.10	86.3	04Aug2013, 13:15	12.9
SCUT-4D	0.04	41.5	04Aug2013, 13:20	5.3
ADD SCUT-4D	0.14	125.1	04Aug2013, 13:15	18.2
RT SCUT-4D	0.14	124.3	04Aug2013, 13:20	18.2
ADD SCUT 4	0.55	157.8	04Aug2013, 14:05	54.9
RT - UT to Swift Creek 3	0.55	157.5	04Aug2013, 14:10	54.8
SCUT-5	0.06	45.6	04Aug2013, 13:40	7.9
D/S Limit SCUT	0.61	188.8	04Aug2013, 14:00	62.8

2-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
ADD SCUT to SC	2.17	333.8	04Aug2013, 14:35	186.8
RT - Swift Creek 3	2.17	322.1	04Aug2013, 15:10	183.3
SC-6	1.37	336.6	04Aug2013, 15:20	129.7
ADD SC-6	3.54	657.2	04Aug2013, 15:15	313
RT - Swift Creek 4	3.54	643.5	04Aug2013, 15:30	310.1
GS-2A	0.46	67.4	04Aug2013, 17:05	36
GS-2B	0.07	45.6	04Aug2013, 13:35	7.3
ADD GS-2A-2B	0.53	72	04Aug2013, 16:55	43.3
RT-GS-2A-2B	0.53	71.9	04Aug2013, 17:05	43
GS-2C	0.06	37.1	04Aug2013, 13:25	5
Davenport Farm Road West	0.58	77.9	04Aug2013, 13:35	48
RT GS-2C	0.58	76.3	04Aug2013, 13:45	47.8
U/S Limit GS	0.58	76.3	04Aug2013, 13:45	47.8
GS-1C	0.50	54.6	04Aug2013, 18:50	34.2
GS-1B	0.24	25.9	04Aug2013, 17:30	14.5
GS-1A	0.16	31.2	04Aug2013, 14:45	10.2
ADD GS-1A-1B	0.40	41.7	04Aug2013, 15:15	24.8
RT GS-1A-1B	0.40	41.4	04Aug2013, 15:40	24.2
GS-1D	0.10	67.7	04Aug2013, 13:25	9.1
RT GS-1D	0.10	64.7	04Aug2013, 13:35	9
ADD GS-1	1.58	166.4	04Aug2013, 17:30	115.2
GS-3	0.13	55.3	04Aug2013, 14:00	12.5
ADD GS-3	1.71	185.7	04Aug2013, 13:40	127.7
Frog Level Road	1.71	172	04Aug2013, 17:55	124.9
RT- Gum Swamp 1	1.71	171.9	04Aug2013, 18:05	124.1
GS-4B	0.12	32.1	04Aug2013, 15:15	12
GS-4A	0.08	50.2	04Aug2013, 13:35	8
RT GS-4A	0.08	48.8	04Aug2013, 13:40	8
ADD GS-4B	0.19	58.8	04Aug2013, 13:40	20
RT GS-4B	0.19	58.1	04Aug2013, 13:45	19.9
GS-4C	0.10	25.1	04Aug2013, 15:15	9.4
ADD GS-4C	0.29	67.3	04Aug2013, 15:05	29.3
RT GS-4C	0.29	67.3	04Aug2013, 15:05	29.3
GS-4D	0.13	26.2	04Aug2013, 15:50	11.4
ADD GS-4D	0.42	91.3	04Aug2013, 15:20	40.7
RT GS-4D	0.42	91.3	04Aug2013, 15:20	40.6
Davenport Farm Road East	0.42	91.3	04Aug2013, 15:20	40.6
GS-4E	0.05	19.9	04Aug2013, 14:10	4.8
ADD GS-4E	2.19	243	04Aug2013, 14:30	169.5
RT GS-4E	2.19	243	04Aug2013, 14:35	169.1
GS-5A	0.15	23.2	04Aug2013, 15:55	10.4
GS-5B	0.05	36.6	04Aug2013, 13:25	4.9
ADD GS-5A-5B	2.39	265.2	04Aug2013, 15:40	184.3
RT GS-5A-5B	2.39	265.2	04Aug2013, 15:40	184
GS-5C	0.04	37.6	04Aug2013, 13:20	4.5
RT GS-5C	0.04	37	04Aug2013, 13:25	4.5
ADD GS-5C	2.43	269	04Aug2013, 15:25	188.5
RT- Gum Swamp 2	2.43	269	04Aug2013, 15:30	187.6
GS-5D	0.14	35.8	04Aug2013, 15:15	13.4
ADD GS-5D	2.56	304.7	04Aug2013, 15:15	201
RT GS-5D	2.56	304.4	04Aug2013, 15:25	199.7
GS-6	0.17	31.5	04Aug2013, 15:20	12.1
D/S Limit GS	2.73	335.8	04Aug2013, 15:25	211.9
ADD GS to SC	6.27	979.3	04Aug2013, 15:25	521.9
RT - Swift Creek 5	6.27	968.8	04Aug2013, 15:35	518.1
OUTLET	6.27	968.8	04Aug2013, 15:35	518.1

10-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	72	04Aug2013, 15:50	31.1
SC-1D	0.16	41	04Aug2013, 17:30	23.3
ADD SC-1C-1D	0.36	104.7	04Aug2013, 16:15	54.3
RT SC-1C-1D	0.36	104.7	04Aug2013, 16:15	54.2
SC-1A	0.15	52.5	04Aug2013, 17:25	29.9
RT SC-1A	0.15	52.4	04Aug2013, 17:35	29.6
SC-1B	0.10	68.1	04Aug2013, 14:05	16.2
ADD SC-1B	0.26	79.2	04Aug2013, 14:10	45.9
SC-1E	0.17	92.6	04Aug2013, 15:10	34.4
RT SC-1E	0.17	91.9	04Aug2013, 15:20	34.2
U/S Limit SC	0.79	248.6	04Aug2013, 15:45	134.3
RT - Swift Creek 1	0.79	247.7	04Aug2013, 15:55	133.5
SC-2A	0.16	51.7	04Aug2013, 16:20	24.9
SC-2B	0.09	132.6	04Aug2013, 13:25	17.7
ADD SC-2	1.04	310.9	04Aug2013, 16:00	176.2
SC-3B	0.10	82.6	04Aug2013, 13:55	17.5
SC-3A	0.09	20.1	04Aug2013, 16:30	9.9
ADD SC-3A-3B	0.18	86.3	04Aug2013, 13:55	27.4
RT SC-3A-3B	0.18	86	04Aug2013, 14:00	27.3
SC-3C	0.05	54.4	04Aug2013, 13:45	10.1
ADD SC-3	1.28	358.7	04Aug2013, 15:50	213.7
Thomas Langston - SC	1.28	358.1	04Aug2013, 15:55	213
RT - Swift Creek 2	1.28	358	04Aug2013, 16:00	211.6
SC-4	0.17	148.3	04Aug2013, 13:50	29.5
Sterling Trace Drive	1.45	415.6	04Aug2013, 14:30	238
RT SC-4	1.45	395.5	04Aug2013, 15:15	235.6
SC-5B	0.08	58.6	04Aug2013, 14:10	14.6
SC-5A	0.04	46.7	04Aug2013, 13:30	7.1
ADD SC-5A-5B	1.56	439.1	04Aug2013, 14:55	257.4
SCUT-1B	0.07	33.2	04Aug2013, 14:45	10.5
SCUT-1A	0.07	68.1	04Aug2013, 13:50	13.7
ADD SCUT-1A-1B	0.15	88.7	04Aug2013, 14:00	24.2
SCUT-1C	0.05	70.8	04Aug2013, 13:30	10.2
U/S Limit SCUT	0.20	138	04Aug2013, 13:40	34.5
RT SCUT-1C	0.20	135.1	04Aug2013, 13:45	34.3
SCUT-1D	0.06	30.1	04Aug2013, 15:05	10.7
Thomas Langston Road - SCUT	0.26	145.1	04Aug2013, 13:55	44.9
RT SCUT-1D	0.26	139.9	04Aug2013, 14:10	44.7
SCUT-2	0.05	32.5	04Aug2013, 14:35	10.1
Belfair Drive	0.31	162.5	04Aug2013, 14:30	54.6
RT - UT to Swift Creek 1	0.31	162.5	04Aug2013, 14:35	54.2
SCUT-3	0.09	92.1	04Aug2013, 13:55	19.9
Sterling Pointe Drive	0.40	239.1	04Aug2013, 14:10	73.2
RT - UT to Swift Creek 2	0.40	238.4	04Aug2013, 14:15	73.2
SCUT-4C	0.05	71.3	04Aug2013, 13:35	11.5
SCUT-4B	0.05	109	04Aug2013, 13:10	11.7
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	109	04Aug2013, 13:10	11.8
ADD SCUT-4C	0.10	152.6	04Aug2013, 13:15	23.3
SCUT-4D	0.04	73.2	04Aug2013, 13:20	9.5
ADD SCUT-4D	0.14	221.8	04Aug2013, 13:15	32.8
RT SCUT-4D	0.14	219.5	04Aug2013, 13:20	32.8
ADD SCUT 4	0.55	304.3	04Aug2013, 14:05	105.9
RT - UT to Swift Creek 3	0.55	301.1	04Aug2013, 14:10	105.8
SCUT-5	0.06	80.5	04Aug2013, 13:40	14.2
D/S Limit SCUT	0.61	370.7	04Aug2013, 13:40	120

10-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
ADD SCUT to SC	2.17	729.9	04Aug2013, 14:30	377.4
RT - Swift Creek 3	2.17	698.9	04Aug2013, 14:55	371.8
SC-6	1.37	668.2	04Aug2013, 15:15	255
ADD SC-6	3.54	1357.1	04Aug2013, 15:10	626.8
RT - Swift Creek 4	3.54	1332.6	04Aug2013, 15:15	621.8
GS-2A	0.46	140.7	04Aug2013, 16:55	74.2
GS-2B	0.07	86.7	04Aug2013, 13:35	13.9
ADD GS-2A-2B	0.53	148.8	04Aug2013, 16:50	88.1
RT-GS-2A-2B	0.53	148.6	04Aug2013, 16:55	87.7
GS-2C	0.06	76.3	04Aug2013, 13:25	10.2
Davenport Farm Road West	0.58	162.3	04Aug2013, 13:35	97.9
RT GS-2C	0.58	159.9	04Aug2013, 13:40	97.5
U/S Limit GS	0.58	159.9	04Aug2013, 13:40	97.5
GS-1C	0.50	115.4	04Aug2013, 18:35	72.2
GS-1B	0.24	59	04Aug2013, 17:15	32.4
GS-1A	0.16	73.6	04Aug2013, 14:40	22.9
ADD GS-1A-1B	0.40	98.9	04Aug2013, 15:05	55.3
RT GS-1A-1B	0.40	98.3	04Aug2013, 15:30	54.4
GS-1D	0.10	137	04Aug2013, 13:25	18.3
RT GS-1D	0.10	130.5	04Aug2013, 13:30	18.2
ADD GS-1	1.58	351.9	04Aug2013, 17:15	242.3
GS-3	0.13	109.3	04Aug2013, 14:00	24.5
ADD GS-3	1.71	390	04Aug2013, 13:40	266.8
Frog Level Road	1.71	367.9	04Aug2013, 17:15	262.3
RT- Gum Swamp 1	1.71	366.7	04Aug2013, 17:35	261.2
GS-4B	0.12	61.7	04Aug2013, 15:10	22.9
GS-4A	0.08	95.3	04Aug2013, 13:35	15.3
RT GS-4A	0.08	92.4	04Aug2013, 13:35	15.3
ADD GS-4B	0.19	114.6	04Aug2013, 13:40	38.2
RT GS-4B	0.19	112.7	04Aug2013, 13:45	38.1
GS-4C	0.10	49.7	04Aug2013, 15:10	18.5
ADD GS-4C	0.29	132.5	04Aug2013, 13:50	56.6
RT GS-4C	0.29	131.7	04Aug2013, 13:50	56.5
GS-4D	0.13	53.7	04Aug2013, 15:45	23.1
ADD GS-4D	0.42	179.5	04Aug2013, 15:15	79.5
RT GS-4D	0.42	179.4	04Aug2013, 15:15	79.5
Davenport Farm Road East	0.42	179.4	04Aug2013, 15:15	79.5
GS-4E	0.05	40.4	04Aug2013, 14:05	9.6
ADD GS-4E	2.19	511.6	04Aug2013, 14:30	350.3
RT GS-4E	2.19	511.1	04Aug2013, 14:40	349.6
GS-5A	0.15	52.3	04Aug2013, 15:50	22.6
GS-5B	0.05	70.4	04Aug2013, 13:25	9.4
ADD GS-5A-5B	2.39	559.9	04Aug2013, 14:50	381.6
RT GS-5A-5B	2.39	559.2	04Aug2013, 14:55	381
GS-5C	0.04	70.2	04Aug2013, 13:15	8.5
RT GS-5C	0.04	70	04Aug2013, 13:20	8.5
ADD GS-5C	2.43	567.7	04Aug2013, 14:50	389.5
RT- Gum Swamp 2	2.43	566.1	04Aug2013, 15:05	387.9
GS-5D	0.14	69.9	04Aug2013, 15:10	25.9
ADD GS-5D	2.56	636	04Aug2013, 15:10	413.9
RT GS-5D	2.56	634.8	04Aug2013, 15:20	411.8
GS-6	0.17	69.6	04Aug2013, 15:15	26
D/S Limit GS	2.73	704.1	04Aug2013, 15:20	437.7
ADD GS to SC	6.27	2036.5	04Aug2013, 15:15	1059.6
RT - Swift Creek 5	6.27	2015.4	04Aug2013, 15:25	1053.4
OUTLET	6.27	2015.4	04Aug2013, 15:25	1053.4

25-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	101.8	04Aug2013, 15:45	43.7
SC-1D	0.16	57.6	04Aug2013, 17:25	32.7
ADD SC-1C-1D	0.36	147.9	04Aug2013, 16:10	76.4
RT SC-1C-1D	0.36	147.8	04Aug2013, 16:15	76.2
SC-1A	0.15	69.8	04Aug2013, 17:20	40
RT SC-1A	0.15	69.7	04Aug2013, 17:30	39.7
SC-1B	0.10	96.1	04Aug2013, 14:05	22.7
ADD SC-1B	0.26	112.4	04Aug2013, 14:10	62.5
SC-1E	0.17	124.3	04Aug2013, 15:10	46.3
RT SC-1E	0.17	123.3	04Aug2013, 15:15	46.1
U/S Limit SC	0.79	342.4	04Aug2013, 15:45	184.8
RT - Swift Creek 1	0.79	341	04Aug2013, 15:50	183.8
SC-2A	0.16	72.6	04Aug2013, 16:20	34.9
SC-2B	0.09	178.2	04Aug2013, 13:25	24.1
ADD SC-2	1.04	428.6	04Aug2013, 15:55	242.8
SC-3B	0.10	113.3	04Aug2013, 13:55	24
SC-3A	0.09	30.2	04Aug2013, 16:25	14.7
ADD SC-3A-3B	0.18	119.8	04Aug2013, 13:55	38.7
RT SC-3A-3B	0.18	119.1	04Aug2013, 14:00	38.6
SC-3C	0.05	74	04Aug2013, 13:45	13.8
ADD SC-3	1.28	496.1	04Aug2013, 15:45	295.3
Thomas Langston - SC	1.28	495.9	04Aug2013, 15:50	294.5
RT - Swift Creek 2	1.28	495.9	04Aug2013, 15:50	293.1
SC-4	0.17	204.6	04Aug2013, 13:50	40.8
Sterling Trace Drive	1.45	627.5	04Aug2013, 14:10	330
RT SC-4	1.45	562.5	04Aug2013, 14:45	326.9
SC-5B	0.08	79.5	04Aug2013, 14:10	19.9
SC-5A	0.04	62.4	04Aug2013, 13:30	9.6
ADD SC-5A-5B	1.56	640.3	04Aug2013, 14:35	356.4
SCUT-1B	0.07	48	04Aug2013, 14:40	15
SCUT-1A	0.07	92.3	04Aug2013, 13:50	18.7
ADD SCUT-1A-1B	0.15	122.9	04Aug2013, 14:00	33.7
SCUT-1C	0.05	96.3	04Aug2013, 13:25	14
U/S Limit SCUT	0.20	189.9	04Aug2013, 13:35	47.7
RT SCUT-1C	0.20	187.3	04Aug2013, 13:45	47.5
SCUT-1D	0.06	41.9	04Aug2013, 15:05	14.9
Thomas Langston Road - SCUT	0.26	202.8	04Aug2013, 13:55	62.2
RT SCUT-1D	0.26	197.2	04Aug2013, 14:05	62.1
SCUT-2	0.05	42.6	04Aug2013, 14:35	13.3
Belfair Drive	0.31	220.2	04Aug2013, 14:30	75.2
RT - UT to Swift Creek 1	0.31	220.2	04Aug2013, 14:35	74.7
SCUT-3	0.09	121.9	04Aug2013, 13:55	26.5
Sterling Pointe Drive	0.40	315.3	04Aug2013, 14:15	100.2
RT - UT to Swift Creek 2	0.40	314.4	04Aug2013, 14:15	100.1
SCUT-4C	0.05	94.1	04Aug2013, 13:35	15.3
SCUT-4B	0.05	140.3	04Aug2013, 13:10	15.3
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	140.4	04Aug2013, 13:10	15.3
ADD SCUT-4C	0.10	198.7	04Aug2013, 13:15	30.7
SCUT-4D	0.04	95.1	04Aug2013, 13:20	12.5
ADD SCUT-4D	0.14	288.9	04Aug2013, 13:15	43.2
RT SCUT-4D	0.14	285.6	04Aug2013, 13:20	43.2
ADD SCUT 4	0.55	410.8	04Aug2013, 13:55	143.3
RT - UT to Swift Creek 3	0.55	408.1	04Aug2013, 14:00	143
SCUT-5	0.06	104.7	04Aug2013, 13:40	18.7
D/S Limit SCUT	0.61	494.7	04Aug2013, 13:50	161.7

25-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
ADD SCUT to SC	2.17	1055	04Aug2013, 14:25	518.1
RT - Swift Creek 3	2.17	998.6	04Aug2013, 14:40	510.2
SC-6	1.37	908.3	04Aug2013, 15:15	347.3
ADD SC-6	3.54	1869	04Aug2013, 15:00	857.5
RT - Swift Creek 4	3.54	1836.1	04Aug2013, 15:10	851.5
GS-2A	0.46	195	04Aug2013, 16:50	102.9
GS-2B	0.07	115.7	04Aug2013, 13:35	18.7
ADD GS-2A-2B	0.53	205.5	04Aug2013, 16:50	121.6
RT-GS-2A-2B	0.53	205.3	04Aug2013, 16:55	121.2
GS-2C	0.06	104.8	04Aug2013, 13:25	14
Davenport Farm Road West	0.58	225.4	04Aug2013, 13:30	135.2
RT GS-2C	0.58	222.7	04Aug2013, 13:40	134.8
U/S Limit GS	0.58	222.7	04Aug2013, 13:40	134.8
GS-1C	0.50	160.9	04Aug2013, 18:35	101
GS-1B	0.24	84.4	04Aug2013, 17:10	46.3
GS-1A	0.16	106.2	04Aug2013, 14:40	32.7
ADD GS-1A-1B	0.40	143.7	04Aug2013, 15:05	79
RT GS-1A-1B	0.40	142.8	04Aug2013, 15:25	77.8
GS-1D	0.10	186.9	04Aug2013, 13:25	25.1
RT GS-1D	0.10	179.3	04Aug2013, 13:30	25
ADD GS-1	1.58	491	04Aug2013, 17:10	338.6
GS-3	0.13	148.1	04Aug2013, 14:00	33.4
ADD GS-3	1.71	547.8	04Aug2013, 13:40	371.9
Frog Level Road	1.71	512.8	04Aug2013, 17:10	366.1
RT- Gum Swamp 1	1.71	511.4	04Aug2013, 17:25	364.6
GS-4B	0.12	82.8	04Aug2013, 15:10	30.9
GS-4A	0.08	127.2	04Aug2013, 13:35	20.6
RT GS-4A	0.08	124	04Aug2013, 13:35	20.6
ADD GS-4B	0.19	154.6	04Aug2013, 13:40	51.4
RT GS-4B	0.19	151.5	04Aug2013, 13:45	51.3
GS-4C	0.10	67.6	04Aug2013, 15:10	25.1
ADD GS-4C	0.29	179.4	04Aug2013, 13:45	76.5
RT GS-4C	0.29	178.7	04Aug2013, 13:50	76.4
GS-4D	0.13	73.9	04Aug2013, 15:45	31.8
ADD GS-4D	0.42	243.1	04Aug2013, 15:15	108.1
RT GS-4D	0.42	243.1	04Aug2013, 15:15	108.1
Davenport Farm Road East	0.42	243.1	04Aug2013, 15:15	108.1
GS-4E	0.05	55.3	04Aug2013, 14:05	13.1
ADD GS-4E	2.19	736.1	04Aug2013, 14:20	485.8
RT GS-4E	2.19	735.3	04Aug2013, 14:30	484.7
GS-5A	0.15	74.4	04Aug2013, 15:45	32
GS-5B	0.05	94.4	04Aug2013, 13:25	12.8
ADD GS-5A-5B	2.39	799.9	04Aug2013, 14:35	529.5
RT GS-5A-5B	2.39	796.3	04Aug2013, 14:40	528.7
GS-5C	0.04	93.4	04Aug2013, 13:15	11.4
RT GS-5C	0.04	92.5	04Aug2013, 13:20	11.4
ADD GS-5C	2.43	808.8	04Aug2013, 14:35	540.1
RT- Gum Swamp 2	2.43	802.1	04Aug2013, 14:45	538.2
GS-5D	0.14	94.4	04Aug2013, 15:10	35.1
ADD GS-5D	2.56	893.5	04Aug2013, 14:55	573.3
RT GS-5D	2.56	891	04Aug2013, 15:05	570.6
GS-6	0.17	98.4	04Aug2013, 15:10	36.5
D/S Limit GS	2.73	989.1	04Aug2013, 15:10	607.1
ADD GS to SC	6.27	2825.1	04Aug2013, 15:10	1458.5
RT - Swift Creek 5	6.27	2794.5	04Aug2013, 15:15	1450.8
OUTLET	6.27	2794.5	04Aug2013, 15:15	1450.8

50-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	128.6	04Aug2013, 15:45	55.2
SC-1D	0.16	72.5	04Aug2013, 17:25	41.2
ADD SC-1C-1D	0.36	186.8	04Aug2013, 16:10	96.4
RT SC-1C-1D	0.36	186.8	04Aug2013, 16:10	96.3
SC-1A	0.15	85.1	04Aug2013, 17:20	49.1
RT SC-1A	0.15	85	04Aug2013, 17:25	48.7
SC-1B	0.10	121.1	04Aug2013, 14:05	28.7
ADD SC-1B	0.26	142.3	04Aug2013, 14:10	77.4
SC-1E	0.17	152.2	04Aug2013, 15:10	57
RT SC-1E	0.17	151.1	04Aug2013, 15:15	56.7
U/S Limit SC	0.79	426.3	04Aug2013, 15:40	230.4
RT - Swift Creek 1	0.79	425	04Aug2013, 15:50	229.3
SC-2A	0.16	91.3	04Aug2013, 16:15	44
SC-2B	0.09	218.3	04Aug2013, 13:25	29.7
ADD SC-2	1.04	534.2	04Aug2013, 15:50	302.9
SC-3B	0.10	140.4	04Aug2013, 13:55	29.9
SC-3A	0.09	39.5	04Aug2013, 16:20	19.1
ADD SC-3A-3B	0.18	149.8	04Aug2013, 13:55	49
RT SC-3A-3B	0.18	149.2	04Aug2013, 14:00	48.9
SC-3C	0.05	91.3	04Aug2013, 13:45	17.2
ADD SC-3	1.28	620	04Aug2013, 15:45	369
Thomas Langston - SC	1.28	619.8	04Aug2013, 15:45	368.2
RT - Swift Creek 2	1.28	619.7	04Aug2013, 15:50	366.7
SC-4	0.17	254.6	04Aug2013, 13:50	50.9
Sterling Trace Drive	1.45	805.4	04Aug2013, 14:05	413
RT SC-4	1.45	721.4	04Aug2013, 14:35	408.7
SC-5B	0.08	97.9	04Aug2013, 14:10	24.6
SC-5A	0.04	76.1	04Aug2013, 13:30	11.8
ADD SC-5A-5B	1.56	826.8	04Aug2013, 14:30	445.1
SCUT-1B	0.07	61.4	04Aug2013, 14:40	19.1
SCUT-1A	0.07	113.5	04Aug2013, 13:50	23.1
ADD SCUT-1A-1B	0.15	153.4	04Aug2013, 14:00	42.2
SCUT-1C	0.05	118.9	04Aug2013, 13:25	17.3
U/S Limit SCUT	0.20	236	04Aug2013, 13:35	59.6
RT SCUT-1C	0.20	232.8	04Aug2013, 13:45	59.4
SCUT-1D	0.06	52.4	04Aug2013, 15:00	18.7
Thomas Langston Road - SCUT	0.26	253.1	04Aug2013, 13:55	77.9
RT SCUT-1D	0.26	252.2	04Aug2013, 13:55	77.7
SCUT-2	0.05	51.4	04Aug2013, 14:35	16.2
Belfair Drive	0.31	283.4	04Aug2013, 14:20	93.7
RT - UT to Swift Creek 1	0.31	284	04Aug2013, 14:20	93.2
SCUT-3	0.09	147.9	04Aug2013, 13:55	32.4
Sterling Pointe Drive	0.40	411.8	04Aug2013, 14:15	124.4
RT - UT to Swift Creek 2	0.40	410.1	04Aug2013, 14:15	124.4
SCUT-4C	0.05	113.9	04Aug2013, 13:35	18.7
SCUT-4B	0.05	167.5	04Aug2013, 13:10	18.4
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	167.5	04Aug2013, 13:10	18.5
ADD SCUT-4C	0.10	238.8	04Aug2013, 13:15	37.2
SCUT-4D	0.04	114.2	04Aug2013, 13:20	15.2
ADD SCUT-4D	0.14	347.3	04Aug2013, 13:15	52.4
RT SCUT-4D	0.14	343.3	04Aug2013, 13:20	52.4
ADD SCUT 4	0.55	504.6	04Aug2013, 14:10	176.7
RT - UT to Swift Creek 3	0.55	502.4	04Aug2013, 14:15	176.4
SCUT-5	0.06	125.6	04Aug2013, 13:40	22.7
D/S Limit SCUT	0.61	615.7	04Aug2013, 13:45	199.1

50-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
ADD SCUT to SC	2.17	1372.7	04Aug2013, 14:20	644.2
RT - Swift Creek 3	2.17	1284.8	04Aug2013, 14:35	634.6
SC-6	1.37	1120.5	04Aug2013, 15:15	429.9
ADD SC-6	3.54	2328.7	04Aug2013, 14:55	1064.4
RT - Swift Creek 4	3.54	2287	04Aug2013, 15:05	1057.4
GS-2A	0.46	243.5	04Aug2013, 16:50	128.8
GS-2B	0.07	141.1	04Aug2013, 13:35	23
ADD GS-2A-2B	0.53	256.2	04Aug2013, 16:45	151.8
RT-GS-2A-2B	0.53	256	04Aug2013, 16:50	151.3
GS-2C	0.06	130.1	04Aug2013, 13:25	17.5
Davenport Farm Road West	0.58	283.1	04Aug2013, 13:30	168.8
RT GS-2C	0.58	279.6	04Aug2013, 13:35	168.3
U/S Limit GS	0.58	279.6	04Aug2013, 13:35	168.3
GS-1C	0.50	201.8	04Aug2013, 18:30	127.1
GS-1B	0.24	107.6	04Aug2013, 17:10	59
GS-1A	0.16	135.7	04Aug2013, 14:40	41.7
ADD GS-1A-1B	0.40	184.8	04Aug2013, 15:00	100.7
RT GS-1A-1B	0.40	183.6	04Aug2013, 15:20	99.3
GS-1D	0.10	231	04Aug2013, 13:25	31.2
RT GS-1D	0.10	221.9	04Aug2013, 13:30	31.1
ADD GS-1	1.58	616	04Aug2013, 17:05	425.8
GS-3	0.13	182.3	04Aug2013, 14:00	41.3
ADD GS-3	1.71	690	04Aug2013, 13:40	467
Frog Level Road	1.71	660.1	04Aug2013, 13:50	459.6
RT- Gum Swamp 1	1.71	641	04Aug2013, 17:20	458
GS-4B	0.12	101.4	04Aug2013, 15:10	38
GS-4A	0.08	155.2	04Aug2013, 13:35	25.3
RT GS-4A	0.08	151.2	04Aug2013, 13:35	25.3
ADD GS-4B	0.19	190.1	04Aug2013, 13:40	63.2
RT GS-4B	0.19	186	04Aug2013, 13:40	63.1
GS-4C	0.10	83.3	04Aug2013, 15:10	31.1
ADD GS-4C	0.29	221.3	04Aug2013, 13:45	94.2
RT GS-4C	0.29	220.3	04Aug2013, 13:50	94.1
GS-4D	0.13	91.9	04Aug2013, 15:40	39.6
ADD GS-4D	0.42	299.3	04Aug2013, 15:10	133.7
RT GS-4D	0.42	299.3	04Aug2013, 15:15	133.7
Davenport Farm Road East	0.42	299.3	04Aug2013, 15:15	133.7
GS-4E	0.05	68.4	04Aug2013, 14:05	16.3
ADD GS-4E	2.19	938.9	04Aug2013, 14:10	608
RT GS-4E	2.19	938.1	04Aug2013, 14:20	606.7
GS-5A	0.15	94.4	04Aug2013, 15:45	40.5
GS-5B	0.05	115.4	04Aug2013, 13:20	15.7
ADD GS-5A-5B	2.39	1016.2	04Aug2013, 14:25	662.9
RT GS-5A-5B	2.39	1010.2	04Aug2013, 14:30	662.1
GS-5C	0.04	113.7	04Aug2013, 13:15	13.9
RT GS-5C	0.04	112.9	04Aug2013, 13:20	13.9
ADD GS-5C	2.43	1027	04Aug2013, 14:25	676
RT- Gum Swamp 2	2.43	1016.3	04Aug2013, 14:35	673.8
GS-5D	0.14	116	04Aug2013, 15:10	43.4
ADD GS-5D	2.56	1123.3	04Aug2013, 14:45	717.1
RT GS-5D	2.56	1119.7	04Aug2013, 14:55	713.8
GS-6	0.17	124.2	04Aug2013, 15:10	46.1
D/S Limit GS	2.73	1241.8	04Aug2013, 15:00	759.9
ADD GS to SC	6.27	3528.5	04Aug2013, 15:00	1817.3
RT - Swift Creek 5	6.27	3490	04Aug2013, 15:10	1808.6
OUTLET	6.27	3490	04Aug2013, 15:10	1808.6

100-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	158.7	04Aug2013, 15:45	68.2
SC-1D	0.16	89.2	04Aug2013, 17:25	50.8
ADD SC-1C-1D	0.36	230.7	04Aug2013, 16:05	119.1
RT SC-1C-1D	0.36	230.6	04Aug2013, 16:10	118.9
SC-1A	0.15	102	04Aug2013, 17:20	59.1
RT SC-1A	0.15	101.9	04Aug2013, 17:25	58.7
SC-1B	0.10	149.2	04Aug2013, 14:05	35.4
ADD SC-1B	0.26	175.8	04Aug2013, 14:10	94.1
SC-1E	0.17	183.1	04Aug2013, 15:05	68.9
RT SC-1E	0.17	181.8	04Aug2013, 15:15	68.6
U/S Limit SC	0.79	520	04Aug2013, 15:40	281.7
RT - Swift Creek 1	0.79	515.5	04Aug2013, 15:55	280.2
SC-2A	0.16	112.4	04Aug2013, 16:15	54.2
SC-2B	0.09	263	04Aug2013, 13:20	36
ADD SC-2	1.04	649.7	04Aug2013, 15:55	370.4
SC-3B	0.10	170.5	04Aug2013, 13:55	36.5
SC-3A	0.09	50.3	04Aug2013, 16:20	24.2
ADD SC-3A-3B	0.18	183.5	04Aug2013, 13:55	60.7
RT SC-3A-3B	0.18	182.6	04Aug2013, 14:00	60.6
SC-3C	0.05	110.5	04Aug2013, 13:45	20.9
ADD SC-3	1.28	753.9	04Aug2013, 15:45	451.9
Thomas Langston - SC	1.28	753.7	04Aug2013, 15:50	451
RT - Swift Creek 2	1.28	753.6	04Aug2013, 15:50	449.5
SC-4	0.17	310	04Aug2013, 13:50	62.3
Sterling Trace Drive	1.45	993.4	04Aug2013, 14:00	506.2
RT SC-4	1.45	900	04Aug2013, 14:30	500.4
SC-5B	0.08	118.3	04Aug2013, 14:10	29.9
SC-5A	0.04	91.3	04Aug2013, 13:30	14.3
ADD SC-5A-5B	1.56	1034	04Aug2013, 14:25	544.5
SCUT-1B	0.07	76.5	04Aug2013, 14:40	23.8
SCUT-1A	0.07	137	04Aug2013, 13:50	28.1
ADD SCUT-1A-1B	0.15	187.4	04Aug2013, 14:00	51.9
SCUT-1C	0.05	143.9	04Aug2013, 13:25	21.1
U/S Limit SCUT	0.20	287.5	04Aug2013, 13:35	73
RT SCUT-1C	0.20	283.3	04Aug2013, 13:45	72.8
SCUT-1D	0.06	64.3	04Aug2013, 15:00	23
Thomas Langston Road - SCUT	0.26	309.2	04Aug2013, 13:50	95.6
RT SCUT-1D	0.26	309.2	04Aug2013, 13:55	95.4
SCUT-2	0.05	61.2	04Aug2013, 14:35	19.4
Belfair Drive	0.31	351	04Aug2013, 14:10	114.5
RT - UT to Swift Creek 1	0.31	351	04Aug2013, 14:10	114
SCUT-3	0.09	176.5	04Aug2013, 13:55	39
Sterling Pointe Drive	0.40	513.6	04Aug2013, 14:05	151.6
RT - UT to Swift Creek 2	0.40	513.2	04Aug2013, 14:10	151.5
SCUT-4C	0.05	135.8	04Aug2013, 13:35	22.5
SCUT-4B	0.05	197.3	04Aug2013, 13:10	21.9
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	197.4	04Aug2013, 13:10	22
ADD SCUT-4C	0.10	282.9	04Aug2013, 13:15	44.5
SCUT-4D	0.04	135.1	04Aug2013, 13:20	18.1
ADD SCUT-4D	0.14	411.5	04Aug2013, 13:15	62.6
RT SCUT-4D	0.14	406.5	04Aug2013, 13:20	62.6
ADD SCUT 4	0.55	647	04Aug2013, 14:00	214.1
RT - UT to Swift Creek 3	0.55	644.1	04Aug2013, 14:05	213.8
SCUT-5	0.06	148.7	04Aug2013, 13:40	27.1
D/S Limit SCUT	0.61	744.6	04Aug2013, 14:00	240.9

100-YEAR EXISTING				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
ADD SCUT to SC	2.17	1732	04Aug2013, 14:10	785.4
RT - Swift Creek 3	2.17	1610.1	04Aug2013, 14:25	774.2
SC-6	1.37	1355.9	04Aug2013, 15:15	522.5
ADD SC-6	3.54	2833.5	04Aug2013, 14:50	1296.7
RT - Swift Creek 4	3.54	2785	04Aug2013, 15:00	1288.8
GS-2A	0.46	297.8	04Aug2013, 16:50	158
GS-2B	0.07	169.1	04Aug2013, 13:35	27.8
ADD GS-2A-2B	0.53	312.9	04Aug2013, 16:45	185.8
RT-GS-2A-2B	0.53	312.7	04Aug2013, 16:50	185.3
GS-2C	0.06	158	04Aug2013, 13:25	21.4
Davenport Farm Road West	0.58	349	04Aug2013, 13:30	206.7
RT GS-2C	0.58	344.8	04Aug2013, 13:35	206.2
U/S Limit GS	0.58	344.8	04Aug2013, 13:35	206.2
GS-1C	0.50	247.7	04Aug2013, 18:30	156.6
GS-1B	0.24	133.8	04Aug2013, 17:10	73.4
GS-1A	0.16	169.1	04Aug2013, 14:40	52
ADD GS-1A-1B	0.40	231.5	04Aug2013, 15:00	125.4
RT GS-1A-1B	0.40	230	04Aug2013, 15:20	123.9
GS-1D	0.10	279.8	04Aug2013, 13:25	38.1
RT GS-1D	0.10	269.1	04Aug2013, 13:30	38
ADD GS-1	1.58	756.4	04Aug2013, 17:05	524.7
GS-3	0.13	220.1	04Aug2013, 14:00	50.1
ADD GS-3	1.71	851.1	04Aug2013, 13:40	574.8
Frog Level Road	1.71	825	04Aug2013, 13:45	565.4
RT- Gum Swamp 1	1.71	786.9	04Aug2013, 17:15	563.8
GS-4B	0.12	121.9	04Aug2013, 15:05	45.9
GS-4A	0.08	186	04Aug2013, 13:35	30.6
RT GS-4A	0.08	181.2	04Aug2013, 13:35	30.5
ADD GS-4B	0.19	229.1	04Aug2013, 13:40	76.5
RT GS-4B	0.19	224.6	04Aug2013, 13:40	76.4
GS-4C	0.10	100.8	04Aug2013, 15:10	37.8
ADD GS-4C	0.29	268	04Aug2013, 13:45	114.1
RT GS-4C	0.29	266.6	04Aug2013, 13:50	114
GS-4D	0.13	112	04Aug2013, 15:40	48.4
ADD GS-4D	0.42	361.8	04Aug2013, 15:10	162.4
RT GS-4D	0.42	361.7	04Aug2013, 15:10	162.4
Davenport Farm Road East	0.42	361.7	04Aug2013, 15:10	162.4
GS-4E	0.05	83	04Aug2013, 14:05	19.9
ADD GS-4E	2.19	1171.7	04Aug2013, 14:05	746
RT GS-4E	2.19	1170.1	04Aug2013, 14:15	744.4
GS-5A	0.15	116.9	04Aug2013, 15:45	50.2
GS-5B	0.05	138.9	04Aug2013, 13:20	19
ADD GS-5A-5B	2.39	1264	04Aug2013, 14:15	813.7
RT GS-5A-5B	2.39	1254.7	04Aug2013, 14:20	812.7
GS-5C	0.04	136	04Aug2013, 13:15	16.8
RT GS-5C	0.04	133.5	04Aug2013, 13:20	16.8
ADD GS-5C	2.43	1277.1	04Aug2013, 14:15	829.5
RT- Gum Swamp 2	2.43	1260.1	04Aug2013, 14:25	826.9
GS-5D	0.14	140	04Aug2013, 15:10	52.6
ADD GS-5D	2.56	1381.7	04Aug2013, 14:35	879.5
RT GS-5D	2.56	1376.3	04Aug2013, 14:45	875.7
GS-6	0.17	153.3	04Aug2013, 15:10	57
D/S Limit GS	2.73	1523.5	04Aug2013, 14:55	932.7
ADD GS to SC	6.27	4308	04Aug2013, 14:55	2221.5
RT - Swift Creek 5	6.27	4262.6	04Aug2013, 15:05	2211.7
OUTLET	6.27	4262.6	04Aug2013, 15:05	2211.7

PRIMARY SYSTEM FUTURE CONDITIONS: HEC-HMS OUTPUT

100-YEAR FUTURE				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	204.4	04Aug2013, 15:35	92.5
SC-1D	0.16	97.5	04Aug2013, 17:20	56
ADD SC-1C-1D	0.36	281	04Aug2013, 15:55	148.4
RT SC-1C-1D	0.36	280.8	04Aug2013, 15:55	148.3
SC-1A	0.15	103.4	04Aug2013, 17:15	60.1
RT SC-1A	0.15	103.3	04Aug2013, 17:25	59.7
SC-1B	0.10	159.8	04Aug2013, 14:05	38.2
ADD SC-1B	0.26	187.1	04Aug2013, 14:10	97.9
SC-1E	0.17	183.1	04Aug2013, 15:05	68.9
RT SC-1E	0.17	181.8	04Aug2013, 15:15	68.6
U/S Limit SC	0.79	578.1	04Aug2013, 15:35	314.8
RT - Swift Creek 1	0.79	574.6	04Aug2013, 15:50	313.4
SC-2A	0.16	139.9	04Aug2013, 16:10	70.1
SC-2B	0.09	264.8	04Aug2013, 13:20	36.3
ADD SC-2	1.04	737.2	04Aug2013, 15:50	419.9
SC-3B	0.10	173.2	04Aug2013, 13:55	37.2
SC-3A	0.09	58.8	04Aug2013, 16:15	28.3
ADD SC-3A-3B	0.18	190.7	04Aug2013, 13:55	65.5
RT SC-3A-3B	0.18	190	04Aug2013, 14:00	65.4
SC-3C	0.05	112.1	04Aug2013, 13:45	21.3
ADD SC-3	1.28	852.6	04Aug2013, 15:40	506.5
Thomas Langston - SC	1.28	852.4	04Aug2013, 15:45	505.6
RT - Swift Creek 2	1.28	852.2	04Aug2013, 15:45	504
SC-4	0.17	310	04Aug2013, 13:50	62.3
Sterling Trace Drive	1.45	1067.4	04Aug2013, 14:05	560.5
RT SC-4	1.45	981.6	04Aug2013, 14:30	554.3
SC-5B	0.08	118.3	04Aug2013, 14:10	29.9
SC-5A	0.04	91.3	04Aug2013, 13:30	14.3
ADD SC-5A-5B	1.56	1116.4	04Aug2013, 14:25	598.4
SCUT-1B	0.07	84.2	04Aug2013, 14:40	26.4
SCUT-1A	0.07	137	04Aug2013, 13:50	28.1
ADD SCUT-1A-1B	0.15	194.6	04Aug2013, 14:00	54.4
SCUT-1C	0.05	143.9	04Aug2013, 13:25	21.1
U/S Limit SCUT	0.20	292.7	04Aug2013, 13:35	75.5
RT SCUT-1C	0.20	288.9	04Aug2013, 13:45	75.3
SCUT-1D	0.06	76.3	04Aug2013, 15:00	28.2
Thomas Langston Road - SCUT	0.26	324.7	04Aug2013, 13:55	103.3
RT SCUT-1D	0.26	324.5	04Aug2013, 13:55	103.1
SCUT-2	0.05	61.2	04Aug2013, 14:35	19.4
Belfair Drive	0.31	368.5	04Aug2013, 14:10	122.2
RT - UT to Swift Creek 1	0.31	368.5	04Aug2013, 14:15	121.7
SCUT-3	0.09	176.5	04Aug2013, 13:55	39
Sterling Pointe Drive	0.40	531.4	04Aug2013, 14:10	159.3
RT - UT to Swift Creek 2	0.40	531.1	04Aug2013, 14:10	159.2
SCUT-4C	0.05	145.3	04Aug2013, 13:30	25
SCUT-4B	0.05	200.4	04Aug2013, 13:10	22.6
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	200.5	04Aug2013, 13:10	22.6
ADD SCUT-4C	0.10	294.3	04Aug2013, 13:15	47.6
SCUT-4D	0.04	135.1	04Aug2013, 13:20	18.1
ADD SCUT-4D	0.14	422.9	04Aug2013, 13:15	65.7
RT SCUT-4D	0.14	418.1	04Aug2013, 13:20	65.7
ADD SCUT 4	0.55	674.7	04Aug2013, 14:00	224.9
RT - UT to Swift Creek 3	0.55	668	04Aug2013, 14:05	224.7
SCUT-5	0.06	148.7	04Aug2013, 13:40	27.1

100-YEAR FUTURE				
Hydrologic Element	**Drainage Area (mi^2)**	**Peak Discharge (CFS)**	**Time of Peak**	**Volume (AC-FT)**
D/S Limit SCUT	0.61	771.8	04Aug2013, 14:00	251.8
ADD SCUT to SC	2.17	1836.8	04Aug2013, 14:10	850.3
RT - Swift Creek 3	2.17	1715.8	04Aug2013, 14:25	838.8
SC-6	1.37	1355.9	04Aug2013, 15:15	522.5
ADD SC-6	3.54	2934.4	04Aug2013, 14:50	1361.3
RT - Swift Creek 4	3.54	2887	04Aug2013, 15:00	1353.3
GS-2A	0.46	313.4	04Aug2013, 16:45	167.1
GS-2B	0.07	175.2	04Aug2013, 13:35	29.2
ADD GS-2A-2B	0.53	328.8	04Aug2013, 16:40	196.3
RT-GS-2A-2B	0.53	328.6	04Aug2013, 16:45	195.8
GS-2C	0.06	160.4	04Aug2013, 13:25	21.8
Davenport Farm Road West	0.58	365.4	04Aug2013, 13:30	217.6
RT GS-2C	0.58	361.1	04Aug2013, 13:35	217
U/S Limit GS	0.58	361.1	04Aug2013, 13:35	217
GS-1C	0.50	270.1	04Aug2013, 18:25	172.5
GS-1B	0.24	157.6	04Aug2013, 17:05	87.5
GS-1A	0.16	189.5	04Aug2013, 14:35	58.6
ADD GS-1A-1B	0.40	268.8	04Aug2013, 15:00	146.1
RT GS-1A-1B	0.40	267.3	04Aug2013, 15:15	144.5
GS-1D	0.10	279.8	04Aug2013, 13:25	38.1
RT GS-1D	0.10	269.1	04Aug2013, 13:30	38
ADD GS-1	1.58	824.9	04Aug2013, 17:00	572
GS-3	0.13	220.1	04Aug2013, 14:00	50.1
ADD GS-3	1.71	900	04Aug2013, 13:40	622.1
Frog Level Road	1.71	879.6	04Aug2013, 13:45	612.2
RT- Gum Swamp 1	1.71	856.3	04Aug2013, 17:10	610.7
GS-4B	0.12	121.9	04Aug2013, 15:05	45.9
GS-4A	0.08	186	04Aug2013, 13:35	30.6
RT GS-4A	0.08	181.2	04Aug2013, 13:35	30.5
ADD GS-4B	0.19	229.1	04Aug2013, 13:40	76.5
RT GS-4B	0.19	224.6	04Aug2013, 13:40	76.4
GS-4C	0.10	100.8	04Aug2013, 15:10	37.8
ADD GS-4C	0.29	268	04Aug2013, 13:45	114.1
RT GS-4C	0.29	266.6	04Aug2013, 13:50	114
GS-4D	0.13	112	04Aug2013, 15:40	48.4
ADD GS-4D	0.42	361.8	04Aug2013, 15:10	162.4
RT GS-4D	0.42	361.7	04Aug2013, 15:10	162.4
Davenport Farm Road East	0.42	361.7	04Aug2013, 15:10	162.4
GS-4E	0.05	83.7	04Aug2013, 14:05	20
ADD GS-4E	2.19	1227.5	04Aug2013, 14:05	793.1
RT GS-4E	2.19	1224.7	04Aug2013, 14:15	791.6
GS-5A	0.15	123.8	04Aug2013, 15:40	53.3
GS-5B	0.05	138.9	04Aug2013, 13:20	19
ADD GS-5A-5B	2.39	1324.1	04Aug2013, 14:15	863.9
RT GS-5A-5B	2.39	1314.3	04Aug2013, 14:15	862.9
GS-5C	0.04	136	04Aug2013, 13:15	16.8
RT GS-5C	0.04	133.5	04Aug2013, 13:20	16.8
ADD GS-5C	2.43	1338.3	04Aug2013, 14:15	879.7
RT- Gum Swamp 2	2.43	1320.4	04Aug2013, 14:25	877
GS-5D	0.14	140	04Aug2013, 15:10	52.6
ADD GS-5D	2.56	1441.6	04Aug2013, 14:35	929.6
RT GS-5D	2.56	1437.5	04Aug2013, 14:45	925.8
GS-6	0.17	159.1	04Aug2013, 15:10	59.2
D/S Limit GS	2.73	1592.9	04Aug2013, 15:00	985
ADD GS to SC	6.27	4479.9	04Aug2013, 15:00	2338.4
RT - Swift Creek 5	6.27	4436.5	04Aug2013, 15:05	2328.4
OUTLET	6.27	4436.5	04Aug2013, 15:05	2328.4

PRIMARY SYSTEM ALTERNATIVE #1: HEC-HMS OUTPUT

2-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	68.9	04Aug2013, 15:40	30
SC-1D	0.16	24.1	04Aug2013, 17:35	13.7
ADD SC-1C-1D	0.36	86.1	04Aug2013, 15:55	43.6
RT SC-1C-1D	0.36	86.1	04Aug2013, 16:00	43.6
SC-1A	0.15	29.2	04Aug2013, 17:25	16.6
RT SC-1A	0.15	29.2	04Aug2013, 17:40	16.4
SC-1B	0.10	37.7	04Aug2013, 14:10	9.1
ADD SC-1B	0.26	42.4	04Aug2013, 14:15	25.5
SC-1E	0.17	48.2	04Aug2013, 15:15	18
RT SC-1E	0.17	47.8	04Aug2013, 15:25	17.9
U/S Limit SC	0.79	164.7	04Aug2013, 15:45	86.9
RT - Swift Creek 1	0.79	164.2	04Aug2013, 15:55	86.4
SC-2A	0.16	44.9	04Aug2013, 16:15	21.7
SC-2B	0.09	69.9	04Aug2013, 13:25	9.3
ADD SC-2	1.04	216	04Aug2013, 16:00	117.4
SC-3B	0.10	42.3	04Aug2013, 13:55	9.1
SC-3A	0.09	11.7	04Aug2013, 16:35	5.8
ADD SC-3A-3B	0.18	44.5	04Aug2013, 14:00	14.9
RT SC-3A-3B	0.18	44.3	04Aug2013, 14:05	14.9
SC-3C	0.05	28.4	04Aug2013, 13:45	5.3
ADD SC-3	1.28	243.2	04Aug2013, 15:50	137.6
Thomas Langston - SC	1.28	243.1	04Aug2013, 15:55	137.3
RT - Swift Creek 2	1.28	243.1	04Aug2013, 15:55	136
SC-4	0.17	71.2	04Aug2013, 13:50	14.5
Sterling Trace Drive	1.45	259.5	04Aug2013, 15:50	149.1
RT SC-4	1.45	257.2	04Aug2013, 16:15	147.1
SC-5B	0.08	29.6	04Aug2013, 14:15	7.5
SC-5A	0.04	24.5	04Aug2013, 13:30	3.7
ADD SC-5A-5B	1.56	269.9	04Aug2013, 16:00	158.3
SCUT-1B	0.07	18.5	04Aug2013, 14:45	5.9
SCUT-1A	0.07	34.5	04Aug2013, 13:50	7
ADD SCUT-1A-1B	0.15	46.1	04Aug2013, 14:00	13
SCUT-1C	0.05	35.6	04Aug2013, 13:30	5.2
U/S Limit SCUT	0.20	69.9	04Aug2013, 13:40	18.1
RT SCUT-1C	0.20	66.3	04Aug2013, 13:55	18
SCUT-1D	0.06	23.5	04Aug2013, 15:00	8.4
Thomas Langston Road - SCUT	0.26	80	04Aug2013, 14:10	26.3
RT SCUT-1D	0.26	79.2	04Aug2013, 14:20	26.2
SCUT-2	0.05	18	04Aug2013, 14:40	5.5
Belfair Drive	0.31	96.2	04Aug2013, 14:25	31.7
RT - UT to Swift Creek 1	0.31	96.1	04Aug2013, 14:25	31.3
SCUT-3	0.09	49.7	04Aug2013, 13:55	10.7
Sterling Pointe Drive	0.40	136.4	04Aug2013, 14:15	41.7
RT - UT to Swift Creek 2	0.40	136.1	04Aug2013, 14:15	41.7
SCUT-4C	0.05	48.9	04Aug2013, 13:35	8
SCUT-4B	0.05	67.5	04Aug2013, 13:10	7.2
SCUT-4A	0.00	0	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	67.5	04Aug2013, 13:10	7.2
ADD SCUT-4C	0.10	98.6	04Aug2013, 13:15	15.2
SCUT-4D	0.04	41.5	04Aug2013, 13:20	5.3
ADD SCUT-4D	0.14	137.4	04Aug2013, 13:15	20.5
RT SCUT-4D	0.14	136.8	04Aug2013, 13:20	20.5
ADD SCUT 4	0.55	184.9	04Aug2013, 14:05	62.2
RT - UT to Swift Creek 3	0.55	184.6	04Aug2013, 14:10	62.1
SCUT-5	0.06	45.6	04Aug2013, 13:40	7.9

2-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
D/S Limit SCUT	0.61	229.1	04Aug2013, 13:40	70
ADD SCUT to SC	2.17	441.8	04Aug2013, 14:25	228.3
RT - Swift Creek 3	2.17	422.1	04Aug2013, 14:55	224.6
SC-6	1.37	336.6	04Aug2013, 15:20	129.7
ADD SC-6	3.54	752.2	04Aug2013, 15:15	354.3
RT - Swift Creek 4	3.54	737.6	04Aug2013, 15:25	351.2
GS-2A	0.46	77.5	04Aug2013, 17:00	41
GS-2B	0.07	51.3	04Aug2013, 13:35	8.2
ADD GS-2A-2B	0.53	82.4	04Aug2013, 16:55	49.2
RT-GS-2A-2B	0.53	82.3	04Aug2013, 17:00	49
GS-2C	0.06	38.8	04Aug2013, 13:25	5.2
Davenport Farm Road West	0.58	87.3	04Aug2013, 13:35	54.2
RT GS-2C	0.58	85.5	04Aug2013, 13:40	54
U/S Limit GS	0.58	85.5	04Aug2013, 13:40	54
GS-1C	0.50	68.6	04Aug2013, 18:40	42.8
GS-1B	0.24	40.1	04Aug2013, 17:15	22
GS-1A	0.16	43.1	04Aug2013, 14:40	13.6
ADD GS-1A-1B	0.40	61.6	04Aug2013, 15:10	35.5
RT GS-1A-1B	0.40	61.3	04Aug2013, 15:40	34.8
GS-1D	0.10	67.7	04Aug2013, 13:25	9.1
RT GS-1D	0.10	64.7	04Aug2013, 13:35	9
ADD GS-1	1.58	208	04Aug2013, 17:20	140.7
GS-3	0.13	55.3	04Aug2013, 14:00	12.5
ADD GS-3	1.71	217.1	04Aug2013, 17:15	153.2
Frog Level Road	1.71	211.2	04Aug2013, 18:00	150.1
RT- Gum Swamp 1	1.71	211.2	04Aug2013, 18:05	149.4
GS-4B	0.12	32.1	04Aug2013, 15:15	12
GS-4A	0.08	50.2	04Aug2013, 13:35	8
RT GS-4A	0.08	48.8	04Aug2013, 13:40	8
ADD GS-4B	0.19	58.8	04Aug2013, 13:40	20
RT GS-4B	0.19	58.1	04Aug2013, 13:45	19.9
GS-4C	0.10	25.1	04Aug2013, 15:15	9.4
ADD GS-4C	0.29	67.3	04Aug2013, 15:05	29.3
RT GS-4C	0.29	67.3	04Aug2013, 15:05	29.3
GS-4D	0.13	26.2	04Aug2013, 15:50	11.4
ADD GS-4D	0.42	91.3	04Aug2013, 15:20	40.7
RT GS-4D	0.42	91.3	04Aug2013, 15:20	40.6
Davenport Farm Road East	0.42	91.3	04Aug2013, 15:20	40.6
GS-4E	0.05	20.4	04Aug2013, 14:10	4.9
ADD GS-4E	2.19	269.7	04Aug2013, 16:00	194.9
RT GS-4E	2.19	269.7	04Aug2013, 16:05	194.4
GS-5A	0.15	27.2	04Aug2013, 15:55	11.9
GS-5B	0.05	36.6	04Aug2013, 13:25	4.9
ADD GS-5A-5B	2.39	300.7	04Aug2013, 15:55	211.2
RT GS-5A-5B	2.39	300.6	04Aug2013, 16:00	210.8
GS-5C	0.04	37.6	04Aug2013, 13:20	4.5
RT GS-5C	0.04	37	04Aug2013, 13:25	4.5
ADD GS-5C	2.43	304	04Aug2013, 15:55	215.4
RT- Gum Swamp 2	2.43	303.7	04Aug2013, 16:05	214.4
GS-5D	0.14	35.8	04Aug2013, 15:15	13.4
ADD GS-5D	2.56	336.4	04Aug2013, 15:40	227.7
RT GS-5D	2.56	336.1	04Aug2013, 15:50	226.3
GS-6	0.17	34.9	04Aug2013, 15:20	13.3
D/S Limit GS	2.73	369.6	04Aug2013, 15:35	239.7
ADD GS to SC	6.27	1106.1	04Aug2013, 15:25	590.9
RT - Swift Creek 5	6.27	1094.4	04Aug2013, 15:35	586.8
OUTLET	6.27	1094.4	04Aug2013, 15:35	586.8

10-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	114.9	04Aug2013, 15:35	50.8
SC-1D	0.16	47.8	04Aug2013, 17:25	27.1
ADD SC-1C-1D	0.36	150.9	04Aug2013, 15:55	77.9
RT SC-1C-1D	0.36	150.8	04Aug2013, 16:00	77.8
SC-1A	0.15	53.8	04Aug2013, 17:20	30.7
RT SC-1A	0.15	53.7	04Aug2013, 17:30	30.5
SC-1B	0.10	77.2	04Aug2013, 14:05	18.3
ADD SC-1B	0.26	88.8	04Aug2013, 14:10	48.8
SC-1E	0.17	92.6	04Aug2013, 15:10	34.4
RT SC-1E	0.17	91.9	04Aug2013, 15:20	34.2
U/S Limit SC	0.79	301.2	04Aug2013, 15:40	160.8
RT - Swift Creek 1	0.79	300	04Aug2013, 15:50	160
SC-2A	0.16	77	04Aug2013, 16:10	37.8
SC-2B	0.09	134.3	04Aug2013, 13:25	18
ADD SC-2	1.04	389.1	04Aug2013, 15:55	215.7
SC-3B	0.10	85	04Aug2013, 13:55	18
SC-3A	0.09	26.3	04Aug2013, 16:25	12.7
ADD SC-3A-3B	0.18	91.1	04Aug2013, 13:55	30.7
RT SC-3A-3B	0.18	90.8	04Aug2013, 14:00	30.7
SC-3C	0.05	55.9	04Aug2013, 13:45	10.4
ADD SC-3	1.28	444.6	04Aug2013, 15:45	256.8
Thomas Langston - SC	1.28	444.4	04Aug2013, 15:50	256.4
RT - Swift Creek 2	1.28	444.4	04Aug2013, 15:50	255
SC-4	0.17	148.3	04Aug2013, 13:50	29.5
Sterling Trace Drive	1.45	511.2	04Aug2013, 14:10	282.8
RT SC-4	1.45	479.3	04Aug2013, 14:50	280.7
SC-5B	0.08	58.6	04Aug2013, 14:10	14.6
SC-5A	0.04	46.7	04Aug2013, 13:30	7.1
ADD SC-5A-5B	1.56	537.6	04Aug2013, 14:35	302.4
SCUT-1B	0.07	39.5	04Aug2013, 14:40	12.3
SCUT-1A	0.07	68.1	04Aug2013, 13:50	13.7
ADD SCUT-1A-1B	0.15	94.1	04Aug2013, 14:00	26.1
SCUT-1C	0.05	70.8	04Aug2013, 13:30	10.2
U/S Limit SCUT	0.20	142	04Aug2013, 13:40	36.3
RT SCUT-1C	0.20	139.4	04Aug2013, 13:45	36.1
SCUT-1D	0.06	41.3	04Aug2013, 15:00	14.9
Thomas Langston Road - SCUT	0.26	159.8	04Aug2013, 13:55	51
RT SCUT-1D	0.26	155.7	04Aug2013, 14:05	50.8
SCUT-2	0.05	32.5	04Aug2013, 14:35	10.1
Belfair Drive	0.31	183.4	04Aug2013, 14:15	60.8
RT - UT to Swift Creek 1	0.31	183.4	04Aug2013, 14:20	60.3
SCUT-3	0.09	92.1	04Aug2013, 13:55	19.9
Sterling Pointe Drive	0.40	266.6	04Aug2013, 14:10	79.9
RT - UT to Swift Creek 2	0.40	265.9	04Aug2013, 14:10	79.8
SCUT-4C	0.05	81.7	04Aug2013, 13:35	13.7
SCUT-4B	0.05	112.8	04Aug2013, 13:10	12.3
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	112.8	04Aug2013, 13:10	12.3
ADD SCUT-4C	0.10	165.3	04Aug2013, 13:15	26
SCUT-4D	0.04	73.2	04Aug2013, 13:20	9.5
ADD SCUT-4D	0.14	234.4	04Aug2013, 13:15	35.5
RT SCUT-4D	0.14	232.6	04Aug2013, 13:20	35.5
ADD SCUT 4	0.55	350.5	04Aug2013, 13:55	115.3
RT - UT to Swift Creek 3	0.55	348.1	04Aug2013, 14:00	115.1
SCUT-5	0.06	80.5	04Aug2013, 13:40	14.2

10-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
D/S Limit SCUT	0.61	413.8	04Aug2013, 13:45	129.4
ADD SCUT to SC	2.17	891.5	04Aug2013, 14:15	431.8
RT - Swift Creek 3	2.17	840.4	04Aug2013, 14:35	426
SC-6	1.37	668.2	04Aug2013, 15:15	255
ADD SC-6	3.54	1469.8	04Aug2013, 15:00	681
RT - Swift Creek 4	3.54	1444.5	04Aug2013, 15:10	675.9
GS-2A	0.46	153.8	04Aug2013, 16:50	81.2
GS-2B	0.07	93	04Aug2013, 13:35	15.1
ADD GS-2A-2B	0.53	162.3	04Aug2013, 16:50	96.2
RT-GS-2A-2B	0.53	162.2	04Aug2013, 16:55	95.8
GS-2C	0.06	78.5	04Aug2013, 13:25	10.5
Davenport Farm Road West	0.58	175	04Aug2013, 13:35	106.3
RT GS-2C	0.58	172.5	04Aug2013, 13:40	105.9
U/S Limit GS	0.58	172.5	04Aug2013, 13:40	105.9
GS-1C	0.50	133.9	04Aug2013, 18:30	84.2
GS-1B	0.24	78.3	04Aug2013, 17:10	43
GS-1A	0.16	90	04Aug2013, 14:40	27.7
ADD GS-1A-1B	0.40	127.6	04Aug2013, 15:05	70.7
RT GS-1A-1B	0.40	126.8	04Aug2013, 15:25	69.6
GS-1D	0.10	137	04Aug2013, 13:25	18.3
RT GS-1D	0.10	130.5	04Aug2013, 13:30	18.2
ADD GS-1	1.58	407.9	04Aug2013, 17:10	277.9
GS-3	0.13	109.3	04Aug2013, 14:00	24.5
ADD GS-3	1.71	425	04Aug2013, 17:00	302.4
Frog Level Road	1.71	424.2	04Aug2013, 17:15	297.6
RT- Gum Swamp 1	1.71	423	04Aug2013, 17:30	296.5
GS-4B	0.12	61.7	04Aug2013, 15:10	22.9
GS-4A	0.08	95.3	04Aug2013, 13:35	15.3
RT GS-4A	0.08	92.4	04Aug2013, 13:35	15.3
ADD GS-4B	0.19	114.6	04Aug2013, 13:40	38.2
RT GS-4B	0.19	112.7	04Aug2013, 13:45	38.1
GS-4C	0.10	49.7	04Aug2013, 15:10	18.5
ADD GS-4C	0.29	132.5	04Aug2013, 13:50	56.6
RT GS-4C	0.29	131.7	04Aug2013, 13:50	56.5
GS-4D	0.13	53.7	04Aug2013, 15:45	23.1
ADD GS-4D	0.42	179.5	04Aug2013, 15:15	79.5
RT GS-4D	0.42	179.4	04Aug2013, 15:15	79.5
Davenport Farm Road East	0.42	179.4	04Aug2013, 15:15	79.5
GS-4E	0.05	41	04Aug2013, 14:05	9.7
ADD GS-4E	2.19	552.6	04Aug2013, 14:35	385.7
RT GS-4E	2.19	552.4	04Aug2013, 16:00	384.8
GS-5A	0.15	57.8	04Aug2013, 15:45	24.9
GS-5B	0.05	70.4	04Aug2013, 13:25	9.4
ADD GS-5A-5B	2.39	616.6	04Aug2013, 15:55	419.1
RT GS-5A-5B	2.39	616.3	04Aug2013, 15:55	418.5
GS-5C	0.04	70.2	04Aug2013, 13:15	8.5
RT GS-5C	0.04	70	04Aug2013, 13:20	8.5
ADD GS-5C	2.43	622.3	04Aug2013, 15:55	427
RT- Gum Swamp 2	2.43	621.8	04Aug2013, 16:00	425.3
GS-5D	0.14	69.9	04Aug2013, 15:10	25.9
ADD GS-5D	2.56	686.3	04Aug2013, 15:25	451.2
RT GS-5D	2.56	685.8	04Aug2013, 15:40	448.9
GS-6	0.17	74.3	04Aug2013, 15:15	27.7
D/S Limit GS	2.73	758.4	04Aug2013, 15:25	476.6
ADD GS to SC	6.27	2199.7	04Aug2013, 15:10	1152.5
RT - Swift Creek 5	6.27	2178.2	04Aug2013, 15:20	1146.1
OUTLET	6.27	2178.2	04Aug2013, 15:20	1146.1

