Shelby City Council Agenda
Regular Meeting
October 5, 2026, at 6:00 p.m.

City Hall Council Chambers
300 South Washington Street
Shelby, North Carolina

Welcome and Call to Order by Mayor O. Stanhope Anthony, III

Invocation

Pledge of Allegiance

A. Approval of Agenda

Discussion and revision of the proposed agenda, including consent agenda; adoption of an agenda.

1) Motion to adopt the agenda as proposed or amended

B. Special Presentation:

1) Proclamation recognizing Public Power Week, October 4 – 10, 2026	**1 - 2**
2) Proclamation recognizing Public Natural Gas Week, October 4 – 10, 2026	**3 - 4**
3) Proclamation recognizing Fire Prevention Week, October 4 – 10, 2026	**5 - 6**

C. Consent Agenda:

Prior to approval and adoption of the agenda, a Council Member may move an item from the Consent Agenda to the regular agenda. Items remaining on the Consent Agenda will be considered collectively through a single motion and vote.

1) Approval of the Minutes of the Regular Meeting of September 21, 2026	**7 - 37**

END OF CONSENT AGENDA

D. Unfinished Business: (Alan Gossett, presenting) **38 -217**

1) Approval of a resolution to accept the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan prepared by McGill Associates: Resolution No. 77-2026

E. New Business: (Brian Burgess, presenting) **218 - 225**

1) Permanent closure of Eastfield Street:

a) Approval of a resolution declaring approval of the petition by the City Council of the City of Shelby for the permanent closure of Eastfield Street: Resolution No. 78-2026

b) Approval of a resolution declaring the intent of the City Council of the City of Shelby to consider the permanent closure of Eastfield Street: Resolution No. 79-2026

F. City Manager's Report **226**

G. Council Announcements and Remarks **226**

H. Adjournment: **226**

To adjourn a meeting of City Council, a majority of the Council Members must vote for a motion to adjourn.

1) Motion to adjourn

City of Shelby
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B. Special Presentations:

Agenda Item B-1

1) Proclamation recognizing Public Power Week, Oct. 4 – 10, 2026

Presenting: (Stan Anthony, Mayor)

- Proclamation

City Manager's Recommendation / Comments

This time is scheduled on City Councils agenda to allow Mayor Anthony time to present the above referenced proclamation and to recognize the value of public power in our community.

Each year during the first week of October, Public Power Week is celebrated across our nation. The City of Shelby has been a proud public power provider since 1912. During this week the City will take time to thank our customers for trusting us to meet their power needs. Being a public power provider means that our electric system is governed by what is best for our customers, not shareholders. A public power provider offers many benefits to our customers including:

- A locally and publicly owned and operated electric system.
- A not for profit model, functioning to serve the utility needs of their citizens while offering competitive rates.
- Offering reliable service to their customers and responding quickly to outages and emergencies.
- Providing consistently lower instances of power outages.
- Knowing and caring about our customers as neighbors, friends and citizens.

Please join me in celebrating Public Power week.

PROCLAMATION RECOGNIZING PUBLIC POWER WEEK, OCT. 4-10, 2026

WHEREAS, public power is a crucial component in cities and towns across North Carolina, driving the overall health of communities by providing unmatched electric reliability, affordable and sustainable power, excellent local service, and essential jobs in communities;

WHEREAS, North Carolina's more than 70 public power cities and towns are among more than 2,000 across the country, providing electricity with a reliability rating of 99.99 percent to nearly 1.6 million North Carolinians;

WHEREAS, many of North Carolina's public power cities and towns have been electric providers for more than 100 years, assisting their communities through prosperous times as well as pandemics and economic downturns, maintaining life-saving electricity to homes and businesses;

WHEREAS, North Carolina public power communities are part of a mutual aid network that spans the state and country, providing invaluable support during times of hurricanes and other natural disasters while maintaining a superior safety record;

WHEREAS, North Carolina's public power providers are essential community assets that contribute to the well-being of the community and provide irreplaceable economic development opportunities;

WHEREAS, North Carolina's public power utilities are dependable institutions that provide excellent service, valuable energy solutions, and a commitment to community;

WHEREAS, the City of Shelby recognizes Public Power Week and commends the public power cities and towns across our state and nation for their outstanding contributions to our communities;

NOW, THEREFORE, the City of Shelby hereby proclaims October 4-10, 2026, as "PUBLIC POWER WEEK" in Shelby, North Carolina and commends its observation to all citizens.

_____

O. Stanhope Anthony, III
Mayor

ATTEST:

_____

Carol Williams
City Clerk

City of Shelby
Agenda Item Summary
October 5, 2026
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Agenda Item B-2

2) Proclamation recognizing Public Natural Gas Week, Oct. 4 – 10, 2026

Presenting: (Stan Anthony, Mayor)

- Proclamation

City Manager's Recommendation / Comments

This time is scheduled on City Councils agenda to allow Mayor Anthony time to present the above referenced proclamation and to recognize the importance of public natural gas in our community.

Each year during the first week of October, Public Natural Gas Week is celebrated across our nation. The City of Shelby has been a proud public natural gas provider since 1955. During this week the City will take time to thank our customers for trusting us to meet their natural gas needs. Being one of eight municipal public natural gas providers means that our system is governed by what is best for our customers, not shareholders.

A public natural gas provider offers many benefits to our customers including:

- A locally and publicly owned and operated natural gas utility system.
- A not-for-profit model, functioning to serve the utility needs of their citizens while offering competitive rates.
- Offering safe, reliable natural gas service to their customers.
- Knowing and caring about our customers as neighbors, friends and citizens.

Please join me in celebrating Public Natural Gas week.



A PROCLAMATION
DECLARING OCTOBER 4 – 10, 2026 AS "PUBLIC NATURAL GAS WEEK" IN THE CITY OF SHELBY, NORTH CAROLINA

WHEREAS, we the residents of the City of Shelby own and operate our own natural gas utility system; and,

WHEREAS, we enjoy the economy, efficiency and environmental benefit of this community-owned natural gas system; and,

WHEREAS, this natural gas utility system has provided clean-burning natural gas and high standards of service at rates competitive with those of alternate energy sources; and,

WHEREAS, we, the residents of the City of Shelby, have benefited from the dedication of the employees of the natural gas utility by providing responsible, safe, and reliable natural gas.

NOW, THEREFORE, I, O. Stanhope Anthony, III, Mayor of the City of Shelby, hereby proclaim that the Shelby City Council declares and designates the week of October 4 – 10, 2026 as **Public Natural Gas Week**, in order to honor the employees, policy leaders and community owners, who work together to provide safe, clean, dependable natural gas.

BE IT FURTHER PROCLAIMED that through the observance of **Public Natural Gas Week**, the City of Shelby joins with hundreds of other communities across the United States served by publicly owned natural gas utilities to recognize this dedication and service from which all Americans benefit.

_____
O. Stanhope Anthony, III
Mayor

ATTEST:

_____
Carol Williams
City Clerk

City of Shelby
Agenda Item Summary
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Agenda Item B-3

3) Proclamation recognizing Fire Prevention Week, October 4 – 10, 2026

Presenting: (Stan Anthony, Mayor)

- Proclamation

City Manager's Recommendation / Comments

This time is scheduled on City Councils agenda to allow Mayor Anthony time to present the above referenced proclamation and to recognize the importance of Fire Prevention efforts in our Commmunity.

The National Fire Protection Association recognizes Fire Prevention Week as the Week of October 4th through 10th. This year, the theme is "Charge into Fire Safety", which focuses on everyday changes we can make to safely charge our ever-increasing array of electronic devices.

Fire Prevention and the awareness of how to take small steps to improve safety is critical to reducing loss of life and property due to fire. The recognition of Fire Prevention Week is one way we can bring this to the forefront in our Community.

Please join me in recognizing Fire Prevention Week.

FIRE PREVENTION WEEK™
October 4-10, 2026

WHEREAS, the City of Shelby is committed to ensuring the safety and security of all those living in and visiting Shelby, North Carolina; and

WHEREAS, fire remains a serious public safety concern both locally and nationally, and the presence of lithium-ion batteries in many household devices introduces fire risks; and

WHEREAS, most of the rechargeable electronics used in homes daily, including smartphones, tablets, laptops, power tools, e-bikes, e-scooters, and toys, are powered by lithium-ion batteries, which if misused, damaged, or improperly charged, can overheat, start a fire, or explode; and

WHEREAS, the National Fire Protection Association® (NFPA®) reports an increase in battery-related fires, underscoring the need for public education on the safe use of lithium-ion batteries and devices; and

WHEREAS, the way lithium-ion battery devices are charged can make a difference in helping prevent home fires; and

WHEREAS, safe charging includes using the cord and charger that came with your device or one approved by the manufacturer, charging on a hard, flat surface, watching for warning signs like devices that are very hot or start to swell, unplugging when fully charged, and charging larger devices like e-bikes outside and away from exits; and

WHEREAS, residents are encouraged to understand that safe charging means making smart choices every time they plug in; and

WHEREAS, City of Shelby first responders remain dedicated to reducing the occurrence of fires through prevention, safety education, and community outreach; and

WHEREAS, the 2026 Fire Prevention Week™ theme, "Charge into Fire Safety™: Safe Charging Is a Superpower," serves to remind all residents that safe charging can help reduce the risk of fires in homes and communities;

NOW, THEREFORE, I, O. Stanhope Anthony, III, Mayor of the City of Shelby, do hereby proclaim October 4–10, 2026, as Fire Prevention Week throughout the City of Shelby, and urge all residents to learn about and practice safe charging habits.

_____
O. Stanhope Anthony, III
Mayor

ATTEST:

_____
Carol Williams
City Clerk

City of Shelby
Agenda Item Summary
October 5, 2026
City Hall Council Chambers

C. Consent Agenda:

Agenda Item: C-1

1) Approval of the Minutes of the Regular Meeting of September 21, 2026

Consent Agenda Item: (Carol Williams, City Clerk)

Summary of Available Information:

Please read and offer changes as you deem necessary.

- Minutes of the Regular Meeting of September 21, 2026

City Manager's Recommendation / Comments

Approve the minutes as presented or as amended by the Mayor and City Council via the Consent Agenda.

MINUTES

Regular Meeting of Shelby City Council **September 21, 2026**
City Hall Council Chambers **Monday, 6:00 p.m.**

Present: Mayor O. Stanhope Anthony, III, presiding; Council Members Andrew Hopper, Sr., Emilie Bullock, David White, Violet Arth, Lori Waris and Charles Webber; City Manager Justin S. Merritt, Assistant City Manager Ben Yarboro, Assistant City Manager Kerri Melton, City Attorney Jason Lunsford, City Clerk Carol Williams, Director of Finance Chris Costner, Chief of Police Brad Fraser, Fire Chief William Hunt, EFO, Airport Supervisor Jack Poole, Public Information/Communications Officer Chip Nuhrah, Deputy Clerk Breanna Jones, and Paralegal Nicole Hart

Mayor Anthony called the meeting to order at 6:00 p.m. and delivered the invocation.

Dr. Webber led the Pledge of Allegiance.

A. Approval of agenda:

Mayor Anthony recommended that City Council consider suspending the rules for Public Comment and proposed that each speaker be allowed 2 minutes to speak. Public Comment would last a total of 15 minutes.

Motion to adopt the proposed agenda as amended.

ACTION TAKEN: Upon a motion by Mr. White, City Council voted unanimously to approve the agenda with the proposed amendment.

B. Public Comment:

1) Jeff Jaeger, 1321 Williamson Road, Shelby, North Carolina, spoke in favor of the Kristen Boggs-Jaeger proposal. He is Kristen's husband and has extensive experience in building affordable housing and other business ventures. Laurel Hill Apartments in Shelby is one of his projects; his company invested over $100,000 in each apartment unit for a total investment of $16 million.

2) Bob Trotman, 368 Quince Road, Casar, North Carolina, spoke in favor of the Kristen Boggs-Jaeger proposal. He is an artist himself and is asking City Council to choose to develop the Webbley as a non-profit art museum and cultural center rather than a commercial hotel. If the City wants a hotel, he believes they should invest money in the Charles Hotel. The combination of the Webbley and the Charles Hotel would give people a good place to visit and a nice place to stay. The Webbley as an art museum and cultural center would give students a place to learn, while also being able to host weddings and other events. The Webbley

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would be supported in perpetuity by a philanthropist and former Cleveland County native who has an ongoing interest in Shelby. Andy Warhol declared that "Art is the leading edge of real estate." A cultural center would boost the tax values of S. Washington Street properties. Lastly, he asked City Council members not to be shortsighted. Don't jump automatically to the bottom-line consideration. He urged Council to remember; the brand of Shelby is the City of Pleasant Living.

3) Nicole Ingram, 9741 Southern Pine Blvd., Charlotte, North Carolina, spoke in favor of the Kristen Boggs-Jaeger proposal. She has been retained by Kristen Boggs-Jaeger to be the lead designer for Webbley. She believes the chosen proposal should be the one that can protect the history of the property and serve the people of Shelby, respect the surrounding neighborhood and turn its commitments into an accountable plan. Her role would be to translate the Webbley vision with coordinated buildable and operationally responsible decisions that begin with historical research, documentation and significant interior features. She will have close coordination with architects and engineers preserving each room. Preservation would extend beyond the mansion and cover the entire campus, including the botanical grounds, mature trees, and the historic relationship between the buildings and landscape buffers, etc. Her responsibility is not to merely create beautiful rooms; it is to help and respect accessible function.

4) Betsy Wells, 725 Dixon School Road, Kings Mountain, North Carolina, spoke in favor of the Kristen Boggs-Jaeger proposal. She was a drama teacher at Kings Mountain High School for 24 years and has been a member of the Arts Council in Shelby. This is a once in a lifetime opportunity that so many children and people in the County would benefit from. She stated that art is not the icing on the cake, it's another layer of the cake. The arts add to the intellect and the spirit of the community.

5) Gary Spangler, 215 Jones Road, Shelby, North Carolina, spoke in favor of the Kristen Boggs-Jaeger proposal. He is the first cousin of Kristen Boggs-Jaeger's mother and stated the Spangler family has deep roots in Cleveland County. Through family and Kristen Boggs-Jaeger's involvement at Double Springs Baptist Church he has had the opportunity to see Kristen grow into the motivated and determined woman that she is today. The decision concerning the Webbley mansion is a significant one and it reflects the deep care that we all have in the direction of our City. Both proposals have a distinct path forward, but when we look at the long-term identity of Shelby, Kristen Boggs-Jaeger's proposal is the choice that delivers the greatest value to our community. This approach aligns with the City of Shelby's revitalization efforts connecting the corridor of the Earl Scruggs Center and the Don Gibson Theater. It turns the Webbley into a daily destination that draws people into Uptown Shelby. From a neighborhood perspective the cultural arts center introduces a stable day time operational footprint that avoids late night traffic and ensures that the Webbley remains a harmonious part of the surrounding area. He strongly believes with Kristen's

efforts and dedication that this project will not fail. The City Council has made a great effort to stabilize the Webbley structure. Kristen Boggs-Jaeger's proposal ensures that the public investment yields a broad public return. It honors our past while building our community's future. He urges Council to support the cultural arts center proposal and choose the path that enriches Shelby in the years to come.

6) Kenny Boggs, 1321 Williamson Road, Shelby, North Carolina, is Kristen Boggs-Jaeger's father and stated that both sides of Kristen's family, the Spanglers and the Boggs, have been in this area for hundreds of years and they aren't going anywhere. He asked the people in the audience in favor of the Kristen Boggs-Jaeger proposal to please stand up, an overwhelming majority stood. He hopes the City doesn't lose the opportunity for a cultural center for Shelby.

7) David Teddy, 139 Westfield Road, Shelby, North Carolina, stated that in 1841, James and Susan Love, a philanthropic couple, donated 150 acres to Cleveland County to develop the City of Shelby. Tonight's meeting is being held on property donated to the County by James and Susan Love. Now, another philanthropic couple, Jeff and Kristen Jaeger, are asking for the opportunity to write a check for the Webbley. Kristen Boggs-Jaeger's proposal does not tether the City to a 10-year loan; the updated Kristen Boggs-Jaeger proposal writes a check for the value of the Webbley at closing. This is a difference that should matter to Council and to the taxpayers. Mr. Teddy's research shows that the tax implication of putting the Webbley on non-profit status is negligible compared to the City budget. In the updated proposal, Kristen has a team that is behind her and she comes to this Council also investing in a second home here in Cleveland County very shortly. The Jaegers plan to come back to Cleveland County and are willing to write a check to preserve the Webbley.

C. Special Presentations:

1) Presentations regarding Webbley proposals, introduced by Sara VanLear of Development Finance Initiative (DFI) with the School of Government

a) Bob Englander of CathFord Consulting, LLC Consulting, presenting
b) Kristen Boggs-Jaeger, presenting

Ms. VanLear shared the following:

- **DFI works across the state providing local governments assistance in evaluating and accessing real estate opportunities**
- **DFI has worked with the City for the past couple years to understand the feasibility of the Webbley mansion redevelopment**
- **Each team was given four primary requirements to address in their presentations which included:**
  - **Document any new information shared verbally or in written form**
  - **Present a timeline for the project**

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    - Present members of the project team
    - Present any contingency plan if development or operation metrics are not met
- Council is in a difficult by good spot due to both proposals being beneficial to the City of Shelby
- Council and staff must act quickly to finalize a developer and secure a development agreement due to the time restraints on the state funding

Mayor Anthony stated that each presenter will have 15 minutes and Mr. Englander will present first. Council will not ask any questions during the presentation. After both presentations have been completed, Mayor Anthony will ask a set of questions for both presenters to answer, and then Council will ask any questions they have.

The first proposal is from CathFord Consulting, LLC based in Richmond, Virginia.

Mr. Englander introduced Lisa Bricker, a historic architect, and she gave the following presentation.

Ms. Bricker's stated her contribution to this project includes the preservation of the Webbley, the cottage, and the carriage house in ways that protect their historic character and is consistent with state and federal guidelines with historic rehabilitation.

Ms. Bricker grew up in Reidsville, North Carolina. She showed some of the similarities of her hometown with the City of Shelby. Both were shaped on industry, and both had to adapt as those industries changed.





Historic buildings are more than bricks and mortar, they tell stories, connect us to people that came before us, and give the community a sense of continuity and identity that can't be recreated.

Ms. Bricker is impressed with the City of Shelby's willingness to invest in the historic fabric of Shelby with places like the historic Courtsquare, Earl Scruggs Center, the Don Gibson theater, the busy uptown streets with shops, restaurants

and small businesses. She also commended the City for saving Webbley and stabilizing its structure.

In her 1940 history of the City of Shelby, Madge Webb Riley, wrote about her great grandfather, James Love, who provided land for the establishment of the City of Shelby. With the broad streets and the central square, she wrote they had an eye for the beauty. Nearly a century later that still holds true with the beauty of South Washington Street. Webbley has long been a place for people to gather. In 1995 it was reported that every NC Governor since 1900 had visited Webbley, along with Presidents Franklin D. Roosevelt, Harry Truman, and celebrities Ava Gardner and Whitney Houston.



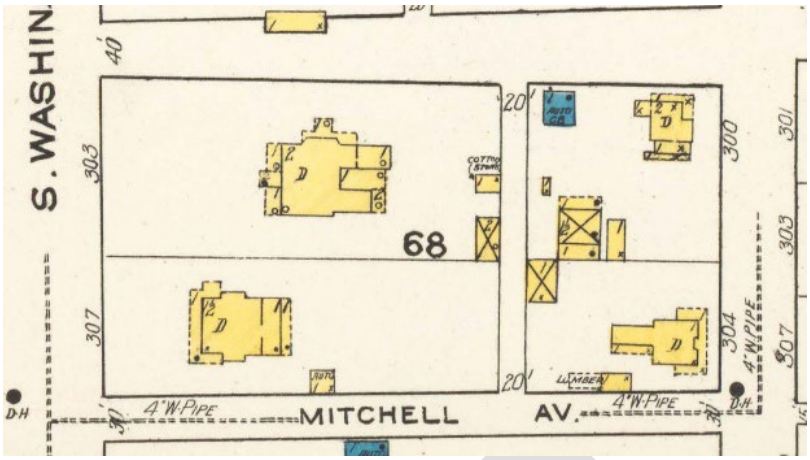




In 1943 Governor O. Max Gardner sent a pair of pajamas to President Roosevelt made from Cleveland County yarn. This was a small gift, but it was something carried all the way to the White House. This story shows that Webbley is known for its hospitality which extended far beyond the mansion walls.

A 1921 Sanborn map shows the small cottage that is still standing behind Webbley that was used for cotton storage. Over time the surrounding houses and outbuildings disappeared and the lot was consolidated. Today, Webbley, the carriage house, and the small cottage are the only historic buildings that remain.

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Hospitality, industry, residence, politics, and community are all woven into the story of this place. The question becomes what is Webbley's next chapter?

Ms. Bricker continued by stating their plan is not to introduce a new identity, they want to continue the tradition of hospitality that has been a part of the Webbley for generations.

Their hotel operating partner, Retro Hospitality, has experience operating independent hotels in unique and historic properties and pairing them with dining and event uses.



The Clifton in Charlottesville, Virginia is one example. Similar to their Webbley proposal, the Clifton combines a small historic inn with dining and event uses that work together to keep the property active and economically sustainable.

That same philosophy has guided CathFord Consulting, LLC's approach to Webbley. As the Sanborn map shows, the property has evolved considerably over time. This gives the team an opportunity to carefully introduce new development while remaining respectful of its historic fabric.

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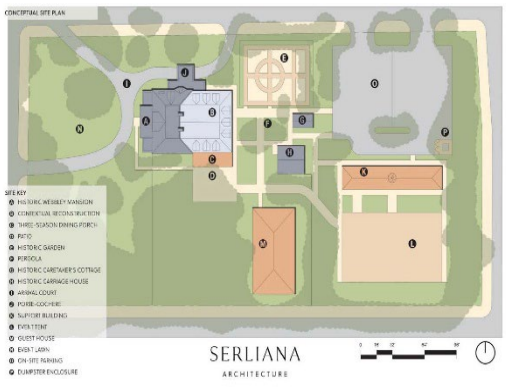








In the CathFord Consulting, LLC plan, the historic house remains the clear architectural centerpiece. The reconstructed portion follows the same footprint of the demolished rear additions, while additional guest accommodations regress deeper into the property. Their plan also rehabilitates the historic house and cottage, restoring the rose garden, and preserving mature trees and landscape features where possible. The new development is intended to support Webbley rather than compete with it.





Their goal is for Webbley to once again contribute to the vibrancy of the Shelby community. The restaurant and bar will be open to the public, the gardens and grounds will be places that people can enjoy, and weddings, celebrations and

community gatherings will bring people back to Webbley's property just as they have in the past.

Preservation is not just about saving the building; it's about keeping these historic places meaningful and giving people an opportunity to experience them and make memories.

CathFord Consulting, LLC believes that Webbley can once again be a place where Shelby welcomes people both near and far.

Mr. Bob Englander, managing partner of CathFord Consulting, LLC Consulting, a real estate consulting firm in Richmond, Virginia, stated that he stepped back from development projects about ten years ago and limited his consulting work to just a few local projects that he thought were meaningful. When the solicitation for Webbley came across his desk, he read it, came to visit, and was hooked.

Webbley deserves to be restored to its highest and best use and returned to the grandeur it enjoyed for over 140 years with expansion and renovation.

Mr. Englander believes that his team can accomplish those things that were stipulated in the solicitation: bring it back to its glamour, highest and best use, and create a positive economic impact for Shelby and Cleveland County.

These are the details of the CathFord Consulting, LLC proposal that shows how they plan to accomplish this:

Program Element	Detail
Total Guest Rooms	21 rooms (all en suite)
Proposed ADR	$246 blended - $275 mansion, $325 bridal suite, $220 new construction guest house
Projected Occupancy	50% (Year 1) ramping to 68% stabilized (Year 4)
Restaurant	50 seats, open to hotel guests and public
Bar / Lounge	20 seats, open to hotel guests and public
Event Venue	Outdoor lawn, activated pergola, garden, 6,000 SF tent
Parking	33 off-street spaces together with extended angled parking along the South Washington frontage

Mr. Englander stressed that they want people that live in Shelby to enjoy the grounds and historic renovations as much as paying guests that stay in the inn. He continued by stating that Shelby is in need of an upscale restaurant with a bar, indoor/outdoor dining and event space for up to 200 guests with beautiful lawns and gardens, all within two blocks of Uptown Shelby.

The guest rooms are the engine, a large share of the revenue and profit. The restaurant and event space will fill the rooms, and this provides a revenue stream and put life into the community.

Mr. Englander continued by stating this was advertised as an economic development project. Right now, Webbley generates nothing to the city, no property tax, no occupancy tax, no sales tax – it's a line item on the expense side of the City's budget.

Mr. Englander went over the financial side of the CathFord Consulting, LLC proposal as seen below:

Metric	Value
Total Project Cost (including deferred city loan)	$10,022,967
NC State grant (equity)	$3,100,000
Senior Loan	$6,222,967
City of Shelby Loan (deferred and paid out Year 8)	$700,000
Loan-to-cost (including land)	69.07%
Stabilized net operating income (Year 4)	$713,339
Minimum debt service coverage	1.25x
Local tax revenue to City and County (10-year)	$1,550,881
Permanent jobs created (estimated)	31

Over 17,000 restaurant covers a year, with most of them being people that are within a 45-minute drive and hopefully they will return often. The local bed and breakfast and highway hotels will benefit from the Webbley's hosted events. Where these rooms sit matters just as much as that they exist. Webbley is the southern gateway to Uptown Shelby, within walking distance of Earl Scruggs Center, the Don Gibson Theater, the shops and other restaurants Uptown. The guests at the Webbley will be spending their money uptown.

The City gets a clean documented exit. CathFord Consulting, LLC takes the complete risk including the operating risk from day one of closing.

CathFord Consulting, LLC Team for the Webbley Project:

<u>DEVELOPMENT PARTNER</u>
CathFord Consulting, LLC Consulting, LLC Bob Englander, Manager

<u>ARCHITECTURE & PLANNING</u>
Serliana Architecture, PLLC Tim Hayes, AIA, Managing Partner

<u>HOTEL OPERATING PARTNER</u>
Retro Hospitality
Paul Cooper, Chief Executive Officer

LANDSCAPE ARCHITECTURE
Fred B. Blackley, ASLA

PRESERVATION ARCHITECTURE
Golden Leaf Design Studio, PLLC Lisa Bricker, AIA, NCARB, Principal

CONTRACTOR
Foothills Historic Conservation, Inc.
David Stone

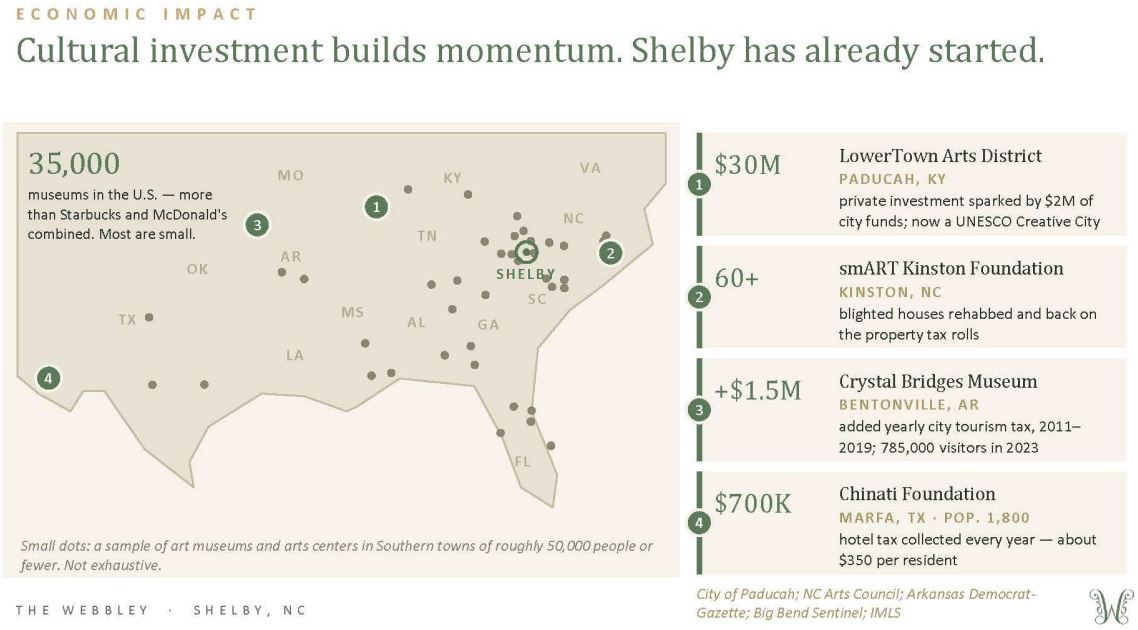
Mr. Englander showed the proposed timeline from CathFord Consulting, LLC:

Milestone	Timing
Development Partner Proposal submitted	September 14, 2026
Execute Memorandum of Understanding; commission joint interior conditions assessment with Foothills Historic Conservation	Early Q4 2026
Negotiate and execute Development Agreement; finalize financing structure; complete design documents; obtain Historic Preservation approvals and building permits; finalize construction contracts	Q4 2026
Begin interior rehabilitation of mansion; begin three-story reconstruction; begin L-shaped guest building construction	Q1 2027
Complete rehabilitation and new construction; hospitality operator onboarding and soft opening; full operations commence	Mid 2028

In closing, Mr. Englander stated that Ms. Bricker began her presentation by talking about the many threads of history that have come together at Webbley. In the following photograph it shows that Webbley is not only a beautiful building, but it's a place filled with people. Webbley has welcomed people for generations. The CathFord Consulting, LLC proposal is about preserving what is extraordinary while giving it a sustainable future. A place where people can stay, dine, celebrate and gather to make memories.



Next, Kristen Boggs-Jaeger presented her proposal. Kristen is based in Los Angeles, California, and is a Cleveland County native.



Mrs. Boggs-Jaeger started her presentation explaining what an institution can do for a small city. She gave an example of Paducah, Kentucky where a $2 million city investment in an artist relocation program sparked $30 million in private investment in what's known as the Lower Town Arts District. This ultimately turned Paducah, Kentucky into a UNESCO Creative City.

This along with other examples show that cultural investments can fuel economic growth and development in the areas they serve.



Mrs. Boggs-Jaeger stated that Webbley is not going to be a fancy New York style museum. There will be art on the walls, but it will be dynamic, a place of connection, conversation and community.

Two points that Mrs. Boggs-Jaeger focused on were Contemporary Art Gallery and Community Programming.

Contemporary Art Gallery:

- **This is an opportunity to connect to a much larger network of private collections and renowned institutions across the country, and possibly the world.**
- **This will give our residents and our children access that they may never have.**

Community Programming:

- **A program director will be hired whose sole job is dedicated to building a robust community program that will give people reasons to keep returning to this campus repeatedly.**

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THE STRATEGIC MOMENT

Shelby has the momentum; A rising tide lifts all boats....



A district already forming
Earl Scruggs Center · Don Gibson Theater · The Banker's House · Farmers Market Pavilion · Harmony Trail · forthcoming Train Depot

A county winning on jobs
170+ manufacturers · 600K+ workers within 35 miles · PPG's $380M investment. Employers now weigh culture when siting talent.

A plan that already calls for it
Imagine Shelby and the Center City Master Plan name Uptown as the region's destination. The Webbley can help anchor that vision.

WHAT CULTURAL TOURISM RETURNS — NORTH CAROLINA BENCHMARKS

$39.10	1 in 3	Top 7 of 100
per arts visitor, beyond admission	visitors are out-of-town; they spend 2×	Cleveland County's NC rank, visitor growth
Americans for the Arts, AEP6 (NC)	*Americans for the Arts, AEP6 (NC)*	*NC Commerce / Visit NC, 2025*

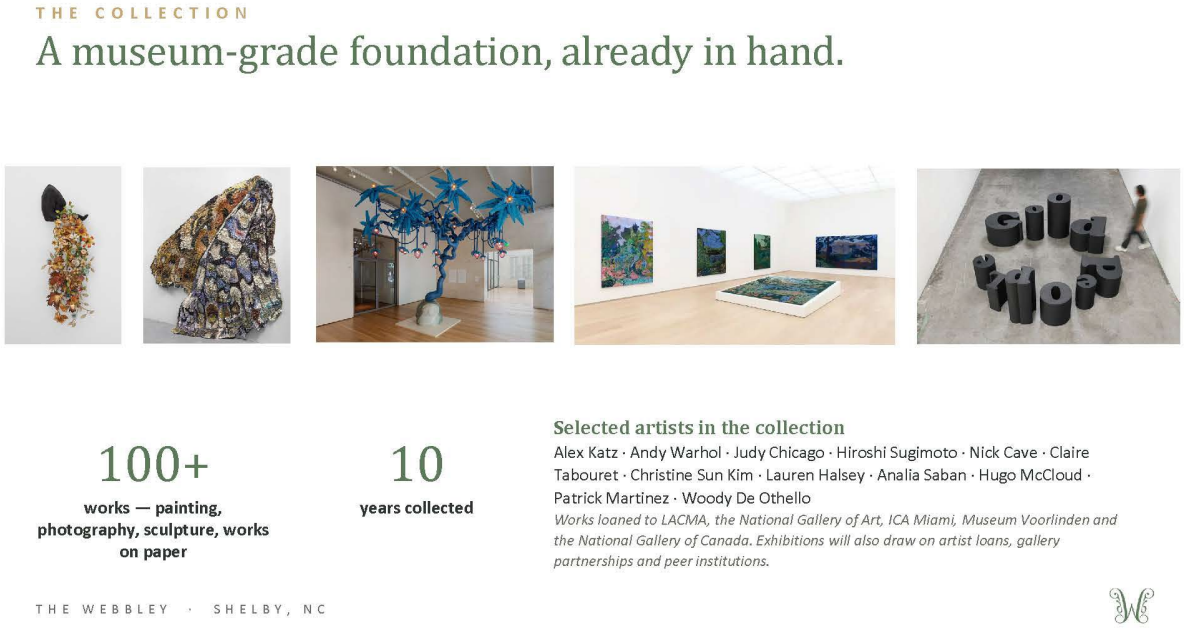
THE WEBBLEY · SHELBY, NC

Mrs. Boggs-Jaeger said there is already a cultural eco-system taking place in Shelby with the Earl Scruggs Center, the Don Gibson Theater, the Arts Council, Bankers House, and the train depot. The Webbley is not here to compete with those assets, it's here to compliment them and build on the momentum already created. The idea is not to start something from scratch, it's to strengthen the eco-system already in place.

Cultural institutions help raise high school graduation rates, create prosperity in the neighborhoods they reside in, lower crime rates, build civic pride which raises volunteerism, and makes people more likely to invest their money here.



Mrs. Boggs-Jaeger continued by stating the vision of the Webbley is to bring it alive again with art, weddings, art camps, birthday dinners, field trips, etc. There should always be a reason to walk through the door.



Mrs. Boggs-Jaeger mentioned artist Claire Tabouret has been chosen to create the new stained-glass windows in Notre Dame in Paris. Mrs. Boggs-Jaeger has the painting rendition in her collection. She stated that young people tend to aspire towards what they can see around them. Children already have a foundation to learn from. The Webbley gives an opportunity to add another layer to that foundation. A child in Cleveland County can stand in front of a famous painting, learn about the artist, follow the story of the artist, and perhaps leave asking – I wonder what I can do? This is the type of access Mrs. Boggs-Jaeger wants to bring to this community.

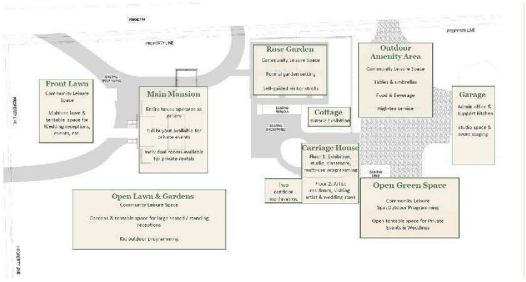
Mrs. Boggs-Jaeger explained the layout she's proposing for Webbley:

- **Working within the existing footprint**
- **Not proposing any new major additions**
- **Restoring the main house, gardens, carriage house, and garage**
- **Special attention will be given to the cottage to give the complete story of all that have lived at Webbley**
- **Inside the main house, every room will be accessible to the public**
- **Every room works twice, as gallery and gathering space**

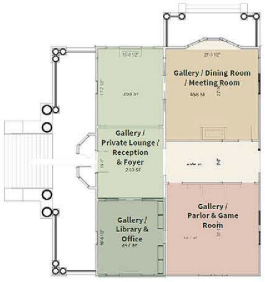
THE LAYOUT

Every room works twice: Gallery and Gathering.

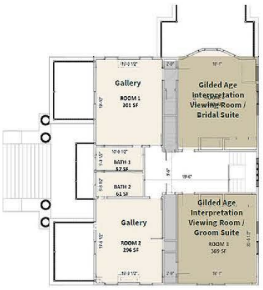
THE CAMPUS



GROUND FLOOR



SECOND FLOOR



Plans adapted from Clearscapes / SDP test-fit; illustrative.

Mrs. Boggs-Jaeger went over the financial side of her proposal as seen below:

TOTAL INVESTMENT IN THE WEBBLEY

Roughly $6.6 million reinvested in one campus.

$1,000,000	**City of Shelby — exterior stabilization** Underway since April 2026	
$2,000,000	**State grant**	PUBLIC ≈ $3.0M
$1,887,500	**Founder pledged contribution***	
$1,000,000	**Bank financing**	PRIVATE ≈ $3.6M
$700,000	**Philanthropic capital** Donors, foundations, state grants, sponsors	

≈ $6.6M

total reinvested in the Webbley campus

UP TO $875K*

paid to the City at closing, at appraised value — an outright purchase, no carry-back loan, no tax credits, no City subsidy

**Estimated per the City's SDP. Final price to be set by an independent appraisal under N.C. Gen. Stat. § 158-7.1, which must reflect the recorded public-use covenants the nonprofit will place on title. The final appraised price may differ from the estimate; and will be paid from the private sources shown.*

SOURCES & USES — DEVELOPMENT PHASE

Fully funded. Founder-led.

USES

Property acquisition — up to*	$875,000
Interior renovation & historic restoration — Main House	$400,000
Auxiliary buildings renovation (Cottage, Carriage House, Garage)	$875,000
FF&E — Main House	$150,000
FF&E — Auxiliary buildings	$100,000
Technology & AV — Main House	$200,000
Technology & AV — Auxiliary buildings	$100,000
Grounds & landscaping	$500,000
Professional fees	$133,125
Legal, title & closing	$21,875
Contingency (10% of hard costs)	$232,500
TOTAL DEVELOPMENT COST	**$3,587,500**

SOURCES

$1,887,500 — **Founder pledged contribution***	53%
$1,000,000 — **Bank financing**	28%
$700,000 — **Philanthropic funding** Major donors, foundations, state grants, corporate sponsors	20%
TOTAL SOURCES	**$3,587,500**

**Acquisition shown at the City's SDP estimate of $875,000. The Foundation proposes an outright purchase at appraised value, with no City carry-back financing. Per the RFP, the final price will be set by a licensed independent appraisal (nonprofit nominates; City approves) — which must take into account the recorded covenants restricting the property to the nonprofit's public, cultural use. Founder equity flexes to balance. Assumes city will provide a "grey shell" from the state funded dollars. These assumptions were assumed in Appendix A of our original submittal.*

THE WEBBLEY · SHELBY, NC

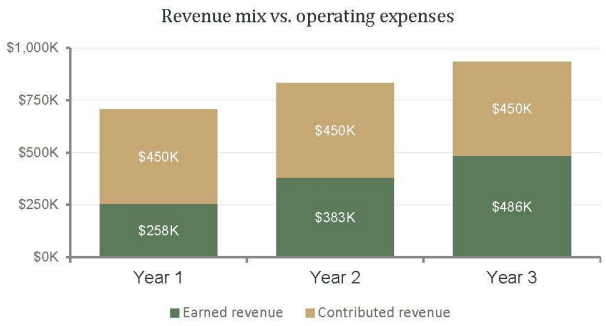
Her development plan adds an additional $3.6 million on top of the state grant. The funding sources include founder capital, $1 million bank financing loan, and philanthropic capital. The Jaeger family is pledging $1.9 million personally towards the purchase and completion of the property and grounds. All total, this comes to $6.6 million reinvested into the Webbley campus.

Mrs. Boggs-Jaeger stated she heard the concern from Council at the August meeting, and she addressed it. Her updated proposal includes theJaeger's outright purchase the Webbley property for the appraised value; no city carry-back financing, no promised gift.

Mrs. Boggs-Jaeger discussed the operational side of her proposal, clarifying that this is a conservative model which included a small net surplus for Year 1 of approximately $16,000 to a net surplus in Year 3 of $42,000; Mrs. Boggs-Jaeger reminded Council that this is a non-profit. The Jaeger family is contributing $150,000 a year for 10 years. The remaining $300,000 a year is based on an annual fundraising target, and they will not look at only one source to provide it; it will come from local contributors, and the Jaeger's national philanthropic network, corporate sponsorships, foundations, and grants. If the fundraising falls short, the Jaegers are offering additional support up to $3 million to cover shortfalls or to expand programming.

ONGOING NEEDS

A conservative model that stands on its own by Year 3.



	Yr 1	Yr 2	Yr 3
Total revenue	$708K	$833K	$936K
Operating expenses	$692K	$829K	$894K
Net surplus	$16K	$3K	$42K
Earned revenue share	36%	46%	52%
Founder annual support	$150K	$150K	$150K
Annual fund (grants & gifts)	$300K	$300K	$300K
Events hosted	27	50	76

FOUNDER ONGOING COMMITMENT

$150K a year for 10 years — $1.5M minimum

Should other fundraising fall short, support can expand to **$300K a year — up to $3M** — to cover shortfalls or grow programming. Beyond Year 3, the founder hopes to underwrite additional programming as The Webbley grows.

Conservative base case. Debt service of ~$77K/yr included in expenses. 501(c)(3) surplus is reinvested in mission.

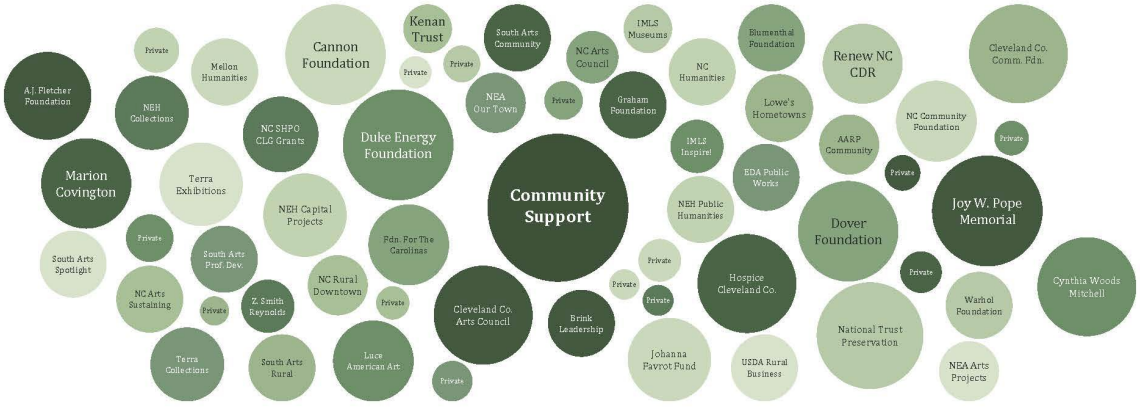
THE WEBBLEY · SHELBY, NC

Below are sources of support and possible fundraising sources. These include 45 grants that can be applied for, this is just a snapshot, and doesn't include all possibilites.

PHILANTHROPIC SUPPORT

Support is already taking shape.

45 GRANT PROGRAMS IDENTIFIED



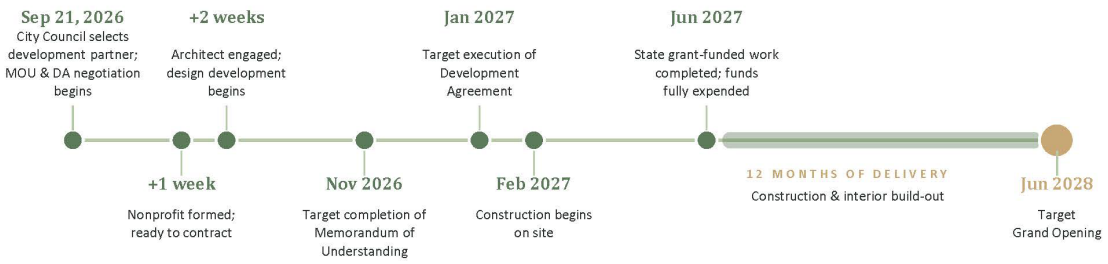
Grant programs shown are candidates under evaluation, not awards.

THE WEBBLEY · SHELBY, NC

Mrs. Boggs-Jaeger explained, within a week of selection, the non-profit can be formed and ready to contract. Due to the City's timeline for state grant funds and because the plan is to work with the exisitng footprint of Webbley, the architecture process should move efficiently, allowing her team to be nimble with the construction start date and keeping the project moving forward.

OUR TIMELINE

Target grand opening: June 2028



The schedule reflects our current anticipated path from selection through development, construction, and opening — a clear view of the project's key milestones and our target timing for moving The Webbley forward.

THE WEBBLEY · SHELBY, NC

She also gave an example of what a monthly schedule could look like including possible events and gatherings:

A MONTH AT THE WEBBLEY

October 2028 — one possible rhythm of a living house.



Illustrative only. Mondays reserved for care and installation; Tuesdays for corporate use; public hours Wednesday–Sunday. ~40% of peak season weekends for private events, ~40% for community, ~20% rest.

THE WEBBLEY · SHELBY, NC

Mrs. Boggs-Jaeger detailed her team information which includes, founder and principal, strategists, legal counsel, designers, builders and landscape architects.

MEET OUR TEAM

Principal, counsel, designers, builders, advisors — Assembled and ready.

PRINCIPALS & STRATEGY

Kristen Boggs Jaeger
Founder & Board Chair

Jeffrey Jaeger
Standard Communities
RE Development & Strategic Advisor

Ali Nemerov
Schwartzman&
5-Year Strategic Plan

LEGAL

Nick Tosco
Poyner Spruill LLP
General Counsel

Jason Kohout
Foley & Lardner LLP
501(c)(3) Counsel

BUILD

Charlie Wilson
CT Wilson Construction
General Contractor*

David Stone
Foothills Historic Conservation
General Contractor*

Tony Brooks
Beam, Edwards & Brooks
General Contractor*

DESIGN

Fred Belledin
Clearscapes
Architect

Matt Sprouse
Sitework Studio
Landscape Architect

Nicole Ingram
Stacy Nicole Interiors
Interior Designer

Reann Elk
Head Chef
Food & Beverage

**General contractor to be finalized by competitive bid upon completion of the drawing set.*

THE WEBBLEY · SHELBY, NC

Mrs. Boggs-Jaeger discussed the experience her team will bring to this type of project. She and her husband have renovated older and historic homes. Jeff Jaeger has spent 20+ years overseeing acquisition, financing and construction across hundreds of real estate projects, including public-private partnerships and preservations of older buildings.

OUR EXPERIENCE

A record of working carefully with historic and older structures.



Los Angeles, CA c.1928

Historic residence
Full interior renovation and exterior scope. Original character retained; systems, finishes and site brought to current standard.



Los Angeles, CA c.1939

Historic residence
Full interior renovation and exterior scope. Period detailing preserved and repaired; envelope and landscape restored.



Shelby, NC c.1975

Affordable housing community
Full renovation of an occupied community — interiors, exterior and site — in partnership with the City of Shelby.

Jeffrey Jaeger, Co-founder of Standard Communities (2008), one of the 50 largest affordable housing owners in the U.S. (#6), with a portfolio across 24 states and more than $8 billion of development, acquisition and rehabilitation nationwide. For over 20 years he has directed the acquisition, financing and construction oversight of more than 300 projects — much of it the renovation and preservation of older buildings through public-private partnership.

THE WEBBLEY · SHELBY, NC

Mrs. Boggs-Jaeger continued by stating this is only the beginning. Phase 1 is what was discussed tonight. If the community wants more, there is more room to grow.

One piece Mrs. Boggs-Jaeger is excited about is education. Helping teachers bring contemporary art into the classroom through programs that are already being used by other cultural centers is something that can be lifechanging.



Mrs. Boggs-Jaeger asked Council who is Webbley going to be for? A person passing through? Or for the residents that live here? She acknowledged that we want people to come here and eat in our restaurants, shop in our stores, and discover our town but should Webbley be created for someone just passing through? Or should it be created for the people that live here.

Mrs. Boggs-Jaeger concluded by stating City Council had some concerns about her previous proposal; she believes those concerns have been addressed, such as:

- **Her team is in place**
- **Fundraising dollars are not just local, but national**
- **Keeping the footprint of the mansion, with no new construction**
- **Buying the Webbley outright, with no loan, carry-back or no promised gift**

Questions from Mayor Anthony to both Mr. Englander and Mrs. Bogg-Jaeger:

1) Have you spoken with any comparable local entities about the demand or their challenges that they are seeing?

Kristen Boggs-Jaeger – She has met with the Arts Council, and they were excited about her proposal. They could see how this could continue to build the eco-system of the Arts in the community; branding Shelby as an Art cultural city.

DRAFT

Bob Englander – He has spoken with the Chamber, and the owners of the bed and breakfasts in town and both were very encouraging and viewed this project as complimentary and envisioned a collaboration due to the lack of beds/rooms available currently in Shelby. During weddings and other events, the additional 21 rooms would be helpful. Uptown merchants, such as Angela Franklin, were encouraging because this project will build on what she's already achieved.

2) What is your project management plan due to you being out of state?

Bob Englander – His plan is that David Stone, who is a local contractor, will be the project manager. Mr. Englander also plans to spend a lot of time in Shelby. His team has been very careful in putting this plan together; stress tests were conducted as to how many rooms, or what the average daily rate for a room would need to be to make Webbley profitable. Also Zoom is a great tool for meetings.

Kristen Boggs-Jaeger – She plans to be here frequently which is a blessing due to her family being here. She would hire a local contractor, and her husband has extensive experience with running projects, timelines and getting things pushed through.

3) For each team member you've identified, can you tell us how you secured their commitment to this project, what conversation you've had about scope, timeline, and expected level of involvement?

Kristen Boggs-Jaeger – Legal is already under retainer. Design is lined up. Chef is coming in November to view the area and do a local food tour, and she will be linked to a local grower. Strategic planners are on board, and a Zoom meeting is scheduled for Thursday of this week. David Stone has also talked with this team and is very motivated to do this project. CT Wilson, a contractor in the Raleigh/Durham area, is happy to sign on as a consultant.

Bob Englander – His two architects will be partners in the project. David Stone has indicated he would like to partner as well as this project.

Mayor Anthony followed up with how much commitment in terms of hours and deliverables – have you had with your team and how much do you expect out of them.

Bob Englander – All team members are committed to this project.

Kristen Boggs-Jaeger - The architect has already looked at their numbers, and he's indicated that they are good to go. Due to the lack of construction being done, it allows them to be nimble and move quickly.

DRAFT

4) Tell us about a time you have disagreed with a client, partner, or governing body during a project. How did you handle the disagreement and how did you keep the relationship functional afterward?

Kristen Boggs-Jaeger – There's so many elements that play into the decision-making. There's financial issues, structural issue, or possibly code issues – can't give a blanket statement that remedies all that. This is a place of business, and you have to find a solution to move the project forward and not let it get stopped.

Bob Englander – About 10 years ago, in Hendersonville, the project was to renovate an old mill. His team came in with an agreed upon idea and they started moving forward. However, the organization that they thought was going to lease the property backed out. This brought on problems with the project moving forward. Ultimately, the project was completed but in a very different way.

Mayor Anthony thanked both Kristen Boggs-Jaeger and Mr. Englander for their time and effort into these proposals; "Council wants you both here. It'd be great if you could work together".

<u>Questions/Comments from City Council members:</u>

Dr. Webber stated for the record that he served two terms on the Cleveland County Arts Council Board and he has an affinity for the Arts. As the Mayor stated, Council is not voting against someone but voting for which proposal would be the best. It would be great if both could work together.

Mr. White – Thanked both for coming. No matter what happens he feels honored that both are interested in investing in Shelby. Shelby is the winner, either way.

Ms. Arth – She also has a background in the Arts and worked for the Cleveland County Arts Council for 19 years. She would love the Webbley to be for everyone, not just a bed and breakfast; she would love to see that at the Hotel Charles one day.

Mr. Englander interjected that his team came and evaluated the Hotel Charles, but it was determined that it has numerous problems that make it difficult to use it as a hotel. The narrow hallways, the length of hallway, the means of egress, and other reasons make it problematic.

Mrs. Boggs-Jaeger commented that the numbers for the Hotel Charles may not work now but the more cultural experiences that we put into our community, the more sought after it will become. She believes this will raise the average room rates, which can make it more attractive for a developer.

DRAFT

Mrs. Bullock – Thanked both for coming and presenting tonight. For Mr. Merritt, she asked if the issues that the City previously had concerns about have been addressed?

Mr. Merritt stated that the City has not conducted an analysis of any of the new information presented tonight. In Kristen Boggs-Jaeger proposal there was a request for a gift of property, the City was not in favor of that, primarily because it would require a reverting clause attached which meant if the property was no longer used as a public purpose, the property would revert to the City of Shelby making the city responsible for maintaining the upkeep, grounds and maintenance, which would be an undue burden on the taxpayers. With the new proposal a gift of property, this is not an issue. The Jaeger's will acquire the property by an outright purchase for the appraised price at the time of the transaction.

Mr. Merritt continued by stating one scenario (CathFord Consulting, LLC proposal) would generate an ongoing property tax revenue stream for the City. The other proposal (Kristen Boggs-Jaeger proposal) is held in a non-profit organization that would likely qualify for tax-exempt status; meaning it would not pay property taxes to the City in the long term. Occupancy tax also needs to be considered. A bed and breakfast obviously generates occupancy tax that the City uses primarily to advance tourism development and for capital investment such as wayfinding signage. There is some opportunity under Kristen Boggs-Jaeger's proposal that could generate some occupancy tax revenue due to overnight stays associated with weddings and other events.

Mr. Merritt stated there are indirect benefits to the City through sales tax generation, anticipated private investment, and what it means to the City long term as a compliment to what already exists in Uptown. Mr. Merritt does not have a recommendation; he feels like his position is to present the facts and the information for City Council to consider. From a purely financial perspective, every dollar that we get into the city's coffers matters to him. We have very few revenue streams and the North Carolina legislature may further limit our revenue streams. There are also rising costs such as fuel costs.

Kristen Boggs-Jaeger asked Mr. Merritt if the monies that will come in from the bed and breakfast will move the needle enough to take away a cultural asset to the community that is for the people? Is it significant or is it negligible against the city budget?

Mr. Merritt said that's a good question. Every dollar matters to someone. It may be significant to a group of people that have worked diligently on a project, or fuel for police vehicles or responding to a fire. The question is do the other benefits that may come from a museum being Uptown outweigh the property tax received. One is quantifiable, the other is indirect and intangible benefits which is hard to put a number on.

DRAFT

Mr. Englander stated he believes there are either 93 or 96 non-profits in the City of Shelby and Cleveland County, all of them trying to get dollars. The only difference between Kristen Boggs-Jaeger and the others is that she can fund the losses.

Mayor Anthony asked one more question to Mr. Englander – Have you tested your numbers, are they out of reach for our area? Mr. Englander responded that his team has stress tested the room rates and they are comparable to the local highway hotels. He stated they have been conservative on their expenses, and conservative on their room rates.

Mayor Anthony asked one more question to Kristen Boggs-Jaeger – Are you willing to put a trust or endowment that will be set aside "in perpetuity." Mrs. Boggs-Jaeger stated that in the 61-page proposal that she submitted in June there is a section there addressing that. She stated she is not putting close to $2 million into something and watching it go away. "Yes, she is prepared to set up a trust or endowment".

Mayor Anthony asked Mr. Merritt to review the timeline for this project and how it has progressed. Mr. Merritt stated the City received funding from the state legislature in 2024. Shortly after, the City engaged with DFI to help plan how those funds would be used. The city then purchased the property in 2024 and engaged with an architect and the DFI team to determine what needed to be done to stabilize the structure. The City sought after a Certificate of Appropriateness from the Historic Preservation Commission in the fall of 2025; this allowed the city to move forward with the construction, renovation, stabilization and a small demolition project. The City bid the construction project in February 2026 and bid the solicitation of proposals in spring 2026, receiving two proposals. Due to questions with both , the proposers were asked to resubmit with clarifications. Since the proposals have been reviewed by DFI and City staff. If a developer is chosen tonight, the City will immediately move into negotiations of a development agreement with the selected developer. The City has just under $2 million left to spend of the $3.95 million grant received from the state. The idea is to incorporate the future use into the architectural plans so that the funds will benefit the preservation of the property and also benefit the developer that is selected. The City has received two extensions on the utilization of the grant funds. Mr. Merritt has worked with the Office of State Budget and Management. According to them, the monies must be encumbered by June 30, 2027. Any monies not encumbered revert back to the state. This is a tight timeframe. In his opinion, the City needs to be under contract with the developer within 60 days. If it takes longer than 60 days, the City should consider developing a scope of work that expends those funds.

Ms. Arth stated that ultimately the Webbley will become a community project and overwhelmingly the community came out in favor of one project. That should carry a lot of weight in Council's decision.

DRAFT

Mayor Anthony gave direction as to how the vote will take place by secret ballot in the interest of time and expediency.

By consensus, City Council decided that the vote on a developer for Webbley be done by secret ballot with Council members choosing a developer on their ballot, the City Clerk picking up the ballots, and the City Attorney tallying and reading the results.

Mr. Lunsford read the results as follows: The vote is 4 – 2, in favor of CathFord Consulting, LLC Consulting, LLC.

Mrs. Lori Waris voted for CathFord Consulting, LLC Consulting, LLC.
Mr. Andrew Hopper voted for CathFord Consulting, LLC Consulting, LLC.
Dr. Charles Webber voted for CathFord Consulting, LLC Consulting, LLC.
Mr. David White voted for CathFord Consulting, LLC Consulting, LLC.
Ms. Arth voted for Kristen Boggs-Jaeger.
Mrs. Bullock voted for Kristen Boggs-Jaeger.

Mayor Anthony stated the next action necessary would be for a motion to allow the City Manager to begin negotiating a development agreement with CathFord Consulting, LLC Consulting, LLC.

> **ACTION TAKEN: Upon a motion from Mr. White, City Council voted 5 – 1 (Arth opposed) to allow the City Manager to begin negotiating a development contract with CathFord Consulting, LLC.**

D. Consent Agenda:

Mayor Anthony presented the consent agenda. Mr. Hopper moved to approve the consent agenda, and the following items were unanimously adopted:

1) **Approval of the Minutes of the Regular Meeting of August 17, 2026**
2) **Approval of a resolution authorizing the sale of City of Shelby owned real property through the Upset Bid Procedure of N. C. General Statute § 160A-269 and identified by parcel numbers:**
    - **a) Parcel 17980: Resolution No. 60-2026**
    - **b) Parcel 18169: Resolution No. 61-2026**
    - **c) Parcel 26522: Resolution No. 62-2026**
    - **d) Parcel 26523: Resolution No. 63-2026**
    - **e) Parcel 18832: Resolution No. 64-2026**
    - **f) Parcel 18842: Resolution No. 65-2026**
    - **g) Parcel 18831: Resolution No. 66-2026**
    - **h) Parcel 18843: Resolution No. 67-2026**
    - **i) Parcel 40701: Resolution No. 68-2026**
    - **j) Parcel 40713: Resolution No. 69-2026**

DRAFT

3) Approval of a resolution to accept an offer to purchase property by Upset Bid Process:

a) 414 Jose Street (Parcel 1774): Resolution No. 70-2026
b) 507 Smith Street (Parcel 18136): Resolution No. 71-2026
c) 515 Smith Street (Parcel 22315): Resolution No. 72-2026
d) 1106 Dodd Street (Parcel 20597):Resolution No. 73-2026

4) Approval of a resolution authorizing application for state loan and/or grant assistance for Water and Wastewater Asset Inventory and Assessment Projects: Resolution No. 74-2026

5) Approval of a resolution approving an application by the City of Shelby Police Department to the U.S. Department of Justice for an Edward Byrne Memorial Justice Assistance Grant and accepting the funds of same: Resolution No. 75-2026

6) Special Event applications:

a) Uptown Hounds 5K: requested date: November 14, 2026

b) First Baptist Church concert, requested date: October 17, 2026

c) Central United Methodist Church Trunk or Treat, requested date: October 25, 2026

END OF CONSENT AGENDA

E. Unfinished Business:

1) City of Shelby's Airport Corporate Hangar Development Project:

a) Adoption of a budget ordinance amendment for the City of Shelby's Airport Corporate Hangar Development Project: Ordinance No. 38-2026

b) Approval of a resolution awarding the contract for the construction of Project Fast at the Shelby-Cleveland County Regional Airport to Two Brothers Utilities, LLC: Resolution No. 76-2026

<u>Presenting: Airport Supervisor, Jack Poole</u>:

- In 2024 Fast Aircraft Supplies contacted the Shelby-Cleveland County Regional about possibly relocating their avionics repair and installation company to North Carolina.

DRAFT

- **The city submitted an economic development application to the Department of Aviation, and they determined it would create 11 new jobs.**
- **The Department of Aviation awarded the airport a grant in the amount of $1.235 million, this amount is 100% grant, with no local match.**
- **In November 2024, City Council adopted Ordinance 65-2024 establishing a project budget ordinance, and Resolution No. 66-2024 authorizing submittal of the grant application to the Department of Aviation.**
- **As owner of the airport, the City's obligation is to complete the grading and construct the utility infrastructure (a shovel ready-building pad, ramp extension, and vehicle access road) necessary to allow the private company to then construct the 100' x 100' hangar building at their full expense.**
- **Construction can begin next month and be completed in 120 days.**
- **This hangar is not for airplane storage, it will be used for avionics, airplane maintenance and repair, which is much needed in this area.**
- **The low bid for this project was submitted by Two Brothers Utilities in the amount of $2.36 million. This was over the anticipated project budget, so the scope of work was reduced by $373,922, resulting in a proposed contract of $1.986 million.**
- **Development Fund fund balance will be used to provide the funding needed to complete this project. This transfer from the economic development fund will then be reimbursed with future annual Non-Primary Entitlement Grant funding that the City receives in the fall of each year. These NPE grants are $166,667 annually.**

ACTION TAKEN: Upon a motion from Mr. Hopper, City Council voted unanimously to approve Ordinance No. 38-2026 entitled, "A BUDGET ORDINANCE AMENDMENT FOR THE CITY OF SHELBY'S AIRPORT CORPORATE HANGAR DEVELOPMENT PROJECT" and Resolution No. 76-2026 entitled, "A RESOLUTION AWARDING THE CONTRACT FOR THE CONSTRUCTION OF PROJECT FAST AT THE SHELBY-CLEVELAND COUNTY REGIONAL AIRPORT TO TWO BROTHERS UTILITIES, LLC."

F. New Business:

1) Golden Leaf grant presentation

a) Approval of the Memorandum of Understanding (MOU) concerning the Golden Leaf Grant for Farmville Road Development between Cleveland County, North Carolina and the City of Shelby, North Carolina

<u>Presenting, Kerri Melton, Assistant City Manager</u>:

DRAFT

- **In 2011 Cleveland County and the City of Shelby jointly purchased the property on Farmville Road and marketed it for manufacturing use.**
- **Approximately 107 acres remain undeveloped at this site.**
- **Unanswered RFI's report the need for shovel-ready sites, so it's been a hard property to market because it hasn't been cleared or graded.**
- **The City and the County worked together to secure a Golden Leaf Grant that was awarded in August 2026.**
- **The project consists of mass grading for a 300,000-sf shovel ready pad and grading for employee and truck parking.**
- **The Golden Leaf Grant award is $1.5 million.**
- **There is a Memorandum of Understanding (MOU) prepared that the County approved of last week.**
- **The MOU details include:**
    - **Cleveland County will serve as grant administrator**
    - **City of Shelby will serve as project manager**
    - **This grant does require a match in the amount of $240,512 which will be shared equally between the City and County**
    - **If additional funding is required the City and County will share the costs**
- **This project will come back before Council several times to approve the design, construction contract awards, and required sewer expansion, but tonight Council is asked to consider approving the MOU between the County and the City.**

ACTION TAKEN: Upon a motion from Dr. Webber, City Council voted unanimously to approve THE MEMORANDUM OF UNDERSTANDING (MOU) CONCERNING THE GOLDEN LEAF GRANT FOR FARMVILLE ROAD DEVELOPMENT BETWEEN CLEVELAND COUNTY, NORTH CAROLINA AND THE CITY OF SHELBY, NORTH CAROLINA."

G. City Manager's Report:

- **City of Shelby has been named one of the Healthiest Employers in North Carolina for 2026. This award celebrates organizations committed to supporting employee health and wellbeing through benefits and initiatives. Thank you to Deb Jolly and our HR team and all our employees for making this achievement possible.**
- **The City of Shelby received the following awards from the United Way:**
    - **R.T. LeGrand award is for the Volunteer of the Year, but rather than recognizing one individual, United Way recognized all city employees for their generosity**
    - **Local Government Campaign with the highest percentage of potential attained in giving**

DRAFT

- Largest Employee giving increase – our employees giving increased by $11,041 from 2025 – higher than any other Cleveland County organization, not just governmental
- Largest Total campaign – City employees raised a total $239,288 which accounts for nearly 30% of the United Way Cleveland County total campaign
- Scott Franklin Commitment to Impact Award was given to Chief Brad Fraser. This award is given to someone that chooses to serve something bigger than themselves. He is certainly worthy of this award

- Regarding the drought conditions – As of September 17th the City is at designation D1 which is a moderate drought. Testing of our secondary water source, the Broad River waterline was successful. It took 3 weeks for the water to flow through the 12-mile waterline from the Broad River to the Water plant; it was done slowly and cautiously. Thank you to Jody Black, Ben Yarboro, Brian Wilson and his team for the many hours that went into testing this intake and transmission line.
- Regarding S. Lafayette Street Waterline Project – Majority of the linear work is complete. There are two remaining tie-ins and a manhole to be installed. Two Brothers Utilities plan to begin paving this week, weather permitting. They are on track to complete the project ahead of the scheduled completion date of October 5th.
- The City has been awarded the 2027 Tarheel League State Baseball tournament that will be held July 22nd – 25th. Four age groups with a total of 42 teams, with over 700 people spending time in Shelby. This is the first time Shelby has hosted the boys' baseball tournament.
- Mr. Merritt recognized one of the City Park employees, William Jeff Wright, for the empathy he demonstrated while assisting a resident that has a loved one at Sunset Cemetery.
- He thanked Shelby Police Department for the diligent work they conducted in arresting the suspect in a homicide that occurred this past weekend. Within a matter of hours they had identified, arrested and secured a confession from the suspect.
- Mayor Anthony and Council member Arth inquired about the timeframe of Sumter Street being paved. Mr. Merritt stated it should be paved within the next 60 days.

H. Council Announcements and Remarks:

Mayor Anthony reminded City Council of the Employee Picnic scheduled for Wednesday, rain or shine.

Mayor Anthony thanked all of City Council for the action they took in the meeting.

DRAFT

It was very stressful and they were under a lot of pressure. This action tonight does not mean that Council does not want any art in this community.

Mrs. Waris stated it was very stressful and you aren't going to make both sides happy unfortunately. Both proposals were good and it was a hard choice.

Mr. Hopper stated that you can't please everyone, and when there are tough decisions to be made, Council must look at being good stewards based on the best interest of all the taxpayers. He believes the decision that was made tonight is in the best interest in the long run and Shelby will benefit. There are other properties in Shelby that can be purchased for the art museum. Elected officials have to make tough decisions and that's what you were elected to do.

Dr. Webber stated it is encouraging to see the level of giving that our city employees give to the United Way. When he was HR Director 15-20 years ago we were a leader in our campaign, and it's great to see the City is still contributing in such a large way. He believes each employee deserves some sort of recognition.

Mr. White gave kudos to the city employees for all their giving to the United Way. Shelby is still a winner no matter how the vote went tonight.

Ms. Arth apologized for missing the ceremony last Saturday at Sunset Cemetery, she's been under the weather. She enjoyed the tour of Webbley she went to the other day, and she looks forward to Webbley coming back to life.

Mrs. Bullock agreed that both candidates were great and Shelby is a winner. She's happy to see Webbley is going to be restored.

I. Adjournment:

1) Motion to adjourn

ACTION TAKEN: Upon a motion made by Ms. Arth, City Council voted unanimously to adjourn the meeting at 8:02 p.m.

Respectfully submitted,

Carol Williams
City Clerk

O. Stanhope Anthony, III
Mayor

Minutes of September 21, 2026

DRAFT

City of Shelby
Agenda Item Summary
October 5, 2026
City Hall Council Chambers

D. Unfinished Business

Agenda Item: D-1

1) Approval of a resolution to accept the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan prepared by McGill Associates: Resolution No. 77-2026

Unfinished Business Item: (Alan Gossett, Stormwater Coordinator)

- Memorandum dated October 1, 2026, from Justin Wright, Engineering Manager to Justin Merritt, City Manager
- Memorandum dated September 24, 2026, from Alan Gossett, Stormwater Coordinator to Justin Wright, Engineering Manager
- Resolution No. 68-2023
- Resolution No. 74-2023
- Stormwater Modeling Master Plan
- Resolution No. 77-2026

City Manager's Recommendation / Comments

Resolution 77-2026 is presented to City Council for consideration to accept the Stormwater Modeling Master Plan, which was conducted by City staff and the engineering firm McGill and Associates.

The Stormwater Master Plan was funded by a $330,000 grant from the NC Division of Water Infrastructure (NCDWI) for stormwater planning. The assessment evaluated the City's existing stormwater system, which included updating our existing GIS database, evaluating future system upgrades and creating a hydrologic and hydraulic model to provide information about how our system may respond to varying amounts of rainfall, typically classified at 10-, 25-, 50-and 100-year storms.

The attached resolution will formally accept the master plan and allow City staff to close out the grant with NCDWI, which is a requirement of the grant terms.

It is my recommendation that Resolution No. 77-2026 be adopted and approved by City Council at this time.

Shelby
NORTH CAROLINA
Post Office Box 207 · Shelby, NC 28151-0207

Memorandum

To: **Justin Merritt, City Manager**

CC: **Ben Yarboro, Assistance City Manager**

From: **Justin Wright, Engineering Manager**

RE: **Recommendation to Accept the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan**

Date: **October 1, 2026**

Background

As noted in the attached memo from Alan Gossett, Stormwater Coordinator, in 2023 the City of Shelby received a funding award offer letter from the NC Division of Water Infrastructure for a $330,000 grant for Stormwater Planning. The City Staff selected McGill Associates based off RFQ selection to complete the Modeling, Infrastructure Assessment, and Master Plan. McGill Associates has completed the project that includes the following:

- Update the City's existing GIS stormwater database through new field data collection, GPS mapping, and condition assessment of conveyance features.
- Hydrologic and Hydraulic Model & System Evaluation
- Evaluating Alternative Solutions at Areas of Concern to alleviate the deficiencies
- Evaluating System Upgrades
- Stormwater Masterplan

As portion of this project McGill associates completed an inventory assessment of stormwater collection. Currently the City of Shelby has 1,065 existing database segment/features and McGill Associates found 277 new segments/features that were added into the City of Shelby GIS database. During this inventory assessment the consultant visually inspected the items and identified 52 areas that City staff need to perform maintenance/replace. Along with this information the consultant created a stormwater model that provides information about what occurs to the City Stormwater System when a 10, 25, 50, and 100-year storm occurs.

This Master Plan provides an updated GIS system that identified 277 new segments that currently were not shown which provides an updated system to model that the City can update, evaluate, and determine where the system needs to be upsized to prevent surcharging of the lines. In the attachments on the Master Plan the model provides a heat map of how the stormwater system handles 10, 25, 50, and 100-year storm that provides staff an idea of how the existing system can handle certain storms. This information provides City staff the tools to help identify areas that have surcharging issues, blockage issues, and alternative solutions to areas of concern that were identified by City staff. This will help with planning along with creating capital improvement plan (CIP) budgeting.

Recommendation

City staff recommend that the Shelby City Council approve the resolution accepting the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan. This resolution will accept the Master Plan and its findings and give City staff engineered guidance on how to approach some of the more challenging drainage areas within the City of Shelby. This resolution will also give the City Manager the authority to sign an executive letter that is required for DWI to obtain final reimbursement.

Please advise if you have any questions or need additional information.

Attachments:

Shelby
NORTH CAROLINA
Post Office Box 207 · Shelby, NC 28151-0207

Memorandum

To: **Justin Wright, Engineering Manager**

From: **Alan Gossett, Stormwater Coordinator**

RE: **Recommendation to Accept the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan**

Date: **September 24, 2026**

Background

In 2023, The North Carolina General Assembly appropriated $82 million from the state's allocation of the American Rescue Plan Act (ARPA) funding for stormwater projects. Utilizing this funding, the State of NC established the Local Assistance for Stormwater Infrastructure Investments (LASII) fund. These funds were made available to municipalities and counties through a competitive grant process managed by North Carolina Department of Environmental Quality (NCDEQ). The purpose of this newly allocated funding is for construction and planning projects that will improve or create infrastructure for controlling stormwater quantity and quality.

In September of 2022, City staff contracted with a consultant to submit an application to the North Carolina Division of Water Infrastructure (DWI) with the intention of funding a modeling project that will aid in future planning for stormwater collection systems for the City of Shelby. In August of 2023, the City of Shelby received a funding award offer letter from the DWI to fund this project. In September of 2023, City Council approved Resolution 68-2023 accepting the $330,000 Stormwater Planning Grant offer from DWI. City Council also approved Resolution 74-2023 selecting McGill Associates for the Citywide Stormwater Modeling, Infrastructure Assessment and Masterplan.

After the selection, City staff met with McGill Associates on the priorities of the project, which included:

- Inventory and Assessment of Stormwater Collection Systems Citywide
- Update the City's existing GIS stormwater database through new field data collection, GPS mapping, and condition assessment of conveyance features

- Develop an approximate Hydrologic and Hydraulic (H&H) Model & System Evaluation of the City's stormwater system within the project scope limits using the Storm Water Management Model (SWMM) platform
- Analyze the existing stormwater system and drainage conditions within specific areas of concern utilizing detailed H&H models for the 10-year, 25-yea, 50-year, and 100-year rainfall events
- Identify deficiencies in the existing stormwater network and evaluate feasible alternatives at specific areas of concern to improve flooding and drainage capacity
- Prepare a prioritized plan for capital improvements recommendations for short- and long-term stormwater projects, funding opportunities, and operation and maintenance strategies
- Evaluating Alternative Solutions to alleviate the deficiencies (Implement nature-based solutions to eliminate erosion and sedimentation)

The purpose of this project was to update and expand the City's existing stormwater system database, assess system condition and performance, and develop a citywide planning tool to guide future improvements, maintenance, capital investment, and evaluate flooding and infrastructure capacity across the City, and identify feasible solutions to reduce flooding and improve system performance. The plan will also assist the City in maintaining compliance with its National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit and in meeting long-term goals for stormwater program management.

Review

McGill Associates has completed the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan and has completed the goals that were set out for the project. Four (4) primary Areas of Concern (AOCs) were selected for detailed evaluation based on observed and reported flooding, as well as coordination with City staff. These include:

- Area 1 – Suttle Street and Carolina Avenue
- Area 2 – Montrose Drive near Windsor Drive and Hickory Creek
- Areas 3 & 4 – Royster Avenue and Broad Street

For each AOC, H&H Modeling was conducted to assess existing and future flooding conditions and to evaluate two conceptual alternatives for potential improvements. A Stormwater Master Plan (SWMP) has been prepared to summarize these findings and provide recommendations for the City's consideration.

Recommendation

City staff recommends that the Shelby City Council approve the resolution accepting the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan. This resolution will accept the Master Plan and its findings and give City staff engineered guidance on how to approach some of the more challenging drainage areas within the City of Shelby. This resolution will also give the City Manager the authority to sign an executive letter that is required for DWI to obtain final reimbursement.

Please advise if you have any questions or need additional information.

Attachments:

- Resolution No. 68-2023
- Resolution No. 74-2023
- Stormwater Modeling Master Plan

RESOLUTION NO. 68-2023

A RESOLUTION FOR THE ACCEPTANCE OF THE LOCAL ASSISTANCE FOR STORMWATER INFRASTRUCTURE INVESTMENTS (LASII) FUNDING GRANT OFFER FOR CITYWIDE STORMWATER MODELING, INFRASTRUCTURE ASSESSMENT, AND MASTER PLAN

WHEREAS, the American Rescue Plan Act (ARPA), funded from the State Fiscal Recovery Fund, was established in Session Law (S.L.) 2021-180 to assist eligible units of local government with meeting their drinking water and/or wastewater and/or stormwater infrastructure needs; and,

WHEREAS, the North Carolina Department of Environmental Quality has offered Local Assistance for Stormwater Infrastructure Investments (LASII) ARPA funding in the amount of $330,000 to perform the work detailed in the submitted application; and,

WHEREAS, the City of Shelby intends to perform said project in accordance with the agreed scope of work.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SHELBY, NORTH CAROLINA:

Section 1. That the City of Shelby does hereby accept the ARPA grant offer of $330,000.

Section 2. That the City of Shelby does hereby give assurance to the North Carolina Department of Environmental Quality (NCDEQ) that any Conditions or Assurances contained in the Funding Offer and Acceptance (award offer) will be adhered to; has substantially complied, or will substantially comply, with all federal, State of North Carolina (State), and local laws, rules, regulations, and ordinances applicable to the project; and to federal and State grants and loans pertaining thereto.

Section 3. That Rick Howell, City Manager, and successors so titled, is hereby authorized and directed to furnish such information as the appropriate State agency may request in connection with this project; to make the assurances as contained above; and to execute such other documents as may be required by the North Carolina Department of Environmental Quality, Division of Water Infrastructure.

Adopted this the 18th day of September 2023 at Shelby, North Carolina.

O. Stanhope Anthony III
Mayor

ATTEST:

Carol Williams
City Clerk

RESOLUTION NO. 74 – 2023

A RESOLUTION AUTHORIZING SELECTION OF MCGILL ASSOCIATES BASED ON QUALIFICATIONS FOR PROFESSIONAL CIVIL ENGINEERING SERVICES FOR THE CITYWIDE STORMWATER MODELING, INFRASTRUCTURE ASSESSMENT, AND MASTER PLAN

WHEREAS, the City of Shelby desires to obtain expert professional civil engineering services related to the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan; and,

WHEREAS, the City of Shelby must contract with a professional civil engineering firm to provide the professional civil engineering services needed for the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan; and,

WHEREAS, City staff issued a Request for Qualifications on September 15, 2023 to obtain professional civil engineering services from interested firms related to this project in accordance with North Carolina General Statute 143-6.31; and,

WHEREAS, five (5) proposals were received on October 6, 2023 from professional civil engineering firms interested in performing the work associated with this project; and,

WHEREAS, City staff has reviewed the proposals and determined that McGill Associates is the most qualified firm to perform and provide the services as outlined in the Request for Qualifications.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SHELBY, NORTH CAROLINA:

Section 1. The City Council of the City of Shelby hereby desires for the City Manager to enter into negotiations with McGill Associates to negotiate a contract for the above referenced project.

Section 2. If a fair and reasonable fee cannot be negotiated with the best qualified firm, negotiations will be terminated and initiated with the next best qualified firm.

Section 3. The City Manager is hereby authorized to execute a contract with a firm after successful negotiations.

Section 4. This resolution shall become effective upon its adoption and approval.

Adopted and Approved this the 6th day of November, 2023.

O. Stanhope Anthony III
Mayor

ATTEST:

Carol Williams
City Clerk

2026

Stormwater Master Plan Report

CITY OF SHELBY, NORTH CAROLINA

Prepared by:

McGill Associates

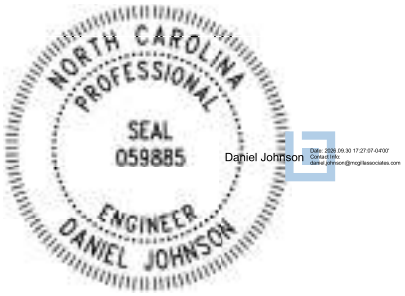
McGill Associates, P.A.
55 Broad Street
Asheville, North Carolina 28801
Firm License No.: C-0459

CITY OF SHELBY

CLEVELAND COUNTY, NORTH CAROLINA

STORMWATER MASTER PLAN REPORT

DANIEL JOHNSON, PE



55 Broad Street

Asheville, North Carolina 28801

828.412.4599

SEPTEMBER 2026

PROJECT NO. 22.00142

EXECUTIVE SUMMARY

City of Shelby Stormwater Master Plan Report

Introduction/Scope of Work

The City of Shelby (City) retained McGill Associates (McGill) to complete the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan. The primary purpose of this project was to establish a comprehensive stormwater system inventory, evaluate flooding and infrastructure capacity across the City, and identify feasible solutions to reduce flooding and improve system performance.

The project included updating the City's geographic information systems (GIS) -based stormwater system inventory through field global positioning system (GPS) and survey data collection, completing a condition assessment of stormwater infrastructure, and performing citywide hydrologic and hydraulic modeling using Personal Computer Storm Water Management Model (PCSWMM). The modeling effort evaluated existing and future development conditions for the 10-, 25-, 50-, and 100-year design storms to assess the capacity of the City's stormwater network.

Four primary Areas of Concern (AOCs) were selected for detailed evaluation based on observed and reported flooding, as well as coordination with City staff. These include:

- Area 1 – Suttle Street and Carolina Avenue
- Area 2 – Montrose Drive near Windsor Drive and Hickory Creek
- Area 3 & 4 – Royster Avenue and Broad Street

For each AOC, hydrologic and hydraulic (H&H) modeling was conducted to assess existing and future flooding conditions and to evaluate two conceptual alternatives for potential improvements. A Stormwater Master Plan (SWMP) has been prepared to summarize these findings and provide recommendations for the City's consideration.

Recommendations for Stormwater Improvements

After completing the requested scope of services, McGill is pleased to provide the following recommendations to the City:

Area 1 – Suttle Street and Carolina Avenue

Issue: Roadway flooding occurs during the 25-year storm event near the culvert crossing at Suttle Street and Carolina Avenue due to limited inlet capacity, low roadway elevations, and elevated tailwater conditions in the receiving stream.