25-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	146.6	04Aug2013, 15:35	65.4
SC-1D	0.16	65.1	04Aug2013, 17:25	37.1
ADD SC-1C-1D	0.36	196.6	04Aug2013, 15:55	102.5
RT SC-1C-1D	0.36	196.5	04Aug2013, 16:00	102.4
SC-1A	0.15	71.2	04Aug2013, 17:20	41
RT SC-1A	0.15	71.1	04Aug2013, 17:30	40.6
SC-1B	0.10	106	04Aug2013, 14:05	25.1
ADD SC-1B	0.26	122.9	04Aug2013, 14:10	65.8
SC-1E	0.17	124.3	04Aug2013, 15:10	46.3
RT SC-1E	0.17	123.3	04Aug2013, 15:15	46.1
U/S Limit SC	0.79	398.1	04Aug2013, 15:40	214.2
RT - Swift Creek 1	0.79	396.9	04Aug2013, 15:45	213.2
SC-2A	0.16	99.2	04Aug2013, 16:10	49.1
SC-2B	0.09	180	04Aug2013, 13:25	24.3
ADD SC-2	1.04	511.8	04Aug2013, 15:50	286.7
SC-3B	0.10	115.8	04Aug2013, 13:55	24.6
SC-3A	0.09	37.4	04Aug2013, 16:20	18
ADD SC-3A-3B	0.18	125.6	04Aug2013, 13:55	42.6
RT SC-3A-3B	0.18	125.3	04Aug2013, 14:00	42.5
SC-3C	0.05	75.6	04Aug2013, 13:45	14.2
ADD SC-3	1.28	588.6	04Aug2013, 15:40	343.4
Thomas Langston - SC	1.28	587.7	04Aug2013, 15:50	343
RT - Swift Creek 2	1.28	587.7	04Aug2013, 15:50	341.5
SC-4	0.17	204.6	04Aug2013, 13:50	40.8
Sterling Trace Drive	1.45	702.9	04Aug2013, 14:05	380.4
RT SC-4	1.45	652.4	04Aug2013, 14:40	377.2
SC-5B	0.08	79.5	04Aug2013, 14:10	19.9
SC-5A	0.04	62.4	04Aug2013, 13:30	9.6
ADD SC-5A-5B	1.56	738.3	04Aug2013, 14:30	406.7
SCUT-1B	0.07	55	04Aug2013, 14:40	17.1
SCUT-1A	0.07	92.3	04Aug2013, 13:50	18.7
ADD SCUT-1A-1B	0.15	129.1	04Aug2013, 14:00	35.8
SCUT-1C	0.05	96.3	04Aug2013, 13:25	14
U/S Limit SCUT	0.20	194.3	04Aug2013, 13:40	49.8
RT SCUT-1C	0.20	192	04Aug2013, 13:45	49.6
SCUT-1D	0.06	53.7	04Aug2013, 15:00	19.6
Thomas Langston Road - SCUT	0.26	215.7	04Aug2013, 13:55	69
RT SCUT-1D	0.26	211.9	04Aug2013, 14:10	68.9
SCUT-2	0.05	42.6	04Aug2013, 14:35	13.3
Belfair Drive	0.31	249.3	04Aug2013, 14:20	82.1
RT - UT to Swift Creek 1	0.31	249.4	04Aug2013, 14:20	81.6
SCUT-3	0.09	121.9	04Aug2013, 13:55	26.5
Sterling Pointe Drive	0.40	358.2	04Aug2013, 14:10	107.8
RT - UT to Swift Creek 2	0.40	357.5	04Aug2013, 14:10	107.7
SCUT-4C	0.05	104.2	04Aug2013, 13:30	17.7
SCUT-4B	0.05	143.9	04Aug2013, 13:10	15.9
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	143.9	04Aug2013, 13:10	15.9
ADD SCUT-4C	0.10	211	04Aug2013, 13:15	33.6
SCUT-4D	0.04	95.1	04Aug2013, 13:20	12.5
ADD SCUT-4D	0.14	301.2	04Aug2013, 13:15	46.1
RT SCUT-4D	0.14	298.3	04Aug2013, 13:20	46.1
ADD SCUT 4	0.55	466.4	04Aug2013, 13:50	153.8
RT - UT to Swift Creek 3	0.55	465.3	04Aug2013, 13:55	153.5
SCUT-5	0.06	104.7	04Aug2013, 13:40	18.7

25-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
D/S Limit SCUT	0.61	560.8	04Aug2013, 13:45	172.3
ADD SCUT to SC	2.17	1222.3	04Aug2013, 14:15	579
RT - Swift Creek 3	2.17	1151.6	04Aug2013, 14:30	571
SC-6	1.37	908.3	04Aug2013, 15:15	347.3
ADD SC-6	3.54	1987.6	04Aug2013, 14:55	918.3
RT - Swift Creek 4	3.54	1953.9	04Aug2013, 15:05	912.2
GS-2A	0.46	209.4	04Aug2013, 16:50	110.8
GS-2B	0.07	122.1	04Aug2013, 13:35	20
ADD GS-2A-2B	0.53	220.3	04Aug2013, 16:45	130.7
RT-GS-2A-2B	0.53	220.1	04Aug2013, 16:50	130.3
GS-2C	0.06	107.2	04Aug2013, 13:25	14.4
Davenport Farm Road West	0.58	239.9	04Aug2013, 13:30	144.6
RT GS-2C	0.58	236.9	04Aug2013, 13:40	144.2
U/S Limit GS	0.58	236.9	04Aug2013, 13:40	144.2
GS-1C	0.50	181.3	04Aug2013, 18:30	114.6
GS-1B	0.24	106	04Aug2013, 17:05	58.3
GS-1A	0.16	124.5	04Aug2013, 14:40	38.3
ADD GS-1A-1B	0.40	176.5	04Aug2013, 15:00	96.6
RT GS-1A-1B	0.40	175.4	04Aug2013, 15:20	95.4
GS-1D	0.10	186.9	04Aug2013, 13:25	25.1
RT GS-1D	0.10	179.3	04Aug2013, 13:30	25
ADD GS-1	1.58	553.1	04Aug2013, 17:05	379.2
GS-3	0.13	148.1	04Aug2013, 14:00	33.4
ADD GS-3	1.71	586.4	04Aug2013, 13:40	412.6
Frog Level Road	1.71	575.3	04Aug2013, 17:05	406.3
RT- Gum Swamp 1	1.71	573.9	04Aug2013, 17:20	404.8
GS-4B	0.12	82.8	04Aug2013, 15:10	30.9
GS-4A	0.08	127.2	04Aug2013, 13:35	20.6
RT GS-4A	0.08	124	04Aug2013, 13:35	20.6
ADD GS-4B	0.19	154.6	04Aug2013, 13:40	51.4
RT GS-4B	0.19	151.5	04Aug2013, 13:45	51.3
GS-4C	0.10	67.6	04Aug2013, 15:10	25.1
ADD GS-4C	0.29	179.4	04Aug2013, 13:45	76.5
RT GS-4C	0.29	178.7	04Aug2013, 13:50	76.4
GS-4D	0.13	73.9	04Aug2013, 15:45	31.8
ADD GS-4D	0.42	243.1	04Aug2013, 15:15	108.1
RT GS-4D	0.42	243.1	04Aug2013, 15:15	108.1
Davenport Farm Road East	0.42	243.1	04Aug2013, 15:15	108.1
GS-4E	0.05	55.9	04Aug2013, 14:05	13.3
ADD GS-4E	2.19	783.4	04Aug2013, 14:20	526.2
RT GS-4E	2.19	782.8	04Aug2013, 14:30	525
GS-5A	0.15	80.6	04Aug2013, 15:45	34.6
GS-5B	0.05	94.4	04Aug2013, 13:25	12.8
ADD GS-5A-5B	2.39	852.3	04Aug2013, 14:30	572.4
RT GS-5A-5B	2.39	849.1	04Aug2013, 14:35	571.6
GS-5C	0.04	93.4	04Aug2013, 13:15	11.4
RT GS-5C	0.04	92.5	04Aug2013, 13:20	11.4
ADD GS-5C	2.43	861.6	04Aug2013, 14:35	583
RT- Gum Swamp 2	2.43	855.4	04Aug2013, 15:55	581
GS-5D	0.14	94.4	04Aug2013, 15:10	35.1
ADD GS-5D	2.56	947.2	04Aug2013, 14:55	616.1
RT GS-5D	2.56	945.7	04Aug2013, 15:10	613.2
GS-6	0.17	103.6	04Aug2013, 15:10	38.4
D/S Limit GS	2.73	1049.4	04Aug2013, 15:10	651.6
ADD GS to SC	6.27	3002.4	04Aug2013, 15:05	1563.9
RT - Swift Creek 5	6.27	2970.8	04Aug2013, 15:10	1556
OUTLET	6.27	2970.8	04Aug2013, 15:10	1556

50-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	174.1	04Aug2013, 15:35	78.3
SC-1D	0.16	80.4	04Aug2013, 17:20	46
ADD SC-1C-1D	0.36	236.6	04Aug2013, 15:55	124.2
RT SC-1C-1D	0.36	236.5	04Aug2013, 15:55	124.1
SC-1A	0.15	86.5	04Aug2013, 17:20	50
RT SC-1A	0.15	86.4	04Aug2013, 17:25	49.7
SC-1B	0.10	131.5	04Aug2013, 14:05	31.3
ADD SC-1B	0.26	153.3	04Aug2013, 14:10	80.9
SC-1E	0.17	152.2	04Aug2013, 15:10	57
RT SC-1E	0.17	151.1	04Aug2013, 15:15	56.7
U/S Limit SC	0.79	483.6	04Aug2013, 15:35	261.8
RT - Swift Creek 1	0.79	479.4	04Aug2013, 15:50	260.4
SC-2A	0.16	118.6	04Aug2013, 16:10	59.1
SC-2B	0.09	220	04Aug2013, 13:20	30
ADD SC-2	1.04	617.1	04Aug2013, 15:50	349.5
SC-3B	0.10	143	04Aug2013, 13:55	30.5
SC-3A	0.09	47.5	04Aug2013, 16:20	22.9
ADD SC-3A-3B	0.18	156.4	04Aug2013, 13:55	53.4
RT SC-3A-3B	0.18	156	04Aug2013, 14:00	53.3
SC-3C	0.05	92.9	04Aug2013, 13:45	17.5
ADD SC-3	1.28	711.3	04Aug2013, 15:45	420.3
Thomas Langston - SC	1.28	710.7	04Aug2013, 15:50	419.8
RT - Swift Creek 2	1.28	710.5	04Aug2013, 15:50	418.3
SC-4	0.17	254.6	04Aug2013, 13:50	50.9
Sterling Trace Drive	1.45	869.4	04Aug2013, 14:05	467.1
RT SC-4	1.45	808.8	04Aug2013, 14:35	463
SC-5B	0.08	97.9	04Aug2013, 14:10	24.6
SC-5A	0.04	76.1	04Aug2013, 13:30	11.8
ADD SC-5A-5B	1.56	918.5	04Aug2013, 14:25	499.4
SCUT-1B	0.07	68.8	04Aug2013, 14:40	21.5
SCUT-1A	0.07	113.5	04Aug2013, 13:50	23.1
ADD SCUT-1A-1B	0.15	160.1	04Aug2013, 14:00	44.6
SCUT-1C	0.05	118.9	04Aug2013, 13:25	17.3
U/S Limit SCUT	0.20	240.8	04Aug2013, 13:35	61.9
RT SCUT-1C	0.20	237.9	04Aug2013, 13:45	61.7
SCUT-1D	0.06	64.4	04Aug2013, 15:00	23.7
Thomas Langston Road - SCUT	0.26	266.7	04Aug2013, 13:55	85.2
RT SCUT-1D	0.26	266.2	04Aug2013, 14:00	85.1
SCUT-2	0.05	51.4	04Aug2013, 14:35	16.2
Belfair Drive	0.31	302.8	04Aug2013, 14:15	101.1
RT - UT to Swift Creek 1	0.31	302.8	04Aug2013, 14:20	100.6
SCUT-3	0.09	147.9	04Aug2013, 13:55	32.4
Sterling Pointe Drive	0.40	439.7	04Aug2013, 14:05	132.6
RT - UT to Swift Creek 2	0.40	438.8	04Aug2013, 14:05	132.5
SCUT-4C	0.05	123.7	04Aug2013, 13:30	21.2
SCUT-4B	0.05	170.8	04Aug2013, 13:10	19.1
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	170.9	04Aug2013, 13:10	19.1
ADD SCUT-4C	0.10	250.7	04Aug2013, 13:15	40.3
SCUT-4D	0.04	114.2	04Aug2013, 13:20	15.2
ADD SCUT-4D	0.14	359.2	04Aug2013, 13:15	55.4
RT SCUT-4D	0.14	355.3	04Aug2013, 13:20	55.4
ADD SCUT 4	0.55	573	04Aug2013, 13:55	187.9
RT - UT to Swift Creek 3	0.55	571.3	04Aug2013, 14:00	187.7
SCUT-5	0.06	125.6	04Aug2013, 13:40	22.7

50-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
D/S Limit SCUT	0.61	682.3	04Aug2013, 13:45	210.4
ADD SCUT to SC	2.17	1519.6	04Aug2013, 14:10	709.7
RT - Swift Creek 3	2.17	1427.4	04Aug2013, 14:25	700.3
SC-6	1.37	1120.5	04Aug2013, 15:15	429.9
ADD SC-6	3.54	2444.6	04Aug2013, 14:55	1130.2
RT - Swift Creek 4	3.54	2405.8	04Aug2013, 15:00	1123.2
GS-2A	0.46	258.6	04Aug2013, 16:50	137.3
GS-2B	0.07	147.4	04Aug2013, 13:35	24.4
ADD GS-2A-2B	0.53	271.7	04Aug2013, 16:45	161.6
RT-GS-2A-2B	0.53	271.5	04Aug2013, 16:50	161.1
GS-2C	0.06	132.4	04Aug2013, 13:25	17.9
Davenport Farm Road West	0.58	298.6	04Aug2013, 13:30	178.9
RT GS-2C	0.58	295.1	04Aug2013, 13:35	178.5
U/S Limit GS	0.58	295.1	04Aug2013, 13:35	178.5
GS-1C	0.50	223.3	04Aug2013, 18:25	141.9
GS-1B	0.24	130.4	04Aug2013, 17:05	72.1
GS-1A	0.16	155.2	04Aug2013, 14:35	47.8
ADD GS-1A-1B	0.40	220.1	04Aug2013, 15:00	119.9
RT GS-1A-1B	0.40	218.8	04Aug2013, 15:20	118.5
GS-1D	0.10	231	04Aug2013, 13:25	31.2
RT GS-1D	0.10	221.9	04Aug2013, 13:30	31.1
ADD GS-1	1.58	681.7	04Aug2013, 17:00	470
GS-3	0.13	182.3	04Aug2013, 14:00	41.3
ADD GS-3	1.71	733.9	04Aug2013, 13:40	511.3
Frog Level Road	1.71	708.8	04Aug2013, 17:05	503.3
RT- Gum Swamp 1	1.71	707.3	04Aug2013, 17:15	501.8
GS-4B	0.12	101.4	04Aug2013, 15:10	38
GS-4A	0.08	155.2	04Aug2013, 13:35	25.3
RT GS-4A	0.08	151.2	04Aug2013, 13:35	25.3
ADD GS-4B	0.19	190.1	04Aug2013, 13:40	63.2
RT GS-4B	0.19	186	04Aug2013, 13:40	63.1
GS-4C	0.10	83.3	04Aug2013, 15:10	31.1
ADD GS-4C	0.29	221.3	04Aug2013, 13:45	94.2
RT GS-4C	0.29	220.3	04Aug2013, 13:50	94.1
GS-4D	0.13	91.9	04Aug2013, 15:40	39.6
ADD GS-4D	0.42	299.3	04Aug2013, 15:10	133.7
RT GS-4D	0.42	299.3	04Aug2013, 15:15	133.7
Davenport Farm Road East	0.42	299.3	04Aug2013, 15:15	133.7
GS-4E	0.05	69.1	04Aug2013, 14:05	16.5
ADD GS-4E	2.19	991.6	04Aug2013, 14:10	651.9
RT GS-4E	2.19	990.9	04Aug2013, 14:20	650.6
GS-5A	0.15	101	04Aug2013, 15:45	43.4
GS-5B	0.05	115.4	04Aug2013, 13:20	15.7
ADD GS-5A-5B	2.39	1073.2	04Aug2013, 14:25	709.7
RT GS-5A-5B	2.39	1067.7	04Aug2013, 14:25	708.8
GS-5C	0.04	113.7	04Aug2013, 13:15	13.9
RT GS-5C	0.04	112.9	04Aug2013, 13:20	13.9
ADD GS-5C	2.43	1084.7	04Aug2013, 14:25	722.7
RT- Gum Swamp 2	2.43	1074.3	04Aug2013, 14:35	720.4
GS-5D	0.14	116	04Aug2013, 15:10	43.4
ADD GS-5D	2.56	1181.9	04Aug2013, 14:45	763.7
RT GS-5D	2.56	1179.1	04Aug2013, 14:55	760.4
GS-6	0.17	129.8	04Aug2013, 15:10	48.2
D/S Limit GS	2.73	1307.9	04Aug2013, 15:05	808.6
ADD GS to SC	6.27	3713.6	04Aug2013, 15:00	1931.8
RT - Swift Creek 5	6.27	3674.9	04Aug2013, 15:05	1922.9
OUTLET	6.27	3674.9	04Aug2013, 15:05	1922.9

100-YEAR ALTERNATIVE #1				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	204.4	04Aug2013, 15:35	92.5
SC-1D	0.16	97.5	04Aug2013, 17:20	56
ADD SC-1C-1D	0.36	281	04Aug2013, 15:55	148.4
RT SC-1C-1D	0.36	280.8	04Aug2013, 15:55	148.3
SC-1A	0.15	103.4	04Aug2013, 17:15	60.1
RT SC-1A	0.15	103.3	04Aug2013, 17:25	59.7
SC-1B	0.10	159.8	04Aug2013, 14:05	38.2
ADD SC-1B	0.26	187.1	04Aug2013, 14:10	97.9
SC-1E	0.17	183.1	04Aug2013, 15:05	68.9
RT SC-1E	0.17	181.8	04Aug2013, 15:15	68.6
U/S Limit SC	0.79	578.1	04Aug2013, 15:35	314.8
RT - Swift Creek 1	0.79	574.6	04Aug2013, 15:50	313.4
SC-2A	0.16	139.9	04Aug2013, 16:10	70.1
SC-2B	0.09	264.8	04Aug2013, 13:20	36.3
ADD SC-2	1.04	737.2	04Aug2013, 15:50	419.9
SC-3B	0.10	173.2	04Aug2013, 13:55	37.2
SC-3A	0.09	58.8	04Aug2013, 16:15	28.3
ADD SC-3A-3B	0.18	190.7	04Aug2013, 13:55	65.5
RT SC-3A-3B	0.18	190	04Aug2013, 14:00	65.4
SC-3C	0.05	112.1	04Aug2013, 13:45	21.3
ADD SC-3	1.28	852.6	04Aug2013, 15:40	506.5
Thomas Langston - SC	1.28	852.4	04Aug2013, 15:45	506.1
RT - Swift Creek 2	1.28	852.3	04Aug2013, 15:45	504.5
SC-4	0.17	310	04Aug2013, 13:50	62.3
Sterling Trace Drive	1.45	1057.8	04Aug2013, 14:05	564.5
RT SC-4	1.45	985.8	04Aug2013, 14:30	559
SC-5B	0.08	118.3	04Aug2013, 14:10	29.9
SC-5A	0.04	91.3	04Aug2013, 13:30	14.3
ADD SC-5A-5B	1.56	1122.6	04Aug2013, 14:20	603.2
SCUT-1B	0.07	84.2	04Aug2013, 14:40	26.4
SCUT-1A	0.07	137	04Aug2013, 13:50	28.1
ADD SCUT-1A-1B	0.15	194.6	04Aug2013, 14:00	54.4
SCUT-1C	0.05	143.9	04Aug2013, 13:25	21.1
U/S Limit SCUT	0.20	292.7	04Aug2013, 13:35	75.5
RT SCUT-1C	0.20	288.9	04Aug2013, 13:45	75.3
SCUT-1D	0.06	76.3	04Aug2013, 15:00	28.2
Thomas Langston Road - SCUT	0.26	324.9	04Aug2013, 13:55	103.4
RT SCUT-1D	0.26	324.8	04Aug2013, 13:55	103.2
SCUT-2	0.05	61.2	04Aug2013, 14:35	19.4
Belfair Drive	0.31	362	04Aug2013, 14:15	122.4
RT - UT to Swift Creek 1	0.31	362.1	04Aug2013, 14:20	121.9
SCUT-3	0.09	176.5	04Aug2013, 13:55	39
Sterling Pointe Drive	0.40	521.6	04Aug2013, 14:10	160.4
RT - UT to Swift Creek 2	0.40	520.9	04Aug2013, 14:10	160.3
SCUT-4C	0.05	145.3	04Aug2013, 13:30	25
SCUT-4B	0.05	200.4	04Aug2013, 13:10	22.6
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	200.5	04Aug2013, 13:10	22.6
ADD SCUT-4C	0.10	294.3	04Aug2013, 13:15	47.6
SCUT-4D	0.04	135.1	04Aug2013, 13:20	18.1
ADD SCUT-4D	0.14	422.9	04Aug2013, 13:15	65.7
RT SCUT-4D	0.14	418.1	04Aug2013, 13:20	65.7
ADD SCUT 4	0.55	692.6	04Aug2013, 13:50	226.1
RT - UT to Swift Creek 3	0.55	686.8	04Aug2013, 13:55	225.8
SCUT-5	0.06	148.7	04Aug2013, 13:40	27.1

100-YEAR ALTERNATIVE #1				
Hydrologic Element	**Drainage Area (mi^2)**	**Peak Discharge (CFS)**	**Time of Peak**	**Volume (AC-FT)**
D/S Limit SCUT	0.61	822.7	04Aug2013, 13:45	252.9
ADD SCUT to SC	2.17	1841.2	04Aug2013, 14:10	856.1
RT - Swift Creek 3	2.17	1736.4	04Aug2013, 14:25	845.1
SC-6	1.37	1355.9	04Aug2013, 15:15	522.5
ADD SC-6	3.54	2945.1	04Aug2013, 14:50	1367.7
RT - Swift Creek 4	3.54	2900	04Aug2013, 14:55	1359.8
GS-2A	0.46	313.4	04Aug2013, 16:45	167.1
GS-2B	0.07	175.2	04Aug2013, 13:35	29.2
ADD GS-2A-2B	0.53	328.8	04Aug2013, 16:40	196.3
RT-GS-2A-2B	0.53	328.6	04Aug2013, 16:45	195.8
GS-2C	0.06	160.4	04Aug2013, 13:25	21.8
Davenport Farm Road West	0.58	365.4	04Aug2013, 13:30	217.6
RT GS-2C	0.58	361.1	04Aug2013, 13:35	217
U/S Limit GS	0.58	361.1	04Aug2013, 13:35	217
GS-1C	0.50	270.1	04Aug2013, 18:25	172.5
GS-1B	0.24	157.6	04Aug2013, 17:05	87.5
GS-1A	0.16	189.5	04Aug2013, 14:35	58.6
ADD GS-1A-1B	0.40	268.8	04Aug2013, 15:00	146.1
RT GS-1A-1B	0.40	267.3	04Aug2013, 15:15	144.5
GS-1D	0.10	279.8	04Aug2013, 13:25	38.1
RT GS-1D	0.10	269.1	04Aug2013, 13:30	38
ADD GS-1	1.58	824.9	04Aug2013, 17:00	572
GS-3	0.13	220.1	04Aug2013, 14:00	50.1
ADD GS-3	1.71	900	04Aug2013, 13:40	622.1
Frog Level Road	1.71	879.6	04Aug2013, 13:45	612.2
RT- Gum Swamp 1	1.71	856.3	04Aug2013, 17:10	610.7
GS-4B	0.12	121.9	04Aug2013, 15:05	45.9
GS-4A	0.08	186	04Aug2013, 13:35	30.6
RT GS-4A	0.08	181.2	04Aug2013, 13:35	30.5
ADD GS-4B	0.19	229.1	04Aug2013, 13:40	76.5
RT GS-4B	0.19	224.6	04Aug2013, 13:40	76.4
GS-4C	0.10	100.8	04Aug2013, 15:10	37.8
ADD GS-4C	0.29	268	04Aug2013, 13:45	114.1
RT GS-4C	0.29	266.6	04Aug2013, 13:50	114
GS-4D	0.13	112	04Aug2013, 15:40	48.4
ADD GS-4D	0.42	361.8	04Aug2013, 15:10	162.4
RT GS-4D	0.42	361.7	04Aug2013, 15:10	162.4
Davenport Farm Road East	0.42	361.7	04Aug2013, 15:10	162.4
GS-4E	0.05	83.7	04Aug2013, 14:05	20
ADD GS-4E	2.19	1227.5	04Aug2013, 14:05	793.1
RT GS-4E	2.19	1224.7	04Aug2013, 14:15	791.6
GS-5A	0.15	123.8	04Aug2013, 15:40	53.3
GS-5B	0.05	138.9	04Aug2013, 13:20	19
ADD GS-5A-5B	2.39	1324.1	04Aug2013, 14:15	863.9
RT GS-5A-5B	2.39	1314.3	04Aug2013, 14:15	862.9
GS-5C	0.04	136	04Aug2013, 13:15	16.8
RT GS-5C	0.04	133.5	04Aug2013, 13:20	16.8
ADD GS-5C	2.43	1338.3	04Aug2013, 14:15	879.7
RT- Gum Swamp 2	2.43	1320.4	04Aug2013, 14:25	877
GS-5D	0.14	140	04Aug2013, 15:10	52.6
ADD GS-5D	2.56	1441.6	04Aug2013, 14:35	929.6
RT GS-5D	2.56	1437.5	04Aug2013, 14:45	925.8
GS-6	0.17	159.1	04Aug2013, 15:10	59.2
D/S Limit GS	2.73	1592.9	04Aug2013, 15:00	985
ADD GS to SC	6.27	4492.8	04Aug2013, 14:55	2344.9
RT - Swift Creek 5	6.27	4451.3	04Aug2013, 15:05	2335.1
OUTLET	6.27	4451.3	04Aug2013, 15:05	2335.1

PRIMARY SYSTEM ALTERNATIVE #2: HEC-HMS OUTPUT

2-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	68.9	04Aug2013, 15:40	30
SC-1D	0.16	24.1	04Aug2013, 17:35	13.7
Proposed Swift Det _23	0.36	4.5	05Aug2013, 01:30	2.3
RT SC-1C-1D	0.36	4.5	05Aug2013, 01:30	2.3
SC-1A	0.15	29.2	04Aug2013, 17:25	16.6
RT SC-1A	0.15	29.2	04Aug2013, 17:40	16.4
SC-1B	0.10	37.7	04Aug2013, 14:10	9.1
ADD SC-1B	0.26	42.4	04Aug2013, 14:15	25.5
SC-1E	0.17	48.2	04Aug2013, 15:15	18
RT SC-1E	0.17	47.8	04Aug2013, 15:25	17.9
U/S Limit SC	0.79	80.7	04Aug2013, 15:25	45.6
RT - Swift Creek 1	0.79	80.6	04Aug2013, 15:35	45.2
SC-2A	0.16	44.9	04Aug2013, 16:15	21.7
SC-2B	0.09	69.9	04Aug2013, 13:25	9.3
ADD SC-2	1.04	131.7	04Aug2013, 15:50	76.3
SC-3B	0.10	42.3	04Aug2013, 13:55	9.1
SC-3A	0.09	11.7	04Aug2013, 16:35	5.8
ADD SC-3A-3B	0.18	44.5	04Aug2013, 14:00	14.9
RT SC-3A-3B	0.18	44.3	04Aug2013, 14:05	14.9
SC-3C	0.05	28.4	04Aug2013, 13:45	5.3
ADD SC-3	1.28	161.5	04Aug2013, 14:10	96.4
Thomas Langston - SC	1.28	161.5	04Aug2013, 14:10	96.2
RT - Swift Creek 2	1.28	161.3	04Aug2013, 14:15	95
SC-4	0.17	71.2	04Aug2013, 13:50	14.5
Sterling Trace Drive	1.45	225.2	04Aug2013, 14:05	108.3
RT SC-4	1.45	199.6	04Aug2013, 14:55	106.2
SC-5A	0.04	24.5	04Aug2013, 13:30	3.7
ADD SC-5A-5B	1.48	204.6	04Aug2013, 14:50	109.9
SCUT-1B	0.07	18.5	04Aug2013, 14:45	5.9
SCUT-1A	0.07	34.5	04Aug2013, 13:50	7
ADD SCUT-1A-1B	0.15	46.1	04Aug2013, 14:00	13
SCUT-1C	0.05	35.6	04Aug2013, 13:30	5.2
Proposed Swift Det_17	0.20	5.4	04Aug2013, 21:30	4.8
RT SCUT-1C	0.20	5.4	04Aug2013, 21:40	4.6
SCUT-1D	0.06	23.5	04Aug2013, 15:00	8.4
Thomas Langston Road - SCUT	0.26	26.9	04Aug2013, 15:10	12.9
RT SCUT-1D	0.26	26.9	04Aug2013, 15:10	12.8
SCUT-2	0.05	18	04Aug2013, 14:40	5.5
Belfair Drive	0.31	43.6	04Aug2013, 15:00	18.2
RT - UT to Swift Creek 1	0.31	43.6	04Aug2013, 15:00	17.8
SCUT-3	0.09	49.7	04Aug2013, 13:55	10.7
Sterling Pointe Drive	0.40	73.7	04Aug2013, 14:30	28.3
RT - UT to Swift Creek 2	0.40	73.6	04Aug2013, 14:35	28.2
SCUT-4C	0.05	48.9	04Aug2013, 13:35	8
SCUT-4B	0.05	67.5	04Aug2013, 13:10	7.2
SCUT-4A	0.00	0	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	67.5	04Aug2013, 13:10	7.2
ADD SCUT-4C	0.10	98.6	04Aug2013, 13:15	15.2
SCUT-4D	0.04	41.5	04Aug2013, 13:20	5.3
ADD SCUT-4D	0.14	137.4	04Aug2013, 13:15	20.5
RT SCUT-4D	0.14	136.8	04Aug2013, 13:20	20.5
ADD SCUT 4	0.55	154.1	04Aug2013, 13:25	48.7
RT - UT to Swift Creek 3	0.55	153.3	04Aug2013, 13:30	48.6
SCUT-5	0.06	45.6	04Aug2013, 13:40	7.9
D/S Limit SCUT	0.61	196.3	04Aug2013, 13:35	56.5

2-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-5B	0.08	29.6	04Aug2013, 14:15	7.5
ADD SCUT to SC	2.17	347.1	04Aug2013, 14:25	173.9
RT - Swift Creek 3	2.17	332.7	04Aug2013, 14:55	170.6
SC-6	1.37	336.6	04Aug2013, 15:20	129.7
ADD SC-6	3.54	661.3	04Aug2013, 15:10	300.3
RT - Swift Creek 4	3.54	647.5	04Aug2013, 15:20	297.5
GS-2A	0.46	77.5	04Aug2013, 17:00	41
GS-2B	0.07	51.3	04Aug2013, 13:35	8.2
ADD GS-2A-2B	0.53	82.4	04Aug2013, 16:55	49.2
RT-GS-2A-2B	0.53	82.3	04Aug2013, 17:00	49
GS-2C	0.06	38.8	04Aug2013, 13:25	5.2
Davenport Farm Road West	0.58	87.3	04Aug2013, 13:35	54.2
RT GS-2C	0.58	85.5	04Aug2013, 13:40	54
U/S Limit GS	0.58	85.5	04Aug2013, 13:40	54
GS-1C	0.50	68.6	04Aug2013, 18:40	42.8
GS-1B	0.24	40.1	04Aug2013, 17:15	22
GS-1A	0.16	43.1	04Aug2013, 14:40	13.6
ADD GS-1A-1B	0.40	61.6	04Aug2013, 15:10	35.5
RT GS-1A-1B	0.40	61.3	04Aug2013, 15:40	34.8
GS-1D	0.10	67.7	04Aug2013, 13:25	9.1
RT GS-1D	0.10	64.7	04Aug2013, 13:35	9
ADD GS-1	1.58	208	04Aug2013, 17:20	140.7
GS-3	0.13	55.3	04Aug2013, 14:00	12.5
ADD GS-3	1.71	217.1	04Aug2013, 17:15	153.2
Frog Level Road	1.71	211.2	04Aug2013, 18:00	150.1
RT- Gum Swamp 1	1.71	211.2	04Aug2013, 18:05	149.4
GS-4B	0.12	32.1	04Aug2013, 15:15	12
GS-4A	0.08	50.2	04Aug2013, 13:35	8
RT GS-4A	0.08	48.8	04Aug2013, 13:40	8
ADD GS-4B	0.19	58.8	04Aug2013, 13:40	20
RT GS-4B	0.19	58.1	04Aug2013, 13:45	19.9
GS-4C	0.10	25.1	04Aug2013, 15:15	9.4
ADD GS-4C	0.29	67.3	04Aug2013, 15:05	29.3
RT GS-4C	0.29	67.3	04Aug2013, 15:05	29.3
GS-4D	0.13	26.2	04Aug2013, 15:50	11.4
ADD GS-4D	0.42	91.3	04Aug2013, 15:20	40.7
RT GS-4D	0.42	91.3	04Aug2013, 15:20	40.6
Davenport Farm Road East	0.42	91.3	04Aug2013, 15:20	40.6
GS-4E	0.05	20.4	04Aug2013, 14:10	4.9
ADD GS-4E	2.19	269.7	04Aug2013, 16:00	194.9
RT GS-4E	2.19	269.7	04Aug2013, 16:05	194.4
GS-5A	0.15	27.2	04Aug2013, 15:55	11.9
GS-5B	0.05	36.6	04Aug2013, 13:25	4.9
ADD GS-5A-5B	2.39	300.7	04Aug2013, 15:55	211.2
RT GS-5A-5B	2.39	300.6	04Aug2013, 16:00	210.8
GS-5C	0.04	37.6	04Aug2013, 13:20	4.5
RT GS-5C	0.04	37	04Aug2013, 13:25	4.5
ADD GS-5C	2.43	304	04Aug2013, 15:55	215.4
RT- Gum Swamp 2	2.43	303.7	04Aug2013, 16:05	214.4
GS-5D	0.14	35.8	04Aug2013, 15:15	13.4
ADD GS-5D	2.56	336.4	04Aug2013, 15:40	227.7
RT GS-5D	2.56	336.1	04Aug2013, 15:50	226.3
GS-6	0.17	34.9	04Aug2013, 15:20	13.3
D/S Limit GS	2.73	369.6	04Aug2013, 15:35	239.7
ADD GS to SC	6.27	1015.7	04Aug2013, 15:25	537.1
RT - Swift Creek 5	6.27	1004.6	04Aug2013, 15:30	533.3
OUTLET	6.27	1004.6	04Aug2013, 15:30	533.3

10-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	114.9	04Aug2013, 15:35	50.8
SC-1D	0.16	47.8	04Aug2013, 17:25	27.1
Proposed Swift Det _23	0.36	11.5	05Aug2013, 01:30	7
RT SC-1C-1D	0.36	11.5	05Aug2013, 01:30	6.9
SC-1A	0.15	53.8	04Aug2013, 17:20	30.7
RT SC-1A	0.15	53.7	04Aug2013, 17:30	30.5
SC-1B	0.10	77.2	04Aug2013, 14:05	18.3
ADD SC-1B	0.26	88.8	04Aug2013, 14:10	48.8
SC-1E	0.17	92.6	04Aug2013, 15:10	34.4
RT SC-1E	0.17	91.9	04Aug2013, 15:20	34.2
U/S Limit SC	0.79	157.4	04Aug2013, 15:10	89.9
RT - Swift Creek 1	0.79	157.2	04Aug2013, 15:15	89.2
SC-2A	0.16	77	04Aug2013, 16:10	37.8
SC-2B	0.09	134.3	04Aug2013, 13:25	18
ADD SC-2	1.04	243.4	04Aug2013, 15:35	145
SC-3B	0.10	85	04Aug2013, 13:55	18
SC-3A	0.09	26.3	04Aug2013, 16:25	12.7
ADD SC-3A-3B	0.18	91.1	04Aug2013, 13:55	30.7
RT SC-3A-3B	0.18	90.8	04Aug2013, 14:00	30.7
SC-3C	0.05	55.9	04Aug2013, 13:45	10.4
ADD SC-3	1.28	329.3	04Aug2013, 14:00	186.1
Thomas Langston - SC	1.28	329.2	04Aug2013, 14:00	185.7
RT - Swift Creek 2	1.28	328.9	04Aug2013, 14:05	184.3
SC-4	0.17	148.3	04Aug2013, 13:50	29.5
Sterling Trace Drive	1.45	458.5	04Aug2013, 14:05	212.4
RT SC-4	1.45	418.7	04Aug2013, 14:35	210.4
SC-5A	0.04	46.7	04Aug2013, 13:30	7.1
ADD SC-5A-5B	1.48	429.7	04Aug2013, 14:35	217.6
SCUT-1B	0.07	39.5	04Aug2013, 14:40	12.3
SCUT-1A	0.07	68.1	04Aug2013, 13:50	13.7
ADD SCUT-1A-1B	0.15	94.1	04Aug2013, 14:00	26.1
SCUT-1C	0.05	70.8	04Aug2013, 13:30	10.2
Proposed Swift Det_17	0.20	10.8	04Aug2013, 20:35	9.8
RT SCUT-1C	0.20	10.8	04Aug2013, 20:40	9.6
SCUT-1D	0.06	41.3	04Aug2013, 15:00	14.9
Thomas Langston Road - SCUT	0.26	48.6	04Aug2013, 15:05	24.4
RT SCUT-1D	0.26	48.6	04Aug2013, 15:10	24.2
SCUT-2	0.05	32.5	04Aug2013, 14:35	10.1
Belfair Drive	0.31	78.7	04Aug2013, 14:55	34.1
RT - UT to Swift Creek 1	0.31	78.7	04Aug2013, 15:00	33.7
SCUT-3	0.09	92.1	04Aug2013, 13:55	19.9
Sterling Pointe Drive	0.40	140.6	04Aug2013, 14:20	53.2
RT - UT to Swift Creek 2	0.40	140.3	04Aug2013, 14:20	53.1
SCUT-4C	0.05	81.7	04Aug2013, 13:35	13.7
SCUT-4B	0.05	112.8	04Aug2013, 13:10	12.3
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	112.8	04Aug2013, 13:10	12.3
ADD SCUT-4C	0.10	165.3	04Aug2013, 13:15	26
SCUT-4D	0.04	73.2	04Aug2013, 13:20	9.5
ADD SCUT-4D	0.14	234.4	04Aug2013, 13:15	35.5
RT SCUT-4D	0.14	232.6	04Aug2013, 13:20	35.5
ADD SCUT 4	0.55	279.2	04Aug2013, 13:25	88.6
RT - UT to Swift Creek 3	0.55	273.8	04Aug2013, 13:30	88.3
SCUT-5	0.06	80.5	04Aug2013, 13:40	14.2
D/S Limit SCUT	0.61	350.1	04Aug2013, 13:35	102.6

10-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-5B	0.08	58.6	04Aug2013, 14:10	14.6
ADD SCUT to SC	2.17	719	04Aug2013, 14:15	334.8
RT - Swift Creek 3	2.17	681.2	04Aug2013, 14:35	329.6
SC-6	1.37	668.2	04Aug2013, 15:15	255
ADD SC-6	3.54	1308.9	04Aug2013, 15:00	584.7
RT - Swift Creek 4	3.54	1283.7	04Aug2013, 15:10	580
GS-2A	0.46	153.8	04Aug2013, 16:50	81.2
GS-2B	0.07	93	04Aug2013, 13:35	15.1
ADD GS-2A-2B	0.53	162.3	04Aug2013, 16:50	96.2
RT-GS-2A-2B	0.53	162.2	04Aug2013, 16:55	95.8
GS-2C	0.06	78.5	04Aug2013, 13:25	10.5
Davenport Farm Road West	0.58	175	04Aug2013, 13:35	106.3
RT GS-2C	0.58	172.5	04Aug2013, 13:40	105.9
U/S Limit GS	0.58	172.5	04Aug2013, 13:40	105.9
GS-1C	0.50	133.9	04Aug2013, 18:30	84.2
GS-1B	0.24	78.3	04Aug2013, 17:10	43
GS-1A	0.16	90	04Aug2013, 14:40	27.7
ADD GS-1A-1B	0.40	127.6	04Aug2013, 15:05	70.7
RT GS-1A-1B	0.40	126.8	04Aug2013, 15:25	69.6
GS-1D	0.10	137	04Aug2013, 13:25	18.3
RT GS-1D	0.10	130.5	04Aug2013, 13:30	18.2
ADD GS-1	1.58	407.9	04Aug2013, 17:10	277.9
GS-3	0.13	109.3	04Aug2013, 14:00	24.5
ADD GS-3	1.71	425	04Aug2013, 17:00	302.4
Frog Level Road	1.71	424.2	04Aug2013, 17:15	297.6
RT- Gum Swamp 1	1.71	423	04Aug2013, 17:30	296.5
GS-4B	0.12	61.7	04Aug2013, 15:10	22.9
GS-4A	0.08	95.3	04Aug2013, 13:35	15.3
RT GS-4A	0.08	92.4	04Aug2013, 13:35	15.3
ADD GS-4B	0.19	114.6	04Aug2013, 13:40	38.2
RT GS-4B	0.19	112.7	04Aug2013, 13:45	38.1
GS-4C	0.10	49.7	04Aug2013, 15:10	18.5
ADD GS-4C	0.29	132.5	04Aug2013, 13:50	56.6
RT GS-4C	0.29	131.7	04Aug2013, 13:50	56.5
GS-4D	0.13	53.7	04Aug2013, 15:45	23.1
ADD GS-4D	0.42	179.5	04Aug2013, 15:15	79.5
RT GS-4D	0.42	179.4	04Aug2013, 15:15	79.5
Davenport Farm Road East	0.42	179.4	04Aug2013, 15:15	79.5
GS-4E	0.05	41	04Aug2013, 14:05	9.7
ADD GS-4E	2.19	552.6	04Aug2013, 14:35	385.7
RT GS-4E	2.19	552.4	04Aug2013, 16:00	384.8
GS-5A	0.15	57.8	04Aug2013, 15:45	24.9
GS-5B	0.05	70.4	04Aug2013, 13:25	9.4
ADD GS-5A-5B	2.39	616.6	04Aug2013, 15:55	419.1
RT GS-5A-5B	2.39	616.3	04Aug2013, 15:55	418.5
GS-5C	0.04	70.2	04Aug2013, 13:15	8.5
RT GS-5C	0.04	70	04Aug2013, 13:20	8.5
ADD GS-5C	2.43	622.3	04Aug2013, 15:55	427
RT- Gum Swamp 2	2.43	621.8	04Aug2013, 16:00	425.3
GS-5D	0.14	69.9	04Aug2013, 15:10	25.9
ADD GS-5D	2.56	686.3	04Aug2013, 15:25	451.2
RT GS-5D	2.56	685.8	04Aug2013, 15:40	448.9
GS-6	0.17	74.3	04Aug2013, 15:15	27.7
D/S Limit GS	2.73	758.4	04Aug2013, 15:25	476.6
ADD GS to SC	6.27	2038.8	04Aug2013, 15:10	1056.5
RT - Swift Creek 5	6.27	2017	04Aug2013, 15:15	1050.4
OUTLET	6.27	2017	04Aug2013, 15:15	1050.4

25-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	146.6	04Aug2013, 15:35	65.4
SC-1D	0.16	65.1	04Aug2013, 17:25	37.1
Proposed Swift Det _23	0.36	15.8	05Aug2013, 01:30	10.1
RT SC-1C-1D	0.36	15.8	05Aug2013, 01:30	10
SC-1A	0.15	71.2	04Aug2013, 17:20	41
RT SC-1A	0.15	71.1	04Aug2013, 17:30	40.6
SC-1B	0.10	106	04Aug2013, 14:05	25.1
ADD SC-1B	0.26	122.9	04Aug2013, 14:10	65.8
SC-1E	0.17	124.3	04Aug2013, 15:10	46.3
RT SC-1E	0.17	123.3	04Aug2013, 15:15	46.1
U/S Limit SC	0.79	213.3	04Aug2013, 14:55	121.9
RT - Swift Creek 1	0.79	213.1	04Aug2013, 15:05	121.1
SC-2A	0.16	99.2	04Aug2013, 16:10	49.1
SC-2B	0.09	180	04Aug2013, 13:25	24.3
ADD SC-2	1.04	322.8	04Aug2013, 15:30	194.5
SC-3B	0.10	115.8	04Aug2013, 13:55	24.6
SC-3A	0.09	37.4	04Aug2013, 16:20	18
ADD SC-3A-3B	0.18	125.6	04Aug2013, 13:55	42.6
RT SC-3A-3B	0.18	125.3	04Aug2013, 14:00	42.5
SC-3C	0.05	75.6	04Aug2013, 13:45	14.2
ADD SC-3	1.28	453.1	04Aug2013, 14:00	251.2
Thomas Langston - SC	1.28	452.2	04Aug2013, 14:05	250.8
RT - Swift Creek 2	1.28	452.3	04Aug2013, 14:05	249.4
SC-4	0.17	204.6	04Aug2013, 13:50	40.8
Sterling Trace Drive	1.45	628.8	04Aug2013, 14:05	288.6
RT SC-4	1.45	577.3	04Aug2013, 14:30	286.1
SC-5A	0.04	62.4	04Aug2013, 13:30	9.6
ADD SC-5A-5B	1.48	593	04Aug2013, 14:30	295.7
SCUT-1B	0.07	55	04Aug2013, 14:40	17.1
SCUT-1A	0.07	92.3	04Aug2013, 13:50	18.7
ADD SCUT-1A-1B	0.15	129.1	04Aug2013, 14:00	35.8
SCUT-1C	0.05	96.3	04Aug2013, 13:25	14
Proposed Swift Det_17	0.20	16.3	04Aug2013, 19:45	14.6
RT SCUT-1C	0.20	16.3	04Aug2013, 19:55	14.3
SCUT-1D	0.06	53.7	04Aug2013, 15:00	19.6
Thomas Langston Road - SCUT	0.26	64.1	04Aug2013, 15:05	33.7
RT SCUT-1D	0.26	64.1	04Aug2013, 15:10	33.6
SCUT-2	0.05	42.6	04Aug2013, 14:35	13.3
Belfair Drive	0.31	103.4	04Aug2013, 14:55	46.7
RT - UT to Swift Creek 1	0.31	103.3	04Aug2013, 14:55	46.2
SCUT-3	0.09	121.9	04Aug2013, 13:55	26.5
Sterling Pointe Drive	0.40	188.9	04Aug2013, 14:10	72.3
RT - UT to Swift Creek 2	0.40	188.3	04Aug2013, 14:10	72.1
SCUT-4C	0.05	104.2	04Aug2013, 13:30	17.7
SCUT-4B	0.05	143.9	04Aug2013, 13:10	15.9
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	143.9	04Aug2013, 13:10	15.9
ADD SCUT-4C	0.10	211	04Aug2013, 13:15	33.6
SCUT-4D	0.04	95.1	04Aug2013, 13:20	12.5
ADD SCUT-4D	0.14	301.2	04Aug2013, 13:15	46.1
RT SCUT-4D	0.14	298.3	04Aug2013, 13:20	46.1
ADD SCUT 4	0.55	365.7	04Aug2013, 13:20	118.2
RT - UT to Swift Creek 3	0.55	358.3	04Aug2013, 13:30	118
SCUT-5	0.06	104.7	04Aug2013, 13:40	18.7
D/S Limit SCUT	0.61	457.7	04Aug2013, 13:30	136.7

25-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-5B	0.08	79.5	04Aug2013, 14:10	19.9
ADD SCUT to SC	2.17	988	04Aug2013, 14:10	452.3
RT - Swift Creek 3	2.17	933.6	04Aug2013, 14:30	445.3
SC-6	1.37	908.3	04Aug2013, 15:15	347.3
ADD SC-6	3.54	1772.1	04Aug2013, 14:55	792.6
RT - Swift Creek 4	3.54	1740.7	04Aug2013, 15:05	786.9
GS-2A	0.46	209.4	04Aug2013, 16:50	110.8
GS-2B	0.07	122.1	04Aug2013, 13:35	20
ADD GS-2A-2B	0.53	220.3	04Aug2013, 16:45	130.7
RT-GS-2A-2B	0.53	220.1	04Aug2013, 16:50	130.3
GS-2C	0.06	107.2	04Aug2013, 13:25	14.4
Davenport Farm Road West	0.58	239.9	04Aug2013, 13:30	144.6
RT GS-2C	0.58	236.9	04Aug2013, 13:40	144.2
U/S Limit GS	0.58	236.9	04Aug2013, 13:40	144.2
GS-1C	0.50	181.3	04Aug2013, 18:30	114.6
GS-1B	0.24	106	04Aug2013, 17:05	58.3
GS-1A	0.16	124.5	04Aug2013, 14:40	38.3
ADD GS-1A-1B	0.40	176.5	04Aug2013, 15:00	96.6
RT GS-1A-1B	0.40	175.4	04Aug2013, 15:20	95.4
GS-1D	0.10	186.9	04Aug2013, 13:25	25.1
RT GS-1D	0.10	179.3	04Aug2013, 13:30	25
ADD GS-1	1.58	553.1	04Aug2013, 17:05	379.2
GS-3	0.13	148.1	04Aug2013, 14:00	33.4
ADD GS-3	1.71	586.4	04Aug2013, 13:40	412.6
Frog Level Road	1.71	575.3	04Aug2013, 17:05	406.3
RT- Gum Swamp 1	1.71	573.9	04Aug2013, 17:20	404.8
GS-4B	0.12	82.8	04Aug2013, 15:10	30.9
GS-4A	0.08	127.2	04Aug2013, 13:35	20.6
RT GS-4A	0.08	124	04Aug2013, 13:35	20.6
ADD GS-4B	0.19	154.6	04Aug2013, 13:40	51.4
RT GS-4B	0.19	151.5	04Aug2013, 13:45	51.3
GS-4C	0.10	67.6	04Aug2013, 15:10	25.1
ADD GS-4C	0.29	179.4	04Aug2013, 13:45	76.5
RT GS-4C	0.29	178.7	04Aug2013, 13:50	76.4
GS-4D	0.13	73.9	04Aug2013, 15:45	31.8
ADD GS-4D	0.42	243.1	04Aug2013, 15:15	108.1
RT GS-4D	0.42	243.1	04Aug2013, 15:15	108.1
Davenport Farm Road East	0.42	243.1	04Aug2013, 15:15	108.1
GS-4E	0.05	55.9	04Aug2013, 14:05	13.3
ADD GS-4E	2.19	783.4	04Aug2013, 14:20	526.2
RT GS-4E	2.19	782.8	04Aug2013, 14:30	525
GS-5A	0.15	80.6	04Aug2013, 15:45	34.6
GS-5B	0.05	94.4	04Aug2013, 13:25	12.8
ADD GS-5A-5B	2.39	852.3	04Aug2013, 14:30	572.4
RT GS-5A-5B	2.39	849.1	04Aug2013, 14:35	571.6
GS-5C	0.04	93.4	04Aug2013, 13:15	11.4
RT GS-5C	0.04	92.5	04Aug2013, 13:20	11.4
ADD GS-5C	2.43	861.6	04Aug2013, 14:35	583
RT- Gum Swamp 2	2.43	855.4	04Aug2013, 15:55	581
GS-5D	0.14	94.4	04Aug2013, 15:10	35.1
ADD GS-5D	2.56	947.2	04Aug2013, 14:55	616.1
RT GS-5D	2.56	945.7	04Aug2013, 15:10	613.2
GS-6	0.17	103.6	04Aug2013, 15:10	38.4
D/S Limit GS	2.73	1049.4	04Aug2013, 15:10	651.6
ADD GS to SC	6.27	2789.3	04Aug2013, 15:05	1438.5
RT - Swift Creek 5	6.27	2757.3	04Aug2013, 15:10	1430.9
OUTLET	6.27	2757.3	04Aug2013, 15:10	1430.9

50-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	174.1	04Aug2013, 15:35	78.3
SC-1D	0.16	80.4	04Aug2013, 17:20	46
Proposed Swift Det _23	0.36	19.6	05Aug2013, 01:30	12.9
RT SC-1C-1D	0.36	19.6	05Aug2013, 01:30	12.8
SC-1A	0.15	86.5	04Aug2013, 17:20	50
RT SC-1A	0.15	86.4	04Aug2013, 17:25	49.7
SC-1B	0.10	131.5	04Aug2013, 14:05	31.3
ADD SC-1B	0.26	153.3	04Aug2013, 14:10	80.9
SC-1E	0.17	152.2	04Aug2013, 15:10	57
RT SC-1E	0.17	151.1	04Aug2013, 15:15	56.7
U/S Limit SC	0.79	263.7	04Aug2013, 14:40	150.4
RT - Swift Creek 1	0.79	262.8	04Aug2013, 15:00	149.5
SC-2A	0.16	118.6	04Aug2013, 16:10	59.1
SC-2B	0.09	220	04Aug2013, 13:20	30
ADD SC-2	1.04	393.5	04Aug2013, 15:30	238.5
SC-3B	0.10	143	04Aug2013, 13:55	30.5
SC-3A	0.09	47.5	04Aug2013, 16:20	22.9
ADD SC-3A-3B	0.18	156.4	04Aug2013, 13:55	53.4
RT SC-3A-3B	0.18	156	04Aug2013, 14:00	53.3
SC-3C	0.05	92.9	04Aug2013, 13:45	17.5
ADD SC-3	1.28	563.2	04Aug2013, 13:55	309.3
Thomas Langston - SC	1.28	562.1	04Aug2013, 14:00	308.9
RT - Swift Creek 2	1.28	561.9	04Aug2013, 14:05	307.5
SC-4	0.17	254.6	04Aug2013, 13:50	50.9
Sterling Trace Drive	1.45	801.7	04Aug2013, 14:00	356.6
RT SC-4	1.45	717	04Aug2013, 14:25	353.3
SC-5A	0.04	76.1	04Aug2013, 13:30	11.8
ADD SC-5A-5B	1.48	738.5	04Aug2013, 14:20	365.1
SCUT-1B	0.07	68.8	04Aug2013, 14:40	21.5
SCUT-1A	0.07	113.5	04Aug2013, 13:50	23.1
ADD SCUT-1A-1B	0.15	160.1	04Aug2013, 14:00	44.6
SCUT-1C	0.05	118.9	04Aug2013, 13:25	17.3
Proposed Swift Det_17	0.20	20.4	04Aug2013, 19:35	18.7
RT SCUT-1C	0.20	20.4	04Aug2013, 19:45	18.4
SCUT-1D	0.06	64.4	04Aug2013, 15:00	23.7
Thomas Langston Road - SCUT	0.26	78.6	04Aug2013, 15:10	41.8
RT SCUT-1D	0.26	78.1	04Aug2013, 15:20	41.7
SCUT-2	0.05	51.4	04Aug2013, 14:35	16.2
Belfair Drive	0.31	123.3	04Aug2013, 15:00	57.6
RT - UT to Swift Creek 1	0.31	123.3	04Aug2013, 15:00	57.1
SCUT-3	0.09	147.9	04Aug2013, 13:55	32.4
Sterling Pointe Drive	0.40	229.2	04Aug2013, 14:10	89
RT - UT to Swift Creek 2	0.40	228.8	04Aug2013, 14:10	88.9
SCUT-4C	0.05	123.7	04Aug2013, 13:30	21.2
SCUT-4B	0.05	170.8	04Aug2013, 13:10	19.1
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	170.9	04Aug2013, 13:10	19.1
ADD SCUT-4C	0.10	250.7	04Aug2013, 13:15	40.3
SCUT-4D	0.04	114.2	04Aug2013, 13:20	15.2
ADD SCUT-4D	0.14	359.2	04Aug2013, 13:15	55.4
RT SCUT-4D	0.14	355.3	04Aug2013, 13:20	55.4
ADD SCUT 4	0.55	438.3	04Aug2013, 13:20	144.3
RT - UT to Swift Creek 3	0.55	431.3	04Aug2013, 13:30	144
SCUT-5	0.06	125.6	04Aug2013, 13:40	22.7
D/S Limit SCUT	0.61	551.1	04Aug2013, 13:30	166.7

50-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-5B	0.08	97.9	04Aug2013, 14:10	24.6
ADD SCUT to SC	2.17	1241.4	04Aug2013, 14:05	556.3
RT - Swift Creek 3	2.17	1162.7	04Aug2013, 14:25	547.6
SC-6	1.37	1120.5	04Aug2013, 15:15	429.9
ADD SC-6	3.54	2169.6	04Aug2013, 14:55	977.5
RT - Swift Creek 4	3.54	2133.7	04Aug2013, 15:00	970.9
GS-2A	0.46	258.6	04Aug2013, 16:50	137.3
GS-2B	0.07	147.4	04Aug2013, 13:35	24.4
ADD GS-2A-2B	0.53	271.7	04Aug2013, 16:45	161.6
RT-GS-2A-2B	0.53	271.5	04Aug2013, 16:50	161.1
GS-2C	0.06	132.4	04Aug2013, 13:25	17.9
Davenport Farm Road West	0.58	298.6	04Aug2013, 13:30	178.9
RT GS-2C	0.58	295.1	04Aug2013, 13:35	178.5
U/S Limit GS	0.58	295.1	04Aug2013, 13:35	178.5
GS-1C	0.50	223.3	04Aug2013, 18:25	141.9
GS-1B	0.24	130.4	04Aug2013, 17:05	72.1
GS-1A	0.16	155.2	04Aug2013, 14:35	47.8
ADD GS-1A-1B	0.40	220.1	04Aug2013, 15:00	119.9
RT GS-1A-1B	0.40	218.8	04Aug2013, 15:20	118.5
GS-1D	0.10	231	04Aug2013, 13:25	31.2
RT GS-1D	0.10	221.9	04Aug2013, 13:30	31.1
ADD GS-1	1.58	681.7	04Aug2013, 17:00	470
GS-3	0.13	182.3	04Aug2013, 14:00	41.3
ADD GS-3	1.71	733.9	04Aug2013, 13:40	511.3
Frog Level Road	1.71	708.8	04Aug2013, 17:05	503.3
RT- Gum Swamp 1	1.71	707.3	04Aug2013, 17:15	501.8
GS-4B	0.12	101.4	04Aug2013, 15:10	38
GS-4A	0.08	155.2	04Aug2013, 13:35	25.3
RT GS-4A	0.08	151.2	04Aug2013, 13:35	25.3
ADD GS-4B	0.19	190.1	04Aug2013, 13:40	63.2
RT GS-4B	0.19	186	04Aug2013, 13:40	63.1
GS-4C	0.10	83.3	04Aug2013, 15:10	31.1
ADD GS-4C	0.29	221.3	04Aug2013, 13:45	94.2
RT GS-4C	0.29	220.3	04Aug2013, 13:50	94.1
GS-4D	0.13	91.9	04Aug2013, 15:40	39.6
ADD GS-4D	0.42	299.3	04Aug2013, 15:10	133.7
RT GS-4D	0.42	299.3	04Aug2013, 15:15	133.7
Davenport Farm Road East	0.42	299.3	04Aug2013, 15:15	133.7
GS-4E	0.05	69.1	04Aug2013, 14:05	16.5
ADD GS-4E	2.19	991.6	04Aug2013, 14:10	651.9
RT GS-4E	2.19	990.9	04Aug2013, 14:20	650.6
GS-5A	0.15	101	04Aug2013, 15:45	43.4
GS-5B	0.05	115.4	04Aug2013, 13:20	15.7
ADD GS-5A-5B	2.39	1073.2	04Aug2013, 14:25	709.7
RT GS-5A-5B	2.39	1067.7	04Aug2013, 14:25	708.8
GS-5C	0.04	113.7	04Aug2013, 13:15	13.9
RT GS-5C	0.04	112.9	04Aug2013, 13:20	13.9
ADD GS-5C	2.43	1084.7	04Aug2013, 14:25	722.7
RT- Gum Swamp 2	2.43	1074.3	04Aug2013, 14:35	720.4
GS-5D	0.14	116	04Aug2013, 15:10	43.4
ADD GS-5D	2.56	1181.9	04Aug2013, 14:45	763.7
RT GS-5D	2.56	1179.1	04Aug2013, 14:55	760.4
GS-6	0.17	129.8	04Aug2013, 15:10	48.2
D/S Limit GS	2.73	1307.9	04Aug2013, 15:05	808.6
ADD GS to SC	6.27	3441.4	04Aug2013, 15:00	1779.4
RT - Swift Creek 5	6.27	3404.6	04Aug2013, 15:05	1770.9
OUTLET	6.27	3404.6	04Aug2013, 15:05	1770.9

100-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-1C	0.20	204.4	04Aug2013, 15:35	92.5
SC-1D	0.16	97.5	04Aug2013, 17:20	56
Proposed Swift Det _23	0.36	23.4	05Aug2013, 01:30	15.9
RT SC-1C-1D	0.36	23.4	05Aug2013, 01:30	15.7
SC-1A	0.15	103.4	04Aug2013, 17:15	60.1
RT SC-1A	0.15	103.3	04Aug2013, 17:25	59.7
SC-1B	0.10	159.8	04Aug2013, 14:05	38.2
ADD SC-1B	0.26	187.1	04Aug2013, 14:10	97.9
SC-1E	0.17	183.1	04Aug2013, 15:05	68.9
RT SC-1E	0.17	181.8	04Aug2013, 15:15	68.6
U/S Limit SC	0.79	320.1	04Aug2013, 14:40	182.3
RT - Swift Creek 1	0.79	318.5	04Aug2013, 14:55	181.1
SC-2A	0.16	139.9	04Aug2013, 16:10	70.1
SC-2B	0.09	264.8	04Aug2013, 13:20	36.3
ADD SC-2	1.04	472.4	04Aug2013, 15:30	287.6
SC-3B	0.10	173.2	04Aug2013, 13:55	37.2
SC-3A	0.09	58.8	04Aug2013, 16:15	28.3
ADD SC-3A-3B	0.18	190.7	04Aug2013, 13:55	65.5
RT SC-3A-3B	0.18	190	04Aug2013, 14:00	65.4
SC-3C	0.05	112.1	04Aug2013, 13:45	21.3
ADD SC-3	1.28	683.6	04Aug2013, 13:55	374.2
Thomas Langston - SC	1.28	679.3	04Aug2013, 14:05	373.8
RT - Swift Creek 2	1.28	679.3	04Aug2013, 14:05	372.3
SC-4	0.17	310	04Aug2013, 13:50	62.3
Sterling Trace Drive	1.45	971.5	04Aug2013, 14:00	432.6
RT SC-4	1.45	879	04Aug2013, 14:20	428.2
SC-5A	0.04	91.3	04Aug2013, 13:30	14.3
ADD SC-5A-5B	1.48	906.8	04Aug2013, 14:20	442.5
SCUT-1B	0.07	84.2	04Aug2013, 14:40	26.4
SCUT-1A	0.07	137	04Aug2013, 13:50	28.1
ADD SCUT-1A-1B	0.15	194.6	04Aug2013, 14:00	54.4
SCUT-1C	0.05	143.9	04Aug2013, 13:25	21.1
Proposed Swift Det_17	0.20	24.3	04Aug2013, 19:35	22.5
RT SCUT-1C	0.20	24.3	04Aug2013, 19:45	22.2
SCUT-1D	0.06	76.3	04Aug2013, 15:00	28.2
Thomas Langston Road - SCUT	0.26	94.7	04Aug2013, 15:05	50.2
RT SCUT-1D	0.26	94	04Aug2013, 15:15	50
SCUT-2	0.05	61.2	04Aug2013, 14:35	19.4
Belfair Drive	0.31	147.6	04Aug2013, 15:00	69.1
RT - UT to Swift Creek 1	0.31	147.5	04Aug2013, 15:05	68.6
SCUT-3	0.09	176.5	04Aug2013, 13:55	39
Sterling Pointe Drive	0.40	274.1	04Aug2013, 14:10	107
RT - UT to Swift Creek 2	0.40	273.5	04Aug2013, 14:10	106.8
SCUT-4C	0.05	145.3	04Aug2013, 13:30	25
SCUT-4B	0.05	200.4	04Aug2013, 13:10	22.6
SCUT-4A	0.00	0.1	04Aug2013, 14:30	0
ADD SCUT-4A-4B	0.05	200.5	04Aug2013, 13:10	22.6
ADD SCUT-4C	0.10	294.3	04Aug2013, 13:15	47.6
SCUT-4D	0.04	135.1	04Aug2013, 13:20	18.1
ADD SCUT-4D	0.14	422.9	04Aug2013, 13:15	65.7
RT SCUT-4D	0.14	418.1	04Aug2013, 13:20	65.7
ADD SCUT 4	0.55	520.7	04Aug2013, 13:20	172.6
RT - UT to Swift Creek 3	0.55	514.5	04Aug2013, 13:25	172.2
SCUT-5	0.06	148.7	04Aug2013, 13:40	27.1
D/S Limit SCUT	0.61	655.5	04Aug2013, 13:30	199.3