Recommended Solution: Install concrete swales along both sides of the culvert to improve drainage and route stormwater toward the receiving stream. This solution enhances runoff conveyance from both roadway sags without overloading the existing network.

Public Benefit: Reduces roadway ponding and improves access along Suttle Street during storm events.

Area 2 – Montrose Drive near Windsor Drive and Hickory Creek

Issue: Flooding occurs during the 10-year storm event along Windsor Drive between Pinecone Lane and Hickory Creek due to backwater from the creek and undersized stormwater infrastructure.

Recommended Solution: Install new swales and catch basins along Windsor Drive, construct a berm along Hickory Creek to prevent backwater effects, and install flap gates on existing and new outfalls. These improvements enhance system performance and reduce flood impacts from high creek stages.

Public Benefit: Reduces roadway and yard flooding, increases conveyance capacity, and improves discharge to Hickory Creek.

Area 3 & 4 – Royster Avenue and Broad Street

Issue: Overbank flooding along the Tributary to the First Broad River causes roadway overtopping and access limitations along Royster Avenue and Broad Street during the 10-year storm event and smaller high-intensity events.

Recommended Solution: Replace the Broad Street culvert with a larger box culvert and create floodplain benching upstream of Royster Avenue. These improvements expand conveyance capacity, lower flood elevations, and reduce the frequency of roadway overtopping.

Public Benefit: Reduces roadway overtopping, mitigates flooding near homes and businesses, and improves safety and mobility along both corridors.

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INTRODUCTION

The City of Shelby is located in Cleveland County, North Carolina. As a regional hub for Cleveland County, the City includes a mix of residential, commercial, and industrial development within a drainage network that ultimately discharges to tributaries of the First Broad River. The City's stormwater infrastructure consists of a combination of closed-pipe networks, open ditches, culverts, and drainage channels located throughout its urbanized area and extending into surrounding areas. Much of the system was constructed decades ago, and portions of the network have reached the end of their service life or are insufficient to convey runoff from today's rainfall events. As a result, the City experiences recurring roadway flooding, ponding, and erosion in several neighborhoods and intersections following moderate to heavy rainfall.

In 2024, the City received grant funding from the North Carolina Department of Environmental Quality's Division of Water Infrastructure (NCDEQ DWI) to complete a Stormwater Asset Inventory and Assessment and SWMP. The purpose of this project is to update and expand the City's existing stormwater system database, assess system condition and performance, and develop a citywide planning tool to guide future improvements, maintenance, and capital investment. The plan will also assist the City in maintaining compliance with its National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Permit and in meeting long-term goals for stormwater program management.

The City retained McGill to evaluate the City's stormwater network with a focus on key drainage problem areas. The goals of this evaluation were to:

1. Update the City's existing GIS stormwater database through new field data collection, GPS mapping, and condition assessment of conveyance features.
2. Develop an approximate H&H model of the City's stormwater system within the project scope limits using the Storm Water Management Model (SWMM) platform. For the purposes of this report, this model will be referred to as the "citywide" model.
3. Analyze the existing stormwater system and drainage conditions within specific areas of concern utilizing detailed H&H models for the 10-, 25-, 50-, and 100-year rainfall events.
4. Identify deficiencies in the existing stormwater network and evaluate feasible alternatives at specific areas of concern to improve flooding and drainage capacity.
5. Prepare a prioritized plan for capital improvements recommendations for short- and long-term stormwater projects, funding opportunities, and operation and maintenance strategies.
6. Conduct a public meeting to present the plan's findings and recommendations.

The AOCs evaluated as part of this study include locations identified by the City as experiencing recurring roadway flooding and drainage deficiencies and are outlined below:

- Area 1 – Suttle Street and Carolina Avenue

- Area 2 – Montrose Drive near Windsor Drive and Hickory Creek
- Area 3 – Royster Avenue near Legrand Street
- Area 4 – Broad Street near Wilmouth Street

Areas 3 and 4 are located within the same region of the city and are hydraulically connected through a shared tributary to Hickory Creek. Due to their proximity, similar drainage characteristics, and interdependent flow paths, these two areas have been evaluated together within the H&H analysis. Accordingly, references to these locations are combined throughout the remainder of this report and collectively described as Area 3 & 4 – Royster Avenue and Broad Street.

Figure 1.1 illustrates the location of the AOCs within the city limits.

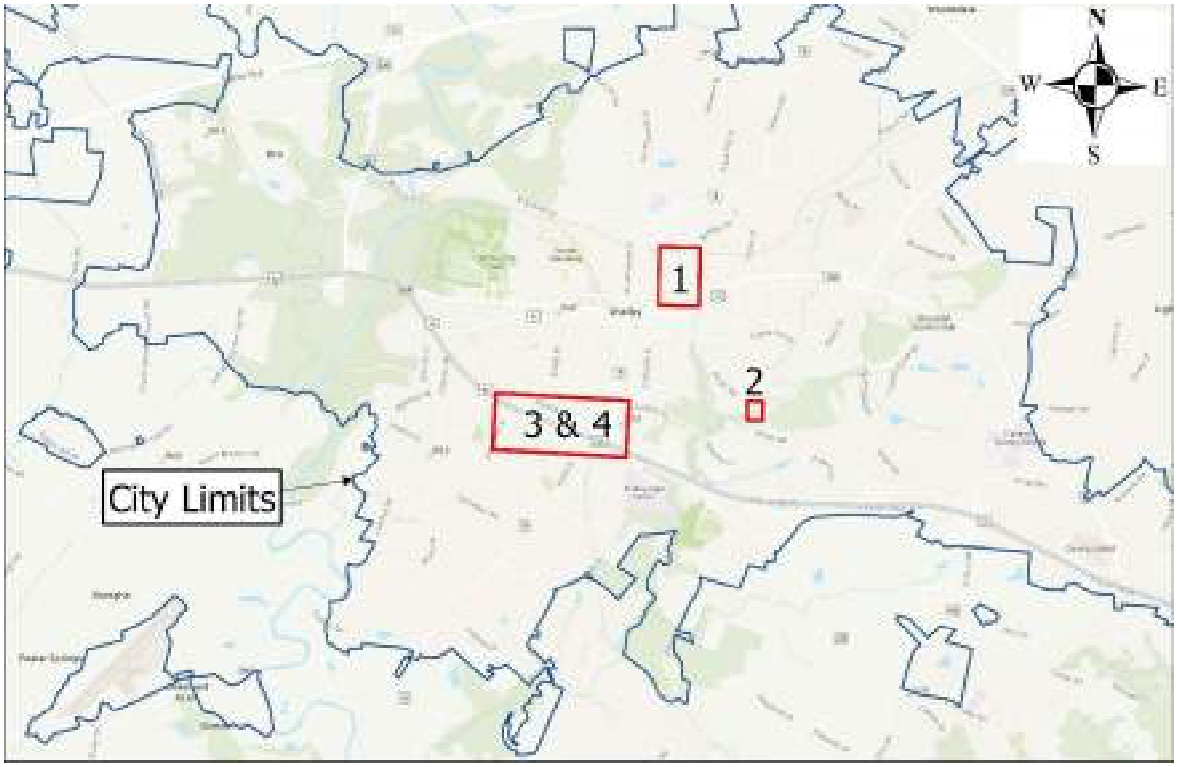


Figure 1.1 - Location Map

The SWMP serves as a comprehensive reference document summarizing existing conditions, modeling results, conceptual improvement alternatives, and recommendations for infrastructure upgrades throughout the city. Deliverables include a GIS geodatabase, validated H&H models, alternatives evaluation matrix, recommendations for capital improvement projects, project fact sheets, and a final SWMP report for submittal to NCDEQ DWI.

Completion of this master planning effort provides the City with a robust, data-driven framework to guide future stormwater management decisions, improve flood resilience, and protect public infrastructure, property, and water quality throughout the City of Shelby.

EXISTING STORMWATER SYSTEM MAPPING AND CONDITION

As part of the citywide SWMP, McGill obtained and reviewed available information from the City and other public sources to establish an understanding of the City's existing stormwater network. Available data from City records, the North Carolina Department of Transportation (NCDOT), the North Carolina Spatial Data Download (NC SDD), and the United States Geological Survey (USGS) StreamStats database were compiled to identify existing stormwater infrastructure, drainage patterns, and watershed boundaries within the study area.

McGill performed a desktop review of the City's existing GIS stormwater database, including feature layers, attribute fields, and available mapping, to identify missing or incomplete data. Field data collection was completed to document stormwater features, including pipes, structures, inlets, manholes, junction boxes, and conveyances. Data collection consisted of GPS location and attributes for each identified feature, including structure type, pipe sizes, and structure depths where applicable. Field staff were trained to identify the presence of flow that could indicate potential illicit discharges to the City's (MS4) system. There were no such reported flags of suspicious dry-weather flows or concerning characteristics of flows, in general. Field personnel also annotated the condition of stormwater features wherever condition did not meet a functional standard. The Condition Assessment included comments indicating structural degradation or maintenance needs, and observations of operational and hydraulic functionality (debris/blockage), and are supported by photographic evidence where possible. The assessment included findings related to blocking, burying, structural damage, function, access, visibility, and general need for maintenance or repair. Any asset with such findings and/or greater than 50% blockage were flagged. From over six hundred assets collected, fifty-two assets received the Condition Assessment flag.

Survey data were collected within each of the four AOCs to obtain survey-grade elevations necessary for H&H modeling. Horizontal survey control was based on the North Carolina State Plane Coordinate System, NAD 83 (2011), and vertical data were referenced to NAVD 88 (GEOID 2018).

Upon completion of field data collection, McGill updated the City's stormwater GIS database with the collected information, utilizing existing attribute fields and additional comments regarding flow that can be used to indicate potential illicit discharges. Quality assurance and quality control (QA/QC) reviews were performed with the City to verify data accuracy and completeness. A desktop analysis was performed to review open and closed network points and to connect conveyance systems and eliminate gaps in the mapped network. This effort also included review of available record drawings to identify unmapped features. In total, 1,065 existing database features were updated and 277 are new. The updates are split nearly evenly between structures and pipes.

The updated GIS stormwater database would serve as the foundation for the hydraulic and hydrologic modeling completed as part of this study and will be provided as a digital submittal to the City. Mapping developed from this effort, including citywide stormwater network figures and detailed mapping within each AOC, as well as a Condition Assessment Table is provided in **Appendix A**.

HYDROLOGIC AND HYDRAULIC ANALYSIS

H&H modeling was performed using Computational Hydraulics International's (CHI) PCSWMM to evaluate the City's stormwater network under existing conditions. The modeling program was developed in two primary stages. First, a citywide model was created to evaluate general drainage performance across the entire municipal boundary and identify areas prone to flooding. Second, detailed models were developed for the four AOCs to evaluate localized flooding mechanisms and to assess potential improvement alternatives.

The models were developed using a two-dimensional (2D) modeling framework that incorporates one dimensional (1D) hydraulic elements within the 2D domain. In this type of model, the 1D components represent the closed conveyance system such as pipes, culverts, manholes, and some open channel sections, where flow is routed through a connected network using dynamic wave routing to simulate full flow, pressurized, and surcharge conditions. The 2D mesh represents the ground surface and captures overland flow movement across the terrain. Rainfall is applied to subcatchments within the 2D surface, portions of the rainfall infiltrate, flow as shallow sheet runoff, or enter inlets connected to the 1D system. The mesh allows surface water to accumulate in low-lying areas, spread across roadways, and flow toward inlets or outfalls according to topography. This integrated approach provides a realistic representation of how runoff moves across the land surface and through the stormwater system during storm events.

Hydrologic parameters were developed using the Soil Conservation Service (SCS) Curve Number method based on land cover and soil characteristics. Land cover data were obtained from the National Land Cover Database (NLCD), and soil data were sourced from the United States Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database. Rainfall depths for the 10-, 25-, 50-, and 100-year, 24-hour design storms were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 database.

Topographic data were derived from LiDAR and digital elevation models obtained from the NC SDD, supplemented by aerial imagery and field survey information collected within the AOCs. Subcatchments were generated at the same resolution as the mesh elements to maintain consistency between the hydrologic and hydraulic domains. Horizontal references for pipes, inlets, and manholes were obtained from the City's existing GIS database and updated using McGill's field data collection. Rim elevations and pipe inverts were estimated where survey data were not available, with actual survey-grade data used in the AOC models.

CITYWIDE MODEL DEVELOPMENT

The citywide model was developed as a planning-level tool to evaluate overall drainage system performance within city limits and identify areas where capacity limitations may exist within the City's network. The model was constructed at a coarser scale than the detailed AOC models, using LiDAR-grade topography and a broader computational mesh that generally ranged from 50 to 250 feet, depending on local terrain, proximity to stormwater infrastructure, and relative density of stormwater infrastructure. Available GIS data for stormwater features were

incorporated, and pipe connectivity was generalized to represent the primary conveyance network while maintaining computational efficiency.

Since the purpose of the citywide model was to assess general system behavior rather than design-level performance, small or isolated drainage features were omitted. Pipes 15 inches in diameter and smaller were generally excluded, particularly where they were identified as serving private properties or local connections with limited system influence. Outfalls were assigned fixed tailwater conditions based on average water surface elevations within major receiving streams or were otherwise modeled with a normal depth. The model simulated the 10-year, 25-year, 50-year, and 100-year, 24-hour design storms to evaluate system response, identify areas of surface flooding, and highlight locations where surcharging may occur within the existing stormwater system.

Results of the citywide analysis were used to delineate major drainage patterns across the city, generate heat maps of predicted flooding, and validate modeled flooding extents against historical flooding locations documented by City staff. The model successfully indicated flooding in areas consistent with field observations, including the four defined AOCs, indicating that the overall drainage patterns were accurately represented and that the model provides a reliable foundation for subsequent, detailed evaluation.

AREA OF CONCERN MODEL DEVELOPMENT

Following completion of the citywide modeling, detailed H&H models were developed for the four AOCs identified by the City. These localized models incorporated survey-grade data at specific locations, higher mesh resolution, and field-verified infrastructure information to accurately simulate street-level drainage behavior and ponding. Mesh resolution within these models ranged from 10 to 100 feet, compared to the coarser mesh used for the citywide model. The detailed AOC models were used to evaluate existing system performance, identify deficiencies such as undersized or missing infrastructure, and analyze roadway flooding during design storm events. The results from these models provided the technical basis for developing and comparing conceptual improvement alternatives and for recommending potential capital improvement projects consistent with the objectives of the SWMP.

The data used to develop the models is provided in **Appendix B**. This appendix includes maps illustrating the soil and land cover data used to develop curve numbers and hydrologic inputs, as well as rainfall data obtained from NOAA. The complete citywide and AOC hydrologic and hydraulic models are included as digital submittals with this report.

A brief description of each AOC is provided below.

AREA 1 – SUTTLE STREET AND CAROLINA AVENUE

The first AOC includes Carolina Avenue, Suttle Street, and the surrounding drainage basin represented in the model. To accurately characterize hydrologic inputs and system performance, the model was extended beyond the immediate AOC area to encompass the upstream watershed and stormwater infrastructure that contribute flow to the primary AOC system. The primary focus area, where roadway flooding has been observed and evaluated for

potential improvements, includes portions of Suttle Street, Carolina Avenue, East Sumter Street, Oakland Drive, and adjacent local roads that directly influence drainage conditions within the AOC. Land use in the area is primarily residential, with occasional open grass parcels and some commercial or industrial development in the upper watershed.

Existing stormwater infrastructure within the primary focus area consists of a series of curb inlets, manholes, and underground storm pipes ranging in size up to approximately 60 inches in diameter. A tributary stream of Hickory Creek flows from northwest to southeast through this portion of the model and is conveyed beneath three roadway crossings. At North Dekalb Street, the tributary passes through a 6-foot-tall by 13-foot-wide box culvert. Downstream at Carolina Avenue, the stream is conveyed through a single-barrel 5-foot by 5-foot box culvert. At Suttle Street, the stream flows through a triple-barrel culvert system consisting of one 7-foot-diameter circular barrel and two 5.5-foot-diameter circular barrels. Stormwater runoff within the AOC generally follows street grades toward curb inlets, is conveyed through the closed pipe network, and ultimately discharges to the tributary stream at multiple points within the focus area.

AREA 2 – MONTROSE DRIVE NEAR WINDSOR DRIVE AND HICKORY CREEK

This AOC includes Montrose Drive, Windsor Drive, and the surrounding drainage basins where Hickory Creek and Logan Branch converge. The hydraulic model developed for this area was extended beyond the immediate area of focus to include the contributing watershed and upstream stormwater infrastructure that influence flow conditions at the AOC. The modeled area also extends downstream beyond the Kings Road bridge in order to capture the impacts of several stream convergences near the Kings Road bridge constriction. The primary focus area, where roadway and yard flooding have been reported and evaluated for potential improvements, encompasses Montrose Drive, Windsor Drive, and Pinecone Lane. Land use within this area is primarily residential, characterized by established neighborhoods with mature tree cover and open lawns.

Existing stormwater infrastructure within the primary focus area consists of small, disconnected segments of storm drainage, generally ranging from 15 to 24 inches in diameter. These systems primarily capture localized roadway runoff and discharge directly to Hickory Creek or its tributaries at multiple locations within the modeled area. Hickory Creek flows generally from north to south through the AOC, with open channel segments that receive direct discharge from several stormwater outfalls. The network lacks continuous conveyance between most streets, resulting in limited system connectivity and dependence on surface flow to route runoff toward inlets or open channel sections. Stormwater within the AOC primarily follows street grades toward these inlets, with excess flow conveyed overland toward Hickory Creek or its tributaries. At several locations throughout the AOC, low-lying areas near residences impact the conveyance of overland flow toward the local creeks.

AREA 3 & 4 – ROYSTER AVENUE AND BROAD STREET

This AOC includes Royster Avenue, Broad Street, and the surrounding drainage basin contributing to the tributary stream of Hickory Creek and the stormwater system along West Dixon Boulevard. The hydraulic model for this area was extended beyond the primary focus

area to incorporate the contributing watershed and upstream stormwater infrastructure that influence flow conditions and runoff reaching the AOC. The primary focus area encompasses Royster Avenue and Broad Street, including the tributary stream that runs between them, as well as adjacent commercial and residential parcels that drain toward this corridor. Land use within the area consists of a mix of commercial development fronting West Dixon Boulevard and residential neighborhoods along connecting local streets.

Existing stormwater infrastructure within the primary focus area consists of a combination of curb inlets, manholes, and underground storm pipes generally ranging from 15 to 36 inches in diameter, along with several culverts along the tributary stream. The Royster Avenue crossing includes a double-barrel 5-foot culvert, and the Broad Street crossing includes a double-barrel 5-foot by 7-foot elliptical culvert. Additionally, the tributary travels under West Dixon Boulevard, and nearby development, through a non-uniform culvert. The stormwater network in this area is fragmented, with separate drainage systems serving portions of Royster Avenue, Broad Street, and nearby commercial developments before discharging to open channels or the tributary of Hickory Creek. The tributary flows generally from northeast to southwest through the AOC, consisting of open channel sections that transition into enclosed culverts as it passes beneath Royster Avenue, Broad Street, West Dixon Boulevard, and portions of the commercial development. Runoff from the commercial parcels along West Dixon Boulevard is primarily captured through isolated storm systems within parking areas, while roadway runoff along Royster Avenue and Broad Street is conveyed through smaller diameter pipes with limited connectivity between systems. Drainage within the AOC is conveyed through multiple outfalls that discharge to the tributary and adjacent open channel segments.

EXISTING STORMWATER SYSTEM ANALYSIS

The existing stormwater system analysis evaluated drainage performance across the city and within each of the identified AOCs under existing and projected development conditions. Modeling results confirmed the locations of known flooding and identified additional areas where the stormwater system exhibits capacity limitations or incomplete connectivity. The analysis also provided insight into the underlying causes of flooding, including undersized conveyance, shallow grades, and restricted discharge to receiving streams.

The citywide and detailed H&H models described in Section 3 were used to simulate the 10-, 25-, 50-, and 100-year storm events. These simulations were used to evaluate system behavior, roadway ponding, and surcharging across a range of design conditions. Future development conditions were also evaluated by adjusting land use and impervious cover parameters to reflect the maximum development densities permitted by current zoning, providing an understanding of how additional runoff could impact system performance.

Maps illustrating the modeled flooding extents for each storm event, both at the citywide scale and within each AOC, are included in **Appendix C**. These figures supplement the analysis by depicting inundation patterns, areas of roadway overtopping, and locations where system capacity limitations are most pronounced.

CITYWIDE ANALYSIS

The citywide analysis provided an overall assessment of existing stormwater system performance throughout the city. Model results were reviewed to evaluate general drainage patterns, identify locations of surface flooding and surcharging, and compare predicted flooding extents to documented problem areas.

The analysis confirmed that modeled flooding corresponded closely with areas known to experience recurring drainage issues, indicating that the citywide model reliably represents existing system behavior. While flooding and surcharging were observed in various locations across the city, these conditions were most prevalent within the older, urbanized areas of the network where stormwater infrastructure is aged, undersized, or fragmented. The relatively high percentage of impervious areas in the urbanized areas quickly overwhelm the stormwater system by decreasing infiltration and increasing runoff.

Overall, the citywide model established a comprehensive baseline understanding of how the existing stormwater system performs under major storm events and provided a consistent framework for the more detailed AOC evaluations that follow.

AREA 1 – SUTTLE STREET AND CAROLINA AVENUE

This AOC includes Suttle Street and Carolina Avenue near the culvert crossing of a tributary to Hickory Creek. The roadway experiences recurrent flooding during the 25-year storm event, with ponding occurring at the low-points on both sides of the culvert where grades slope toward the stream and runoff is not efficiently conveyed out of the roadway. Flooding in this area is primarily the result of high tailwater conditions in the tributary that limit discharge from the local storm drainage system, though some pipes are undersized in the existing stormwater network.

Stormwater within this area is directed toward the tributary crossing through three primary closed drainage systems that converge at or near the culvert on Suttle Street. On the east side, a main stormwater line begins near the intersection of Carolina Avenue and Airline Extension and flows southwest along Carolina Avenue before outfalling to the tributary at the south side of the roadway, just east of the culvert crossing. A second system originates near Oak Street and extends southwest beneath the adjacent church parking lot to Suttle Street, where it discharges to the tributary on the south side of the roadway. A third system begins along East Sumter Street and flows northeast toward Suttle Street, outfalling to the tributary on the south side of Suttle Street near the same crossing. These three conveyance networks all route stormwater toward the same receiving stream, creating two primary outfall locations at the culvert crossing where elevated water levels in the tributary strongly influence upstream hydraulic conditions.

During major rainfall events, water levels in the tributary rise downstream of the Suttle Street culvert and create backwater that propagates into both the eastern and western storm drain networks. The elevated stream stage prevents stormwater from freely discharging from the upstream pipes, causing surcharging within the aforementioned stormwater conveyance lines. The backwater condition reduces the effectiveness of the existing system which results in

surface ponding within the roadway sags and along the approaches to the culvert until the water level in the tributary subsides.

Area 2 – Montrose Drive near Windsor Drive and Hickory Creek

This AOC includes Montrose Drive, Windsor Drive, and the surrounding drainage basin connected to Hickory Creek east of State Road 2050 (Kings Road). The area experiences significant flooding during the 10-year storm, and larger storm events, due to the combined effects of the confluence of Hickory Creek with Logan Branch, the flow restriction where Kings Road crosses the creek, and localized low-points in the creek overbanks. In addition to the backwater experienced upstream of Kings Road, the area experiences localized flooding along Windsor Drive in areas where runoff is not effectively conveyed to the streams.

Existing stormwater infrastructure within the focus area consists of small, fragmented segments of storm drainage that collect localized roadway runoff and discharge directly to Hickory Creek or its tributaries at multiple points, with limited connectivity between networks. One drainage pipe originating near 315 Windsor Drive crosses beneath the roadway and continues parallel to it before outfalling to the tributary, where it becomes submerged during elevated creek stages, reducing system discharge capacity. Model results are consistent with the flooding reported by the City near 315 Windsor Drive, where a shallow depression between the residence and the roadway collects runoff from surrounding streets and experiences prolonged ponding during large storm events.

When water levels in Hickory Creek and its Logan Branch rise, backwater propagates into the storm drain system and the stream overtops its banks, further limiting the ability of the Windsor Drive outfall to adequately drain the adjacent yard and roadway. Ponding along the east side of Windsor Drive near 315 persists as the accumulated water has limited opportunity to drain until creek levels recede.

Area 3 & 4 – Royster Avenue and Broad Street

This AOC includes Royster Avenue, Broad Street, and the surrounding drainage basin that contributes to the tributary of the First Broad River. The tributary flows generally from northeast to southwest through the study area and passes beneath Royster Avenue, West Dixon Boulevard, and Broad Street through a series of culvert crossings. The area experiences recurring flooding as a result of overbank flow from the tributary, which overtops both Royster Avenue and Broad Street during the 10-year storm event and even smaller, high-intensity rainfall events. This level of flooding during relatively frequent storms indicates that the existing culverts are insufficiently sized to convey runoff from the contributing watershed, restricting safe travel and affecting access to nearby homes and businesses.

The culvert beneath Royster Avenue consists of a double-barrel 5-foot circular system, while the Broad Street crossing includes a double-barrel elliptical culvert measuring approximately 5 feet high by 7 feet wide per barrel. The Royster Avenue culvert is undersized to convey the 10-year storm event and experiences full flow conditions that result in upstream ponding and overtopping of the roadway. The Broad Street culvert, while possessing a higher capacity than

Royster Avenue, causes overtopping during the 25-year event. Anecdotally, this crossing has also experienced overtopping during shorter high-intensity storms. During storm events, runoff from the surrounding watershed combines with high flows in the tributary, quickly exceeding the capacity of these culverts and forcing water out of the channel banks and across the adjacent roadways. The magnitude and velocity of these flows are further influenced by the surrounding land use, which includes extensive commercial development and large paved areas that generate rapid runoff during rainfall events.

Hydraulic modeling results confirm that Royster Avenue overtops during the 10-year storm and Broad Street overtops during the 25-year storm event. Both culverts remain inundated for an extended duration during larger storms. These results are consistent with observed flooding within the area and field conditions documented during the study. Low roadway elevations and undersized culvert capacity contribute to the recurring flooding observed within this area.

Modeling Results Summary

The results of the existing conditions analysis are summarized in Table 4.1, which presents representative water surface elevations (WSEL) and flood depths at key points of interest (POIs) within each area of concern. These values provide a reference for understanding current flooding conditions and serve as the basis for comparison with the improvement alternatives discussed in Section 5.0.

Additional modeling outputs are provided in **Appendix C**, including existing condition maps of the 10-, 25-, 50- and 100-year storm events, depths and surcharging junctions, and supplemental AOC-specific tables that expand upon Table 4.1. These tables present WSELs and flood depths for all evaluated storm events, using the same POIs shown below.

Table 4.1 - Existing Condition Model Results

Area of Concern	Point of Interest	Elevation (ft.)	25-YR Storm	
			WSEL (ft.)	Flood Depth (ft.)
1	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.66	2.12
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00		
	Carolina Ave. - Downstream of Culvert (Stream El.)	800.75	803.50	2.75
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.25	3.99
	Suttle St. - Upstream of Culvert (Road El.)	806.20		
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.83	4.72
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.67	0.59
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.45	0.85
2	Upstream Kings Rd: North Side - Hickory Creek	742.66	743.50	0.84
	Upstream Kings Rd: South Side - Hickory Creek	744.20	744.22	0.02
	315 Windsor Dr.: House - NW of House	744.71	744.76	0.05
	315 Windsor Dr.: House - SW of House	744.06	744.76	0.69

	315 Windsor Dr.: House - West of House	744.07	744.76	0.68
3 & 4	**Royster Ave. - Upstream of Culvert (Stream El.)**	806.32	815.20	8.88
	Royster Ave. - Upstream of Culvert (Road El.)	814.20		
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	808.57	9.72
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.42	6.32
	Broad St. - Upstream of Culvert (Road El.)	800.90		

FUTURE DEVELOPMENT

Future development conditions were evaluated to assess how increases in impervious cover could influence stormwater runoff and system performance across the citywide model and within each AOC. Current zoning regulations do not specify maximum percent impervious limits for most districts, and existing land use conditions generally fall below the densities permitted by zoning. To represent potential buildout conditions, curve numbers within the models were adjusted to reflect the maximum density and land use allowed under current zoning classifications.

For example, areas zoned R10 were updated from their existing NLCD assignments to a curve number of 75 to represent typical one-quarter-acre residential development. Larger increases occurred within undeveloped business-zoned areas and throughout the Corridor Protection District, where future growth and redevelopment are expected.

Citywide simulations were completed for all storm events under these future-development assumptions. The resulting changes in water surface elevation varied across the city, with some basins exhibiting little or no change and others experiencing increases of up to approximately 2.5 feet. The level of change was dependent on drainage characteristics, existing system capacity, and the degree of impervious expansion within each contributing watershed.

Future development conditions were also applied to each of the AOC models. These simulations were performed for the AOC existing conditions models as well as for the Alternative 1 and Alternative 2 models to evaluate how potential development could affect localized drainage patterns, roadway flooding, and the performance of the proposed improvements.

All supporting materials for the future development evaluations are included in **Appendix E**. The appendix contains maps that illustrate projected flooding extents for the citywide and AOC models, a map showing changes to Curve Number for different zoning areas, along with tables that summarize water surface elevations and flood depths for every storm event and for each modeled configuration. These tables use the same representative POIs presented earlier in Section 4 and provide a consistent basis for comparing existing conditions, improvement alternatives, and projected changes associated with future development.

Given the variability in results, future development conditions should be considered during the design and prioritization of stormwater improvement projects, particularly within areas where continued growth is anticipated. Changes to zoning and land use will directly influence future

runoff and may require corresponding updates to stormwater infrastructure to maintain desired levels of service.

EVALUATION OF ALTERNATIVES

Two alternatives were evaluated for the AOCs to improve drainage performance and reduce roadway flooding. All design storm events (10-, 25-, 50-, and 100-year) were modeled to understand system response under a range of conditions; however, the 25-year storm was selected as the baseline level of service for evaluating the effectiveness of the proposed alternatives and for consideration in future design criteria. Where achieving a full 25-year level of service was not feasible, the alternatives were developed to reduce flooding to the extent practicable and to enhance roadway access, infrastructure reliability, and public safety. The following subsections present the alternatives, anticipated benefits, costs, and challenges for each AOC.

The evaluation of Alternative 1 and Alternative 2 was intended to explore a range of potential improvement strategies with differing levels of impact, cost, and complexity. In general, Alternative 1 represents a lower-impact approach focused on targeted drainage improvements that can be implemented within existing right-of-way (ROW) and with limited disturbance, while Alternative 2 introduces more extensive infrastructure upgrades designed to achieve greater hydraulic benefit through larger-scale construction or additional permitting. This approach allows the City to compare performance, constructability, and cost, and provides flexibility to combine or phase improvements as funding and priorities allow.

Modeled results presented in this section are based on representative POIs identified within each AOC. These POIs include not only roadway locations where flooding is most prominent under existing conditions, but also general points of concern within the stormwater network and adjacent streams that provide insight into how headwater and tailwater elevations respond under different storm events and alternative scenarios. Tracking conditions at these points allows for consistent comparison between existing and proposed conditions and provides a means to evaluate both roadway flooding and potential changes in flood stage within the receiving channels. For each AOC, tables summarize modeled water surface elevations and flood depths under existing conditions and for each alternative, providing a clear basis for comparison.

The alternatives described herein are conceptual and not intended as final designs. Final layouts, slopes, and material selections may change as design-level evaluations are completed and utility conflicts, ROW limits, and permitting requirements are verified. Improvements that involve culvert replacements, new outfalls, or floodplain grading may require environmental coordination with the North Carolina Department of Environmental Quality (NCDEQ) and the U.S. Army Corps of Engineers (USACE). Construction within existing roadways will require traffic control and site restoration to minimize community impacts.

Supporting materials are provided to supplement the descriptions in this section. Fact sheets following each subsection summarize the problem, proposed solution, anticipated benefits, and cost range in a format suitable for public presentation. **Appendix D** includes figures that depict

modeled flooding extents within each AOC for all storm events under both Alternative 1 and Alternative 2, illustrating changes in roadway ponding and areas of inundation resulting from the proposed improvements. The appendix also contains tables summarizing water surface elevations and flood depths at the POIs for each storm event and each alternative. **Appendix F** includes detailed Opinions of Probable Project Cost (OPPC) for each AOC and proposed alternative.

AREA 1 – SUTTLE STREET AND CAROLINA AVENUE

Flooding along Suttle Street occurs near the culvert crossing over the tributary to Hickory Creek, where low roadway elevations, limited inlet capacity, and high tailwater conditions in the receiving stream contribute to recurring ponding during major storm events. Modeling of existing conditions showed flooding depths up to approximately 0.85 feet during the 25-year storm, primarily within the roadway sags on both sides of the culvert.

While Carolina Avenue did not exhibit significant surface flooding in the model, preliminary analysis indicated that a majority of the storm drainage system along this corridor would need to be upsized to relieve surcharging, extending from the outfall at the tributary of Hickory Creek upstream to Airline Extension.

Two conceptual alternatives were developed to reduce roadway flooding along Suttle Street while maintaining the functionality of the existing culvert and downstream network. Modeling results for existing conditions, Alternative 1, and Alternative 2 are summarized in Table 5.1.

Alternative 1 Description

Alternative 1 proposes targeted drainage improvements intended to reduce roadway flooding along Suttle Street near the culvert crossing. This alternative focuses on improving how stormwater is conveyed across the low points on both sides of the culvert without increasing demand on the existing stormwater network.

The proposed improvements include construction of shallow, concrete-lined swales approximately nine inches deep and four feet wide along the roadway approaches to the culvert. On the east side of the crossing, a new swale extends from a curb opening on the south side of the street near the existing catch basin and connects directly to the stream. On the west side, the existing concrete swale within the adjacent parking area is regraded, widened to match the new cross section, and extended from a curb opening on the south side of the street to the stream. These swales intercept and redirect stormwater that would otherwise pond in the roadway sags and onto adjacent properties due to limited infiltration through the existing stormwater pipes, providing a more efficient surface pathway for runoff to reach the receiving stream.

Hydraulic modeling of the 25-year design storm Alternative 1 condition indicates measurable reductions in flood depths at the two roadway depressions. On the west side of the culvert, flood depths are reduced from approximately 0.59 feet under existing conditions to 0.44 feet, while on the east side, depths decrease from 0.85 feet to 0.43 feet. These reductions correspond to a

noticeable improvement in roadway drainage and travel conditions during major storm events, resulting in less ponding and shorter durations of standing water following heavy rainfall.

The estimated probable construction cost for Alternative 1 is between $41,000 and $51,000.

Alternative 2 Description

Alternative 2 builds upon the improvements described in Alternative 1 by increasing the capacity of the existing stormwater infrastructure on both sides of the culvert crossing and introducing a new upstream catch basin to enhance surface capture. This approach combines expanded conveyance capacity with improved interception of roadway runoff before it reaches the low-points, reducing flooding duration and overall ponding within the roadway sags.

On the east side of the culvert, approximately 90 linear feet of existing 18-inch pipe is replaced with a 30-inch pipe to alleviate surcharging at the upstream manhole. The larger pipe also increases conveyance capacity farther upstream, where both infiltration and internal flow through the existing system were observed to be restricted during existing conditions modeling. This improvement enhances overall hydraulic performance and allows stormwater to more efficiently discharge to the receiving stream.

On the west side of the culvert, a new catch basin is installed on the south side of Suttle Street, positioned just upstream of the roadway sag to capture runoff before it begins to accumulate in the low area. This additional inlet reduces the volume of stormwater reaching the sag where high tailwater conditions previously limited infiltration into the existing catch basin. Downstream of the new structure, approximately 130 linear feet of existing 48-inch pipe is replaced with a 60-inch pipe to improve conveyance capacity and accommodate the additional flow. Together, these improvements reduce the potential for surface ponding and increase the system's ability to convey runoff away from the roadway during higher-intensity storm events.

Hydraulic modeling of the 25-year design storm demonstrates measurable flood reduction at the two critical roadway depressions. At the west-side depression, maximum flood depth decreases from approximately 0.59 feet under existing conditions to 0.42 feet, while at the east-side depression, depths are reduced from 0.85 feet to 0.43 feet. These results reflect a modest improvement over Alternative 1, particularly in capturing and redirecting runoff before it reaches the low points most affected by tailwater conditions.

The estimated probable construction cost for Alternative 2 is between $241,000 and $298,000.

Project Challenges

While both alternatives provide measurable reductions in roadway flooding, implementation will require careful coordination due to site constraints and hydraulic limitations at the existing culvert. High tailwater conditions in the tributary of Hickory Creek will continue to limit the efficiency of stormwater discharge, particularly during peak flow events, and may restrict the overall benefit achievable through pipe upsizing alone. Construction activities along Suttle Street will temporarily disrupt traffic and may require lane closures or detours to accommodate excavation near the culvert crossing.

Underground utilities within the roadway ROW could affect the alignment and depth of proposed improvements, particularly where larger-diameter pipes are installed. Coordination with utility providers will be necessary to minimize conflicts and ensure proper clearances. Additionally, minor easement acquisition is anticipated for portions of the proposed swales and outlet connections extending onto adjacent properties. Proper erosion control and restoration measures will also be required to maintain streambank stability at the culvert outlets during and after construction.

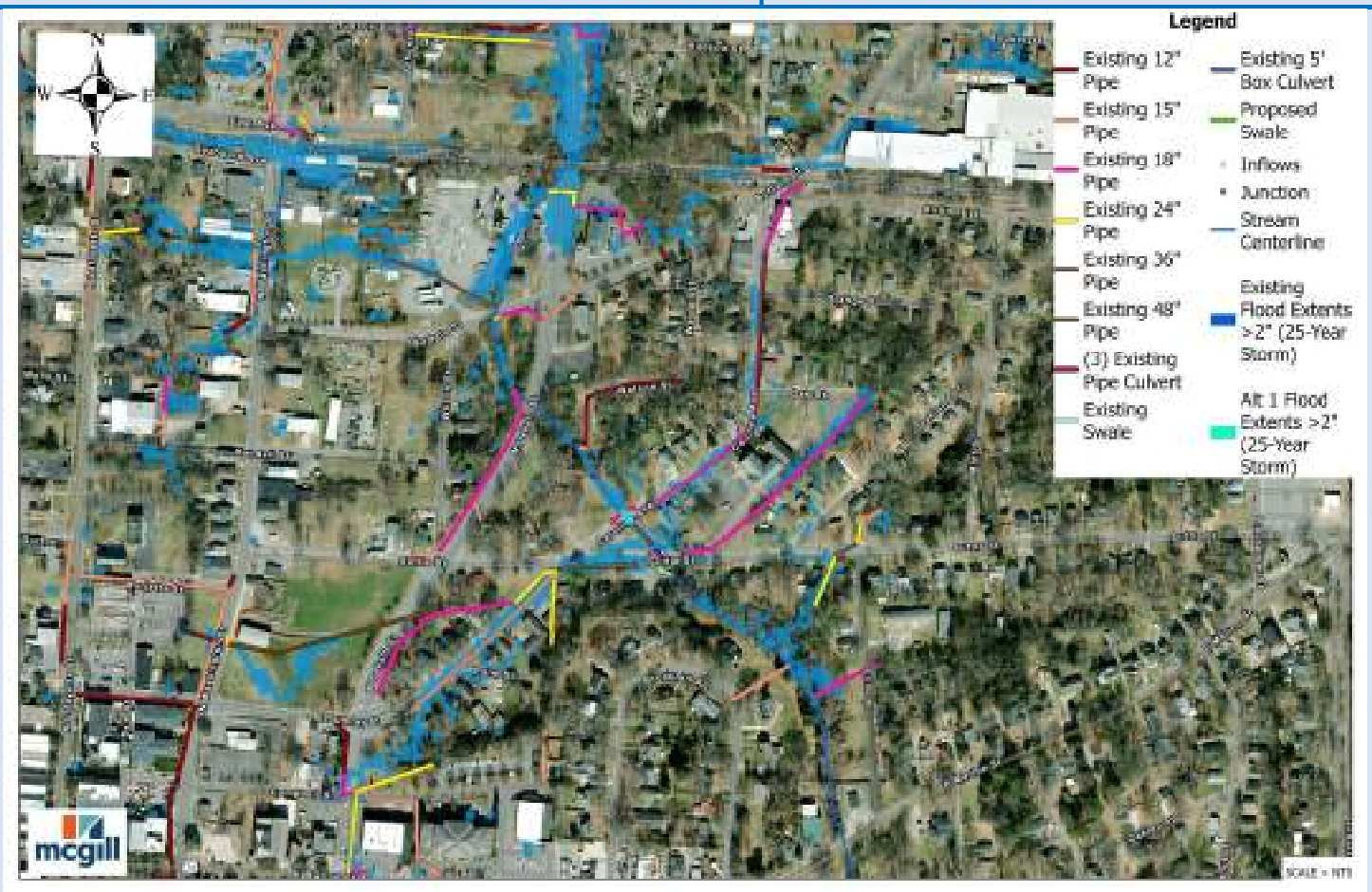
Modeling Results Comparison

Table 5.1 - Area 1 Results Comparison

Point of Interest	Elevation (ft.)	25-Year Storm Event					
		Existing Conditions		Alternative 1		Alternative 2	
		WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.66	2.12	803.66	2.12	803.66	2.12
Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
Carolina Ave. - Downstream of Culvert (Stream El.)	800.75	803.50	2.75	803.44	2.69	803.39	2.64
Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.25	3.99	803.16	3.90	803.12	3.86
Suttle St. - Upstream of Culvert (Road El.)	806.20						
Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.83	4.72	802.79	4.68	802.81	4.70
Suttle St. - West Side of Culvert (Road El.)	805.08	805.67	0.59	805.52	0.44	805.51	0.42
Suttle St. - East Side of Culvert (Road El.)	804.60	805.45	0.85	805.03	0.43	805.03	0.43

* Tabulated model results for all design storms are provided in **Appendix D**.