100-YEAR ALTERNATIVE #2				
Hydrologic Element	Drainage Area (mi^2)	Peak Discharge (CFS)	Time of Peak	Volume (AC-FT)
SC-5B	0.08	118.3	04Aug2013, 14:10	29.9
ADD SCUT to SC	2.17	1518.1	04Aug2013, 14:05	671.7
RT - Swift Creek 3	2.17	1422.5	04Aug2013, 14:20	661.5
SC-6	1.37	1355.9	04Aug2013, 15:15	522.5
ADD SC-6	3.54	2619.7	04Aug2013, 14:50	1184
RT - Swift Creek 4	3.54	2577.3	04Aug2013, 14:55	1176.6
GS-2A	0.46	313.4	04Aug2013, 16:45	167.1
GS-2B	0.07	175.2	04Aug2013, 13:35	29.2
ADD GS-2A-2B	0.53	328.8	04Aug2013, 16:40	196.3
RT-GS-2A-2B	0.53	328.6	04Aug2013, 16:45	195.8
GS-2C	0.06	160.4	04Aug2013, 13:25	21.8
Davenport Farm Road West	0.58	365.4	04Aug2013, 13:30	217.6
RT GS-2C	0.58	361.1	04Aug2013, 13:35	217
U/S Limit GS	0.58	361.1	04Aug2013, 13:35	217
GS-1C	0.50	270.1	04Aug2013, 18:25	172.5
GS-1B	0.24	157.6	04Aug2013, 17:05	87.5
GS-1A	0.16	189.5	04Aug2013, 14:35	58.6
ADD GS-1A-1B	0.40	268.8	04Aug2013, 15:00	146.1
RT GS-1A-1B	0.40	267.3	04Aug2013, 15:15	144.5
GS-1D	0.10	279.8	04Aug2013, 13:25	38.1
RT GS-1D	0.10	269.1	04Aug2013, 13:30	38
ADD GS-1	1.58	824.9	04Aug2013, 17:00	572
GS-3	0.13	220.1	04Aug2013, 14:00	50.1
ADD GS-3	1.71	900	04Aug2013, 13:40	622.1
Frog Level Road	1.71	879.6	04Aug2013, 13:45	612.2
RT- Gum Swamp 1	1.71	856.3	04Aug2013, 17:10	610.7
GS-4B	0.12	121.9	04Aug2013, 15:05	45.9
GS-4A	0.08	186	04Aug2013, 13:35	30.6
RT GS-4A	0.08	181.2	04Aug2013, 13:35	30.5
ADD GS-4B	0.19	229.1	04Aug2013, 13:40	76.5
RT GS-4B	0.19	224.6	04Aug2013, 13:40	76.4
GS-4C	0.10	100.8	04Aug2013, 15:10	37.8
ADD GS-4C	0.29	268	04Aug2013, 13:45	114.1
RT GS-4C	0.29	266.6	04Aug2013, 13:50	114
GS-4D	0.13	112	04Aug2013, 15:40	48.4
ADD GS-4D	0.42	361.8	04Aug2013, 15:10	162.4
RT GS-4D	0.42	361.7	04Aug2013, 15:10	162.4
Davenport Farm Road East	0.42	361.7	04Aug2013, 15:10	162.4
GS-4E	0.05	83.7	04Aug2013, 14:05	20
ADD GS-4E	2.19	1227.5	04Aug2013, 14:05	793.1
RT GS-4E	2.19	1224.7	04Aug2013, 14:15	791.6
GS-5A	0.15	123.8	04Aug2013, 15:40	53.3
GS-5B	0.05	138.9	04Aug2013, 13:20	19
ADD GS-5A-5B	2.39	1324.1	04Aug2013, 14:15	863.9
RT GS-5A-5B	2.39	1314.3	04Aug2013, 14:15	862.9
GS-5C	0.04	136	04Aug2013, 13:15	16.8
RT GS-5C	0.04	133.5	04Aug2013, 13:20	16.8
ADD GS-5C	2.43	1338.3	04Aug2013, 14:15	879.7
RT- Gum Swamp 2	2.43	1320.4	04Aug2013, 14:25	877
GS-5D	0.14	140	04Aug2013, 15:10	52.6
ADD GS-5D	2.56	1441.6	04Aug2013, 14:35	929.6
RT GS-5D	2.56	1437.5	04Aug2013, 14:45	925.8
GS-6	0.17	159.1	04Aug2013, 15:10	59.2
D/S Limit GS	2.73	1592.9	04Aug2013, 15:00	985
ADD GS to SC	6.27	4170	04Aug2013, 14:55	2161.6
RT - Swift Creek 5	6.27	4128	04Aug2013, 15:05	2152
OUTLET	6.27	4128	04Aug2013, 15:05	2152

PRIMARY SYSTEM EXISTING CONDITIONS: HEC-RAS OUTPUT

Swift Creek Existing Conditions

HEC-RAS Plan: Swift Cr - Ex River: Swift Creek Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	234198	2-year	199.00	51.54	55.52	54.10	55.73	0.003004	3.72	55.27	26.55	0.39
Reach-1	234198	10-year	439.00	51.54	56.93	55.26	57.22	0.003002	4.69	251.46	350.92	0.40
Reach-1	234198	25-year	640.00	51.54	57.45	56.25	57.74	0.003001	5.07	451.49	426.51	0.41
Reach-1	234198	50-year	827.00	51.54	57.80	57.22	58.08	0.003001	5.31	606.57	454.27	0.42
Reach-1	234198	100-year	1034.00	51.54	58.14	57.52	58.41	0.003001	5.55	767.97	487.59	0.42
Reach-1	234875	2-year	199.00	52.10	56.86		56.98	0.001227	2.81	103.07	161.15	0.26
Reach-1	234875	10-year	439.00	52.10	58.12		58.19	0.000780	2.69	515.23	443.34	0.22
Reach-1	234875	25-year	640.00	52.10	58.62		58.68	0.000751	2.82	746.49	486.05	0.21
Reach-1	234875	50-year	827.00	52.10	58.98		59.03	0.000772	2.99	931.84	549.63	0.22
Reach-1	234875	100-year	1034.00	52.10	59.31		59.36	0.000765	3.08	1116.59	568.65	0.22
Reach-1	235139	2-year	199.00	51.75	57.14	53.74	57.20	0.000545	1.97	112.83	145.26	0.18
Reach-1	235139	10-year	439.00	51.75	58.31	54.90	58.36	0.000567	2.24	499.97	474.06	0.18
Reach-1	235139	25-year	640.00	51.75	58.80	55.66	58.84	0.000548	2.35	740.43	512.36	0.18
Reach-1	235139	50-year	827.00	51.75	59.16	56.28	59.20	0.000546	2.45	930.19	547.16	0.18
Reach-1	235139	100-year	1034.00	51.75	59.48	57.96	59.53	0.000559	2.58	1115.40	584.92	0.19
Reach-1	235165		Bridge									
Reach-1	235183	2-year	199.00	51.76	57.45	53.84	57.48	0.000310	1.56	127.96	159.25	0.14
Reach-1	235183	10-year	439.00	51.76	59.39	54.92	59.41	0.000138	1.28	883.63	480.04	0.10
Reach-1	235183	25-year	640.00	51.76	59.76	55.60	59.78	0.000201	1.62	1070.52	546.71	0.12
Reach-1	235183	50-year	827.00	51.76	59.96	56.14	59.99	0.000268	1.92	1182.98	551.34	0.14
Reach-1	235183	100-year	1034.00	51.76	60.13	56.64	60.17	0.000351	2.24	1278.79	555.42	0.16
Reach-1	235196	2-year	199.00	52.47	57.43	54.93	57.51	0.000992	2.33	85.51	401.55	0.23
Reach-1	235196	10-year	439.00	52.47	59.39	56.11	59.41	0.000259	1.60	644.79	598.98	0.13
Reach-1	235196	25-year	640.00	52.47	59.79	56.83	59.80	0.000064	0.84	2010.71	603.93	0.06
Reach-1	235196	50-year	827.00	52.47	60.01	57.35	60.01	0.000089	1.01	2142.30	606.30	0.08
Reach-1	235196	100-year	1034.00	52.47	60.20	57.86	60.20	0.000118	1.19	2256.83	608.36	0.09
Reach-1	235219		Culvert									
Reach-1	235247	2-year	199.00	53.17	58.50	56.02	58.56	0.000696	1.92	108.02	418.79	0.21
Reach-1	235247	10-year	439.00	53.17	59.52	57.09	59.56	0.000507	1.96	528.54	508.86	0.18
Reach-1	235247	25-year	640.00	53.17	59.85	57.73	59.87	0.000328	1.66	1023.86	525.28	0.15
Reach-1	235247	50-year	827.00	53.17	60.07	58.30	60.09	0.000413	1.92	1137.09	536.71	0.16

Swift Creek Existing Conditions

HEC-RAS Plan: Swift Cr - Ex River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	235247	100-year	1034.00	53.17	60.26	58.80	60.29	0.000506	2.19	1244.71	551.80	0.18
Reach-1	235428	2-year	189.00	53.13	58.62	55.76	58.65	0.000368	1.65	312.40	260.75	0.15
Reach-1	235428	10-year	416.00	53.13	59.60	56.96	59.65	0.000512	2.27	592.58	313.11	0.18
Reach-1	235428	25-year	628.00	53.13	59.89	58.14	59.97	0.000846	3.03	685.95	324.53	0.24
Reach-1	235428	50-year	805.00	53.13	60.11	58.48	60.22	0.001101	3.56	758.57	332.57	0.27
Reach-1	235428	100-year	993.00	53.13	60.32	58.73	60.45	0.001361	4.06	828.02	358.48	0.30
Reach-1	235914	2-year	189.00	53.95	58.86		58.97	0.001184	2.65	111.95	132.14	0.25
Reach-1	235914	10-year	416.00	53.95	59.92		60.05	0.001342	3.38	326.22	242.74	0.28
Reach-1	235914	25-year	628.00	53.95	60.39		60.56	0.001699	4.06	447.96	277.65	0.32
Reach-1	235914	50-year	805.00	53.95	60.73		60.91	0.001846	4.43	547.06	297.19	0.34
Reach-1	235914	100-year	993.00	53.95	61.05		61.24	0.001942	4.73	643.33	306.94	0.35
Reach-1	236412	2-year	189.00	54.78	59.40		59.46	0.000779	2.10	199.56	247.21	0.21
Reach-1	236412	10-year	416.00	54.78	60.48		60.52	0.000628	2.25	543.11	375.31	0.19
Reach-1	236412	25-year	628.00	54.78	61.05		61.10	0.000656	2.51	776.49	431.29	0.20
Reach-1	236412	50-year	805.00	54.78	61.44		61.49	0.000687	2.70	950.68	465.97	0.21
Reach-1	236412	100-year	993.00	54.78	61.79		61.84	0.000699	2.85	1115.42	482.33	0.21
Reach-1	236856	2-year	189.00	54.38	59.81	57.31	59.93	0.001425	2.82	87.16	100.28	0.27
Reach-1	236856	10-year	416.00	54.38	60.82	58.66	61.01	0.001981	3.85	254.71	213.47	0.33
Reach-1	236856	25-year	628.00	54.38	61.41	60.23	61.61	0.002136	4.36	392.78	255.47	0.35
Reach-1	236856	50-year	805.00	54.38	61.81	60.68	62.02	0.002186	4.66	503.70	304.05	0.36
Reach-1	236856	100-year	993.00	54.38	62.16	61.07	62.38	0.002259	4.94	617.96	351.59	0.37
Reach-1	237179	2-year	189.00	55.37	60.27		60.38	0.001414	2.81	82.12	95.95	0.27
Reach-1	237179	10-year	416.00	55.37	61.42		61.57	0.001570	3.51	284.69	221.76	0.30
Reach-1	237179	25-year	628.00	55.37	62.04		62.20	0.001643	3.92	427.14	238.12	0.31
Reach-1	237179	50-year	805.00	55.37	62.45		62.62	0.001712	4.23	527.63	249.00	0.32
Reach-1	237179	100-year	993.00	55.37	62.82		63.00	0.001797	4.53	621.55	258.76	0.33
Reach-1	237456	2-year	189.00	55.98	60.68	58.47	60.78	0.001408	2.65	92.49	171.09	0.27
Reach-1	237456	10-year	416.00	55.98	61.87	59.71	61.98	0.001322	3.04	289.24	295.71	0.28
Reach-1	237456	25-year	628.00	55.98	62.51	61.01	62.62	0.001358	3.42	412.70	330.60	0.29
Reach-1	237456	50-year	805.00	55.98	62.91	61.44	62.98	0.000966	3.05	791.98	351.37	0.25
Reach-1	237456	100-year	993.00	55.98	63.29	61.68	63.37	0.000971	3.22	930.10	360.61	0.25

Swift Creek Existing Conditions

HEC-RAS Plan: Swift Cr - Ex River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	237708	2-year	189.00	56.29	61.02	58.87	61.12	0.001240	2.51	101.50	154.22	0.26
Reach-1	237708	10-year	416.00	56.29	62.22	60.03	62.31	0.001072	2.85	475.08	423.98	0.26
Reach-1	237708	25-year	628.00	56.29	62.87	61.09	62.96	0.000953	2.99	759.66	468.11	0.25
Reach-1	237708	50-year	805.00	56.29	63.18	61.77	63.27	0.001072	3.31	897.11	488.20	0.27
Reach-1	237708	100-year	993.00	56.29	63.57	61.87	63.66	0.001047	3.45	1074.57	504.37	0.27
Reach-1	237781		Culvert									
Reach-1	237845	2-year	189.00	56.31	62.28	59.03	62.33	0.000476	1.84	151.77	363.88	0.16
Reach-1	237845	10-year	416.00	56.31	63.25	60.28	63.29	0.000390	1.93	685.43	441.57	0.15
Reach-1	237845	25-year	628.00	56.31	63.57	61.18	63.60	0.000464	2.19	985.44	487.13	0.17
Reach-1	237845	50-year	805.00	56.31	63.80	61.70	63.84	0.000615	2.60	1066.15	521.14	0.20
Reach-1	237845	100-year	993.00	56.31	63.95	62.23	64.02	0.000813	3.05	1121.49	535.30	0.23
Reach-1	238094	2-year	173.00	56.52	62.41	59.10	62.47	0.000700	2.08	107.60	286.72	0.19
Reach-1	238094	10-year	358.00	56.52	63.35	60.27	63.46	0.001055	2.90	302.50	490.86	0.24
Reach-1	238094	25-year	496.00	56.52	63.68	60.93	63.82	0.001364	3.44	392.41	545.07	0.27
Reach-1	238094	50-year	620.00	56.52	63.94	61.45	64.10	0.001553	3.80	466.84	555.52	0.30
Reach-1	238094	100-year	754.00	56.52	64.15	62.20	64.34	0.001824	4.23	524.10	563.53	0.32
Reach-1	238526	2-year	173.00	56.20	62.57	57.78	62.59	0.000133	1.13	164.38	62.57	0.09
Reach-1	238526	10-year	358.00	56.20	63.63	58.64	63.68	0.000285	1.86	241.92	170.48	0.14
Reach-1	238526	25-year	496.00	56.20	64.05	59.17	64.13	0.000414	2.35	304.67	227.24	0.17
Reach-1	238526	50-year	620.00	56.20	64.37	59.58	64.48	0.000517	2.72	363.83	247.32	0.19
Reach-1	238526	100-year	754.00	56.20	64.66	59.99	64.79	0.000634	3.10	419.01	277.99	0.21
Reach-1	238936	2-year	173.00	56.88	62.63	58.64	62.65	0.000163	1.15	150.54	37.22	0.10
Reach-1	238936	10-year	358.00	56.88	63.76	59.39	63.81	0.000333	1.84	195.27	44.47	0.15
Reach-1	238936	25-year	496.00	56.88	64.23	59.85	64.31	0.000480	2.32	217.43	50.28	0.18
Reach-1	238936	50-year	620.00	56.88	64.60	60.22	64.71	0.000602	2.71	236.83	54.78	0.20
Reach-1	238936	100-year	754.00	56.88	64.92	60.59	65.07	0.000732	3.10	255.50	58.64	0.23
Reach-1	239177	2-year	173.00	57.85	62.62	60.74	62.80	0.002494	3.39	50.97	17.72	0.35
Reach-1	239177	10-year	358.00	57.85	63.72	61.96	64.11	0.004197	4.96	72.21	20.79	0.47
Reach-1	239177	25-year	496.00	57.85	64.16	62.65	64.74	0.005811	6.08	81.60	40.19	0.56
Reach-1	239177	50-year	620.00	57.85	64.50	63.18	65.25	0.007164	6.95	90.12	84.64	0.62
Reach-1	239177	100-year	754.00	57.85	64.79	63.69	65.73	0.008623	7.82	104.92	135.47	0.69

Swift Creek Existing Conditions

HEC-RAS Plan: Swift Cr - Ex River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	239470	2-year	173.00	57.77	63.02	59.59	63.06	0.000359	1.62	106.73	27.00	0.14
Reach-1	239470	10-year	358.00	57.77	64.48	60.45	64.57	0.000611	2.42	148.24	30.02	0.19
Reach-1	239470	25-year	496.00	57.77	65.23	60.97	65.36	0.000783	2.89	171.44	31.59	0.22
Reach-1	239470	50-year	620.00	57.77	65.84	61.40	66.00	0.000900	3.25	192.27	45.04	0.24
Reach-1	239470	100-year	754.00	57.77	66.41	61.82	66.61	0.000988	3.57	222.61	62.59	0.25
Reach-1	239543		Culvert									
Reach-1	239601	2-year	173.00	57.56	64.13	59.56	64.16	0.000210	1.35	127.92	27.66	0.11
Reach-1	239601	10-year	358.00	57.56	67.61	60.51	67.63	0.000097	1.24	485.36	329.39	0.08
Reach-1	239601	25-year	496.00	57.56	68.16	61.08	68.19	0.000124	1.48	600.82	387.08	0.09
Reach-1	239601	50-year	620.00	57.56	68.43	61.54	68.47	0.000160	1.71	657.64	411.02	0.11
Reach-1	239601	100-year	754.00	57.56	68.65	61.99	68.69	0.000200	1.95	749.64	429.43	0.12
Reach-1	239904	2-year	152.00	58.41	64.22	60.78	64.28	0.000698	1.95	77.79	23.70	0.19
Reach-1	239904	10-year	311.00	58.41	67.65	61.91	67.68	0.000241	1.46	361.74	306.27	0.11
Reach-1	239904	25-year	429.00	58.41	68.21	62.61	68.24	0.000247	1.57	529.08	348.54	0.12
Reach-1	239904	50-year	534.00	58.41	68.49	63.16	68.53	0.000281	1.73	622.57	372.44	0.13
Reach-1	239904	100-year	650.00	58.41	68.73	63.66	68.77	0.000313	1.87	748.49	392.22	0.13
Reach-1	240316	2-year	152.00	59.47	64.64		64.83	0.002715	3.49	43.52	14.20	0.35
Reach-1	240316	10-year	311.00	59.47	67.78		67.86	0.000775	2.46	241.46	187.63	0.20
Reach-1	240316	25-year	429.00	59.47	68.35		68.42	0.000755	2.57	366.95	255.90	0.20
Reach-1	240316	50-year	534.00	59.47	68.65		68.72	0.000812	2.74	449.89	287.95	0.21
Reach-1	240316	100-year	650.00	59.47	68.90		68.98	0.000886	2.96	525.00	308.11	0.22
Reach-1	240800	2-year	152.00	60.78	65.71		65.83	0.001624	2.80	54.32	18.24	0.29
Reach-1	240800	10-year	311.00	60.78	68.15		68.23	0.000769	2.52	181.77	133.85	0.21
Reach-1	240800	25-year	429.00	60.78	68.71		68.81	0.000845	2.81	274.10	191.48	0.22
Reach-1	240800	50-year	534.00	60.78	69.05		69.16	0.000936	3.05	343.46	224.07	0.23
Reach-1	240800	100-year	650.00	60.78	69.34		69.46	0.001061	3.34	414.47	263.01	0.25
Reach-1	241107	2-year	152.00	61.47	66.28		66.44	0.002369	3.20	48.07	22.36	0.34
Reach-1	241107	10-year	311.00	61.47	68.42		68.51	0.001096	2.71	205.50	160.86	0.24
Reach-1	241107	25-year	429.00	61.47	69.01		69.10	0.001024	2.79	318.43	221.31	0.24
Reach-1	241107	50-year	534.00	61.47	69.37		69.46	0.001021	2.91	404.63	257.16	0.24
Reach-1	241107	100-year	650.00	61.47	69.70		69.79	0.001024	3.02	494.68	289.92	0.24

Swift Creek Existing Conditions

HEC-RAS Plan: Swift Cr - Ex River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	241592	2-year	122.00	62.40	67.11		67.18	0.000964	2.14	57.01	20.07	0.22
Reach-1	241592	10-year	249.00	62.40	68.90		68.99	0.000861	2.44	126.89	93.05	0.22
Reach-1	241592	25-year	342.00	62.40	69.47		69.57	0.000910	2.70	193.14	139.27	0.23
Reach-1	241592	50-year	426.00	62.40	69.84		69.95	0.000970	2.91	249.81	170.74	0.24
Reach-1	241592	100-year	520.00	62.40	70.17		70.29	0.001020	3.09	320.12	240.16	0.25
Reach-1	241994	2-year	122.00	63.58	67.52		67.60	0.001130	2.23	54.61	20.44	0.24
Reach-1	241994	10-year	249.00	63.58	69.26		69.36	0.000959	2.51	121.75	72.67	0.23
Reach-1	241994	25-year	342.00	63.58	69.86		69.96	0.001026	2.78	172.06	96.15	0.24
Reach-1	241994	50-year	426.00	63.58	70.25		70.37	0.001109	3.04	235.20	227.67	0.26
Reach-1	241994	100-year	520.00	63.58	70.60		70.72	0.001100	3.15	329.00	307.38	0.26

GUM SWAMP EXISTING CONDITIONS

HEC-RAS Plan: Gum Swamp - Ex River: Gum Swamp Reach: Reach - 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	663.5	2-Year	305.00	46.81	52.94	50.33	53.35	0.002603	5.28	74.92	19.31	0.38
Reach - 1	663.5	10-Year	636.00	46.81	54.83	52.37	55.28	0.002605	6.35	347.35	294.78	0.40
Reach - 1	663.5	25-Year	894.00	46.81	55.40	54.72	55.80	0.002603	6.66	525.41	326.04	0.41
Reach - 1	663.5	50-Year	1123.00	46.81	55.81	55.25	56.18	0.002603	6.87	662.90	345.86	0.41
Reach - 1	663.5	100-Year	1382.00	46.81	56.23	55.51	56.57	0.002602	7.09	812.67	380.08	0.41
Reach - 1	1000.0	2-Year	305.00	46.98	53.77		53.93	0.001144	3.75	178.58	132.52	0.26
Reach - 1	1000.0	10-Year	636.00	46.98	55.65		55.74	0.000726	3.54	733.28	376.36	0.21
Reach - 1	1000.0	25-Year	894.00	46.98	56.19		56.28	0.000817	3.91	943.83	398.26	0.23
Reach - 1	1000.0	50-Year	1123.00	46.98	56.59		56.68	0.000887	4.20	1105.20	414.26	0.24
Reach - 1	1000.0	100-Year	1382.00	46.98	57.00		57.09	0.000943	4.45	1276.52	430.60	0.25
Reach - 1	1500.0	2-Year	305.00	47.40	54.34		54.60	0.001455	4.31	111.15	57.17	0.29
Reach - 1	1500.0	10-Year	636.00	47.40	56.03		56.32	0.001669	5.36	432.29	365.66	0.33
Reach - 1	1500.0	25-Year	894.00	47.40	56.64		56.91	0.001737	5.73	703.17	519.15	0.34
Reach - 1	1500.0	50-Year	1123.00	47.40	57.08		57.31	0.001609	5.69	938.25	543.71	0.33
Reach - 1	1500.0	100-Year	1382.00	47.40	57.51		57.70	0.001461	5.59	1178.37	566.96	0.31
Reach - 1	2000.0	2-Year	305.00	47.83	55.08		55.36	0.001562	4.37	98.35	25.33	0.29
Reach - 1	2000.0	10-Year	636.00	47.83	56.87		57.17	0.001705	5.31	499.46	398.28	0.32
Reach - 1	2000.0	25-Year	894.00	47.83	57.51		57.75	0.001601	5.40	761.52	420.53	0.31
Reach - 1	2000.0	50-Year	1123.00	47.83	57.90		58.14	0.001704	5.72	930.59	452.15	0.32
Reach - 1	2000.0	100-Year	1382.00	47.83	58.28		58.51	0.001756	5.95	1105.21	463.93	0.33
Reach - 1	2535.0	2-Year	305.00	48.54	55.91		56.16	0.001414	4.21	116.87	62.82	0.28
Reach - 1	2535.0	10-Year	636.00	48.54	57.75		57.93	0.001183	4.48	635.37	423.94	0.26
Reach - 1	2535.0	25-Year	894.00	48.54	58.34		58.52	0.001264	4.83	918.93	512.41	0.28
Reach - 1	2535.0	50-Year	1123.00	48.54	58.76		58.92	0.001235	4.92	1136.53	519.70	0.27
Reach - 1	2535.0	100-Year	1382.00	48.54	59.16		59.31	0.001248	5.07	1345.45	530.94	0.28
Reach - 1	3000.0	2-Year	265.00	48.92	56.54		56.75	0.001143	3.83	118.68	99.80	0.25
Reach - 1	3000.0	10-Year	560.00	48.92	58.29		58.49	0.001183	4.49	500.61	356.36	0.26
Reach - 1	3000.0	25-Year	800.00	48.92	58.92		59.13	0.001342	5.00	756.81	466.31	0.28
Reach - 1	3000.0	50-Year	1016.00	48.92	59.34		59.54	0.001399	5.26	971.28	565.92	0.29
Reach - 1	3000.0	100-Year	1264.00	48.92	59.75		59.93	0.001390	5.38	1206.30	580.20	0.29
Reach - 1	3500.0	2-Year	265.00	49.52	57.12		57.28	0.000951	3.49	152.01	116.26	0.23
Reach - 1	3500.0	10-Year	560.00	49.52	58.87		59.00	0.000858	3.82	695.10	443.05	0.22

GUM SWAMP EXISTING CONDITIONS

HEC-RAS Plan: Gum Swamp - Ex River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	3500.0	25-Year	800.00	49.52	59.56		59.66	0.000829	3.94	1021.54	506.76	0.22
Reach - 1	3500.0	50-Year	1016.00	49.52	59.99		60.09	0.000861	4.14	1248.84	541.91	0.23
Reach - 1	3500.0	100-Year	1264.00	49.52	60.39		60.49	0.000907	4.36	1472.50	570.59	0.24
Reach - 1	4000.0	2-Year	265.00	50.17	57.61		57.82	0.001174	3.82	107.13	29.69	0.25
Reach - 1	4000.0	10-Year	560.00	50.17	59.31	55.49	59.70	0.001973	5.70	306.63	277.80	0.34
Reach - 1	4000.0	25-Year	800.00	50.17	59.98		60.39	0.002209	6.34	536.47	382.54	0.36
Reach - 1	4000.0	50-Year	1016.00	50.17	60.45		60.81	0.002158	6.47	727.04	423.70	0.36
Reach - 1	4000.0	100-Year	1264.00	50.17	60.90		61.22	0.002118	6.59	921.06	451.42	0.36
Reach - 1	4500.0	2-Year	265.00	51.25	58.25		58.49	0.001488	4.12	98.06	29.00	0.28
Reach - 1	4500.0	10-Year	560.00	51.25	60.30		60.51	0.001291	4.59	464.72	261.52	0.27
Reach - 1	4500.0	25-Year	800.00	51.25	61.06		61.25	0.001307	4.87	675.59	309.14	0.28
Reach - 1	4500.0	50-Year	1016.00	51.25	61.51		61.71	0.001465	5.32	828.44	363.60	0.30
Reach - 1	4500.0	100-Year	1264.00	51.25	61.93		62.14	0.001577	5.67	989.00	394.19	0.31
Reach - 1	5000.0	2-Year	243.00	51.44	58.92		59.07	0.000877	3.31	141.64	66.00	0.22
Reach - 1	5000.0	10-Year	512.00	51.44	60.90		61.01	0.000772	3.65	596.29	333.88	0.21
Reach - 1	5000.0	25-Year	736.00	51.44	61.65		61.75	0.000767	3.84	867.47	377.71	0.21
Reach - 1	5000.0	50-Year	939.00	51.44	62.15		62.25	0.000786	4.01	1061.30	391.49	0.22
Reach - 1	5000.0	100-Year	1172.00	51.44	62.61		62.71	0.000831	4.25	1245.70	404.16	0.23
Reach - 1	5500.0	2-Year	243.00	52.17	59.39		59.55	0.001041	3.44	119.98	31.56	0.23
Reach - 1	5500.0	10-Year	512.00	52.17	61.30		61.63	0.001706	5.18	351.66	325.10	0.31
Reach - 1	5500.0	25-Year	736.00	52.17	62.07		62.34	0.001608	5.31	621.76	377.29	0.30
Reach - 1	5500.0	50-Year	939.00	52.17	62.59		62.83	0.001560	5.42	827.87	410.28	0.30
Reach - 1	5500.0	100-Year	1172.00	52.17	63.09		63.30	0.001539	5.56	1037.88	441.37	0.30
Reach - 1	6000.0	2-Year	243.00	52.71	59.93		60.08	0.001090	3.47	132.51	35.29	0.23
Reach - 1	6000.0	10-Year	512.00	52.71	62.16		62.32	0.001088	4.17	564.67	384.75	0.24
Reach - 1	6000.0	25-Year	736.00	52.71	62.85		62.98	0.001027	4.26	851.28	421.72	0.24
Reach - 1	6000.0	50-Year	939.00	52.71	63.35		63.46	0.001017	4.38	1062.02	436.44	0.24
Reach - 1	6000.0	100-Year	1172.00	52.71	63.83		63.95	0.001089	4.67	1288.76	492.35	0.25
Reach - 1	6400	2-Year	243.00	55.71	60.55		60.72	0.002542	3.37	72.00	21.91	0.33
Reach - 1	6400	10-Year	512.00	55.71	62.54		62.58	0.000426	1.75	386.70	553.23	0.14
Reach - 1	6400	25-Year	736.00	55.71	63.09		63.12	0.000148	1.11	705.42	605.10	0.09
Reach - 1	6400	50-Year	939.00	55.71	63.53		63.55	0.000084	0.88	971.80	615.52	0.07

GUM SWAMP EXISTING CONDITIONS

HEC-RAS Plan: Gum Swamp - Ex River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	6400	100-Year	1172.00	55.71	64.00		64.02	0.000055	0.75	1269.24	672.05	0.05
Reach - 1	6909	2-Year	172.00	55.80	61.58		61.66	0.001224	2.30	74.69	23.79	0.23
Reach - 1	6909	10-Year	368.00	55.80	62.83		62.94	0.001410	2.88	307.93	331.69	0.25
Reach - 1	6909	25-Year	513.00	55.80	63.17		63.30	0.001696	3.28	427.19	355.72	0.28
Reach - 1	6909	50-Year	660.00	55.80	63.55		63.67	0.001694	3.42	566.52	375.81	0.29
Reach - 1	6909	100-Year	825.00	55.80	64.00		64.11	0.001523	3.40	744.49	415.44	0.27
Reach - 1	7470	2-Year	172.00	56.41	62.26		62.34	0.001209	2.29	75.25	23.94	0.23
Reach - 1	7470	10-Year	368.00	56.41	63.64		63.76	0.001516	2.98	245.90	291.97	0.26
Reach - 1	7470	25-Year	513.00	56.41	64.11		64.24	0.001659	3.30	405.41	399.97	0.28
Reach - 1	7470	50-Year	660.00	56.41	64.49		64.62	0.001660	3.45	565.55	441.48	0.28
Reach - 1	7470	100-Year	825.00	56.41	64.87		64.99	0.001609	3.54	741.95	481.19	0.28
Reach - 1	7628	2-Year	172.00	56.38	62.45	59.63	62.53	0.001148	2.25	76.43	23.71	0.22
Reach - 1	7628	10-Year	368.00	56.38	63.87	60.82	64.03	0.001651	3.20	131.01	78.43	0.28
Reach - 1	7628	25-Year	513.00	56.38	64.36	61.48	64.55	0.001951	3.69	255.21	338.76	0.30
Reach - 1	7628	50-Year	660.00	56.38	64.74	62.04	64.93	0.001939	3.84	396.16	396.78	0.31
Reach - 1	7628	100-Year	825.00	56.38	65.12	62.60	65.28	0.001803	3.89	553.09	443.08	0.30
Reach - 1	7705		Culvert									
Reach - 1	7759	2-Year	172.00	56.45	62.70	59.55	62.77	0.000904	2.06	83.53	24.83	0.20
Reach - 1	7759	10-Year	368.00	56.45	64.96	60.77	65.05	0.000734	2.43	175.27	410.72	0.19
Reach - 1	7759	25-Year	513.00	56.45	65.31	61.43	65.37	0.000599	2.27	600.74	534.81	0.17
Reach - 1	7759	50-Year	660.00	56.45	65.46	62.00	65.54	0.000810	2.69	684.15	568.71	0.20
Reach - 1	7759	100-Year	825.00	56.45	65.63	62.56	65.72	0.001011	3.07	783.57	606.66	0.23
Reach - 1	7930	2-Year	166.00	57.33	62.87		62.95	0.001220	2.31	71.90	22.35	0.23
Reach - 1	7930	10-Year	352.00	57.33	65.12		65.17	0.000562	2.01	432.92	428.13	0.16
Reach - 1	7930	25-Year	491.00	57.33	65.42		65.48	0.000716	2.34	571.83	498.62	0.18
Reach - 1	7930	50-Year	616.00	57.33	65.62		65.68	0.000863	2.63	672.72	549.56	0.20
Reach - 1	7930	100-Year	756.00	57.33	65.82		65.90	0.000975	2.87	793.15	604.25	0.22
Reach - 1	8400	2-Year	166.00	57.72	63.53		63.63	0.001682	2.57	64.58	21.24	0.26
Reach - 1	8400	10-Year	352.00	57.72	65.43		65.48	0.000775	2.21	383.91	369.05	0.19
Reach - 1	8400	25-Year	491.00	57.72	65.79		65.85	0.000874	2.47	528.94	425.30	0.20
Reach - 1	8400	50-Year	616.00	57.72	66.05		66.11	0.000946	2.67	639.28	440.02	0.21

GUM SWAMP EXISTING CONDITIONS

HEC-RAS Plan: Gum Swamp - Ex River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	8400	100-Year	756.00	57.72	66.30		66.36	0.000995	2.83	751.88	449.17	0.22
Reach - 1	8872	2-Year	166.00	59.13	64.00		64.04	0.000524	1.64	101.30	28.67	0.15
Reach - 1	8872	10-Year	352.00	59.13	65.75		65.83	0.000682	2.27	155.85	35.28	0.18
Reach - 1	8872	25-Year	491.00	59.13	66.18		66.31	0.000987	2.86	220.02	309.82	0.22
Reach - 1	8872	50-Year	616.00	59.13	66.48		66.63	0.001175	3.22	315.01	327.94	0.24
Reach - 1	8872	100-Year	756.00	59.13	66.76		66.93	0.001324	3.51	412.42	362.93	0.26
Reach - 1	9293	2-Year	76.00	60.27	64.28		64.42	0.003963	3.01	25.28	11.93	0.36
Reach - 1	9293	10-Year	160.00	60.27	66.11	63.85	66.24	0.002446	3.01	79.66	287.45	0.30
Reach - 1	9293	25-Year	223.00	60.27	66.70		66.76	0.001217	2.31	282.59	397.26	0.22
Reach - 1	9293	50-Year	280.00	60.27	67.05		67.08	0.000833	1.99	431.36	455.96	0.18
Reach - 1	9293	100-Year	345.00	60.27	67.35		67.37	0.000630	1.79	575.93	505.41	0.16

SCUT1 EXISTING CONDITIONS

HEC-RAS Plan: SCUT1 - Ex River: Swift Creek UT1 Reach: Reach1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	231	2-Year	158.00	53.45	57.01	55.90	57.24	0.004002	3.84	41.09	17.71	0.44
Reach1	231	10-Year	304.00	53.45	58.20	56.74	58.52	0.004002	4.61	89.04	152.97	0.46
Reach1	231	25-Year	411.00	53.45	58.60	57.26	58.91	0.004004	4.84	155.90	188.62	0.46
Reach1	231	50-Year	505.00	53.45	58.85	57.67	59.15	0.004001	4.98	207.04	211.87	0.46
Reach1	231	100-Year	647.00	53.45	59.16	58.76	59.45	0.004001	5.14	277.71	240.33	0.47
Reach1	584	2-Year	158.00	53.78	58.02		58.14	0.001728	2.82	57.32	95.29	0.30
Reach1	584	10-Year	304.00	53.78	59.19		59.28	0.001280	2.83	197.55	146.73	0.27
Reach1	584	25-Year	411.00	53.78	59.59		59.69	0.001379	3.06	260.97	165.56	0.28
Reach1	584	50-Year	505.00	53.78	59.86		59.97	0.001493	3.28	307.32	177.90	0.29
Reach1	584	100-Year	647.00	53.78	60.19		60.31	0.001635	3.58	367.58	188.43	0.31
Reach1	1005	2-Year	158.00	54.86	58.74		58.80	0.001383	2.27	132.31	147.97	0.27
Reach1	1005	10-Year	304.00	54.86	59.69		59.73	0.000874	2.09	290.00	180.30	0.22
Reach1	1005	25-Year	411.00	54.86	60.11		60.15	0.000848	2.22	367.02	188.38	0.22
Reach1	1005	50-Year	505.00	54.86	60.41		60.45	0.000865	2.35	423.61	194.10	0.22
Reach1	1005	100-Year	647.00	54.86	60.78		60.83	0.000928	2.58	497.98	205.90	0.24
Reach1	1429	2-Year	123.00	54.48	59.33		59.43	0.001570	2.55	48.32	18.82	0.28
Reach1	1429	10-Year	239.00	54.48	60.14		60.35	0.002713	3.69	64.70	21.65	0.38
Reach1	1429	25-Year	315.00	54.48	60.52		60.81	0.003369	4.29	73.35	23.01	0.42
Reach1	1429	50-Year	412.00	54.48	60.81		61.22	0.004566	5.15	80.02	24.01	0.50
Reach1	1429	100-Year	514.00	54.48	61.17		61.69	0.005366	5.78	88.90	25.27	0.54
Reach1	1546	2-Year	123.00	55.52	59.53	58.04	59.65	0.002208	2.77	44.38	20.64	0.33
Reach1	1546	10-Year	239.00	55.52	60.47	58.86	60.68	0.002899	3.63	65.81	24.96	0.39
Reach1	1546	25-Year	315.00	55.52	60.95	59.27	61.20	0.003168	4.03	78.24	27.15	0.42
Reach1	1546	50-Year	412.00	55.52	61.40	59.73	61.72	0.003620	4.53	90.98	29.23	0.45
Reach1	1546	100-Year	514.00	55.52	61.89	60.14	62.26	0.003774	4.86	105.69	31.45	0.47
Reach1	1588.5		Culvert									
Reach1	1635	2-Year	123.00	55.72	60.47	57.86	60.51	0.000537	1.60	77.04	28.72	0.17
Reach1	1635	10-Year	239.00	55.72	61.74	58.61	61.80	0.000601	2.06	117.25	34.54	0.19
Reach1	1635	25-Year	315.00	55.72	62.07	59.00	62.16	0.000794	2.47	137.94	184.61	0.22
Reach1	1635	50-Year	412.00	55.72	62.26	59.43	62.39	0.001061	2.94	178.77	223.37	0.26
Reach1	1635	100-Year	514.00	55.72	62.40	59.81	62.56	0.001337	3.37	210.62	239.71	0.29

SCUT1 EXISTING CONDITIONS

HEC-RAS Plan: SCUT1 - Ex River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1798	2-Year	84.00	56.04	60.56		60.57	0.000191	1.01	83.44	29.31	0.10
Reach1	1798	10-Year	163.00	56.04	61.85		61.88	0.000223	1.33	126.41	37.08	0.12
Reach1	1798	25-Year	220.00	56.04	62.22		62.26	0.000303	1.62	154.13	123.58	0.14
Reach1	1798	50-Year	283.00	56.04	62.47		62.52	0.000387	1.88	187.35	140.69	0.16
Reach1	1798	100-Year	351.00	56.04	62.66		62.73	0.000480	2.14	215.47	153.69	0.18
Reach1	2289	2-Year	84.00	56.55	60.72		60.84	0.002680	2.75	30.57	15.77	0.35
Reach1	2289	10-Year	163.00	56.55	62.02		62.16	0.002140	2.98	54.77	21.33	0.33
Reach1	2289	25-Year	220.00	56.55	62.45		62.63	0.002514	3.43	64.23	23.50	0.36
Reach1	2289	50-Year	283.00	56.55	62.75		62.99	0.003048	3.97	71.63	25.66	0.40
Reach1	2289	100-Year	351.00	56.55	62.99		63.31	0.003703	4.55	78.09	27.41	0.45
Reach1	2669	2-Year	84.00	57.94	61.79		61.91	0.002985	2.72	30.92	18.07	0.37
Reach1	2669	10-Year	163.00	57.94	62.89		63.03	0.002427	3.01	54.41	25.02	0.35
Reach1	2669	25-Year	220.00	57.94	63.39		63.56	0.002369	3.31	67.83	28.40	0.35
Reach1	2669	50-Year	283.00	57.94	63.83		64.03	0.002435	3.63	80.91	31.34	0.37
Reach1	2669	100-Year	351.00	57.94	64.23		64.47	0.002514	3.93	94.18	34.07	0.38
Reach1	2906	2-Year	84.00	59.36	62.26	60.69	62.31	0.001018	1.84	45.58	22.29	0.23
Reach1	2906	10-Year	163.00	59.36	63.33	61.25	63.41	0.001070	2.28	71.61	26.16	0.24
Reach1	2906	25-Year	220.00	59.36	63.86	61.56	63.96	0.001174	2.56	85.92	28.06	0.26
Reach1	2906	50-Year	283.00	59.36	64.34	61.88	64.46	0.001287	2.84	99.70	29.78	0.27
Reach1	2906	100-Year	351.00	59.36	64.78	62.18	64.93	0.001394	3.10	113.24	31.37	0.29
Reach1	2952.5		Culvert									
Reach1	3015	2-Year	84.00	60.48	62.59	61.59	62.67	0.001959	2.21	37.99	23.35	0.31
Reach1	3015	10-Year	163.00	60.48	64.50	62.06	64.55	0.000626	1.84	88.62	29.79	0.19
Reach1	3015	25-Year	220.00	60.48	65.33	62.34	65.38	0.000538	1.92	115.38	37.04	0.18
Reach1	3015	50-Year	283.00	60.48	65.79	62.63	65.87	0.000604	2.17	134.30	44.25	0.19
Reach1	3015	100-Year	351.00	60.48	66.04	62.90	66.14	0.000766	2.53	155.98	247.80	0.22
Reach1	3270	2-Year	68.00	59.93	63.17		63.28	0.002965	2.68	25.41	15.23	0.37
Reach1	3270	10-Year	145.00	59.93	64.71		64.82	0.001780	2.67	54.30	22.21	0.30
Reach1	3270	25-Year	203.00	59.93	65.50		65.62	0.001433	2.79	74.09	27.85	0.28
Reach1	3270	50-Year	253.00	59.93	65.98		66.12	0.001406	2.99	88.22	31.30	0.28
Reach1	3270	100-Year	309.00	59.93	66.27		66.41	0.001368	3.11	158.90	275.56	0.28

SCUT1 EXISTING CONDITIONS

HEC-RAS Plan: SCUT1 - Ex River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	3690	2-Year	68.00	59.63	64.14		64.23	0.001785	2.37	28.65	12.14	0.27
Reach1	3690	10-Year	145.00	59.63	65.50		65.64	0.002107	3.04	47.66	16.42	0.31
Reach1	3690	25-Year	203.00	59.63	66.18	63.74	66.33	0.001945	3.22	98.35	243.73	0.30
Reach1	3690	50-Year	253.00	59.63	66.58		66.65	0.001135	2.59	207.29	294.38	0.24
Reach1	3690	100-Year	309.00	59.63	66.83		66.88	0.000904	2.37	283.89	325.38	0.21
Reach1	3808	2-Year	68.00	59.63	64.34		64.42	0.001430	2.18	31.17	12.69	0.25
Reach1	3808	10-Year	145.00	59.63	65.74		65.87	0.001669	2.81	52.20	20.72	0.28
Reach1	3808	25-Year	203.00	59.63	66.43		66.50	0.001083	2.48	163.38	275.04	0.23
Reach1	3808	50-Year	253.00	59.63	66.72		66.77	0.000797	2.20	249.23	311.73	0.20
Reach1	3808	100-Year	309.00	59.63	66.94		66.97	0.000694	2.11	319.58	338.86	0.19
Reach1	3936	2-Year	68.00	59.42	64.50	61.71	64.53	0.000465	1.42	47.83	17.39	0.15
Reach1	3936	10-Year	145.00	59.42	65.95	62.56	66.01	0.000606	1.90	76.27	21.70	0.18
Reach1	3936	25-Year	203.00	59.42	66.54	63.03	66.61	0.000688	2.14	127.81	152.08	0.19
Reach1	3936	50-Year	253.00	59.42	66.81	63.38	66.88	0.000756	2.32	174.40	206.71	0.20
Reach1	3936	100-Year	309.00	59.42	67.01	63.74	67.09	0.000836	2.50	221.85	253.54	0.22
Reach1	3967.5		Culvert									
Reach1	3997	2-Year	68.00	61.44	65.97	63.50	66.00	0.000533	1.44	47.08	19.45	0.16
Reach1	3997	10-Year	145.00	61.44	67.36	64.32	67.38	0.000281	1.30	220.43	250.05	0.13
Reach1	3997	25-Year	203.00	61.44	67.53	64.77	67.55	0.000403	1.60	264.44	281.03	0.15
Reach1	3997	50-Year	253.00	61.44	67.66	65.10	67.69	0.000489	1.80	302.26	304.15	0.17
Reach1	3997	100-Year	309.00	61.44	67.76	65.43	67.80	0.000595	2.02	335.32	321.93	0.19
Reach1	4120	2-Year	67.00	61.75	66.04		66.07	0.000584	1.47	46.24	38.66	0.17
Reach1	4120	10-Year	138.00	61.75	67.40		67.41	0.000197	1.08	223.27	195.19	0.11
Reach1	4120	25-Year	190.00	61.75	67.58		67.60	0.000253	1.26	259.50	204.23	0.12
Reach1	4120	50-Year	236.00	61.75	67.72		67.74	0.000294	1.38	288.52	211.19	0.13
Reach1	4120	100-Year	288.00	61.75	67.84		67.86	0.000349	1.53	313.95	217.10	0.14
Reach1	4307.5*	2-Year	67.00	62.35	66.17		66.23	0.001262	2.05	32.67	14.87	0.24
Reach1	4307.5*	10-Year	138.00	62.35	67.42		67.51	0.001307	2.49	69.64	121.59	0.26
Reach1	4307.5*	25-Year	190.00	62.35	67.60		67.73	0.001815	3.03	94.90	156.02	0.31
Reach1	4307.5*	50-Year	236.00	62.35	67.75		67.89	0.002118	3.34	119.52	183.46	0.33
Reach1	4307.5*	100-Year	288.00	62.35	67.88		68.04	0.002416	3.64	145.02	208.11	0.36

SCUT1 EXISTING CONDITIONS

HEC-RAS Plan: SCUT1 - Ex River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	4495	2-Year	67.00	62.94	66.46		66.59	0.002719	2.85	23.54	10.66	0.34
Reach1	4495	10-Year	138.00	62.94	67.70		67.90	0.003110	3.59	38.47	13.34	0.37
Reach1	4495	25-Year	190.00	62.94	67.98	66.38	68.30	0.004581	4.49	42.29	14.75	0.45
Reach1	4495	50-Year	236.00	62.94	68.17	66.76	68.59	0.005784	5.21	50.92	78.89	0.51
Reach1	4495	100-Year	288.00	62.94	68.35	67.14	68.85	0.006707	5.76	70.79	134.27	0.56

PRIMARY SYSTEM FUTURE CONDITIONS: HEC-RAS OUTPUT

SWIFT CREEK FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	234198	2-year	266.00	51.54	56.05	54.47	56.31	0.003003	4.12	79.15	63.57	0.40
Reach-1	234198	10-year	508.00	51.54	57.13	55.55	57.42	0.003002	4.84	324.17	373.01	0.41
Reach-1	234198	25-year	718.00	51.54	57.60	57.03	57.89	0.003002	5.18	518.67	439.94	0.41
Reach-1	234198	50-year	907.00	51.54	57.94	57.36	58.21	0.003001	5.41	670.42	471.80	0.42
Reach-1	234198	100-year	1116.00	51.54	58.26	57.60	58.52	0.003000	5.63	825.28	492.50	0.42
Reach-1	234875	2-year	266.00	52.10	57.37		57.47	0.001074	2.82	218.32	293.96	0.25
Reach-1	234875	10-year	508.00	52.10	58.31		58.37	0.000762	2.73	600.74	459.40	0.21
Reach-1	234875	25-year	718.00	52.10	58.77		58.83	0.000755	2.88	823.94	515.05	0.22
Reach-1	234875	50-year	907.00	52.10	59.11		59.17	0.000769	3.03	1006.31	558.52	0.22
Reach-1	234875	100-year	1116.00	52.10	59.42		59.48	0.000766	3.13	1182.70	574.63	0.22
Reach-1	235139	2-year	266.00	51.75	57.62	54.10	57.69	0.000573	2.11	225.53	318.43	0.18
Reach-1	235139	10-year	508.00	51.75	58.49	55.18	58.54	0.000558	2.28	588.48	489.36	0.18
Reach-1	235139	25-year	718.00	51.75	58.95	55.93	59.00	0.000548	2.40	820.78	524.12	0.18
Reach-1	235139	50-year	907.00	51.75	59.29	56.52	59.34	0.000554	2.51	1004.17	565.17	0.19
Reach-1	235139	100-year	1116.00	51.75	59.60	58.05	59.65	0.000571	2.64	1183.15	588.99	0.19
Reach-1	235165		Bridge									
Reach-1	235183	2-year	266.00	51.76	58.07	54.19	58.12	0.000335	1.79	148.69	320.04	0.15
Reach-1	235183	10-year	508.00	51.76	59.56	55.17	59.58	0.000154	1.39	967.89	516.32	0.10
Reach-1	235183	25-year	718.00	51.76	59.85	55.84	59.87	0.000228	1.75	1120.61	548.78	0.13
Reach-1	235183	50-year	907.00	51.76	60.03	56.34	60.07	0.000300	2.04	1222.71	552.97	0.15
Reach-1	235183	100-year	1116.00	51.76	60.19	56.82	60.24	0.000385	2.36	1312.24	556.98	0.17
Reach-1	235196	2-year	266.00	52.47	58.05	55.31	58.16	0.000992	2.59	102.77	504.67	0.24
Reach-1	235196	10-year	508.00	52.47	59.56	56.38	59.59	0.000281	1.70	700.56	601.17	0.13
Reach-1	235196	25-year	718.00	52.47	59.89	57.07	59.89	0.000074	0.91	2069.11	604.98	0.07
Reach-1	235196	50-year	907.00	52.47	60.09	57.55	60.09	0.000100	1.08	2189.48	607.15	0.08
Reach-1	235196	100-year	1116.00	52.47	60.26	58.04	60.27	0.000131	1.27	2297.37	610.79	0.09
Reach-1	235219		Culvert									
Reach-1	235247	2-year	266.00	53.17	59.05	56.37	59.07	0.000368	1.55	388.42	493.09	0.15
Reach-1	235247	10-year	508.00	53.17	59.63	57.32	59.68	0.000583	2.14	562.50	514.36	0.19
Reach-1	235247	25-year	718.00	53.17	59.95	57.98	59.97	0.000362	1.77	1074.55	530.05	0.15
Reach-1	235247	50-year	907.00	53.17	60.18	58.46	60.21	0.000430	1.99	1199.10	543.33	0.17

SWIFT CREEK FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	235247	100-year	1116.00	53.17	60.31	58.88	60.35	0.000555	2.30	1272.75	556.44	0.19
Reach-1	235428	2-year	256.00	53.13	59.10	56.16	59.14	0.000350	1.75	444.27	286.07	0.15
Reach-1	235428	10-year	494.00	53.13	59.72	57.70	59.78	0.000630	2.56	631.52	318.35	0.20
Reach-1	235428	25-year	703.00	53.13	59.99	58.32	60.08	0.000954	3.26	718.29	328.14	0.25
Reach-1	235428	50-year	877.00	53.13	60.23	58.59	60.34	0.001162	3.71	797.26	345.10	0.28
Reach-1	235428	100-year	1067.00	53.13	60.37	58.82	60.52	0.001488	4.27	847.00	367.24	0.32
Reach-1	235914	2-year	256.00	53.95	59.33		59.44	0.001149	2.84	193.17	208.47	0.26
Reach-1	235914	10-year	494.00	53.95	60.11		60.25	0.001480	3.65	372.86	253.15	0.30
Reach-1	235914	25-year	703.00	53.95	60.54		60.72	0.001778	4.24	491.25	290.49	0.33
Reach-1	235914	50-year	877.00	53.95	60.87		61.05	0.001854	4.52	589.35	301.74	0.34
Reach-1	235914	100-year	1067.00	53.95	61.16		61.35	0.001993	4.85	676.40	310.08	0.36
Reach-1	236412	2-year	256.00	54.78	59.84		59.89	0.000661	2.08	327.89	307.27	0.19
Reach-1	236412	10-year	494.00	54.78	60.71		60.75	0.000640	2.36	631.96	403.39	0.20
Reach-1	236412	25-year	703.00	54.78	61.23		61.27	0.000660	2.58	852.57	450.06	0.20
Reach-1	236412	50-year	877.00	54.78	61.59		61.63	0.000685	2.75	1019.38	472.86	0.21
Reach-1	236412	100-year	1067.00	54.78	61.91		61.96	0.000706	2.90	1174.66	488.09	0.22
Reach-1	236856	2-year	256.00	54.38	60.20	57.76	60.35	0.001671	3.21	139.96	157.03	0.30
Reach-1	236856	10-year	494.00	54.38	61.06	59.03	61.25	0.002063	4.08	307.10	233.24	0.34
Reach-1	236856	25-year	703.00	54.38	61.58	60.48	61.79	0.002162	4.49	438.86	272.73	0.36
Reach-1	236856	50-year	877.00	54.38	61.95	60.80	62.17	0.002261	4.82	549.06	324.20	0.37
Reach-1	236856	100-year	1067.00	54.38	62.29	61.16	62.51	0.002253	5.01	661.33	377.80	0.37
Reach-1	237179	2-year	256.00	55.37	60.72		60.86	0.001493	3.09	143.32	165.35	0.28
Reach-1	237179	10-year	494.00	55.37	61.67		61.82	0.001590	3.67	341.45	228.43	0.30
Reach-1	237179	25-year	703.00	55.37	62.22		62.38	0.001676	4.06	470.68	242.89	0.32
Reach-1	237179	50-year	877.00	55.37	62.62		62.79	0.001719	4.32	568.41	253.28	0.32
Reach-1	237179	100-year	1067.00	55.37	62.95		63.13	0.001844	4.65	653.94	262.04	0.34
Reach-1	237456	2-year	256.00	55.98	61.16	58.90	61.26	0.001396	2.79	159.79	261.45	0.28
Reach-1	237456	10-year	494.00	55.98	62.13	60.05	62.24	0.001333	3.19	338.11	308.92	0.28
Reach-1	237456	25-year	703.00	55.98	62.70	61.27	62.76	0.000926	2.90	719.09	339.99	0.24
Reach-1	237456	50-year	877.00	55.98	63.07	61.53	63.14	0.000958	3.11	849.65	355.24	0.25
Reach-1	237456	100-year	1067.00	55.98	63.43	61.76	63.51	0.000983	3.30	979.19	365.25	0.25

SWIFT CREEK FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	237708	2-year	256.00	56.29	61.51	59.26	61.61	0.001237	2.70	188.93	294.65	0.27
Reach-1	237708	10-year	494.00	56.29	62.48	60.35	62.57	0.001011	2.90	588.09	441.21	0.25
Reach-1	237708	25-year	703.00	56.29	62.96	61.31	63.05	0.001068	3.21	798.47	473.81	0.26
Reach-1	237708	50-year	877.00	56.29	63.34	61.87	63.43	0.001052	3.36	970.33	496.38	0.27
Reach-1	237708	100-year	1067.00	56.29	63.71	62.19	63.80	0.001045	3.51	1137.92	507.24	0.27
Reach-1	237781		Culvert									
Reach-1	237845	2-year	256.00	56.31	62.85	59.45	62.87	0.000222	1.38	573.76	402.90	0.11
Reach-1	237845	10-year	494.00	56.31	63.39	60.66	63.42	0.000340	1.84	925.17	461.28	0.14
Reach-1	237845	25-year	703.00	56.31	63.68	61.40	63.72	0.000523	2.36	1024.24	503.70	0.18
Reach-1	237845	50-year	877.00	56.31	63.82	61.90	63.87	0.000715	2.81	1074.05	523.16	0.21
Reach-1	237845	100-year	1067.00	56.31	64.01	62.38	64.08	0.000894	3.22	1141.82	540.29	0.24
Reach-1	238094	2-year	242.00	56.52	62.91	59.59	62.99	0.000819	2.42	187.07	408.20	0.21
Reach-1	238094	10-year	444.00	56.52	63.47	60.69	63.62	0.001403	3.39	335.66	529.48	0.28
Reach-1	238094	25-year	588.00	56.52	63.80	61.33	63.97	0.001647	3.84	427.50	550.01	0.30
Reach-1	238094	50-year	711.00	56.52	63.99	61.80	64.19	0.001933	4.27	480.26	557.40	0.33
Reach-1	238094	100-year	852.00	56.52	64.23	63.06	64.45	0.002138	4.62	546.16	566.61	0.35
Reach-1	238526	2-year	242.00	56.20	63.11	58.14	63.14	0.000184	1.41	195.73	72.78	0.11
Reach-1	238526	10-year	444.00	56.20	63.84	58.98	63.91	0.000381	2.20	271.54	200.36	0.16
Reach-1	238526	25-year	588.00	56.20	64.25	59.47	64.35	0.000507	2.66	340.89	241.43	0.19
Reach-1	238526	50-year	711.00	56.20	64.52	59.86	64.64	0.000616	3.01	391.26	256.57	0.21
Reach-1	238526	100-year	852.00	56.20	64.82	60.27	64.97	0.000726	3.37	453.70	290.26	0.23
Reach-1	238936	2-year	242.00	56.88	63.20	58.95	63.23	0.000219	1.41	172.11	39.07	0.12
Reach-1	238936	10-year	444.00	56.88	64.01	59.69	64.08	0.000439	2.17	206.75	47.57	0.17
Reach-1	238936	25-year	588.00	56.88	64.47	60.13	64.57	0.000586	2.63	229.92	53.28	0.20
Reach-1	238936	50-year	711.00	56.88	64.78	60.48	64.92	0.000709	3.00	247.12	56.94	0.22
Reach-1	238936	100-year	852.00	56.88	65.12	60.84	65.30	0.000837	3.39	267.84	68.64	0.24
Reach-1	239177	2-year	242.00	57.85	63.18	61.25	63.42	0.002970	3.95	61.33	19.28	0.39
Reach-1	239177	10-year	444.00	57.85	63.95	62.40	64.47	0.005419	5.76	77.09	21.43	0.54
Reach-1	239177	25-year	588.00	57.85	64.38	63.05	65.10	0.007001	6.80	86.52	63.37	0.61
Reach-1	239177	50-year	711.00	57.85	64.65	63.53	65.56	0.008461	7.66	96.96	114.89	0.68
Reach-1	239177	100-year	852.00	57.85	64.96	64.03	66.05	0.009707	8.42	116.14	158.25	0.73

SWIFT CREEK FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	239470	2-year	242.00	57.77	63.69	59.94	63.75	0.000447	1.93	125.28	28.39	0.16
Reach-1	239470	10-year	444.00	57.77	64.93	60.78	65.05	0.000733	2.74	162.12	30.97	0.21
Reach-1	239470	25-year	588.00	57.77	65.67	61.29	65.83	0.000882	3.17	185.69	34.40	0.23
Reach-1	239470	50-year	711.00	57.77	66.22	61.68	66.41	0.000968	3.48	211.25	59.23	0.25
Reach-1	239470	100-year	852.00	57.77	66.79	62.10	67.01	0.001038	3.77	249.37	83.41	0.26
Reach-1	239543		Culvert									
Reach-1	239601	2-year	242.00	57.56	65.40	59.95	65.43	0.000206	1.47	165.91	44.43	0.11
Reach-1	239601	10-year	444.00	57.56	68.02	60.88	68.04	0.000110	1.37	570.96	374.01	0.09
Reach-1	239601	25-year	588.00	57.56	68.38	61.43	68.41	0.000150	1.65	645.96	406.30	0.10
Reach-1	239601	50-year	711.00	57.56	68.57	61.85	68.61	0.000192	1.90	686.43	422.67	0.12
Reach-1	239601	100-year	852.00	57.56	68.76	62.29	68.81	0.000236	2.14	781.87	438.78	0.13
Reach-1	239904	2-year	216.00	58.41	65.48	61.29	65.54	0.000562	1.94	111.17	29.40	0.18
Reach-1	239904	10-year	389.00	58.41	68.06	62.36	68.09	0.000239	1.51	483.02	336.17	0.11
Reach-1	239904	25-year	512.00	58.41	68.43	63.04	68.47	0.000276	1.70	602.45	367.42	0.12
Reach-1	239904	50-year	617.00	58.41	68.64	63.53	68.68	0.000321	1.88	674.51	385.09	0.14
Reach-1	239904	100-year	737.00	58.41	68.85	63.99	68.90	0.000354	2.02	798.36	404.47	0.14
Reach-1	240316	2-year	216.00	59.47	65.79		65.99	0.002196	3.52	61.38	16.68	0.32
Reach-1	240316	10-year	389.00	59.47	68.19		68.26	0.000744	2.51	329.42	238.07	0.20
Reach-1	240316	25-year	512.00	59.47	68.59		68.66	0.000806	2.72	431.95	282.42	0.21
Reach-1	240316	50-year	617.00	59.47	68.82		68.90	0.000879	2.92	500.51	301.68	0.22
Reach-1	240316	100-year	737.00	59.47	69.05		69.13	0.000960	3.13	571.33	321.56	0.23
Reach-1	240800	2-year	216.00	60.78	66.70		66.83	0.001397	2.88	83.30	47.16	0.27
Reach-1	240800	10-year	389.00	60.78	68.55		68.65	0.000814	2.71	244.84	175.94	0.22
Reach-1	240800	25-year	512.00	60.78	68.98		69.09	0.000921	3.01	328.74	217.56	0.23
Reach-1	240800	50-year	617.00	60.78	69.25		69.37	0.001034	3.27	392.33	250.72	0.25
Reach-1	240800	100-year	737.00	60.78	69.52		69.66	0.001148	3.52	465.17	289.19	0.26
Reach-1	241107	2-year	216.00	61.47	67.19		67.34	0.001958	3.22	79.81	54.80	0.32
Reach-1	241107	10-year	389.00	61.47	68.84		68.93	0.001040	2.75	282.60	204.66	0.24
Reach-1	241107	25-year	512.00	61.47	69.30		69.39	0.001022	2.89	386.62	250.10	0.24
Reach-1	241107	50-year	617.00	61.47	69.61		69.69	0.001030	3.00	468.00	280.61	0.24
Reach-1	241107	100-year	737.00	61.47	69.91		70.00	0.001038	3.11	557.18	310.91	0.25

SWIFT CREEK FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	241592	2-year	165.00	62.40	67.91		67.99	0.000866	2.22	74.25	22.66	0.22
Reach-1	241592	10-year	301.00	62.40	69.30		69.39	0.000842	2.54	170.20	125.21	0.22
Reach-1	241592	25-year	398.00	62.40	69.76		69.86	0.000917	2.80	236.81	163.86	0.23
Reach-1	241592	50-year	484.00	62.40	70.08		70.19	0.000985	3.01	297.30	232.68	0.24
Reach-1	241592	100-year	578.00	62.40	70.39		70.50	0.001006	3.13	373.69	270.68	0.25
Reach-1	241994	2-year	165.00	63.58	68.28		68.37	0.001007	2.32	71.65	29.53	0.23
Reach-1	241994	10-year	301.00	63.58	69.66		69.76	0.000969	2.63	153.69	89.08	0.23
Reach-1	241994	25-year	398.00	63.58	70.15		70.27	0.001076	2.96	214.23	205.66	0.25
Reach-1	241994	50-year	484.00	63.58	70.49		70.61	0.001085	3.09	296.95	282.69	0.25
Reach-1	241994	100-year	578.00	63.58	70.80		70.92	0.001057	3.17	395.48	349.55	0.25