AOC 1 – Alternative 1	Suttle Street & Carolina Avenue



PROBLEM

Suttle St. experiences significant roadway flooding during the 25-year storm, primarily on the east side of the culvert where a depression forms between the downward-sloping roadway and the culvert crest. Additional ponding occurs on the west side of the culvert, although flooding there is less severe as runoff can overtop the curb and drain toward the stream or other low-lying areas. Flooding in this area results from the local topography, limited infrastructure to capture roadway runoff, and restricted discharge through the existing infrastructure due to elevated tailwater conditions in the receiving stream.

SOLUTION

- Provide additional stormwater conveyance capacity to route runoff from the depressions on both sides of the culvert along the south side of Suttle St. to the receiving stream.
- On the east side of the culvert crossing, construct a concrete swale approximately 9" deep and 4' wide extending from a curb opening near the existing catch basin to the receiving stream.
- On the west side of the culvert crossing, increase the capacity of the existing concrete swale within the adjacent parking lot to 9" deep and 4' wide and extend it from a new curb opening near the existing catch basin to the receiving stream.

PROJECT BENEFITS

This alternative reduces roadway flood depths during the 25-year storm within the sags on both sides of the Suttle St. culvert without increasing demand on the existing stormwater network. The new and improved swales will function in conjunction with the existing infrastructure to convey runoff that bypasses the inlets or becomes trapped in the low-lying areas due to limited infiltration through the existing structures.

PROJECT CHALLENGES

- Increasing the capacity of the existing stormwater infrastructure at the roadway sags would provide limited benefit due to high tailwater conditions in the receiving stream.
- Traffic disruption is expected during construction.
- Existing underground utilities may limit or affect the design and installation of proposed improvements.
- Easement acquisition will be required.

ESTIMATED PROBABLE PROJECT COST RANGE

$41,000 to $51,000

AOC 1 – Alternative 2	Suttle Street & Carolina Avenue



PROBLEM

Suttle St. experiences significant roadway flooding during the 25-year storm, primarily on the east side of the culvert where a depression forms between the downward-sloping roadway and the culvert crest. Additional ponding occurs on the west side of the culvert, although flooding there is less severe as runoff can overtop the curb and drain toward the stream or other low-lying areas. Flooding in this area results from the local topography, limited infrastructure to capture roadway runoff, and restricted discharge through the existing infrastructure due to elevated tailwater conditions in the receiving stream.

SOLUTION

- Includes the proposed swales outlined in Alternative 1.
- On the east side of the culvert crossing, replace approximately 90 feet of 18-inch pipe with a 30-inch pipe to alleviate surcharging at the upstream manhole.
- On the west side of the culvert crossing, install a new catch basin on the south side of Suttle St. and replace approximately 130 feet of 48-inch pipe with a 60-inch pipe downstream of the new catch basin.

PROJECT BENEFITS

This alternative reduces roadway flooding during the 25-year storm within the depressions on both sides of the Suttle St. culvert while increasing the overall capacity of the existing stormwater network. The proposed swales provide supplemental drainage for stormwater that collects within the roadway sags, while the new catch basin enhances capture efficiency and increases flow conveyance into the upgraded storm drainage system.

PROJECT CHALLENGES

- Increasing the capacity of the existing stormwater infrastructure at the roadway sags would provide limited benefit due to high tailwater conditions in the receiving stream.
- Traffic disruption is expected during construction.
- Existing underground utilities may limit or affect the design and installation of proposed improvements.
- Easement acquisition will be required.

ESTIMATED PROBABLE PROJECT COST RANGE

$241,000 to $298,000

AREA 2 – MONTROSE DRIVE NEAR WINDSOR DRIVE AND HICKORY CREEK

This AOC includes Montrose Drive, Windsor Drive, and the surrounding drainage basin connected to Hickory Creek east of State Road 2050 (Kings Road). Flooding in this area primarily results from the combined effects of the confluence of Hickory Creek with Logan Branch, the flow restriction where Kings Road crosses the creek, and localized low points in the creek overbanks. These factors elevate water levels upstream and reduce the ability of the Windsor Drive outfall to discharge. Poor connectivity between local low-points and the stream further causes flooding near 315 Windsor Drive and adjacent residential yards. Modeling of existing conditions showed flood depths up to approximately 0.7 feet during the 25-year storm within the low-lying areas along the east side of Windsor Drive.

Two conceptual alternatives were developed to reduce localized flooding near Windsor Drive and improve drainage reliability during elevated creek stages while maintaining the functionality of the existing outfall system. Modeling results for existing conditions, Alternative 1, and Alternative 2 are summarized in Table 5.2.

Alternative 1 Description

Alternative 1 proposes targeted surface drainage improvements intended to reduce localized flooding along Windsor Drive near 315 Windsor Drive. This alternative focuses on enhancing overland conveyance to direct runoff away from low-lying residential yards and toward Logan Branch, while maintaining the existing underground stormwater infrastructure.

The proposed improvements include installation of shallow grassed swales approximately one foot deep along portions of Windsor Drive south of Pinecone Lane, connecting to the existing catch basin within the Windsor Drive ROW. Two lateral swales extend westward from the yard at 315 Windsor Drive to tie into the new roadside swale, creating defined overland flow paths for runoff to drain toward the roadway. The swale system continues south from the existing catch basin along the east side of Windsor Drive and provides a direct surface drainage path to Logan Branch. Together, these improvements enhance conveyance throughout the area and allow stormwater to bypass the existing storm drain network, which continues to convey flow to Logan Branch, but experiences reduced discharge capacity during high creek stages due to tailwater conditions.

Hydraulic modeling of the 25-year design storm indicates measurable reductions in flood depths near 315 Windsor Drive. Flood depths within the affected yard areas decrease from approximately 0.69 – 0.68 feet under existing conditions to less than 0.1 feet with the proposed improvements. Flood extents are generally reduced along the entire eastern side of Windsor Drive near the 315 Windsor property, where improved surface grading provides a more efficient drainage route toward the tributary. The existing storm drain along the west side of Windsor Drive remains active as part of the overall drainage system, providing both conveyance and limited storage capacity during larger storm events.

The estimated probable construction cost for Alternative 1 is between $69,000 and $87,000.

Alternative 2 Description

Alternative 2 expands upon the improvements in Alternative 1 by incorporating additional measures to mitigate backwater impacts from Hickory Creek and its tributary. This alternative combines surface drainage features with new piped infrastructure, a protective berm, and flap gates to prevent reverse flow into the storm drain system. The goal is to maintain improved local drainage along Windsor Drive while enhancing system reliability during elevated creek stages.

Proposed improvements include the same swale construction described in Alternative 1, consisting of one-foot-deep swales along portions of Windsor Drive south of Pinecone Lane and two lateral swales extending westward from the yards near 315 Windsor Drive to the existing catch basin within the Windsor Drive ROW. Instead of the swale continuing south from the existing catch basin to Logan Branch, as proposed in Alternative 1, this portion is replaced with a new 15-inch storm drainpipe that follows the same alignment to a new outfall through a constructed berm adjacent to Logan Branch. The berm provides a physical barrier against creek backflow during high-water conditions, while flap gates installed on both the new and existing outfall pipes prevent reverse flow from entering the drainage system. These combined improvements allow stormwater to discharge to Logan Branch under normal conditions while protecting the system from inundation when creek water levels rise.

Hydraulic modeling of the 25-year design storm indicates that Alternative 2 achieves similar reductions in localized flooding as Alternative 1, with flood depths around 315 Windsor Drive reduced from approximately 0.69 – 0.68 feet under existing conditions to 0.09 – 0.11 feet with the proposed improvements. Flood extents along the eastern side of Windsor Drive near the 315 Windsor property are also reduced, consistent with the improved conveyance and backflow prevention provided by the new infrastructure. While performance is comparable to Alternative 1 for the 10- and 25-year events, Alternative 2 offers additional benefit during larger storm events by preventing backwater propagation into the storm drain system and confining floodwaters within the creek channel.

Alternative 2 provides a more resilient long-term solution by integrating surface and subsurface drainage improvements with structural protection from backwater flooding. The estimated probable construction cost for this alternative is between $149,000 and $188,000.

Project Challenges

Construction of the proposed improvements along Windsor Drive will require coordination to minimize traffic disruption and address potential utility conflicts within the ROW. Portions of the proposed swales extend onto private property near 315 Windsor Drive and will require drainage easements.

For Alternative 2, installation of the new outfall pipe and berm may require environmental permitting due to disturbance within the stream buffer and adjacent riparian area. Modifications to the existing catch basin will also be needed to accommodate new inflows. Proper erosion control and site restoration will be essential to maintain streambank stability following construction.

Modeling Results Comparison

Table 5.2 - Area 2 Results Comparison

Point of Interest	Elevation (ft.)	25-Year Storm Event					
		Existing Conditions		Alternative 1		Alternative 2	
		WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
Upstream Kings Rd: North Side - Hickory Creek	742.66	743.50	0.84	743.50	0.84	743.50	0.84
Upstream Kings Rd: South Side - Hickory Creek	744.20	744.22	0.02	744.20	0.00	744.21	0.01
315 Windsor Dr.: House - NW of House	744.71	744.76	0.05	744.72	0.01	744.72	0.01
315 Windsor Dr.: House - SW of House	744.06	744.76	0.69	744.15	0.09	744.15	0.09
315 Windsor Dr.: House - West of House	744.07	744.76	0.68	744.19	0.11	744.19	0.11

* Tabulated model results for all design storms are provided in **Appendix D**.

AOC 2 – Alternative 1	Montrose Drive near Windsor Drive and Hickory Creek



PROBLEM

The area east of State Road 2050 (Kings Road) experiences significant flooding from Hickory Creek during the 25-year storm event. This flooding results from two factors: the confluence of Hickory Creek with its unnamed tributary, and flow restriction where Kings Road crosses Hickory Creek. Together, these create a backwater condition that causes localized flooding in the area upstream of Kings Road. Undersized stormwater infrastructure compounds the nuisance flooding, particularly the 15" CPP pipe that outfalls to Hickory Creek and becomes inundated during the 25-year storm event.

SOLUTION

- Install one (1) 1-foot-deep swale along a portion of Windsor Drive south of Pinecone Lane, leading to a new catch basin in the Windsor Drive right-of-way. Connect to the existing catch basin 70 LF to the south via 12" pipe.
- Install two (2) new 1-foot-deep swales conveying water west from 315 Windsor Drive to both the new and existing catch basins along Windsor Drive.
- Install one (1) 1-foot-deep swale leading from the existing catch basin on the east side of Windsor Drive right-of-way south to Hickory Creek.

PROJECT BENEFITS

This alternative reduces flooding extents and depths along Windsor Drive between Pinecone Lane and Hickory Creek. The additional swales convey surface water from 315 Windsor Drive to existing infrastructure and provide bypass capacity when existing infrastructure becomes inundated, safely discharging stormwater to Hickory Creek.

PROJECT CHALLENGES

- Traffic disruption during construction
- Backwater conditions created by the confluence of Hickory Creek and its tributary at Kings Road will periodically inundate existing infrastructure and limit proposed swale capacity
- Existing catch basin at Windsor Drive will require modification to accommodate swale inflows

Two (2) of the proposed swales needed to effectively drain nuisance flooding at 315 Windsor Drive must be placed on private property, requiring drainage easements

ESTIMATED PROBABLE PROJECT COST RANGE

$69,000 to $87,000

AOC 2 – Alternative 2	Montrose Drive near Windsor Drive and Hickory Creek



PROBLEM

The area east of State Road 2050 (Kings Road) experiences significant flooding from Hickory Creek during the 25-year storm event. This flooding results from two factors: the confluence of Hickory Creek with its unnamed tributary, and flow restriction where Kings Road crosses Hickory Creek. Together, these create a backwater condition that causes localized flooding in the area upstream of Kings Road. Undersized stormwater infrastructure compounds the nuisance flooding, particularly the 15" CPP pipe that outfalls to Hickory Creek and becomes inundated during the 25-year storm event.

SOLUTION

- Create a berm along Hickory Creek to prevent backwater effects from inundating existing stormwater infrastructure.
- Install one (1) 1-foot-deep swale along a portion of Windsor Drive south of Pinecone Lane, leading to a new catch basin in the Windsor Drive right-of-way. Connect to the existing catch basin 70 LF to the south via 12" pipe.
- Install two (2) new 1-foot-deep swales conveying water west from 315 Windsor Drive to both the new and existing catch basins along Windsor Drive.
- Install one (1) 15" pipe along east side of Windsor Drive to a new outfall through proposed berm.
- Install flap gates on both proposed and existing 15" outfalls.

PROJECT BENEFITS

This alternative reduces flooding extents and depths along Windsor Drive between Pinecone Lane and Hickory Creek. The berm protects existing stormwater infrastructure from backwater inundation, improving system capacity and reliability. The additional swales convey surface water from 315 Windsor Drive to existing infrastructure and provide bypass capacity when needed. Flap gates prevent backflow into the drainage system, allowing stormwater to discharge to Hickory Creek while protecting against flooding from creek level rises.

PROJECT CHALLENGES

- Traffic disruption during construction
- Existing catch basin at Windsor Drive will require modification to accommodate swale inflows
- Two (2) of the proposed swales needed to effectively drain nuisance flooding at 315 Windsor Drive must be placed on private property, requiring drainage easements
- Berm construction along Hickory Creek may require environmental permitting and impact riparian vegetation

Two (2) of the proposed swales needed to effectively drain nuisance flooding at 315 Windsor Drive must be placed on private property, requiring drainage easements

ESTIMATED PROBABLE PROJECT COST RANGE

$149,000 to $188,000

AREA 3 & 4 – ROYSTER AVENUE AND BROAD STREET

This area of concern includes Royster Avenue, Broad Street, and the surrounding drainage basin that drains to a tributary of the First Broad River. Flooding occurs during the 10-year storm when the tributary overtops its banks and overtops Royster Avenue, threatening to overtop Broad Street as well. This flooding is largely due to undersized culverts and limited channel capacity. These conditions restrict stormwater conveyance, causing backwater ponding upstream of the crossings and flooding that affects nearby homes and businesses. Modeling of existing conditions confirms overtopping of roadways during the 10- and 25-year storms, with water levels rising approximately 1 foot above the roadway at Royster Avenue (road elevation 814.2 feet) and about 0.5 foot above the roadway at Broad Street (road elevation 800.9 feet) during the 25-year event.

The alternatives developed for this area focus on improvements to the Royster Avenue and Broad Street crossings; however, they do not address the capacity of the culvert located beneath West Dixon Boulevard. Further evaluation of this culvert would be necessary to fully assess its influence on upstream and downstream flooding conditions. In the event of future NCDOT improvements or replacement projects in this area, evaluation of the West Dixon Boulevard culvert and its hydraulic impacts should be considered. Any modification to this crossing could alter the hydraulic performance of the alternatives presented in this report.

Two conceptual alternatives were developed to reduce roadway overtopping and improve conveyance through the tributary corridor. Modeling results for existing conditions, Alternative 1, and Alternative 2 are summarized in Table 5.3.

Alternative 1 Description

Alternative 1 proposes improvements to increase the floodplain storage of the tributary and reduce roadway overtopping at the Royster Avenue and Broad Street crossings. This alternative focuses on alleviating upstream ponding and reducing the frequency of overbank flooding by modifying the tributary overbanks and upgrading the Broad Street culvert to improve overall conveyance through the corridor.

The proposed improvements include excavation of a localized high point along the right bank of the tributary upstream of Royster Avenue to create approximately 250 linear feet of floodplain benching. The bench, approximately 40 feet wide, would provide additional overbank storage and reduce flow velocities approaching the Royster Avenue crossing. In conjunction with these channel improvements, the existing double-barrel elliptical culvert at Broad Street is replaced with a single 6-foot by 12-foot reinforced concrete box culvert with upgraded headwalls and wingwalls. The combination of increased channel storage upstream and enhanced conveyance at the Broad Street crossing reduces backwater effects that currently contribute to roadway overtopping during moderate storm events.

Hydraulic modeling of the 25-year design storm indicates measurable reductions in flooding depths and roadway overtopping at both major crossings. At Royster Avenue, the modeled water surface elevation decreases from 1 foot above the roadway under existing conditions to

approximately 0.3 feet below the roadway surface with the proposed improvements, eliminating overtopping during the 25-year storm. At Broad Street, water levels decrease from about 0.5 feet above the roadway to roughly 1.7 feet below the roadway surface. These results reflect improved channel conveyance and reduced backwater effects throughout the tributary corridor, significantly lowering the frequency and duration of roadway inundation and improving flood resilience for adjacent properties and businesses.

The estimated probable construction cost for Alternative 1 is between $823,000 and $1,003,000.

Alternative 2 Description

Alternative 2 builds upon the improvements described in Alternative 1 by further increasing conveyance capacity within the tributary corridor and at the major roadway crossings. This alternative focuses on reducing roadway overtopping at both Royster Avenue and Broad Street through a combination of culvert replacements, floodplain grading, and channel improvements designed to relieve upstream ponding and improve flow efficiency to the First Broad River.

Proposed improvements include excavation of a localized high-point in the tributary's overbank and construction of approximately 50 linear feet of 40-foot-wide floodplain benching on the right bank of the channel upstream of Royster Avenue. Additional grading provides approximately 250 linear feet of 30-foot-wide floodplain benching along the right bank downstream of Royster Avenue to enhance channel capacity and storage. The existing double 5-foot circular culvert at Royster Avenue is replaced with a larger 8-foot by 14-foot reinforced concrete box culvert with upgraded end treatments. The existing double-barrel elliptical culvert at Broad Street is replaced with a 6-foot by 12-foot reinforced concrete box culvert with new headwalls and wingwalls. These combined improvements are intended to reduce hydraulic constriction within the corridor and improve the passage of high flows while maintaining channel stability.

Hydraulic modeling results indicate that Alternative 2 provides additional improvement during smaller storm events but limited benefit for larger storms compared to Alternative 1. For the 10-year storm, overtopping is eliminated at both Royster Avenue and Broad Street, with water surface elevations remaining below the roadway surface. However, during the 25-year storm, the model results show a slight increase in water surface elevation at Royster Avenue from approximately 0.3 feet below the roadway under Alternative 1 to about 1.1 feet above the roadway under Alternative 2, indicating that the improvements are insufficient to prevent overtopping during larger events. Despite this, the duration of overtopping at Royster Avenue is reduced from approximately 15 minutes under existing conditions to less than 5 minutes and overtopping at Broad Street remains fully eliminated for both the 10- and 25-year events.

Although the alternative does not fully eliminate flooding at Royster Avenue during major storms, it significantly reduces the frequency and duration of roadway inundation and improves overall conveyance efficiency throughout the tributary corridor. The combined channel and culvert improvements also enhance flood protection for adjacent properties and businesses during more frequent storm events.

The estimated probable construction cost for Alternative 2 is between $1,654,000 and $2,041,000.

Project Challenges

Implementation of either alternative will require substantial construction efforts within the tributary corridor and at both major roadway crossings. Replacement of the Royster Avenue and Broad Street culverts will temporarily disrupt traffic and may require phased construction or detours to maintain local access.

Floodplain benching and channel excavation will occur within regulated riparian areas and are likely to require environmental permitting and coordination with state and federal agencies. Additional temporary easements may be needed on adjacent residential and/or commercial properties to accommodate grading, equipment access, and material staging.

Variable tailwater conditions in the tributary and First Broad River could also affect construction timing and post-construction culvert performance. Proper erosion control, streambank stabilization, and site restoration will be essential to prevent downstream sedimentation and maintain long-term channel stability.

On top of the efforts and impacts of the alternative solutions, both alternatives would require significant costs which may inhibit the support of near-term repairs to this area.

Modeling Results Comparison

Table 5.3 - Area 3 & 4 Results Comparison

Point of Interest	Elevation (ft.)	25-Year Storm Event					
		Existing Conditions		Alternative 1		Alternative 2*	
		WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.20	8.88	813.96	7.64	815.47	9.15
Royster Ave. - Upstream of Culvert (Road El.)	814.20						
Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	808.57	9.72	808.12	9.27	812.29	13.44
Broad St. - Upstream of Culvert (Stream El.)	795.10	801.42	6.32	799.18	4.08	799.97	4.87
Broad St. - Upstream of Culvert (Road El.)	800.90						

* Alternative 2 shows increases to water surface elevation at the culvert under West Dixon Boulevard illustrating that the undersized culvert at Royster Avenue is causing water to attenuate upstream.
** Tabulated model results for all design storms are provided in **Appendix D**.

AOC 3 & 4 – Alternative 1	Royster Avenue and Broad Street



PROBLEM

The Tributary to the First Broad River, which passes under Royster Avenue and Broad Street, experiences overbank flooding resulting in overtopping of the two named roads during the 10-year storm, and even smaller high-intensity events. This flooding restricts safe travel along both roads and encroaches on access for homes and businesses.

SOLUTION

- Excavate a localized high point in the creek overbank and create approximately 250 linear feet of 40-foot-wide floodplain benching on the right bank of the creek upstream of Royster Avenue.
- Replace the Broad Street culvert with a 6-ft x 12-ft box culvert and upgraded end treatments.

PROJECT BENEFITS

This alternative reduces the frequency of overtopping at both Royster Avenue and Broad Street, eliminating overtopping in the 10-year and 25-year storms. It also reduces flood depths near homes and businesses.

PROJECT CHALLENGES

- Disruption of traffic during construction
- Low road surface elevations limit culvert size options.
- Variable high tailwater conditions impact culvert efficiency.
- Floodplain benching will require a large easement on, or acquisition of, private residential-zoned property.

ESTIMATED PROBABLE PROJECT COST RANGE

$823,000 to $1,003,000

AOC 3 & 4 – Alternative 2	Royster Avenue and Broad Street



PROBLEM

The Tributary to the First Broad River, which passes under Royster Avenue and Broad Street, experiences overbank flooding resulting in overtopping of the two named roads during the 10-year storm, and even smaller high-intensity events. This flooding restricts safe travel along both roads and encroaches on access for homes and businesses.

SOLUTION

- Excavate a localized high point in the creek overbank and create approximately 50 linear feet of 40-foot-wide floodplain benching on the right bank of the creek upstream of Royster Avenue.
- Create approximately 250 linear feet of 30-foot-wide floodplain benching on the right bank of the creek downstream of Royster Avenue.
- Replace the Royster Avenue culvert with an 8-ft x 14-ft box culvert and upgraded end treatments.
- Replace the Broad Street culvert with a 6-ft x 12-ft box culvert and upgraded end treatments.

PROJECT BENEFITS

This alternative reduces the frequency of overtopping at both Royster Avenue and Broad Street, eliminating overtopping in the 10-year storm and reducing the time of overtopping during the 25-year storm. It also reduces flood depths near homes and businesses.

PROJECT CHALLENGES

- Disruption of traffic during construction
- Low road surface elevations limit culvert size options.
- Variable high tailwater conditions impact culvert efficiency.
- Floodplain benching will require a small easement on, or acquisition of, private residential-zoned property.
- Floodplain benching may require a moderate easement on, or acquisition of, private general business-zoned property.

ESTIMATED PROBABLE PROJECT COST RANGE

$1,654,000 to $2,041,000

STORMWATER PROJECT RECOMMENDATIONS

Recommended stormwater improvement alternatives for each AOC are outlined based on the findings of the H&H modeling, field assessments, and alternatives evaluation described in Section 5. These recommendations aim to guide the City in prioritizing capital improvements that will reduce roadway flooding, enhance conveyance capacity, and improve overall system performance. Each recommendation was selected considering flood reduction benefits, constructability, permitting requirements, and cost-effectiveness.

The recommended projects at each AOC are not interdependent and may be implemented individually as funding, permitting, and priorities allow. In several areas, the improvements may also be constructed in phases, beginning with lower-impact measures to address immediate drainage concerns and progressing toward larger system upgrades as additional resources become available. This approach provides flexibility for the City to advance projects strategically while maintaining compatibility with future capital improvements.

A summary of the selected alternatives and associated cost ranges is provided in Table 6.1 below.

AREA 1 – SUTTLE STREET AND CAROLINA AVENUE

Alternative 1 is recommended for Area 1. Modeling results indicate that the proposed concrete swales on both sides of the Suttle Street culvert would provide measurable reductions in roadway flooding during the 25-year storm event without increasing demand on the existing stormwater network. These swales will enhance surface conveyance, allowing runoff to drain more efficiently toward the receiving stream and reducing ponding within the roadway sags.

Alternative 1 represents a cost-effective and practical near-term solution that addresses the most prominent drainage deficiencies while minimizing construction disturbance and avoiding extensive pipe replacement. This improvement can also serve as the initial phase of a longer-term drainage enhancement program. Should the City wish to pursue additional capacity improvements in the future, the project could be expanded to incorporate the pipe replacements and new catch basin outlined under Alternative 2. That future phase would further increase conveyance capacity, alleviate surcharging, and enhance the system's ability to capture and route stormwater during larger storm events.

This phased approach provides flexibility in implementation, allowing the City to address immediate flooding issues through Alternative 1 while maintaining the option to advance toward a more comprehensive solution as funding and priorities allow.

AREA 2 – MONTROSE DRIVE NEAR WINDSOR DRIVE AND HICKORY CREEK

Alternative 2 is recommended for Area 2. Modeling results indicate that the combination of a protective berm along Logan Branch, new swales, new pipes, and flap gates would provide the most effective reduction in flooding depths and backwater effects near Windsor Drive in all modeled storm events. These improvements collectively enhance system reliability by

preventing creek backflow into the storm network, improving conveyance, and reducing roadway and yard flooding during the 25-year storm event.

A phased approach could be implemented for this area to align with available funding and capital priorities. The initial phase could include the surface drainage components outlined under Alternative 1, such as swales and limited conveyance improvements to address nuisance flooding in the near term. Subsequent phases could expand the system to include new pipe installations, flap gates, and the proposed berm along Logan Branch. Implementing the project in phases would not diminish the overall effectiveness of the final design but would allow incremental progress toward full system performance as resources permit.

This flexible approach allows the City to begin addressing localized flooding concerns immediately while maintaining the option to construct the full Alternative 2 configuration in the future to achieve the greatest long-term benefit.

AREA 3 & 4 – ROYSTER AVENUE AND BROAD STREET

Alternative 1 is recommended for Areas 3 and 4. Modeling results indicate that the proposed floodplain benching upstream of Royster Avenue and replacement of the Broad Street culvert would provide meaningful reductions in roadway overtopping and flooding during the 25-year storm event. These improvements would also lower flood elevations along the tributary and improve hydraulic efficiency through both crossings, enhancing public safety and reducing the frequency of access limitations for nearby homes and businesses.

Alternative 1 represents a balanced and cost-effective solution that addresses the primary causes of flooding in this corridor while minimizing construction complexity and property impacts. The proposed improvements focus on restoring overbank storage and conveyance capacity where it is most limited, providing measurable benefits without the additional excavation and large-scale structural replacements required under Alternative 2.

This recommendation aligns with the City's overall strategy to improve stormwater conveyance capacity along critical roadways while maintaining constructability and cost efficiency. Implementation of the recommended improvements would reduce the severity of flooding along both Royster Avenue and Broad Street and provide long-term resilience for the adjacent tributary corridor.

Table 6.1 - Summary of Selected Alternatives

Project Area	Area Description	Selected Alternative	Cost Estimate
1	Suttle Street and Carolina Avenue	Alternative 1	$41,000 - $51,000
2	Montrose Drive near Windsor Drive and Hickory Creek	Alternative 2	$149,000 - $188,000
3 & 4	Royster Avenue and Broad Street	Alternative 1	$823,000 - $1,003,000

FUNDING OPPORTUNITIES

Implementation of the stormwater improvement projects identified in this report will require a combination of local, state, and federal funding sources. The City maintains an established stormwater utility and enterprise fund that provides a stable revenue source for maintenance and smaller capital improvements; however, larger infrastructure projects needed to address systemwide deficiencies will likely require supplemental assistance. Potential funding mechanisms include coordination with NCDOT for improvements located along state-maintained corridors, as well as competitive grant and loan programs administered through NCDEQ DWI, other state agencies, and federal programs. The following sections summarize potential cost-sharing and external funding opportunities available to support implementation of the recommended improvements.

NCDOT PROJECT COST SHARING

Several roadways within the identified AOCs are owned and maintained by NCDOT. These include North Dekalb Street (SR-1958) in AOC 1, Kings Road (SR-2050) in AOC 2, and West Dixon Boulevard (US-74) in AOC 3 and 4, as shown in Table 7.1 below. Although the alternatives presented in this report do not propose direct modifications to NCDOT roadways or drainage infrastructure, coordination with NCDOT may still be required or beneficial to ensure compatibility between local and state drainage systems.

If field survey or hydraulic modeling identify deficiencies in stormwater infrastructure within these corridors, the City may coordinate with NCDOT to determine whether a cooperative effort or cost-sharing arrangement is feasible. Early coordination is recommended to identify opportunities for joint improvements, especially if NCDOT has future roadway or drainage projects planned within these areas. In such cases, the City may request that NCDOT consider expanding the scope of work to incorporate stormwater improvements that align with the alternatives outlined in this report. Collaborative planning of this nature can minimize construction impacts, enhance drainage performance, and potentially reduce overall project costs for both parties.

If any work associated with the alternatives presented in this report is performed within NCDOT ROW, the City will be required to coordinate with the appropriate NCDOT Division office and obtain approval of an Encroachment Agreement prior to construction. All construction materials and methods must conform to NCDOT standards, and any cost participation agreement must be reviewed and approved by the agency before implementation. Because cost participation is not guaranteed, the City should continue pursuing supplemental state and federal funding opportunities while maintaining communication with NCDOT regarding planned roadway and drainage improvements.

Table 7.1 - NCDOT Roads within Proposed Project Areas

Area of Concern	Road Name	State Route / US Highway Number
AOC 1 - Suttle Street and Carolina Avenue	North Dekalb Street	SR-1958
AOC 2 - Montrose Drive near Windsor Drive and Hickory Creek	Kings Road	SR-2050
AOC 3 & 4 - Royster Avenue and Broad Street	West Dixon Boulevard	US-74

STATE AND FEDERAL GRANT AND LOAN PROGRAMS

For portions of the project areas outside of NCDOT jurisdiction, several state and federal grant and loan programs are available to support the implementation of stormwater infrastructure improvements. The proposed alternatives in this report primarily address stormwater quantity reduction through traditional conveyance and drainage improvements; however, many funding programs also emphasize green stormwater infrastructure and stormwater quality enhancement. It is recommended that if any such funding is pursued by the City, green infrastructure or stormwater quality improvements be incorporated into the proposed projects to increase competitiveness and eligibility for these programs.

The City of Shelby maintains an established stormwater utility and enterprise fund, which may serve as a source of local match for state or federal programs requiring cost participation. The NCDEQ DWI administers several grant and loan programs, including the Clean Water State Revolving Fund, Green Project Reserve, and Water Resources Development Grants, and periodically releases additional funding opportunities through state appropriations or federal initiatives. Incorporating stormwater quality components, such as infiltration practices, bioretention areas, or other nature-based solutions, can improve project eligibility and competitiveness for these programs. Table 7.2 below summarizes potential funding sources and key program details.

The programs listed below are highly competitive and often require the applicant to demonstrate measurable stormwater quality or community resilience benefits. McGill Associates can assist the City in identifying suitable funding programs, preparing application materials, and developing supporting documentation such as engineering reports, conceptual plans, and benefit-cost analyses to improve the likelihood of successful award and implementation.

Table 7.2 – Potential Funding Sources

Funding Source	Program Name	Funding Type	Eligibility	Typical Projects	Funding Coverage	Notes
State (NCLWF)	North Carolina Land and Water Fund (NCLWF)	Grant	Innovative stormwater projects	Stream Restoration, Stormwater Best Management Practices	Engineering, Construction, Maintenance	Spring application cycle. Emphasis on restoration and water quality.
State (DWR-NCDEQ)	Water Resources Development Grant	Grant	Water management, stream restoration	Stream Restoration, Stormwater Control, Flood Resiliency	Engineering, Construction, Land Acquisition	50% match limit. Spring application cycle.
State (NCDEQ)	Green Project Reserve (subset of SRF)	Grants and Loans	Green infrastructure projects	Stormwater Best Management Practices	Varies	Spring and Fall application cycles.
Non-Profit	Golden Leaf SITE, Economic Catalyst, Open Grants Program	Grants and Loans	Must link to economic benefits (e.g., job creation)	Varies by program	Varies by program	Cannot fund infrastructure on private property.
Federal (USDA Rural Development)	Water & Waste Disposal Loan and Grant Program	Grants and Loans (long-term)	Communities <10,000 population	Stormwater collection, Conveyance, Disposal	Engineering, Construction, Land Acquisition, Permits	Some flexibility in use of funds.
State (NCDEQ)	Clean Water SRF	Loans (low-interest) (some principal forgiveness)	Must address stormwater quality	Stream & Wetland Restoration, Stormwater Control Measures, Stormwater Treatment	Engineering, Construction	Up to 20% match. Maximum loan: $35M. 2% closing fee (not financeable).
Federal	WIFIA (EPA)	Loan (long-term)	$5M minimum for small communities (<25K pop).	Stormwater systems, Green infrastructure	Planning, Engineering, Construction, Land Acquisition	Maximum amount up to 49% of project cost. Can combine with SRF and other grants. Ongoing applications.

CAPITAL IMPROVEMENT PROJECTS RECOMMENDATIONS

McGill's recommendations for capital improvement projects are outlined below based on the technical evaluations described throughout this report. These recommendations reflect findings from hydraulic modeling, field observations, and alternative evaluations, but they do not represent all potential conceptual improvements or funding opportunities the City may ultimately consider. The ordering, timing, and funding of these projects will remain at the discretion of the City. As the City continues assessing long-term financial capacity and overall infrastructure priorities, a more detailed review of funding availability and program needs will help guide development of a formal Capital Improvement Plan for implementation.

The recommendations in this section are based on available data and a preliminary cost-benefit evaluation. Table 8.1, provided below, summarizes each recommended project, including the associated benefits, cost ranges, estimated timeframes for design and implementation, construction duration ranges, and the resulting priority ranking. These values provide planning-level guidance and are not intended to represent final design commitments.

Project benefits were evaluated first through assessment of traffic considerations, property access implications, and direct and indirect improvements to residences and businesses. Traffic benefits were determined by using available traffic information and a qualitative understanding of how roadway flooding disrupts travel. Average Annual Daily Traffic (AADT) values, where known or reasonably inferred, were used to estimate the number of vehicles affected during storm events and the number that would benefit once conditions are improved. Property access benefit was evaluated by considering whether the roadway provides primary or notable access to residences, businesses, schools, hospitals, or emergency routes, and whether reasonable detour options exist when flooding occurs. Direct benefits were assigned where improvements reduce or eliminate standing water on private property, while indirect benefits were assigned where improvements enhance safe travel for through-traffic or improve access generally, even if the property itself does not flood.

Cost-related considerations include the project cost ranges associated with the recommended alternatives described in Section 6.0, the estimated time required for design, permitting, and bidding, and the anticipated construction duration. These values provide context for project complexity, permitting needs, and resource allocation during implementation.

These criteria were applied to the recommended alternatives for each AOC. For Suttle Street and Carolina Avenue (AOC 1), direct AADT data were not available, but the corridor lies between two major roadways carrying approximately 12,000 to 13,000 vehicles per day. Although not a sole-access route, the improvements would provide direct benefit for up to 5 residences and two businesses, with indirect benefits to more than 25 additional residences. While the benefits of this alternative apply directly to 5 residential properties, the scale of the benefit is smaller than the alternative for AOC 2. The recommended alternative is relatively low in cost, has a short construction duration, and can be advanced quickly, resulting in a favorable benefit relative to costs. For these reasons, Suttle Street and Carolina Avenue is recommended as the second priority.

For Montrose Drive and Windsor Drive (AOC 2), no AADT information is available, and roadway overtopping is not as significant of a travel concern as in other areas. Construction may temporarily affect the sole access to one residence. The recommended alternative provides direct benefit to two homes and no businesses. In contrast to the direct benefits provided to residences for AOC 1, the alternatives for this AOC address higher severity flooding at residential structures. While the quantity of properties benefited by this alternative, the improvements remain valuable for addressing localized flooding conditions and eliminating residential structure flooding for the design storm. This evaluation places the recommended alternative for AOC 2 highest priority among recommended alternatives.

For Royster Avenue and Broad Street (AOC 3 & 4), direct traffic count data are unavailable, but the corridor is immediately adjacent to West Dixon Boulevard, which carries nearly 40,000 vehicles per day. While detour options are available, the recommended alternative provides direct benefit to 3 commercial properties and indirect benefits to more than 25 residences and up to ten businesses. The project is larger and more complex, requiring additional time and resources, but the scale of benefit is substantial. The scale of costs associated with this alternative place Royster Avenue and Broad Street as the third priority.

Table 8.1 below summarizes the recommended alternatives for each Area of Concern along with the associated benefits, cost ranges, estimated timeframes, and priority ranking.

Table 8.1 - Recommended Capital Improvement Projects Summary

Scenario		AOC 1 Alternative 1	AOC 2 Alternative 2	AOC 3 & 4 Alternative 1
Benefits	Traffic Benefit	Situated between two roads with greater than 12,000 AADT	Limited residential traffic	Adjacent to W Dixon Boulevard corridor which carries 40,000 AADT
	Property Access Benefit	Does not provide sole access for any properties, detour options apparent	Provides sole access to one residential property	Does not provide sole access for any properties, detour options apparent
	Direct Benefit - Residences	5	2	0
	Direct Benefit - Businesses	2	0	3
	Indirect Benefit - Residences	>25	3	>25
	Indirect Benefit - Businesses	2	0	10
Costs	Cost	$41,000 - $51,000	$149,000 - $188,000	$823,000 - $1,003,000
	Time for Implementation Range (months)	3 - 6	4 - 8	6 - 12
	Construction Duration Range (months)	1 - 2	2 - 4	8 - 12
Priority		2	1	3

Based on this evaluation, the recommended order of implementation is Montrose Drive and Windsor Drive first, followed by Suttle Street and Carolina Avenue, and then Royster Avenue and Broad Street. The Montrose–Windsor improvements reduce localized flooding provide the highest benefit to residential structures. The improvements at Suttle Street and Carolina Avenue are the most straightforward to implement and provide immediate benefit. The Royster and Broad Street improvements offer broad system-wide benefits but require greater investment. As described in Section 6.0, phased implementation may allow incremental benefit to be achieved within the Montrose–Windsor area. Similarly, the Royster Avenue and Broad Street projects may be implemented in phases but would require further evaluation to delineate the proper order and feasibility. All three alternatives provide meaningful progress towards improving flood resilience and protecting public infrastructure, property, and water quality throughout the City of Shelby.