SCUT1 FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek UT1 Reach: Reach1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	231	2-Year	168.00	53.45	57.11	55.97	57.35	0.004002	3.92	42.89	17.92	0.45
Reach1	231	10-Year	321.00	53.45	58.28	56.83	58.60	0.004002	4.66	100.84	159.84	0.46
Reach1	231	25-Year	428.00	53.45	58.65	57.33	58.95	0.004005	4.87	165.46	193.18	0.46
Reach1	231	50-Year	533.00	53.45	58.92	57.78	59.21	0.004001	5.01	221.47	217.99	0.46
Reach1	231	100-Year	675.00	53.45	59.22	58.80	59.50	0.004001	5.17	291.02	245.32	0.47
Reach1	584	2-Year	168.00	53.78	58.13		58.25	0.001712	2.86	67.91	99.56	0.30
Reach1	584	10-Year	321.00	53.78	59.26		59.36	0.001288	2.86	208.90	150.27	0.27
Reach1	584	25-Year	428.00	53.78	59.65		59.75	0.001399	3.10	269.81	168.02	0.28
Reach1	584	50-Year	533.00	53.78	59.93		60.04	0.001522	3.34	319.79	180.13	0.29
Reach1	584	100-Year	675.00	53.78	60.25		60.37	0.001663	3.63	378.49	190.28	0.31
Reach1	1005	2-Year	168.00	54.86	58.83		58.88	0.001291	2.23	145.69	151.27	0.26
Reach1	1005	10-Year	321.00	54.86	59.77		59.81	0.000863	2.11	303.57	181.75	0.22
Reach1	1005	25-Year	428.00	54.86	60.17		60.21	0.000850	2.25	377.85	189.49	0.22
Reach1	1005	50-Year	533.00	54.86	60.48		60.53	0.000874	2.40	438.80	195.60	0.23
Reach1	1005	100-Year	675.00	54.86	60.85		60.90	0.000941	2.62	511.82	208.43	0.24
Reach1	1429	2-Year	130.00	54.48	59.40		59.50	0.001635	2.62	49.60	19.06	0.29
Reach1	1429	10-Year	247.00	54.48	60.20		60.42	0.002736	3.74	66.10	21.88	0.38
Reach1	1429	25-Year	327.00	54.48	60.58		60.88	0.003470	4.38	74.60	23.20	0.43
Reach1	1429	50-Year	431.00	54.48	60.88		61.31	0.004711	5.27	81.81	24.26	0.51
Reach1	1429	100-Year	531.00	54.48	61.23		61.77	0.005451	5.86	90.56	25.50	0.55
Reach1	1546	2-Year	130.00	55.52	59.61	58.10	59.73	0.002247	2.83	45.95	20.99	0.34
Reach1	1546	10-Year	247.00	55.52	60.54	58.90	60.75	0.002891	3.66	67.51	25.27	0.39
Reach1	1546	25-Year	327.00	55.52	61.02	59.33	61.28	0.003204	4.08	80.12	27.47	0.42
Reach1	1546	50-Year	431.00	55.52	61.50	59.80	61.83	0.003650	4.59	93.81	29.67	0.46
Reach1	1546	100-Year	531.00	55.52	61.97	60.21	62.34	0.003782	4.91	108.25	35.58	0.47
Reach1	1588.5		Culvert									
Reach1	1635	2-Year	130.00	55.72	60.66	57.91	60.70	0.000497	1.57	82.61	29.69	0.17
Reach1	1635	10-Year	247.00	55.72	61.80	58.66	61.87	0.000610	2.09	119.30	34.80	0.19
Reach1	1635	25-Year	327.00	55.72	62.10	59.06	62.20	0.000824	2.53	144.51	192.30	0.23
Reach1	1635	50-Year	431.00	55.72	62.28	59.50	62.42	0.001131	3.04	182.78	225.49	0.27
Reach1	1635	100-Year	531.00	55.72	62.40	59.88	62.57	0.001424	3.48	210.86	239.83	0.30

SCUT1 FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1798	2-Year	94.00	56.04	60.74		60.76	0.000197	1.06	88.98	30.42	0.11
Reach1	1798	10-Year	176.00	56.04	61.91		61.94	0.000248	1.41	128.67	37.44	0.12
Reach1	1798	25-Year	239.00	56.04	62.26		62.30	0.000345	1.73	159.02	126.24	0.15
Reach1	1798	50-Year	302.00	56.04	62.50		62.56	0.000426	1.98	191.67	142.76	0.17
Reach1	1798	100-Year	369.00	56.04	62.68		62.75	0.000520	2.23	218.12	154.86	0.18
Reach1	2289	2-Year	94.00	56.55	60.91		61.03	0.002607	2.80	33.62	16.57	0.35
Reach1	2289	10-Year	176.00	56.55	62.10		62.25	0.002299	3.12	56.48	21.66	0.34
Reach1	2289	25-Year	239.00	56.55	62.52		62.72	0.002758	3.63	65.85	24.00	0.38
Reach1	2289	50-Year	302.00	56.55	62.81		63.07	0.003281	4.16	73.10	26.07	0.42
Reach1	2289	100-Year	369.00	56.55	63.04		63.38	0.003929	4.72	79.29	27.72	0.46
Reach1	2669	2-Year	94.00	57.94	61.96		62.08	0.002930	2.77	33.97	19.09	0.37
Reach1	2669	10-Year	176.00	57.94	63.00		63.15	0.002428	3.09	57.37	25.80	0.35
Reach1	2669	25-Year	239.00	57.94	63.52		63.70	0.002409	3.42	71.63	29.28	0.36
Reach1	2669	50-Year	302.00	57.94	63.94		64.15	0.002473	3.73	84.48	32.10	0.37
Reach1	2669	100-Year	369.00	57.94	64.33		64.58	0.002536	4.01	97.56	34.73	0.38
Reach1	2906	2-Year	94.00	59.36	62.42	60.78	62.48	0.001021	1.91	49.26	22.88	0.23
Reach1	2906	10-Year	176.00	59.36	63.46	61.32	63.54	0.001100	2.35	74.91	26.61	0.25
Reach1	2906	25-Year	239.00	59.36	64.01	61.66	64.12	0.001214	2.65	90.10	28.59	0.26
Reach1	2906	50-Year	302.00	59.36	64.46	61.96	64.60	0.001322	2.92	103.49	30.23	0.28
Reach1	2906	100-Year	369.00	59.36	64.89	62.26	65.04	0.001421	3.16	116.63	31.76	0.29
Reach1	2952.5		Culvert									
Reach1	3015	2-Year	94.00	60.48	62.82	61.66	62.89	0.001657	2.17	43.35	24.11	0.28
Reach1	3015	10-Year	176.00	60.48	64.81	62.13	64.86	0.000548	1.79	98.05	30.84	0.18
Reach1	3015	25-Year	239.00	60.48	65.48	62.43	65.55	0.000555	2.00	121.36	39.47	0.18
Reach1	3015	50-Year	302.00	60.48	65.90	62.70	65.98	0.000629	2.25	139.32	45.98	0.20
Reach1	3015	100-Year	369.00	60.48	66.10	62.97	66.20	0.000795	2.59	170.54	263.90	0.22
Reach1	3270	2-Year	78.00	59.93	63.33		63.45	0.003008	2.78	28.01	15.98	0.37
Reach1	3270	10-Year	158.00	59.93	64.99		65.10	0.001511	2.61	60.79	24.15	0.28
Reach1	3270	25-Year	217.00	59.93	65.66		65.78	0.001398	2.83	78.60	29.00	0.28
Reach1	3270	50-Year	268.00	59.93	66.10		66.24	0.001389	3.03	112.23	249.95	0.28
Reach1	3270	100-Year	325.00	59.93	66.34		66.47	0.001338	3.11	176.93	285.01	0.28

SCUT1 FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	3690	2-Year	78.00	59.63	64.34		64.44	0.001880	2.50	31.18	12.69	0.28
Reach1	3690	10-Year	158.00	59.63	65.70		65.85	0.002068	3.11	51.28	19.92	0.31
Reach1	3690	25-Year	217.00	59.63	66.30	63.86	66.43	0.001676	3.04	130.30	259.51	0.28
Reach1	3690	50-Year	268.00	59.63	66.67		66.73	0.001003	2.46	235.30	306.08	0.22
Reach1	3690	100-Year	325.00	59.63	66.88		66.93	0.000880	2.36	300.89	331.87	0.21
Reach1	3808	2-Year	78.00	59.63	64.56		64.64	0.001500	2.30	33.96	13.27	0.25
Reach1	3808	10-Year	158.00	59.63	65.94		66.07	0.001650	2.87	56.61	24.19	0.28
Reach1	3808	25-Year	217.00	59.63	66.52		66.58	0.000987	2.39	188.35	286.20	0.22
Reach1	3808	50-Year	268.00	59.63	66.80		66.84	0.000738	2.14	273.23	321.24	0.19
Reach1	3808	100-Year	325.00	59.63	66.98		67.02	0.000683	2.10	336.14	344.93	0.19
Reach1	3936	2-Year	78.00	59.42	64.72	61.84	64.76	0.000493	1.50	51.84	18.06	0.16
Reach1	3936	10-Year	158.00	59.42	66.15	62.66	66.21	0.000615	1.95	84.70	65.93	0.18
Reach1	3936	25-Year	217.00	59.42	66.62	63.14	66.69	0.000715	2.20	139.78	167.53	0.20
Reach1	3936	50-Year	268.00	59.42	66.88	63.49	66.95	0.000769	2.36	189.40	222.54	0.21
Reach1	3936	100-Year	325.00	59.42	67.06	63.84	67.14	0.000861	2.56	234.15	264.34	0.22
Reach1	3967.5		Culvert									
Reach1	3997	2-Year	78.00	61.44	66.38	63.63	66.41	0.000438	1.38	60.42	69.98	0.15
Reach1	3997	10-Year	158.00	61.44	67.42	64.42	67.44	0.000298	1.36	235.64	261.18	0.13
Reach1	3997	25-Year	217.00	61.44	67.54	64.87	67.57	0.000444	1.68	269.68	284.50	0.16
Reach1	3997	50-Year	268.00	61.44	67.70	65.20	67.73	0.000504	1.84	315.81	311.56	0.17
Reach1	3997	100-Year	325.00	61.44	67.72	65.52	67.77	0.000709	2.19	322.86	315.35	0.20
Reach1	4120	2-Year	70.00	61.75	66.44		66.46	0.000354	1.24	73.35	94.68	0.14
Reach1	4120	10-Year	142.00	61.75	67.46		67.47	0.000183	1.05	235.42	198.26	0.10
Reach1	4120	25-Year	194.00	61.75	67.60		67.62	0.000251	1.26	264.42	205.42	0.12
Reach1	4120	50-Year	241.00	61.75	67.77		67.78	0.000281	1.36	298.23	213.47	0.13
Reach1	4120	100-Year	293.00	61.75	67.81		67.84	0.000378	1.58	308.75	215.91	0.15
Reach1	4307.5*	2-Year	70.00	62.35	66.52		66.57	0.000910	1.84	38.13	16.00	0.21
Reach1	4307.5*	10-Year	142.00	62.35	67.48		67.57	0.001259	2.47	77.07	132.64	0.25
Reach1	4307.5*	25-Year	194.00	62.35	67.62		67.75	0.001811	3.03	98.65	160.50	0.31
Reach1	4307.5*	50-Year	241.00	62.35	67.79		67.93	0.002015	3.28	128.10	192.11	0.33
Reach1	4307.5*	100-Year	293.00	62.35	67.85		68.03	0.002616	3.78	140.57	204.02	0.37

SCUT1 FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	4495	2-Year	70.00	62.94	66.73		66.84	0.002155	2.64	26.54	11.24	0.30
Reach1	4495	10-Year	142.00	62.94	67.75		67.96	0.003154	3.63	39.10	13.44	0.38
Reach1	4495	25-Year	194.00	62.94	68.00	66.42	68.33	0.004680	4.56	42.63	19.39	0.46
Reach1	4495	50-Year	241.00	62.94	68.19	66.80	68.62	0.005901	5.27	52.41	85.28	0.52
Reach1	4495	100-Year	293.00	62.94	68.38	67.18	68.87	0.006662	5.76	74.20	138.43	0.56

GUM SWAMP FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Gum Swamp Reach: Reach - 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	663.5	2-Year	336.00	46.81	53.28	50.55	53.72	0.002603	5.48	82.31	33.59	0.39
Reach - 1	663.5	10-Year	686.00	46.81	54.96	52.65	55.40	0.002602	6.42	386.07	304.64	0.40
Reach - 1	663.5	25-Year	947.00	46.81	55.51	54.77	55.89	0.002602	6.71	558.59	330.93	0.41
Reach - 1	663.5	50-Year	1182.00	46.81	55.91	55.31	56.27	0.002603	6.92	696.45	350.52	0.41
Reach - 1	663.5	100-Year	1442.00	46.81	56.31	55.57	56.65	0.002601	7.13	844.15	390.17	0.41
Reach - 1	1000.0	2-Year	336.00	46.98	54.12		54.27	0.001017	3.67	251.85	229.96	0.25
Reach - 1	1000.0	10-Year	686.00	46.98	55.77		55.86	0.000742	3.61	779.08	381.23	0.22
Reach - 1	1000.0	25-Year	947.00	46.98	56.29		56.38	0.000835	3.98	982.70	402.17	0.23
Reach - 1	1000.0	50-Year	1182.00	46.98	56.68		56.78	0.000903	4.26	1144.42	418.06	0.24
Reach - 1	1000.0	100-Year	1442.00	46.98	57.08		57.17	0.000960	4.51	1311.45	433.86	0.25
Reach - 1	1500.0	2-Year	336.00	47.40	54.64		54.91	0.001464	4.45	132.22	87.24	0.30
Reach - 1	1500.0	10-Year	686.00	47.40	56.16		56.45	0.001677	5.43	483.31	402.54	0.33
Reach - 1	1500.0	25-Year	947.00	47.40	56.75		57.02	0.001764	5.82	759.77	525.76	0.34
Reach - 1	1500.0	50-Year	1182.00	47.40	57.18		57.40	0.001571	5.66	994.40	549.23	0.32
Reach - 1	1500.0	100-Year	1442.00	47.40	57.60		57.78	0.001443	5.58	1228.50	571.70	0.31
Reach - 1	2000.0	2-Year	336.00	47.83	55.39		55.68	0.001613	4.57	110.87	69.72	0.30
Reach - 1	2000.0	10-Year	686.00	47.83	57.01		57.29	0.001680	5.33	554.69	403.13	0.31
Reach - 1	2000.0	25-Year	947.00	47.83	57.63		57.86	0.001577	5.40	811.72	424.00	0.31
Reach - 1	2000.0	50-Year	1182.00	47.83	57.99		58.23	0.001720	5.78	971.33	454.93	0.32
Reach - 1	2000.0	100-Year	1442.00	47.83	58.37		58.59	0.001767	6.00	1143.44	466.47	0.33
Reach - 1	2535.0	2-Year	336.00	48.54	56.24		56.49	0.001404	4.32	155.26	180.06	0.28
Reach - 1	2535.0	10-Year	686.00	48.54	57.88		58.06	0.001201	4.56	690.22	455.31	0.27
Reach - 1	2535.0	25-Year	947.00	48.54	58.45		58.62	0.001253	4.85	973.54	515.01	0.27
Reach - 1	2535.0	50-Year	1182.00	48.54	58.86		59.01	0.001236	4.95	1185.82	521.11	0.27
Reach - 1	2535.0	100-Year	1442.00	48.54	59.25		59.39	0.001252	5.11	1391.16	534.03	0.28
Reach - 1	3000.0	2-Year	301.00	48.92	56.88		57.10	0.001179	4.01	158.84	138.12	0.25
Reach - 1	3000.0	10-Year	617.00	48.92	58.43		58.64	0.001292	4.74	552.18	380.19	0.27
Reach - 1	3000.0	25-Year	852.00	48.92	59.03		59.23	0.001365	5.08	806.75	489.83	0.29
Reach - 1	3000.0	50-Year	1073.00	48.92	59.44		59.64	0.001421	5.33	1027.35	576.56	0.29
Reach - 1	3000.0	100-Year	1324.00	48.92	59.84		60.01	0.001387	5.40	1257.47	581.24	0.29
Reach - 1	3500.0	2-Year	301.00	49.52	57.47		57.63	0.000955	3.61	208.65	210.99	0.23
Reach - 1	3500.0	10-Year	617.00	49.52	59.06		59.17	0.000850	3.85	778.41	462.98	0.22

GUM SWAMP FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	3500.0	25-Year	852.00	49.52	59.67		59.77	0.000837	3.99	1078.71	516.01	0.22
Reach - 1	3500.0	50-Year	1073.00	49.52	60.09		60.19	0.000867	4.18	1305.78	549.35	0.23
Reach - 1	3500.0	100-Year	1324.00	49.52	60.48		60.58	0.000919	4.41	1522.43	576.80	0.24
Reach - 1	4000.0	2-Year	301.00	50.17	57.97		58.20	0.001267	4.10	121.38	50.90	0.26
Reach - 1	4000.0	10-Year	617.00	50.17	59.47	55.80	59.92	0.002193	6.09	356.42	308.64	0.36
Reach - 1	4000.0	25-Year	852.00	50.17	60.10		60.50	0.002182	6.35	583.90	387.74	0.36
Reach - 1	4000.0	50-Year	1073.00	50.17	60.57		60.91	0.002139	6.49	774.94	430.71	0.36
Reach - 1	4000.0	100-Year	1324.00	50.17	60.99		61.31	0.002114	6.63	964.86	457.45	0.36
Reach - 1	4500.0	2-Year	301.00	51.25	58.64		58.89	0.001490	4.29	137.31	134.57	0.28
Reach - 1	4500.0	10-Year	617.00	51.25	60.56		60.74	0.001219	4.54	531.95	268.14	0.27
Reach - 1	4500.0	25-Year	852.00	51.25	61.17		61.36	0.001341	4.97	710.60	325.70	0.28
Reach - 1	4500.0	50-Year	1073.00	51.25	61.61		61.81	0.001494	5.41	866.24	371.03	0.30
Reach - 1	4500.0	100-Year	1324.00	51.25	62.02		62.23	0.001600	5.75	1026.54	401.01	0.31
Reach - 1	5000.0	2-Year	270.00	51.44	59.32		59.47	0.000881	3.44	178.79	122.33	0.22
Reach - 1	5000.0	10-Year	553.00	51.44	61.11		61.22	0.000730	3.61	671.26	352.14	0.21
Reach - 1	5000.0	25-Year	783.00	51.44	61.77		61.87	0.000772	3.88	913.84	381.05	0.22
Reach - 1	5000.0	50-Year	992.00	51.44	62.26		62.36	0.000796	4.07	1105.62	394.57	0.22
Reach - 1	5000.0	100-Year	1228.00	51.44	62.72		62.82	0.000841	4.30	1287.31	406.96	0.23
Reach - 1	5500.0	2-Year	270.00	52.17	59.79		59.95	0.001034	3.56	132.92	33.32	0.23
Reach - 1	5500.0	10-Year	553.00	52.17	61.51		61.80	0.001625	5.13	418.51	340.31	0.30
Reach - 1	5500.0	25-Year	783.00	52.17	62.20		62.46	0.001600	5.35	670.51	385.35	0.30
Reach - 1	5500.0	50-Year	992.00	52.17	62.71		62.94	0.001554	5.45	877.41	417.82	0.30
Reach - 1	5500.0	100-Year	1228.00	52.17	63.20		63.41	0.001535	5.59	1086.27	448.23	0.30
Reach - 1	6000.0	2-Year	270.00	52.71	60.33		60.48	0.001076	3.58	147.11	43.34	0.23
Reach - 1	6000.0	10-Year	553.00	52.71	62.32		62.47	0.001064	4.17	628.18	405.56	0.24
Reach - 1	6000.0	25-Year	783.00	52.71	62.98		63.10	0.001024	4.28	902.41	425.34	0.24
Reach - 1	6000.0	50-Year	992.00	52.71	63.46		63.58	0.001018	4.41	1112.99	450.36	0.24
Reach - 1	6000.0	100-Year	1228.00	52.71	63.94		64.06	0.001095	4.71	1341.82	501.52	0.25
Reach - 1	6400	2-Year	270.00	55.71	60.92		61.09	0.002306	3.36	80.33	23.07	0.32
Reach - 1	6400	10-Year	553.00	55.71	62.66		62.69	0.000324	1.55	450.26	565.81	0.12
Reach - 1	6400	25-Year	783.00	55.71	63.19		63.22	0.000127	1.04	767.75	607.56	0.08
Reach - 1	6400	50-Year	992.00	55.71	63.63		63.66	0.000075	0.85	1037.59	618.96	0.06

GUM SWAMP FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	6400	100-Year	1228.00	55.71	64.10		64.12	0.000051	0.73	1340.46	703.72	0.05
Reach - 1	6909	2-Year	211.00	55.80	61.92		62.02	0.001379	2.54	83.16	25.00	0.25
Reach - 1	6909	10-Year	424.00	55.80	62.88		63.01	0.001740	3.22	326.00	339.49	0.28
Reach - 1	6909	25-Year	575.00	55.80	63.25		63.39	0.001911	3.52	455.86	360.01	0.30
Reach - 1	6909	50-Year	709.00	55.80	63.65		63.77	0.001727	3.49	603.94	384.95	0.29
Reach - 1	6909	100-Year	880.00	55.80	64.10		64.21	0.001537	3.46	785.73	422.12	0.28
Reach - 1	7470	2-Year	211.00	56.41	62.68		62.77	0.001289	2.47	85.59	29.20	0.24
Reach - 1	7470	10-Year	424.00	56.41	63.82		63.95	0.001608	3.14	301.61	326.37	0.27
Reach - 1	7470	25-Year	575.00	56.41	64.26		64.40	0.001690	3.40	469.29	417.06	0.28
Reach - 1	7470	50-Year	709.00	56.41	64.60		64.73	0.001664	3.50	614.75	452.86	0.28
Reach - 1	7470	100-Year	880.00	56.41	64.97		65.10	0.001613	3.58	792.90	491.60	0.28
Reach - 1	7628	2-Year	211.00	56.38	62.88	59.92	62.97	0.001221	2.43	86.94	25.19	0.23
Reach - 1	7628	10-Year	424.00	56.38	64.07	61.08	64.25	0.001891	3.51	162.34	291.49	0.30
Reach - 1	7628	25-Year	575.00	56.38	64.52	61.72	64.72	0.001985	3.79	312.16	364.44	0.31
Reach - 1	7628	50-Year	709.00	56.38	64.85	62.21	65.03	0.001916	3.87	440.73	410.46	0.31
Reach - 1	7628	100-Year	880.00	56.38	65.22	62.77	65.38	0.001781	3.91	600.24	456.07	0.30
Reach - 1	7705		Culvert									
Reach - 1	7759	2-Year	211.00	56.45	63.22	59.84	63.30	0.000877	2.18	98.84	36.07	0.20
Reach - 1	7759	10-Year	424.00	56.45	65.18	61.04	65.22	0.000488	2.02	531.20	494.60	0.16
Reach - 1	7759	25-Year	575.00	56.45	65.39	61.69	65.45	0.000678	2.44	643.16	552.31	0.18
Reach - 1	7759	50-Year	709.00	56.45	65.52	62.17	65.60	0.000869	2.81	715.79	581.06	0.21
Reach - 1	7759	100-Year	880.00	56.45	65.67	62.74	65.77	0.001095	3.21	806.74	615.16	0.24
Reach - 1	7930	2-Year	208.00	57.33	63.39		63.49	0.001262	2.48	84.00	24.03	0.23
Reach - 1	7930	10-Year	408.00	57.33	65.27		65.32	0.000614	2.14	497.72	462.38	0.17
Reach - 1	7930	25-Year	553.00	57.33	65.52		65.58	0.000800	2.50	619.17	523.40	0.20
Reach - 1	7930	50-Year	682.00	57.33	65.68		65.76	0.000967	2.81	709.17	566.67	0.22
Reach - 1	7930	100-Year	825.00	57.33	65.88		65.96	0.001080	3.04	825.81	618.25	0.23
Reach - 1	8400	2-Year	208.00	57.72	64.06		64.17	0.001679	2.72	81.69	114.92	0.26
Reach - 1	8400	10-Year	408.00	57.72	65.60		65.65	0.000807	2.31	448.12	395.65	0.19
Reach - 1	8400	25-Year	553.00	57.72	65.92		65.98	0.000917	2.58	583.94	433.21	0.21
Reach - 1	8400	50-Year	682.00	57.72	66.15		66.22	0.000994	2.77	686.61	444.34	0.22

GUM SWAMP FUTURE CONDITIONS

HEC-RAS Plan: Fut_Base River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	8400	100-Year	825.00	57.72	66.39		66.46	0.001044	2.93	794.16	452.19	0.22
Reach - 1	8872	2-Year	208.00	59.13	64.55		64.60	0.000541	1.77	117.33	30.00	0.16
Reach - 1	8872	10-Year	408.00	59.13	65.94		66.04	0.000810	2.53	162.83	36.51	0.20
Reach - 1	8872	25-Year	553.00	59.13	66.33		66.47	0.001090	3.06	268.07	319.80	0.23
Reach - 1	8872	50-Year	682.00	59.13	66.61		66.77	0.001261	3.38	358.73	339.02	0.25
Reach - 1	8872	100-Year	825.00	59.13	66.88		67.06	0.001394	3.64	456.14	381.28	0.27
Reach - 1	9293	2-Year	86.00	60.27	64.83		64.94	0.002648	2.67	32.27	13.43	0.30
Reach - 1	9293	10-Year	173.00	60.27	66.37		66.46	0.001604	2.53	162.40	331.92	0.25
Reach - 1	9293	25-Year	237.00	60.27	66.88		66.92	0.000898	2.03	355.54	427.75	0.19
Reach - 1	9293	50-Year	295.00	60.27	67.19		67.21	0.000668	1.81	496.11	478.74	0.16
Reach - 1	9293	100-Year	361.00	60.27	67.47		67.49	0.000531	1.67	636.06	524.57	0.15

PRIMARY SYSTEM ALTERNATIVE #1: HEC-RAS OUTPUT

SWIFT CREEK ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	234198	2-year	270.00	51.54	56.08	54.49	56.34	0.003004	4.14	80.97	64.99	0.40
Reach-1	234198	10-year	538.00	51.54	57.21	55.69	57.50	0.003002	4.89	353.68	382.35	0.41
Reach-1	234198	25-year	735.00	51.54	57.64	57.06	57.92	0.003001	5.20	532.83	442.28	0.41
Reach-1	234198	50-year	917.00	51.54	57.96	57.37	58.23	0.003001	5.42	677.98	475.35	0.42
Reach-1	234198	100-year	1121.00	51.54	58.27	57.61	58.53	0.003000	5.63	828.71	492.80	0.42
Reach-1	234875	2-year	270.00	52.10	57.39		57.49	0.001062	2.82	225.60	306.90	0.24
Reach-1	234875	10-year	538.00	52.10	58.39		58.45	0.000759	2.75	635.31	465.86	0.21
Reach-1	234875	25-year	735.00	52.10	58.81		58.86	0.000757	2.90	840.11	520.59	0.22
Reach-1	234875	50-year	917.00	52.10	59.12		59.18	0.000774	3.04	1012.65	559.11	0.22
Reach-1	234875	100-year	1121.00	52.10	59.43		59.48	0.000766	3.13	1186.63	574.99	0.22
Reach-1	235139	2-year	270.00	51.75	57.65	54.13	57.71	0.000573	2.12	232.59	324.27	0.18
Reach-1	235139	10-year	538.00	51.75	58.57	55.30	58.62	0.000555	2.29	624.54	494.92	0.18
Reach-1	235139	25-year	735.00	51.75	58.98	55.99	59.03	0.000549	2.41	837.32	526.50	0.18
Reach-1	235139	50-year	917.00	51.75	59.30	56.55	59.35	0.000557	2.52	1011.12	566.39	0.19
Reach-1	235139	100-year	1121.00	51.75	59.60	58.05	59.65	0.000571	2.64	1187.17	589.19	0.19
Reach-1	235165		Bridge									
Reach-1	235183	2-year	270.00	51.76	58.11	54.21	58.16	0.000338	1.80	149.75	337.51	0.15
Reach-1	235183	10-year	538.00	51.76	59.61	55.28	59.63	0.000164	1.44	992.11	525.62	0.11
Reach-1	235183	25-year	735.00	51.76	59.87	55.88	59.89	0.000234	1.77	1131.11	549.21	0.13
Reach-1	235183	50-year	917.00	51.76	60.04	56.37	60.08	0.000303	2.06	1227.71	553.18	0.15
Reach-1	235183	100-year	1121.00	51.76	60.20	56.83	60.24	0.000387	2.36	1314.25	557.06	0.17
Reach-1	235196	2-year	270.00	52.47	58.09	55.33	58.19	0.000999	2.60	103.66	512.38	0.24
Reach-1	235196	10-year	538.00	52.47	59.61	56.49	59.64	0.000299	1.77	715.75	601.77	0.14
Reach-1	235196	25-year	735.00	52.47	59.91	57.12	59.91	0.000076	0.93	2081.37	605.20	0.07
Reach-1	235196	50-year	917.00	52.47	60.10	57.58	60.10	0.000101	1.09	2195.40	607.25	0.08
Reach-1	235196	100-year	1121.00	52.47	60.27	58.06	60.28	0.000131	1.27	2299.81	610.93	0.09
Reach-1	235219		Culvert									
Reach-1	235247	2-year	270.00	53.17	59.08	56.39	59.10	0.000363	1.54	396.84	493.58	0.15
Reach-1	235247	10-year	538.00	53.17	59.66	57.43	59.71	0.000634	2.24	570.04	515.57	0.20
Reach-1	235247	25-year	735.00	53.17	59.96	58.04	59.99	0.000371	1.80	1083.36	530.88	0.16
Reach-1	235247	50-year	917.00	53.17	60.14	58.48	60.17	0.000462	2.05	1177.20	541.34	0.17

SWIFT CREEK ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	235247	100-year	1121.00	53.17	60.34	58.88	60.37	0.000546	2.29	1285.33	558.51	0.19
Reach-1	235428	2-year	260.00	53.13	59.13	56.19	59.16	0.000349	1.75	452.33	287.61	0.15
Reach-1	235428	10-year	509.00	53.13	59.75	57.70	59.81	0.000646	2.60	641.38	319.48	0.21
Reach-1	235428	25-year	705.00	53.13	60.01	58.33	60.10	0.000942	3.25	724.11	328.78	0.25
Reach-1	235428	50-year	872.00	53.13	60.19	58.58	60.31	0.001191	3.74	785.18	339.97	0.28
Reach-1	235428	100-year	1062.00	53.13	60.40	58.81	60.54	0.001444	4.22	854.38	369.28	0.31
Reach-1	235914	2-year	260.00	53.95	59.22		59.22	0.000054	0.72	865.04	312.08	0.06
Reach-1	235914	10-year	509.00	53.95	59.92		59.92	0.000106	1.12	1093.51	340.82	0.09
Reach-1	235914	25-year	705.00	53.95	60.25		60.26	0.000156	1.41	1208.91	358.50	0.10
Reach-1	235914	50-year	872.00	53.95	60.50		60.51	0.000198	1.63	1300.35	377.01	0.12
Reach-1	235914	100-year	1062.00	53.95	60.76		60.78	0.000236	1.84	1402.41	384.42	0.13
Reach-1	236412	2-year	260.00	54.78	59.26		59.26	0.000145	0.95	619.46	367.34	0.09
Reach-1	236412	10-year	509.00	54.78	59.99		60.00	0.000212	1.31	916.64	423.40	0.12
Reach-1	236412	25-year	705.00	54.78	60.35		60.36	0.000270	1.57	1071.25	438.23	0.13
Reach-1	236412	50-year	872.00	54.78	60.62		60.63	0.000311	1.75	1191.42	449.41	0.14
Reach-1	236412	100-year	1062.00	54.78	60.90		60.92	0.000348	1.93	1322.41	461.30	0.15
Reach-1	236856	2-year	260.00	54.38	59.33		59.34	0.000193	1.07	504.01	226.21	0.10
Reach-1	236856	10-year	509.00	54.38	60.10		60.11	0.000300	1.47	708.12	311.40	0.13
Reach-1	236856	25-year	705.00	54.38	60.49		60.51	0.000382	1.77	834.51	336.71	0.15
Reach-1	236856	50-year	872.00	54.38	60.78		60.81	0.000441	1.99	935.54	358.62	0.16
Reach-1	236856	100-year	1062.00	54.38	61.09		61.12	0.000494	2.20	1049.75	382.59	0.18
Reach-1	237179	2-year	260.00	55.37	59.42		59.43	0.000423	1.55	376.85	208.09	0.16
Reach-1	237179	10-year	509.00	55.37	60.22		60.24	0.000543	2.06	556.97	244.83	0.19
Reach-1	237179	25-year	705.00	55.37	60.64		60.67	0.000651	2.41	663.26	263.29	0.21
Reach-1	237179	50-year	872.00	55.37	60.95		60.99	0.000725	2.67	747.14	275.29	0.22
Reach-1	237179	100-year	1062.00	55.37	61.27		61.32	0.000788	2.91	837.05	280.22	0.23
Reach-1	237456	2-year	260.00	55.98	59.56	58.71	59.67	0.002223	3.36	156.68	130.20	0.35
Reach-1	237456	10-year	509.00	55.98	60.39	59.27	60.54	0.002555	4.27	262.51	234.09	0.39
Reach-1	237456	25-year	705.00	55.98	60.84	59.61	61.01	0.002717	4.76	344.92	265.79	0.42
Reach-1	237456	50-year	872.00	55.98	61.17	59.87	61.35	0.002779	5.07	412.46	291.72	0.43
Reach-1	237456	100-year	1062.00	55.98	61.51	60.13	61.70	0.002779	5.33	486.08	302.53	0.43

SWIFT CREEK ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	237708	2-year	260.00	56.29	59.92	57.67	59.98	0.000643	2.01	172.19	130.41	0.19
Reach-1	237708	10-year	509.00	56.29	60.87	58.57	60.98	0.001031	2.93	233.12	170.88	0.24
Reach-1	237708	25-year	705.00	56.29	61.37	58.99	61.53	0.001346	3.55	265.57	258.64	0.28
Reach-1	237708	50-year	872.00	56.29	61.70	59.28	61.77	0.000768	2.79	624.35	337.45	0.21
Reach-1	237708	100-year	1062.00	56.29	62.07	59.59	62.15	0.000840	3.05	762.27	419.59	0.23
Reach-1	237781		Culvert									
Reach-1	237845	2-year	260.00	56.31	60.09	57.90	60.18	0.001043	2.46	105.58	125.05	0.24
Reach-1	237845	10-year	509.00	56.31	61.30	58.67	61.49	0.001519	3.50	161.63	294.35	0.29
Reach-1	237845	25-year	705.00	56.31	62.17	59.19	62.41	0.001588	3.97	220.03	358.75	0.30
Reach-1	237845	50-year	872.00	56.31	62.84	59.57	62.97	0.000985	3.38	646.65	402.28	0.24
Reach-1	237845	100-year	1062.00	56.31	63.19	60.00	63.34	0.001119	3.74	742.45	433.24	0.26
Reach-1	238094	2-year	243.00	56.52	60.32	58.96	60.33	0.000294	1.28	443.06	308.05	0.13
Reach-1	238094	10-year	445.00	56.52	61.63	59.20	61.64	0.000181	1.29	781.29	364.00	0.11
Reach-1	238094	25-year	588.00	56.52	62.56	59.34	62.57	0.000137	1.27	1036.22	398.62	0.10
Reach-1	238094	50-year	710.00	56.52	63.08	59.45	63.08	0.000134	1.34	1195.50	476.46	0.10
Reach-1	238094	100-year	852.00	56.52	63.46	59.55	63.47	0.000145	1.46	1340.88	551.42	0.10
Reach-1	238526	2-year	243.00	56.20	60.45	58.11	60.47	0.000326	1.58	286.08	131.69	0.14
Reach-1	238526	10-year	445.00	56.20	61.72	59.07	61.75	0.000297	1.83	460.09	141.81	0.14
Reach-1	238526	25-year	588.00	56.20	62.62	59.33	62.66	0.000255	1.89	591.36	148.99	0.14
Reach-1	238526	50-year	710.00	56.20	63.14	59.51	63.17	0.000263	2.03	669.08	153.08	0.14
Reach-1	238526	100-year	852.00	56.20	63.53	59.70	63.57	0.000296	2.24	734.70	194.79	0.15
Reach-1	238936	2-year	243.00	56.88	60.64	58.96	60.71	0.001049	2.34	137.26	63.16	0.25
Reach-1	238936	10-year	445.00	56.88	61.88	59.69	61.97	0.000956	2.73	218.10	67.11	0.25
Reach-1	238936	25-year	588.00	56.88	62.75	60.00	62.85	0.000832	2.83	277.85	69.89	0.24
Reach-1	238936	50-year	710.00	56.88	63.26	60.24	63.38	0.000852	3.02	314.10	71.52	0.24
Reach-1	238936	100-year	852.00	56.88	63.66	60.50	63.80	0.000938	3.33	343.28	75.46	0.26
Reach-1	239177	2-year	243.00	57.85	61.03	60.68	61.25	0.005554	4.50	97.72	78.43	0.54
Reach-1	239177	10-year	445.00	57.85	62.20	61.12	62.36	0.002770	4.24	190.74	81.18	0.41
Reach-1	239177	25-year	588.00	57.85	63.01	61.39	63.16	0.001966	4.14	257.70	83.10	0.36
Reach-1	239177	50-year	710.00	57.85	63.53	61.58	63.68	0.001804	4.28	300.46	84.30	0.35
Reach-1	239177	100-year	852.00	57.85	63.95	61.80	64.12	0.001849	4.59	336.15	85.29	0.36

SWIFT CREEK ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	239470	2-year	243.00	57.77	61.95	59.95	62.10	0.001677	3.08	78.99	24.77	0.30
Reach-1	239470	10-year	445.00	57.77	62.93	60.79	63.21	0.002541	4.27	104.25	26.81	0.38
Reach-1	239470	25-year	588.00	57.77	63.60	61.29	63.96	0.002792	4.79	122.81	28.21	0.40
Reach-1	239470	50-year	710.00	57.77	64.08	61.68	64.50	0.003031	5.20	136.44	29.20	0.42
Reach-1	239470	100-year	852.00	57.77	64.51	62.10	65.02	0.003394	5.71	149.30	30.10	0.45
Reach-1	239543		Culvert									
Reach-1	239601	2-year	243.00	57.56	63.12	59.95	63.21	0.000796	2.41	101.01	25.35	0.21
Reach-1	239601	10-year	445.00	57.56	65.90	60.88	65.99	0.000526	2.46	186.48	136.69	0.18
Reach-1	239601	25-year	588.00	57.56	66.44	61.43	66.57	0.000688	2.95	208.81	177.86	0.21
Reach-1	239601	50-year	710.00	57.56	67.78	61.85	67.85	0.000335	2.35	521.48	349.89	0.15
Reach-1	239601	100-year	852.00	57.56	68.19	62.29	68.27	0.000358	2.51	607.16	389.85	0.16
Reach-1	239904	2-year	216.00	58.41	63.45	61.29	63.65	0.002609	3.55	60.92	20.22	0.36
Reach-1	239904	10-year	389.00	58.41	66.10	62.36	66.24	0.001236	2.98	130.58	34.10	0.26
Reach-1	239904	25-year	512.00	58.41	66.70	63.04	66.88	0.001466	3.39	162.83	102.28	0.28
Reach-1	239904	50-year	617.00	58.41	67.92	63.53	68.00	0.000708	2.56	438.62	323.82	0.20
Reach-1	239904	100-year	737.00	58.41	68.33	63.99	68.41	0.000638	2.56	567.98	358.67	0.19
Reach-1	240316	2-year	216.00	59.47	64.78		65.13	0.004858	4.74	45.54	14.50	0.47
Reach-1	240316	10-year	389.00	59.47	66.76		67.10	0.003436	4.77	104.03	86.17	0.41
Reach-1	240316	25-year	512.00	59.47	67.46		67.75	0.003018	4.71	186.94	151.11	0.39
Reach-1	240316	50-year	617.00	59.47	68.29		68.45	0.001663	3.79	353.56	249.68	0.29
Reach-1	240316	100-year	737.00	59.47	68.67		68.81	0.001502	3.74	456.80	289.87	0.28
Reach-1	240800	2-year	216.00	60.78	66.36		66.52	0.001869	3.22	69.30	34.17	0.31
Reach-1	240800	10-year	389.00	60.78	67.97		68.13	0.001405	3.35	161.35	72.13	0.28
Reach-1	240800	25-year	512.00	60.78	68.56		68.72	0.001403	3.56	245.84	176.49	0.28
Reach-1	240800	50-year	617.00	60.78	69.01		69.16	0.001302	3.58	334.52	220.14	0.28
Reach-1	240800	100-year	737.00	60.78	69.35		69.51	0.001353	3.77	416.87	264.31	0.28
Reach-1	241107	2-year	216.00	61.47	66.99		67.17	0.002374	3.48	70.23	43.48	0.35
Reach-1	241107	10-year	389.00	61.47	68.46		68.60	0.001647	3.33	211.26	164.62	0.30
Reach-1	241107	25-year	512.00	61.47	69.04		69.16	0.001409	3.28	324.64	224.08	0.28
Reach-1	241107	50-year	617.00	61.47	69.45		69.55	0.001243	3.24	424.57	264.77	0.27
Reach-1	241107	100-year	737.00	61.47	69.80		69.90	0.001175	3.27	523.89	299.77	0.26

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	241592	2-year	165.00	62.40	67.83		67.91	0.000927	2.28	72.37	22.40	0.22
Reach-1	241592	10-year	301.00	62.40	69.13		69.23	0.001004	2.72	149.77	111.21	0.24
Reach-1	241592	25-year	398.00	62.40	69.64		69.75	0.001043	2.95	216.97	152.76	0.25
Reach-1	241592	50-year	484.00	62.40	70.00		70.12	0.001068	3.10	279.00	195.86	0.25
Reach-1	241592	100-year	578.00	62.40	70.33		70.45	0.001067	3.21	358.63	261.46	0.26
Reach-1	241994	2-year	165.00	63.58	68.22		68.31	0.001061	2.36	69.98	26.93	0.24
Reach-1	241994	10-year	301.00	63.58	69.54		69.65	0.001085	2.74	143.92	85.04	0.25
Reach-1	241994	25-year	398.00	63.58	70.07		70.20	0.001169	3.05	198.89	187.93	0.26
Reach-1	241994	50-year	484.00	63.58	70.44		70.57	0.001149	3.17	283.38	271.55	0.26
Reach-1	241994	100-year	578.00	63.58	70.76		70.89	0.001103	3.22	383.82	343.43	0.26

SCUT1 ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek UT1 Reach: Reach1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	231	2-Year	185.00	53.45	56.49	56.32	56.61	0.004004	3.51	130.26	218.19	0.44
Reach1	231	10-Year	351.00	53.45	56.90	56.57	57.01	0.004002	3.91	220.17	219.24	0.45
Reach1	231	25-Year	466.00	53.45	57.13	56.72	57.24	0.004003	4.12	270.39	219.83	0.46
Reach1	231	50-Year	573.00	53.45	57.32	56.82	57.44	0.004001	4.29	312.39	220.32	0.46
Reach1	231	100-Year	693.00	53.45	57.51	56.93	57.64	0.004007	4.46	355.42	220.82	0.46
Reach1	584	2-Year	185.00	53.78	57.17		57.20	0.000906	1.85	222.78	179.29	0.22
Reach1	584	10-Year	351.00	53.78	57.68		57.72	0.001200	2.38	315.02	184.67	0.26
Reach1	584	25-Year	466.00	53.78	57.95		58.00	0.001356	2.67	366.35	187.59	0.27
Reach1	584	50-Year	573.00	53.78	58.18		58.23	0.001477	2.90	409.15	190.00	0.29
Reach1	584	100-Year	693.00	53.78	58.41		58.47	0.001594	3.13	453.14	192.49	0.30
Reach1	1005	2-Year	185.00	54.86	57.84		58.10	0.007153	4.55	61.83	58.05	0.59
Reach1	1005	10-Year	351.00	54.86	58.50		58.78	0.006434	5.13	144.92	153.56	0.58
Reach1	1005	25-Year	466.00	54.86	58.84		59.08	0.005470	5.09	199.01	176.92	0.55
Reach1	1005	50-Year	573.00	54.86	59.10		59.33	0.004950	5.15	246.70	184.38	0.53
Reach1	1005	100-Year	693.00	54.86	59.37		59.59	0.004585	5.25	295.98	191.69	0.52
Reach1	1429	2-Year	136.00	54.48	58.73		58.76	0.000497	1.62	145.86	66.69	0.17
Reach1	1429	10-Year	267.00	54.48	59.55		59.60	0.000739	2.33	201.88	70.86	0.21
Reach1	1429	25-Year	358.00	54.48	59.91		59.98	0.000932	2.78	227.87	72.72	0.24
Reach1	1429	50-Year	440.00	54.48	60.20		60.28	0.001087	3.15	249.04	74.20	0.27
Reach1	1429	100-Year	522.00	54.48	60.48		60.58	0.001212	3.46	269.91	75.62	0.28
Reach1	1546	2-Year	136.00	55.50	58.78	56.35	58.80	0.000311	1.29	105.24	32.81	0.13
Reach1	1546	10-Year	267.00	55.50	59.62	56.82	59.68	0.000584	2.01	132.86	33.03	0.18
Reach1	1546	25-Year	358.00	55.50	60.00	57.10	60.09	0.000797	2.46	145.43	33.12	0.21
Reach1	1546	50-Year	440.00	55.50	60.30	57.33	60.42	0.000984	2.83	155.45	33.20	0.23
Reach1	1546	100-Year	522.00	55.50	60.59	57.55	60.74	0.001156	3.16	165.06	33.27	0.25
Reach1	1588.5		Culvert									
Reach1	1635	2-Year	136.00	55.72	58.85	57.01	58.89	0.000600	1.62	84.21	31.90	0.18
Reach1	1635	10-Year	267.00	55.72	59.90	57.49	59.98	0.000815	2.27	117.87	32.32	0.21
Reach1	1635	25-Year	358.00	55.72	60.54	57.77	60.65	0.000890	2.58	138.80	32.57	0.22
Reach1	1635	50-Year	440.00	55.72	61.04	58.01	61.17	0.000954	2.84	155.14	33.34	0.23
Reach1	1635	100-Year	522.00	55.72	61.46	58.23	61.61	0.001026	3.09	169.33	34.52	0.24

SCUT1 ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1798	2-Year	96.00	56.04	58.97		59.05	0.001741	2.27	42.34	22.95	0.29
Reach1	1798	10-Year	183.00	56.04	60.05		60.16	0.001547	2.64	69.32	27.02	0.29
Reach1	1798	25-Year	249.00	56.04	60.71		60.83	0.001434	2.84	87.92	30.21	0.29
Reach1	1798	50-Year	303.00	56.04	61.21		61.35	0.001313	2.95	103.99	33.25	0.28
Reach1	1798	100-Year	362.00	56.04	61.64		61.79	0.001298	3.12	118.82	35.83	0.28
Reach1	2289	2-Year	96.00	56.55	60.32	59.48	60.56	0.006175	3.89	24.68	14.09	0.52
Reach1	2289	10-Year	183.00	56.55	61.26		61.59	0.006345	4.61	39.71	18.07	0.55
Reach1	2289	25-Year	249.00	56.55	61.81		62.19	0.006234	4.94	50.39	20.43	0.55
Reach1	2289	50-Year	303.00	56.55	62.22		62.63	0.006051	5.13	59.05	22.16	0.55
Reach1	2289	100-Year	362.00	56.55	62.61		63.05	0.005734	5.31	68.16	24.67	0.56
Reach1	2669	2-Year	96.00	57.94	62.00		62.12	0.002881	2.76	34.75	19.34	0.36
Reach1	2669	10-Year	183.00	57.94	63.04		63.20	0.002981	3.13	58.42	26.07	0.37
Reach1	2669	25-Year	249.00	57.94	63.65		63.82	0.003075	3.30	75.55	30.17	0.37
Reach1	2669	50-Year	303.00	57.94	64.07		64.25	0.003117	3.41	88.81	32.99	0.37
Reach1	2669	100-Year	362.00	57.94	64.46		64.66	0.003180	3.54	102.23	35.63	0.37
Reach1	2906	2-Year	96.00	58.90	62.32	59.95	62.35	0.000419	1.41	68.28	24.98	0.15
Reach1	2906	10-Year	183.00	58.90	63.43	60.49	63.48	0.000552	1.87	97.70	28.22	0.18
Reach1	2906	25-Year	249.00	58.90	64.06	60.82	64.13	0.000630	2.14	116.23	30.09	0.19
Reach1	2906	50-Year	303.00	58.90	64.50	61.07	64.59	0.000688	2.34	129.66	31.37	0.20
Reach1	2906	100-Year	362.00	58.90	64.91	61.32	65.01	0.000753	2.54	142.79	32.58	0.21
Reach1	2952.5		Culvert									
Reach1	3015	2-Year	96.00	59.40	62.41	60.37	62.45	0.000530	1.51	63.64	25.14	0.17
Reach1	3015	10-Year	183.00	59.40	63.69	60.87	63.75	0.000555	1.87	97.99	28.55	0.18
Reach1	3015	25-Year	249.00	59.40	64.59	61.18	64.65	0.000519	2.00	124.71	30.94	0.18
Reach1	3015	50-Year	303.00	59.40	65.17	61.42	65.24	0.000517	2.12	143.24	35.04	0.18
Reach1	3015	100-Year	362.00	59.40	65.61	61.66	65.69	0.000549	2.30	160.19	41.72	0.18
Reach1	3270	2-Year	80.00	59.93	62.64		62.72	0.003297	2.76	56.86	102.20	0.38
Reach1	3270	10-Year	160.00	59.93	63.88		63.90	0.000625	1.76	188.93	110.87	0.18
Reach1	3270	25-Year	216.00	59.93	64.76		64.77	0.000327	1.52	288.48	116.98	0.14
Reach1	3270	50-Year	267.00	59.93	65.33		65.35	0.000265	1.51	356.97	121.00	0.13
Reach1	3270	100-Year	325.00	59.93	65.79		65.80	0.000254	1.58	412.84	124.19	0.13

SCUT1 ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	3690	2-Year	80.00	59.63	63.33		63.36	0.000851	1.70	92.64	70.02	0.20
Reach1	3690	10-Year	160.00	59.63	64.17		64.20	0.000792	2.01	154.25	77.01	0.20
Reach1	3690	25-Year	216.00	59.63	64.92		64.95	0.000556	1.94	214.46	83.28	0.17
Reach1	3690	50-Year	267.00	59.63	65.47		65.49	0.000480	1.97	261.16	87.83	0.16
Reach1	3690	100-Year	325.00	59.63	65.92		65.95	0.000470	2.07	301.53	91.59	0.16
Reach1	3808	2-Year	80.00	59.63	63.43		63.45	0.000701	1.58	99.25	70.80	0.18
Reach1	3808	10-Year	160.00	59.63	64.26		64.29	0.000697	1.92	161.21	77.76	0.19
Reach1	3808	25-Year	216.00	59.63	64.99		65.01	0.000518	1.89	219.82	83.81	0.17
Reach1	3808	50-Year	267.00	59.63	65.52		65.55	0.000455	1.93	266.07	88.30	0.16
Reach1	3808	100-Year	325.00	59.63	65.97		66.00	0.000448	2.04	306.55	92.04	0.16
Reach1	3936	2-Year	80.00	59.42	63.53	61.88	63.62	0.001836	2.47	32.39	14.53	0.29
Reach1	3936	10-Year	160.00	59.42	64.34	62.69	64.54	0.002999	3.54	45.18	16.93	0.38
Reach1	3936	25-Year	216.00	59.42	65.02	63.13	65.24	0.002879	3.76	57.38	18.95	0.38
Reach1	3936	50-Year	267.00	59.42	65.53	63.48	65.78	0.002845	3.95	67.52	20.47	0.38
Reach1	3936	100-Year	325.00	59.42	65.97	63.84	66.25	0.003002	4.24	76.65	21.75	0.40
Reach1	3967.5		Culvert									
Reach1	3997	2-Year	80.00	61.44	63.65	63.65	64.27	0.024659	6.31	12.68	10.31	1.00
Reach1	3997	10-Year	160.00	61.44	64.94	64.44	65.41	0.010534	5.48	29.22	15.40	0.70
Reach1	3997	25-Year	216.00	61.44	66.03	64.86	66.34	0.004992	4.46	48.49	27.13	0.50
Reach1	3997	50-Year	267.00	61.44	67.08	65.18	67.20	0.001687	3.07	143.29	198.40	0.30
Reach1	3997	100-Year	325.00	61.44	67.36	65.52	67.45	0.001416	2.93	219.95	249.69	0.28
Reach1	4120	2-Year	70.00	61.75	65.06		65.16	0.002355	2.49	28.08	15.91	0.33
Reach1	4120	10-Year	142.00	61.75	65.97		66.13	0.002846	3.20	44.43	19.95	0.38
Reach1	4120	25-Year	194.00	61.75	66.64		66.77	0.001979	3.04	94.97	122.16	0.33
Reach1	4120	50-Year	241.00	61.75	67.32		67.36	0.000723	2.05	207.55	191.13	0.20
Reach1	4120	100-Year	293.00	61.75	67.55		67.59	0.000644	2.00	252.99	202.63	0.19
Reach1	4307.5*	2-Year	70.00	62.35	65.55		65.68	0.003141	2.91	24.03	12.89	0.38
Reach1	4307.5*	10-Year	142.00	62.35	66.54		66.75	0.003673	3.70	38.41	16.05	0.42
Reach1	4307.5*	25-Year	194.00	62.35	67.06		67.32	0.003957	4.11	47.24	21.05	0.44
Reach1	4307.5*	50-Year	241.00	62.35	67.41	65.95	67.70	0.004015	4.36	69.06	120.68	0.45
Reach1	4307.5*	100-Year	293.00	62.35	67.61	66.28	67.91	0.004205	4.62	97.12	158.69	0.47

SCUT1 ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	4495	2-Year	70.00	62.94	66.19		66.37	0.004163	3.37	20.75	10.07	0.41
Reach1	4495	10-Year	142.00	62.94	67.28		67.57	0.004946	4.30	33.02	12.43	0.46
Reach1	4495	25-Year	194.00	62.94	67.85		68.21	0.005373	4.79	40.46	13.66	0.49
Reach1	4495	50-Year	241.00	62.94	68.22	66.79	68.63	0.005730	5.21	54.54	93.64	0.51
Reach1	4495	100-Year	293.00	62.94	68.45	67.18	68.88	0.005895	5.48	84.49	150.27	0.52

GUM SWAMP ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Gum Swamp Reach: Reach - 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	663.5	2-Year	336.00	46.81	53.28	50.55	53.72	0.002603	5.48	82.31	33.59	0.39
Reach - 1	663.5	10-Year	686.00	46.81	54.96	52.64	55.40	0.002602	6.42	386.07	304.64	0.40
Reach - 1	663.5	25-Year	947.00	46.81	55.50	55.09	55.89	0.002602	6.71	558.52	330.92	0.41
Reach - 1	663.5	50-Year	1182.00	46.81	55.91	55.35	56.27	0.002603	6.92	696.42	350.52	0.41
Reach - 1	663.5	100-Year	1442.00	46.81	56.31	55.57	56.65	0.002601	7.13	844.15	390.17	0.41
Reach - 1	1000.0	2-Year	336.00	46.98	54.12		54.27	0.001017	3.67	251.85	229.96	0.25
Reach - 1	1000.0	10-Year	686.00	46.98	55.77		55.86	0.000742	3.61	779.10	381.23	0.22
Reach - 1	1000.0	25-Year	947.00	46.98	56.29		56.38	0.000835	3.98	982.69	402.17	0.23
Reach - 1	1000.0	50-Year	1182.00	46.98	56.68		56.78	0.000903	4.26	1144.41	418.06	0.24
Reach - 1	1000.0	100-Year	1442.00	46.98	57.08		57.17	0.000960	4.51	1311.45	433.86	0.25
Reach - 1	1500.0	2-Year	336.00	47.40	54.64		54.91	0.001464	4.45	132.22	87.24	0.30
Reach - 1	1500.0	10-Year	686.00	47.40	56.16		56.45	0.001677	5.43	483.32	402.55	0.33
Reach - 1	1500.0	25-Year	947.00	47.40	56.75		57.02	0.001764	5.82	759.76	525.76	0.34
Reach - 1	1500.0	50-Year	1182.00	47.40	57.18		57.40	0.001571	5.66	994.40	549.23	0.32
Reach - 1	1500.0	100-Year	1442.00	47.40	57.60		57.78	0.001443	5.58	1228.50	571.70	0.31
Reach - 1	2000.0	2-Year	336.00	47.83	55.01		55.02	0.000061	0.86	753.98	158.06	0.06
Reach - 1	2000.0	10-Year	686.00	47.83	56.60		56.61	0.000098	1.25	1156.02	385.68	0.08
Reach - 1	2000.0	25-Year	947.00	47.83	57.20		57.21	0.000132	1.52	1395.49	409.75	0.09
Reach - 1	2000.0	50-Year	1182.00	47.83	57.59		57.61	0.000165	1.74	1559.14	422.84	0.10
Reach - 1	2000.0	100-Year	1442.00	47.83	57.99		58.01	0.000200	1.97	1734.48	454.86	0.11
Reach - 1	2535.0	2-Year	336.00	48.54	55.06		55.07	0.000195	1.44	468.44	120.48	0.10
Reach - 1	2535.0	10-Year	686.00	48.54	56.68		56.70	0.000355	2.26	762.94	317.70	0.14
Reach - 1	2535.0	25-Year	947.00	48.54	57.30		57.33	0.000409	2.55	984.46	380.96	0.15
Reach - 1	2535.0	50-Year	1182.00	48.54	57.72		57.75	0.000465	2.80	1151.65	430.49	0.17
Reach - 1	2535.0	100-Year	1442.00	48.54	58.14		58.18	0.000514	3.04	1349.91	501.59	0.17
Reach - 1	3000.0	2-Year	301.00	48.92	55.13		55.13	0.000084	0.90	642.35	155.59	0.07
Reach - 1	3000.0	10-Year	617.00	48.92	56.80		56.81	0.000142	1.38	924.16	195.36	0.09
Reach - 1	3000.0	25-Year	852.00	48.92	57.45		57.47	0.000202	1.74	1070.55	276.90	0.11
Reach - 1	3000.0	50-Year	1073.00	48.92	57.89		57.91	0.000246	1.99	1207.00	332.41	0.12
Reach - 1	3000.0	100-Year	1324.00	48.92	58.33		58.36	0.000284	2.21	1368.15	400.80	0.13
Reach - 1	3500.0	2-Year	301.00	49.52	55.18		55.19	0.000154	1.15	550.72	173.85	0.09
Reach - 1	3500.0	10-Year	617.00	49.52	56.88		56.89	0.000189	1.52	882.87	218.26	0.10

GUM SWAMP ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	3500.0	25-Year	852.00	49.52	57.56		57.58	0.000237	1.81	1051.17	287.46	0.11
Reach - 1	3500.0	50-Year	1073.00	49.52	58.02		58.04	0.000280	2.04	1197.52	365.63	0.13
Reach - 1	3500.0	100-Year	1324.00	49.52	58.48		58.51	0.000317	2.26	1380.27	417.95	0.13
Reach - 1	4000.0	2-Year	301.00	50.17	55.28		55.29	0.000269	1.41	419.49	131.91	0.11
Reach - 1	4000.0	10-Year	617.00	50.17	56.99		57.01	0.000291	1.79	650.21	138.18	0.12
Reach - 1	4000.0	25-Year	852.00	50.17	57.70		57.72	0.000364	2.14	749.34	143.79	0.14
Reach - 1	4000.0	50-Year	1073.00	50.17	58.19		58.22	0.000460	2.52	822.96	156.37	0.16
Reach - 1	4000.0	100-Year	1324.00	50.17	58.67		58.72	0.000563	2.90	905.08	198.04	0.18
Reach - 1	4500.0	2-Year	301.00	51.25	55.49		55.51	0.000808	2.14	300.85	138.07	0.19
Reach - 1	4500.0	10-Year	617.00	51.25	57.18		57.21	0.000579	2.29	555.04	162.37	0.17
Reach - 1	4500.0	25-Year	852.00	51.25	57.93		57.96	0.000621	2.58	679.91	173.24	0.18
Reach - 1	4500.0	50-Year	1073.00	51.25	58.46		58.50	0.000686	2.86	774.95	181.89	0.19
Reach - 1	4500.0	100-Year	1324.00	51.25	59.00		59.05	0.000759	3.16	875.80	194.00	0.20
Reach - 1	5000.0	2-Year	270.00	51.44	55.85		55.88	0.000650	1.98	276.30	112.16	0.17
Reach - 1	5000.0	10-Year	553.00	51.44	57.46		57.49	0.000560	2.28	471.84	130.88	0.17
Reach - 1	5000.0	25-Year	783.00	51.44	58.24		58.28	0.000637	2.64	576.31	140.57	0.18
Reach - 1	5000.0	50-Year	992.00	51.44	58.80		58.85	0.000707	2.94	659.17	150.94	0.19
Reach - 1	5000.0	100-Year	1228.00	51.44	59.37		59.43	0.000772	3.24	747.84	161.30	0.21
Reach - 1	5500.0	2-Year	270.00	52.17	56.30		56.35	0.001432	2.73	193.32	88.21	0.24
Reach - 1	5500.0	10-Year	553.00	52.17	57.83		57.90	0.001184	3.11	333.96	94.66	0.23
Reach - 1	5500.0	25-Year	783.00	52.17	58.64		58.72	0.001270	3.53	411.94	98.05	0.25
Reach - 1	5500.0	50-Year	992.00	52.17	59.25		59.35	0.001361	3.88	471.98	100.58	0.26
Reach - 1	5500.0	100-Year	1228.00	52.17	59.85		59.96	0.001453	4.24	533.28	103.10	0.27
Reach - 1	6000.0	2-Year	270.00	52.71	56.89		56.92	0.000912	2.17	257.89	119.10	0.19
Reach - 1	6000.0	10-Year	553.00	52.71	58.34		58.38	0.000784	2.48	436.74	127.16	0.19
Reach - 1	6000.0	25-Year	783.00	52.71	59.18		59.23	0.000803	2.76	545.72	131.83	0.20
Reach - 1	6000.0	50-Year	992.00	52.71	59.82		59.87	0.000833	3.00	631.37	135.38	0.20
Reach - 1	6000.0	100-Year	1228.00	52.71	60.46		60.52	0.000866	3.25	718.89	138.92	0.21
Reach - 1	6400	2-Year	270.00	55.71	58.34	58.34	58.83	0.017439	5.82	59.98	78.15	0.81
Reach - 1	6400	10-Year	553.00	55.71	58.96	58.96	59.62	0.018337	7.26	109.29	81.22	0.87
Reach - 1	6400	25-Year	783.00	55.71	59.64		60.19	0.012006	6.89	165.94	84.61	0.73
Reach - 1	6400	50-Year	992.00	55.71	60.30		60.77	0.008365	6.48	223.14	87.89	0.63

GUM SWAMP ALT 1

HEC-RAS Plan: FINAL ALT 1 River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	6400	100-Year	1228.00	55.71	60.95		61.38	0.006637	6.36	280.66	91.08	0.57
Reach - 1	6909	2-Year	211.00	55.80	61.41		61.55	0.002125	2.98	70.84	23.21	0.30
Reach - 1	6909	10-Year	424.00	55.80	62.60	60.31	62.80	0.002546	3.76	236.16	298.67	0.34
Reach - 1	6909	25-Year	575.00	55.80	62.96	60.95	63.18	0.002871	4.17	352.31	344.27	0.37
Reach - 1	6909	50-Year	709.00	55.80	63.21	61.43	63.44	0.003064	4.44	441.78	357.91	0.38
Reach - 1	6909	100-Year	880.00	55.80	63.55	62.70	63.76	0.003039	4.58	563.89	375.16	0.38
Reach - 1	7470	2-Year	211.00	56.41	61.95		61.97	0.000359	1.34	233.92	84.71	0.13
Reach - 1	7470	10-Year	424.00	56.41	63.29		63.32	0.000460	1.82	388.80	214.10	0.15
Reach - 1	7470	25-Year	575.00	56.41	63.77		63.81	0.000572	2.13	515.58	315.97	0.17
Reach - 1	7470	50-Year	709.00	56.41	64.10		64.15	0.000663	2.37	634.47	399.30	0.19
Reach - 1	7470	100-Year	880.00	56.41	64.47		64.52	0.000739	2.59	788.90	439.57	0.20
Reach - 1	7628	2-Year	211.00	56.38	62.01	59.71	62.03	0.000488	1.58	207.34	69.90	0.15
Reach - 1	7628	10-Year	424.00	56.38	63.37	60.24	63.41	0.000620	2.08	307.46	85.88	0.17
Reach - 1	7628	25-Year	575.00	56.38	63.86	60.54	63.92	0.000791	2.52	355.46	111.13	0.20
Reach - 1	7628	50-Year	709.00	56.38	64.22	60.76	64.28	0.000978	2.93	440.92	331.26	0.22
Reach - 1	7628	100-Year	880.00	56.38	64.60	61.03	64.67	0.001061	3.19	576.40	378.71	0.23
Reach - 1	7705		Culvert									
Reach - 1	7759	2-Year	211.00	56.45	62.04	59.86	62.20	0.002544	3.22	65.53	21.38	0.32
Reach - 1	7759	10-Year	424.00	56.45	63.64	61.08	63.89	0.002580	4.03	119.40	84.30	0.34
Reach - 1	7759	25-Year	575.00	56.45	64.56	61.74	64.82	0.002242	4.28	168.74	394.22	0.33
Reach - 1	7759	50-Year	709.00	56.45	65.18	62.25	65.29	0.001124	3.26	637.45	511.82	0.24
Reach - 1	7759	100-Year	880.00	56.45	65.41	62.82	65.53	0.001287	3.59	758.80	560.69	0.26
Reach - 1	7930	2-Year	208.00	57.33	62.48		62.65	0.002677	3.28	63.48	21.10	0.33
Reach - 1	7930	10-Year	408.00	57.33	64.11	61.55	64.35	0.002793	3.96	121.11	197.96	0.35
Reach - 1	7930	25-Year	553.00	57.33	65.05		65.18	0.001535	3.30	402.64	410.94	0.27
Reach - 1	7930	50-Year	682.00	57.33	65.39		65.51	0.001442	3.31	556.79	491.49	0.26
Reach - 1	7930	100-Year	825.00	57.33	65.65		65.77	0.001476	3.46	692.08	558.71	0.27
Reach - 1	8400	2-Year	208.00	57.72	63.68		63.82	0.002320	3.07	67.79	21.75	0.31
Reach - 1	8400	10-Year	408.00	57.72	65.20		65.30	0.001482	2.95	303.34	322.45	0.26
Reach - 1	8400	25-Year	553.00	57.72	65.74		65.82	0.001198	2.88	506.56	417.70	0.23
Reach - 1	8400	50-Year	682.00	57.72	66.04		66.12	0.001165	2.96	637.78	439.89	0.23