REFERENCES

City of Shelby, NC – Unified Development Ordinance, Sec. 9-1. Zoning Districts https://library.municode.com/nc/shelby/codes/code_of_ordinances?nodeId=PTIICOOR_APXAU

NC Spatial Data Download https://sdd.nc.gov/

NOAA's National Weather Service Precipitation Frequency Data Server https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nc

United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

USGS, National Land Cover Database https://www.usgs.gov/centers/eros/science/national-land-cover-database?qt-science_center_objects=0#qt-science_center_objects

Urban Hydrology for Small Watersheds, Technical Release 55, United States Department of Agriculture, June 1986

Appendix A

Stormwater Network Maps



Shelby
Stormwater Masterplan

Citywide
Sheet Index
Map

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

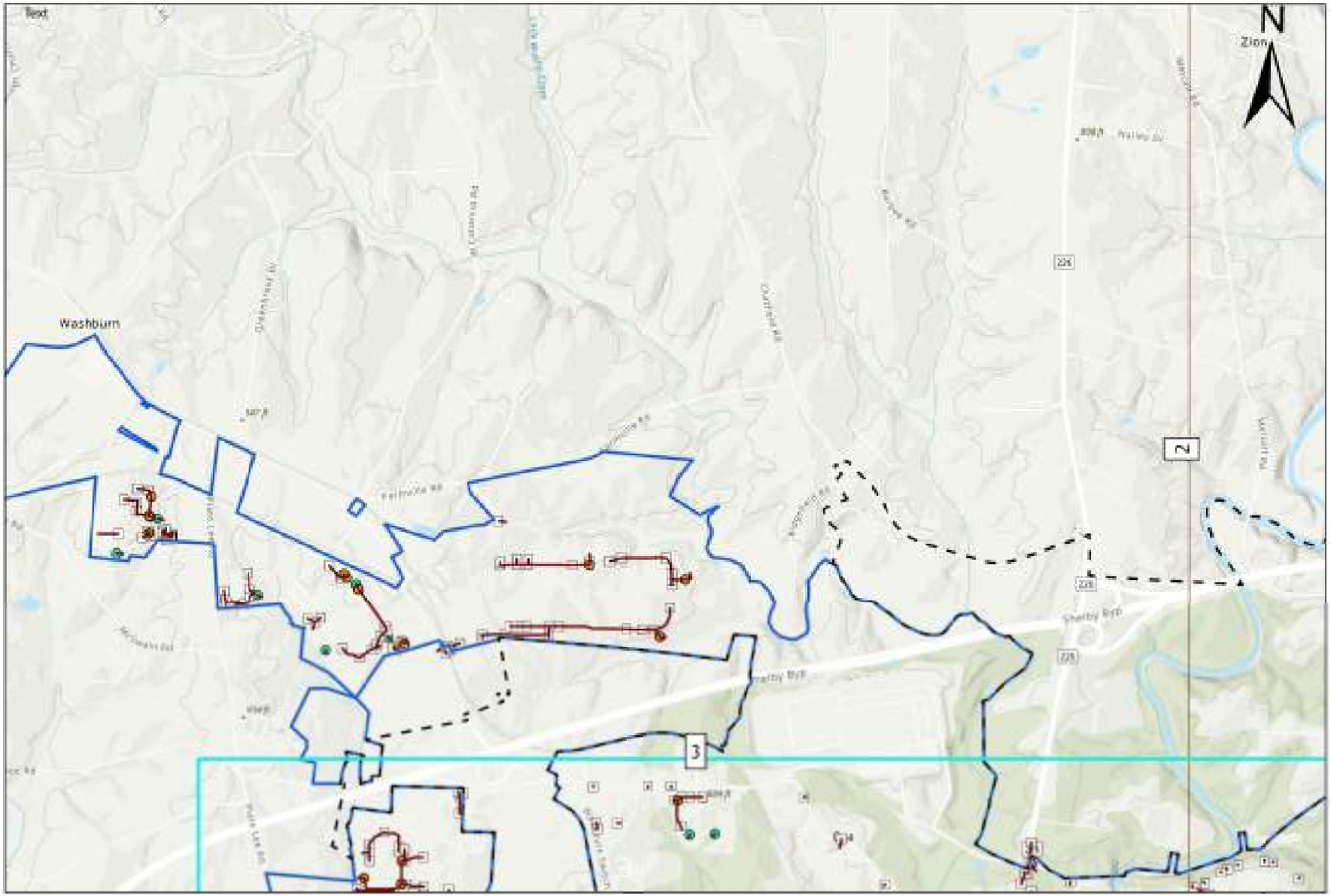
DESIGNER: MF
REVIEWER: DJ
DATE: October 2025

N

Legend

Boundary
- Shelby City Limits
- Shelby ETJ
- Sheet Boundary

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55 Broad St.
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Shelby
Stormwater Masterplan

Appendix A.1
Existing SW Network
Citywide Index Sheet #1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

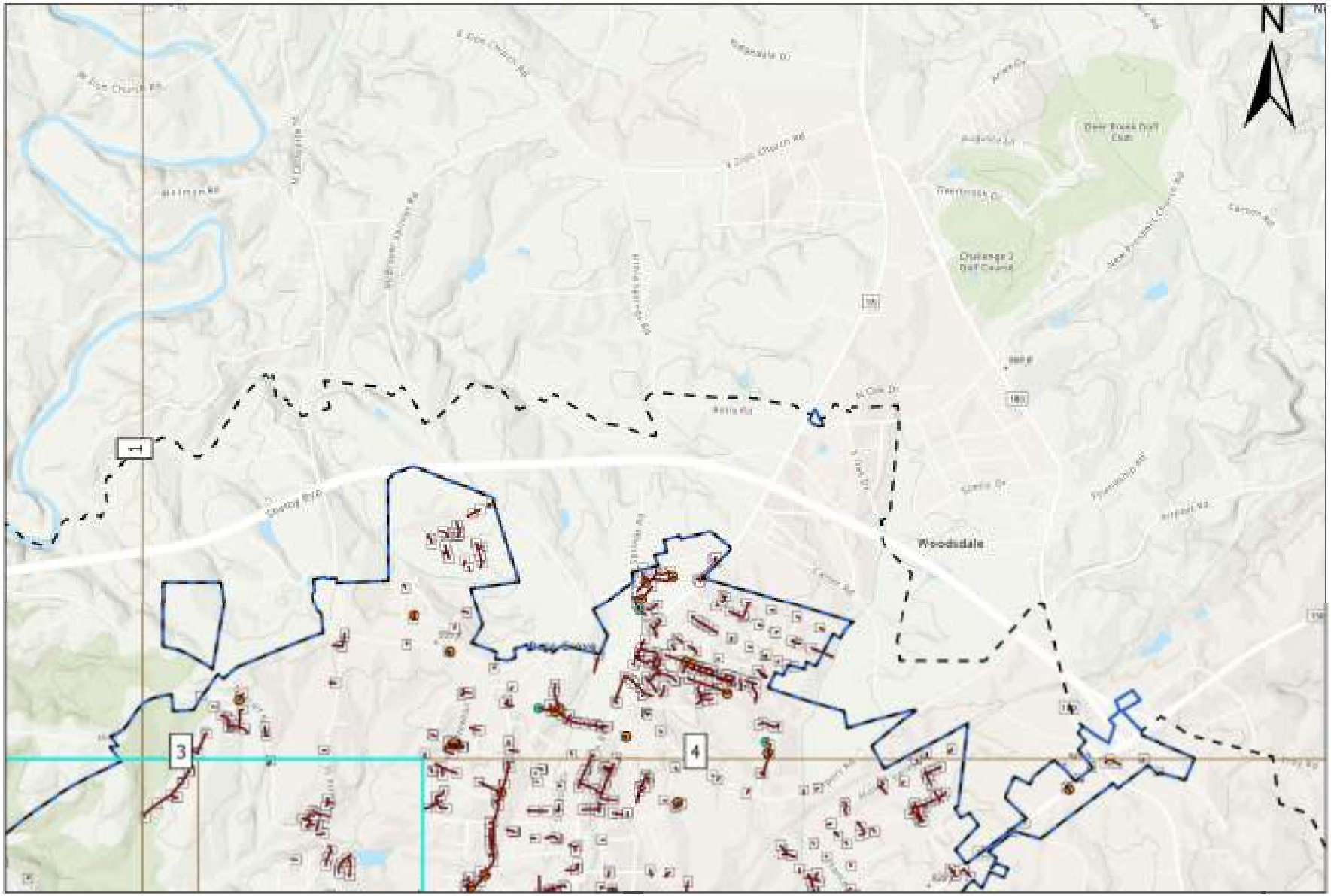
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- Existing Conduits
- SCM Outlet
- Inflow
- Junction Box

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Shelby
Stormwater Masterplan
Appendix A.1
Existing SW Network
Citywide Index Sheet #1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

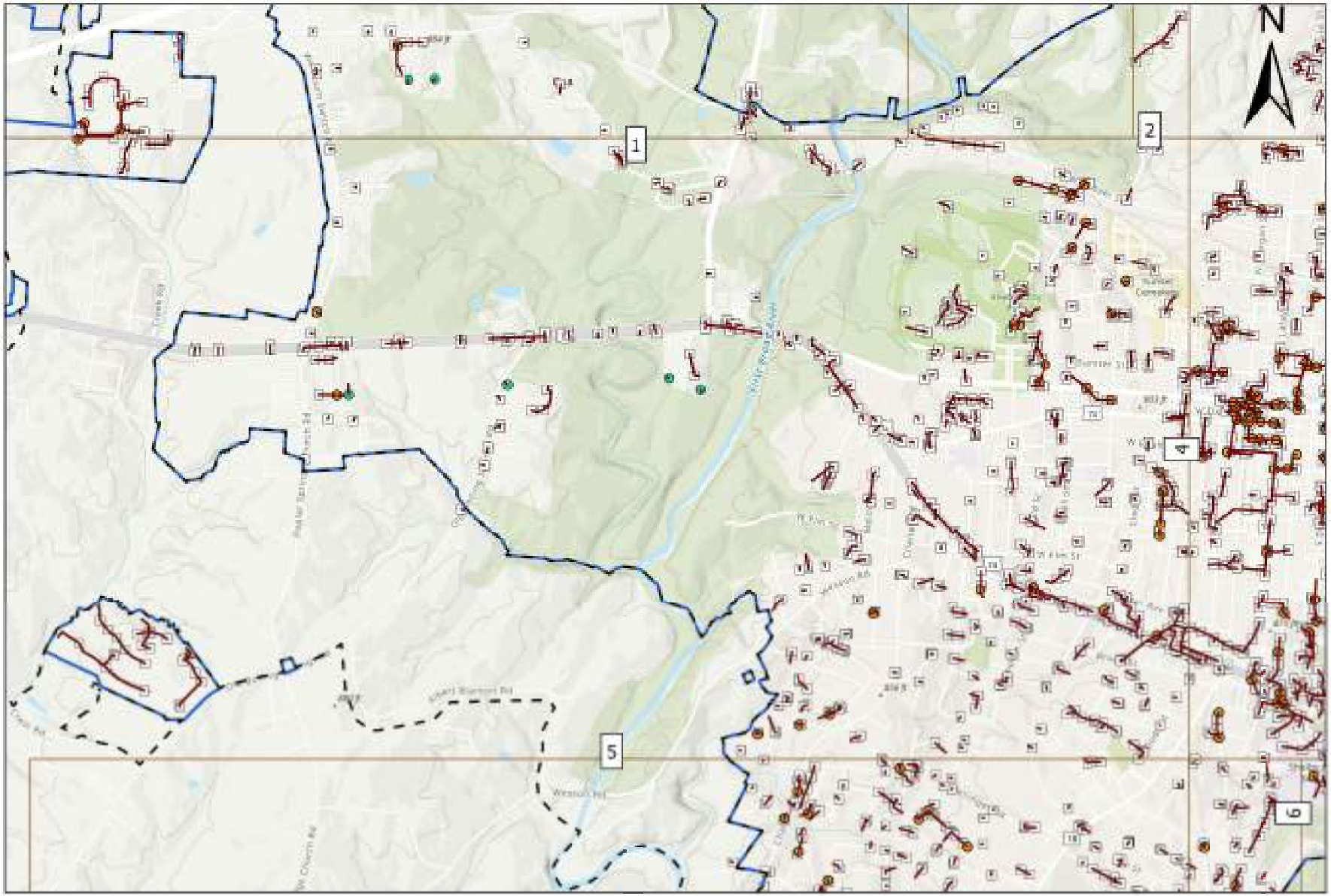
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- Existing Conduits
- SCM Outlet
- Inflow
- Junction Box

0 0.2 0.4 0.8 1.2 1.6 Miles

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Shelby
Stormwater Masterplan
Appendix A.3
Existing SW Network
Citywide Index Sheet #3

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

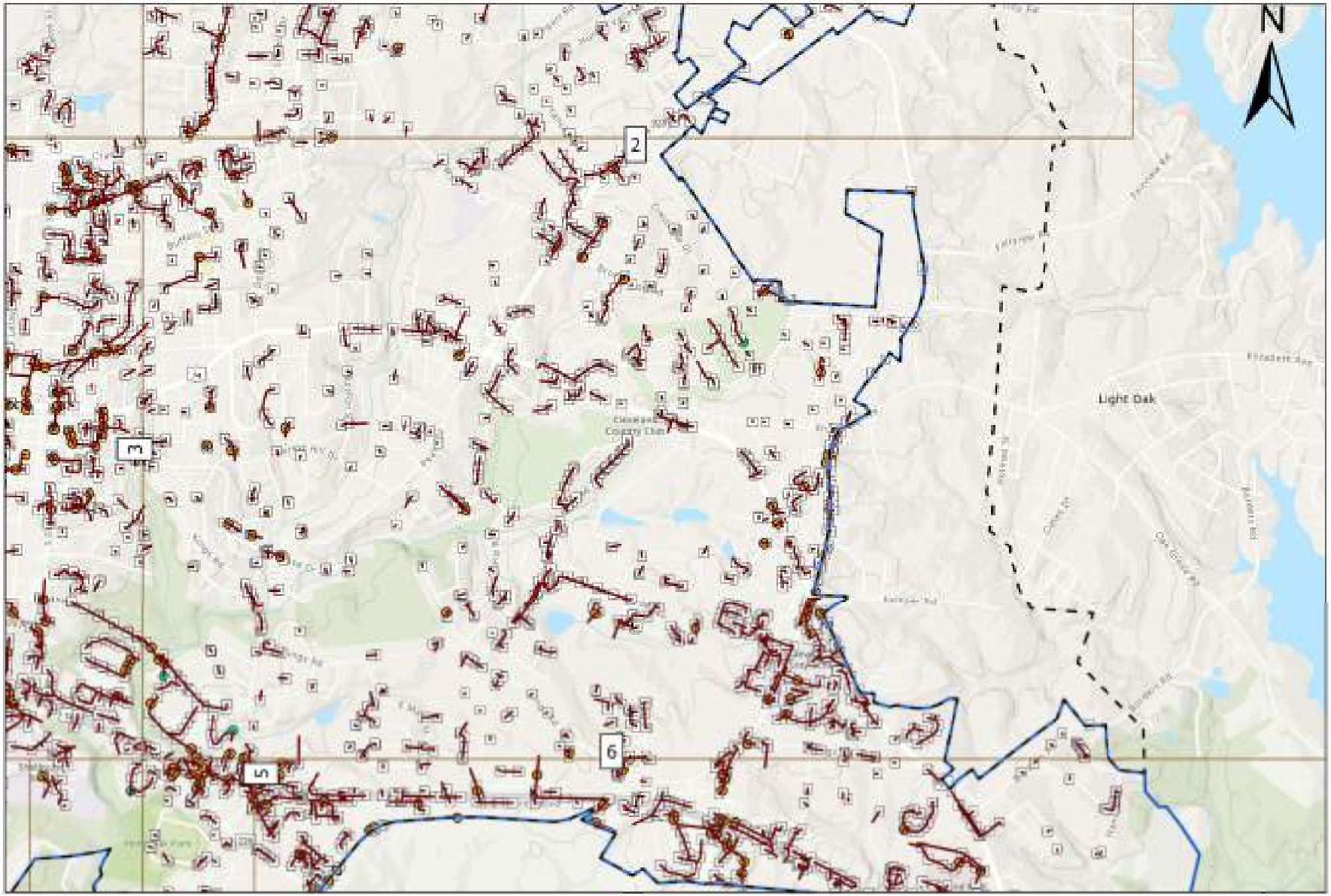
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NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- Existing Conduits
- SCM Outlet
- Inflow
- Junction Box

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Shelby
Stormwater Masterplan
Appendix A.4
Existing SW Network
Citywide Index Sheet #4

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

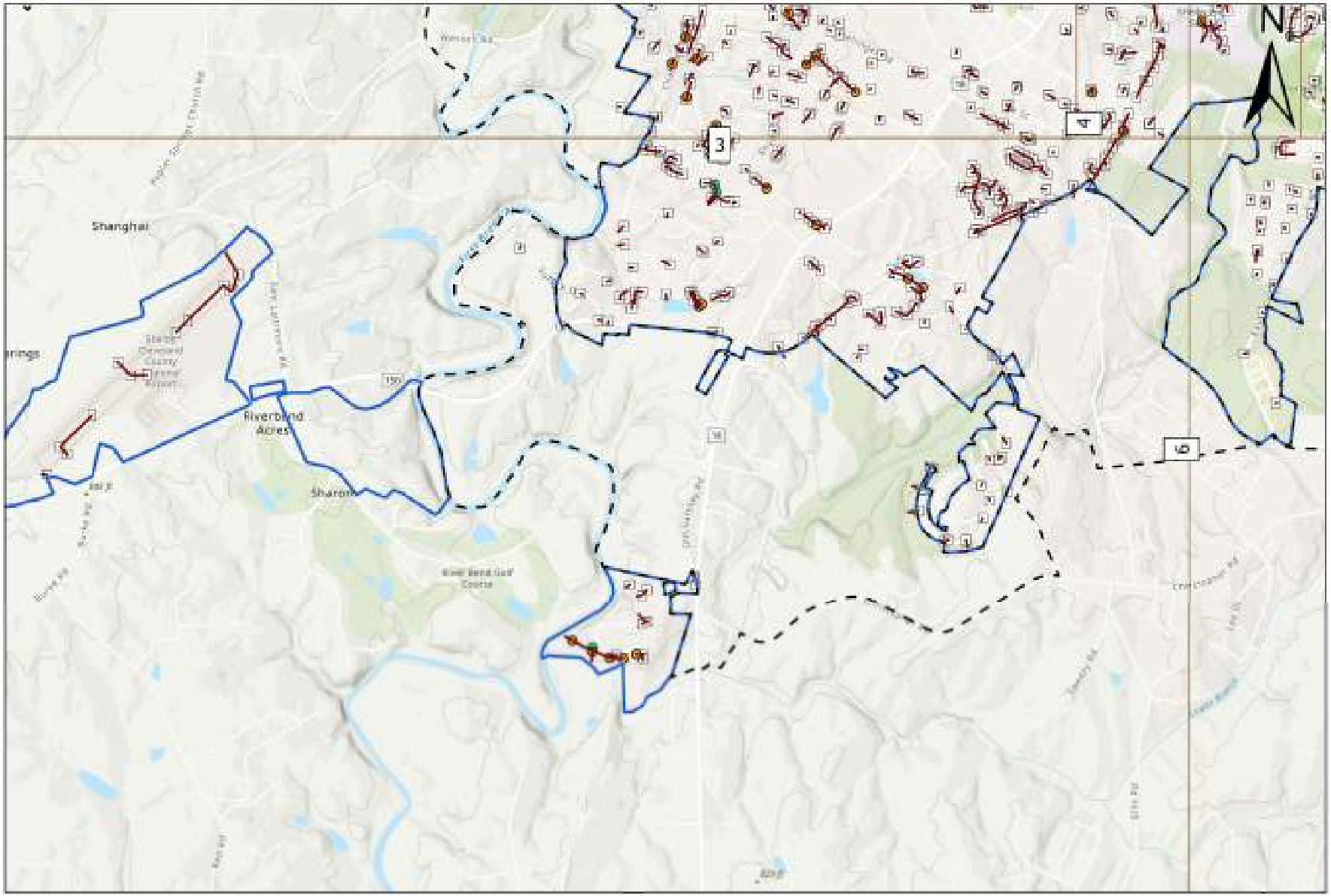
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- Existing Conduits
- SCM Outlet
- Inflow
- Junction Box

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Shelby
Stormwater Masterplan
Appendix A.5
Existing SW Network
Citywide Index Sheet #5

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

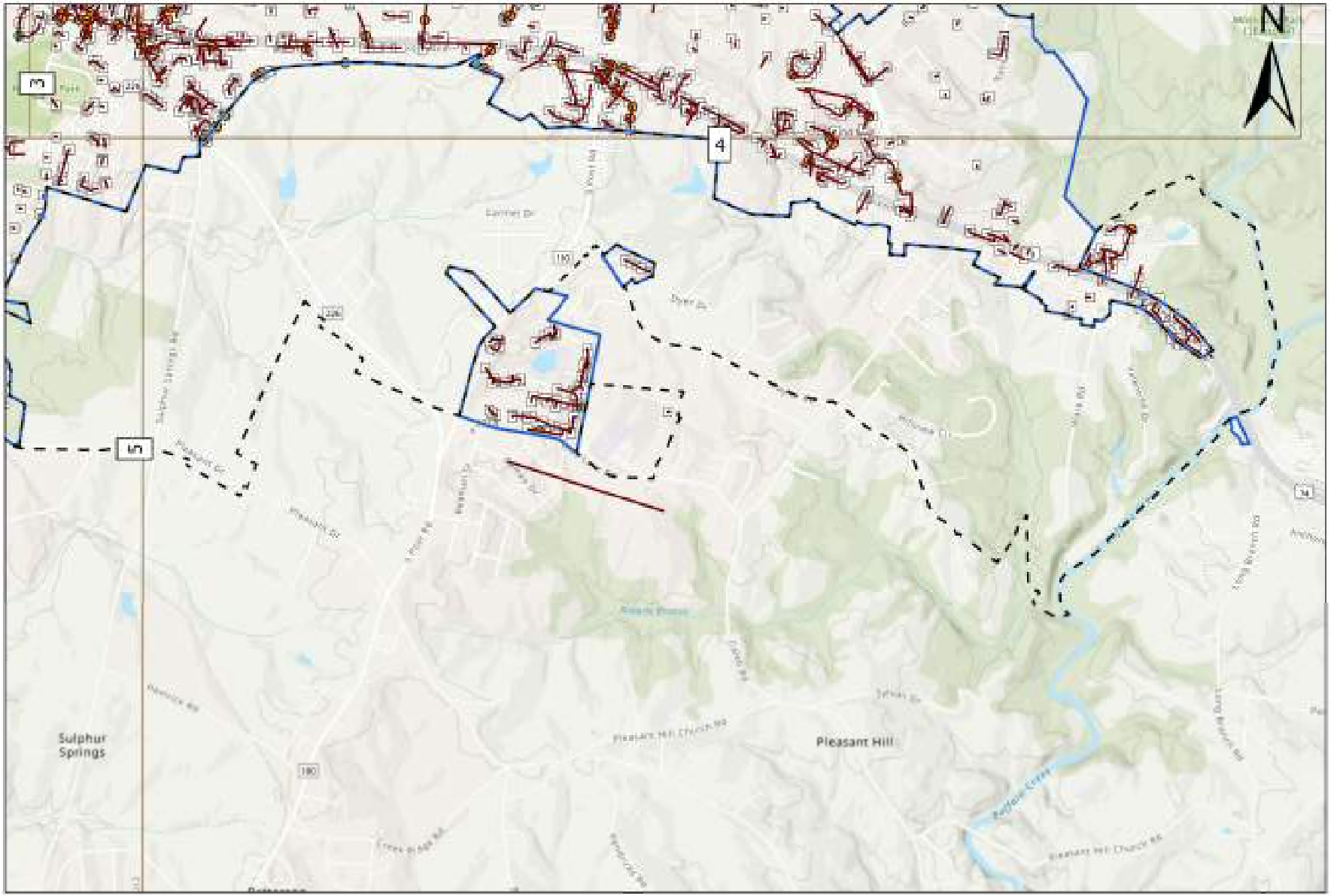
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NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- Existing Conduits
- SCM Outlet
- Inflow
- Junction Box

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Shelby
Stormwater Masterplan
Appendix A.6
Existing SW Network
Citywide Index Sheet #6

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

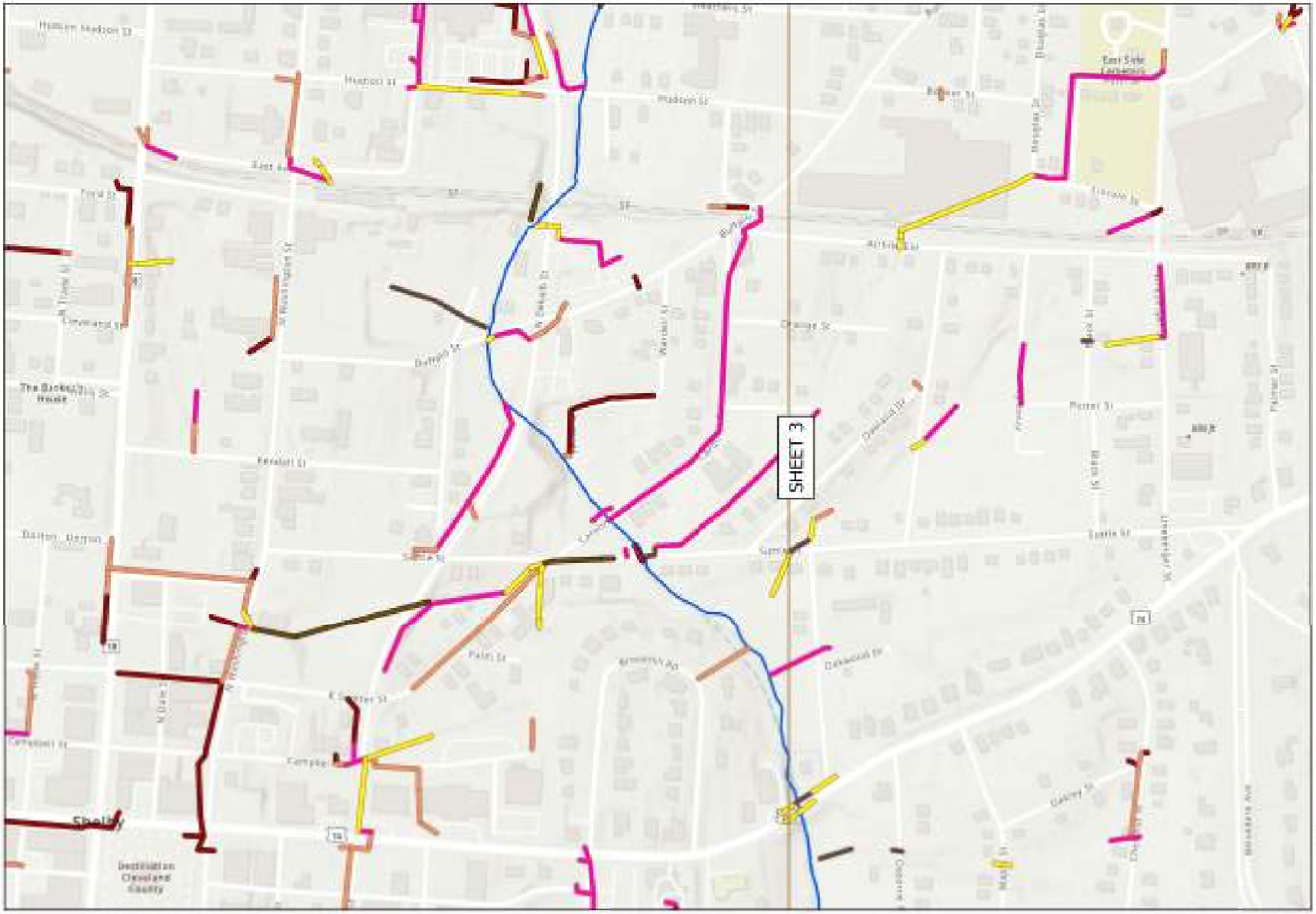
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- Existing Conduits
- SCM Outlet
- Inflow
- Junction Box

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Shelby
Stormwater Masterplan

Appendix A.7
Existing SW Network
AOC 1 - Montrose Dr. Near
AOC 1 - Carolina Ave. &
Suttle Street

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

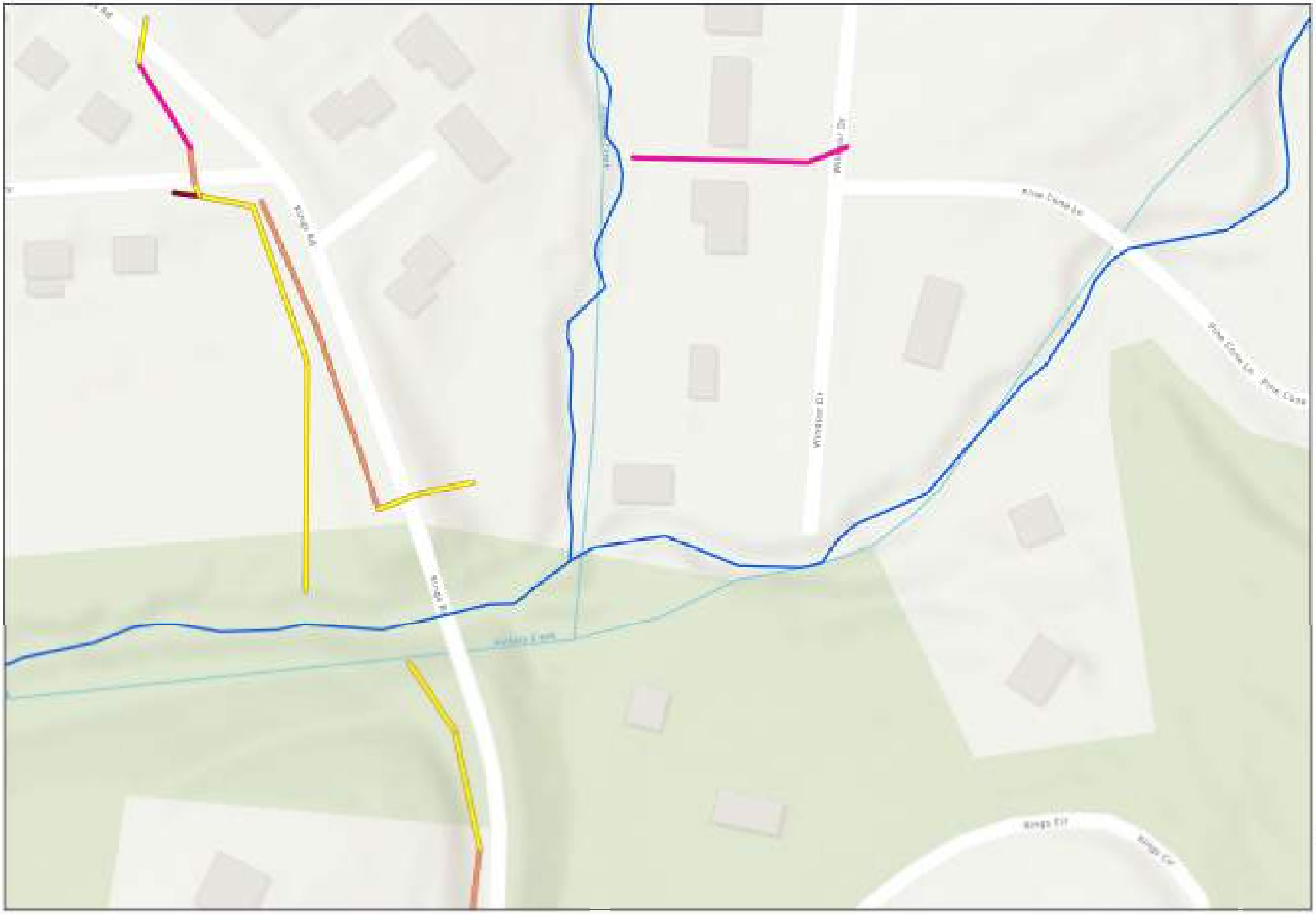
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Legend

- Sheet Boundary
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Stream Centerline

0 0.03 0.07 0.13 0.2 0.26 Miles

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Stormwater Masterplan

Appendix A.8
Existing SW Network
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2020

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Appendix A.9
Existing SW Network
AOC 3 & 4 - Royster Ave. & Broad St.

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2020

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 54" Pipe
- Existing 60" Pipe
- Existing 66" Pipe
- Existing 72" Pipe
- Existing 84" Pipe
- Existing double barrel 9' Culvert
- Existing 9' Culvert
- Existing 7' Culvert
- Stream Centerline

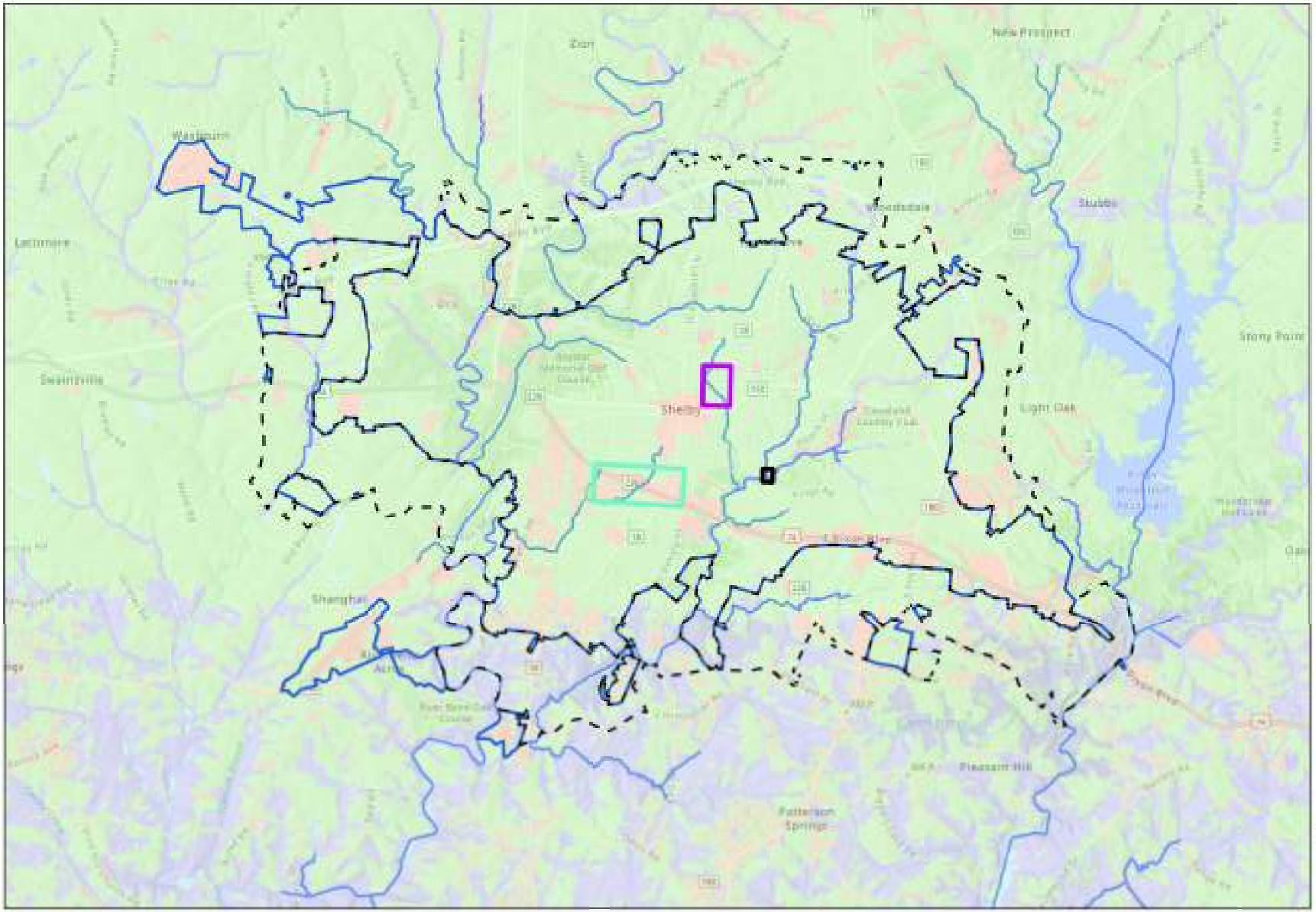
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Table A.1
Assets Flagged During Condition Assessment

Name	City ID	City Layer	Status	Comments_A	Comments_B	Blockage	Condition Flag
J8.312	D09398	Discharge	New	18" HDPE minor outfall. Direction 140	Half full of sediment	50%	Yes
J3.361	D09402	Discharge	New	Barely visible. Buried pipe		100%	Yes
J3.486	D09399	Discharge	New	HDPE		100%	Yes
J2.125	D09390	Discharge	New	Hdpe in rip rap		50	Yes
IN12.3200	I3303	Inflow	Updated			0%30%	Yes
IN12.453	I9222	Inflow	New	Pipe 1 buried		0%	Yes
IN12.54	I9223	Inflow	New			100%	Yes
IN13.8428	I8730	Inflow	Updated	Covered up filled in		0%	Yes
IN14.182	I9213	Inflow	New	Broken brick box no cover		0%80%	Yes
IN14.3844	I3978	Inflow	Updated	Pipes not visible. Broken.		60%	Yes
IN14.3882	I4022	Inflow	Updated	Debris blocking		0%	Yes
IN14.493	I9216	Inflow	New	Needs clean out		90%	Yes
IN5.2024	I2100	Inflow	Updated			95%	Yes
IN8.94	J0100	JunctionBox	Updated	Can't see pipes. Top broken.		0%	Yes
IN9.6427	I6630	Inflow	Updated	Sediment filled pipes not visible		95%	Yes
IN9.6481	I6691	Inflow	Updated	Full of sediment no pipes visible		98%	Yes
IN9.6979	I7231	Inflow	Updated	Completely blocked		100%	Yes
IN10.2170	I2247	Inflow	Updated			60	Yes
IN10.393	I6660	Inflow	Updated	Needs cleaned		95	Yes
IN10.414	I9282	Inflow	New	Structure destroyed needs repair		0%	Yes
IN10.5509	I5683	Inflow	Updated	Needs cleaned		100	Yes
IN10.611	I9279	Inflow	New	Completely filled with debris		100	Yes
IN10.6403	I6605	Inflow	Updated	Needs cleaned out		95	Yes
IN10.6407	I6610	Inflow	Updated	Needs cleaned out		100	Yes
IN10.7	I1106	Inflow	Updated	Needs cleaned		95	Yes
IN10.8122	I8416	Inflow	Updated	Needs repaired		100	Yes
IN2.1625	I1686	Inflow	Updated	Covered with debris, no visible pipes		60%	Yes
IN11.1894	I1957	Inflow	Updated	Covered by overgrown grass	Opening buried	0%	Yes
IN11.5652	I5831	Inflow	Updated	Pipe half full of sediment		50%	Yes
IN11.5963	I6146	Inflow	Updated	Filled full of debri		0%	Yes
IN11.6033	I6216	Inflow	Updated	Buried with sediment to 12" below top		0%	Yes
IN11.6840	I7078	Inflow	Updated	Opening filled with debri	Inside not visible	50%	Yes
IN12.1731	I1793	Inflow	Updated	Unable to access		60%	Yes
IN12.6643	I6885	Inflow	Updated	Could not locate. Buried by sediment		100%	Yes
IN2.143	I9198	Inflow	New			90	Yes
IN3.5555	I5729	Inflow	Updated	Partially collapsed		0%	Yes
IN3.594	I9330	Inflow	New	Filled with gravel to depth 13"	Outlet pipe and pipe 1 inverts unknown	0%	Yes
IN3.6318	I6504	Inflow	Updated	NA		50%	Yes
IN3.6358	I6545	Inflow	Updated	Inside filled with debri. Pipes not visible		0%	Yes
IN4.2864	I2953	Inflow	Updated	100 blocked by sediment		100%	Yes
IN8.2266	I2343	Inflow	Updated	Inside not visible.Opening blocked-overgrown grass		100%	Yes
IN8.608	I9315	Inflow	New	Filled with sediment and debri		80%	Yes
IN8.6177	I6362	Inflow	Updated	No openings for ground inflow	Opening may be buried or may be junction box	0%	Yes
IN2.I8976	I8976	Inflow	Updated	Floode and full of debris	Mostly buried outfall 25ft north. Concrete	100	Yes
JB2.J2346	J2346	JunctionBox	Updated	Accepts ditch flow		80%	Yes
JB9.6978	I7226	Inflow	Updated	Can't see pipes		0%	Yes
JB2.115	J0121	JunctionBox	Updated	Concern top not moveable		0%	Yes
JB14.649	J2368	JunctionBox	New	Not catching, grate on top inlet pipes abandoned?		0%	Yes
JB5.109	J2374	JunctionBox	New	Top cracked		0%	Yes
OUT12.325	D09306	Discharge	Updated	Outlet backed up. No structure or pipe located			Yes
OUT12.326	D09313	Discharge	Updated	Ponding. Cannot locate			Yes
OUT11.332	D09371	Discharge	Updated	Structure destroyed			Yes

Appendix B

Hydrologic Data



Source: U.S. Department of Agriculture - Natural Resources Conservation Service

0 0.5 1 2 3 4 Miles

Shelby
Stormwater Masterplan

Appendix B.1
Soil Map

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

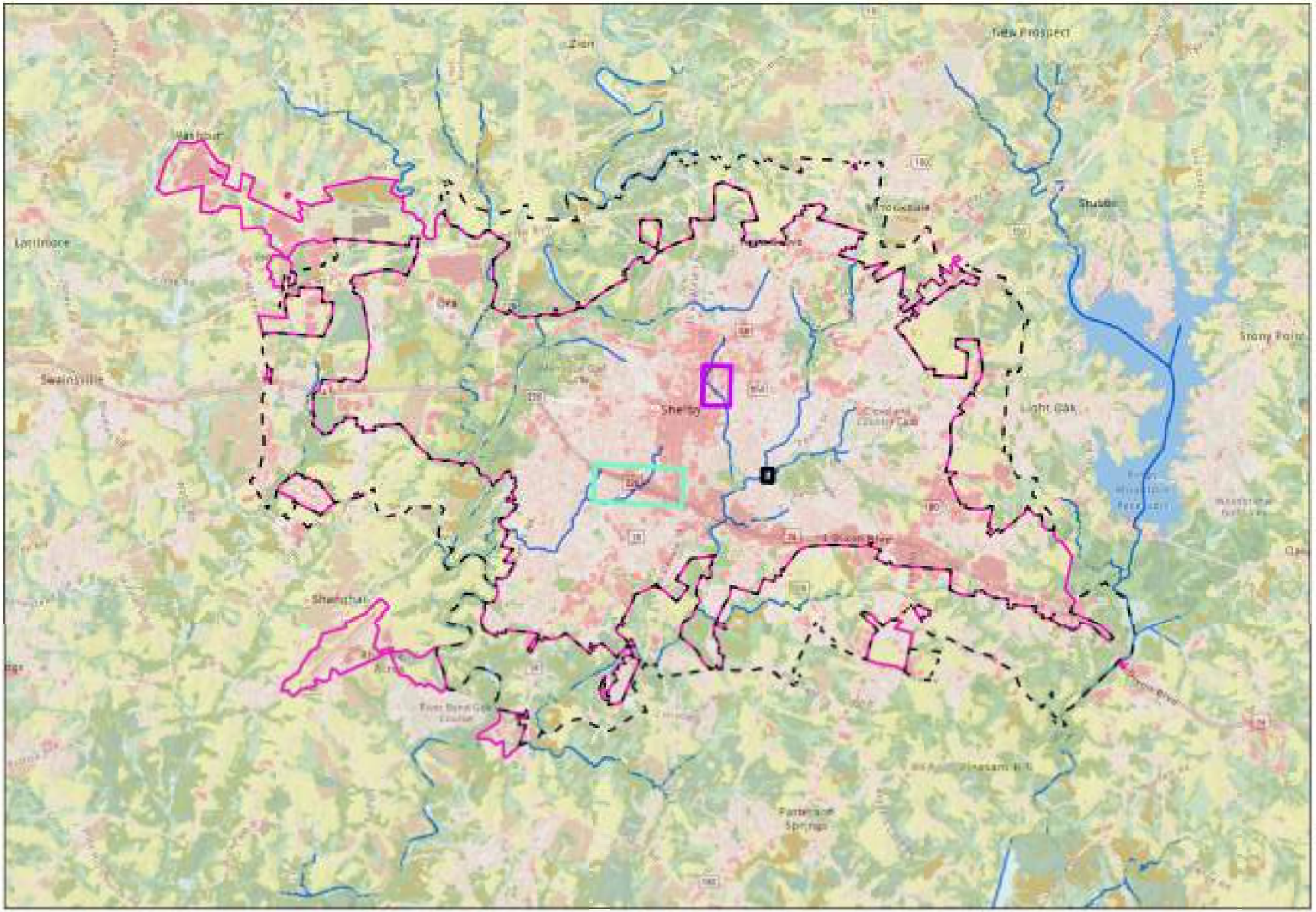
Legend

- Shelby City Limits
- Shelby ETJ
- AOC 1 - Carolina Ave. & Suttle Street
- AOC 2 - Monbrose Dr. Near Windsor Dr. and Hickory Creek
- AOC 3 & 4 - Royster Ave. and Broad St.
- A
- B
- C
- D
- Stream Centerline

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Shelby
Stormwater Masterplan

Appendix 8.2
Land Use Map

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

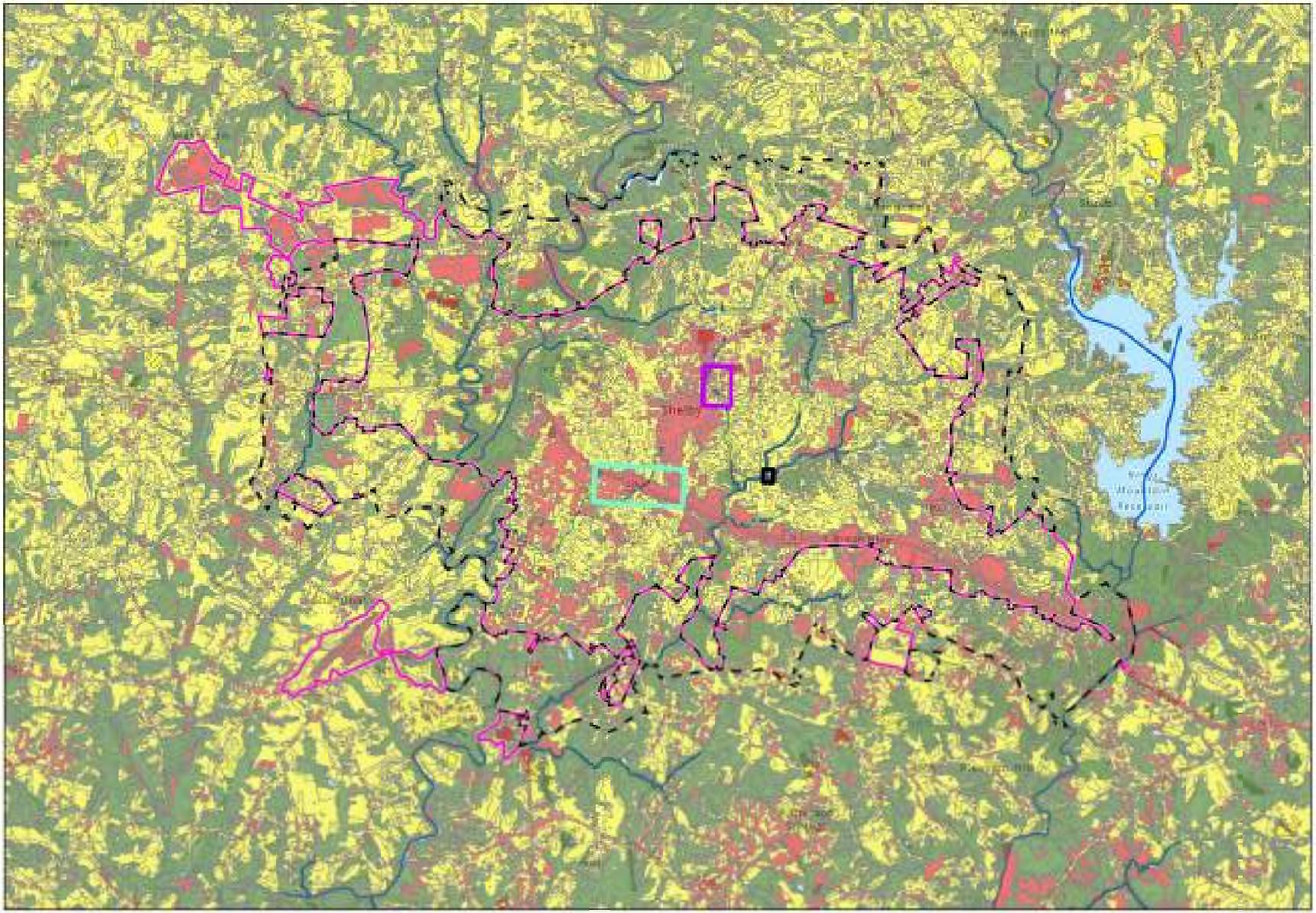
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NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

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Stormwater Masterplan

Appendix B.3
Curve Number (CN) Map

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

Boundary
- Shelby City Limits
- Shelby ETJ

Area of Concern (AOC)
- AOC 1 - Carolina Ave. & Suttle Street
- AOC 2 - Montrose Dr. near Windsor Dr. and Hickory Creek
- AOC 3 & 4 - Royster Ave. and Broad St.

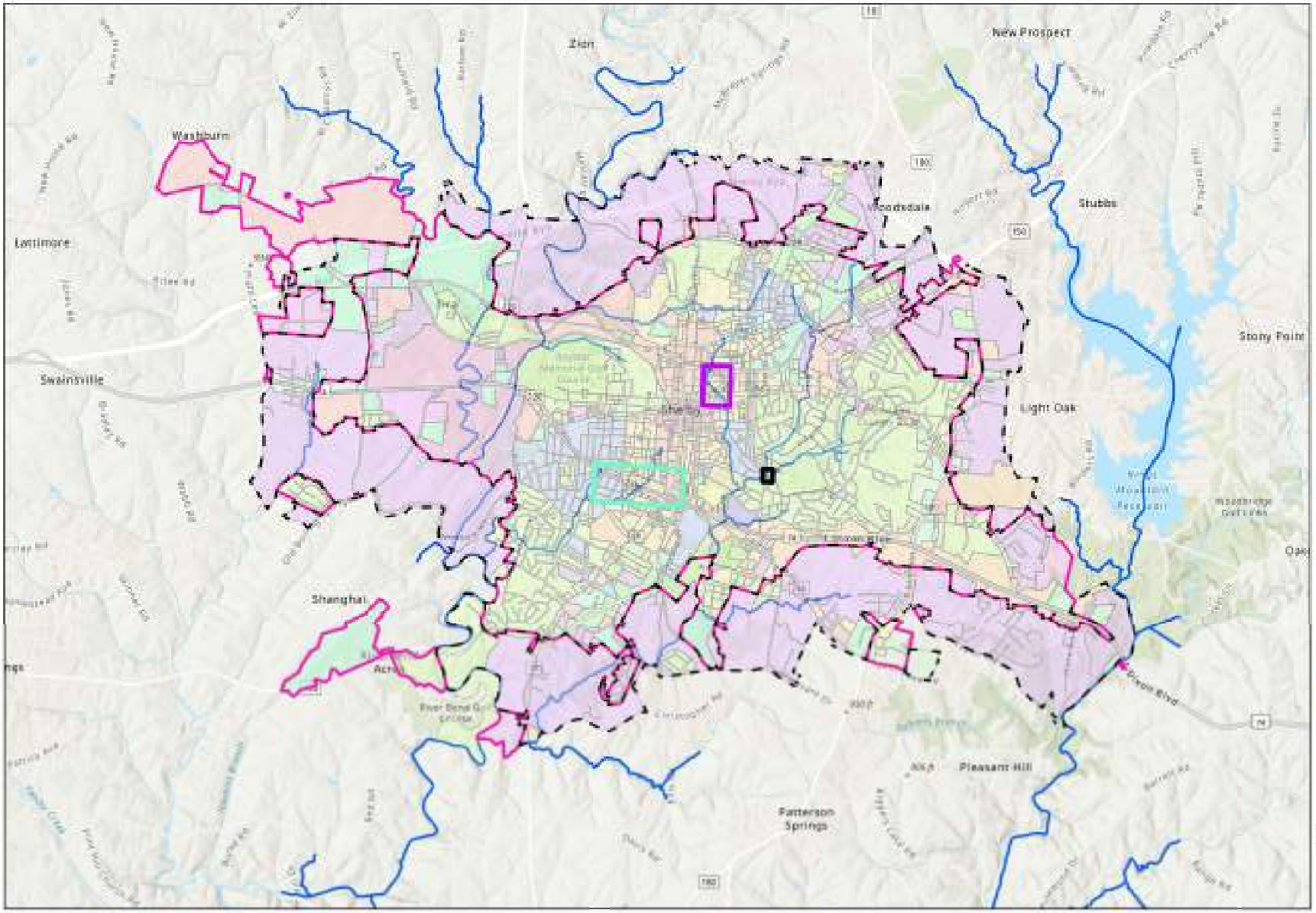
CN
- 30- 55
- 55-61
- 61-78
- 78-98
- Stream Centerline

0 0.5 1 2 3 4 Miles

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Appendix B.4
Zoning Map

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

Boundary
- Shelby City Limits
- Shelby ETJ

Area of Concern (AOC)
- AOC 1 – Carolina Ave. & Dekalb Street
- AOC 2 – Montrose Dr. West Marion Dr. and Hickory Creek
- AOC 3 & 4 – Raynor Ave. and Broad St.

ZoneType
- CB
- CPD
- CPD-CU
- GB
- GB-CU
- HBD
- HBD-CU
- HBD-C2
- I2
- I2-CU
- LI
- LI-CU
- MI
- MI-CU
- R10
- R10-C2
- R10-CU
- R6
- R6-CU
- R6-C2
- R8
- R8-CU
- R8-C2
- Shelby Corporate Limits

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NOAA Atlas 14, Volume 2, Version 3
Location name: Shelby, North Carolina, USA*
Latitude: 35.2938°, Longitude: -81.524°
Elevation: 867 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.399 (0.364-0.437)	0.472 (0.432-0.517)	0.556 (0.507-0.609)	0.621 (0.564-0.679)	0.701 (0.634-0.767)	0.761 (0.684-0.832)	0.821 (0.735-0.899)	0.881 (0.782-0.965)	0.957 (0.842-1.05)	1.02 (0.886-1.12)
10-min	0.637 (0.581-0.698)	0.755 (0.690-0.827)	0.891 (0.812-0.975)	0.993 (0.902-1.09)	1.12 (1.01-1.22)	1.21 (1.09-1.32)	1.30 (1.17-1.43)	1.40 (1.24-1.53)	1.51 (1.33-1.66)	1.60 (1.40-1.77)
15-min	0.796 (0.727-0.873)	0.949 (0.868-1.04)	1.13 (1.03-1.23)	1.26 (1.14-1.37)	1.42 (1.28-1.55)	1.53 (1.38-1.66)	1.65 (1.48-1.80)	1.76 (1.56-1.93)	1.90 (1.68-2.10)	2.01 (1.75-2.22)
30-min	1.09 (0.996-1.20)	1.31 (1.20-1.44)	1.60 (1.46-1.75)	1.82 (1.65-1.99)	2.10 (1.90-2.29)	2.31 (2.08-2.53)	2.53 (2.26-2.76)	2.74 (2.43-3.00)	3.03 (2.67-3.33)	3.26 (2.84-3.60)
60-min	1.36 (1.24-1.49)	1.64 (1.50-1.80)	2.05 (1.87-2.25)	2.37 (2.15-2.59)	2.79 (2.52-3.06)	3.13 (2.81-3.42)	3.48 (3.11-3.81)	3.85 (3.41-4.21)	4.35 (3.82-4.78)	4.76 (4.14-5.25)
2-hr	1.59 (1.46-1.74)	1.93 (1.77-2.11)	2.42 (2.22-2.64)	2.81 (2.57-3.07)	3.35 (3.06-3.66)	3.80 (3.44-4.14)	4.27 (3.84-4.66)	4.77 (4.26-5.22)	5.49 (4.85-6.03)	6.09 (5.32-6.72)
3-hr	1.70 (1.55-1.87)	2.05 (1.88-2.26)	2.58 (2.36-2.84)	3.02 (2.74-3.32)	3.64 (3.29-4.00)	4.16 (3.74-4.58)	4.72 (4.20-5.19)	5.33 (4.70-5.88)	6.22 (5.41-6.89)	6.98 (6.01-7.75)
6-hr	2.08 (1.92-2.28)	2.51 (2.31-2.75)	3.14 (2.88-3.44)	3.67 (3.35-4.01)	4.43 (4.02-4.84)	5.07 (4.56-5.54)	5.76 (5.15-6.30)	6.52 (5.77-7.15)	7.65 (6.65-8.40)	8.61 (7.40-9.47)
12-hr	2.52 (2.32-2.76)	3.05 (2.80-3.34)	3.83 (3.51-4.18)	4.47 (4.08-4.87)	5.40 (4.90-5.87)	6.18 (5.57-6.72)	7.02 (6.28-7.63)	7.95 (7.02-8.64)	9.32 (8.11-10.1)	10.5 (9.01-11.4)
24-hr	3.05 (2.84-3.28)	3.69 (3.43-3.97)	4.64 (4.32-4.99)	5.40 (5.01-5.80)	6.46 (5.97-6.92)	7.32 (6.74-7.84)	8.21 (7.52-8.80)	9.15 (8.34-9.80)	10.5 (9.48-11.2)	11.5 (10.4-12.4)
2-day	3.62 (3.36-3.89)	4.36 (4.05-4.69)	5.46 (5.07-5.87)	6.34 (5.87-6.80)	7.55 (6.96-8.10)	8.52 (7.83-9.14)	9.54 (8.73-10.2)	10.6 (9.67-11.4)	12.1 (10.9-13.0)	13.3 (12.0-14.3)
3-day	3.85 (3.58-4.13)	4.63 (4.31-4.97)	5.75 (5.35-6.17)	6.64 (6.17-7.12)	7.87 (7.28-8.42)	8.85 (8.16-9.47)	9.86 (9.07-10.6)	10.9 (10.0-11.7)	12.4 (11.3-13.3)	13.5 (12.3-14.5)
4-day	4.08 (3.81-4.36)	4.89 (4.58-5.21)	6.04 (5.64-6.46)	6.95 (6.47-7.43)	8.19 (7.60-8.74)	9.17 (8.50-9.80)	10.2 (9.42-10.9)	11.2 (10.3-12.0)	12.6 (11.6-13.5)	13.8 (12.6-14.8)
7-day	4.73 (4.44-5.04)	5.65 (5.30-6.01)	6.88 (6.46-7.32)	7.87 (7.36-8.37)	9.21 (8.60-9.79)	10.3 (9.58-10.9)	11.4 (10.6-12.1)	12.5 (11.6-13.3)	14.0 (12.9-15.0)	15.3 (14.0-16.3)
10-day	5.38 (5.08-5.72)	6.40 (6.04-6.79)	7.69 (7.26-8.17)	8.70 (8.20-9.24)	10.1 (9.46-10.7)	11.1 (10.5-11.8)	12.2 (11.4-13.0)	13.3 (12.4-14.1)	14.8 (13.8-15.8)	16.0 (14.8-17.0)
20-day	7.17 (6.81-7.55)	8.47 (8.04-8.91)	10.0 (9.48-10.5)	11.2 (10.6-11.8)	12.8 (12.1-13.5)	14.1 (13.3-14.8)	15.4 (14.5-16.2)	16.7 (15.6-17.6)	18.4 (17.2-19.5)	19.8 (18.4-21.0)
30-day	8.77 (8.36-9.19)	10.3 (9.84-10.8)	12.0 (11.4-12.6)	13.3 (12.7-13.9)	15.0 (14.3-15.7)	16.3 (15.5-17.1)	17.6 (16.7-18.5)	18.9 (17.9-19.9)	20.6 (19.4-21.7)	22.0 (20.6-23.2)
45-day	11.1 (10.6-11.6)	13.0 (12.4-13.5)	14.8 (14.2-15.4)	16.2 (15.5-16.9)	18.0 (17.2-18.8)	19.4 (18.5-20.3)	20.8 (19.8-21.7)	22.1 (21.0-23.1)	23.9 (22.6-25.0)	25.2 (23.8-26.4)
60-day	13.2 (12.7-13.7)	15.4 (14.8-16.0)	17.4 (16.7-18.1)	18.9 (18.1-19.7)	20.9 (20.0-21.7)	22.4 (21.4-23.3)	23.8 (22.8-24.8)	25.2 (24.1-26.3)	27.0 (25.8-28.3)	28.4 (27.0-29.7)

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

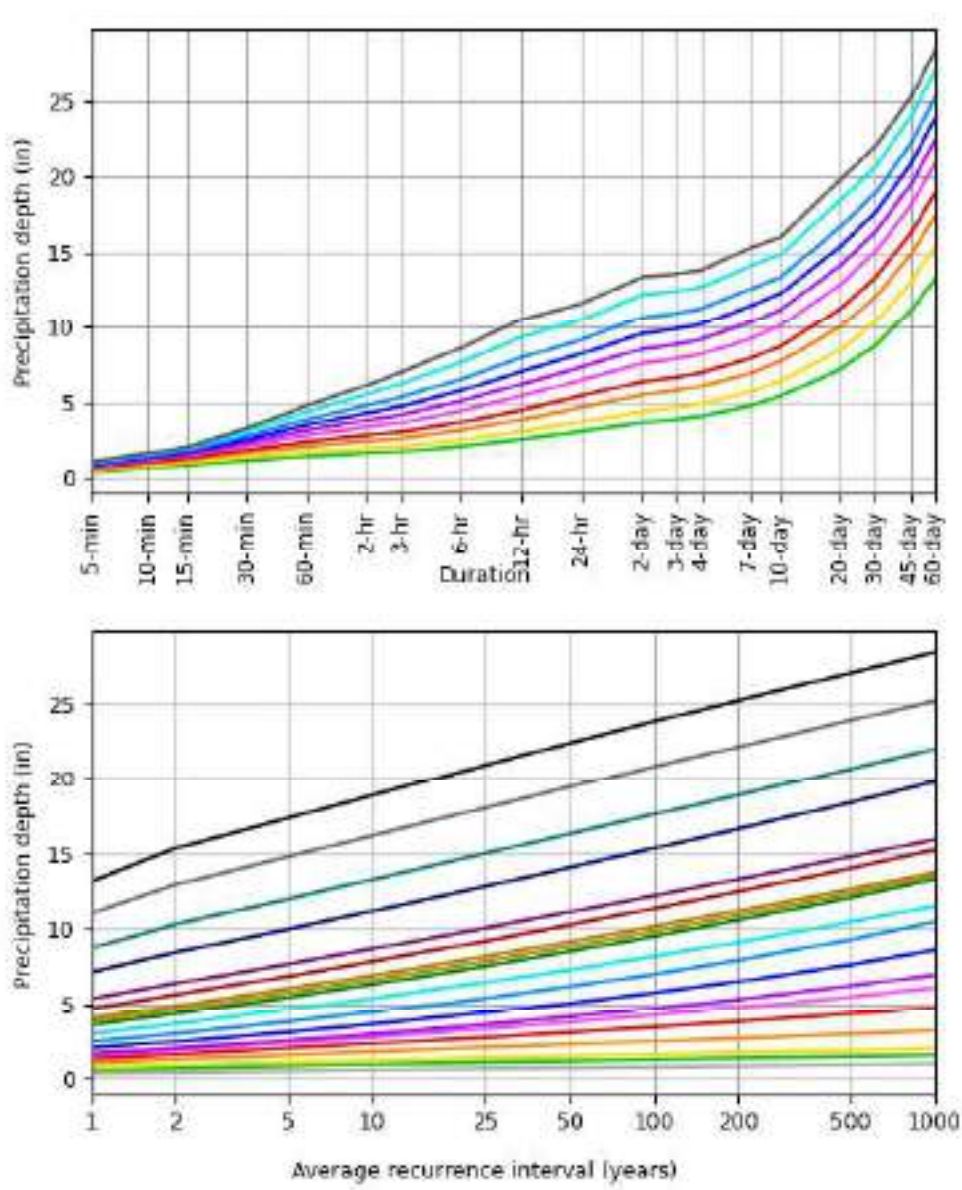
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.2938°, Longitude: -81.5240°

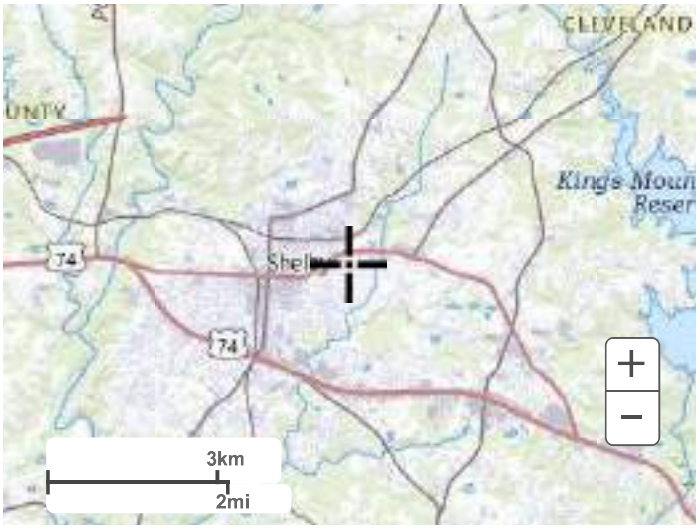


NOAA Atlas 14, Volume 2, Version 3 Created (GMT): Fri Nov 14 22:26:14 2025

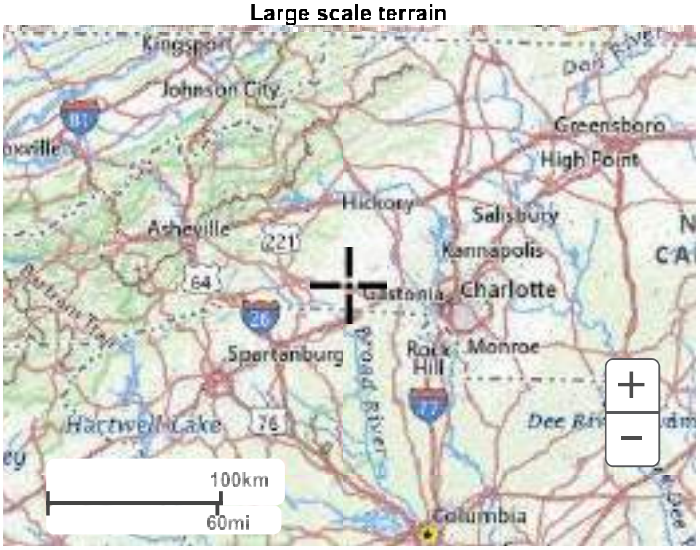
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Maps & aerials

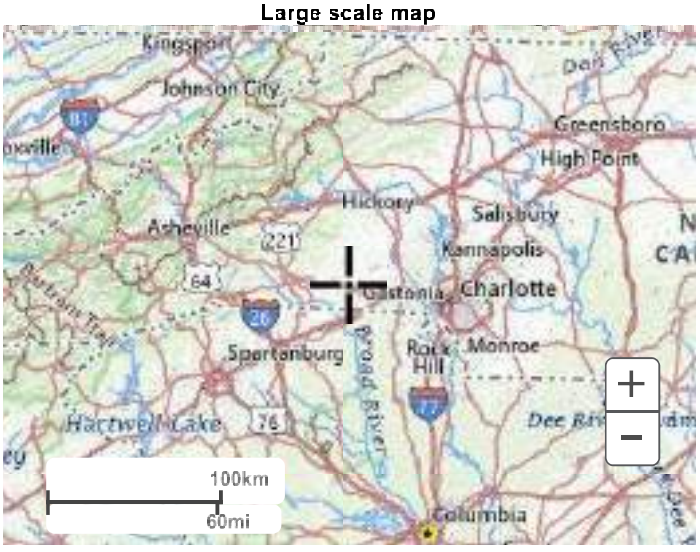
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



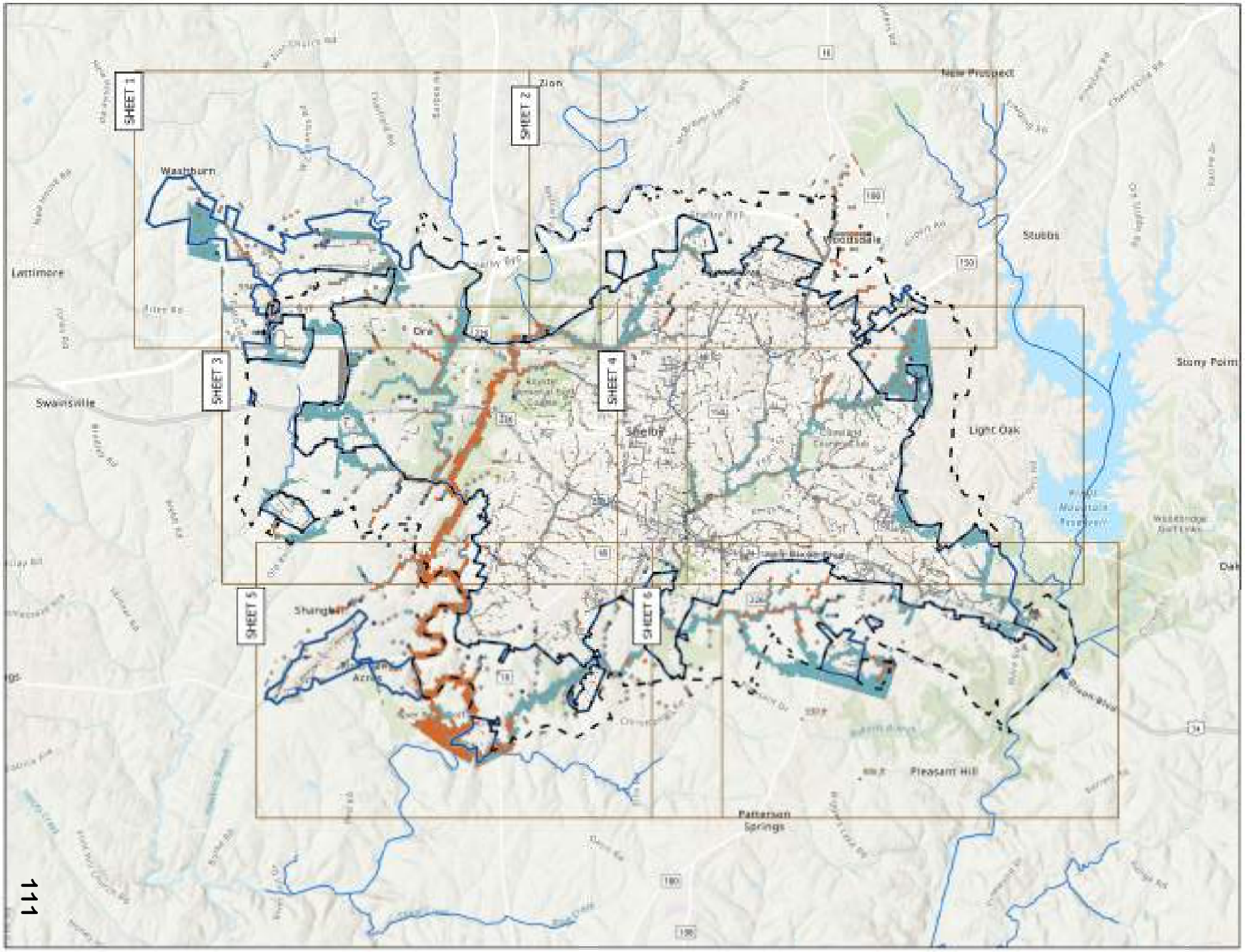
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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Appendix C

Existing Conditions



Shelby
Stormwater Masterplan

Appendix C.0
Existing Conditions
Citywide Index Overview

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: October 2025

N

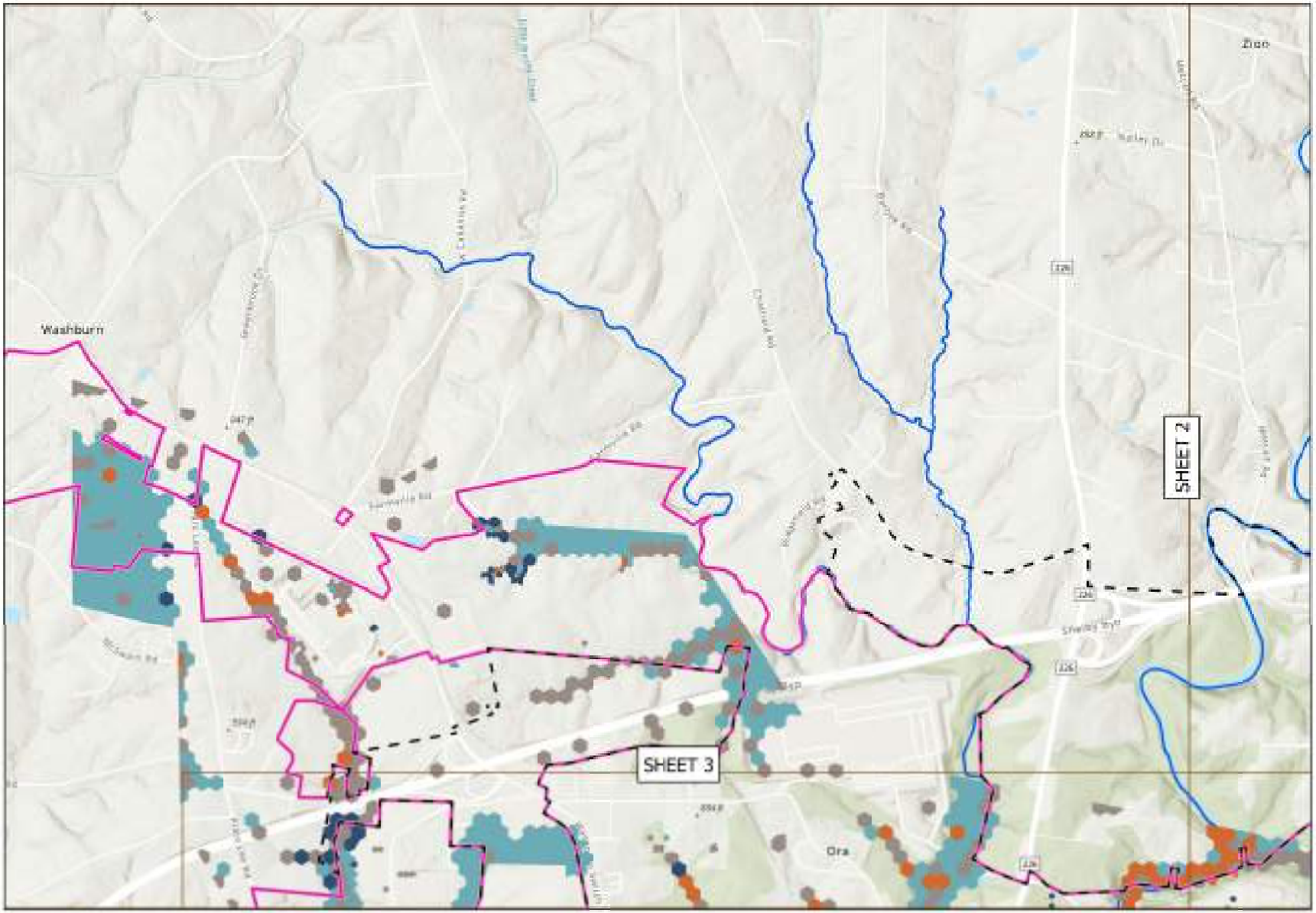
Legend

- Shelby City Limits
- Shelby ETJ
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Sheet Boundary
- Stream Centerline
- Existing Stormwater Infrastructure

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Asheville, NC 28801
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NC Firm License # C-0459



Shelby
Stormwater Masterplan

Appendix C.1
Existing Conditions
Citywide Index Sheet 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

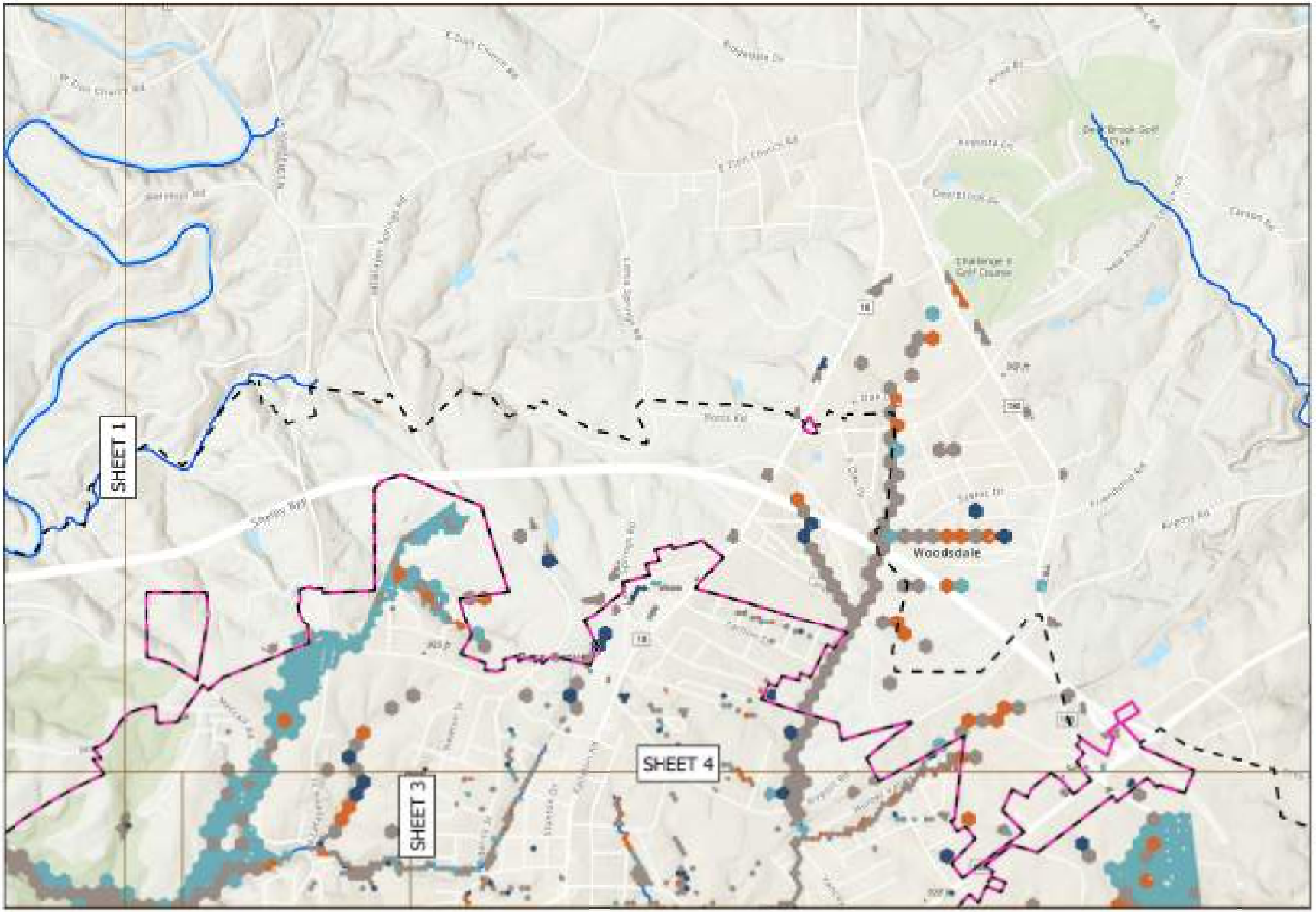
- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Stream Centerline

0 0.15 0.3 0.6 0.9 1.2 Miles

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Appendix C.2
Existing Conditions
Citywide Index Sheet 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

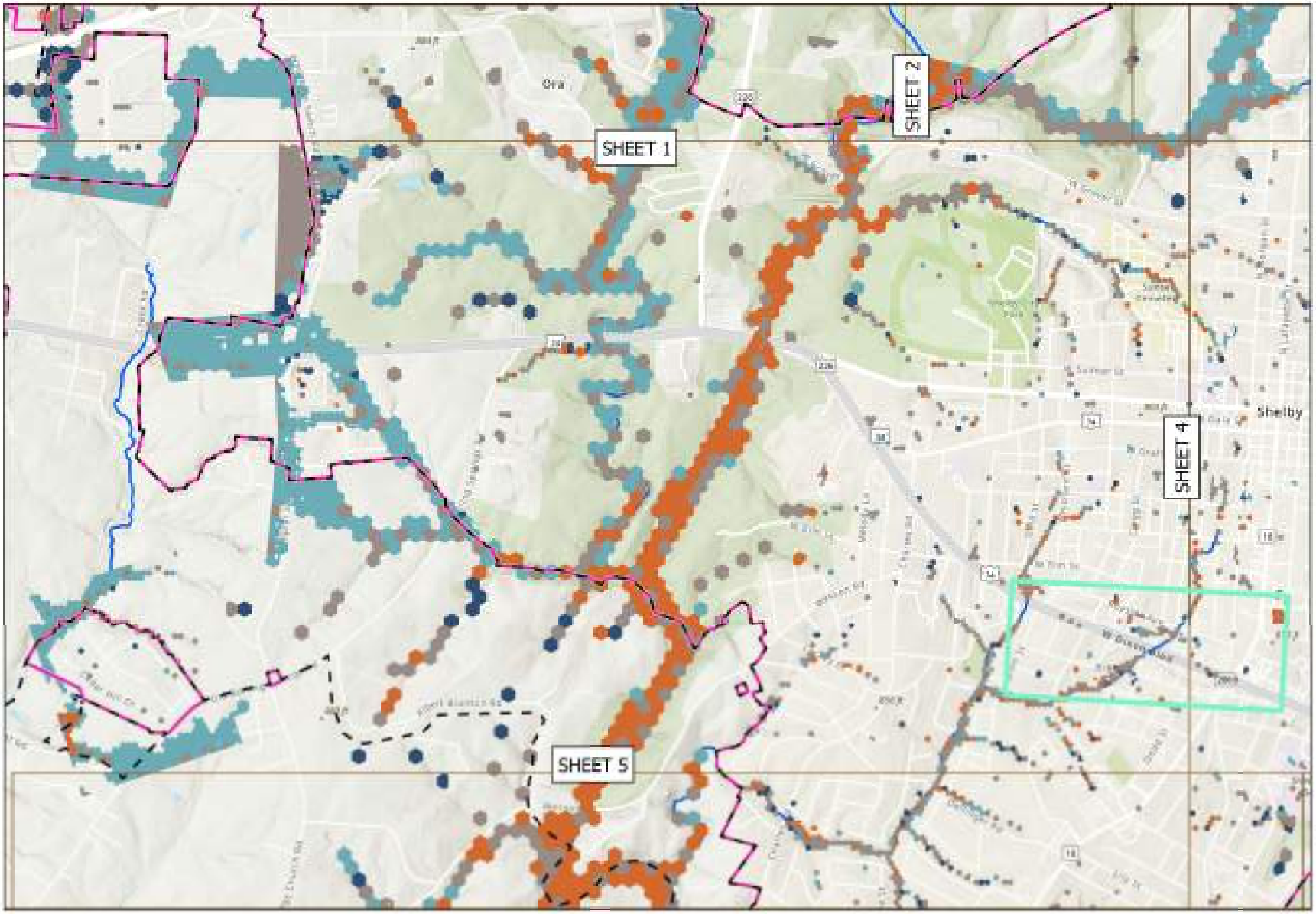
- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Stream Centerline