HEC-RAS Plan: FINAL ALT 1 River: Gum Swamp Reach: Reach - 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach - 1	8400	100-Year	825.00	57.72	66.31		66.38	0.001171	3.07	755.82	449.45	0.24
Reach - 1	8872	2-Year	208.00	59.13	64.30		64.36	0.000650	1.89	109.99	29.40	0.17
Reach - 1	8872	10-Year	408.00	59.13	65.74		65.84	0.000924	2.64	155.36	35.19	0.21
Reach - 1	8872	25-Year	553.00	59.13	66.25		66.40	0.001179	3.15	241.13	314.24	0.24
Reach - 1	8872	50-Year	682.00	59.13	66.56		66.73	0.001325	3.44	342.37	332.25	0.26
Reach - 1	8872	100-Year	825.00	59.13	66.84		67.03	0.001450	3.70	441.95	375.43	0.27
Reach - 1	9293	2-Year	86.00	60.27	64.64		64.77	0.003279	2.89	29.78	12.92	0.34
Reach - 1	9293	10-Year	173.00	60.27	66.22		66.34	0.002298	2.97	112.11	306.61	0.29
Reach - 1	9293	25-Year	237.00	60.27	66.84		66.88	0.000988	2.11	338.74	421.24	0.20
Reach - 1	9293	50-Year	295.00	60.27	67.17		67.20	0.000700	1.85	486.75	475.52	0.17
Reach - 1	9293	100-Year	361.00	60.27	67.45		67.47	0.000548	1.69	628.46	522.20	0.15

PRIMARY SYSTEM ALTERNATIVE #2: HEC-RAS OUTPUT

SWIFT CREEK ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	234198	2-year	205.00	51.54	55.57	54.13	55.79	0.003005	3.76	56.67	27.31	0.39
Reach-1	234198	10-year	430.00	51.54	56.90	55.23	57.19	0.003003	4.67	240.19	340.61	0.40
Reach-1	234198	25-year	593.00	51.54	57.34	56.01	57.63	0.003002	4.99	406.06	408.22	0.41
Reach-1	234198	50-year	739.00	51.54	57.64	57.05	57.92	0.003000	5.20	536.14	442.83	0.41
Reach-1	234198	100-year	907.00	51.54	57.94	57.34	58.21	0.003001	5.41	670.43	471.80	0.42
Reach-1	234875	2-year	205.00	52.10	56.92		57.03	0.001218	2.82	112.53	174.86	0.26
Reach-1	234875	10-year	430.00	52.10	58.09		58.16	0.000787	2.69	502.26	440.74	0.22
Reach-1	234875	25-year	593.00	52.10	58.51		58.57	0.000755	2.79	695.97	476.99	0.21
Reach-1	234875	50-year	739.00	52.10	58.81		58.87	0.000758	2.90	844.12	522.31	0.22
Reach-1	234875	100-year	907.00	52.10	59.11		59.17	0.000769	3.02	1006.46	558.53	0.22
Reach-1	235139	2-year	205.00	51.75	57.20	53.78	57.26	0.000550	1.99	121.55	170.26	0.18
Reach-1	235139	10-year	430.00	51.75	58.28	54.86	58.34	0.000570	2.24	486.94	471.64	0.18
Reach-1	235139	25-year	593.00	51.75	58.69	55.50	58.74	0.000551	2.33	687.90	504.53	0.18
Reach-1	235139	50-year	739.00	51.75	58.99	56.00	59.04	0.000549	2.41	841.38	527.09	0.18
Reach-1	235139	100-year	907.00	51.75	59.29	56.52	59.34	0.000554	2.51	1004.28	565.19	0.19
Reach-1	235165		Bridge									
Reach-1	235183	2-year	205.00	51.76	57.51	53.87	57.55	0.000310	1.57	130.16	165.98	0.14
Reach-1	235183	10-year	430.00	51.76	59.38	54.88	59.39	0.000134	1.27	877.24	478.82	0.10
Reach-1	235183	25-year	593.00	51.76	59.69	55.46	59.71	0.000183	1.53	1036.16	542.14	0.11
Reach-1	235183	50-year	739.00	51.76	59.87	55.90	59.90	0.000236	1.78	1132.69	549.28	0.13
Reach-1	235183	100-year	907.00	51.76	60.03	56.34	60.07	0.000299	2.04	1223.08	552.99	0.15
Reach-1	235196	2-year	205.00	52.47	57.50	54.96	57.58	0.000984	2.35	87.33	408.79	0.23
Reach-1	235196	10-year	430.00	52.47	59.38	56.08	59.40	0.000252	1.57	640.46	598.81	0.13
Reach-1	235196	25-year	593.00	52.47	59.73	56.68	59.73	0.000058	0.79	1970.72	603.21	0.06
Reach-1	235196	50-year	739.00	52.47	59.91	57.13	59.92	0.000077	0.93	2083.31	605.24	0.07
Reach-1	235196	100-year	907.00	52.47	60.09	57.55	60.09	0.000100	1.08	2189.86	607.15	0.08
Reach-1	235219		Culvert									
Reach-1	235247	2-year	205.00	53.17	58.63	56.05	58.68	0.000637	1.88	114.23	437.53	0.20
Reach-1	235247	10-year	430.00	53.17	59.51	57.06	59.55	0.000494	1.94	524.85	508.25	0.18
Reach-1	235247	25-year	593.00	53.17	59.78	57.59	59.80	0.000313	1.60	984.79	521.57	0.14
Reach-1	235247	50-year	739.00	53.17	59.97	58.05	59.99	0.000371	1.80	1087.57	531.27	0.16

SWIFT CREEK ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	235247	100-year	907.00	53.17	60.12	58.46	60.15	0.000465	2.05	1164.86	539.92	0.18
Reach-1	235428	2-year	225.00	53.13	58.74	55.99	58.78	0.000440	1.84	343.54	266.14	0.16
Reach-1	235428	10-year	459.00	53.13	59.59	57.14	59.65	0.000631	2.52	589.34	312.54	0.20
Reach-1	235428	25-year	629.00	53.13	59.82	58.15	59.90	0.000922	3.13	661.28	321.75	0.25
Reach-1	235428	50-year	802.00	53.13	60.01	58.49	60.13	0.001211	3.69	726.07	329.00	0.28
Reach-1	235428	100-year	972.00	53.13	60.17	58.70	60.31	0.001517	4.21	776.82	336.40	0.32
Reach-1	235914	2-year	225.00	53.95	58.84		58.84	0.000060	0.72	750.35	296.61	0.06
Reach-1	235914	10-year	459.00	53.95	59.75		59.75	0.000101	1.06	1035.88	333.80	0.08
Reach-1	235914	25-year	629.00	53.95	60.04		60.05	0.000145	1.33	1137.45	346.07	0.10
Reach-1	235914	50-year	802.00	53.95	60.32		60.33	0.000191	1.57	1233.69	363.61	0.12
Reach-1	235914	100-year	972.00	53.95	60.55		60.56	0.000236	1.80	1318.71	379.81	0.13
Reach-1	236412	2-year	225.00	54.78	58.89		58.89	0.000188	1.01	491.87	317.44	0.10
Reach-1	236412	10-year	459.00	54.78	59.81		59.82	0.000214	1.28	843.84	417.97	0.11
Reach-1	236412	25-year	629.00	54.78	60.14		60.15	0.000271	1.52	981.25	429.66	0.13
Reach-1	236412	50-year	802.00	54.78	60.43		60.45	0.000318	1.72	1110.46	441.91	0.14
Reach-1	236412	100-year	972.00	54.78	60.69		60.70	0.000360	1.90	1223.13	452.32	0.15
Reach-1	236856	2-year	225.00	54.38	58.98		58.99	0.000235	1.12	428.93	209.90	0.11
Reach-1	236856	10-year	459.00	54.38	59.93		59.94	0.000295	1.42	655.47	294.53	0.13
Reach-1	236856	25-year	629.00	54.38	60.28		60.30	0.000377	1.70	765.97	323.88	0.15
Reach-1	236856	50-year	802.00	54.38	60.61		60.63	0.000442	1.94	873.04	343.20	0.16
Reach-1	236856	100-year	972.00	54.38	60.88		60.90	0.000502	2.15	970.13	368.83	0.18
Reach-1	237179	2-year	225.00	55.37	59.09		59.17	0.001641	2.83	150.96	103.70	0.30
Reach-1	237179	10-year	459.00	55.37	60.04		60.16	0.001810	3.64	262.81	135.66	0.34
Reach-1	237179	25-year	629.00	55.37	60.43		60.58	0.002178	4.27	318.62	157.69	0.37
Reach-1	237179	50-year	802.00	55.37	60.76		60.95	0.002447	4.77	376.05	186.96	0.40
Reach-1	237179	100-year	972.00	55.37	61.04		61.30	0.003143	5.63	431.36	210.08	0.46
Reach-1	237456	2-year	225.00	55.98	59.62	58.69	59.74	0.002683	3.36	113.71	98.77	0.38
Reach-1	237456	10-year	459.00	55.98	60.63	59.38	60.79	0.002932	4.08	217.89	217.77	0.41
Reach-1	237456	25-year	629.00	55.98	61.11	59.76	61.28	0.003023	4.39	295.60	258.07	0.42
Reach-1	237456	50-year	802.00	55.98	61.52	60.09	61.69	0.003003	4.58	372.22	277.39	0.42
Reach-1	237456	100-year	972.00	55.98	61.94	60.49	62.11	0.002703	4.67	455.63	298.97	0.41

SWIFT CREEK ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	237708	2-year	225.00	56.29	59.99	57.55	60.02	0.000451	1.70	176.27	130.84	0.16
Reach-1	237708	10-year	459.00	56.29	61.10	58.45	61.18	0.000697	2.48	248.26	211.38	0.20
Reach-1	237708	25-year	629.00	56.29	61.57	58.84	61.61	0.000455	2.11	551.97	308.08	0.16
Reach-1	237708	50-year	802.00	56.29	62.00	59.17	62.04	0.000508	2.35	732.16	416.04	0.18
Reach-1	237708	100-year	972.00	56.29	62.41	59.45	62.46	0.000524	2.50	906.02	436.15	0.18
Reach-1	237781		Culvert									
Reach-1	237845	2-year	225.00	56.31	60.10	57.78	60.17	0.000771	2.12	106.07	127.68	0.20
Reach-1	237845	10-year	459.00	56.31	61.41	58.53	61.56	0.001137	3.07	168.11	301.68	0.25
Reach-1	237845	25-year	629.00	56.31	62.21	58.99	62.39	0.001236	3.52	222.54	360.36	0.27
Reach-1	237845	50-year	802.00	56.31	62.90	59.41	63.01	0.000796	3.06	662.43	405.20	0.22
Reach-1	237845	100-year	972.00	56.31	63.24	59.80	63.37	0.000897	3.37	758.91	440.37	0.23
Reach-1	238094	2-year	162.00	56.52	60.35	59.01	60.58	0.003935	3.89	41.63	77.90	0.43
Reach-1	238094	10-year	329.00	56.52	61.75	60.11	62.11	0.004374	4.86	71.74	140.08	0.47
Reach-1	238094	25-year	452.00	56.52	62.58	60.73	62.91	0.003578	4.83	180.30	329.37	0.43
Reach-1	238094	50-year	562.00	56.52	63.11	61.21	63.38	0.002831	4.62	327.93	456.53	0.39
Reach-1	238094	100-year	679.00	56.52	63.50	62.28	63.73	0.002466	4.51	464.73	538.42	0.37
Reach-1	238526	2-year	162.00	56.20	60.94	57.72	60.98	0.000370	1.58	102.64	28.27	0.15
Reach-1	238526	10-year	329.00	56.20	62.55	58.52	62.62	0.000491	2.17	163.30	62.25	0.17
Reach-1	238526	25-year	452.00	56.20	63.33	59.01	63.43	0.000556	2.51	217.67	90.31	0.19
Reach-1	238526	50-year	562.00	56.20	63.78	59.39	63.90	0.000633	2.82	287.70	191.98	0.20
Reach-1	238526	100-year	679.00	56.20	64.12	59.76	64.27	0.000721	3.13	361.15	236.05	0.22
Reach-1	238936	2-year	162.00	56.88	61.11	58.59	61.15	0.000489	1.66	97.77	32.23	0.17
Reach-1	238936	10-year	329.00	56.88	62.76	59.29	62.83	0.000540	2.12	155.41	37.65	0.18
Reach-1	238936	25-year	452.00	56.88	63.58	59.72	63.67	0.000598	2.42	187.35	42.20	0.20
Reach-1	238936	50-year	562.00	56.88	64.06	60.06	64.17	0.000682	2.72	209.05	48.16	0.21
Reach-1	238936	100-year	679.00	56.88	64.43	60.39	64.58	0.000797	3.05	228.09	52.85	0.23
Reach-1	239177	2-year	162.00	57.85	61.08	60.66	61.64	0.012291	6.02	26.93	13.43	0.75
Reach-1	239177	10-year	329.00	57.85	62.72	61.79	63.32	0.008254	6.24	52.68	17.99	0.64
Reach-1	239177	25-year	452.00	57.85	63.51	62.44	64.20	0.007899	6.66	67.87	20.20	0.64
Reach-1	239177	50-year	562.00	57.85	63.96	62.94	64.78	0.008637	7.28	77.24	21.61	0.68
Reach-1	239177	100-year	679.00	57.85	64.30	63.41	65.30	0.009858	8.02	84.69	53.12	0.73

SWIFT CREEK ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	239470	2-year	162.00	57.77	62.20	59.53	62.26	0.000596	1.90	85.36	25.30	0.18
Reach-1	239470	10-year	329.00	57.77	63.89	60.33	63.98	0.000732	2.51	130.85	28.79	0.21
Reach-1	239470	25-year	452.00	57.77	64.79	60.81	64.92	0.000819	2.86	157.77	30.68	0.22
Reach-1	239470	50-year	562.00	57.77	65.44	61.20	65.59	0.000907	3.16	177.99	32.02	0.24
Reach-1	239470	100-year	679.00	57.77	66.02	61.58	66.21	0.000978	3.44	200.91	46.77	0.25
Reach-1	239543		Culvert									
Reach-1	239601	2-year	162.00	57.56	62.56	59.50	62.62	0.000532	1.86	87.24	24.08	0.17
Reach-1	239601	10-year	329.00	57.56	64.73	60.38	64.81	0.000540	2.27	144.85	29.02	0.18
Reach-1	239601	25-year	452.00	57.56	66.46	60.91	66.54	0.000401	2.26	209.87	178.71	0.16
Reach-1	239601	50-year	562.00	57.56	67.76	61.33	67.81	0.000213	1.87	517.40	347.86	0.12
Reach-1	239601	100-year	679.00	57.56	68.17	61.74	68.22	0.000231	2.01	602.77	387.93	0.13
Reach-1	239904	2-year	132.00	58.41	62.78	60.60	62.90	0.001719	2.73	48.38	17.18	0.29
Reach-1	239904	10-year	243.00	58.41	64.93	61.48	65.03	0.001045	2.54	95.80	26.92	0.24
Reach-1	239904	25-year	323.00	58.41	66.61	61.99	66.68	0.000619	2.19	154.43	83.22	0.18
Reach-1	239904	50-year	394.00	58.41	67.85	62.39	67.89	0.000312	1.68	418.86	318.53	0.13
Reach-1	239904	100-year	472.00	58.41	68.27	62.84	68.30	0.000281	1.68	547.03	353.25	0.13
Reach-1	240316	2-year	132.00	59.47	63.77		64.03	0.004636	4.12	32.03	12.34	0.45
Reach-1	240316	10-year	243.00	59.47	65.52		65.80	0.003406	4.27	56.86	16.09	0.40
Reach-1	240316	25-year	323.00	59.47	66.94		67.14	0.002005	3.70	121.56	103.36	0.31
Reach-1	240316	50-year	394.00	59.47	68.02		68.11	0.000941	2.78	289.52	217.52	0.22
Reach-1	240316	100-year	472.00	59.47	68.42		68.50	0.000836	2.72	386.44	264.68	0.21
Reach-1	240800	2-year	132.00	60.78	65.27		65.39	0.001850	2.83	46.57	16.97	0.30
Reach-1	240800	10-year	243.00	60.78	66.78		66.93	0.001658	3.16	86.87	49.41	0.30
Reach-1	240800	25-year	323.00	60.78	67.76		67.88	0.001175	2.98	146.04	67.64	0.26
Reach-1	240800	50-year	394.00	60.78	68.46		68.56	0.000918	2.85	228.40	166.12	0.23
Reach-1	240800	100-year	472.00	60.78	68.82		68.93	0.000916	2.95	295.97	202.33	0.23
Reach-1	241107	2-year	132.00	61.47	65.91		66.07	0.002596	3.20	41.29	16.26	0.35
Reach-1	241107	10-year	243.00	61.47	67.34		67.51	0.002130	3.42	88.73	64.25	0.33
Reach-1	241107	25-year	323.00	61.47	68.17		68.30	0.001573	3.18	167.65	132.75	0.29
Reach-1	241107	50-year	394.00	61.47	68.78		68.88	0.001151	2.87	270.44	198.79	0.25
Reach-1	241107	100-year	472.00	61.47	69.15		69.23	0.001051	2.87	348.81	234.57	0.24

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	241592	2-year	81.00	62.40	66.69		66.74	0.000639	1.65	49.01	18.75	0.18
Reach-1	241592	10-year	157.00	62.40	68.07		68.13	0.000690	2.02	77.99	27.45	0.19
Reach-1	241592	25-year	213.00	62.40	68.77		68.84	0.000713	2.19	115.17	80.78	0.20
Reach-1	241592	50-year	264.00	62.40	69.25		69.33	0.000680	2.27	164.36	121.37	0.20
Reach-1	241592	100-year	320.00	62.40	69.58		69.66	0.000710	2.42	209.36	148.40	0.20
Reach-1	241994	2-year	81.00	63.58	66.99		67.04	0.000890	1.83	44.20	18.73	0.21
Reach-1	241994	10-year	157.00	63.58	68.37		68.44	0.000843	2.14	74.41	33.39	0.21
Reach-1	241994	25-year	213.00	63.58	69.07		69.15	0.000834	2.30	108.63	64.24	0.21
Reach-1	241994	50-year	264.00	63.58	69.55		69.63	0.000833	2.40	144.09	85.13	0.22
Reach-1	241994	100-year	320.00	63.58	69.89		69.98	0.000867	2.57	175.50	97.42	0.22

SCUT1 ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek UT1 Reach: Reach1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	231	2-Year	154.00	53.45	56.97	55.87	57.20	0.004003	3.82	40.36	17.62	0.44
Reach1	231	10-Year	279.00	53.45	58.07	56.62	58.39	0.004007	4.54	69.73	141.01	0.46
Reach1	231	25-Year	366.00	53.45	58.45	57.06	58.77	0.004003	4.76	129.48	175.40	0.46
Reach1	231	50-Year	438.00	53.45	58.67	57.38	58.98	0.004005	4.88	171.00	195.77	0.46
Reach1	231	100-Year	521.00	53.45	58.89	57.66	59.18	0.004005	5.00	215.18	215.34	0.46
Reach1	584	2-Year	154.00	53.78	57.97		58.10	0.001722	2.80	55.03	20.27	0.30
Reach1	584	10-Year	279.00	53.78	59.06		59.15	0.001283	2.79	179.14	140.79	0.27
Reach1	584	25-Year	366.00	53.78	59.44		59.54	0.001328	2.96	236.19	158.47	0.27
Reach1	584	50-Year	438.00	53.78	59.67		59.78	0.001412	3.13	274.81	169.39	0.28
Reach1	584	100-Year	521.00	53.78	59.90		60.01	0.001509	3.31	314.61	179.20	0.29
Reach1	1005	2-Year	154.00	54.86	58.70		58.76	0.001431	2.29	126.56	146.52	0.27
Reach1	1005	10-Year	279.00	54.86	59.57		59.61	0.000899	2.08	268.29	177.33	0.22
Reach1	1005	25-Year	366.00	54.86	59.95		59.99	0.000849	2.16	336.73	185.24	0.22
Reach1	1005	50-Year	438.00	54.86	60.20		60.24	0.000851	2.26	384.04	190.12	0.22
Reach1	1005	100-Year	521.00	54.86	60.45		60.50	0.000870	2.38	432.42	194.97	0.23
Reach1	1429	2-Year	74.00	54.48	59.18		59.22	0.000666	1.62	45.56	18.30	0.18
Reach1	1429	10-Year	141.00	54.48	59.95		60.03	0.001120	2.32	60.70	21.00	0.24
Reach1	1429	25-Year	189.00	54.48	60.32		60.44	0.001445	2.75	68.70	22.29	0.28
Reach1	1429	50-Year	229.00	54.48	60.57		60.72	0.001708	3.07	74.49	23.18	0.30
Reach1	1429	100-Year	274.00	54.48	60.83		61.01	0.001984	3.40	80.55	24.08	0.33
Reach1	1546	2-Year	74.00	55.50	59.24	56.07	59.25	0.000061	0.61	120.49	32.93	0.06
Reach1	1546	10-Year	141.00	55.50	60.07	56.37	60.09	0.000117	0.95	147.91	33.14	0.08
Reach1	1546	25-Year	189.00	55.50	60.49	56.55	60.51	0.000161	1.17	161.70	33.25	0.09
Reach1	1546	50-Year	229.00	55.50	60.78	56.70	60.81	0.000198	1.34	171.47	33.32	0.10
Reach1	1546	100-Year	274.00	55.50	61.08	56.84	61.12	0.000240	1.51	181.45	33.39	0.11
Reach1	1588.5		Culvert									
Reach1	1635	2-Year	74.00	55.72	59.27	56.72	59.28	0.000112	0.76	97.52	32.06	0.08
Reach1	1635	10-Year	141.00	55.72	60.18	57.03	60.19	0.000182	1.11	126.83	32.43	0.10
Reach1	1635	25-Year	189.00	55.72	60.68	57.22	60.71	0.000225	1.32	143.26	32.63	0.11
Reach1	1635	50-Year	229.00	55.72	61.02	57.36	61.06	0.000262	1.48	154.51	33.28	0.12
Reach1	1635	100-Year	274.00	55.72	61.35	57.51	61.39	0.000302	1.66	165.61	34.21	0.13

SCUT1 ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	1798	2-Year	44.00	56.04	59.29		59.30	0.000230	0.88	49.76	24.14	0.11
Reach1	1798	10-Year	79.00	56.04	60.21		60.23	0.000243	1.07	73.61	27.61	0.12
Reach1	1798	25-Year	103.00	56.04	60.73		60.75	0.000241	1.17	88.50	30.33	0.12
Reach1	1798	50-Year	123.00	56.04	61.08		61.10	0.000245	1.25	99.54	32.44	0.12
Reach1	1798	100-Year	148.00	56.04	61.42		61.45	0.000262	1.36	110.90	34.47	0.13
Reach1	2289	2-Year	44.00	56.55	59.51		59.65	0.005214	3.02	14.56	10.61	0.45
Reach1	2289	10-Year	79.00	56.55	60.42		60.57	0.003603	3.03	26.10	14.52	0.40
Reach1	2289	25-Year	103.00	56.55	60.93		61.07	0.003044	3.03	33.97	16.67	0.37
Reach1	2289	50-Year	123.00	56.55	61.28		61.42	0.002801	3.07	40.06	18.15	0.36
Reach1	2289	100-Year	148.00	56.55	61.63		61.78	0.002705	3.17	46.65	19.64	0.36
Reach1	2669	2-Year	44.00	57.94	61.02		61.10	0.002932	2.35	18.73	13.25	0.35
Reach1	2669	10-Year	79.00	57.94	61.71		61.82	0.003017	2.69	29.36	17.53	0.37
Reach1	2669	25-Year	103.00	57.94	62.08		62.21	0.002936	2.83	36.42	19.87	0.37
Reach1	2669	50-Year	123.00	57.94	62.37		62.50	0.002841	2.91	42.27	21.62	0.37
Reach1	2669	100-Year	148.00	57.94	62.69		62.83	0.002786	2.98	49.60	23.69	0.36
Reach1	2906	2-Year	44.00	58.90	61.28	59.53	61.29	0.000318	1.00	43.79	21.91	0.13
Reach1	2906	10-Year	79.00	58.90	62.02	59.83	62.05	0.000394	1.30	60.89	24.09	0.14
Reach1	2906	25-Year	103.00	58.90	62.42	60.00	62.45	0.000436	1.46	70.71	25.26	0.15
Reach1	2906	50-Year	123.00	58.90	62.71	60.13	62.75	0.000467	1.57	78.23	26.12	0.16
Reach1	2906	100-Year	148.00	58.90	63.05	60.29	63.09	0.000499	1.70	87.11	27.10	0.17
Reach1	2952.5		Culvert									
Reach1	3015	2-Year	44.00	59.40	61.52	59.98	61.54	0.000373	1.04	42.27	22.76	0.13
Reach1	3015	10-Year	79.00	59.40	62.42	60.25	62.44	0.000356	1.24	63.78	25.15	0.14
Reach1	3015	25-Year	103.00	59.40	62.95	60.41	62.98	0.000343	1.33	77.62	26.58	0.14
Reach1	3015	50-Year	123.00	59.40	63.39	60.53	63.42	0.000324	1.37	89.55	27.75	0.13
Reach1	3015	100-Year	148.00	59.40	64.02	60.68	64.05	0.000279	1.38	107.42	29.41	0.13
Reach1	3270	2-Year	27.00	59.93	61.63		61.84	0.012992	3.69	7.32	8.26	0.69
Reach1	3270	10-Year	49.00	59.93	62.54		62.67	0.004702	2.93	16.72	12.38	0.44
Reach1	3270	25-Year	64.00	59.93	63.07		63.18	0.003079	2.67	23.94	14.78	0.37
Reach1	3270	50-Year	79.00	59.93	63.50		63.60	0.002405	2.57	30.75	16.74	0.33
Reach1	3270	100-Year	95.00	59.93	64.11		64.19	0.001536	2.27	41.79	19.49	0.27

SCUT1 ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	3690	2-Year	27.00	59.63	62.99		63.03	0.001193	1.63	16.53	9.01	0.21
Reach1	3690	10-Year	49.00	59.63	63.68		63.75	0.001585	2.10	23.37	10.88	0.25
Reach1	3690	25-Year	64.00	59.63	64.05		64.14	0.001744	2.32	27.61	11.90	0.27
Reach1	3690	50-Year	79.00	59.63	64.39		64.48	0.001840	2.49	31.74	12.81	0.28
Reach1	3690	100-Year	95.00	59.63	64.79		64.89	0.001767	2.56	37.06	13.90	0.28
Reach1	3808	2-Year	27.00	59.63	63.13		63.16	0.000989	1.52	17.76	9.37	0.19
Reach1	3808	10-Year	49.00	59.63	63.86		63.92	0.001279	1.93	25.36	11.37	0.23
Reach1	3808	25-Year	64.00	59.63	64.25		64.32	0.001399	2.13	30.01	12.44	0.24
Reach1	3808	50-Year	79.00	59.63	64.60		64.68	0.001477	2.29	34.49	13.38	0.25
Reach1	3808	100-Year	95.00	59.63	64.99		65.08	0.001448	2.38	39.95	14.45	0.25
Reach1	3936	2-Year	27.00	59.42	63.22	61.01	63.23	0.000308	0.96	28.07	13.62	0.12
Reach1	3936	10-Year	49.00	59.42	63.99	61.43	64.01	0.000406	1.24	39.42	15.89	0.14
Reach1	3936	25-Year	64.00	59.42	64.40	61.66	64.43	0.000453	1.39	46.17	17.11	0.15
Reach1	3936	50-Year	79.00	59.42	64.76	61.86	64.79	0.000488	1.50	52.52	18.17	0.16
Reach1	3936	100-Year	95.00	59.42	65.15	62.05	65.19	0.000495	1.58	59.95	19.35	0.16
Reach1	3967.5		Culvert									
Reach1	3997	2-Year	27.00	61.44	64.24	62.81	64.27	0.000901	1.39	19.37	12.61	0.20
Reach1	3997	10-Year	49.00	61.44	65.20	63.23	65.24	0.000694	1.47	33.36	16.42	0.18
Reach1	3997	25-Year	64.00	61.44	65.81	63.45	65.84	0.000564	1.45	44.02	18.82	0.17
Reach1	3997	50-Year	79.00	61.44	66.44	63.64	66.47	0.000420	1.37	62.46	77.84	0.15
Reach1	3997	100-Year	95.00	61.44	67.05	63.83	67.06	0.000227	1.12	137.56	191.38	0.11
Reach1	4120	2-Year	5.00	61.75	64.32		64.32	0.000042	0.29	17.52	12.64	0.04
Reach1	4120	10-Year	11.00	61.75	65.28		65.28	0.000042	0.35	31.63	16.87	0.04
Reach1	4120	25-Year	16.00	61.75	65.88		65.88	0.000041	0.38	42.51	19.52	0.04
Reach1	4120	50-Year	20.00	61.75	66.49		66.50	0.000027	0.34	78.52	101.93	0.04
Reach1	4120	100-Year	24.00	61.75	67.08		67.08	0.000013	0.26	163.06	179.16	0.03
Reach1	4307.5*	2-Year	5.00	62.35	64.33		64.34	0.000142	0.47	10.74	9.03	0.08
Reach1	4307.5*	10-Year	11.00	62.35	65.29		65.29	0.000114	0.53	20.82	12.07	0.07
Reach1	4307.5*	25-Year	16.00	62.35	65.89		65.89	0.000103	0.56	28.59	13.97	0.07
Reach1	4307.5*	50-Year	20.00	62.35	66.50		66.50	0.000076	0.53	37.79	15.93	0.06
Reach1	4307.5*	100-Year	24.00	62.35	67.08		67.08	0.000059	0.50	47.69	22.88	0.05

SCUT1 ALT 2

HEC-RAS Plan: FINAL ALT 2 River: Swift Creek UT1 Reach: Reach1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach1	4495	2-Year	5.00	62.94	64.38		64.39	0.000620	0.83	6.02	6.16	0.15
Reach1	4495	10-Year	11.00	62.94	65.31		65.31	0.000068	0.36	46.99	120.23	0.05
Reach1	4495	25-Year	16.00	62.94	65.89		65.89	0.000009	0.15	118.93	125.40	0.02
Reach1	4495	50-Year	20.00	62.94	66.51		66.51	0.000003	0.09	197.32	130.80	0.01
Reach1	4495	100-Year	24.00	62.94	67.08		67.08	0.000001	0.07	274.35	135.90	0.01

SECONDARY SYSTEM: SWMM INPUT

Project: Greenville Master Plan
Location: Davenport
Prepared by : MB/EVH
Checked by: DJK
Date: June 2015

SWMM Sub-Basin ID	Curve Number	Area (acres)	Area (sq. ft.)	Width (ft.)	Basin Slope (%)
SUB_GSMB010091	79	0.85	37,026	177	0.22
SUB_GSMB010078	70	27.67	1,205,305	3,240	0.38
SUB_GSMB010057	78	1.52	66,211	282	1.11
SUB_GSMB010055	75	15.17	660,805	1,069	1.11
SUB_1	74	17.73	772,319	772	0.42
SUB_2	76	37.10	1,616,076	1,443	0.26

SECONDARY SYSTEM EXISTING CONDITIONS: SWMM OUTPUT

Existing Conditions: Davenport Farm Road (10-Year)

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

Existing Conditions: Davenport Farm Road (10-Year)
Starting WSEL from Gum Branch XS6400
10-Year = 62.63'

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ MAY-20-2010 00:00:00
Ending Date .............. MAY-21-2010 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:15:00
Wet Time Step ............ 00:10:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 10.00 sec


WARNING 04: minimum elevation drop used for Conduit DUMMY_CHANNEL

WARNING 02: maximum depth increased for Node GSMB010091

WARNING 02: maximum depth increased for Node GSMB010078

WARNING 02: maximum depth increased for Node GSMB010089

WARNING 02: maximum depth increased for Node GSMB010055

WARNING 02: maximum depth increased for Node GSMB010093

**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......        48.467         5.812
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........        18.309         2.196
Surface Runoff ...........        28.410         3.407
Final Surface Storage ....         1.814         0.217
Continuity Error (%) .....        -0.135


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        28.313         9.226
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         1.904         0.620
External Outflow .........         8.452         2.754
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.025         0.008
Final Stored Volume ......        20.825         6.786
Continuity Error (%) .....         3.189
```

```
************************
Highest Continuity Errors
************************
Node DUMMY_JUNCTION (20.30%)
Node GSMB010055 (16.32%)
Node GSMB010057 (5.92%)
Node GSMB010077 (3.95%)
Node GSMB010089 (3.75%)


**************************
Time-Step Critical Elements
**************************
Link DUMMY_CHANNEL (46.63%)
Link 2_EX30CMP (13.33%)
Link 6_EX_5x7_Arch_CMP (4.52%)
Link 4_EX48RCP (3.40%)
Link 1_EX24CMP (2.80%)


*******************************
Highest Flow Instability Indexes
*******************************
Link 8_EX48RCP (3)
Link 7_OPENCHANNEL (3)
Link 6_EX_5x7_Arch_CMP (3)
Link 5_OPENCHANNEL (3)
Link DUMMY_CHANNEL (3)


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     7.03 sec
Maximum Time Step           :    10.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


**************************
Subcatchment Runoff Summary
**************************

---------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                in         in         in         in         in    10^6 gal      CFS
---------------------------------------------------------------------------------------------------------
SUB_GSMB010091            5.81       0.00       0.00       1.82       3.86        0.09     1.71   0.664
SUB_GSMB010078            5.81       0.00       0.00       2.47       3.20        2.41    39.99   0.551
SUB_GSMB010057            5.81       0.00       0.00       1.90       3.82        0.16     3.49   0.658
SUB_GSMB010055            5.81       0.00       0.00       2.12       3.55        1.46    25.32   0.611
SUB_1                     5.81       0.00       0.00       2.19       3.37        1.62    18.13   0.579
SUB_2                     5.81       0.00       0.00       2.05       3.49        3.52    38.57   0.601


******************
Node Depth Summary
******************

---------------------------------------------------------------------
                            Average  Maximum  Maximum  Time of Max
                              Depth    Depth      HGL   Occurrence
Node                 Type      Feet     Feet     Feet  days hr:min
---------------------------------------------------------------------
GSMB010091           JUNCTION  2.75     4.71    66.63     0  20:57
GSMB010078           JUNCTION  4.76     6.73    66.63     0  20:57
GSMB010057           JUNCTION  6.51     8.48    66.63     0  20:56
GSMB010089           JUNCTION  3.07     5.03    66.63     0  20:56
GSMB010077           JUNCTION  5.86     7.83    66.63     0  20:57
GSMB010055           JUNCTION  7.26     9.23    66.63     0  20:56
DUMMY_JUNCTION       JUNCTION  8.27    10.23    66.63     0  20:56
GSMB010093           JUNCTION  1.84     3.66    66.63     0  20:58
Outlet               OUTFALL   6.23     6.23    62.63     0  00:00
```

STORAGE_1	STORAGE	1.65	3.24	66.64	0	20:53
STORAGE_2	STORAGE	1.53	3.45	66.65	0	21:14

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
GSMB010091	JUNCTION	1.71	13.71	0 13:31	0.089	1.675
GSMB010078	JUNCTION	39.98	39.98	0 13:00	2.400	4.384
GSMB010057	JUNCTION	3.49	72.04	0 00:03	0.158	2.962
GSMB010089	JUNCTION	0.00	19.99	0 00:06	0.000	1.701
GSMB010077	JUNCTION	0.00	52.63	0 00:03	0.000	3.610
GSMB010055	JUNCTION	25.31	93.63	0 00:03	1.461	4.486
DUMMY_JUNCTION	JUNCTION	0.00	279.52	0 00:00	0.000	3.927
GSMB010093	JUNCTION	0.00	17.09	0 14:24	0.000	2.023
Outlet	OUTFALL	0.00	279.52	0 00:00	0.000	3.374
STORAGE_1	STORAGE	18.13	18.70	0 13:13	1.612	1.640
STORAGE_2	STORAGE	38.57	43.22	0 13:45	3.507	4.661

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GSMB010057	JUNCTION	8.36	0.478	0.022
DUMMY_JUNCTION	JUNCTION	8.05	0.428	1.772

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STORAGE_1	59.147	15	0	117.945	30	0 20:53	6.07
STORAGE_2	249.687	18	0	566.623	40	0 21:14	3.53

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
Outlet	99.98	6.65	279.52	3.374
System	99.98	6.65	279.52	3.374

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1_EX24CMP	CONDUIT	6.07	0	15:09	2.62	0.52	1.00
OVERLAND_1_EX24CMP	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
2_EX30CMP	CONDUIT	17.01	0	14:24	3.89	1.17	1.00
OVERLAND_2_EX30CMP	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
3_OPENCHANNEL	CONDUIT	13.40	0	13:32	1.18	0.07	0.70
4_EX48RCP	CONDUIT	12.93	0	13:32	2.19	0.07	1.00
5_OPENCHANNEL	CONDUIT	19.99	0	00:06	1.96	0.01	0.89
6_EX_5x7_Arch_CMP	CONDUIT	35.21	0	13:00	3.64	0.08	0.98
OVERLAND_6_EX_5x7_Arch_CMP	CONDUIT	14.06	0	17:15	0.19	0.00	0.53
7_OPENCHANNEL	CONDUIT	52.63	0	00:03	2.96	0.13	1.00
8_EX48RCP	CONDUIT	72.04	0	00:03	4.10	0.21	1.00
OVERLAND_8_EX48RCP	CONDUIT	51.80	0	12:46	1.37	0.01	1.00
DUMMY_CHANNEL	CONDUIT	279.52	0	00:00	12.06	38.26	1.00
9_OPENCHANNEL	CONDUIT	86.38	0	00:03	4.07	0.86	1.00
OVERLAND_9_OPENCHANNEL	CONDUIT	26.17	0	00:06	0.62	0.02	0.95

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
1_EX24CMP	1.00	0.25	0.00	0.00	0.74	0.01	0.00	0.00	0.13	0.0002
OVERLAND_1_EX24CMP	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
2_EX30CMP	1.00	0.25	0.00	0.00	0.75	0.00	0.00	0.00	0.14	0.0002
OVERLAND_2_EX30CMP	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
3_OPENCHANNEL	1.00	0.01	0.26	0.00	0.73	0.00	0.00	0.00	0.03	0.0000
4_EX48RCP	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.01	0.0002
5_OPENCHANNEL	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.01	0.0000
6_EX_5x7_Arch_CMP	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.0001
OVERLAND_6_EX_5x7_Arch_CMP	1.00	0.43	0.27	0.00	0.30	0.00	0.00	0.00	0.01	0.0000
7_OPENCHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.0001
8_EX48RCP	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.0003
OVERLAND_8_EX48RCP	1.00	0.01	0.39	0.00	0.60	0.00	0.00	0.00	0.01	0.0000
DUMMY_CHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.02	0.0100
9_OPENCHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.0002
OVERLAND_9_OPENCHANNEL	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.01	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1_EX24CMP	10.34	10.34	10.34	0.01	0.01
2_EX30CMP	8.69	8.69	8.69	1.36	0.01
4_EX48RCP	9.48	9.48	9.48	0.01	0.01
7_OPENCHANNEL	10.50	10.50	10.50	0.01	0.01
8_EX48RCP	23.92	23.92	23.92	0.01	0.01
OVERLAND_8_EX48RCP	8.36	8.36	8.36	0.01	0.01
DUMMY_CHANNEL	23.99	23.99	23.99	12.71	13.87
9_OPENCHANNEL	23.92	23.92	23.92	0.01	0.01

Analysis begun on: Tue Jan 12 15:11:46 2016
Analysis ended on: Tue Jan 12 15:11:47 2016
Total elapsed time: 00:00:01

SECONDARY SYSTEM ALTERNATIVE: SWMM OUTPUT

Alternative: Davenport Farm Road(10-Year)

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

Alternative: Davenport Farm Road(10-Year)
Starting WSEL from Gum Branch XS6400
10-Year = 62.63'

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ MAY-20-2010 00:00:00
Ending Date .............. MAY-21-2010 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:15:00
Wet Time Step ............ 00:10:00
Dry Time Step ............ 00:10:00
Routing Time Step ........ 10.00 sec


WARNING 04: minimum elevation drop used for Conduit DUMMY_CHANNEL

WARNING 02: maximum depth increased for Node GSMB010091

WARNING 02: maximum depth increased for Node GSMB010078

WARNING 02: maximum depth increased for Node GSMB010089

WARNING 02: maximum depth increased for Node GSMB010055

WARNING 02: maximum depth increased for Node GSMB010093

*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Total Precipitation ......        48.467         5.812
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........        18.309         2.196
Surface Runoff ...........        28.410         3.407
Final Surface Storage ....         1.814         0.217
Continuity Error (%) .....        -0.135


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        28.313         9.226
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         1.904         0.620
External Outflow .........         8.452         2.754
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.025         0.008
Final Stored Volume ......        20.825         6.786
Continuity Error (%) .....         3.189
```

```
************************
Highest Continuity Errors
************************
Node DUMMY_JUNCTION (20.30%)
Node GSMB010055 (16.32%)
Node GSMB010057 (5.92%)
Node GSMB010077 (3.95%)
Node GSMB010089 (3.75%)


*************************
Time-Step Critical Elements
*************************
Link DUMMY_CHANNEL (46.63%)
Link 2_EX30CMP (13.33%)
Link 6_EX_5x7_Arch_CMP (4.52%)
Link 4_EX48RCP (3.40%)
Link 1_EX24CMP (2.80%)


*******************************
Highest Flow Instability Indexes
*******************************
Link 8_EX48RCP (3)
Link 7_OPENCHANNEL (3)
Link 6_EX_5x7_Arch_CMP (3)
Link 5_OPENCHANNEL (3)
Link DUMMY_CHANNEL (3)


************************
Routing Time Step Summary
************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     7.03 sec
Maximum Time Step           :    10.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


*************************
Subcatchment Runoff Summary
*************************

---------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff  Coeff
Subcatchment                in         in         in         in         in    10^6 gal      CFS
---------------------------------------------------------------------------------------------------------
SUB_GSMB010091            5.81       0.00       0.00       1.82       3.86        0.09     1.71   0.664
SUB_GSMB010078            5.81       0.00       0.00       2.47       3.20        2.41    39.99   0.551
SUB_GSMB010057            5.81       0.00       0.00       1.90       3.82        0.16     3.49   0.658
SUB_GSMB010055            5.81       0.00       0.00       2.12       3.55        1.46    25.32   0.611
SUB_1                     5.81       0.00       0.00       2.19       3.37        1.62    18.13   0.579
SUB_2                     5.81       0.00       0.00       2.05       3.49        3.52    38.57   0.601


*****************
Node Depth Summary
*****************

-----------------------------------------------------------------------
                            Average  Maximum  Maximum  Time of Max
                              Depth    Depth      HGL   Occurrence
Node                 Type      Feet     Feet     Feet  days hr:min
-----------------------------------------------------------------------
GSMB010091           JUNCTION  2.75     4.71    66.63     0  20:57
GSMB010078           JUNCTION  4.76     6.73    66.63     0  20:57
GSMB010057           JUNCTION  6.51     8.48    66.63     0  20:56
GSMB010089           JUNCTION  3.07     5.03    66.63     0  20:56
GSMB010077           JUNCTION  5.86     7.83    66.63     0  20:57
GSMB010055           JUNCTION  7.26     9.23    66.63     0  20:56
DUMMY_JUNCTION       JUNCTION  8.27    10.23    66.63     0  20:56
GSMB010093           JUNCTION  1.84     3.66    66.63     0  20:58
Outlet               OUTFALL   6.23     6.23    62.63     0  00:00
```

STORAGE_1	STORAGE	1.65	3.24	66.64	0	20:53
STORAGE_2	STORAGE	1.53	3.45	66.65	0	21:14

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
GSMB010091	JUNCTION	1.71	13.71	0 13:31	0.089	1.675
GSMB010078	JUNCTION	39.98	39.98	0 13:00	2.400	4.384
GSMB010057	JUNCTION	3.49	72.04	0 00:03	0.158	2.962
GSMB010089	JUNCTION	0.00	19.99	0 00:06	0.000	1.701
GSMB010077	JUNCTION	0.00	52.63	0 00:03	0.000	3.610
GSMB010055	JUNCTION	25.31	93.63	0 00:03	1.461	4.486
DUMMY_JUNCTION	JUNCTION	0.00	279.52	0 00:00	0.000	3.927
GSMB010093	JUNCTION	0.00	17.09	0 14:24	0.000	2.023
Outlet	OUTFALL	0.00	279.52	0 00:00	0.000	3.374
STORAGE_1	STORAGE	18.13	18.70	0 13:13	1.612	1.640
STORAGE_2	STORAGE	38.57	43.22	0 13:45	3.507	4.661

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
GSMB010057	JUNCTION	8.36	0.478	0.022
DUMMY_JUNCTION	JUNCTION	8.05	0.428	1.772

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
STORAGE_1	59.147	15	0	117.945	30	0 20:53	6.07
STORAGE_2	249.687	18	0	566.623	40	0 21:14	3.53

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
Outlet	99.98	6.65	279.52	3.374
System	99.98	6.65	279.52	3.374

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1_EX24CMP	CONDUIT	6.07	0	15:09	2.62	0.52	1.00
OVERLAND_1_EX24CMP	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
2_EX30CMP	CONDUIT	17.01	0	14:24	3.89	1.17	1.00
OVERLAND_2_EX30CMP	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
3_OPENCHANNEL	CONDUIT	13.40	0	13:32	1.18	0.07	0.70
4_EX48RCP	CONDUIT	12.93	0	13:32	2.19	0.07	1.00
5_OPENCHANNEL	CONDUIT	19.99	0	00:06	1.96	0.01	0.89
6_EX_5x7_Arch_CMP	CONDUIT	35.21	0	13:00	3.64	0.08	0.98
OVERLAND_6_EX_5x7_Arch_CMP	CONDUIT	14.06	0	17:15	0.19	0.00	0.53
7_OPENCHANNEL	CONDUIT	52.63	0	00:03	2.96	0.13	1.00
8_EX48RCP	CONDUIT	72.04	0	00:03	4.10	0.21	1.00
OVERLAND_8_EX48RCP	CONDUIT	51.80	0	12:46	1.37	0.01	1.00
DUMMY_CHANNEL	CONDUIT	279.52	0	00:00	12.06	38.26	1.00
9_OPENCHANNEL	CONDUIT	86.38	0	00:03	4.07	0.86	1.00
OVERLAND_9_OPENCHANNEL	CONDUIT	26.17	0	00:06	0.62	0.02	0.95

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
1_EX24CMP	1.00	0.25	0.00	0.00	0.74	0.01	0.00	0.00	0.13	0.0002
OVERLAND_1_EX24CMP	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
2_EX30CMP	1.00	0.25	0.00	0.00	0.75	0.00	0.00	0.00	0.14	0.0002
OVERLAND_2_EX30CMP	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
3_OPENCHANNEL	1.00	0.01	0.26	0.00	0.73	0.00	0.00	0.00	0.03	0.0000
4_EX48RCP	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.01	0.0002
5_OPENCHANNEL	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.01	0.0000
6_EX_5x7_Arch_CMP	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.0001
OVERLAND_6_EX_5x7_Arch_CMP	1.00	0.43	0.27	0.00	0.30	0.00	0.00	0.00	0.01	0.0000
7_OPENCHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.0001
8_EX48RCP	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.0003
OVERLAND_8_EX48RCP	1.00	0.01	0.39	0.00	0.60	0.00	0.00	0.00	0.01	0.0000
DUMMY_CHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.02	0.0100
9_OPENCHANNEL	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.01	0.0002
OVERLAND_9_OPENCHANNEL	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.01	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
1_EX24CMP	10.34	10.34	10.34	0.01	0.01
2_EX30CMP	8.69	8.69	8.69	1.36	0.01
4_EX48RCP	9.48	9.48	9.48	0.01	0.01
7_OPENCHANNEL	10.50	10.50	10.50	0.01	0.01
8_EX48RCP	23.92	23.92	23.92	0.01	0.01
OVERLAND_8_EX48RCP	8.36	8.36	8.36	0.01	0.01
DUMMY_CHANNEL	23.99	23.99	23.99	12.71	13.87
9_OPENCHANNEL	23.92	23.92	23.92	0.01	0.01

Analysis begun on: Tue Jan 12 15:14:32 2016
Analysis ended on: Tue Jan 12 15:14:33 2016
Total elapsed time: 00:00:01

Appendix I:

BMP Conceptual Design and Nutrient Calculations

List of Contents:

Bioretention Pond - Ridgewood Elementary

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/15

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	171,751	114,501	Input
Sub-basin CN	80	93	Input
S (in)	2.50	0.75	Calculated
R/O (in)	0.08	0.45	Calculated
Sub-basin WQ Volume (sf*in)	14313	51570	Calculated
Sub-basin WQ Volume (cf)	1193	4297	Calculated
Summary Calculations			
Total Watershed area (sq ft)	286,252		Calculated
Total Watershed area (acres)	6.57		Calculated
Total WQ Runoff Volume (sf*in)	65,882		Calculated
Total WQ Runoff Volume (cf)	5,490		Calculated
Peak Flow Rate, cfs	24.20		Calculated
Pipe Diameter, ft	22.78	**24"**	Calculated
Surface area of bioretention			
Average depth of water (in)	10		Input
Surface area of bioretention (sf)	6,588		Calculated
Surface area of bioretention (ac)	0.151		Calculated
Surface area of bioretention, available (sf)	32,234		Input
Surface area of bioretention, available (ac)	0.74		Input

Water Quality Swale - Pinecrest

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/15

Rv = runoff coefficient = 0.05 + 0.009 (I)
A = area of the development site (acres).
C = Rational Runoff Coefficient)
I = Intensity
Tc = Time of Concentration

Pj = 90%
12, 2.72 conversion factors

DRAINAGE AREA INPUT PARAMETERS

Drainage Area:	2.10	acres	Input
Impervious Area	0.63	acres	Calculated
% Impervious	30.00	percent	Input
Runoff volume1	0.84	inch-acre	Calculated
Runoff volume 2	1.00	inch-acre	Calculated
Runoff volume	3,630.00	cu ft	
Length	590.00	feet	Input
Depth	12.0	inches	Input
Required Cross Section	6.2	sq feet	Calculated
Width	4.0		
SS	3.0	h/v	
Depth	1.0		
Top Width	10.0		
Area check	7.0		

Bioretention Pond - Emerald Park

Project: City of Greenville - Swift CreekWatershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	152,669	38,167	Input
Sub-basin CN	80	93	Input
S (in)	2.50	0.75	Calculated
R/O (in)	0.08	0.45	Calculated
Sub-basin WQ Volume (sf*in)	12722	17190	Calculated
Sub-basin WQ Volume (cf)	1060	1432	Calculated
Summary Calculations			
Total Watershed area (sq ft)	190,836		Calculated
Total Watershed area (acres)	4.38		Calculated
Total WQ Runoff Volume (sf*in)	29,912		Calculated
Total WQ Runoff Volume (cf)	2,493		Calculated
Peak Flow Rate, cfs	12.12		Calculated
Pipe Diameter, ft	17.58	**18"**	Calculated
Surface area of bioretention			
Average depth of water (in)	10		Input
Surface area of bioretention (sf)	2,991		Calculated
Surface area of bioretention (ac)	0.069		Calculated
Surface area of bioretention, available (sf)	4,356		Input
Surface area of bioretention, available (ac)	0.10		Input

Water Quality Swale - Davenport Farm Road

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/15

Rv = runoff coefficient = 0.05 + 0.009 (I)
A = area of the development site (acres).
C = Rational Runoff Coefficient)
I = Intensity
Tc = Time of Concentration

Pj = 90%
12, 2.72 conversion factors

DRAINAGE AREA INPUT PARAMETERS

Drainage Area:	4.75	acres	Input
Impervious Area	0.95	acres	Calculated
% Impervious	20.00	percent	Input
Runoff volume1	1.90	inch-acre	Calculated
Runoff volume 2	1.00	inch-acre	Calculated
Runoff volume	6,897.00	cu ft	
Length	1785.00	feet	Input
Depth	12.0	inches	Input
Required Cross Section	3.9	sq feet	Calculated
Width	2.0		
SS	3.0	h/v	
Depth	1.5		
Top Width	5.0		
Area check	5.3		

APPENDIX I
BMP CONCEPTUAL DESIGN

Regenerative Stormwater Conveyance - South Bend

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	1,631,113	407,778	Input
Sub-basin CN	80	93	Input
S (in)	2.50	0.75	Calculated
R/O (in)	0.08	0.45	Calculated
Sub-basin WQ Volume (sf*in)	135926	183658	Calculated
Sub-basin WQ Volume (cf)	11327	15305	Calculated
Summary Calculations			
Total Watershed area (sq ft)	2,038,891		Calculated
Total Watershed area (acres)	46.81		Calculated
Total WQ Runoff Volume (sf*in)	319,584		Calculated
Total WQ Runoff Volume (cf)	26,632		Calculated
Peak Flow, cfs	129.46		Calculated
Surface area of RSC			
Length of Channel (ft)	350		Input
Riffle Top Width (ft)	30		Calculated
Riffle Depth (ft)	2		Calculated
Pool Depth (ft)	1		Calculated
Number of Pools	15		Calculated
Surface Area of RSC (sf)	10,500		Calculated

Wet Pond - Wells Fargo Bank

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	217,532	507,575	Input
Sub-basin CN	80	93	Input
S (in)	2.50	0.75	Calculated
R/O (in)	0.08	0.45	Calculated
Sub-basin WQ Volume (sf*in)	18128	228605	Calculated
Sub-basin WQ Volume (cf)	1511	19050	Calculated
Summary Calculations			
Total Watershed area (sq ft)	725,107		Calculated
Total Watershed area (acres)	16.65		Calculated
Total WQ Runoff Volume (sf*in)	246,732		Calculated
Total WQ Runoff Volume (cf)	20,561		Calculated
Peak Flow Rate, cfs	84.18		Calculated
Pipe Diameter, ft	36.36	**36"**	Calculated
Surface area of Wet Pond			
Average depth of water (in)	12		Input
Surface area of pond (sf)	20,561		Calculated
Surface area of pond (ac)	0.472		Calculated
Surface area of pond, available (sf)	27,000		Input
Surface area of pond, available (ac)	0.62		Input

APPENDIX I
BMP CONCEPTUAL DESIGN

Wet Pond Retrofit - Sterling Pointe Apartments

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	297,337	302,663	Input
Sub-basin CN	80	93	Input
S (in)	2.50	0.75	Calculated
R/O (in)	0.08	0.45	Calculated
Sub-basin WQ Volume (sf*in)	24778	136315	Calculated
Sub-basin WQ Volume (cf)	2065	11360	Calculated
Summary Calculations			
Total Watershed area (sq ft)	600,000		Calculated
Total Watershed area (acres)	13.77		Calculated
Total WQ Runoff Volume (sf*in)	161,093		Calculated
Total WQ Runoff Volume (cf)	13,424		Calculated
Peak Flow, cfs	57.31		Calculated
Pipe Diameter, ft	31.48	**36"**	Calculated
Surface area of Wet Pond			
Average depth of water (in)	12		Input
Surface area of pond (sf)	13,424		Calculated
Surface area of pond (ac)	0.31		Calculated
Surface area of pond, available (sf)	13,000		Input
Surface area of pond, available (ac)	0.30		Input

APPENDIX I
BMP CONCEPTUAL DESIGN

Regenerative Stormwater Conveyance - South Central High School

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	921,522	102,391	Input
Sub-basin CN	74	93	Input
S (in)	3.51	0.75	Calculated
R/O (in)	0.02	0.45	Calculated
Sub-basin WQ Volume (sf*in)	21373	46115	Calculated
Sub-basin WQ Volume (cf)	1781	3843	Calculated
Summary Calculations			
Total Watershed area (sq ft)	1,023,913		Calculated
Total Watershed area (acres)	23.51		Calculated
Total WQ Runoff Volume (sf*in)	67,489		Calculated
Total WQ Runoff Volume (cf)	5,624		Calculated
Peak Flow, cfs	54.24		Calculated
Surface area of RSC			
Length of Channel (ft)	130		Input
Riffle Top Width (ft)	40		Calculated
Riffle Depth (ft)	1		Calculated
Pool Depth (ft)	2		Calculated
Number of Pools	5		Calculated
Surface Area of RSC (sf)	5,200		Calculated

APPENDIX I
BMP CONCEPTUAL DESIGN

Bioretention Pond - South Central High School

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	570,957	570,957	Input
Sub-basin CN	74	93	Input
S (in)	3.51	0.75	Calculated
R/O (in)	0.02	0.45	Calculated
Sub-basin WQ Volume (sf*in)	13242	257151	Calculated
Sub-basin WQ Volume (cf)	1104	21429	Calculated
Summary Calculations			
Total Watershed area (sq ft)	1,141,914		Calculated
Total Watershed area (acres)	26.21		Calculated
Total WQ Runoff Volume (sf*in)	270,394		Calculated
Total WQ Runoff Volume (cf)	22,533		Calculated
Peak Flow Rate, cfs	108.54		Calculated
Pipe Diameter, ft	40.00	**42"**	Calculated
Surface area of bioretention			
Average depth of water (in)	10		Input
Surface area of bioretention (sf)	27,039		Calculated
Surface area of bioretention (ac)	0.62		Calculated
Surface area of bioretention, available (sf)	33,000		Input
Surface area of bioretention, available (ac)	0.76		Input

Water Quality Wetland - Dana Brooke

Project: City of Greenville - Swift Creek Watershed Master Plan
Prepared by: SMB
Checked by: TLM
Date: 10/26/2015

DRAINAGE AREA INPUT PARAMETERS

Water Quality Event (in)	1.00		Input
	Pervious	**Impervious**	
Drainage Area (sq ft)	4,318,468	1,439,489	Input
Sub-basin CN	74	93	Input
S (in)	3.51	0.75	Calculated
R/O (in)	0.02	0.45	Calculated
Sub-basin WQ Volume (sf*in)	100160	648326	Calculated
Sub-basin WQ Volume (cf)	8347	54027	Calculated
Summary Calculations			
Total Watershed area (sq ft)	5,757,957		Calculated
Total Watershed area (acres)	132.18		Calculated
Total WQ Runoff Volume (sf*in)	748,486		Calculated
Total WQ Runoff Volume (cf)	62,374		Calculated
Peak Flow Rate, cfs	93.55		Calculated
Pipe Diameter, ft	37.83	**42"**	Calculated
Surface area of wetland			
Average depth of water (in)	8		Input
Surface area of wetland (sf)	**93,561**		Calculated
Surface area of wetland (ac)	2.15		Calculated
Surface area of wetland, available (sf)	94,000		Input
Surface area of wetland, available (ac)	2.22		Input

Development:	**Ridgewood Elementary**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	286,189

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	40.0%	42.3%	42.3%
Annual Runoff Volume (c.f.)	475,829	499,660	100,197
Total Nitrogen EMC (mg/L)	1.52	1.50	1.22
Total Nitrogen Loading (lb/ac/yr)	6.88	7.10	1.16
Total Phosphorus EMC (mg/L)	0.53	0.57	0.31
Total Phosphorus Loading (lb/ac/yr)	2.37	2.40	0.30

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	2%	2%	0%
Annual Runoff Volume (c.f.)	5%	-79%	-80%
Total Nitrogen EMC (mg/L)	-2%	-20%	-18%
Total Nitrogen Loading (lb/ac/yr)	3%	-83%	-84%
Total Phosphorus EMC (mg/L)	9%	-40%	-45%
Total Phosphorus Loading (lb/ac/yr)	1%	-87%	-88%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

Return to Instructions
Return to Watershed Characteristics
Return to BMP Characteristics
Print Summary

BMP SUMMARY Ver2.0

	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Bioretention with IWS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	6.57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	500,984	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	80%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.49	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	7.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.505	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	2.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	1.16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.22	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	1.16	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	84%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.313	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.297	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	88%	--	--	--	--	--

Development:	**Pinecrest**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	91,476

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	30.0%	34.8%	34.8%
Annual Runoff Volume (c.f.)	118,627	134,514	121,857
Total Nitrogen EMC (mg/L)	1.58	1.51	1.21
Total Nitrogen Loading (lb/ac/yr)	5.58	6.04	4.37
Total Phosphorus EMC (mg/L)	0.53	0.57	0.26
Total Phosphorus Loading (lb/ac/yr)	1.86	1.92	0.93

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	5%	5%	0%
Annual Runoff Volume (c.f.)	13%	3%	-9%
Total Nitrogen EMC (mg/L)	-5%	-23%	-20%
Total Nitrogen Loading (lb/ac/yr)	8%	-22%	-28%
Total Phosphorus EMC (mg/L)	8%	-51%	-55%
Total Phosphorus Loading (lb/ac/yr)	3%	-50%	-51%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

Return to Instructions
Return to Watershed Characteristics
Return to BMP Characteristics
Print Summary

BMP SUMMARY Ver2.0

	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Grassed Swale	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	2.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	135,397	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	10%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	6.07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.478	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	1.92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	4.37	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.21	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	4.37	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	28%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.258	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.933	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	52%	--	--	--	--	--

Development:	**Emerald Park**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft²):	190,836

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	20.0%	22.3%	22.3%
Annual Runoff Volume (c.f.)	177,873	193,760	38,929
Total Nitrogen EMC (mg/L)	1.69	1.63	1.29
Total Nitrogen Loading (lb/ac/yr)	4.28	4.50	0.71
Total Phosphorus EMC (mg/L)	0.53	0.65	0.31
Total Phosphorus Loading (lb/ac/yr)	1.35	1.38	0.17

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	2%	2%	0%
Annual Runoff Volume (c.f.)	9%	-78%	-80%
Total Nitrogen EMC (mg/L)	-3%	-24%	-21%
Total Nitrogen Loading (lb/ac/yr)	5%	-83%	-84%
Total Phosphorus EMC (mg/L)	22%	-42%	-52%
Total Phosphorus Loading (lb/ac/yr)	2%	-87%	-88%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

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	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Bioretention with IWS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	4.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	194,643	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	80%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	4.51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.497	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	1.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	0.71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.29	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	0.71	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	84%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.309	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.171	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	88%	--	--	--	--	--

Development:	**Davenport Farm Road**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft²):	206,910

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	20.0%	22.9%	22.9%
Annual Runoff Volume (c.f.)	192,856	215,097	194,699
Total Nitrogen EMC (mg/L)	1.69	1.61	1.21
Total Nitrogen Loading (lb/ac/yr)	4.28	4.56	3.09
Total Phosphorus EMC (mg/L)	0.53	0.64	0.26
Total Phosphorus Loading (lb/ac/yr)	1.35	1.39	0.66

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	3%	3%	0%
Annual Runoff Volume (c.f.)	12%	1%	-9%
Total Nitrogen EMC (mg/L)	-4%	-28%	-25%
Total Nitrogen Loading (lb/ac/yr)	7%	-28%	-32%
Total Phosphorus EMC (mg/L)	19%	-52%	-59%
Total Phosphorus Loading (lb/ac/yr)	3%	-51%	-52%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

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	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Grassed Swale	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	4.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	216,332	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	10%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	4.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.488	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	1.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	3.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.21	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	3.09	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	33%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.258	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.659	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	53%	--	--	--	--	--

Development:	**South Bend**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft²):	2,038,891

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	20.0%	20.5%	20.5%
Annual Runoff Volume (c.f.)	1,900,399	1,938,695	1,843,781
Total Nitrogen EMC (mg/L)	1.69	1.67	1.00
Total Nitrogen Loading (lb/ac/yr)	4.28	4.33	2.45
Total Phosphorus EMC (mg/L)	0.53	0.69	0.18
Total Phosphorus Loading (lb/ac/yr)	1.35	1.36	0.44

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	1%	1%	0%
Annual Runoff Volume (c.f.)	2%	-3%	-5%
Total Nitrogen EMC (mg/L)	-1%	-41%	-40%
Total Nitrogen Loading (lb/ac/yr)	1%	-43%	-43%
Total Phosphorus EMC (mg/L)	29%	-66%	-74%
Total Phosphorus Loading (lb/ac/yr)	0%	-67%	-67%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

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	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Sand Filter	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	46.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	1,940,822	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	5%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.67	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	4.33	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.524	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	1.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	2.45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.44	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.00	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	2.45	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	43%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.180	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.443	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	67%	--	--	--	--	--

Development:	**Wells Fargo**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	725,107

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	71.8%	73.7%	73.7%
Annual Runoff Volume (c.f.)	2,045,592	2,096,653	1,786,806
Total Nitrogen EMC (mg/L)	1.43	1.41	1.06
Total Nitrogen Loading (lb/ac/yr)	10.94	11.13	7.07
Total Phosphorus EMC (mg/L)	0.51	0.52	0.16
Total Phosphorus Loading (lb/ac/yr)	3.93	3.96	1.06

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	2%	2%	0%
Annual Runoff Volume (c.f.)	2%	-13%	-15%
Total Nitrogen EMC (mg/L)	-1%	-26%	-25%
Total Nitrogen Loading (lb/ac/yr)	2%	-35%	-36%
Total Phosphorus EMC (mg/L)	2%	-69%	-70%
Total Phosphorus Loading (lb/ac/yr)	1%	-73%	-73%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

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	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Wet Detention Pond	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	16.65	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	2,102,124	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	15%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	11.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.502	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	3.96	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	7.07	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	1.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.06	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	7.07	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	37%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.159	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	1.062	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	73%	--	--	--	--	--

Development:	**Sterling Pointe Apartments**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	600,000

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	51.6%	52.6%	52.6%
Annual Runoff Volume (c.f.)	1,250,993	1,272,877	1,084,184
Total Nitrogen EMC (mg/L)	1.47	1.46	1.06
Total Nitrogen Loading (lb/ac/yr)	8.34	8.44	5.21
Total Phosphorus EMC (mg/L)	0.52	0.55	0.16
Total Phosphorus Loading (lb/ac/yr)	2.92	2.93	0.78

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	1%	1%	0%
Annual Runoff Volume (c.f.)	2%	-13%	-15%
Total Nitrogen EMC (mg/L)	-1%	-28%	-27%
Total Nitrogen Loading (lb/ac/yr)	1%	-38%	-38%
Total Phosphorus EMC (mg/L)	7%	-69%	-71%
Total Phosphorus Loading (lb/ac/yr)	0%	-73%	-73%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

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	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Wet Detention Pond	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	13.77	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	1,275,511	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	15%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	8.45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.508	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	2.94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	5.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.78	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.06	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	5.21	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	38%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.159	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.782	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	73%	--	--	--	--	--

Development:	**South Central High**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	1,023,913

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	10.0%	10.5%	10.5%
Annual Runoff Volume (c.f.)	580,916	599,882	570,889
Total Nitrogen EMC (mg/L)	1.93	1.90	1.02
Total Nitrogen Loading (lb/ac/yr)	2.98	3.03	1.55
Total Phosphorus EMC (mg/L)	0.54	0.83	0.18
Total Phosphorus Loading (lb/ac/yr)	0.84	0.84	0.27

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	1%	1%	0%
Annual Runoff Volume (c.f.)	3%	-2%	-5%
Total Nitrogen EMC (mg/L)	-2%	-47%	-46%
Total Nitrogen Loading (lb/ac/yr)	2%	-48%	-49%
Total Phosphorus EMC (mg/L)	53%	-67%	-78%
Total Phosphorus Loading (lb/ac/yr)	1%	-67%	-68%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

Return to Instructions
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BMP SUMMARY Ver2.0

	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Sand Filter	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	23.51	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	600,935	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	5%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.90	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	3.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.529	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	0.84	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	1.55	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.02	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	1.55	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	49%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.181	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.274	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	68%	--	--	--	--	--

Development:	**South Central High**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	1,141,914

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	50.0%	52.9%	52.9%
Annual Runoff Volume (c.f.)	2,313,803	2,434,162	488,170
Total Nitrogen EMC (mg/L)	1.48	1.46	1.20
Total Nitrogen Loading (lb/ac/yr)	8.17	8.45	1.40
Total Phosphorus EMC (mg/L)	0.52	0.55	0.31
Total Phosphorus Loading (lb/ac/yr)	2.89	2.92	0.36

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	3%	3%	0%
Annual Runoff Volume (c.f.)	5%	-79%	-80%
Total Nitrogen EMC (mg/L)	-2%	-19%	-17%
Total Nitrogen Loading (lb/ac/yr)	3%	-83%	-83%
Total Phosphorus EMC (mg/L)	5%	-41%	-43%
Total Phosphorus Loading (lb/ac/yr)	1%	-87%	-88%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

Return to Instructions
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BMP SUMMARY Ver2.0

	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Bioretention with IWS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	26.21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	2,440,849	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	80%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.46	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	8.47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.503	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	2.92	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	1.40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.36	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.20	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	1.40	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	84%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.311	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.361	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	88%	--	--	--	--	--

Development:	**Dana Brooke**
Prepared By:	SMB
Date:	February 29, 2016

WATERSHED SUMMARY Ver2.0

REGION:	Coastal
TOTAL DEVELOPMENT AREA (ft^2):	5,757,957

	Pre-Development Conditions	Post-Development Conditions	Post-Development w/ BMPs
Percent Impervious (%)	25.0%	26.6%	26.6%
Annual Runoff Volume (c.f.)	6,416,882	6,759,724	5,084,078
Total Nitrogen EMC (mg/L)	1.63	1.59	1.15
Total Nitrogen Loading (lb/ac/yr)	4.93	5.09	2.75
Total Phosphorus EMC (mg/L)	0.53	0.63	0.17
Total Phosphorus Loading (lb/ac/yr)	1.61	1.63	0.41

Percent Difference Between:

	Pre-Dev. & Post-Dev. without BMPs	Pre-Development & Post-Development with BMPs	Post-Dev without BMPs & Post-Dev with BMPs
Percent Impervious (%)	2%	2%	0%
Annual Runoff Volume (c.f.)	5%	-21%	-25%
Total Nitrogen EMC (mg/L)	-2%	-29%	-28%
Total Nitrogen Loading (lb/ac/yr)	3%	-44%	-46%
Total Phosphorus EMC (mg/L)	19%	-68%	-73%
Total Phosphorus Loading (lb/ac/yr)	1%	-75%	-75%

*Negative percent difference values indicate a decrease in runoff volume, pollutant concentration or pollutant loading. Positive values indicate an increase.