0 0.15 0.3 0.6 0.9 1.2 Miles

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Stormwater Masterplan

Appendix C.3
Existing Conditions
Citywide Index Sheet 3

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

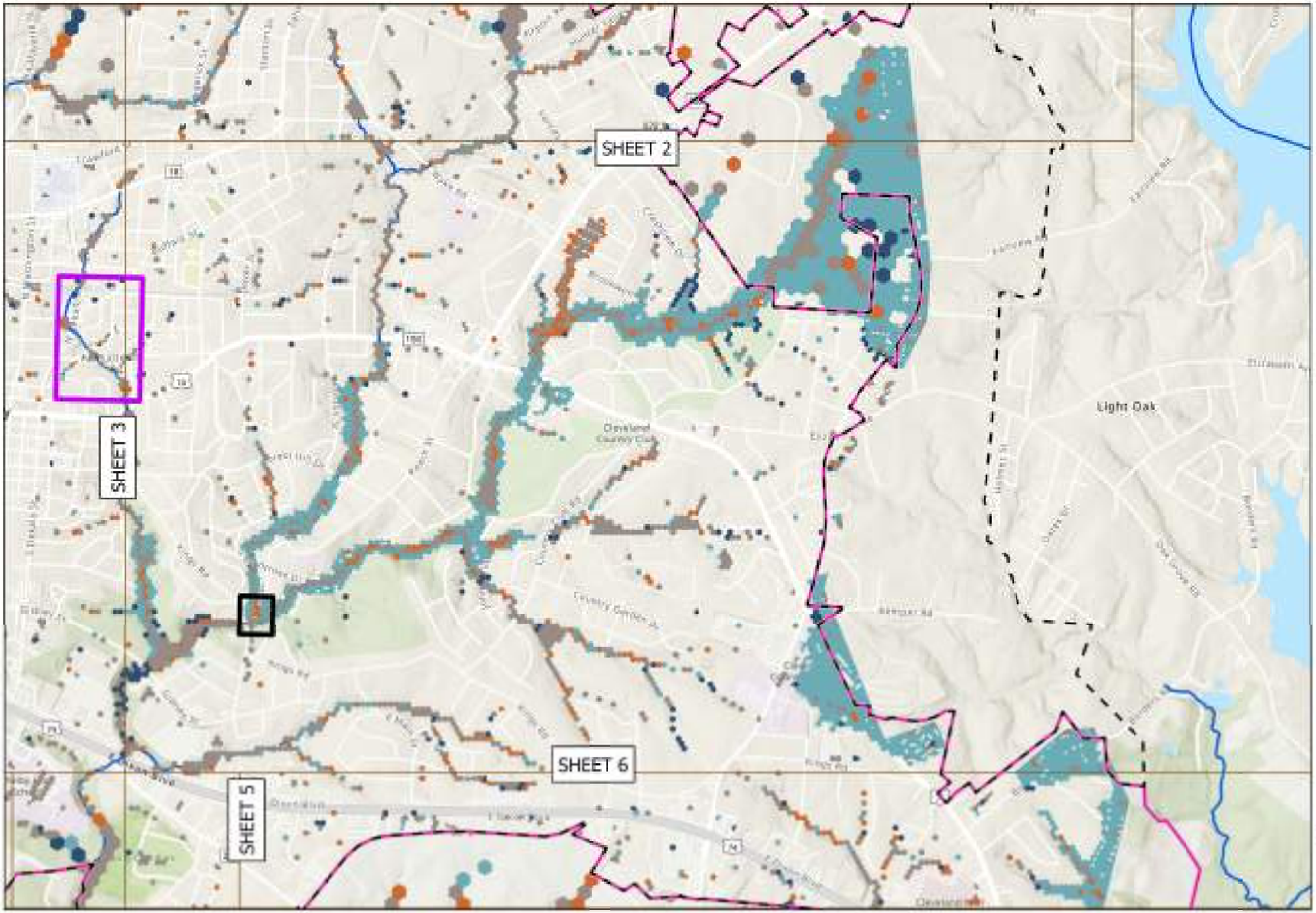
Legend

- Shelby City Limits
- Shelby ETJ
- AOC 3 & 4 - Royster Ave. and Broad St.
- Sheet Boundary
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Stream Centerline

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Stormwater Masterplan

Appendix C.4
Existing Conditions
Citywide Index Sheet 4

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2020

N

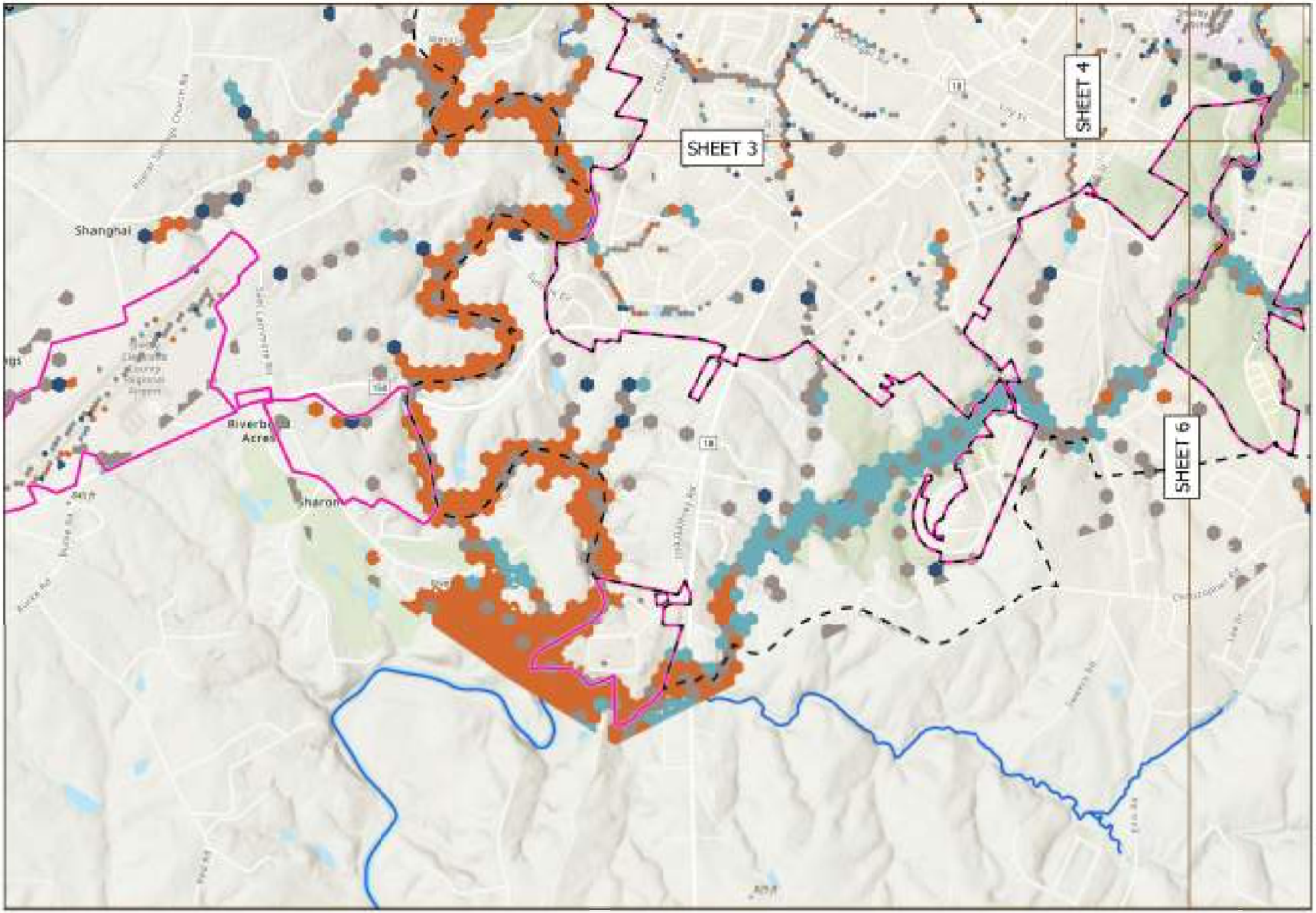
Legend

- Shelby City Limits
- Shelby ETJ
- AOC 1 - Carolina Ave. & Suttle Street
- AOC 2 - Northrop Dr. Near Windsor Dr. and Hickory Creek
- AOC 3 & 4 - Royster Ave. and Broad St.
- Sheet Boundary
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Stream Centerline

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Appendix C.5
Existing Conditions
Citywide Index Sheet 5

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

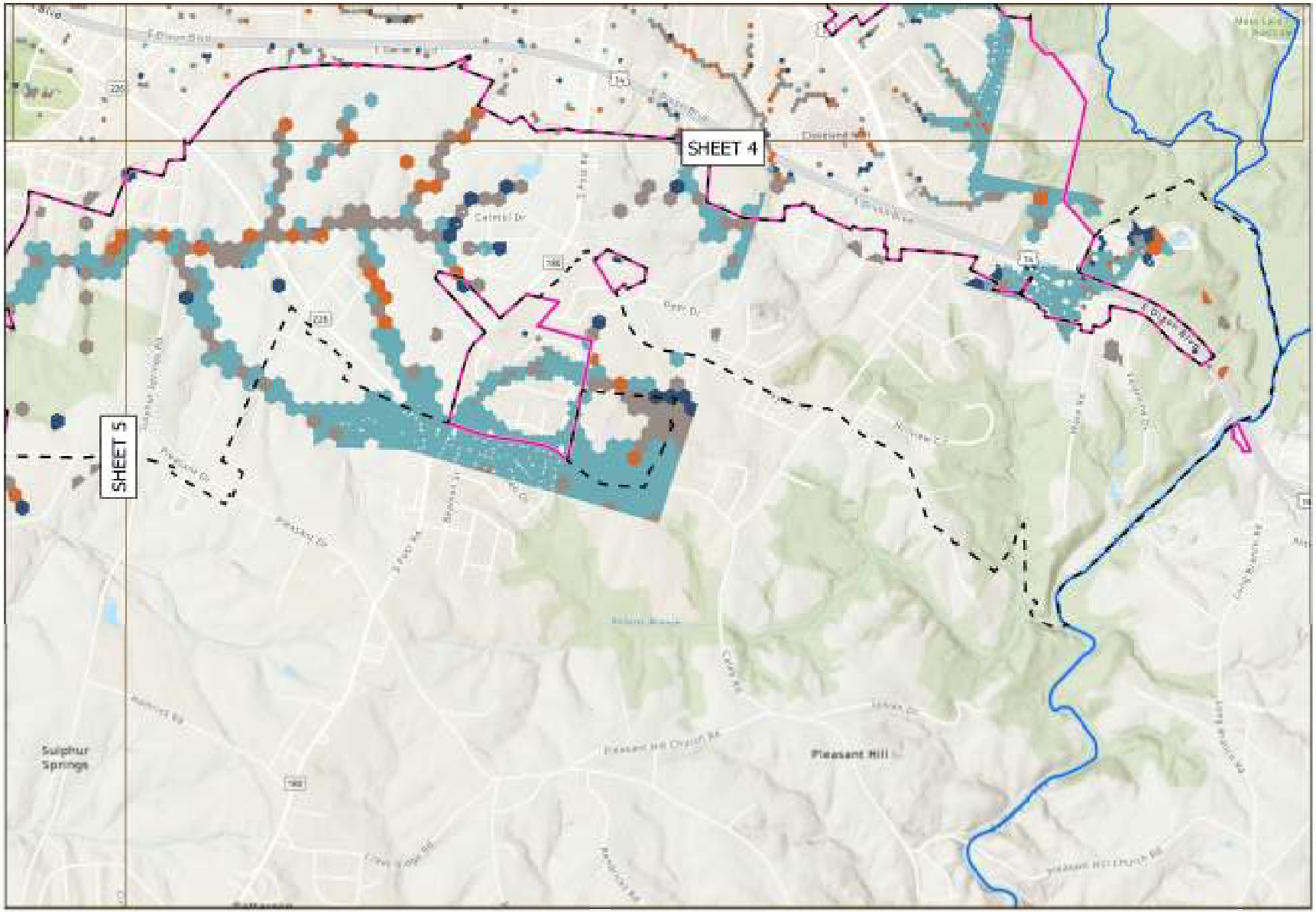
Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Stream Centerline

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Stormwater Masterplan

Appendix C.1
Existing Conditions
Citywide Index Sheet 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Shelby City Limits
- Shelby ETJ
- Sheet Boundary
- 10-Year Flood Extents
- 25-Year Flood Extents
- 50-Year Flood Extents
- 100-Year Flood Extents
- Stream Centerline

0 0.15 0.3 0.6 0.9 1.2 Miles

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Stormwater Masterplan
Appendix C.7
Existing Conditions
10-YR Event
AOC 1 - Carolina Ave. & Suttle Street
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Inflows
Junction
2' - 4'
4' - 6'
6' - 8'
8' - 12'
12' +
Stream Centerline
0
0.02
0.04
0.08
0.12
0.16
Miles
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Stormwater Masterplan
Appendix C.8
Existing Conditions
25-YR Event
AOC 1 - Carolina Ave. & Suttle Street
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Inflows
Junction
2' - 4'
4' - 6'
6' - 8'
8' - 12'
12' +
Stream Centerline
0
0.02
0.04
0.08
0.12
0.16
Miles
mcgill
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Asheville, NC 28801
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Broad St
Wilson St
Dale St
Carolina Ave
Suttle St
Palm St
Brookhill Rd
E Stanley St
Knob St


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Stormwater Masterplan
Appendix C.9
Existing Conditions
50-YR Event
AOC 1 - Carolina Ave. & Suttle Street
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Inflows
Junction
2' - 4'
4' - 6'
6' - 8'
8' - 12'
12' +
Stream Centerline
0
0.02
0.04
0.08
0.12
0.16
Miles
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Appendix C.10
Existing Conditions
100-YR Event
AOC 1 - Carolina Ave. & Suttle Street

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 12"
- 12" - 12"
- 12"+
- Stream Centerline

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Appendix C.11
Existing Conditions
10-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. & Hickory Creek

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2020

N

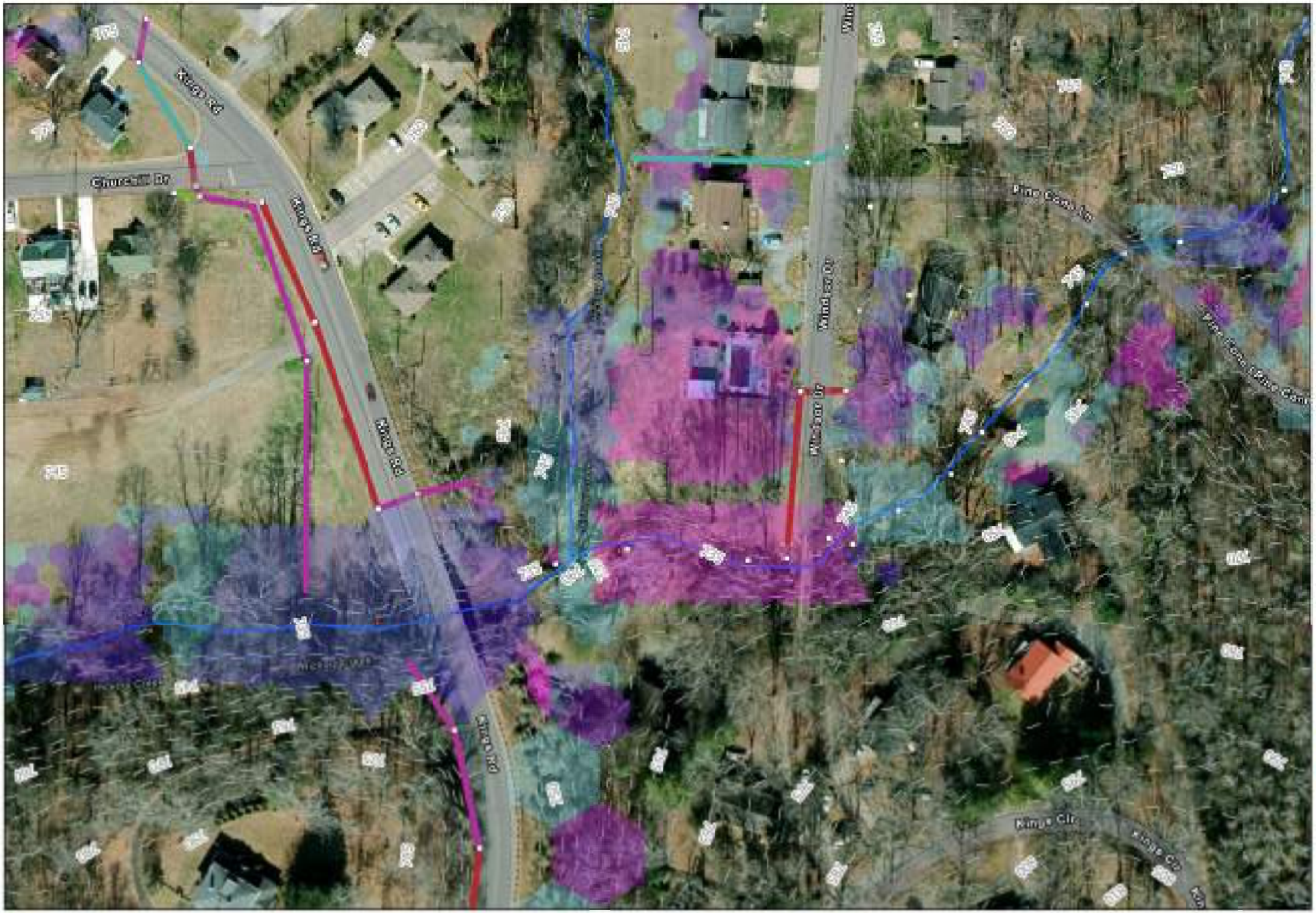
Legend

- Inflows
- Junction
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12" +
- Contours - 5ft
- Stream Centerline

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Appendix C.12
Existing Conditions
25-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. & Hickory Creek

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

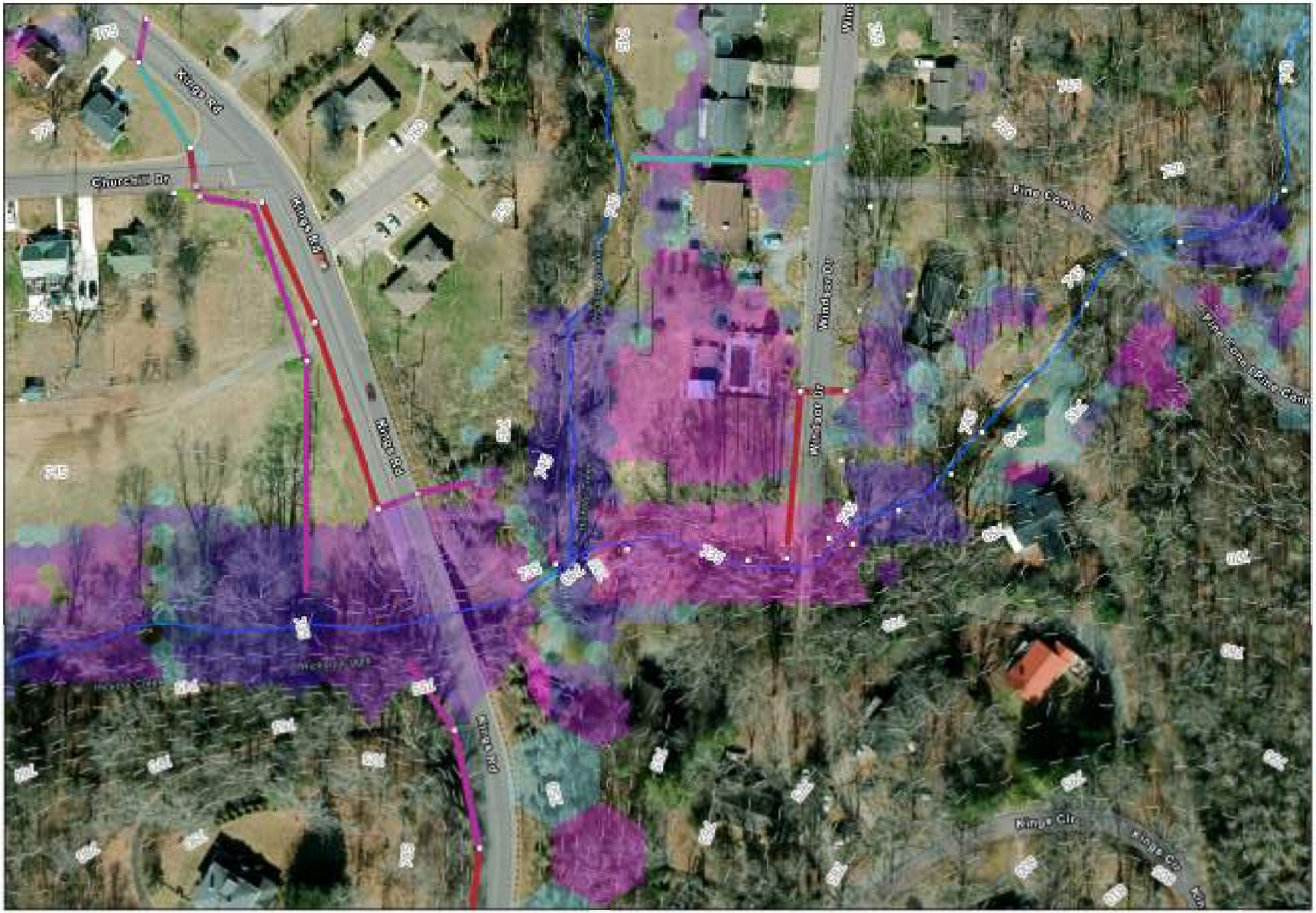
- Inflows
- Junction
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12" +
- Contours - 5ft
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Shelby
Stormwater Masterplan

Appendix C.13
Existing Conditions
50-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. & Hickory Creek

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2020

N

Legend

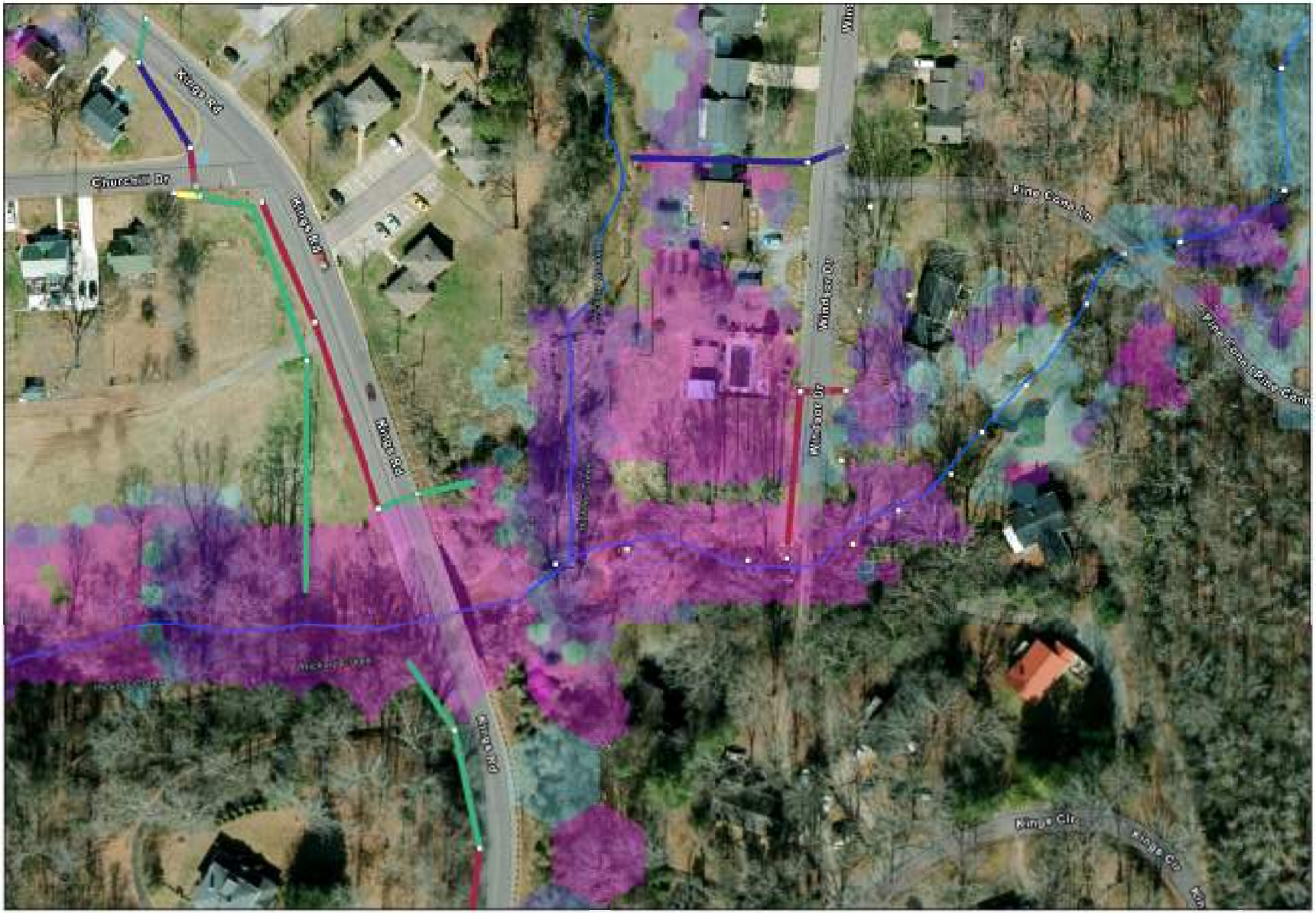
- Inflows
- Junction
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12" +
- Contours - 5ft
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06
Miles

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Shelby
Stormwater Masterplan
Appendix C.14
Existing Conditions
100-YR Event
AOC 2 - Montrose Dr, Near Windsor Dr. & Hickory Creek

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Inflows
- Junction
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Appendix C.15
Existing Conditions
10-YR Event
AOC 3 & 4 - Royster Ave.
& Broad St.

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 32" Culvert
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 49" Pipe
- Existing 58" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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0 0.02 0.04 0.08 0.12 0.16 Miles

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Appendix C.16
Existing Conditions
25-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Culvert
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 48" Pipe
- Existing 54" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2' - 4'
- 4' - 6'
- 6' - 8'
- 8' - 10'
- 10' - 12'
- 12'+
- Stream Centerline

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Stormwater Masterplan

Appendix C.17
Existing Conditions
50-YR Event
AOC 3 & 4 - Royster Ave.
& Broad St.

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 32" Culvert
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 49" Pipe
- Existing 58" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Appendix C.18
Existing Conditions
100-YR Event
AOC 3 & 4 - Royster Ave.
& Broad St.

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

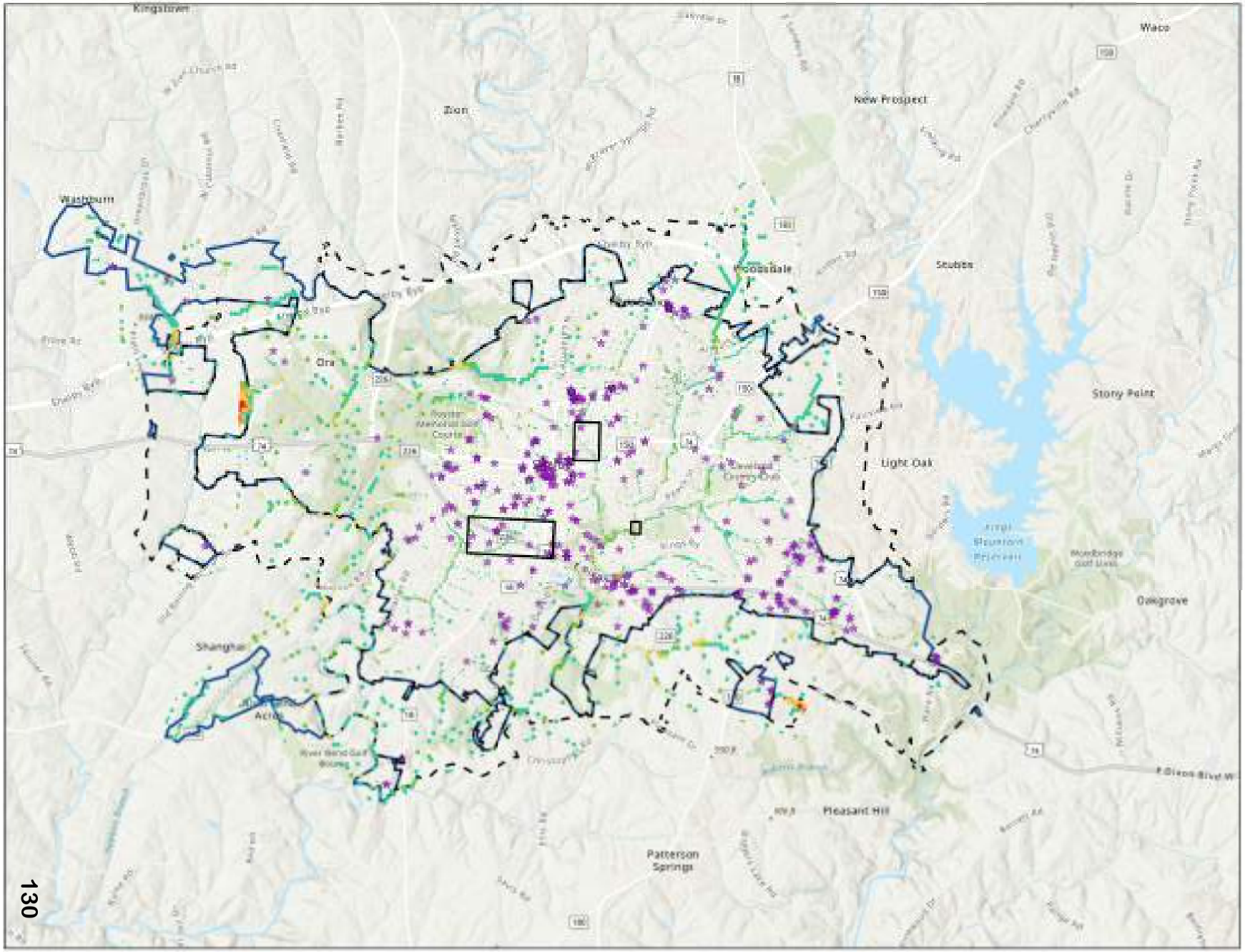
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

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Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
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- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 48" Pipe
- Existing 54" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2' - 4'
- 4' - 6'
- 6' - 8'
- 8' - 10'
- 10' - 12'
- 12'+
- Stream Centerline

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Appendix C.19
Existing Conditions
Max Depth and Surcharges
10-YR Event

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

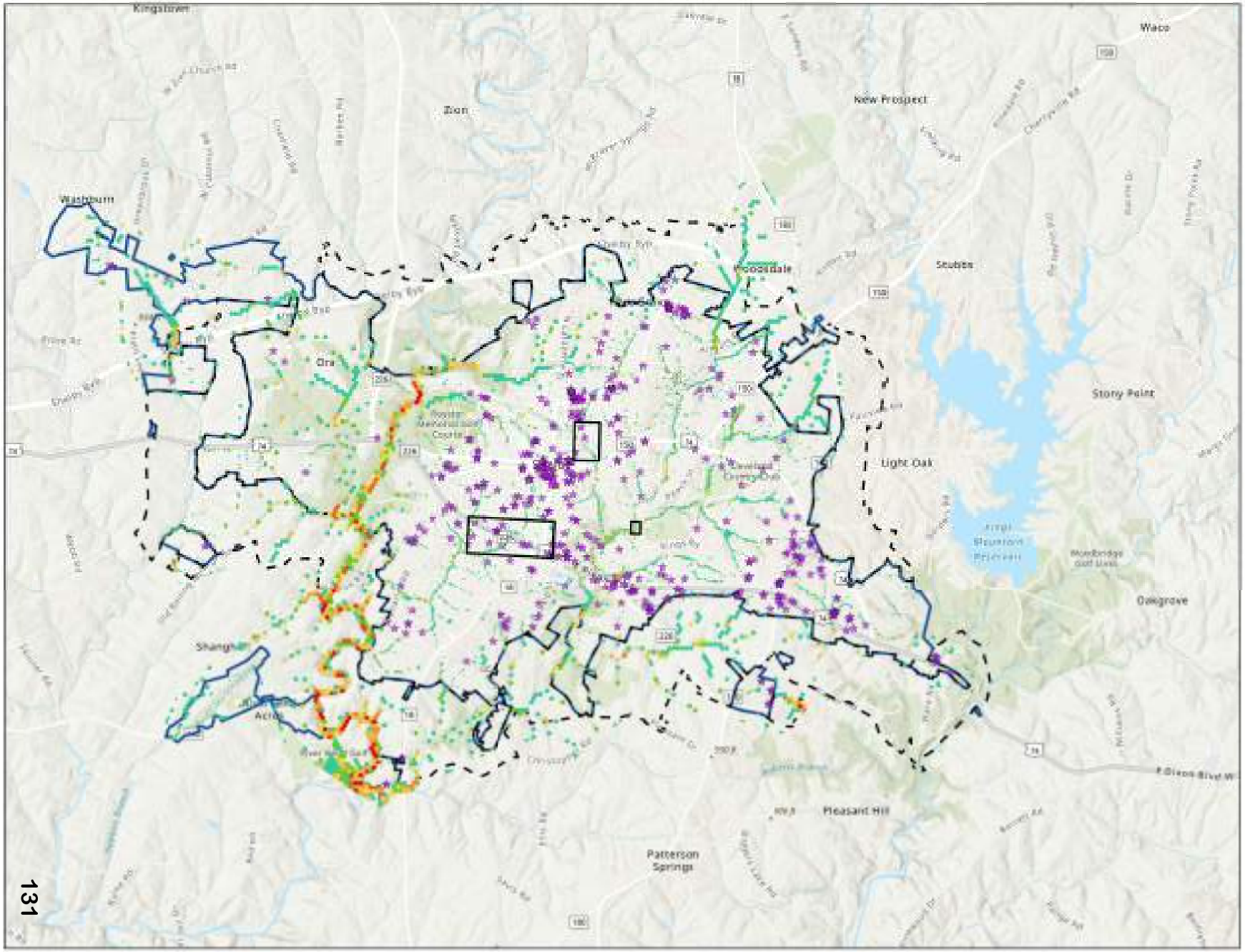
DESIGNER: MF
REVIEWER: DJ
DATE: September 2020

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7 - 8
9 - 10
11 - 12
13 - 14
15 - 16
17 - 18
19 - 20
21 - 22
23 - 24
25 - 26
27 - 28
29 - 30
Max Depth (Feet)
SURCHARGING JUNCTIONS
Shelby City Limits
Shelby ETJ

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Shelby
Stormwater Masterplan

Appendix C.20
Existing Conditions
Max Depth and Surcharges
25-YR Event

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: September 2020

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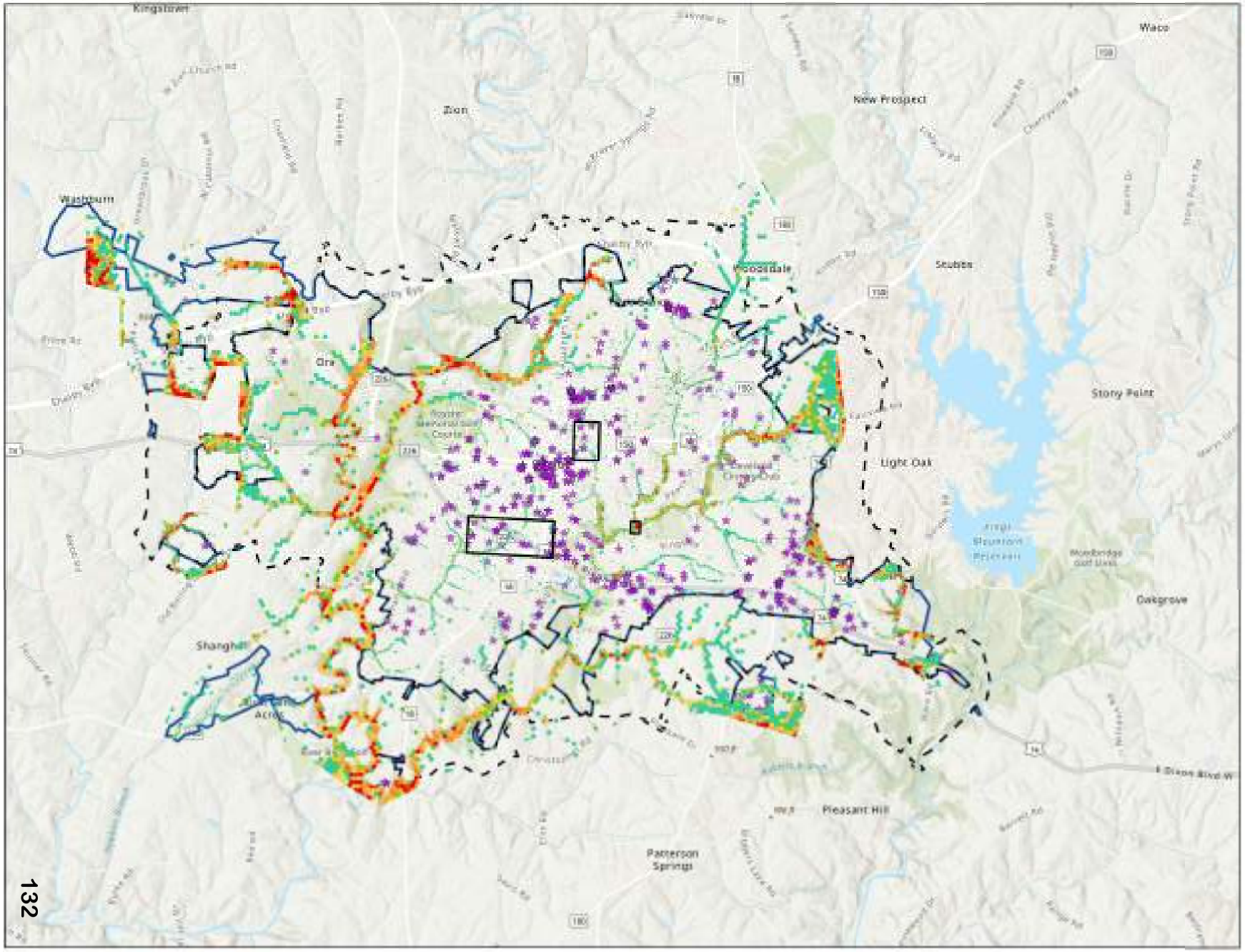
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7 - 8
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13 - 14
15 - 16
17 - 18
19 - 20
21 - 22
23 - 24
25 - 26
27 - 28
29 - 30

Max Depth (Feet)

SURCHARGING JUNCTIONS
Shelby City Limits
Shelby ETJ

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Stormwater Masterplan

Appendix C.21
Existing Conditions
Max Depth and Surcharges
50-YR Event

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

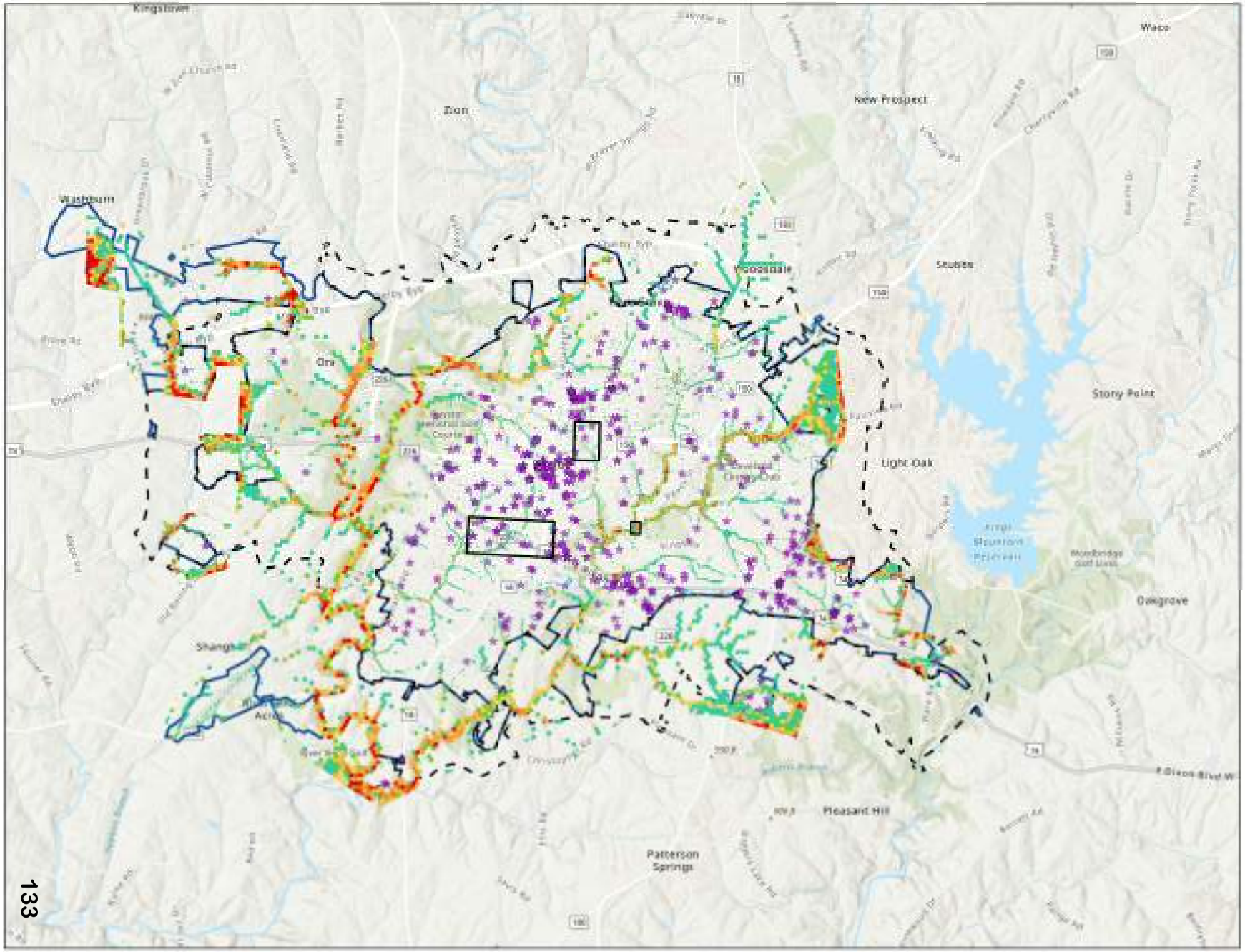
DESIGNER: MF
REVIEWER: DJ
DATE: September 2020