BMP VOLUME REDUCTIONS/EFFLUENT CONCENTRATIONS

	Volume Reduction (%)	TN Effluent Concen. (mg/L)	TP Effluent Concen. (mg/L)
Bioretention with IWS	80%	0.95	0.12
Bioretention without IWS	50%	1.00	0.12
Dry Detention Pond	10%	1.20	0.20
Grassed Swale	10%	1.21	0.26
Green Roof	50%	1.08	0.15
Level Spdr, Filter Strip	50%	1.20	0.15
Permeable Pavement*	60%	1.44	0.39
Sand Filter	5%	0.92	0.14
Water Harvesting	user defined	1.08	0.15
Wet Detention Pond	15%	1.01	0.11
Wetland	25%	1.08	0.12

*if treating commercial parking lot, TP effluent concentration = 0.16 mg/L

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BMP SUMMARY Ver2.0

	CATCHMENT 1			CATCHMENT 2			CATCHMENT 3			CATCHMENT 4			CATCHMENT 5			CATCHMENT 6		
	BMP 1	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**	**BMP 1**	**BMP 2**	**BMP 3**
	Wetland	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Area Treated (ac)	132.18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Volume (c.f.)	6,778,771	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent Volume Reduced (%)	25%	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Nitrogen EMC (mg/L)	1.59	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Nitrogen (lb/ac/yr)	5.10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Inflow Phosphorus EMC (mg/L)	0.508	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Inflow Phosphorus (lb/ac/yr)	1.63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Nitrogen (lbs/ac/yr)	2.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BMP Outflow Phosphorus (lbs/ac/yr)	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Catchment Outflow Nitrogen EMC (mg/L)	1.15	--	--	--	--	--
Catchment Outflow Total Nitrogen (lb/ac/yr)	2.75	--	--	--	--	--
Percent Reduction in Nitrogen Load (%)	46%	--	--	--	--	--
Catchment Outflow Phosphorus EMC (mg/L)	0.169	--	--	--	--	--
Catchment Outflow Total Phosphorus (lb/ac/yr)	0.405	--	--	--	--	--
Percent Reduction in Phosphorus Load (%)	75%	--	--	--	--	--

Designer Engineer:	Stefani Barlow
Project Name:	Swift Creek - South Bend RSC

*Note: This sheet is based of a RSC (SPSC) design model created by Anne Arundel County, MD.
Input values shaded in Grey
Calculated values are noted with dotted pattern
Check parameters in bold

Checking the Channel Conveyance for the design flood				
Design Return Period (Yr)	T	**100**	**10**	**1**
Time of Concentration in minutes (Before Development/Reference)	t_c	5.00		
Post development (No SPSC) Runoff Curve Number	RCN	85.00		
Pre development discharge (cfs)	Q_{pre}	129.46	129.46	129.46
Post development (No BMP) discharge (cfs)	Q_{post}	129.46	129.46	129.46
Total available length (ft)	L	350	**Cascade Design (maximum 5 ft drop per segment)**	
Elevation drop over length (ft)	delta E	10.0	Design Width (ft)	30.00
Total Cascade length for project (ft)	$L_{cascade}$	0.00	Design Depth (ft)	1.00
Cascade Slope (ft/ft)	$Slope_{cascade}$	0.50	Roughness	0.05
Water Quality slope (ft/ft)	Slope	0.03	A	20.00
Maximum Length of Riffle Channel/Weir (Not to exceed 8 ft)	L_{riffle}	8.0	q	0.13
Number of riffle segments/boulder weirs for project	N_{riffle}	15	P	0.00
Number of pool segments for project	N_{pool}	15	Rh	0.66
Minimum required length of pool (ft)	**L_{pool}**	16	Design Velocity (ft/sec)	14.66
Enter a trial median cobble diamater (ft)	**d_{50}**	**1.00**	Conveyed Q (cfs)	293.14
Minimum top width of SPSC riffle channel (ft)	W	40.0	Cascade is adequate,use 0 cascades	
Maximum depth of SPSC riffle channel 10H:1V cross-section (ft)	D	2.0	Minimum Pool Depth "Use 3 pools" following Cascade (ft)	0.80
SPSC (ft)	**h_t**	**2.2**	**ok**	
Enter desired pool depth (Maximum 3 ft)	h_l	1.0	subcritical/ok	
Check Riffle Side Slope, Must be > 10H:1V		**10.0**	Entrenchment ok	
Check the Froude Number to ensure subcritical flow conditions		**0.8**	Pool Depth Inadequate	
Computed Roughness	n	0.05		
Riffle Cross Section Area (ft2), for parabola	A	53.33		
Theta - Intermediate step for solving	θ	0.20		
Riffle Hydraulic Perimeter (ft), for parabola	P	40.27		
Riffle Hydraulic Radius (ft), using Chow 1959	R_h	1.32		
Calculated Flow for design parameters (cfs)	Q	295.91		
Check Riffle Velocity (ft/sec)	**V**	**5.55**		

Choose D50 Cobble size = 12 inches

lsbash curve for Stone Density = 165 lb/ft3

Cobble d50 size	Allowable Velocity (Supercritical)	Allowable Velocity (Subcritical)
[inches]	[ft/sec]	[ft/sec]
4	5.1	7.1
5	5.7	8.0
6	6.3	8.7
7	6.8	9.4
8	7.2	10.1
9	7.7	10.7
10	8.1	11.3
11	8.5	11.8
12	8.8	12.3
15	9.9	13.8
18	10.8	15.1

Adequate conveyance of design storm

Selected Cobble Size is Adequate for 100 year storm

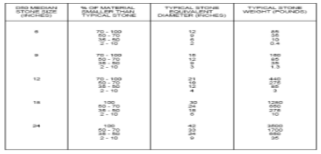
Subcritical Flow is Predominant

Entrenchment Ok.

Number of Pools (This is a preliminary estimate based on uniform length design…The Engineer may use varied pool and riffle length as permitted by the guidelines. Please check provided storage based on actual number of provided pools)	15
Provided cumulative pool depths (ft) =	16

Length of Channel, ft	350
Riffle Top Width, ft	40.0
Riffle Depth, ft	2.0
Pool Depth, ft	1.0
Number of Pools	15

Cobble Gradation Table



Cascade Height (ft)	Maximum Allowable Cascade Slope (ft/ft)	Minimum Required Cascade length (ft)
4	0.5	8
5	0.5	10
6	0.4	15
7	0.3	23
8	0.2	40
9	0.1	90
>10	0.1	>100

The cascade height is measured from the top of the cascade to the lowest point in the subsequent pool. Three full size pools are required at the bottom of a cascade.

Designer Engineer:	Stefani Barlow
Project Name:	Swift Creek - South Central High School RSC

*Note: This sheet is based of a RSC (SPSC) design model created by Anne Arundel County, MD.

Input values shaded in Grey

Calculated values are noted with dotted pattern

Check parameters in bold

Checking the Channel Conveyance for the design flood				
Design Return Period (Yr)	T	**100**	**10**	**1**
Time of Concentration in minutes (Before Development/Reference)	t_c	5.00		
Post development (No SPSC) Runoff Curve Number	RCN	85.00		
Pre development discharge (cfs)	Q_{pre}	108.54	108.54	108.54
Post development (No BMP) discharge (cfs)	Q_{post}	108.54	108.54	108.54
Total available length (ft)	L	130	**Cascade Design (maximum 5 ft drop per segment)**	
Elevation drop over length (ft)	delta E	4.0	Design Width (ft)	30.00
Total Cascade length for project (ft)	$L_{cascade}$	0.00	Design Depth (ft)	1.00
Cascade Slope (ft/ft)	$Slope_{cascade}$	0.50	Roughness	0.05
Water Quality slope (ft/ft)	Slope	0.03	A	20.00
Maximum Length of Riffle Channel/Weir (Not to exceed 8 ft)	L_{riffle}	8.0	q	0.13
Number of riffle segments/boulder weirs for project	N_{riffle}	5	P	0.00
Number of pool segments for project	N_{pool}	5	Rh	0.66
Minimum required length of pool (ft)	**L_{pool}**	16	Design Velocity (ft/sec)	16.45
Enter a trial median cobble diamater (ft)	**d_{50}**	**0.50**	Conveyed Q (cfs)	329.04
Minimum top width of SPSC riffle channel (ft)	W	40.0	Cascade is adequate,use 0 cascades	
Maximum depth of SPSC riffle channel 10H:1V cross-section (ft)	D	1.0	Minimum Pool Depth "Use 3 pools" following Cascade (ft)	0.80
h_f, Minimum required dead storage depth within the pools of the SPSC (ft)	**h_f**	**1.5**	**ok**	
Enter desired pool depth (Maximum 3 ft)	h_f	2.0		
Check Riffle Side Slope, Must be > 10H:1V		**20.0**	subcritical/ok	
Check the Froude Number to ensure subcritical flow conditions		**0.9**	Entrenchment ok	
Computed Roughness	n	0.05		
Riffle Cross Section Area (ft2), for parabola	A	26.67	Pool Depth Adequate	
Theta - Intermediate step for solving	θ	0.10		
Riffle Hydraulic Perimeter (ft), for parabola	P	40.07		
Riffle Hydraulic Radius (ft), using Chow 1959	R_h	0.67		
Calculated Flow for design parameters (cfs)	Q	108.93		
Check Riffle Velocity (ft/sec)	**V**	**4.08**		

Length of Channel, ft	130
Riffle Top Width, ft	40.0
Riffle Depth, ft	1.0
Pool Depth, ft	2.0
Number of Pools	5

Number of Pools (This is a preliminary estimate based on uniform length design…The Engineer may use varied pool and riffle length as permitted by the guidelines. Please check provided storage based on actual number of provided pools)	5
Provided cumulative pool depths (ft) =	7

Choose D50 Cobble size = 6 inches

Isbash curve for Stone Density = 165 lb/ft3

Cobble d50 size	Allowable Velocity (Supercritical)	Allowable Velocity (Subcritical)
[inches]	[ft/sec]	[ft/sec]
4	5.1	7.1
5	5.7	8.0
6	6.3	8.7
7	6.8	9.4
8	7.2	10.1
9	7.7	10.7
10	8.1	11.3
11	8.5	11.8
12	8.8	12.3
15	9.9	13.8
18	10.8	15.1

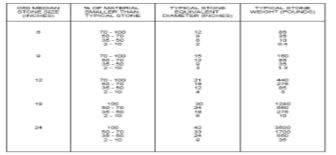
Adequate conveyance of design storm

Selected Cobble Size is Adequate for 100 year storm

Subcritical Flow is Predominant

Entrenchment Ok.

Cobble Gradation Table



Cascade Height (ft)	Maximum Allowable Cascade Slope (ft/ft)	Minimum Required Cascade length (ft)
4	0.5	8
5	0.5	10
6	0.4	15
7	0.3	23
8	0.2	40
9	0.1	90
>10	0.1	>100

The cascade height is measured from the top of the cascade to the lowest point in the subsequent pool. Three full size pools are required at the bottom of a cascade.

Appendix J:

Digital Copy of Hydrologic and Hydraulic Models

List of Contents:

1. Primary System HEC-HMS Model (2-,10-,25-,50-, and 100-Year Storms)
    a. Existing Conditions
    b. Future Conditions
    c. Alternative #1
    d. Alternative #2

2. Primary System HEC-RAS Models (2-,10-,25-,50-, and 100-Year Storms)
    a. Swift Creek Main Branch
    b. Swift Creek UT1
    c. Gum Swamp

    * *The models include Existing and Future Conditions, as well as Alternatives**

3. Secondary System SWMM Models (10-Year Storm)
    a. Existing Conditions
        i. Davenport Farm Road
    b. Alternative
        i. Davenport Farm Road

Appendix K:

Stream Assessment

List of Contents:

Assessment Number	BEHI Score	BEHI Rating	Stability Score	Stability Rating	Stream Reach
5	39.00	High	96	Fair	Gum Swamp BEHI
8	41.00	Very High	101	Poor	Swift Creek BEHI 1
9	37.40	High	94	Fair	Swift Creek BEHI 2
15	43.60	Very High	85	Fair	UT1-SC BEHI

Bank Erosion Hazard Rating Guide

Stream Swift Creek BEHI 1 **Reach** **Date** 8/12/2014 **Crew** BSH, BPB

Bank Erosion Potential

Bank Height (ft): / Bankfull Height (ft):		Bank Height/ Bankfull Ht		Root Depth/ Bank Height		Root Density %		Bank Angle (Degrees)		Surface Protection%	
VERY LOW	Value	1.0-1.1		1.0-0.9		100-80		0-20		100-80	
	Index	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00
LOW	Value	1.11-1.19		0.89-0.5	0.55	79-55		21-60		79-55	60.00
	Index	2.0-3.9	0.00	2.0-3.9	3.66	2.0-3.9	0.00	2.0-3.9	0.00	2.0-3.9	3.50
MODERATE	Value	1.2-1.5		0.49-0.3		54-30		61-80	80.00	54-30	
	Index	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	5.90	4.0-5.9	0.00
HIGH	Value	1.6-2.0	2.00	0.29-0.15		29-15		81-90		29-15	
	Index	6.0-7.9	7.90	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00
VERY HIGH	Value	2.1-2.8		0.14-0.05		14-5.0		91-119		14-10	
	Index	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00
EXTREME	Value	>2.8		<0.05		<5	2.75	>119		<10	
	Index	10	0.00	10	0.00	10	10.00	10	0.00	10	0.00
V = value, I = index								SUB-TOTAL (Sum one index from each column):		**31.0**	

Bank Material Description:

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: **10**

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT:

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL: **41.0**

BEHI RATING: **VERY HIGH**

Bank Erosion Hazard Rating Guide

Stream Swift Creek BEHI 2 **Reach** **Date** 8/13/2014 **Crew** BSH, BPB

Bank Erosion Potential	Bank Height (ft): / Bankfull Height (ft):		Bank Height/ Bankfull Ht		Root Depth/ Bank Height		Root Density %		Bank Angle (Degrees)		Surface Protection%	
	VERY LOW	Value	1.0-1.1		1.0-0.9		100-80		0-20		100-80	
		Index	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00
	LOW	Value	1.11-1.19		0.89-0.5	0.50	79-55		21-60		79-55	70.00
		Index	2.0-3.9	0.00	2.0-3.9	3.90	2.0-3.9	0.00	2.0-3.9	0.00	2.0-3.9	2.71
	MODERATE	Value	1.2-1.5	1.50	0.49-0.3		54-30		61-80	70.00	54-30	
		Index	4.0-5.9	5.90	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	4.90	4.0-5.9	0.00
	HIGH	Value	1.6-2.0		0.29-0.15		29-15		81-90		29-15	
		Index	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00
	VERY HIGH	Value	2.1-2.8		0.14-0.05		14-5.0		91-119		14-10	
		Index	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00
	EXTREME	Value	>2.8		<0.05		<5	2.50	>119		<10	
		Index	10	0.00	10	0.00	10	10.00	10	0.00	10	0.00
	V = value, I = index								SUB-TOTAL (Sum one index from each column):		**27.4**	

Bank Material Description:

Bank Materials

- Bedrock (Bedrock banks have very low bank erosion potential)
- Boulders (Banks composed of boulders have low bank erosion potential)
- Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)
- Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)
- Sand (Add 10 points)
- Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: **10**

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT:

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL: **37.4**

BEHI RATING: **HIGH**

Bank Erosion Hazard Rating Guide

Stream UT1-SC BEHI **Reach** **Date** 8/13/2014 **Crew** BSH,BPB

Bank Erosion Potential	Bank Height (ft): / Bankfull Height (ft):		Bank Height/ Bankfull Ht		Root Depth/ Bank Height		Root Density %		Bank Angle (Degrees)		Surface Protection%	
	VERY LOW	Value	1.0-1.1		1.0-0.9		100-80		0-20		100-80	80.00
		Index	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	1.90
	LOW	Value	1.11-1.19		0.89-0.5		79-55		21-60		79-55	
		Index	2.0-3.9	0.00	2.0-3.9	0.00	2.0-3.9	0.00	2.0-3.9	0.00	2.0-3.9	0.00
	MODERATE	Value	1.2-1.5		0.49-0.3		54-30		61-80	80.00	54-30	
		Index	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	5.90	4.0-5.9	0.00
	HIGH	Value	1.6-2.0		0.29-0.15	0.20	29-15		81-90		29-15	
		Index	6.0-7.9	0.00	6.0-7.9	7.22	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00
	VERY HIGH	Value	2.1-2.8	2.50	0.14-0.05		14-5.0		91-119		14-10	
		Index	8.0-9.0	8.57	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00
	EXTREME	Value	>2.8		<0.05		<5	1.00	>119		<10	
		Index	10	0.00	10	0.00	10	10.00	10	0.00	10	0.00
	V = value, I = index								SUB-TOTAL (Sum one index from each column):		**33.6**	

Bank Material Description:

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: **10**

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT:

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Bank location description (circle one)

Straight Reach Outside of Bend

GRAND TOTAL: **43.6**

BEHI RATING: **VERY HIGH**

Bank Erosion Hazard Rating Guide

Stream Gum Swamp **Reach** **Date** 8/13/2014 **Crew** BSH, BPB

Bank Erosion Potential			Bank Height/ Bankfull Ht		Root Depth/ Bank Height		Root Density %		Bank Angle (Degrees)		Surface Protection%	
Bank Height (ft): / Bankfull Height (ft):												
VERY LOW		Value	1.0-1.1		1.0-0.9		100-80		0-20		100-80	
		Index	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00	1.0-1.9	0.00
LOW		Value	1.11-1.19		0.89-0.5	0.56	79-55		21-60		79-55	70.00
		Index	2.0-3.9	0.00	2.0-3.9	3.61	2.0-3.9	0.00	2.0-3.9	0.00	2.0-3.9	2.71
MODERATE		Value	1.2-1.5	1.33	0.49-0.3		54-30		61-80		54-30	
		Index	4.0-5.9	4.82	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	0.00	4.0-5.9	0.00
HIGH		Value	1.6-2.0		0.29-0.15		29-15		81-90	90.00	29-15	
		Index	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	0.00	6.0-7.9	7.90	6.0-7.9	0.00
VERY HIGH		Value	2.1-2.8		0.14-0.05		14-5.0		91-119		14-10	
		Index	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00	8.0-9.0	0.00
EXTREME		Value	>2.8		<0.05		<5	2.81	>119		<10	
		Index	10	0.00	10	0.00	10	10.00	10	0.00	10	0.00
V = value, I = index									SUB-TOTAL (Sum one index from each column):			**29.0**

Bank Material Description:

Bank Materials

Bedrock (Bedrock banks have very low bank erosion potential)

Boulders (Banks composed of boulders have low bank erosion potential)

Cobble (Subtract 10 points. If sand/gravel matrix greater than 50% of bank material, then do not adjust)

Gravel (Add 5-10 points depending percentage of bank material that is composed of sand)

Sand (Add 10 points)

Silt Clay (+ 0: no adjustment)

BANK MATERIAL ADJUSTMENT: **10**

Stratification Comments:

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage

STRATIFICATION ADJUSTMENT:

VERY LOW	LOW	MODERATE	HIGH	VERY HIGH	EXTREME
5-9.5	10-19.5	20-29.5	30-39.5	40-45	46-50

Bank location description (circle one) Straight Reach Outside of Bend

GRAND TOTAL: **39.0**

BEHI RATING: **HIGH**

Channel Stability Assessment Scores

	Swift Creek BEHI 1	Swift Creek BEHI 2	UT1-SC BEHI	Gum Swamp BEHI
Watershed characteristics	11	9	9	8
Flow habit	11	8	5	9
Channel pattern	10	9	5	10
Entrenchment/channel confinement	10	9	9	9
Bed material	5	8	7	9
Bar development	7	6	10	9
Obstructions/debris jams	6	5	5	9
Bank soil texture and coherence	5	8	6	6
Average bankangle	9	9	10	10
Bank vegetation/protection	8	9	9	7
Bank cutting	9	7	6	5
Mass wasting/bank failure	10	7	4	5
Upstream distance to bridge				
Score	**101**	**94**	**85**	**96**
Rating*	**Poor**	**Fair**	**Fair**	**Fair**

CHANNEL STABILITY ASSESSMENT FORM

Stability Indicator	Excellent (1 -3)	Good (4 - 6)	Fair (7 - 9)	Poor (10 - 12)	Score
1. Watershed and flood plain activity and characteristics	Stable, forested, undisturbed watershed	Occasional minor disturbances in the watershed, including cattle activity (grazing and/or access to stream), construction, logging, or other minor deforestation. Limited agricultural activities	Frequent disturbances in the watershed, including cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Urbanization over significant portion of watershed	Continual disturbances in the watershed. Significant cattle activity, landslides, channel sand or gravel mining, logging, farming, or construction of buildings, roads, or other infrastructure. Highly urbanized or rapidly urbanizing watershed	
2. Flow habit	Perennial stream with no flashy behavior	Perennial stream or ephemeral first-order stream with slightly increased rate of flooding	Perennial or intermittent stream with flashy behavior	Extremely flashy; flash floods prevalent mode of discharge; ephemeral stream other than first-order stream	
3. Channel pattern	Straight to meandering with low radius of curvature; primarily suspended load	Meandering, moderate radius of curvature; mix of suspended and bed loads; well-maintained engineered channel	Meandering with some braiding; tortuous meandering; primarily bed load; poorly maintained engineered channel	Braided; primarily bed load; engineered channel that is maintained	
3. Channel pattern (revised)	No evidence of channelization. Meandering, stable channel or straight (step-pool system, narrow valley), stable channel.	Appears to have previously been channelized. Stream is relatively stable. Channel has some meanders due to previous channel adjustment.	Appears to have previously been channelized. Stream is actively adjusting (meandering); localized areas of instability and/or erosion around bends. Straightened, stable channel.	Appears to have previously been channelized. Stream is actively adjusting (laterally and/or vertically) with few bends. Straight, unstable reach.	
4. Entrenchment/ channel confinement	Active flood plain exists at top of banks; no sign of undercutting infrastructure; no levees	Active flood plain abandoned, but is currently rebuilding; minimal channel confinement; infrastructure not exposed; levees are low and set well back from the river	Moderate confinement in valley or channel walls; some exposure of infrastructure; terraces exist; flood plain abandoned; levees are moderate in size and have minimal setback from the river	Knickpoints visible downstream; exposed water lines or other infrastructure; channel-width-to-top-of-banks ration small; deeply confined; no active flood plain; levees are high and along the channel edge	
5. Bed materia Fs = approximate portion of sand in the bed	Assorted sized tightly packed, overlapping, and possibly imbricated. Most material > 4 mm. Fs < 20%	Moderately packed with some overlapping. Very small amounts of material < 4 mm. 20 < Fs < 50%	Loose assortment with no apparent overlap. Small to medium amounts of material < 4 mm. 50 < Fs < 70%	Very loose assortment with no packing. Large amounts of material < 4 mm. Fs > 70%	
6. Bar development	For S < 0.02 and w/y > 12, bars are mature, narrow relative to stream width at low flow, well-vegetated, and composed of coarse gravel to cobbles. For S > 0.02 and w/y are < 12, no bars are evident	For S < 0.02 and w/y > 12, bars may have vegetation and/or be composed of coarse gravel to cobbles, but minimal recent growth of bar evident by lack of vegetation on portions of the bar. For S > 0.02 and w/y <12, no bars are evident	For S < 0.02 and w/y > 12, bar widths tend to be wide and composed of newly deposited coarse sand to small cobbles and/or may be sparsely vegetated. Bars forming for S > 0.02 and w/y < 12	Bar widths are generally greater than 1/2 the stream width at low flow. Bars are composed of extensive deposits of fine particles up to coarse gravel with little to no vegetation. No bars for S < 0.02 and w/y > 12	
7. Obstructions, including bedrock outcrops, armor layer, LWD jams, grade control, bridge bed paving, revetments, dikes or vanes, riprap	Rare or not present	Occasional, causing cross currents and minor bank and bottom erosion	Moderately frequent and occasionally unstable obstructions, cause noticeable erosion of the channel. Considerable sediment accumulation behind obstructions	Frequent and often unstable, causing a continual shift of sediment and flow. Traps are easily filled, causing channel to migrate and/or widen	
8. Bank soil texture and coherence	Clay and silty clay; cohesive material	Clay loam to sandy clay loam; minor amounts of noncohesive or unconsolidated mixtures; layers may exist, but are cohesive materials	Sandy clay to sandy loam; unconsolidated mixtures of glacial or other materials; small layers and lenses of noncohesive or unconsolidated mixtures	Loamy sand to sand; noncohesive material; unconsolidated mixtures of glacial or other materials; layers of lenses that include noncohesive sands and gravels	
9. Average bank slope angle (where 90° is a vertical bank)	Bank slopes < 3H:1V (18°) for noncohesive or unconsolidated materials to < 1:1 (45°) in clays on both sides	Bank slopes up to 2H:1V (27°) in noncohesive or unconsolidated materials to 0.8:1 (50°) in clays on one or occasionally both banks	Bank slopes to 1H:1V (45°) in noncohesive or unconsolidated materials to 0.6:1 (60°) in clays common on one or both banks	Bank slopes over 45° in noncohesive or unconsolidated materials or over 60° in clays common on one or both banks	
10. Vegetative or engineered bank protection	Wide band of woody vegetation with at least 90% density and cover. Primarily hard wood, leafy, deciduous trees with mature, healthy, and diverse vegetation located on the bank. Woody vegetation oriented vertically. In absence of vegetation, both banks are lined or heavily armored	Medium band of woody vegetation with 70-90% plant density and cover. A majority of hard wood, leafy, deciduous trees with maturing, diverse vegetation located on the bank. Wood vegetation oriented 80-90% from horizontal with minimal root exposure. Partial lining or armoring of one or both banks	Small band of woody vegetation with 50-70% plant density and cover. A majority of soft wood, piney, coniferous trees with young or old vegetation lacking in diversity located on or near the top of bank. Woody vegetation oriented at 70-80% from horizontal, often with evident root exposure. No lining of banks, but some armoring may be in place on one bank	Woody vegetation band may vary depending on age and health with less than 50% plant density and cover. Primarily soft wood, piney, coniferous trees with very young, old and dying, and/or monostand vegetation located off of the bank. Woody vegetation oriented at less than 70% from horizontal with extensive root exposure. No lining or armoring of banks	
11. Bank cutting	Little or none evident. Infrequent raw banks, insignificant percentage of total bank	Some intermittently along channel bends and at prominent constrictions. Raw banks comprise minor portion of bank in vertical direction	Significant and frequent on both banks. Raw banks comprise large portion of bank in vertical direction. Root mat overhangs	Almost continuous cuts on both banks, some extending over most of the banks. Undercutting and sod-root overhangs	
12. Mass wasting or bank failure	No or little evidence of potential or very small amounts of mass wasting. Uniform channel width over the entire reach	Evidence of infrequent and/or minor mass wasting. Mostly healed over with vegetation. Relatively constant channel width and minimal scalloping of banks	Evidence of frequent and/or significant occurrences of mass wasting that can be aggravated by higher flows, which may cause undercutting and mass wasting of unstable banks. Channel width quite irregular, and scalloping of banks is evident	Frequent and extensive mass wasting. The potential for bank failure, as evidenced by tension cracks, massive undercuttings, and bank slumping is considerable. Channel width is highly irregular, and banks are scalloped	
13. Upstream distance to bridge from meander impact point and alignment	More than 35 m; bridge is well-aligned with river flow	20-35 m; bridge is aligned with flow	10-20 m; bridge is skewed to flow, or flow alignment is otherwise not centered beneath bridge	Less than 10 m; bridge is poorly aligned with flow	

H = horizontal, V = vertical, Fs = fraction of sand, S = slope, w/y = width-to-depth ratio

Total Score _____

Appendix L:

Prioritization Matrices

List of Contents:

Project Prioritization Matrix

CATEGORY	Public Health and Safety		Severity of Street Flooding (Public ROW)		Cost Effectiveness		Effect of Improvements		Water Quality - BMP		Water Quality - Erosion Control		Implementation Constraints		Grant Funding		Constructibility		TOTAL WEIGHTED SCORE
Primary System Projects																			
Frog Level Road (Gum Swamp)	5	50	1	10	3	30	5	30	0	0	1	6	1	6	0	0	3	9	**141**
Gum Swamp Floodplain Benching	5	50	1	10	1	10	5	30	0	0	3	18	1	6	1	6	3	9	**139**
Thomas Langston Road (Swift Creek Main Branch) - Alt 1	5	50	3	30	3	30	5	30	0	0	3	18	1	6	1	6	3	9	**179**
Sterling Trace Drive (Swift Creek Main Branch) - Alt 1	3	30	5	50	1	10	3	18	0	0	0	0	1	6	1	6	3	9	**129**
Thomas Langston Road (SCUT1) - Alt 1	5	50	3	30	3	30	5	30	0	0	1	6	1	6	0	0	3	9	**161**
Belfair Drive (SCUT1) - Alt 1	1	10	5	50	3	30	3	18	0	0	0	0	3	18	0	0	3	9	**135**
Sterling Pointe Drive (SCUT1) - Alt 1	3	30	5	50	1	10	3	18	0	0	1	6	1	6	1	6	3	9	**135**
Alternative 2 - SCUT1	5	50	5	50	1	10	5	30	3	18	0	0	0	0	1	6	0	0	**164**
Alternative 2 - Swift Creek Main Branch	5	50	5	50	0	0	5	30	3	18	0	0	0	0	1	6	0	0	**154**
Stream Stabilization Projects																			
Thomas Langston (Swift Creek Main Branch)	0	0	0	0	5	50	3	18	0	0	5	30	3	18	3	18	3	9	**143**
Thomas Langston (SCUT1)	0	0	0	0	1	10	1	6	0	0	1	6	5	30	1	6	3	9	**67**
Water Quality Projects																			
Ridgewood Elementary School Bioretention	0	0	0	0	3	30	0	0	5	30	0	0	3	18	3	18	5	15	**111**
Pinecrest Water Quality Swale	0	0	0	0	3	30	0	0	3	18	0	0	3	18	1	6	3	9	**81**
Emerald Park Bioretention	0	0	0	0	3	30	0	0	5	30	0	0	3	18	3	18	3	9	**105**
Davenport Farm Water Quality Swale	0	0	0	0	3	30	0	0	3	18	0	0	3	18	1	6	3	9	**81**
South Bend RSC	0	0	0	0	1	10	0	0	5	30	0	0	3	18	3	18	3	9	**85**
Wells Fargo Wet Pond Retrofit	0	0	0	0	3	30	0	0	5	30	0	0	1	6	1	6	3	9	**81**
Sterling Pointe Apartments Wet Pond Retrofit	0	0	0	0	5	50	0	0	5	30	0	0	3	18	1	6	3	9	**113**
South Central High School RSC	0	0	0	0	1	10	0	0	3	18	0	0	1	6	3	18	1	3	**55**
South Central High Bioretention	0	0	0	0	1	10	0	0	3	18	0	0	3	18	3	18	3	9	**73**
Dana Brooke Wetland	0	0	0	0	1	10	0	0	5	30	0	0	1	6	3	18	1	3	**67**

*Raw numbers are shown in left side of column and weighted numbers are provided in right side of column. Totals are based on weighted numbers.

Category	General Description	Score	Evaluation Criteria
Public Health and Safety	Evaluates potential impact of flooding on public health and safety. Generally, refers to flooding in and around habitable structures.	5	Flood water depth and/or velocity completely surrounds and threatens the structural integrity of habitable structures or vehicles.
			Finished Floor Flooding Occurs during the design storm.
			Erosion of stream running parallel to road threatening roadway stability or safety for Secondary
		3	Flood water surrounds structure but does not cause imminent danger.
			Crawl space and HVAC units are flooded.
		1	Yard flooding occurs and flood waters are near HVAC, crawl spaces or foundations.
			Model indicates flooding at nodes on private property or on roads/private property within a residential neighborhood.
		0	Minor yard flooding may occur but habitable structure is not directly affected.
			Model indicates no flooding at nodes on private property.
Severity of Street Flooding (City Owned)	Evaluates impact of flood depths to or through an area	5	Street spread requirements are not met and are so severe that the street becomes impassable during the design storm or street flooding has spread into private property.
			Flooding is noted on NCDOT roads as a result spread issues on adjacent city owned street.
			Roadway overtopping exceeding 6" in depth for Primary Systems.
		3	Street spread requirements are not met and the streets are passable only through the center of the street.
			Flooding noted on collector and local streets.
			Roadway overtopping 0-6" in depth for Primary Systems
		1	Spread requirements exceeded but street flooding is considered minor nuisance for traffic.
		0	Spread requirements are met.
Cost Effectiveness	Evaluates the benefit/cost of the proposed improvements	5	Project benefit ratio is greater than 1.5
			Stream Stabilization cost <$400 per linear foot
		3	Project benefit ratio is between 0.5 and 1.5
			Stream Stabilization cost <$600 per linear foot
		1	Project benefit ratio is between 0.075 and 0.5
			Stream Stabilization cost <$1,000 per linear foot
		0	Project ratio is less than 0.075
			Stream Stabilization cost >$1,000 per linear foot

Category	General Description	Score	Evaluation Criteria
Effect of Improvements	Evaluates the number of drainage issues resolved and the number of citizens positively affected	5	Multiple major drainage issues are being resolved through the proposed improvements such as street spread and increased drainage capacity.
			Proposed improvements would resolve major drainage issues for more than 5 properties.
		3	Single drainage issue is being resolved and it is considered major.
			Proposed improvements would resolve drainage issues for 3-5 properties.
		1	Single drainage issue is being resolved and it is considered major.
			Proposed improvements would resolve drainage issues for 2-3 properties.
		0	Single drainage issue is being resolved and it is considered minor.
			Proposed improvements would resolve drainage issue(s) for a single property at most.
Water Quality/Quantity	Evaluates the impact a BMP would have on water quality, water quantity and NPDES Phase II Compliance	5	Provides both water quantity and water quality benefits.
			Does not use manufactured or proprietary BMP technology.
			Incorporates some form of green solution such as infiltration, LID, sustainability etc.
			Is considered a BMP retrofit.
		3	Provides water quality benefits but does not provide water quantity benefit.
			Is considered a BMP retrofit
		1	Improvements will have minimal impacts on water quality and would primarily serve as a demonstration project.
			Is considered a BMP retrofit.
		0	Improvements will have no measurable impact on water quality and would serve only as a demonstration project.

Category	General Description	Score	Evaluation Criteria
Open Channel - Erosion Control	Evaluates the severity of erosion control issues and impact on water quality	5	Severe erosion problems are evident and are contributing significantly to water quality issues.
		3	Moderate erosion problems are evident and are contributing to water quality issues.
			>2,000 Linear feet of floodplain benching with documented erosion.
		1	Minor erosion control issues are evident and are contributing to water quality issues.
			<2,000 Linear feet of floodplain benching with documented erosion.
		0	Minor erosion control issues are evident and are not contributing to water quality issues in a significant way.
Implementation Constraints	Considers potential constraints that may either delay or make the project too difficult to construct. Some examples would include significant permitting issues, high mitigation costs, numerous easement needs, required partnering with other communities, the NCDOT, or railroads.	5	Only minor local or state permits required. Does not involve ACOE, DWQ or FEMA.
			Proposed improvements can be completed without permanent or temporary easements.
			Project can proceed independent of other stormwater improvements identified in the master plan.
		3	Requires State and Federal permits that are typically easy to obtain such as Nationwide permits, FEMA No Rise etc.
			Primarily requires temporary easements with only a few permanent easements needed to build the project.
			Improvements may have limited coordination with other projects such as DOT widening, GUC utility improvements or down stream drainage improvements. Significant delays in the schedule due to this coordination is not anticipated.
			Project can proceed independent of other stormwater improvements identified in the master plan.
			Project is self mitigating or requires very minor mitigation.
		1	Numerous permits required including federal, state and local agencies. Examples would include an individual permit or FEMA CLOMR/LOMR.
			Extensive permanent and temporary easements are required.
			Project can not proceed independent of other stormwater improvements identified in the master plan.
			Requires floodplain benching.

Category	General Description	Score	Evaluation Criteria
Grant Funding	Evaluates the availability and potential to receive grant funding	5	Project qualifies for multiple grants.
			Grant does not require significant match (20% match or less)
			City does not have an open grant from the agency providing the funding.
			Project meets all ranking criteria and will score highly in most if not all categories.
		3	Project qualifies for only one type of grant funding.
			Grant requires match between 20% and 50% range.
			City has an open grant from agency providing the funding.
			Project meets most if not all of the ranking criteria and will score high in key categories.
		1	Project qualifies for only one type of grant funding.
			Grant requires match equal to or greater than 50%.
			City has an open grant from agency providing the funding.
			Project meets some of the ranking criteria and may score high in one or two categories.
		0	Project does not qualify for any type of grant funding
Constructability	Evaluates relative constructability of the project including site constraints, traffic and neighborhood impacts, and impacts on adjacent property owners.	5	Limited to no site constraints.
			Limited to no utility conflicts.
			Limited to no impacts on adjacent property owners.
			Limited to no impacts on traffic or surround neighborhoods.
		3	Some site constraints exist but are considered fairly minor.
			Some utility conflicts exist but are routine and do not require major utility relocation.
			Some traffic and neighborhood impacts occur but are fairly minor. Examples include temporary lane closures, occasional hauling or traffic detours though adjacent neighborhoods.
		1	Site constraints exist and are fairly major.
			Utility conflicts exist and require rerouting or relocation of existing utilities.
			Traffic and neighborhood impacts occur and are fairly major. Examples included extended road closures or hauling operations.

To calculate the project benefit ratio used in evaluating the cost effectiveness, the following steps were taken for each project location:

1. The weighted scores for the Public Health and Safety, Severity of Street Flooding, and Effect of Improvements categories were added together.
2. The sum of the three categories was divided by the total project cost.
3. The quotient was multiplied by a common multiplier, 5,000, to determine the benefit ratio.
4. The value was then assigned a score based on the evaluation criteria shown below for the cost effectiveness criteria.

Score	Evaluation Criteria
5	Project benefit ratio is greater than 1.5
3	Project benefit ratio is between 0.5 and 1.5
1	Project benefit ratio is between 0.075 and 0.5
0	Project ratio is less than 0.075

5. The applicable weighting factor is then applied to the score. The final number obtained is listed in the project prioritization matrix.

Weight Factor	Criteria
10	Public Health and Safety
	Severity of Street Flooding (Town Owned)
	Cost Effectiveness
6	Effect of Improvements
	Water Quality - BMP and Erosion Control
	Implementation Constraints
	Grant Funding
3	Construction Impacts
	Constructability

The above table presents the weighting factors that will be applied to the prioritization criteria, with the reason being that some criteria are viewed as more important (i.e. deserve a higher weighting) than others. So each score of each prioritization criteria will be multiplied by the assigned weight factor for that prioritization criteria category as shown in the Priority Matrix.

Appendix M:

Swift Creek Water Quality Monitoring – Final Report

SWIFT CREEK WATER QUALITY MONITORING

Dr. Eban Bean, Dr. Michael O'Driscoll, and Dr. Charles Humphrey

East Carolina University

Final Report Submitted to WK Dickson

March 4, 2016

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EXECUTIVE SUMMARY

East Carolina University was awarded an 18-month contract to monitor water quality in the Swift Creek (SC) watershed upstream of NC 102 (37.8 mi^2) as part of the City of Greenville's Watershed Master Planning project. The SC watershed was selected because it is currently listed on the 303d list of impaired waters for North Carolina.

The goal of the water quality monitoring program was to determine whether nutrients, pathogens, sediments, or metals are impairing SC, and if so, to locate any potential sources of degradation. Water quality monitoring included sampling stream flow during base and storm flow conditions at least four times at seven locations on SC (1-7), and two outfalls (SC9 & SC10). Two longitudinal surveys of water quality were conducted at 16 locations along SC. Stage and conductivity were recorded continuously at three locations within the watershed as well.

Sampling results were compared with water quality standards or surrogate standards to evaluate whether parameters may be contributing to stream degradation. Exceedance of standards occurred more frequently during storm flow events rather than baseflow events. Total suspended solids (TSS) concentrations exceeded 20 mg/l (North Carolina standard for High Quality Waters) during two storm flow events at nearly all sites on SC, while the turbidity standard (50 NTU) was violated during only one storm (November 24) at five sites, SC3 – SC7. Agricultural land use below the head waters was likely the most significant contributor of sediment loads to SC.

Results for E. coli exceeded EPA recommended levels (528 MPN/100 ml) during only one baseflow event (October 13) at all in-stream sites, while in-stream results from three storms exceeded the standard, primarily upstream of SC6. Similar trends were observed for storm flow concentrations of E. coli, chloride, and organic nitrogen, which could indicate a wastewater source.

Although nutrient concentrations did not exceed existing numeric standards, baseflow nitrate-nitrite concentrations exceeded conservative numeric guidelines set in Florida (0.3 mg/l). Nitrate concentrations steadily increased downstream from headwaters for baseflow and storm flow events. Baseflow concentrations were highest for the winter sampling, likely due to increased agricultural drainage in response to an elevated water table during this time of year. Results of $^{15}N\text{-}NO_3$ isotope analyses suggest fertilizer or soil as the primary source of nitrate, although wastewater could not be ruled out due to possible mixing. Of note, baseflow $^{15}N\text{-}NO_3$ from SC4 was most enriched, suggesting this was the site most likely to be influenced by wastewater. Additional monitoring and comparison of sewered and septic areas could help to determine wastewater-related N-inputs. In addition, baseflow nitrate concentrations at SC4 were elevated compared to in-stream concentrations at SC3 (upstream) and SC5 (downstream). Efforts to reduce nitrogen along the tributary upstream of SC4 would likely reduce nitrogen and improve water quality along the main stem.

Total dissolved phosphorus concentrations primarily exceeded numeric guidelines from Florida (0.06 mg/l) during one storm event (November 24). Otherwise, baseflow and storm flow concentrations generally increased downstream from head waters, where agricultural land use is more prevalent in the watershed.

None of the metals were found to exceed state standards, as concentrations were below detection limits for copper (10 µg/l) and lead (5 µg/l) and zinc concentrations were less than state standards (50 µg/l).

INTRODUCTION

Study Location

Swift Creek's (SC's) headwaters originate in the Greenville, NC area and the study area extends from its headwaters, down to the Route 102 Bridge at Ayden, NC. The SC watershed (HUC12: 030202020401) is located in the inner Coastal Plain, where the bulk of discharge to streams is from unconfined aquifers (Winner and Coble, 1996). The main stem of SC flows from urbanized headwaters to the south through a mostly agricultural watershed towards the Neuse River. Topographic relief and land cover are shown with the SC watershed boundary in Figures 1 and 2, respectively.

Soils within the SC watershed are mostly poorly drained with fine-loamy texture. Typically the surficial aquifer drains to streams and it is underlain at approximately 10-20 ft. below the surface by the Yorktown confining unit (which overlays the Yorktown aquifer). As much of the SC watershed is or was once used for agricultural production, drainage channels and tile drains serve as collectors of stormwater runoff within the rural catchments. These channels efficiently convey runoff to SC and its tributaries. Historical channelization has also reduced the channel length and increased the channel slope along sections of SC, which has led to incision, lateral erosion and disconnection between the stream channel and its flood plain.

On average, the watershed receives 125 cm (49.3 in.) of rain per year, ranging from a maximum of 15.0 cm (5.89 in.) in August to a low of 7.09 cm (2.79 in.) in November (Holder et al., 2006; Southeast Regional Climate Center, 2009). The mean air temperature is 16.2°C (61.2°F), from a low of -0.39°C (31.3°F) in January to a high of 21.2°C (70.2°F) in July (NCEI, 2015). Elevated evapotranspiration in the summer months can result in reductions in streamflow during this period. On an annual basis, evapotranspiration accounts for approximately 70% of precipitation losses (Sun et al. 2002). Based on previous studies in the region, groundwater inputs to streams are typically lowest during the period of June–November. Total discharge follows this seasonal pattern but may also increase during September due to increased runoff from tropical storms. Typically streamflow is greatest during March and lowest during October. Groundwater is usually the dominant source of streamflow, contributing approximately 60% of annual discharge (O'Driscoll et al. 2010).

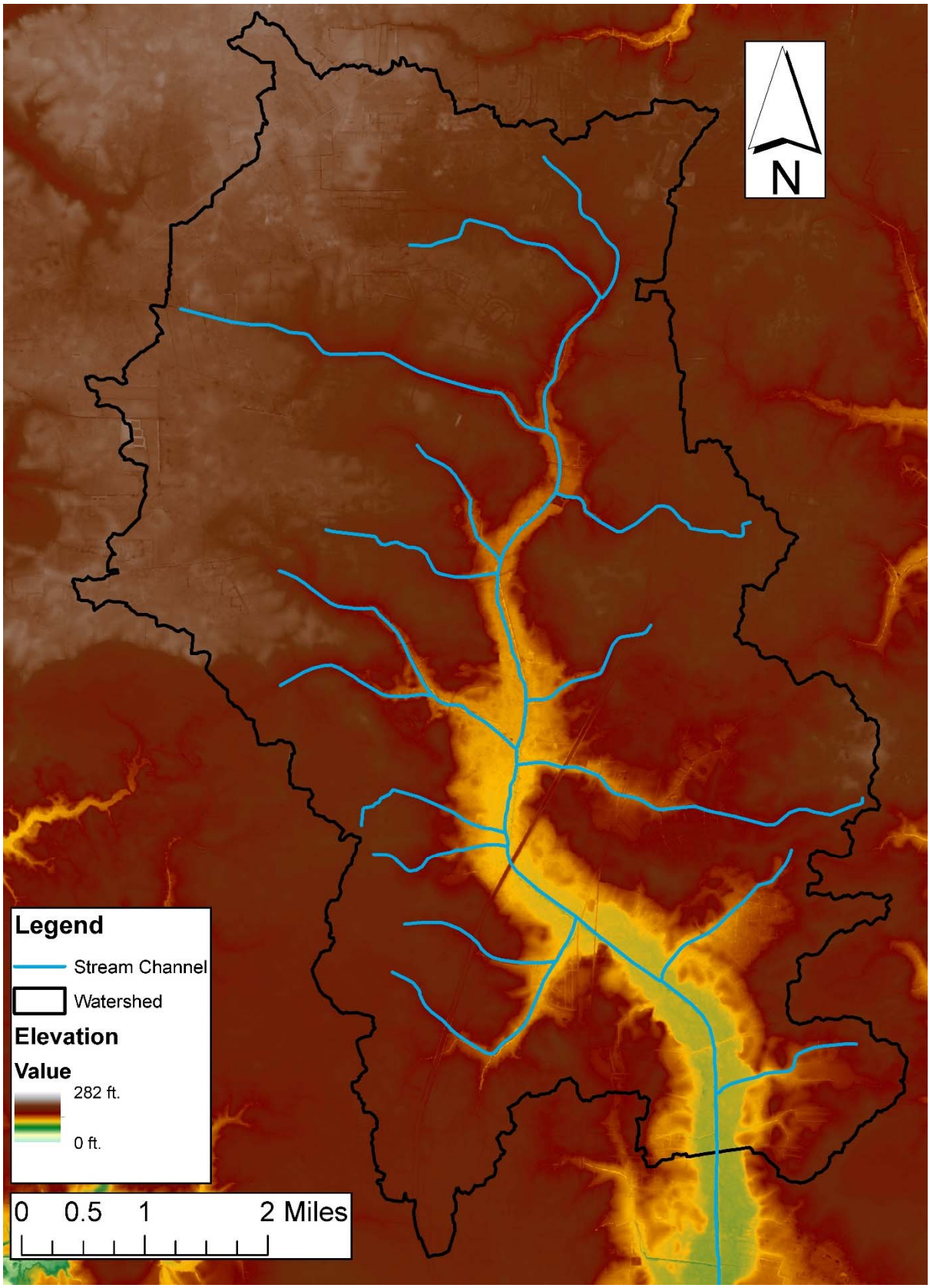


Figure 1. Topography within and around Swift Creek watershed.

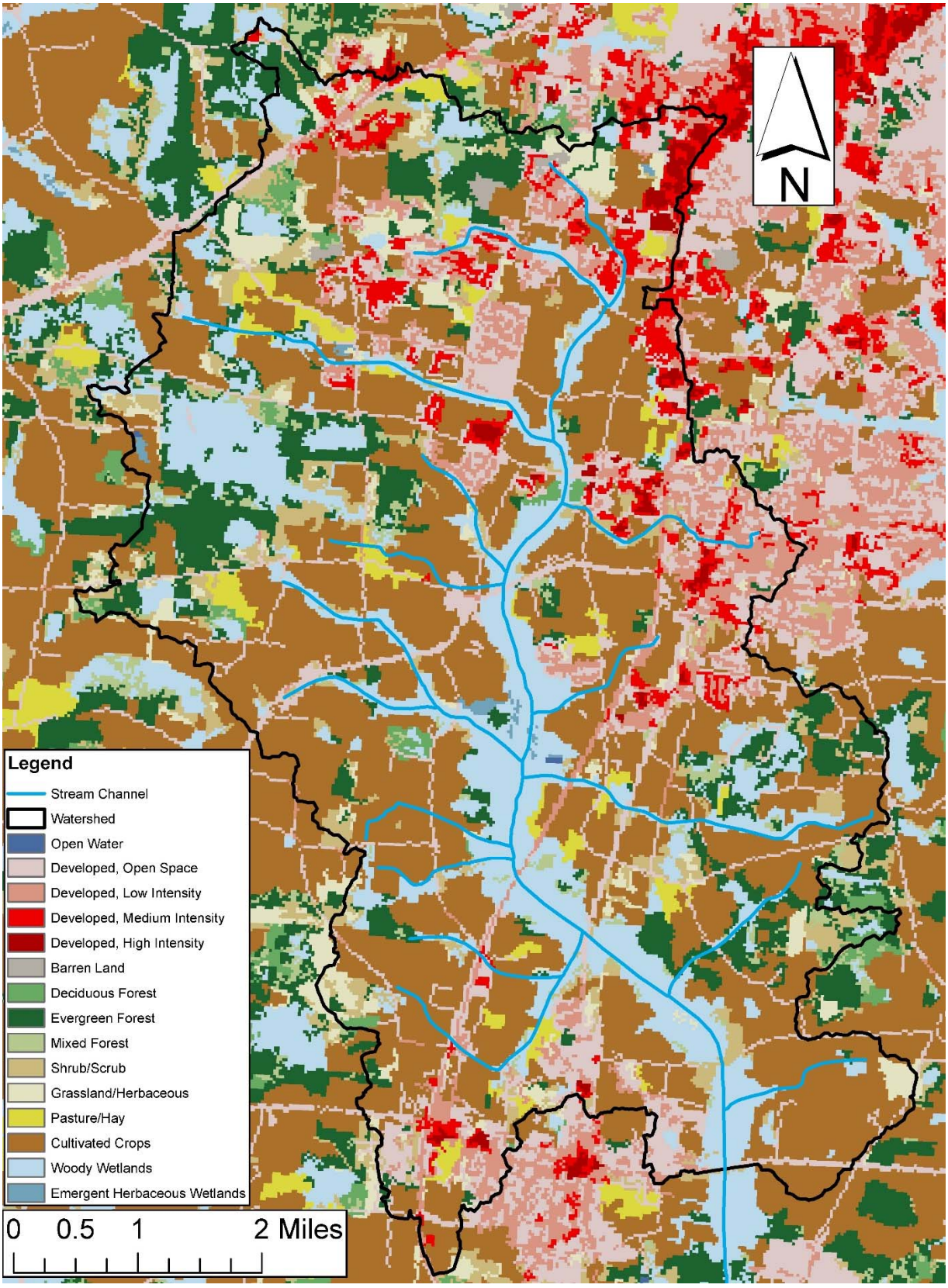


Figure 2. Land cover within and around Swift Creek watershed. Data from National Land Cover Data set.

Current Condition

The North Carolina Department of Environmental Quality (NCDEQ) currently lists Swift Creek as being a Class C surface water, meaning it is protected for secondary recreation (wading, boating, and other types of infrequent, unorganized, or incidental human body contact), fishing, wildlife, fish consumption, aquatic life (propagation, survival, and maintenance of biological integrity), and agriculture. In addition, NCDEQ has applied two supplemental classifications to Swift Creek. The Swamp Waters (Sw) supplemental classification is intended to recognize waters having “low velocities and other natural characteristics which are different from adjacent streams”, such as lower pH, lower dissolved oxygen, and higher temperatures (NCDENR, 2009). The Nutrient Sensitive Waters (NSW) supplemental classification is “intended for waters needing additional nutrient management due to their being subject to excessive growth of microscopic or macroscopic vegetation” and is applied to Swift Creek as a tributary to the Neuse River.

Since 1998, a 19.3 mile stretch of Swift Creek (from its source to 5.3 miles upstream of Clayroot Swamp) has been classified as impaired for not meeting the aquatic life standard due to a poor bioclassification rating for ecological or biological integrity of benthos. This classification does not specify the cause of the condition and may result from individual or multiple environmental factors.

Study Objectives

The goal of the water quality monitoring program was to determine whether nutrients, pathogens, sediments, or metals were contributing to impairment of Swift Creek.

METHODS

Sampling and monitoring plans were developed to evaluate the flow and water quality over time within Swift Creek, upstream of NC 102.

Water Quality Sampling and Measurements

Seven in-stream (SC1-SC7) and two outfall (SC9, SC10) locations were selected for sampling along Swift Creek and its tributaries (Table 1 and Figure 3). Water quality samples and measurements were collected during baseflow and storm flow (or wet weather) events during the study period. These sites were distributed along SC and its tributaries to evaluate water quality throughout the watershed and determine if any section(s) of SC was more affected than others. In addition, baseflow and storm flow samples were collected across seasons to evaluate seasonal fluctuations of water quality.

Samples were collected during four baseflow and four storm flow events. All sites were sampled for each baseflow and storm sampling event. Samples were also collected in coordination with benthic sampling on August 18-21, 2014; when available results were included with those from the other four baseflow events. Seasonal baseflow and storm

flow event dates are listed in Table 2 and occurred approximately during each season between October 2014 and September 2015. Rainfall less than 1.00 in. during 72 hours (3 days) prior to sampling was required for baseflow events. This criterion was supported with monitoring data as storm hydrographs returned to baseflow within 72 hours of precipitation events, except for the largest of rainfall events. In addition, samples were also collected in conjunction with benthic sampling in August 2014 and met the criteria for baseflow sampling.

Table 1. Locations of baseflow and stormwater monitoring sites along Swift Creek, an un-named tributary (SC4), and two outfalls (SC9, SC10).

Location	Latitude	Longitude	Sampling	Stage Monitoring	Conductivity Monitoring
SC 1	35° 33' 14.52" N	77° 24' 52.38" W	Y		
SC 2	35° 33' 13.62" N	77° 24' 48.54" W	Y	Y	Y*
SC 3	35° 32' 44.4" N	77° 25' 11.1" W	Y		
SC 4	35° 32' 36.66" N	77° 25' 30.24" W	Y		
SC 5	35° 32' 17.1" N	77° 25' 7.92" W	Y	Y	Y
SC 6	35° 30' 0.06" N	77° 25' 29.22" W	Y	Y	Y
SC 7	35° 28' 10.02" N	77° 24' 1.98" W	Y		
SC 9	35° 32' 13.67" N	77° 25' 7.17" W	Y		
SC 10	35° 32' 14.02" N	77° 25' 7.08" W	Y		
Rain Gauge	35° 32' 31.2" N	77° 25' 37.2" W			

*Removed due to burial and operational issues.

Table 2. Sampling dates for baseflows, storm (wet weather) flows, and longitudinal surveys.

Sampling	Dates
Baseflow	2014: Aug 18-21, Oct 13; 2015: Feb 24, Apr 13, Aug 24[a]
Storm Flow	2014: Nov 24; 2015: Feb 2, Jul 13, Sep 25[a,b]
Longitudinal Surveys	2015: Apr 13, Aug 24

[a]Samples for metals analysis collected at SC 1, 3, and 5. [b]Samples for isotope analyses collected at all sampling sites.

The target threshold for storm flow sampling was set at 0.50 in. of rainfall within a three hour period. Only the July 13 event did not meet this criterion, when approximately 0.34 in. fell during a three hour period. Storm flow samples were collected by first flush sampling on November 24, 2014, and February 2, 2015. All other base flow and storm flow samples were collected via direct grab sampling. For grab sampling, bottles were rinsed in stream water three times prior to collecting each sample. Sample bottles were labeled with identification numbers and immediately put on ice after collection.

TSS and Nutrient Analyses

For each sampling event, samples were collected in high density polyethylene (HDPE) bottles, for water quality analyses at the Environmental Research Lab. Samples were filtered on same day as they were collected. These analyses included Total Suspended Solids (TSS), nitrogen species (Ammonia (NH_4), Nitrate+Nitrite (NO_{2+3}), Total Dissolved

Nitrogen (TDN)), phosphate (PO_4), Dissolved Organic Carbon (DOC), and chloride (Cl). Nutrient samples were frozen until analyses were performed.

Bacterial Analyses
Samples for bacteria analyses were also collected for each sampling event. Analyses were completed at the ECU Environmental Health Sciences Water Laboratory. Bacteria samples were collected in sealed polyethylene terephthalate (PET) bottles and were analyzed for total coliform and *E. coli*. Samples were diluted (dilution factors of 10:100) before preparation and incubation because of anticipated high concentrations. Samples were prepared and incubated within 6 hours of collection. Samples were analyzed for total coliform and *E. coli* using the IDEXX *Colilert* substrate with *Quantitray 2000* for most probable number (MPN) determination. The sample trays were incubated at 35°C for 24 hours and wells which illuminated yellow under laboratory lights were recorded as positives for total coliform. Tray wells that illuminated under a black light were recorded as positives for *E. coli*.

Metals Analyses
Samples were collected of baseflow on August 24, 2015 and storm flow on September 25, 2015 for metals analyses (Copper (Cu), Lead (Pb), and Zinc (Zn)) at SC 1, 3, and 5. The sample analyses were performed by Environment One Laboratories, Inc. in Greenville, NC using EPA method 200.7 for Cu and Zn, and Standard Method 3113B-04 for Pb.

Isotope Analyses
Storm flow samples were collected for isotope analyses on September 25, 2015. These samples will be analyzed at the University of California at Davis for N^{15} and O^{18} in NO_3. These data will provide information on the sources of nitrogen entering SC. Samples were sent to UC Davis in December.

In Stream Measurements
In stream water quality readings for temperature, specific conductivity, conductivity, dissolved oxygen concentration, and pH were measured using calibrated YSI 556 MPS sensors. Turbidity was measured using a HACH 2020we turbidimeter.

At each site, field sampling sheets were completed to record field meter readings, sample identification numbers, location of any photos, arrival and departure time, and relevant other notes. Field sheets were scanned and stored electronically.

Monitoring Sites

Three sites (SC 2, SC 5, and SC 6) were also selected as water level monitoring sites. At each monitoring site, Onset HOBO Water Level Data Loggers (U20-001 or U20L-01) were deployed to record and collect pressure every 30 minutes. Readings were corrected for atmospheric pressure fluctuations to estimate water level records. Staff gauges were also installed at each location. Stage was monitored at these sites during the period of January 9 through October 14, 2015.

Discharge was calculated from stage records using stage-discharge rating curves. Stage and discharge were measured on nine occasions during the monitoring period. Flow meters were used to measure the flow velocity across the stream cross-section. The cross-section area was estimated by measuring equally spaced depths across the channel width. Discharge was calculated as the product of the average flow velocity and cross-sectional area. Staff gauge water levels were also recorded and used to correct water level records as necessary.

The stage-discharge rating curves took the form of $Q = C*(s^n)$, where Q is the discharge (cfs), s is the stage (ft.), and C and n were values determined by linear regression. Rating curves were developed by linear regression of discharge and stage on log-log plots. Rating curve equations are listed in the Appendix.

These three sites were also instrumented with conductivity loggers. Conductivity can be used in place of direct measurement of other water quality parameters and at a much lower cost to record changes in water quality over time. Each site was instrumented with an Onset HOBO Fresh Water Conductivity Data Logger (U24-001) and set to record every 30 minutes.

Longitudinal Surveys

Two longitudinal surveys were conducted (April 15 and August 24) during base flow conditions along the main stem and tributaries of SC. These surveys were conducted to provide a finer spatial resolution of water quality variation along SC. Any significant changes along SC could detect where sources of water quality impairment may be entering. A total of 24 sites, including the 5 sampling sites and 11 additional sites, were included in these surveys (Figure 3). At each site, a YSI 556 MPS was used to measure temperature, specific conductivity, dissolved oxygen, and pH, while turbidity was measured using a LaMotte 2020we turbidimeter. At each site, field sampling sheets were completed to record field meter readings, sample identification numbers, location of any photos, arrival and departure time, and relevant other notes. Field sheets were scanned and stored electronically.

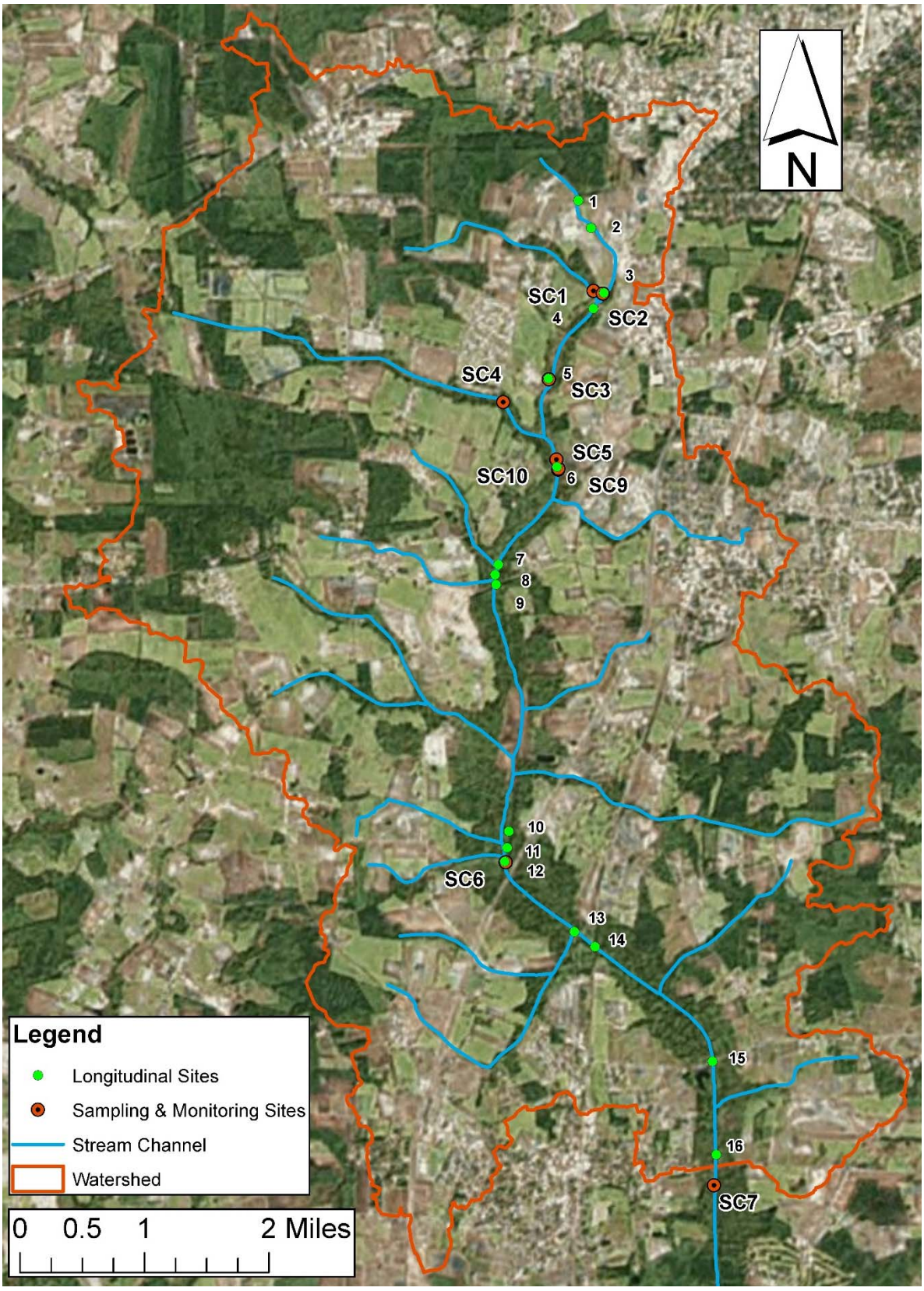


Figure 3. Swift Creek sampling and monitoring sites (SC 1-7, 9, 10; orange target symbols) and longitudinal sampling sites (1-16; green dots)

RESULTS AND DISCUSSION

Stream Flow

During the monitoring period (October 2014 - September 2015), baseflow was generally elevated during the late fall, winter, and early spring. During late spring, summer and early fall, baseflow was typically low (Figure 4). Data from the SC5 (Figure 4) is representative of discharge fluctuations at SC2 and SC6, included in Appendix A. Flow at SC6 was greater than at SC5 due to the larger watershed area, while flow at SC2 was less than at SC5 due to a smaller watershed area. Based on the discharge data, the October 2014 and February 2015 baseflow sampling events were during periods with greater baseflow and the April and August 2015 events were during periods of lower baseflow, presumably this could result in less dilution of non-point source contaminants on these dates.

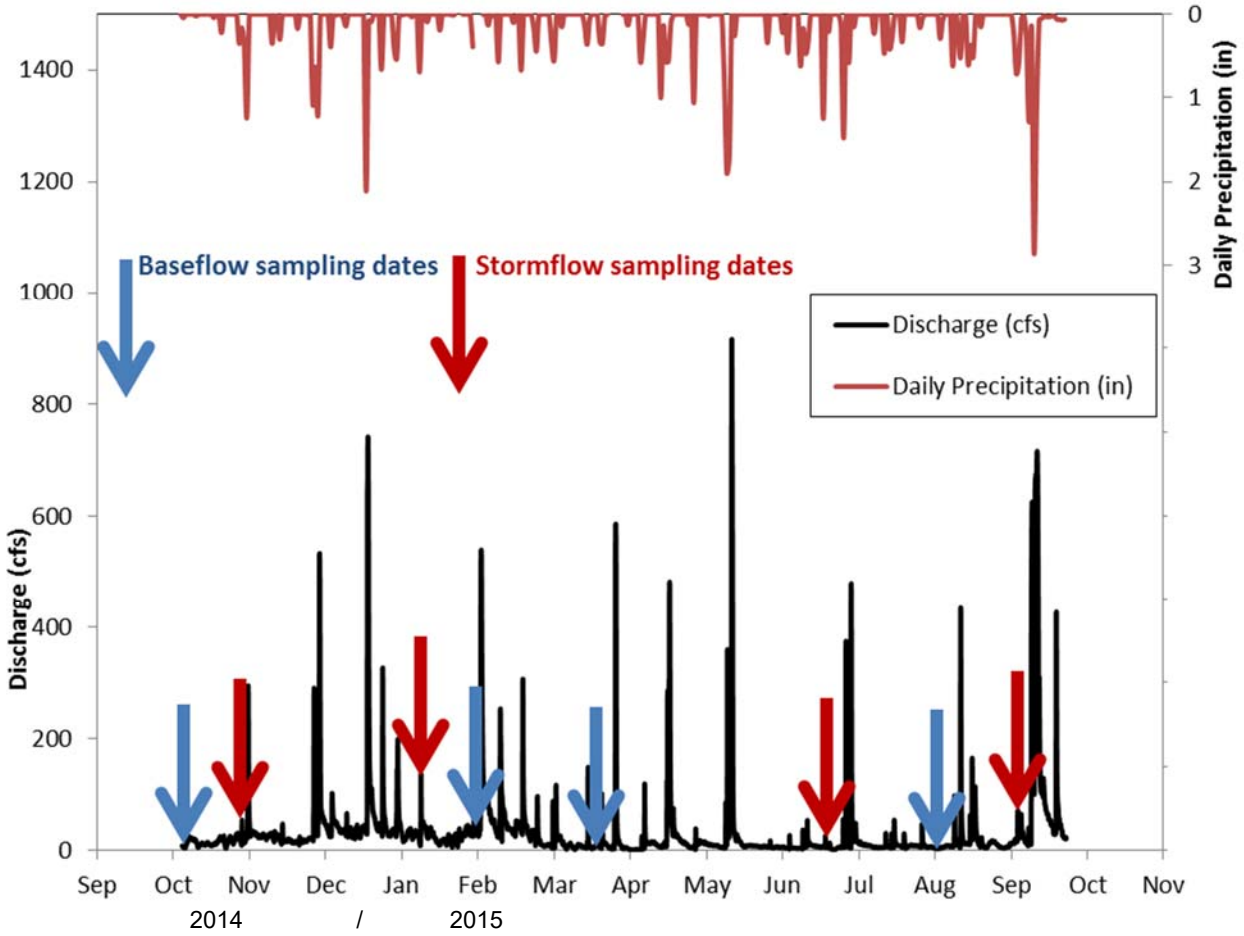


Figure 4. Swift Creek discharge data collected at station SC5 compared to precipitation inputs over the course of the study. Baseflow and storm flow monitoring dates are indicated by blue and red arrows, respectively.

Water Quality

Turbidity

Turbidity is an indicator of water clarity and serves as a metric for suspended sediment and colored dissolved organic matter. The NC standard for turbidity in surface waters is 50 NTU (instantaneous) or 25 NTU (10 day average). Turbidity measurements exceeded 50 NTU at five sites, SC 3-7 during one event (November 24). The turbidity measurements were between 25 and 50 NTU on five other storm flow and three baseflow sampling events. All longitudinal measurements were less than 20 NTU. In general, median turbidity values at each site increased during storm flows compared to baseflow (Figure 5). This is likely related to the increase in suspended sediments that commonly occurs during storm flow events. In addition, flushing of organic rich waters from riparian wetlands can also increase turbidity during storm events in coastal plain streams

Median storm flow turbidity at SC1 and SC2 were both 22 NTU. Runoff from active urban development in the headwaters upstream of SC 1 and SC 2 is likely mobilizing sediments into SC. Downstream, median storm flow turbidity increased from 13 NTU at SC3 to 24 NTU at SC 7. Agricultural runoff between SC 5 and SC 7 is likely the cause of increased turbidity at these downstream locations.

Baseflow turbidity measurements tended to decline downstream as shown by medians in Figure 5 and longitudinal survey measurements in Figure 6. . During the longitudinal surveys, there was a great deal of variability in baseflow turbidity measurements for the August sampling event (Figure 6), which may be related to increased algal growth during summer months at certain sites.

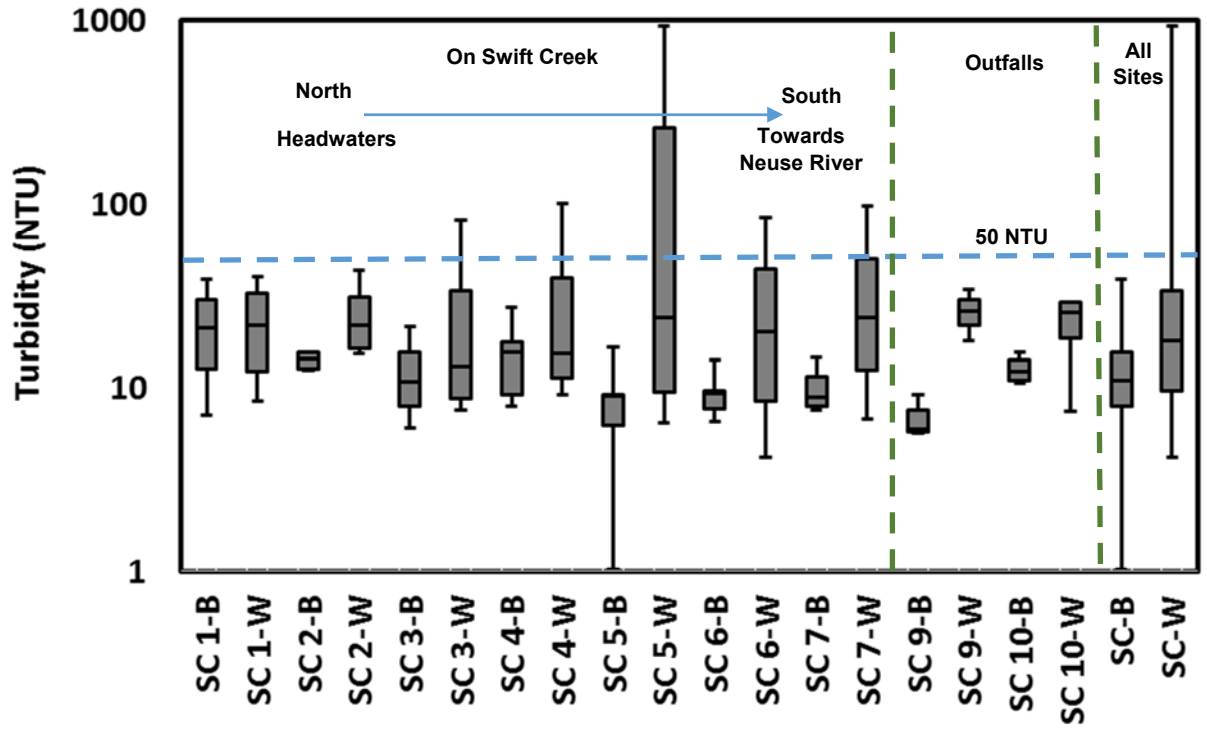


Figure 5. Box and whisker plots of turbidity measurements collected during baseflow (B) and storm or wet weather (W) flow conditions. Instantaneous turbidity limit of 50 NTU displayed for reference.

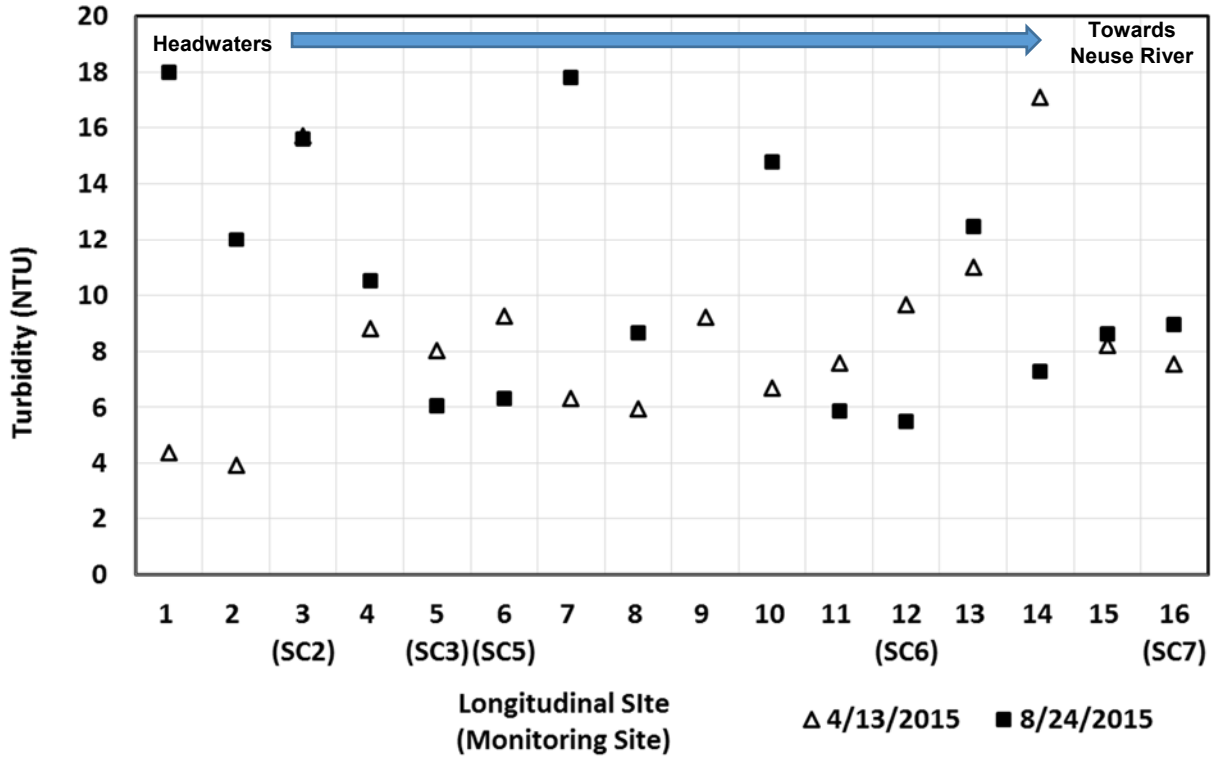


Figure 6. Swift Creek turbidity data collected during longitudinal surveys.

Total Suspended Solids

Storm flow TSS concentrations were generally higher than baseflow TSS values at each site, and storm flow medians were greater than corresponding base flow medians at each site (Figure 7). Although there is not a standard for most streams, NC has a TSS standard for high quality waters set at 20 mg/l. All but one baseflow sample had TSS concentrations less than this standard, while TSS concentrations during two storms exceeded 20 mg/l at nearly all in-stream sites, but only one site (SC2) exceeded 20 mg/l for the remaining two storms. The main pattern observed in TSS data was elevated TSS during storm events, with the greatest concentrations at SC5 and SC6, where TSS during storm events could be elevated to greater than 1000 mg/l (Figure 7). The two outfalls each exceeded 20 mg/l during three storms, while baseflow concentrations were typically lower.

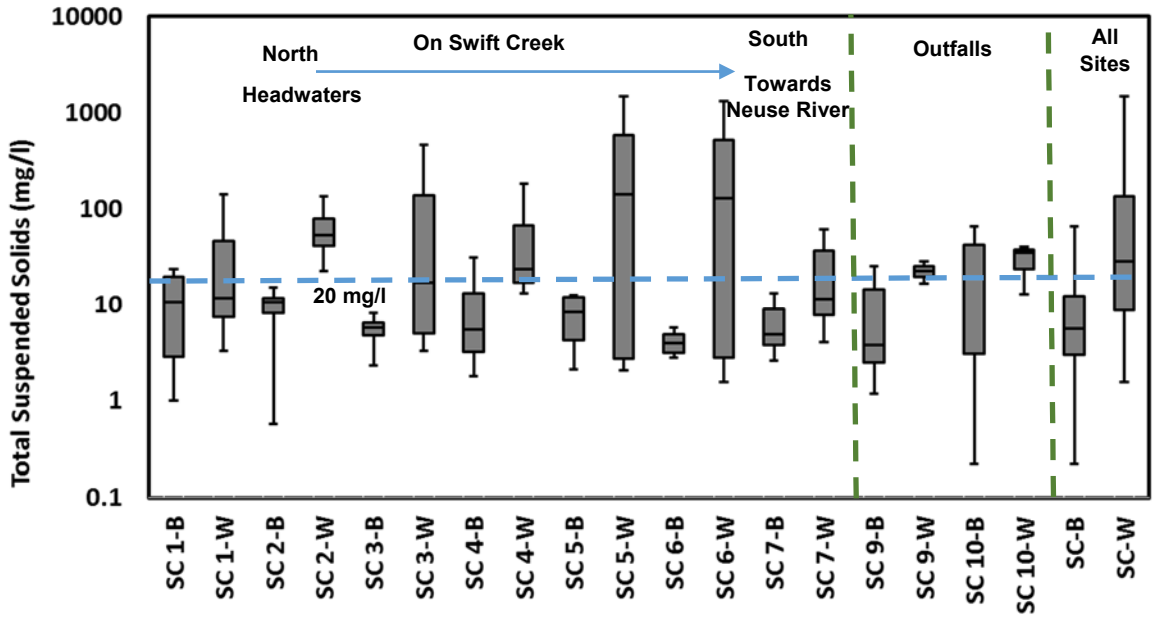


Figure 7. Swift Creek total suspended solids data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC 9 and SC10 are outfalls. The 20 mg/l for TSS in High Quality Waters is shown for reference.

Dissolved Organic Carbon

Dissolved Organic Carbon (DOC) does not have a water quality criteria. It is produced by the decomposition of organic substances, commonly in streams or wetlands. Dissolved organic carbon (DOC) was relatively low in headwaters baseflow samples, and generally increased downstream, particularly between stations SC5 and SC7 (Figure 8). At most sites, there was an increase in DOC during storm events. This indicates a stormwater-related source which could include flushing of organics from wetlands and riparian areas, although leaking wastewater infrastructure may be a contributor as well.

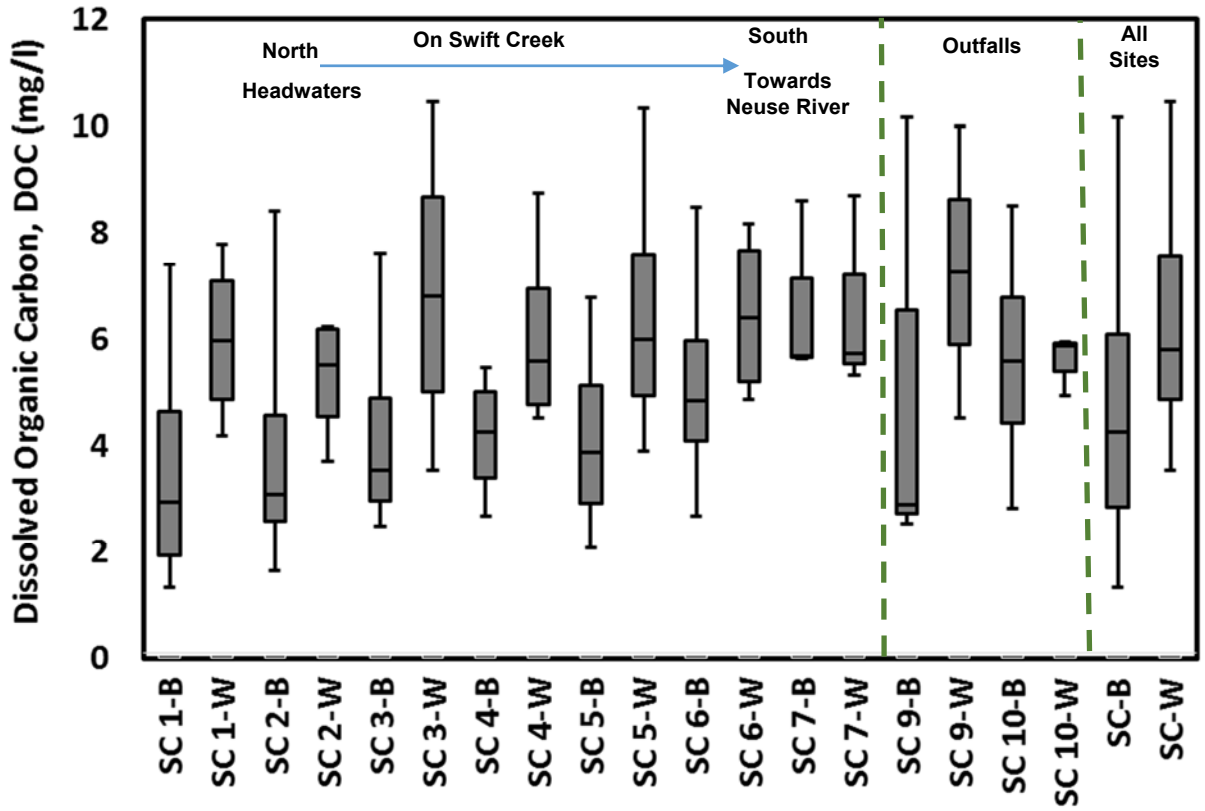


Figure 8. Swift Creek dissolved organic carbon concentration data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC 9 and 10 are outfalls.

Specific Conductivity

Specific conductivity provides an indication of the concentration of dissolved ions in the water. It can also be used to indicate significant changes in water chemistry such as from wastewater or road salts. Chloride (Cl) is a primary ion in common salts. Since fluctuations of Cl concentrations and SC measurements were nearly identical, Cl results are included in Appendix C.

Median base flow specific conductivity values were greater for base flow than storm flow for all sites. Conductivity logger plots for SC2, SC5, and SC6 (included in Appendix B) generally showed a similar pattern of a sharp spike in conductivity at the beginning of storm events, followed by a sharp decrease as storm events extended, and increasing towards an equilibrium value following events as the end of the storm hydrograph and interflow taper off.

Conductivity values were generally less than 0.10 mS/cm throughout the record, except during a period in late January and March at SC 6, following road salt applications in Pitt County due to ice and snow events. Base flow conductivities decreased noticeably from late winter into summer before rising in the fall. This was likely due to agricultural drainage inputs fluctuating with groundwater elevation changes. Agricultural drainage made up a greater proportion of baseflow during the winter and late fall than in the summer. During the winter months, increased drainage transports leached dissolved

ions from fields, whereas in a lower water table during the summer reduced drainage flows and transport of drainage.

In general, the stormwater outfalls had the most variable data. There was a subtle increase in median specific conductivity values when comparing the forested and urbanized headwater reach (SC1) vs the farthest downstream reach (SC7) during baseflow and storm flow conditions (Figure 9). During the longitudinal surveys (Figure 10), the comparison between the wetter and cooler April sampling data and the drier and warmer August sampling dates, suggests a slight difference in dilution occurs seasonally related to seasonal variations in groundwater recharge, most noticeable upstream of SC5.

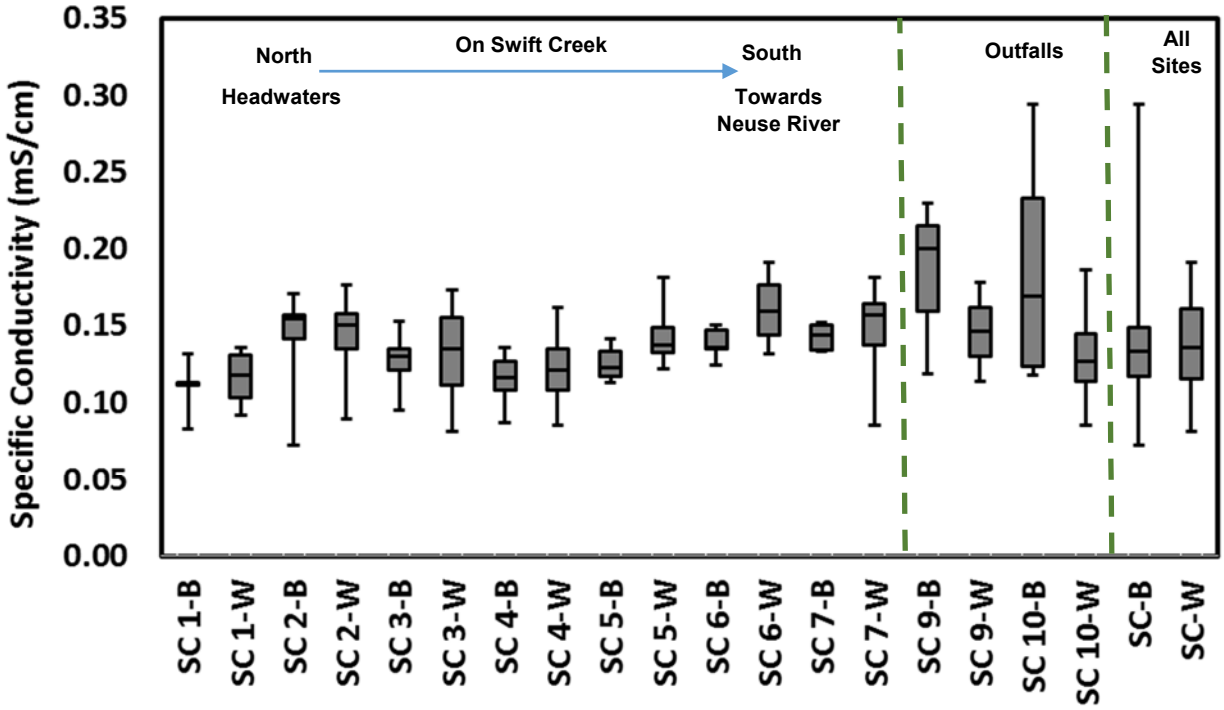


Figure 9. Swift Creek specific conductivity data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC 9 and 10 are outfalls.

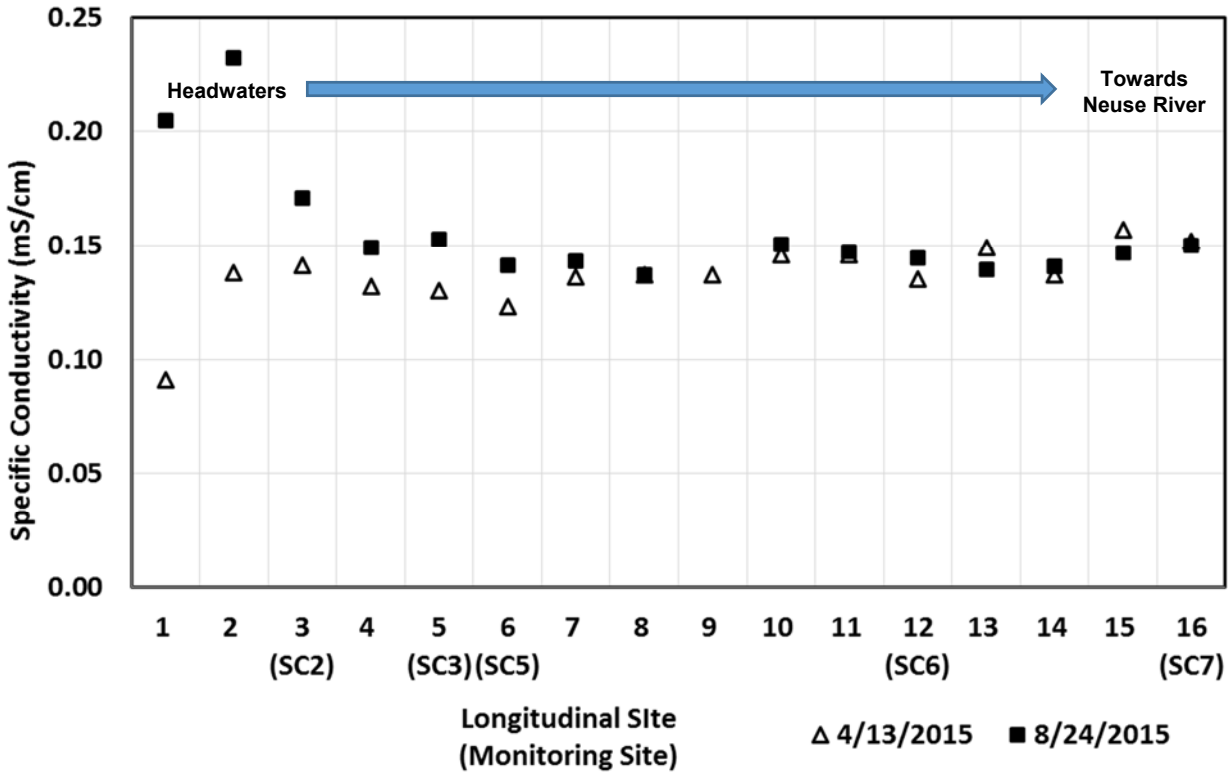


Figure 10. Swift Creek specific conductivity data collected during longitudinal surveys.

Total Dissolved Nitrogen

Nitrogen is an essential nutrient in the environment and can be transformed between different species through biological processes. Total Dissolved Nitrogen (TDN) includes Ammonium (NH_4), Nitrate and Nitrite (NO_{2+3}), and more complex dissolved forms of cumulatively referred to as Organic Nitrogen (ON). TDN concentrations for base flows and storm flows are summarized in Figure 11. Based on guidelines already developed in Florida, their criteria for TDN in streams ranges between 0.67-1.87 mg/l depending on the region. Median baseflow and storm flow concentrations exceeded 0.67 mg/l for all sites except SC 1 and SC 10 during baseflow, although only one sample exceeded 1.87 mg/l (Figure 11). Generally, ammonium concentrations were relatively low (<0.25 mg/l at all sites/dates; see Appendix C for data plots), while nitrate was the dominant form of inorganic nitrogen found in Swift Creek samples (typically >0.25 mg/l).

Median storm flow concentrations were typically greater than baseflow concentrations for all in-stream and outfall sampling sites (Figure 11). Storm flow and baseflow concentrations were less variable for instream samples from sites upstream of SC 6 and had similar baseflow and storm flow trends. Concentrations tended to increase from the headwater sites, SC 1 and SC 2, towards SC 3. Higher concentrations from a tributary, SC 4, corresponded with slightly higher concentrations at SC 5 than upstream at SC 3. Baseflow and storm flow concentrations were similarly variable at SC 6 for baseflow and storm flow, increasing slightly from SC 5. Baseflow concentrations at SC 7 were greater than SC 6, however, storm flow concentrations slightly lower than at SC 6. Baseflow

concentrations were greater for the February and April samplings than the August and October samples. This corresponded with changes in specific conductivity and corresponds with grater transport of TDN during periods with higher water tables and increased agricultural drainage.

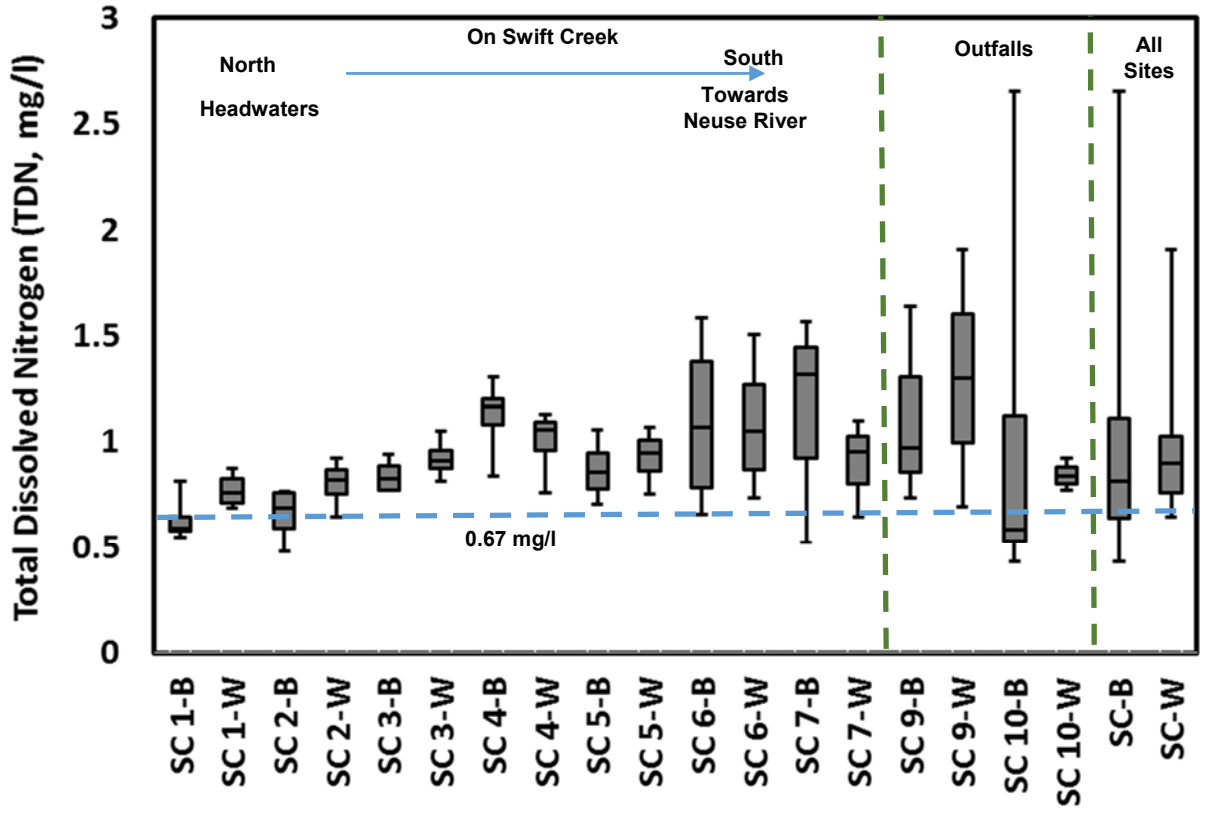


Figure 11. Swift Creek total nitrogen concentration data collected during baseflow (B) and storm flow or wet weather (W) conditions. SC9 and SC10 are stormwater outfalls. The guideline concentration of 0.67 mg/l of TDN for Florida is shown for reference.

Nitrate and Nitrite

Nitrate & nitrite (NO_{2+3}) concentrations for base flows and storm flows are summarized in Figure 12. Reference streams (undisturbed, forested watersheds) in the southeastern Coastal Plain generally have nitrate concentrations below 0.3 mg/l (EPA, 2000), in contrast SC sites typically had nitrate concentrations greater than 0.3 mg/l indicating anthropogenic nitrate inputs are affecting downstream waters. The nitrate concentrations during baseflow conditions generally increased with distance downstream from headwaters (Figure 12), and median storm flow concentrations were less than base flow concentrations. At the lower portions of the study watershed, median nitrate concentrations were > 1 mg/l (SC 6 & SC 7) with the highest median concentration of 1.90 mg/l at an outfall, SC 10. The greatest base flow concentrations at each in-stream site occurred in February. Elevated concentrations were likely due to increased agricultural drainage during a period when groundwater levels were likely highest of all base flow sampling dates. These data and the general decline in nitrate

concentration during storm flow events indicate that groundwater transport of nitrate to the channel results in increasing concentrations downstream.

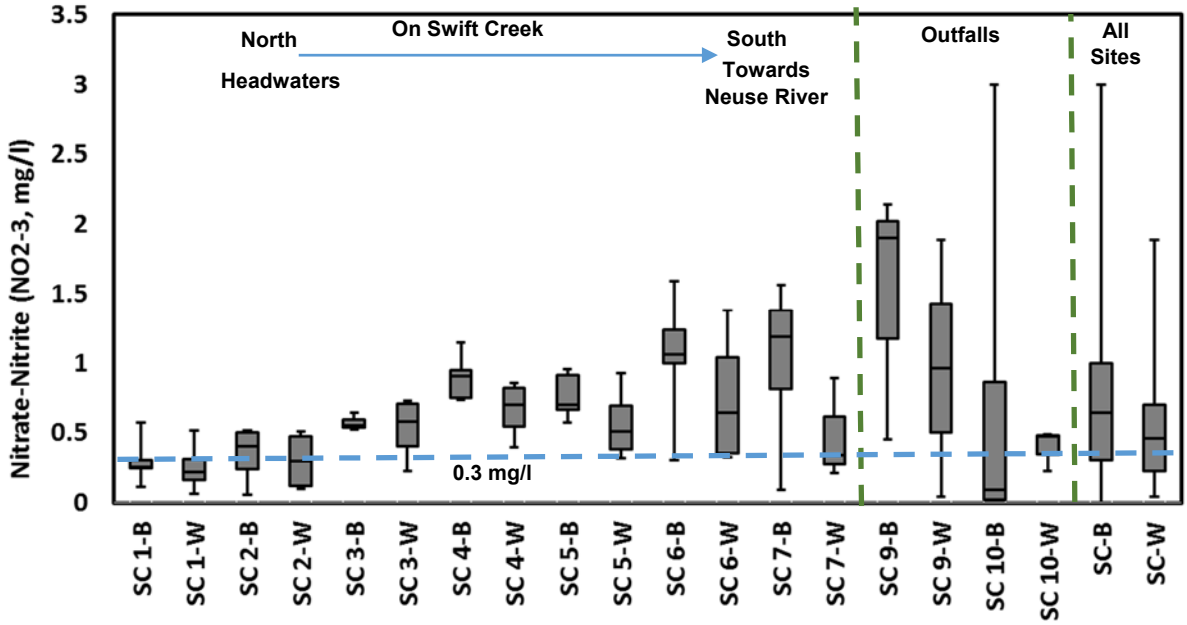


Figure 12. Swift Creek nitrate concentration data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC 9 and 10 are outfalls. The estimate of 0.3 mg/l for nitrate in undisturbed coastal plain forests is shown for reference.

^{15}N and ^{18}O Isotopes in NO_3

To help identify the source of NO_{2+3} during storm flows, samples from each site were collected on August 24 (base flow) and September 25 (storm flow) at each site for analyses of ^{15}N and ^{18}O isotopes in NO_3. Since N in fertilizer is typically derived from atmospheric N, which is the reference standard used for $\delta^{15}N$, ^{15}N in nitrate derived from fertilizer is typically found at low levels (depleted) and the $\delta^{15}N$ composition of fertilizer should be close to 0 (Kendall et al. 2007). Since denitrifying bacteria reduce and remove nitrate from surface waters, and the bacteria preferentially remove the lighter ^{14}N, the remaining nitrate becomes enriched with ^{15}N. Similarly ^{18}O becomes enriched as denitrification occurs. Therefore, as waters with nitrate experience denitrification the ^{15}N and ^{18}O become enriched in the nitrate pool remaining in the water. This means that samples with ^{15}N values that are enriched may also suggest a nitrate source that was initially less enriched, if denitrification occurred as the nitrate cycled through the watershed. This trend is shown indicated by the denitrification arrow in Figure 13.

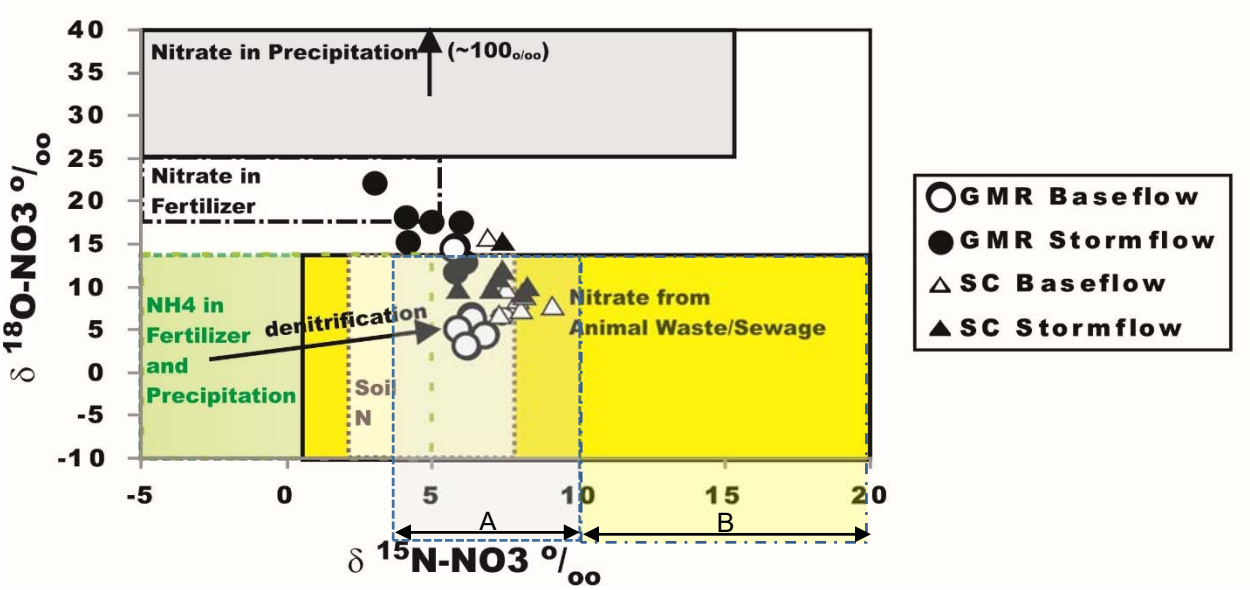


Figure 13. ^{15}N and ^{18}O isotopes in nitrate measured at sampling stations along Swift Creek (SC) and Greens Mill Run (GMR) overlain on the source ranges (shaded) presented by Kendall et al. (2007). Sample collection for isotopic analyses occurred on 8/24//2015 (baseflow) and 9/25/2015 (storm flow). A: Fertilizer ^{15}N 25-75th per centile range measured under crop fields and golf courses in eastern North Carolina (Spruill et al. 2002). B: Waste ^{15}N 25-75th percentile range measured under septic drainfields, poultry, and hog farms in eastern North Carolina (Spruill et al. 2002, Iverson et al. 2015).

In Figure 13, the majority of samples fall in the range corresponding to soil and waste sources provided by Kendall et al. (2007). The ranges for nitrate sources from Kendall et al. (2007) are based on a broad range of data sources. Although the general ranges presented by Kendall et al. (2007) may represent the initial fertilizer sources in eastern North Carolina, it appears that there may be an offset as the nitrate sourced from fertilizer migrates through the soils, to the groundwater, and ultimately to a stream or wetland. Local work by Spruill et al. (2002) provided a tighter range of ^{15}N values for groundwater underlying croplands and golf courses (most fertilizer sources had ^{15}N from 4-10 o/oo) and underlying septic, poultry, and hog waste (most waste sources had ^{15}N from 10 to 22 o/oo). Spruill et al. (2002) used a cutoff for ^{15}N of 10 o/oo to discriminate between fertilizer and waste sources. In addition, Iverson et al. (2015) measured septic drainfield ^{15}N in Pitt County and their median ^{15}N value for 8 measurements was approximately 18 o/oo for groundwater and 11 o/oo for streams adjacent to septic systems. Recent work in Beaufort County by O'Driscoll et al. (2014) traced a septic plume and found that wastewater-affected groundwater was indicated by ^{15}N compositions of approximately 10 o/oo or greater. Overall, these regional datasets suggest that wastewater in eastern NC tends to be on the enriched side of the range provide by Kendall et al. (2007), generally > 10 o/oo ^{15}N-NO_3. The study by Spruill et al. (2002) measured ^{15}N in groundwater of the North Carolina Coastal Plain. Their data showed enriched fertilizer ^{15}N relative to the ranges provided by Kendall and others (2007). It is likely that the enrichment that occurs between fertilizer application and transport to the groundwater (presumably linked to denitrification or mixing with more enriched soil N or wastewater sources) can explain this offset. We included the Spruill

et al. (2002) data in Figure 13, as those may provide a tighter range for comparison with regional ^{15}N data. Based on these data, the ^{15}N range of our current study samples during late summer and early fall suggest fertilizer or soil N as the dominant source of nitrate in SC. However, wastewater influences could not be ruled out because when mixed with fertilizer or soil N sources, wastewater sources would tend to enrich samples and there were locations where enrichment was observed, particularly within Swift Creek.

To evaluate if mixing or denitrification is the mechanism for enrichment of ^{15}N, a plot of NO_3-N vs ^{15}N-NO_3 can provide insights. If denitrification is the mechanism for ^{15}N enrichment, then an inverse relationship is expected between NO_3-N and ^{15}N, whereas if mixing with enriched sources of ^{15}N is the mechanism then ^{15}N would increase with increasing NO_3-N concentrations. These plots are shown in Figure 14 and suggest that that enriched ^{15}N compositions in surface water are more likely related to mixing with enriched sources rather than denitrification along the channel. The pattern of similar ^{15}N across the SC watershed during baseflow conditions suggests a similar source of nitrates during baseflow (Figure 14).

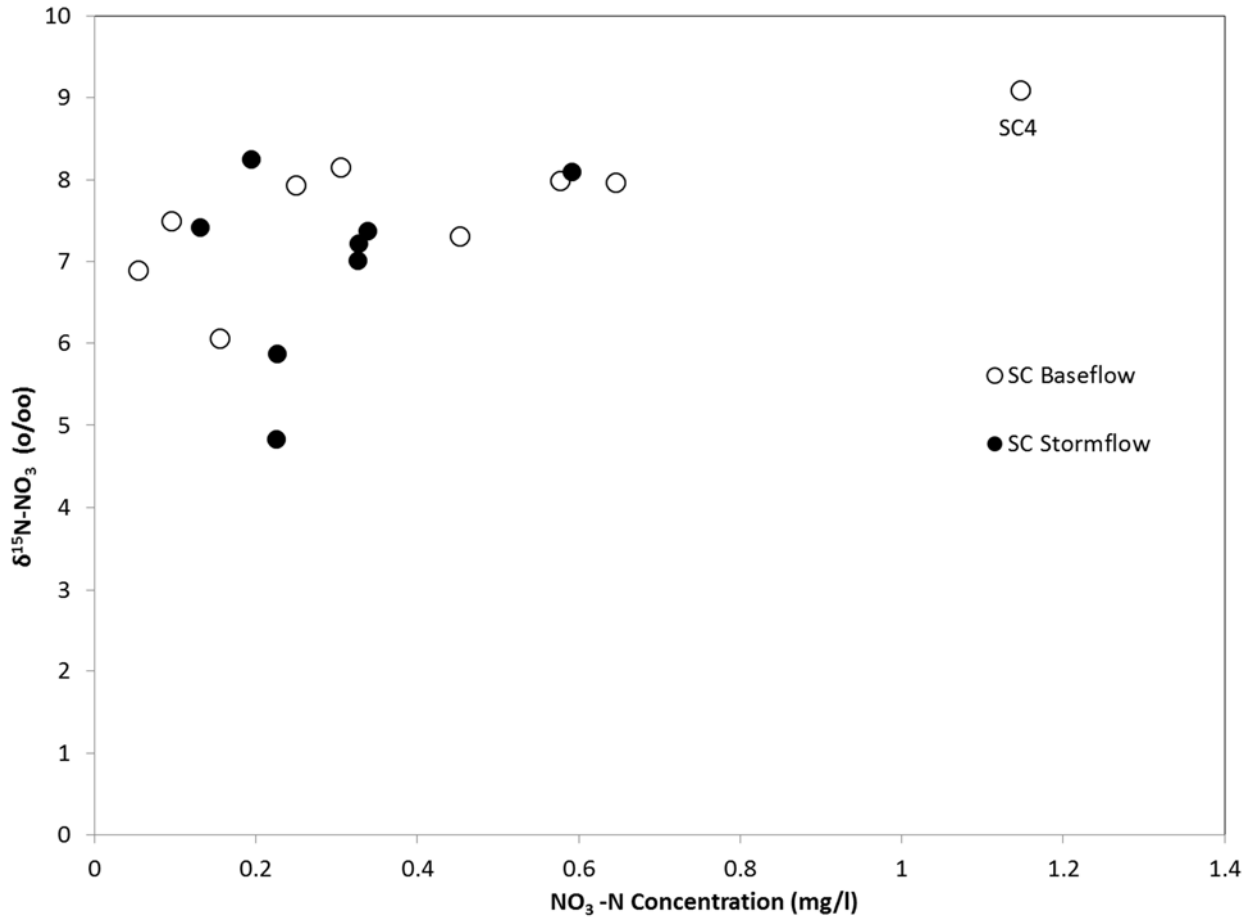


Figure 14. Nitrate (NO_3-N) vs $\delta^{15}N$ for SC for the baseflow (8/24/15) and storm (9/25/15) events.

For Swift Creek, some results are closer to the range of potential waste sources provided by Kendall et al. (2007). However, those samples do not fall in the regional range provided by Spruill et al. (2002). Most of Swift Creek watershed is served by septic systems. Therefore it is expected that wastewater nitrogen inputs to streams may occur in the Swift Creek watershed. Site SC4 in particular had nitrate with enriched ^{15}N, relative to the others. More monitoring and a comparison of septic vs. sewered neighborhoods could help further determine the wastewater-related N-inputs. These and other data suggest that the Swift Creek tributary upstream of the SC4 monitoring point is causing increases in nitrogen along the main stem. Efforts to reduce contaminants along this tributary would likely improve water quality along the main stem.

Based on median values for baseflow (7.94 $\delta^{15}N\text{-}NO_3$ o/oo, 7.83 $\delta^{18}O\text{-}NO_3$ o/oo), the ^{15}N during baseflow along SC falls within the range of fertilizer (Spruill et al., 2002) or soil nitrogen (Kendall et al., 2007). From headwaters to the bottom of the watershed there was a subtle increase in ^{15}N and ^{18}O in nitrate during baseflow (Figure 15) and storm flow (Figure 16), suggesting some potential denitrification along the stream. The baseflow ^{18}O in nitrate from SC2 was elevated (Figure 15), suggesting either lab error or a contrasting groundwater source from the other sites. However, since similar enrichment was observed during the storm event (Figure 16), it is unlikely that the enrichment was related to lab error.

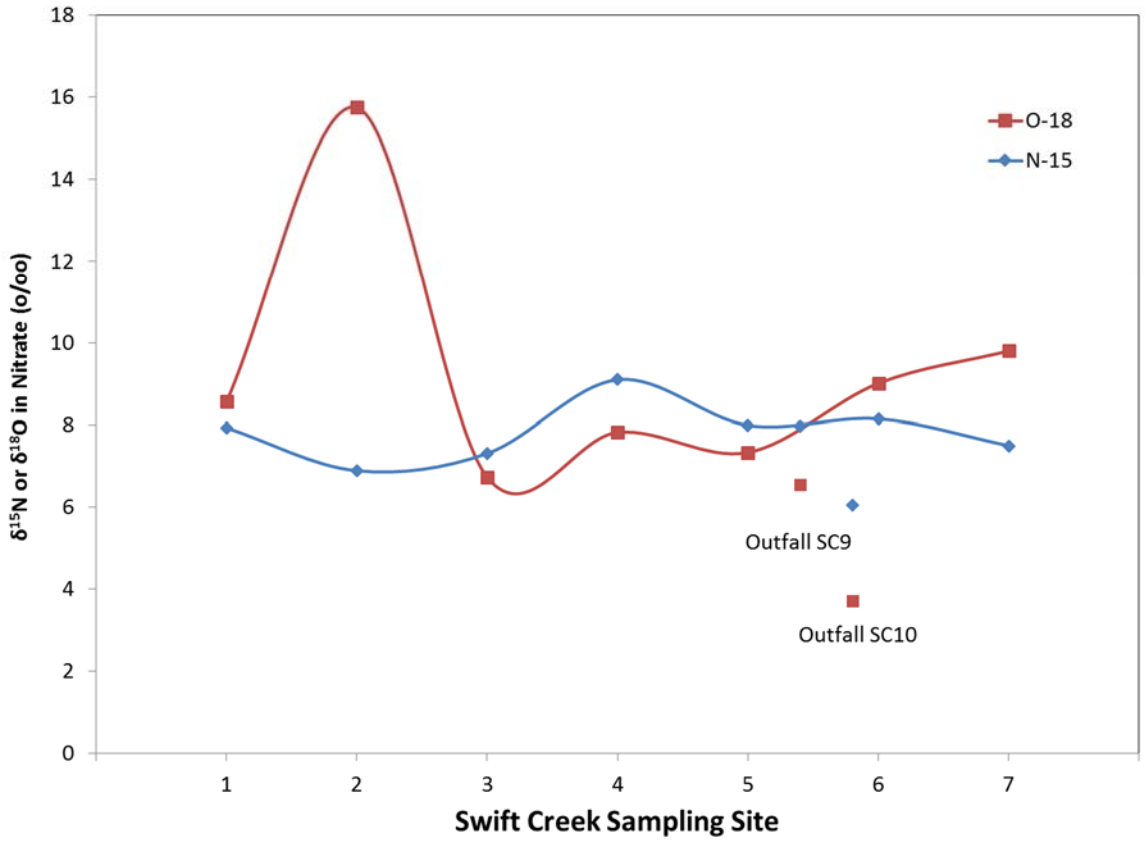


Figure 15. SC $\delta^{15}N$ and $\delta^{18}O$ in nitrate trends from headwaters to lowest monitoring point during baseflow.

During the storm event, there was a slight decline in ^{15}N and enrichment in ^{18}O from headwaters to SC3, suggesting stormwater inputs (Figure 16). The enrichment in ^{15}N at SC4 suggests potentially enriched inputs, possibly wastewater (previously discussed). These data suggest mixing of multiple N sources during the storm event. The effects of stormwater inputs on Swift Creek are less pronounced relative to those observed on Greens Mill Run.

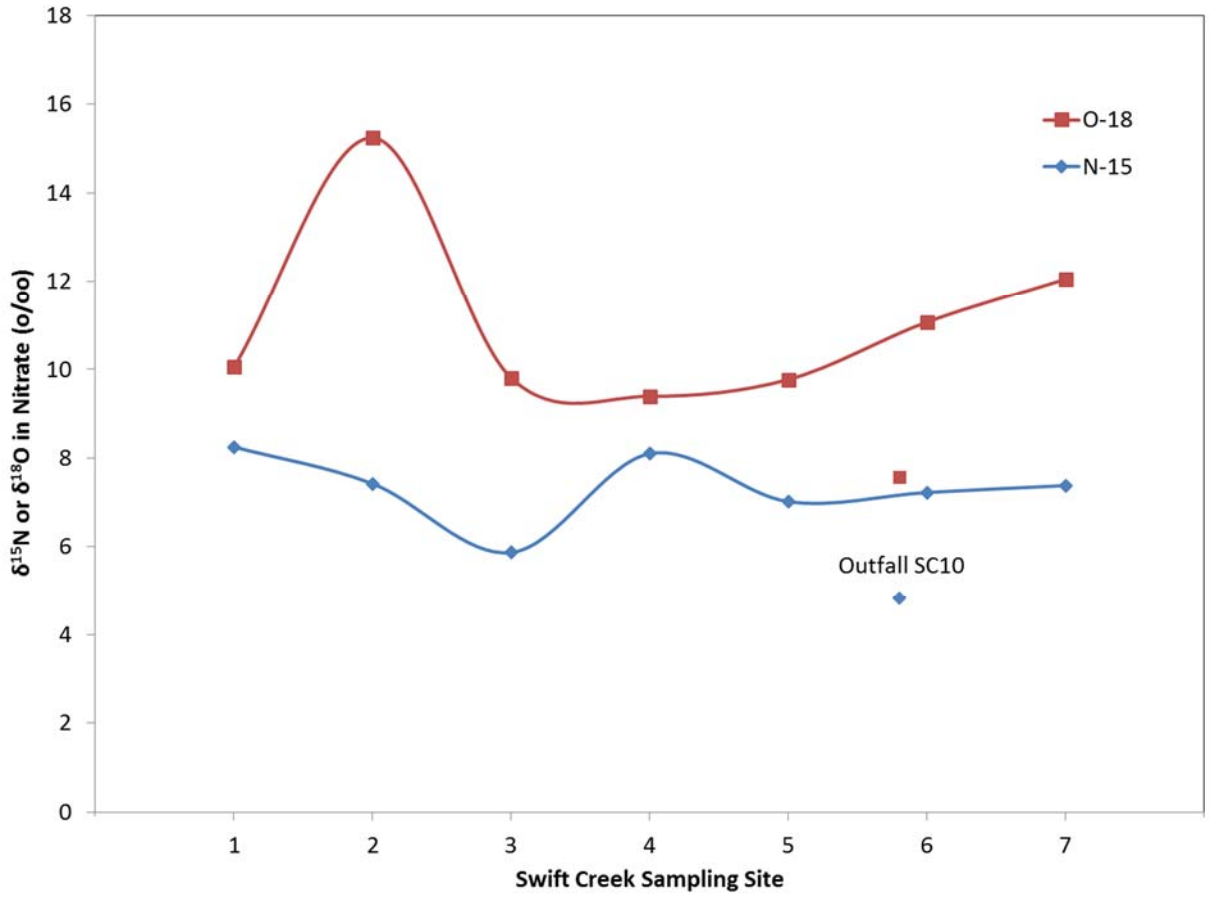


Figure 16. SC $\delta^{15}N$ and $\delta^{18}O$ in nitrate trends from headwaters to lowest monitoring point during storm flow.

Along Swift Creek, nitrate concentrations were most elevated at SC4, both during the baseflow event and the storm event. During baseflow conditions, chloride concentrations were similar at monitoring stations (Figure 17). During the storm event, differences in chloride concentration between the monitoring sites and outfall (10) became more pronounced, presumably due to dilution effects (Figure 18).

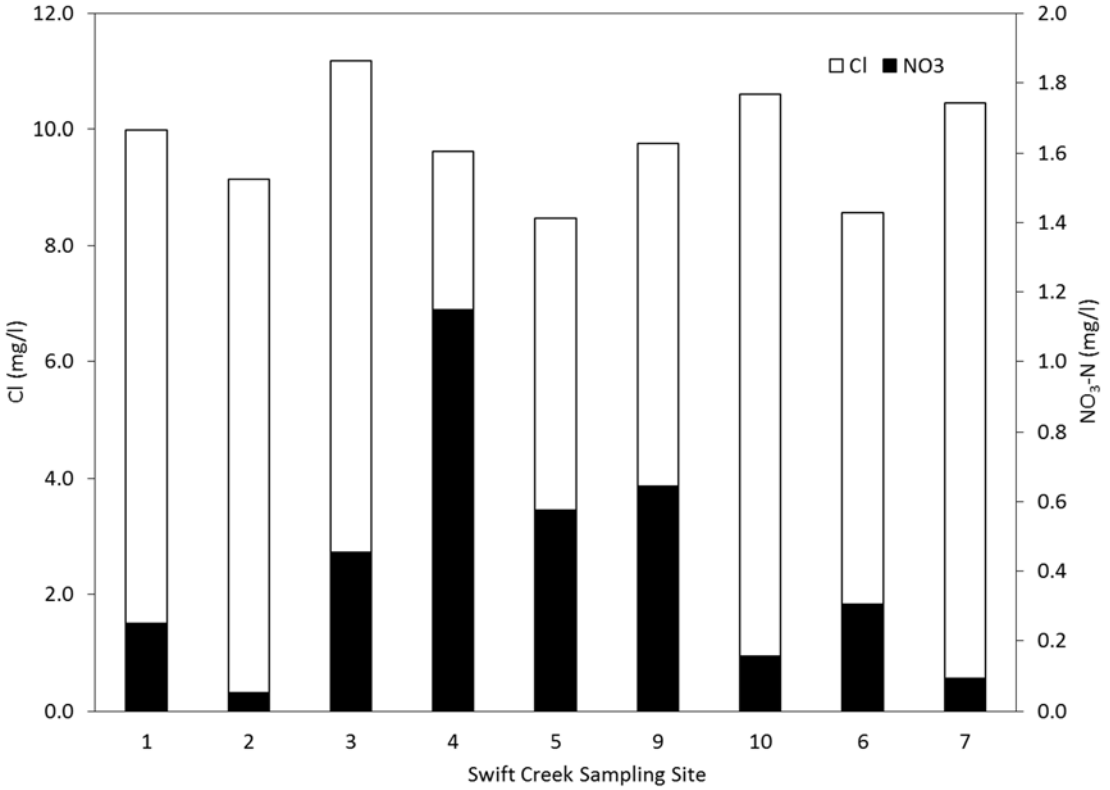


Figure 17. Nitrate and chloride concentrations along SC during baseflow event.

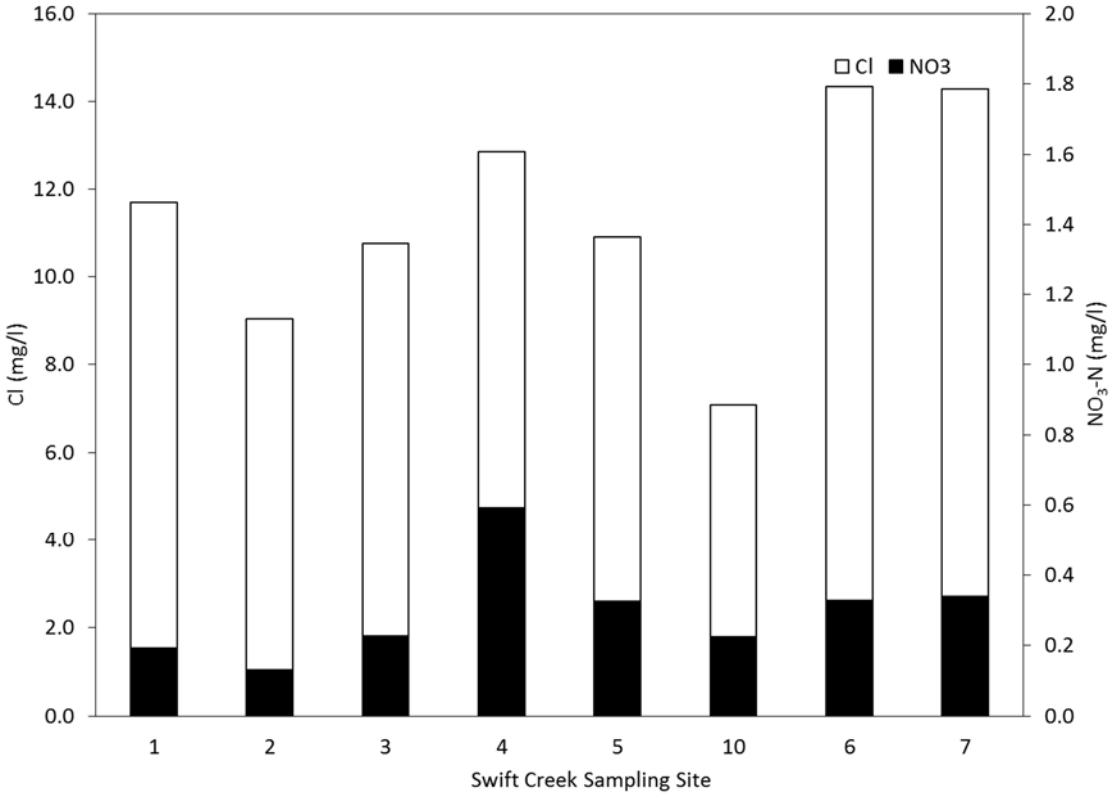


Figure 18. Nitrate and chloride concentrations along SC during storm event.

Overall, the data presented suggest that fertilizer and soil nitrogen inputs are likely the dominant nitrogen sources. However, more detailed year-round surface water and groundwater isotopic monitoring would be needed to better isolate the dominant sources with greater certainty. Since the isotopic sampling was only conducted for one baseflow and one storm event during the summer, it is likely that there is seasonal and intra-storm variability in isotopic composition, further isotopic sampling could help better elucidate the major sources of nitrate inputs to these streams.

Organic Nitrogen

Organic Nitrogen (ON) was relatively low in baseflow samples, but in contrast to nitrate it increased during runoff events (Figure 19). In some cases, during storm events ON was the dominant form of dissolved nitrogen in the stream. This indicates a stormwater-related source which could include flushing of organics from wetlands and riparian areas, and possibly leaking wastewater infrastructure. Although NC doesn't currently have a standard for nitrogen in streams, nitrogen criteria are being developed for the future.

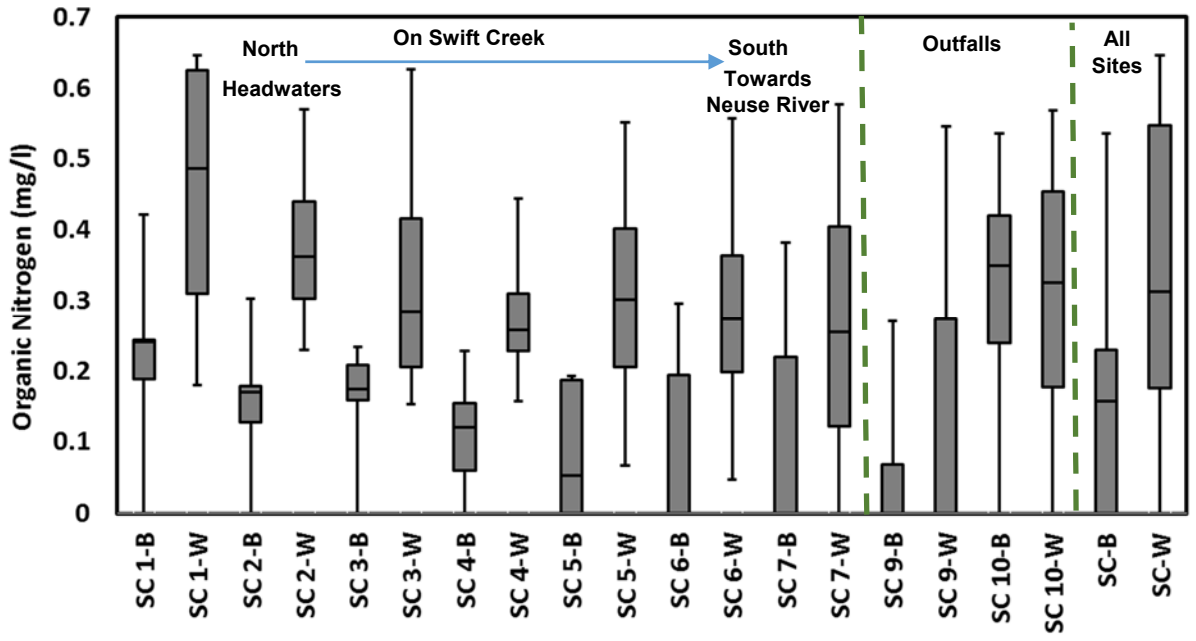


Figure 19. Swift Creek organic nitrogen concentration data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC9 and SC10 are outfalls.

Total Dissolved Phosphorus

Phosphorus is an essential nutrient in the environment as well and in excess can lead to algal blooms and eutrophication. Total Dissolved Phosphorus (TDP) includes phosphate ($PO4_4$) and other forms of soluble phosphorus. Based on guidelines already developed in Florida, criteria for TDP in streams range between 0.06 - 0.49 mg/l depending on the region. TDP along Swift Creek was generally lower during baseflow and typically increased during storm events. Based on guidelines already developed in Florida, criteria for TDP in streams ranges between 0.06-0.49 mg/l, depending on the region.

Along Swift Creek, during baseflow most sites had TDP concentrations that fell below or on the low end of this range, however as the watershed area increases downstream, most sites showed an increase in TDP concentrations, particularly during storm events. At all stream sites TDP was elevated above 0.06 mg/l during at least one storm event (Figure 20).

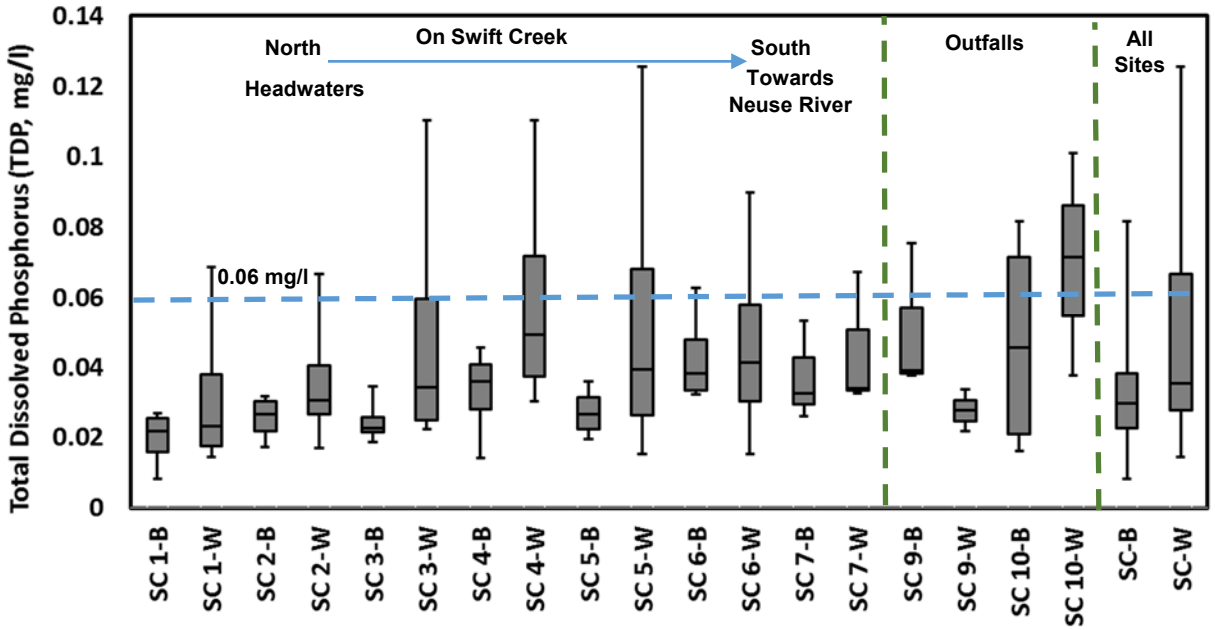


Figure 20. Swift Creek total dissolved phosphorus concentration data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC9 and 10 are outfalls. The guideline of 0.06 mg/l for TDP for Florida is shown for reference.

Dissolved Oxygen

North Carolina water quality standards (15A NCAC 2B) for dissolved oxygen for freshwater aquatic life is 5 mg/l (daily average), however there is no standard for streams classified as swamp waters. At SC 1, 2, 4, 6, and 7 dissolved oxygen was less than 5 mg/l on at least one date (Figure 21). The effects of low flows and warmer air temperatures on dissolved oxygen are evident in the longitudinal survey data (Figure 22). During the August longitudinal survey, most sites downstream of SC5 had dissolved oxygen concentrations below 5 mg/l. Low gradients, low streamflow, and warm temperatures can contribute to increased likelihood of low oxygen conditions in summer months. In addition, increased algal growth and decomposition can lead to dissolved oxygen declines.

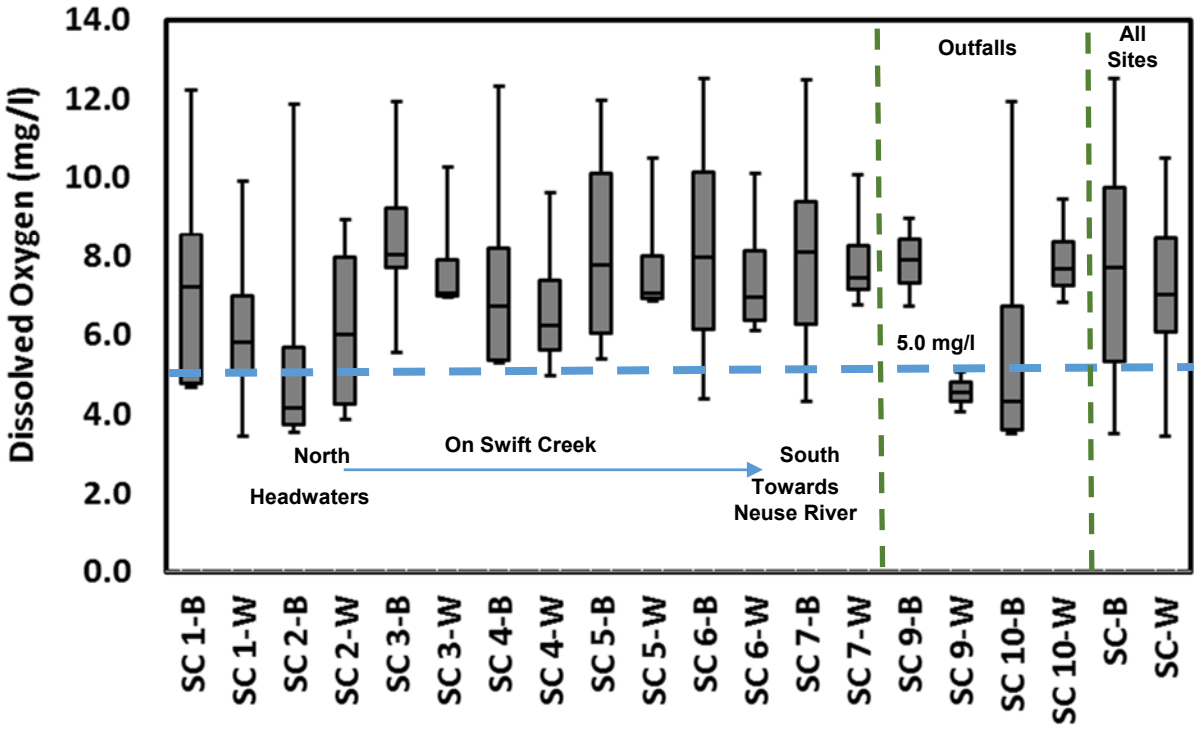


Figure 21. Swift Creek dissolved oxygen data collected during baseflow (B) and storm or wet weather (W) flow conditions. SC9 and 10 are outfalls. The NC standard daily average DO concentration of 5 mg/l is shown for reference.

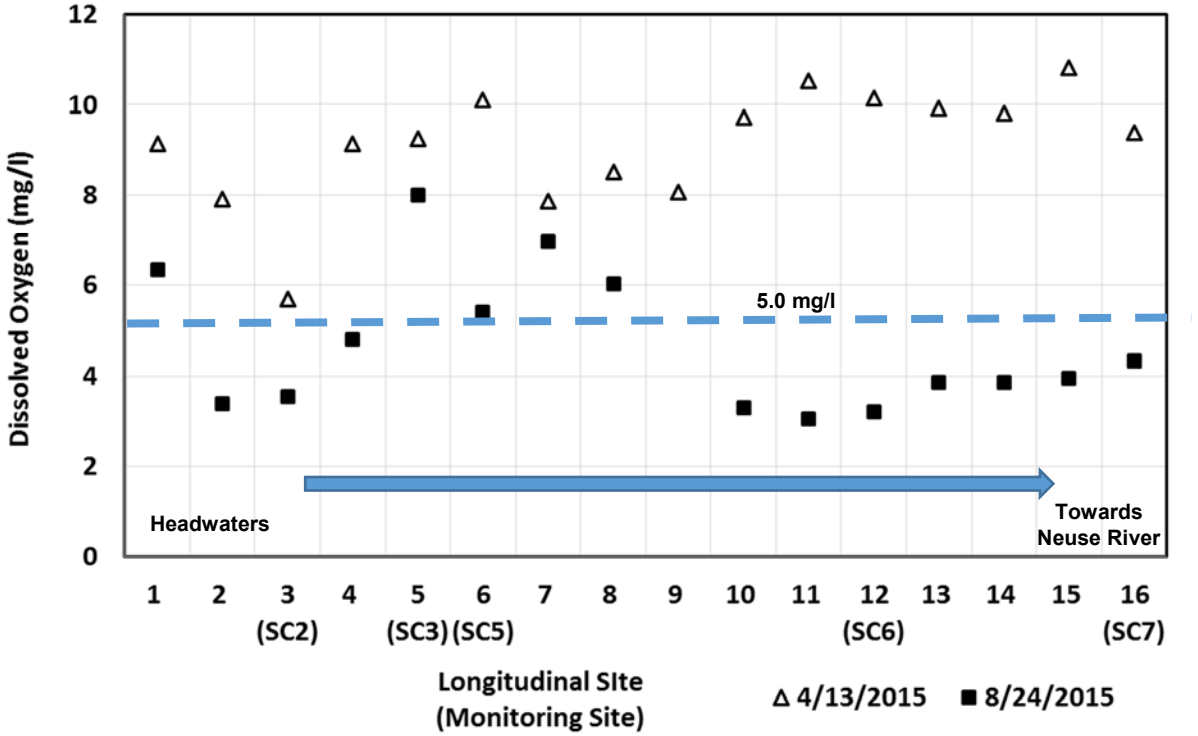


Figure 22. Swift Creek dissolved oxygen data collected during longitudinal surveys. The NC standard daily average DO concentration of 5 mg/l is shown for reference.

E. Coli & Total Coliform

E. coli is a species of fecal coliform bacteria used to indicate the presence of waste. The NC standard for *E.Coli* in Class C waters is 576/100 ml or $10^{2.8}$. Analysis was mostly focused on *E. coli*, as that is the US EPA (1986) recommended indicator bacteria for fresh waters. As expected, total coliform concentrations were elevated relative to *E. coli* concentrations for each sampling location during baseflow and storm flow conditions. Total coliform concentrations were significantly higher ($p = 0.0003$) during baseflow and storm flow ($p = 0.0000$) than *E. coli* concentrations.

Storm flow *E. coli* concentrations were elevated relative to baseflow *E. coli* concentrations for 6 of the 7 sampling locations along SC (Figure 23). Statistically significant differences ($p = 0.0026$) were observed when comparing *E. coli* concentrations for all baseflow samples (geometric mean = 151 MPN/100 mL or $\log_{10} = 2.178$) to all storm flow samples (geometric mean = 487 MPN/100 mL or $\log_{10} = 2.687$). Similar trends were found regarding total coliform concentrations (Figure 24). More specifically, the total coliform concentrations were elevated during storm flow conditions (geometric mean = 2,756 MPN/100 mL or $\log_{10} = 3.440$) relative to baseflow conditions (geometric mean = 2,488 MPN/100 mL or $\log_{10} = 3.396$) for all sampling locations, and the differences between the baseflow and storm flow samples were statistically significant ($p = 0.0102$).

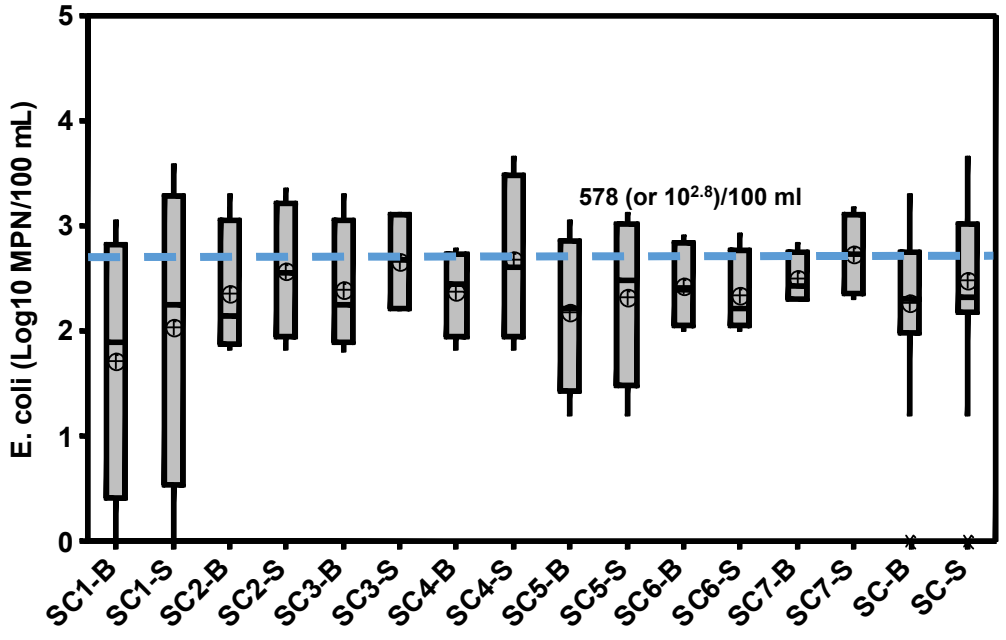


Figure 23. Baseflow (B) and storm (S) or wet weather flow E. coli concentrations for Swift Creek along 7 sampling locations (1-7), and the pooled data (SC-B, SC-S). The NC standard for E. coli of 578/100 ml ($10^{2.8}$/100 ml) is shown for reference.

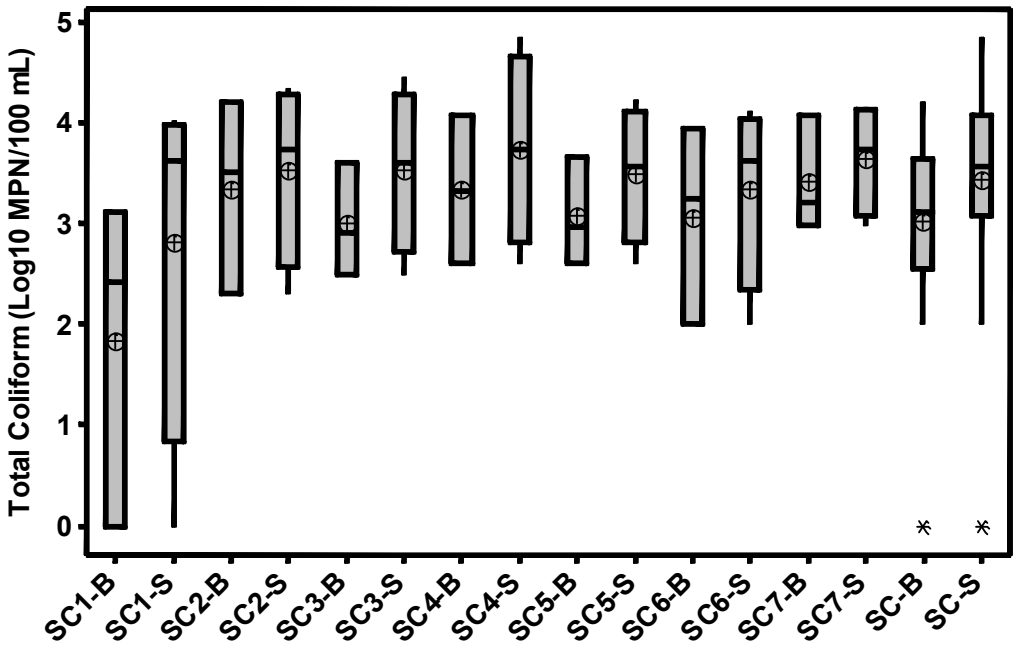


Figure 24. Swift Creek baseflow (B) and storm (S) or wet weather flow total coliform concentrations along 7 sampling locations (1-7), and the pooled data (SC-B, SC-S).

There is subtle evidence in the increasing *E. coli* with chloride and nitrate along Swift Creek during the storm event (Figure 25). These together may indicate wastewater as a source. In addition, the *E. coli* concentrations in Swift Creek during baseflow conditions typically increased along the main stem of the creek from SC 1 to SC 7. Notably, concentrations on two tributaries, SC2 and SC4, were higher than concentrations at monitoring sites on the main stem but upstream of the confluences, SC1 and SC5, respectively. The drainage areas upstream of SC2 and SC4 have substantial residential development, generally more than other areas within the watershed. Pet waste or poorly functioning septic systems could be contributing to elevated *E. coli* in these areas.

When temperatures are warmer, bacteria grow more quickly, and animals are more active and may contribute more waste to streams. Baseflow *E. coli* concentrations were lowest during the February sampling event (geometric mean = 35 MPN/100 mL or $\log_{10}$ = 1.542), and highest during the October event (geometric mean = 1,079 MPN/100 mL or $\log_{10}$ = 3.033). The August and April sampling events yielded intermediate *E. coli* concentrations with 97 MPN/100 mL (log10 = 1.985) and 142 MPN/100 mL ($\log_{10}$ = 2.151), respectively. *E. coli* concentrations were significantly higher in October relative to February ($p = 0.0020$), April ($p = 0.0021$), and August ($p = 0.0021$). The geometric mean *E. coli* concentrations during storm flow were lowest in February (85 MPN/100 mL or $\log_{10}$ = 1.929), followed by July (612 MPN/100 mL or $\log_{10}$ = 2.786), September (678 MPN/100 mL or $\log_{10}$ = 2.831) and November (1,591 MPN/100 mL or $\log_{10}$ = 3.202). Storm flow *E. coli* concentrations in February were significantly lower than in November ($p = 0.0017$), July ($p = 0.0130$) and September ($p = 0.0017$).

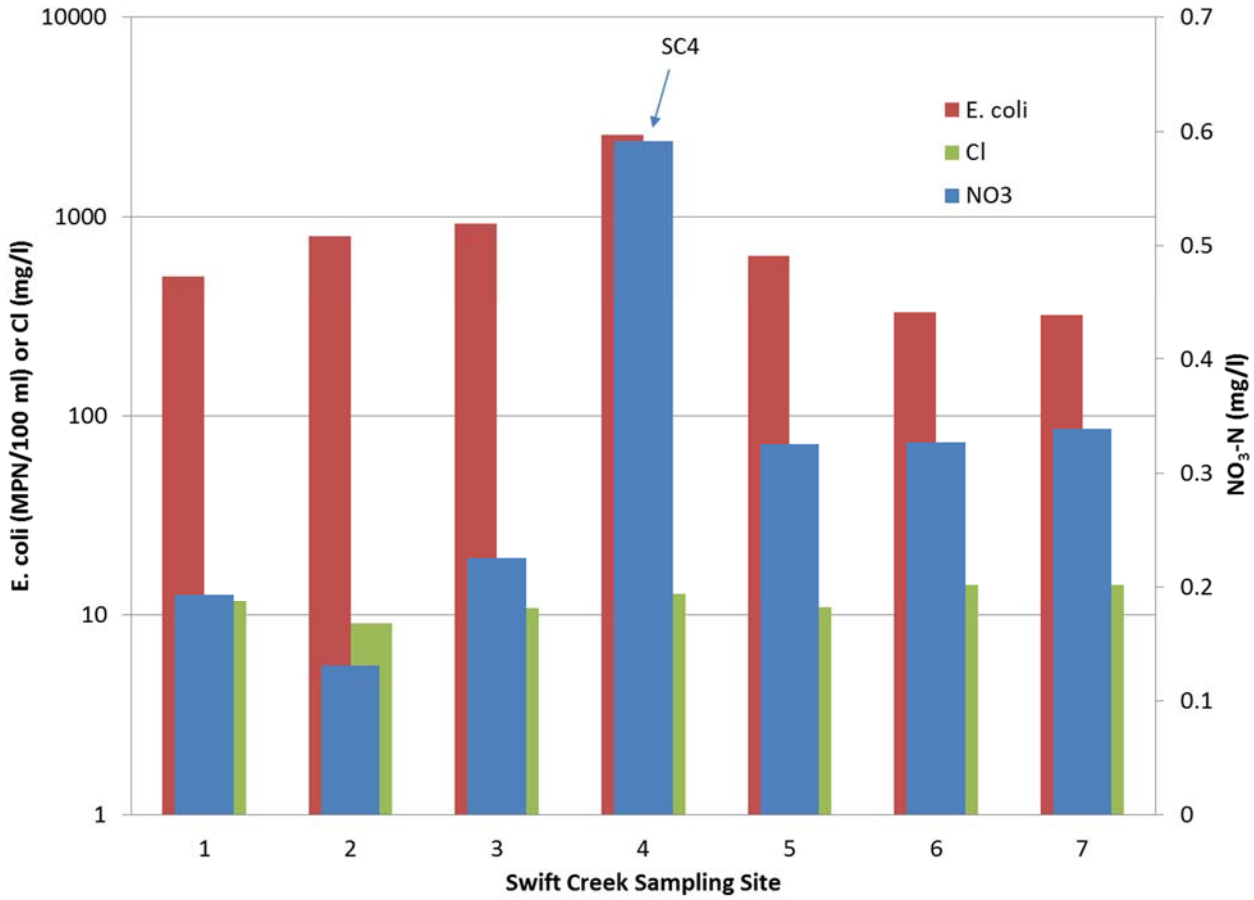


Figure 25. E.Coli, Cl, and NO3 during the storm flow event sampled on 9/25/2015. From Swift Creek headwaters (1) to lowest monitoring station downstream (7).

Metals

All results of metals analyses (Table 3) were below detection for Copper and Lead, with Zinc concentrations only above detection at SC1 (both samples) and SC3 (storm flow). The NC water quality standard for Zn in freshwaters is 50 ug/l (ppb).

Table 3. Analytical results of metals analyses on baseflow and storm or wet weather flow samples.

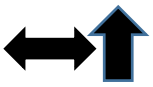
Monitoring Site	Baseflow 8/24/2015			Storm (Wet Weather) Flow 9/25/2015		
	Copper (µg/l)	Lead (µg/l)	Zinc (µg/l)	Copper (µg/l)	Lead (µg/l)	Zinc (µg/l)
SC 1	<10	<5.0	13	<10	<5.0	11
SC 3	<10	<5.0	<10	<10	<5.0	11
SC 5	<10	<5.0	<10	<10	<5.0	<10

*Analytical method for analysis of Copper and Zinc: EPA 200.7; Analytical method for analysis of Lead: Standard Method 3113B-04.

CONCLUSIONS AND RECOMMENDATIONS

Several indicators suggested that pollutant and sediment inputs increased downstream. In general most water quality parameters increased as the watershed area expanded (Table 4). However, during summer dissolved oxygen decreased in the lower portions of the watershed. Overall, the water quality data suggested that urban and agricultural land-uses in the watershed have contributed non-point source pollution resulting in increases in nutrient, sediment, and bacteria inputs to Swift Creek. Most water quality parameters, with the exception of nitrate and dissolved oxygen, increased with storm flow; suggesting that improved stormwater management could help reduce water quality impairment. The nitrate decline during storm events suggests a groundwater source of nitrate. Presumably this is related to agricultural fertilizer inputs as the increases correspond to the lower portions of the watershed that contain extensive agricultural drainage which are most evident during winter when agricultural drainage increases due to the shallower water table.

Table 4. General water quality trends associated with stormwater inputs and distance downstream. NC water quality standards are indicated with an asterisk.

	Runoff Events	Downstream	Standard* or Guideline Level	Standards or Guidelines Exceeded
Specific Conductivity			n/a	n/a
Dissolved Oxygen		 summer	5 mg/l*	Yes
Turbidity		 storm	50NTU*	Yes
Total Suspended Sediment		 storm	20 mg/l	Yes
Nitrate			0.3 mg/l	Yes
Dissolved Organic Nitrogen			n/a	n/a
Total Dissolved Nitrogen			0.67 mg/l	Yes
Total Dissolved Phosphorus			0.06 mg/l	Yes
Dissolved Organic Carbon		 baseflow	n/a	n/a
E. Coli			576/100ml*	Yes
Total Coliform			n/a	n/a

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APPENDICES

APPENDIX A: Rating Curves and Discharge Records

Rating Curves

Rating curve equations for SC 2, SC 5, and SC 6 are listed below.

Table A1. Rating curve coefficients ($Q = C*h^n$) for the three stage monitoring sites.

Station	Rating Curve Coefficients	
	C	n
SC 2	2.84	1.84
SC 5	14.99	1.93
SC 6	5.53	2.96

Discharge Records

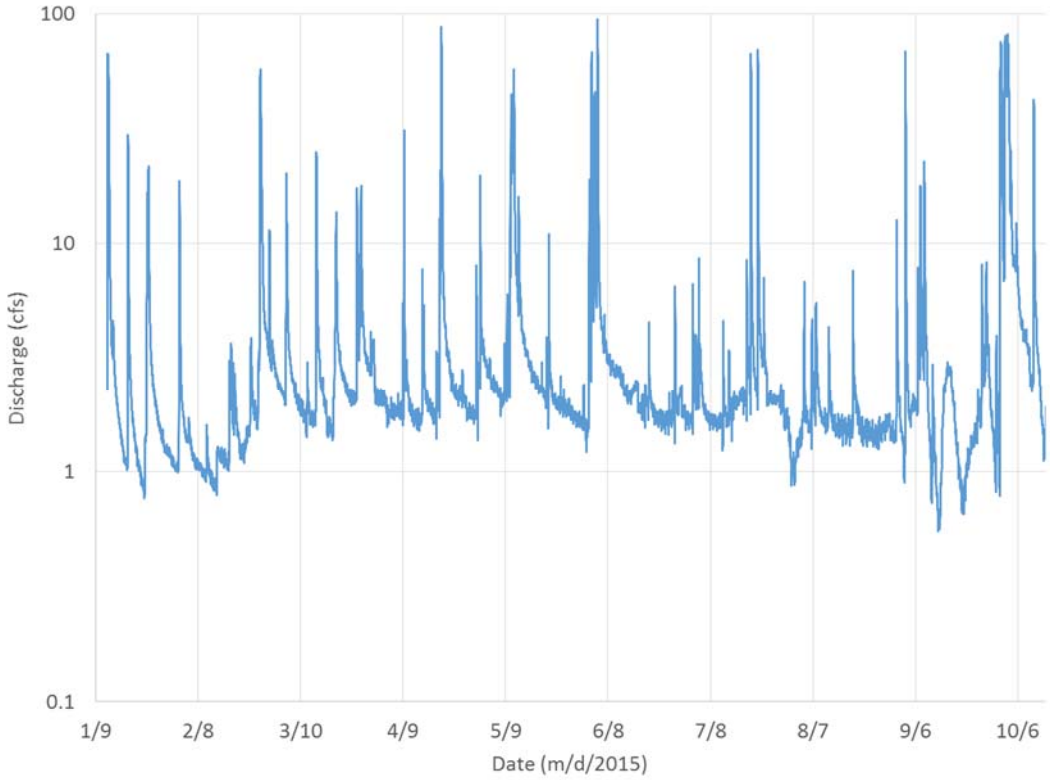

Figure A1. Discharge record for SC 2 monitoring site (January 9 - October 14, 2015).

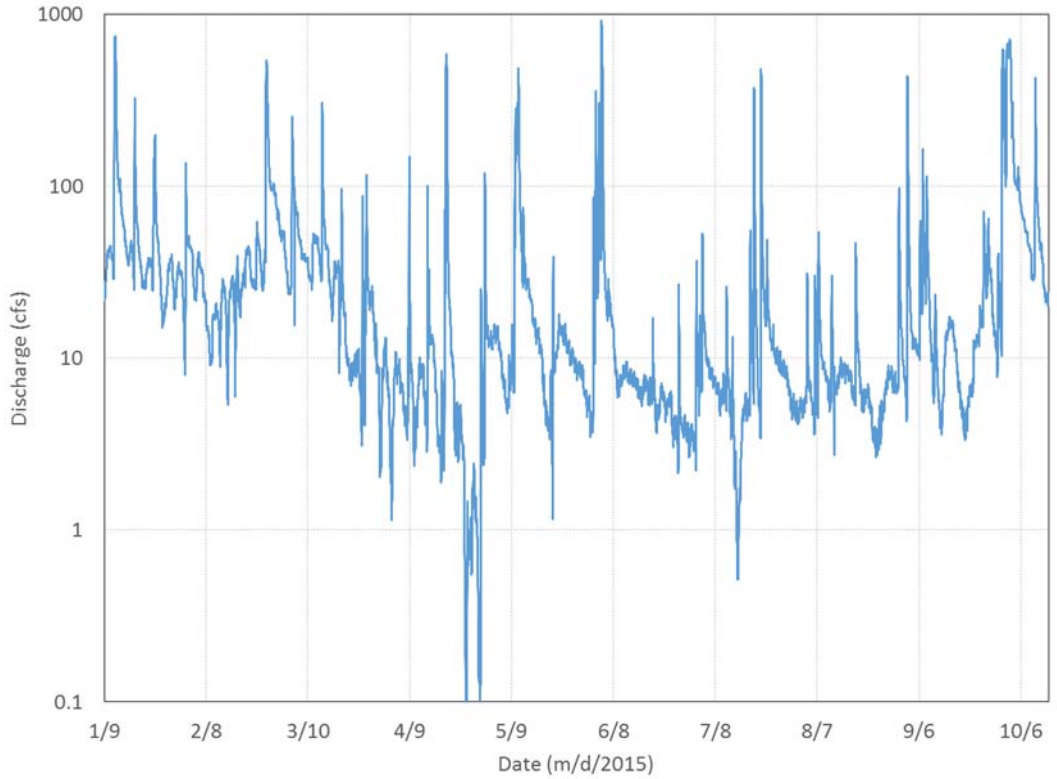

Figure A2. Discharge record for SC5 monitoring site (January 9 - October 14, 2015).

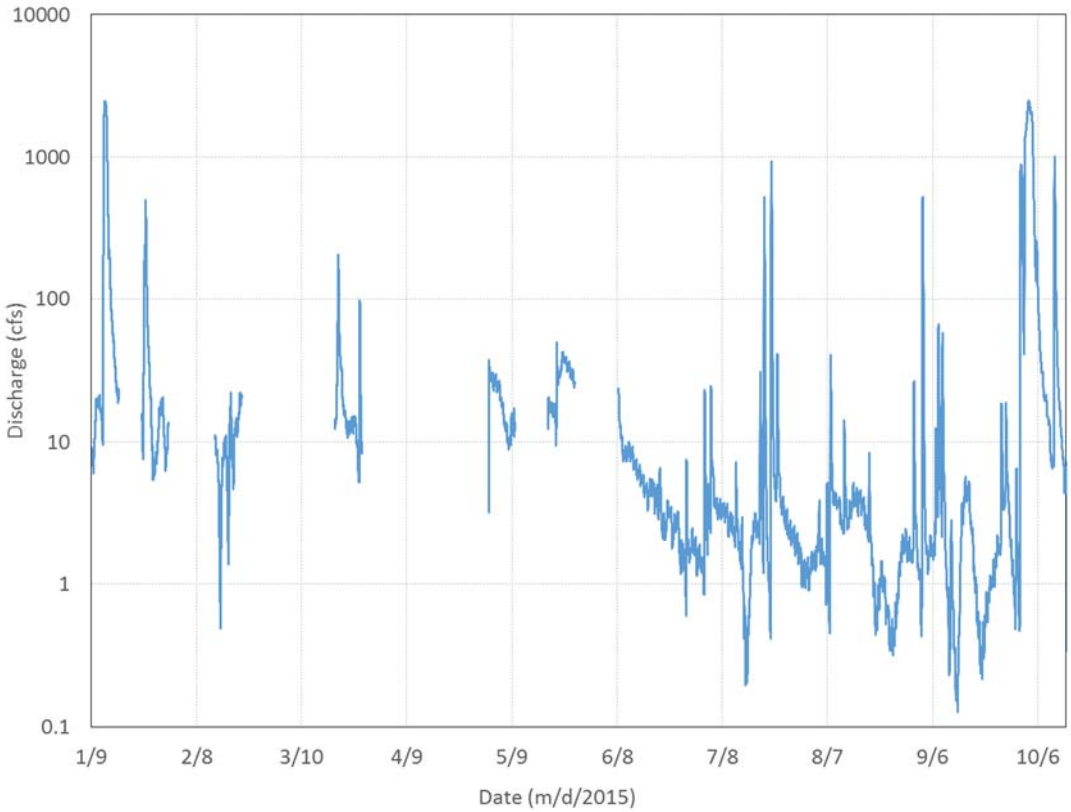

Figure A3. Discharge data for SC6 monitoring site (January 9 - October 14, 2015). Gaps in data resulted from improper configuration of logger.

APPENDIX B: Conductivity Records

A conductivity logger was initially installed at SC2. However, the logger was initially configured to log conductivity every 30 seconds, rather than every 30 minutes. In May, the logger was no longer recoverable from the stilling well at the monitoring station and was not replaced.

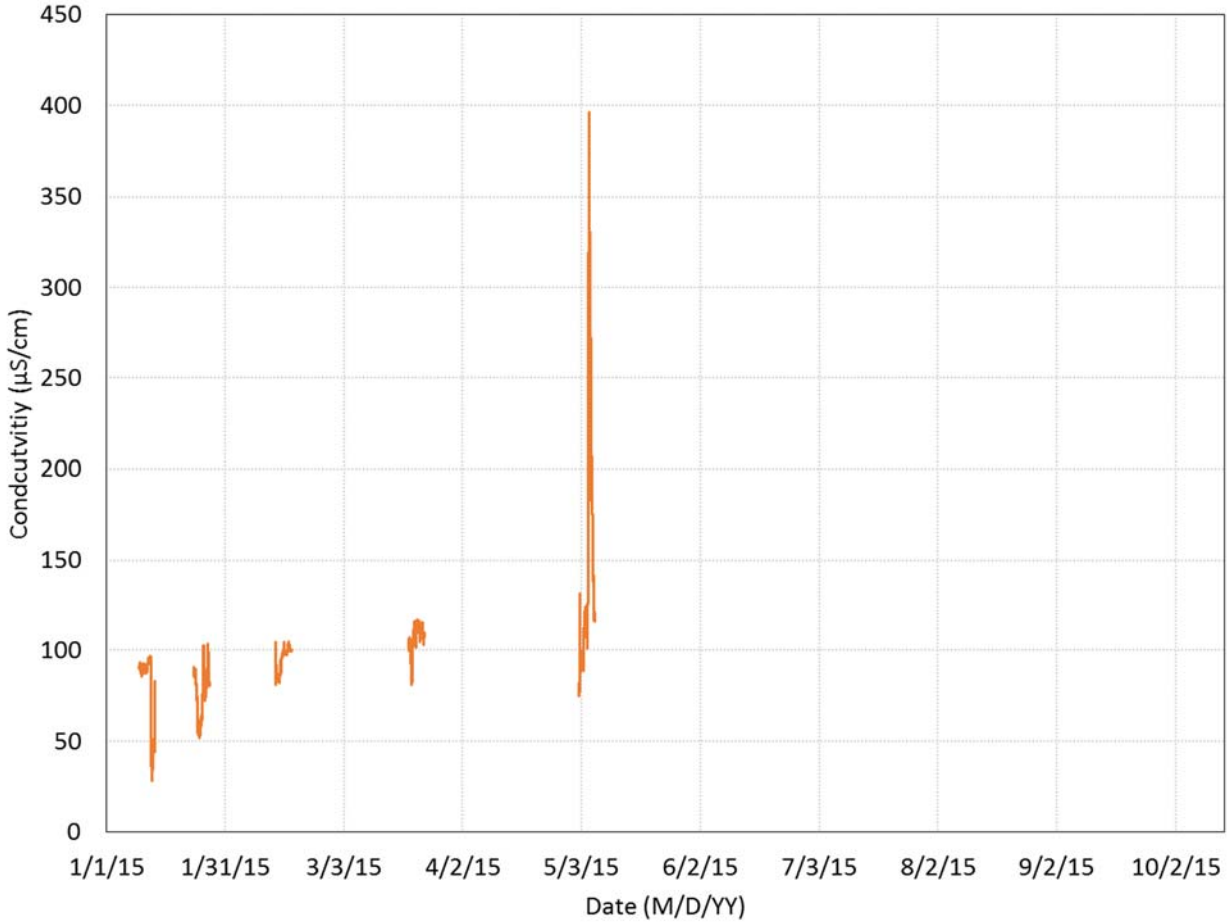

Figure B1. Conductivity Record for SC2 (January 9 - May 6, 2015).

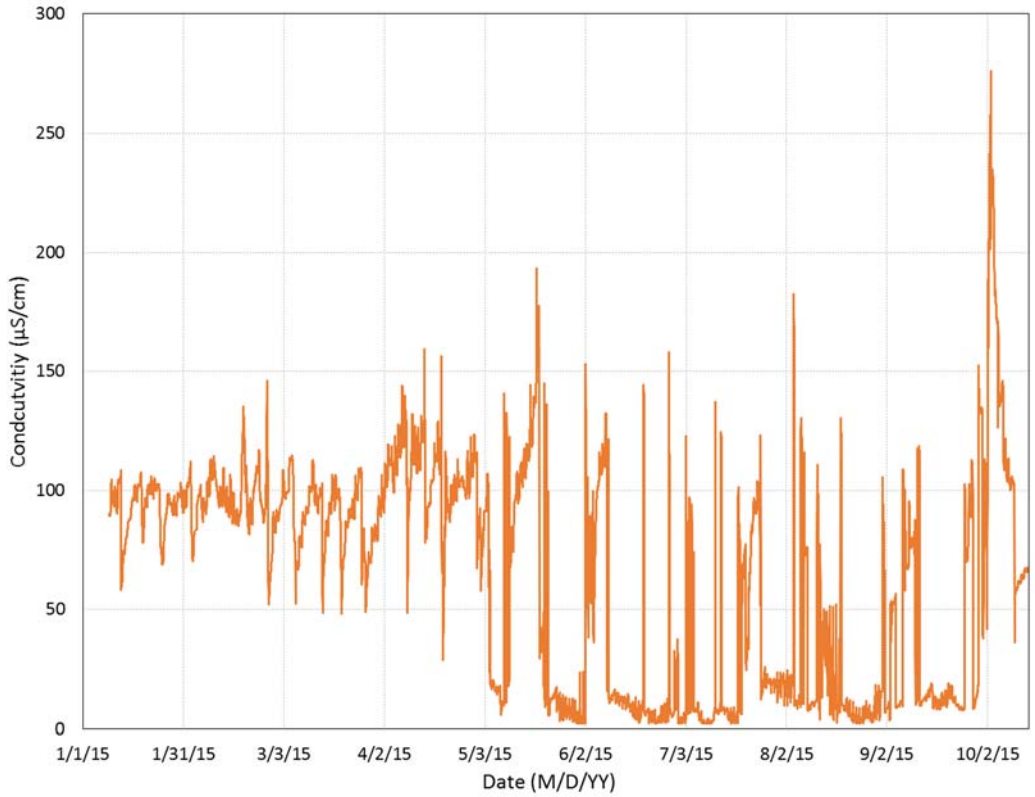

Figure 26. Conductivity record for SC5 (January 9 - October 14, 2015).

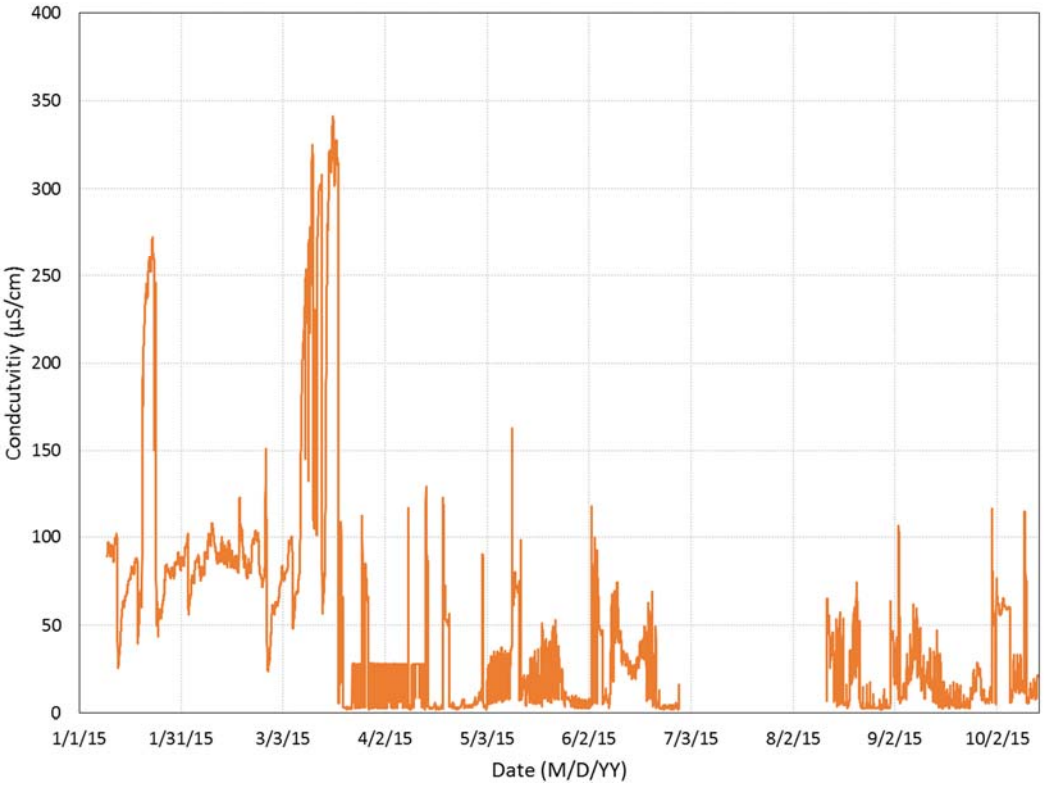

Figure B3. Conductivity record for SC6 (January 9 - October 14, 2015).

APPENDIX C: Water Quality Measurements and Concentrations

Temperature

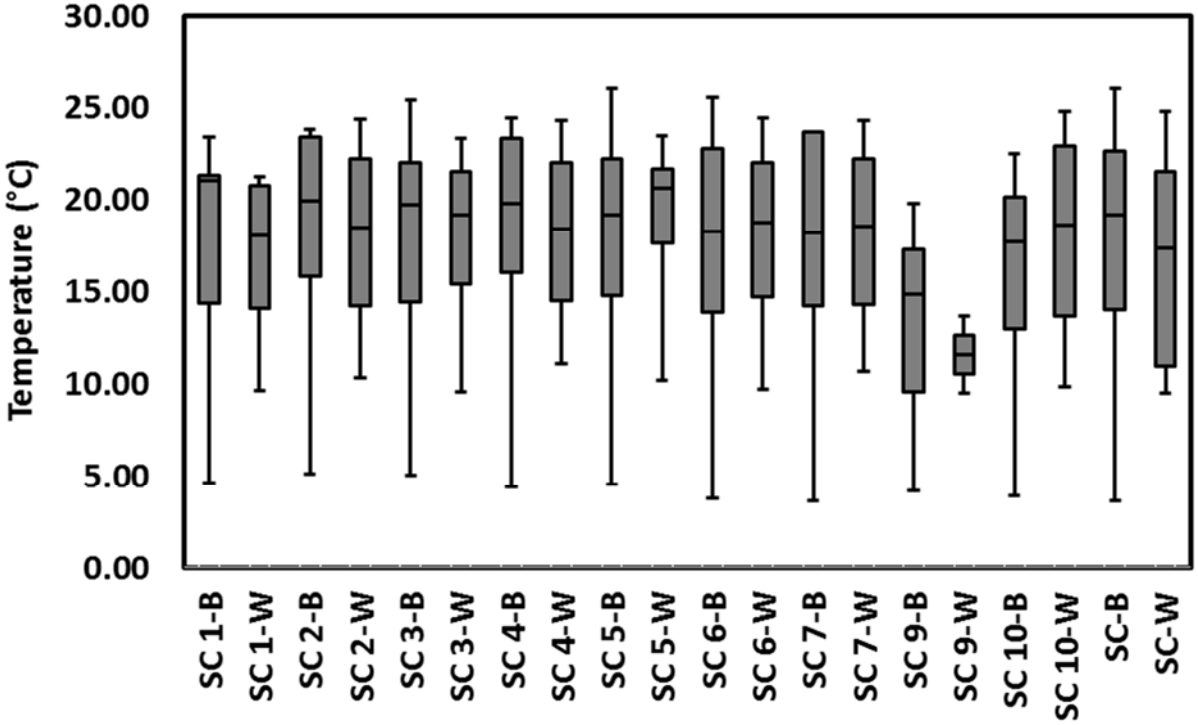

Figure 27. Box and whisker plots of Temperatures recorded for base (B) and storm or wet weather (W) flows. SC-B and SC-W are combined for all base and storm flow values, respectively.

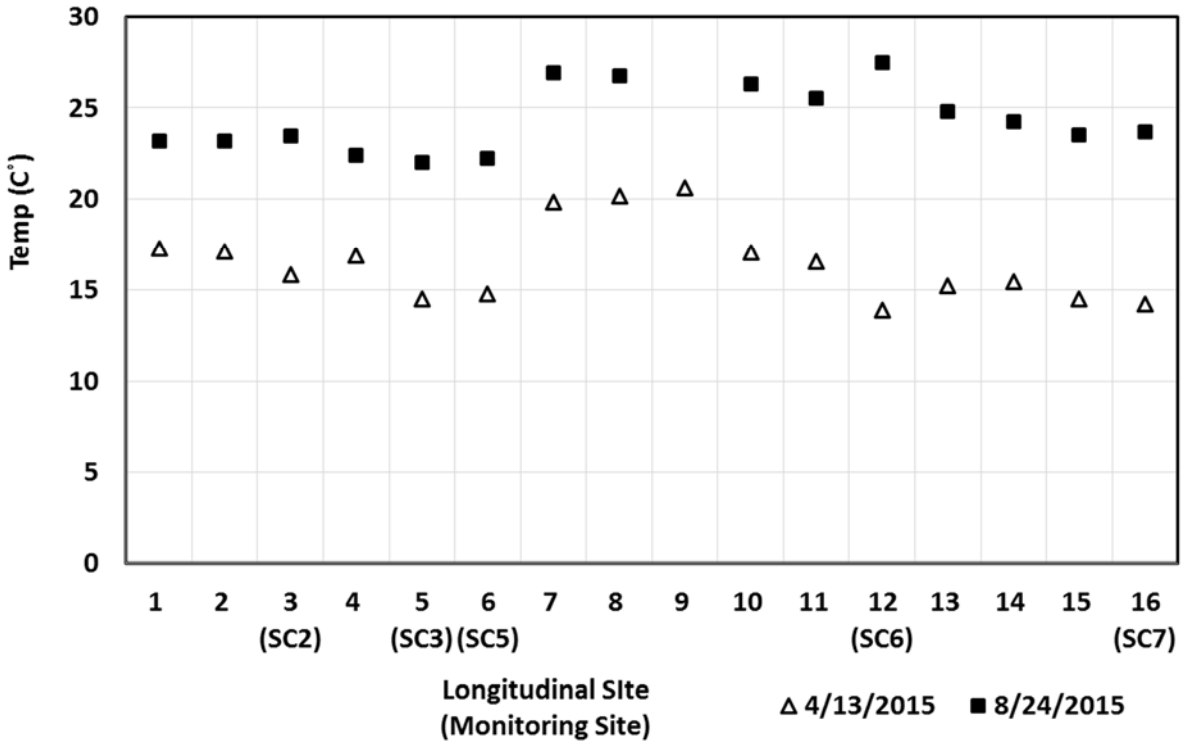

Figure C28. Temperature readings from longitudinal surveys on Swift Creek.

Dissolved Oxygen Saturation

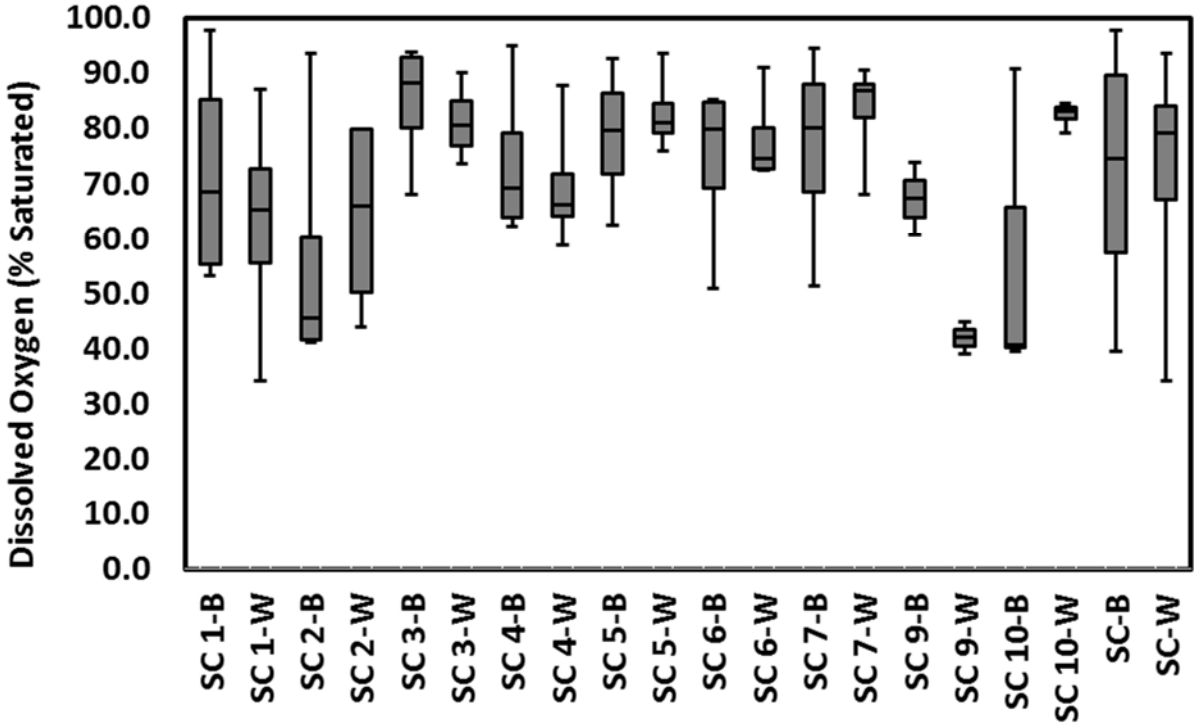

Figure 29. Box and whisker plots of Dissolved Oxygen (% Saturation) recorded for base (B) and storm or wet weather (W) flows. SC-B and SC-W are combined for all base and storm flow values, respectively.

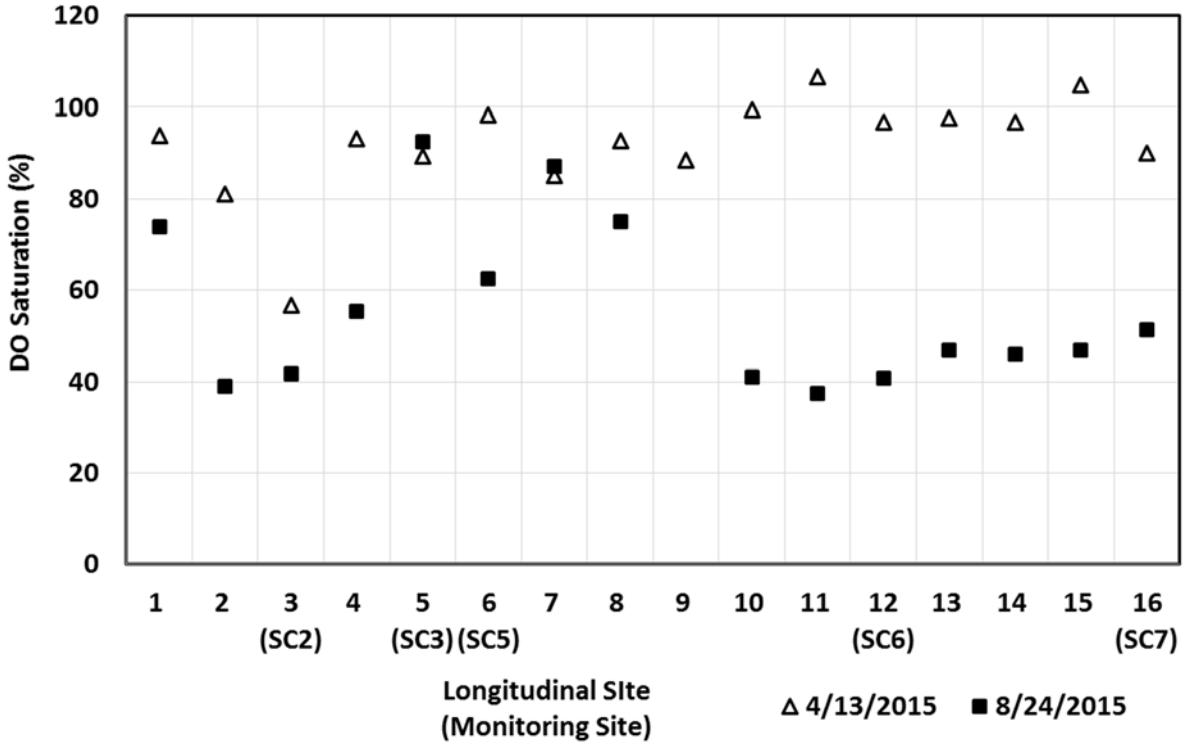

Figure 30. Dissolved Oxygen (% Saturated) readings from longitudinal surveys on Swift Creek.

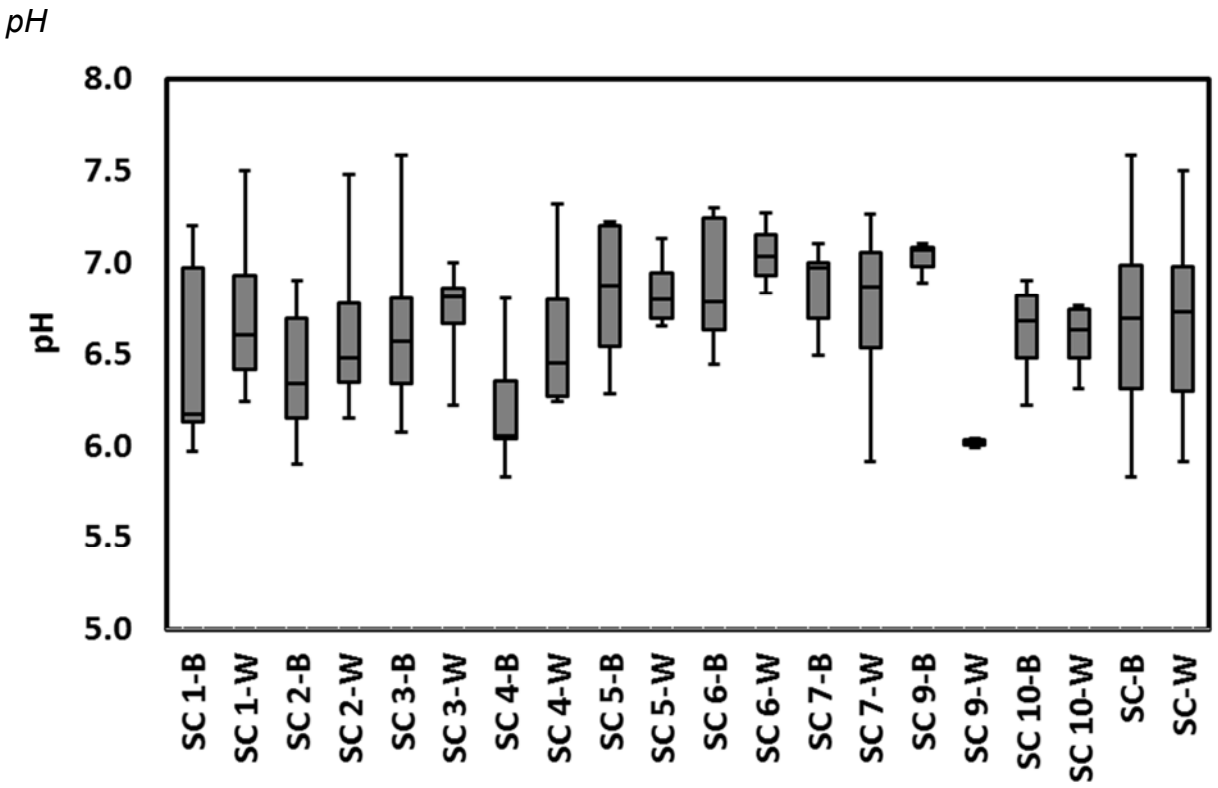

Figure C5. Box and whisker plots of pH recorded for base (B) and storm or wet weather (W) flows. SC-B and SC-W are combined for all base and storm flow values, respectively.

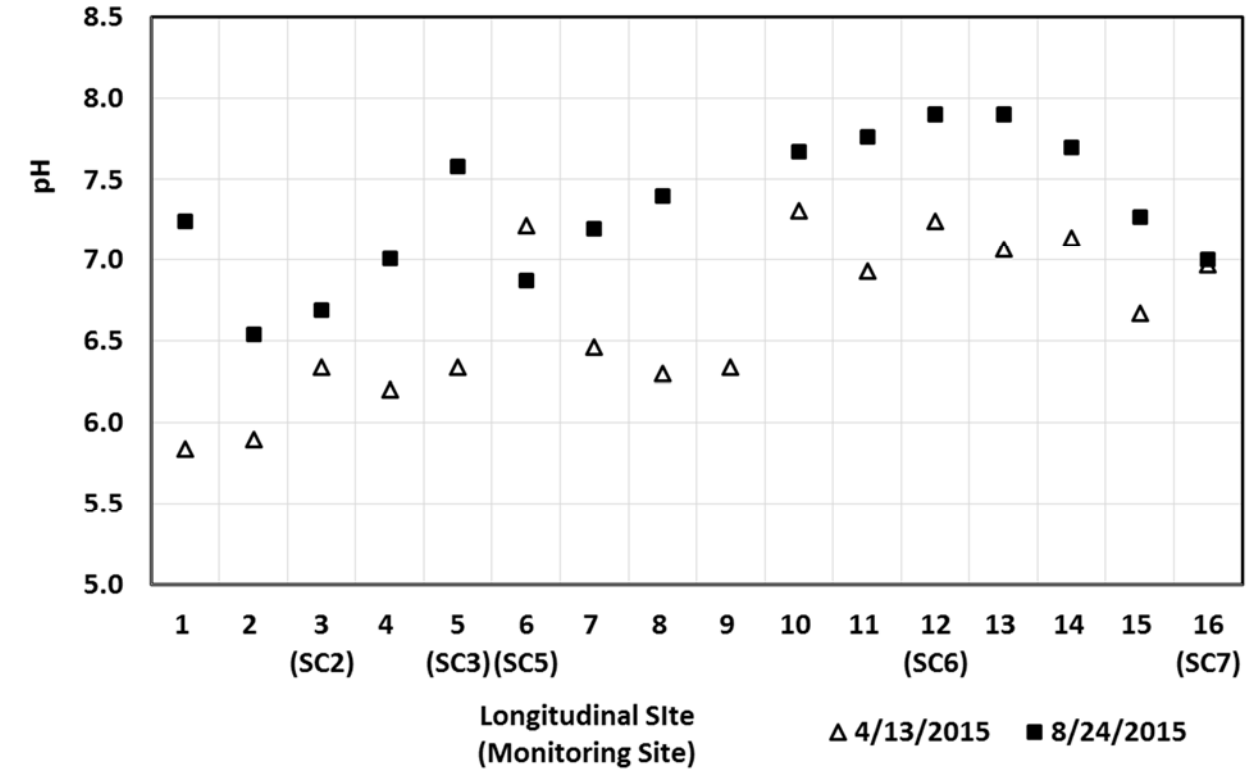

Figure C6. pH readings from longitudinal surveys on Swift Creek.

Chloride

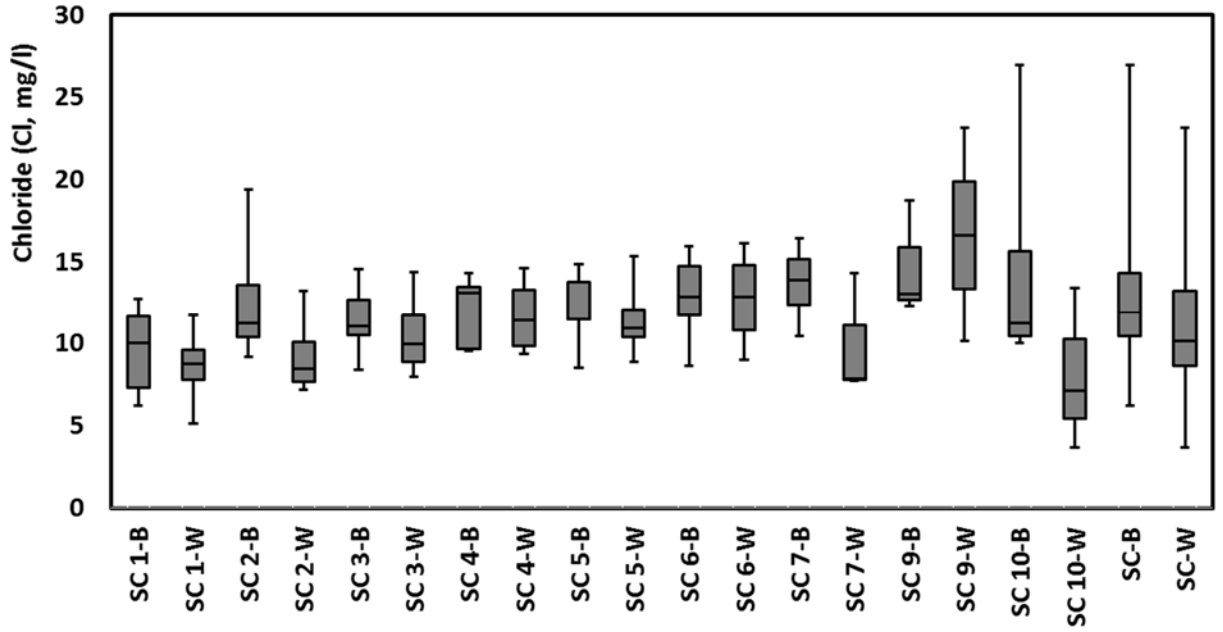

Figure C7. Box and whisker plots of chloride concentrations for base (B) and storm or wet weather (W) flows. SC-B and SC-W are combined for all base and storm flow values, respectively.

Ammonia

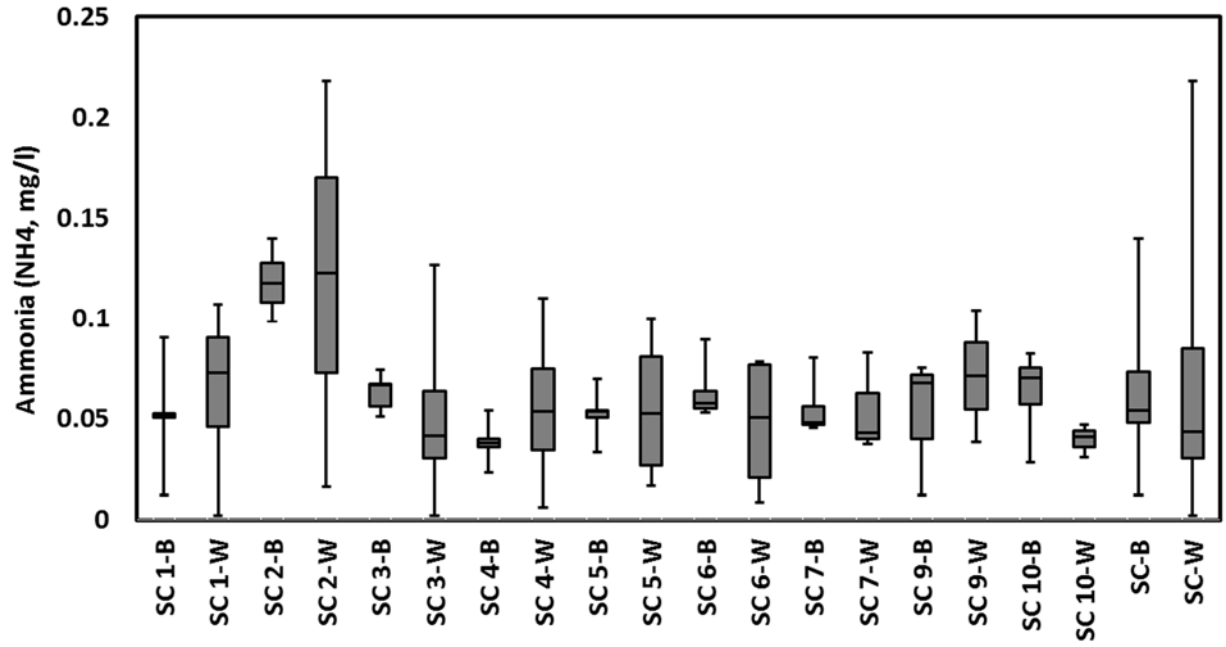

Figure 31. Box and whisker plots of ammonia concentrations for base (B) and storm or wet weather (W) flows. SC-B and SC-W are combined for all base and storm flow values, respectively.