N

Legend

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9 - 10
11 - 12
13 - 14
15 - 16
17 - 18
19 - 20
21 - 22
23 - 24
25 - 26
27 - 28
29 - 30
Max Depth (Feet)
SURCHARGING JUNCTIONS
Shelby City Limits
Shelby ETJ

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Stormwater Masterplan

Appendix C.22
Existing Conditions
Max Depth and Surcharges
100-YR Event

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: September 2020

N

Legend

SheetSeries_Shelby
Name
AOCs
0 - 0
1 - 2
3 - 4
5 - 6
7 - 8
9 - 10
11 - 12
13 - 14
15 - 16
17 - 18
19 - 20
21 - 22
23 - 24
25 - 26
27 - 28
29 - 30
Max Depth (Feet)
SURCHARGING JUNCTIONS
Shelby City Limits
Shelby ETJ

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Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions	
			WSEL (ft.)	Flood Depth (ft.)
10-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.30	1.76
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00		
	Carolina Ave. - Downstream of Culvert	800.75	802.88	2.13
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	802.52	3.26
	Suttle St. - Upstream of Culvert (Road El.)	806.20		
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.14	4.03
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.62	0.54
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.21	0.61
25-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.66	2.12
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00		
	Carolina Ave. - Downstream of Culvert	800.75	803.50	2.75
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.25	3.99
	Suttle St. - Upstream of Culvert (Road El.)	806.20		
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.83	4.72
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.67	0.59
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.45	0.85
50-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.15	2.61
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00		
	Carolina Ave. - Downstream of Culvert	800.75	804.01	3.26
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.81	4.55
	Suttle St. - Upstream of Culvert (Road El.)	806.20		
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.35	5.24
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.76	0.67
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.56	0.96
100-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.78	3.24
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00		
	Carolina Ave. - Downstream of Culvert	800.75	804.64	3.89
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	804.50	5.24
	Suttle St. - Upstream of Culvert (Road El.)	806.20		
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.98	5.87
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.84	0.76
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.66	1.06

Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions	
			WSEL (ft.)	Flood Depth (ft.)
10-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.36	0.70
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.20	0.00
	315 Windsor Drive:House - NW of House	744.71	744.71	0.01
	315 Windsor Drive:House - SW of House	744.06	744.70	0.64
	315 Windsor Drive:House - West of House	744.07	744.70	0.63
25-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.50	0.84
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.22	0.02
	315 Windsor Drive:House - NW of House	744.71	744.76	0.05
	315 Windsor Drive:House - SW of House	744.06	744.76	0.69
	315 Windsor Drive:House - West of House	744.07	744.76	0.68
50-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.80	1.14
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.29	0.09
	315 Windsor Drive:House - NW of House	744.71	744.78	0.08
	315 Windsor Drive:House - SW of House	744.06	744.78	0.72
	315 Windsor Drive:House - West of House	744.07	744.78	0.71
100-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.20	1.53
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.40	0.20
	315 Windsor Drive:House - NW of House	744.71	744.83	0.12
	315 Windsor Drive:House - SW of House	744.06	744.83	0.77
	315 Windsor Drive:House - West of House	744.07	744.83	0.75

Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions	
			WSEL (ft.)	Flood Depth (ft.)
10-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	814.99	8.67
	Royster Ave. - Upstream of Culvert (Road El.)	814.20		
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	807.46	8.61
	Broad St. - Upstream of Culvert (Stream El.)	795.10	799.23	4.13
	Broad St. - Upstream of Culvert (Road El.)	800.90		
25-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.20	8.88
	Royster Ave. - Upstream of Culvert (Road El.)	814.20		
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	808.57	9.72
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.42	6.32
	Broad St. - Upstream of Culvert (Road El.)	800.90		
50-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.24	8.92
	Royster Ave. - Upstream of Culvert (Road El.)	814.20		
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	810.14	11.29
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.52	6.42
	Broad St. - Upstream of Culvert (Road El.)	800.90		
100-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.23	8.91
	Royster Ave. - Upstream of Culvert (Road El.)	814.20		
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	811.22	12.37
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.56	6.46
	Broad St. - Upstream of Culvert (Road El.)	800.90		

Appendix D

Proposed Conditions



Shelby
Stormwater Masterplan
Appendix D.1
Proposed Conditions
10-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

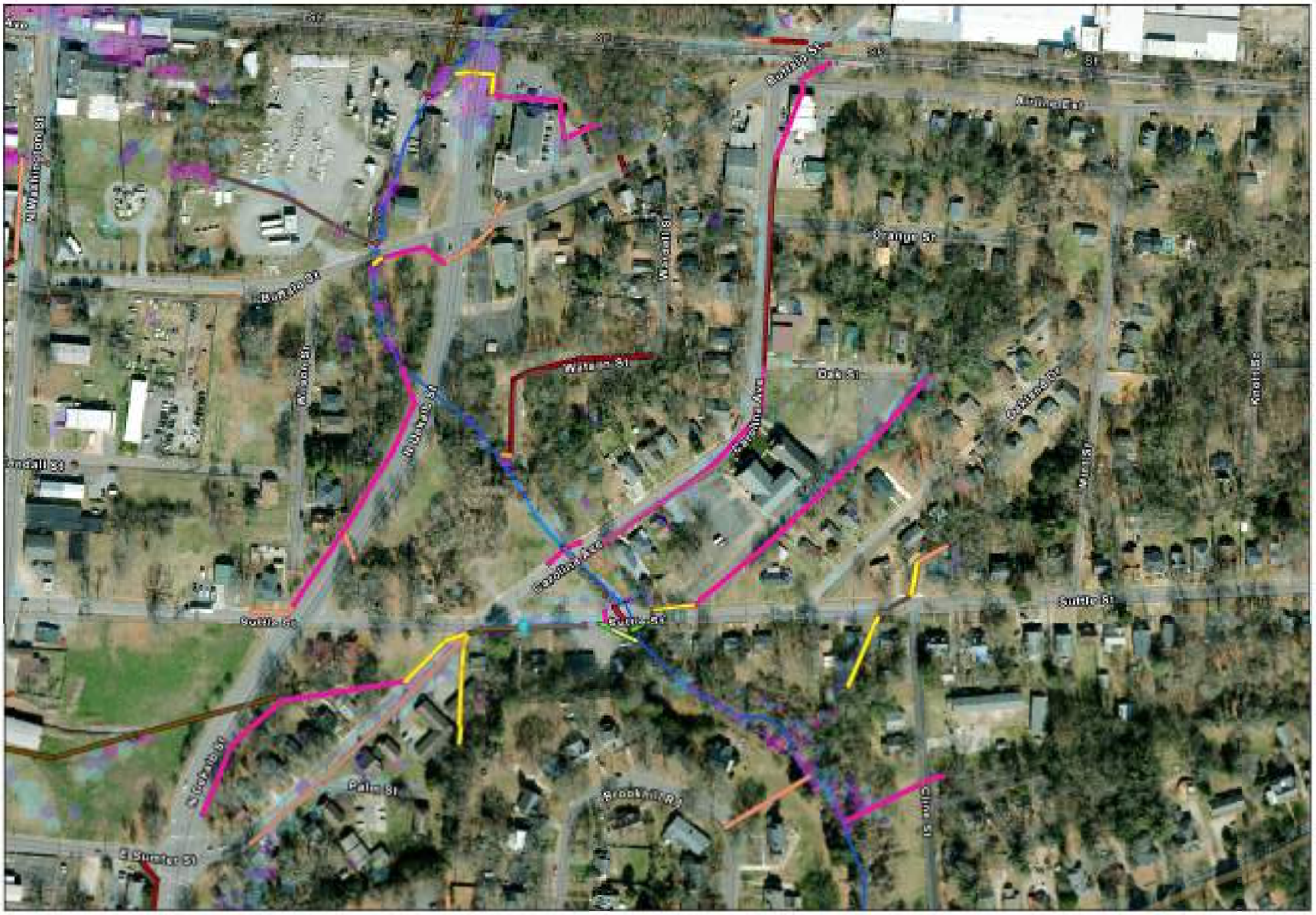
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Inflow
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix D.2
Proposed Conditions
10-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Proposed 24" Pipe
- Proposed 30" Pipe
- Proposed 60" Pipe
- Proposed Swale Upsizing
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix D.3
Proposed Conditions
25-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Inflow
- Junction
- 2' - 4'
- 4' - 6'
- 6' - 8'
- 8' - 10'
- 10' - 12'
- 12'+
- Stream Centerline

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Appendix D.4
Proposed Conditions
25-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Proposed 24" Pipe
Proposed 30" Pipe
Proposed 60" Pipe
Proposed Swale Upsizing
Inflows
Junction
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
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Asheville, NC 28801
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Shelby
Stormwater Masterplan
Appendix D.5
Proposed Conditions
50-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Inflow
Junction
2' - 4'
4' - 6'
6' - 8'
8' - 10'
10' - 12'
12'+
Stream Centerline

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Shelby
Stormwater Masterplan
Appendix D.6
Proposed Conditions
50-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
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Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Proposed 24" Pipe
Proposed 30" Pipe
Proposed 60" Pipe
Proposed Swale Upsizing
Inflows
Junction
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
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Shelby
Stormwater Masterplan
Appendix D.7
Proposed Conditions
100-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Inflows
Junction
2' - 4'
4' - 6'
6' - 8'
8' - 10'
10' - 12'
12'+
Stream Centerline
0
0.02
0.04
0.08
0.12
0.16
Miles
mcgill
55 Broad St.
Asheville, NC 28801
828.252.0575
NC Firm License # C-0459



0 0.02 0.04 0.08 0.12 0.16 Miles

Shelby
Stormwater Masterplan
Appendix D.8
Proposed Conditions
100-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

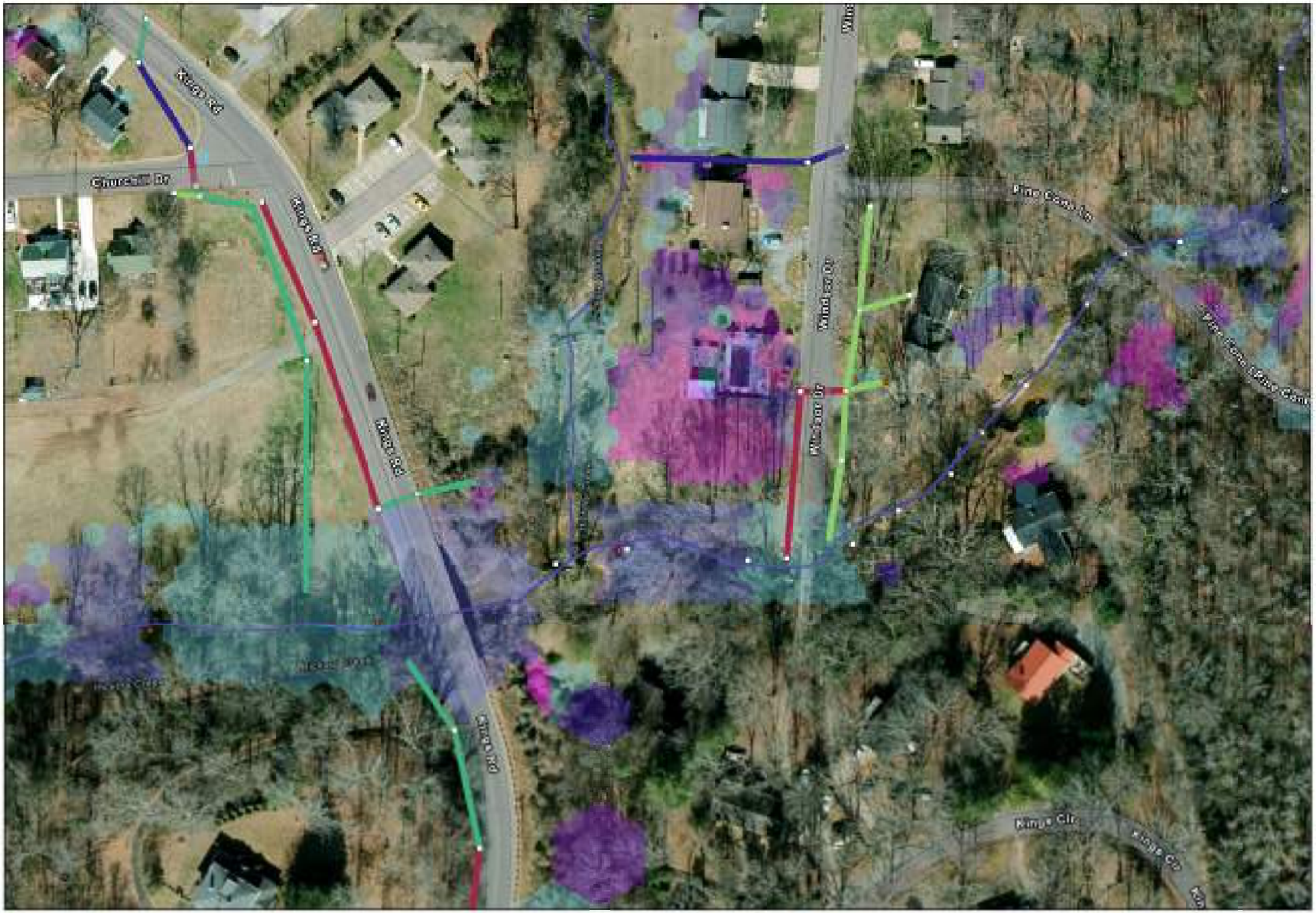
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Proposed 24" Pipe
- Proposed 30" Pipe
- Proposed 60" Pipe
- Proposed Swale Upsizing
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix D.9
Proposed Conditions
10-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06
Miles

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Stormwater Masterplan
Appendix D.10
Proposed Conditions
10-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

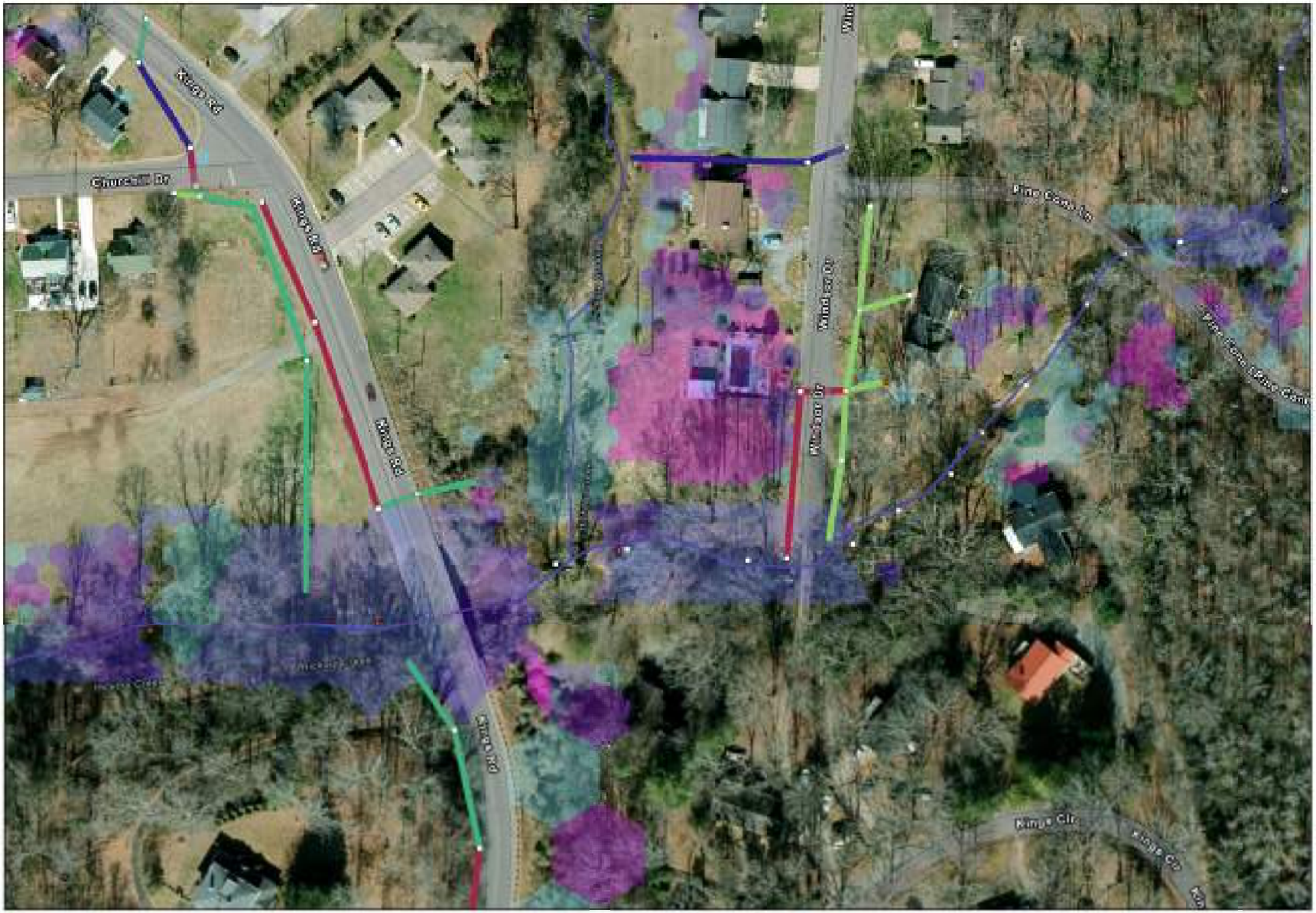
N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Appendix D.11
Proposed Conditions
25-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

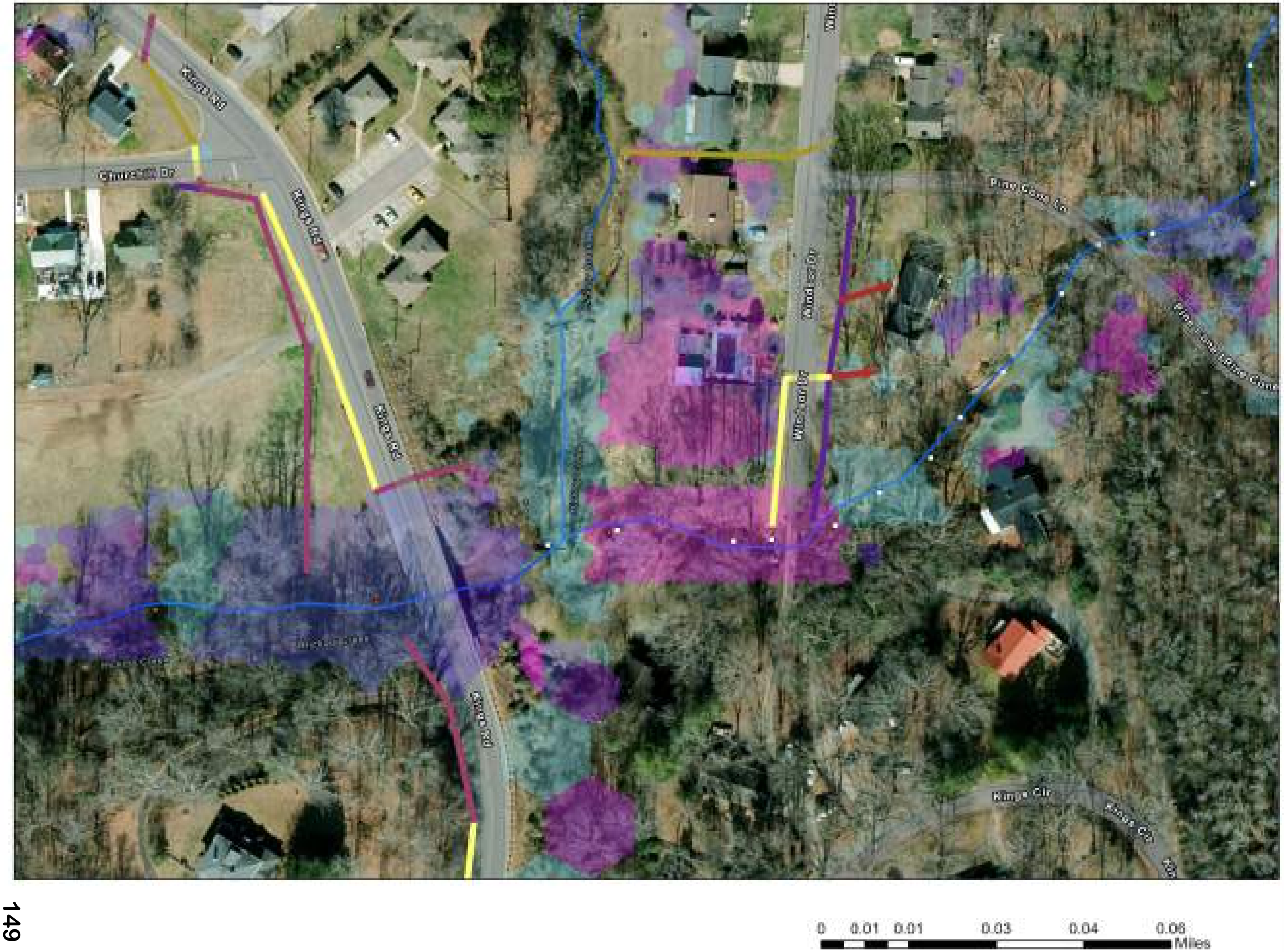
N

Legend

- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Shelby
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Appendix D.12
Proposed Conditions
25-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

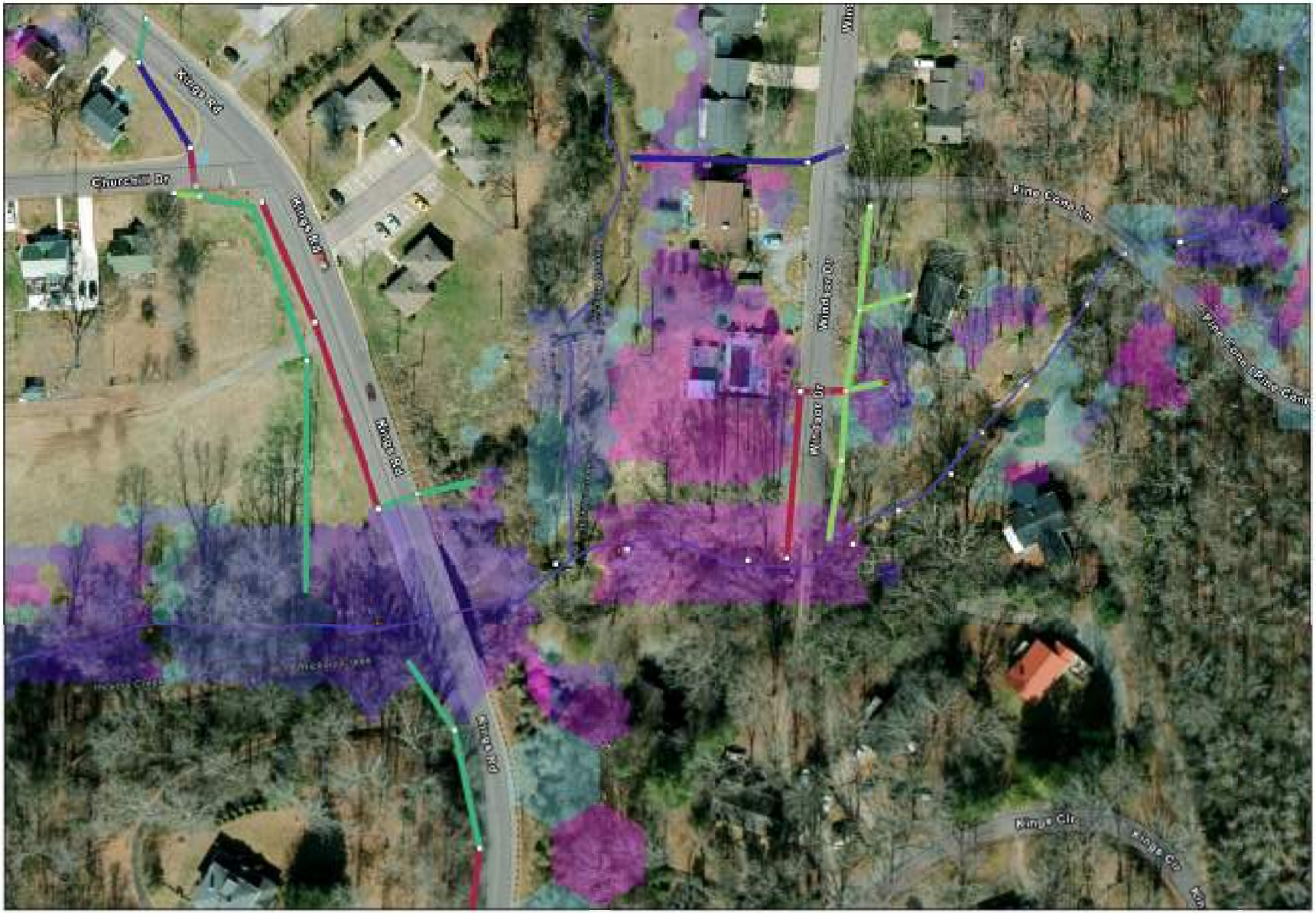
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12" +
- Stream Centerline

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0 0.01 0.01 0.03 0.04 0.06 Miles

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Appendix D.13
Proposed Conditions
50-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Appendix D.14
Proposed Conditions
50-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 3" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix D.15
Proposed Conditions
100-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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0 0.01 0.01 0.03 0.04 0.06 Miles

Shelby
Stormwater Masterplan
Appendix D.16
Proposed Conditions
100-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2' - 4'
- 4' - 6'
- 6' - 8'
- 8' - 10'
- 10' - 12'
- 12' +
- Stream Centerline

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0 0.02 0.04 0.08 0.12 0.16 Miles

Shelby
Stormwater Masterplan
Appendix D.17
Proposed Conditions
10-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing Double Barrel 9' Culvert
- Existing 7' Culvert
- Proposed 6'x12' Channel
- Proposed Channel Modification
- 3" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 18"
- 18" - 12"
- 12"+
- Inflows
- Junction
- Stream Centerline

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0 0.02 0.04 0.08 0.12 0.16 Miles

Shelby
Stormwater Masterplan
Appendix D.18
Proposed Conditions
10-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

Existing Channel
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 7' Culvert
Proposed 6'x14' Box Culvert
Proposed 6'x12' Box Culvert
Proposed Channel Modification
Catch Other Weirs
2' - 4'
4' - 6'
6' - 8'
8' - 10'
10' - 12'
12'+
Inflows
Junction
Stream Centerline

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Appendix D.19
Proposed Conditions
25-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

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Shelby
Stormwater Masterplan
Appendix D.20
Proposed Conditions
25-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

N

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Shelby
Stormwater Masterplan
Appendix D.21
Proposed Conditions
50-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

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Stormwater Masterplan
Appendix D.22
Proposed Conditions
50-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

Existing Channel
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 30" Pipe
Existing 7' Culvert
Proposed 6'x14' Box Culvert
Proposed 6'x12' Box Culvert
Proposed Channel Modification
Catch Other Water
2' - 4'
4' - 6'
6' - 8'
8' - 10'
10' - 12'
12'+
Inflows
Junction
Stream Centerline

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Shelby
Stormwater Masterplan
Appendix D.23
Proposed Conditions
100-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

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Shelby
Stormwater Masterplan
Appendix D.24
Proposed Conditions
100-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

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Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
10-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.30	1.76	803.30	1.76	803.30	1.76
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	802.88	2.13	802.84	2.09	802.80	2.05
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	802.52	3.26	802.44	3.18	802.40	3.14
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.14	4.03	802.12	4.01	802.12	4.01
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.62	0.54	805.46	0.38	805.44	0.35
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.21	0.61	804.99	0.39	804.99	0.39
25-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.66	2.12	803.66	2.12	803.66	2.12
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	803.50	2.75	803.44	2.69	803.39	2.64
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.25	3.99	803.16	3.90	803.12	3.86
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.83	4.72	802.79	4.68	802.81	4.70
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.67	0.59	805.52	0.44	805.51	0.42
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.45	0.85	805.03	0.43	805.03	0.43
50-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.15	2.61	804.08	2.54	804.04	2.50
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	804.01	3.26	803.93	3.18	803.88	3.13
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.81	4.55	803.72	4.46	803.69	4.43
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.35	5.24	803.32	5.21	803.35	5.24
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.76	0.67	805.56	0.48	805.56	0.48
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.56	0.96	805.06	0.46	805.06	0.46
100-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.78	3.24	804.64	3.10	804.64	3.10
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	804.64	3.89	804.49	3.74	804.49	3.74
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	804.50	5.24	804.33	5.07	804.34	5.08
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.98	5.87	803.89	5.78	803.96	5.85
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.84	0.76	805.62	0.54	805.59	0.51
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.66	1.06	805.09	0.49	805.10	0.50

Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
10-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.36	0.70	743.36	0.69	743.36	0.69
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.20	0.00	744.20	0.00	744.20	0.00
	315 Windsor Drive:House - NW of House	744.71	744.71	0.01	744.71	0.01	744.71	0.01
	315 Windsor Drive:House - SW of House	744.06	744.70	0.64	744.13	0.07	744.13	0.07
	315 Windsor Drive:House - West of House	744.07	744.70	0.63	744.17	0.09	744.17	0.09
25-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.50	0.84	743.50	0.84	743.50	0.84
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.22	0.02	744.20	0.00	744.21	0.01
	315 Windsor Drive:House - NW of House	744.71	744.76	0.05	744.72	0.01	744.72	0.01
	315 Windsor Drive:House - SW of House	744.06	744.76	0.69	744.15	0.09	744.15	0.09
	315 Windsor Drive:House - West of House	744.07	744.76	0.68	744.19	0.11	744.19	0.11
50-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.80	1.14	743.58	0.92	743.76	1.10
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.29	0.09	744.20	0.00	744.29	0.09
	315 Windsor Drive:House - NW of House	744.71	744.78	0.08	744.72	0.01	744.72	0.01
	315 Windsor Drive:House - SW of House	744.06	744.78	0.72	744.17	0.11	744.17	0.11
	315 Windsor Drive:House - West of House	744.07	744.78	0.71	744.20	0.13	744.20	0.13
100-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.20	1.53	744.64	1.97	744.14	1.48
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.40	0.20	744.84	0.64	744.38	0.18
	315 Windsor Drive:House - NW of House	744.71	744.83	0.12	744.72	0.01	744.72	0.01
	315 Windsor Drive:House - SW of House	744.06	744.83	0.77	744.43	0.37	744.19	0.12
	315 Windsor Drive:House - West of House	744.07	744.83	0.75	744.43	0.36	744.22	0.15

Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions		Alternative 1		Alternative 2*	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
10-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	814.99	8.67	813.88	7.56	810.75	4.43
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	807.46	8.61	807.33	8.48	807.84	8.99
	Broad St. - Upstream of Culvert (Stream El.)	795.10	799.23	4.13	798.95	3.85	798.96	3.86
	Broad St. - Upstream of Culvert (Road El.)	800.90						
25-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.20	8.88	813.96	7.64	815.47	9.15
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	808.57	9.72	808.12	9.27	812.29	13.44
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.42	6.32	799.18	4.08	799.97	4.87
	Broad St. - Upstream of Culvert (Road El.)	800.90						
50-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.24	8.92	814.01	7.69	815.74	9.42
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	810.14	11.29	808.84	9.99	813.57	14.72
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.52	6.42	801.35	6.25	801.45	6.35
	Broad St. - Upstream of Culvert (Road El.)	800.90						
100-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.23	8.91	814.00	7.68	815.60	9.28
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	811.22	12.37	809.89	11.04	814.29	15.44
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.56	6.46	801.48	6.38	801.39	6.29
	Broad St. - Upstream of Culvert (Road El.)	800.90						

*Note: Alternative 2 increases the Royster Ave. Road El. To 814.35'.

Appendix E

Future Development


Shelby
Stormwater Masterplan
Appendix E.1
Future Conditions
10-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Existing Infrastructure
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
Existing 3' Box Culvert
Inflows
Junction
3" - 4"
4" - 6"
6" - 8"
8" - 18"
18" - 12"
12"+
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
55 Broad St.
Asheville, NC 28801
828.252.0575
NC Firm License # C-0459


Shelby
Stormwater Masterplan
Appendix E.2
Future Conditions
50-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Existing Infrastructure
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
Existing 5'-8'x6' Culvert
Inflows
Catch Basins
Junction
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
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Asheville, NC 28801
828.252.0575
NC Firm License # C-0459


Shelby
Stormwater Masterplan
Appendix E.3
Future Conditions
50-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Existing Infrastructure
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
Existing 5' Box Culvert
Inflows
Catch Basins
Junction
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
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Asheville, NC 28801
828.252.0575
NC Firm License # C-0459


Shelby
Stormwater Masterplan
Appendix E.4
Future Conditions
100-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Existing Infrastructure
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
Existing 5' Box Culvert
Inflows
Catch Basins
Junction
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
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Asheville, NC 28801
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Shelby
Stormwater Masterplan
Appendix E.5
Future Conditions
10-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

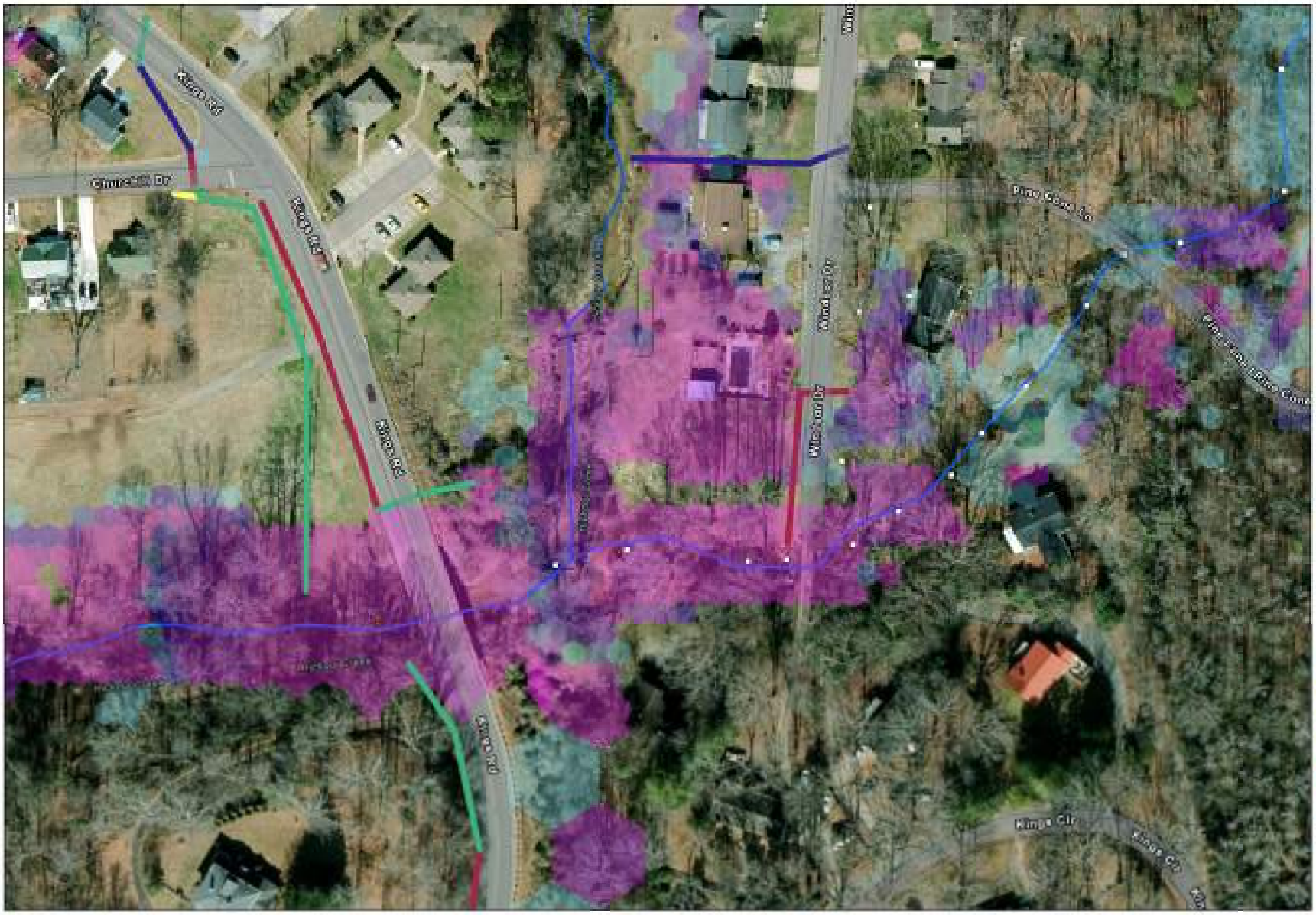
N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Stormwater Masterplan
Appendix E6
Future Conditions
25-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

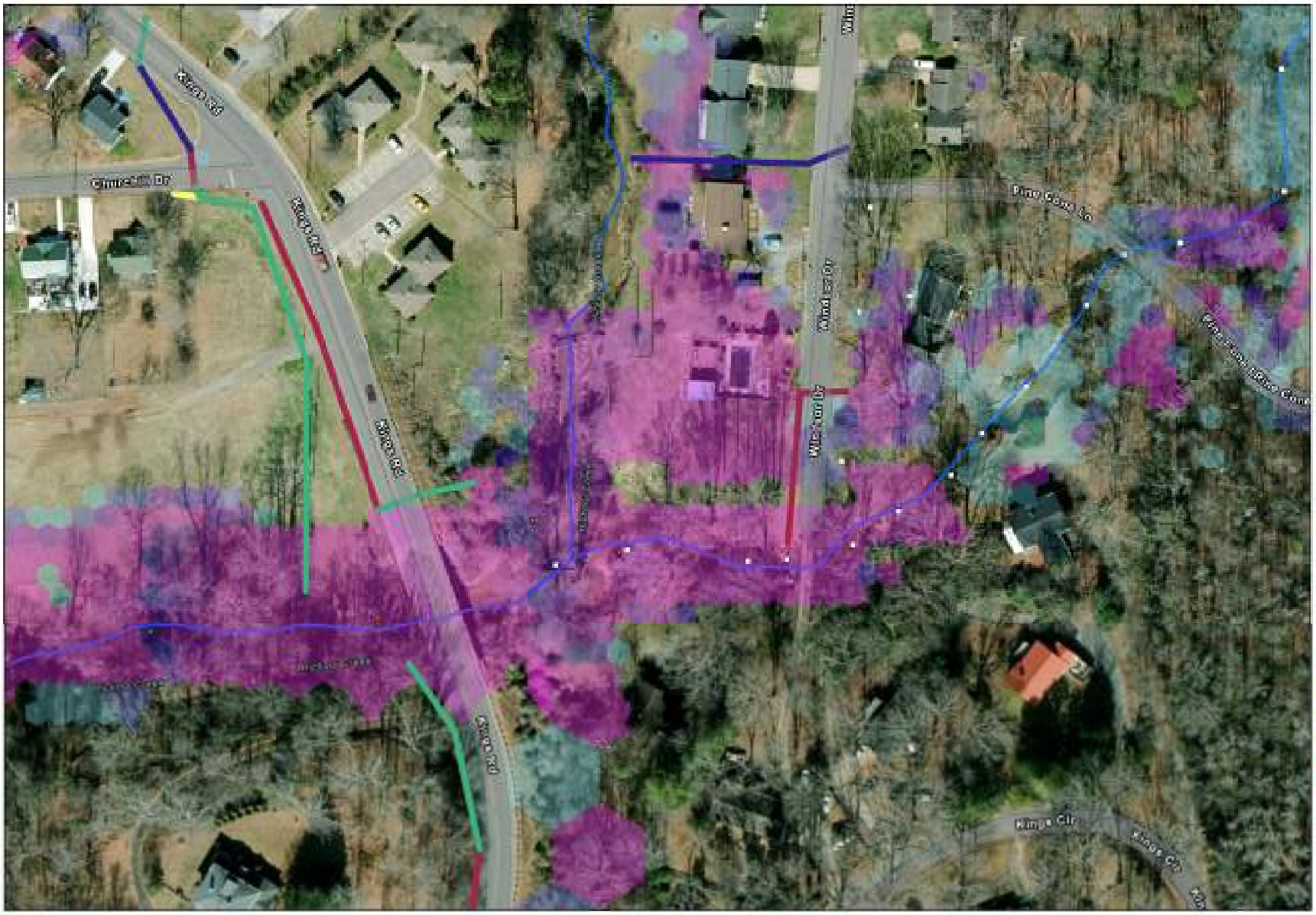
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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Stormwater Masterplan
Appendix E7
Future Conditions
50-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

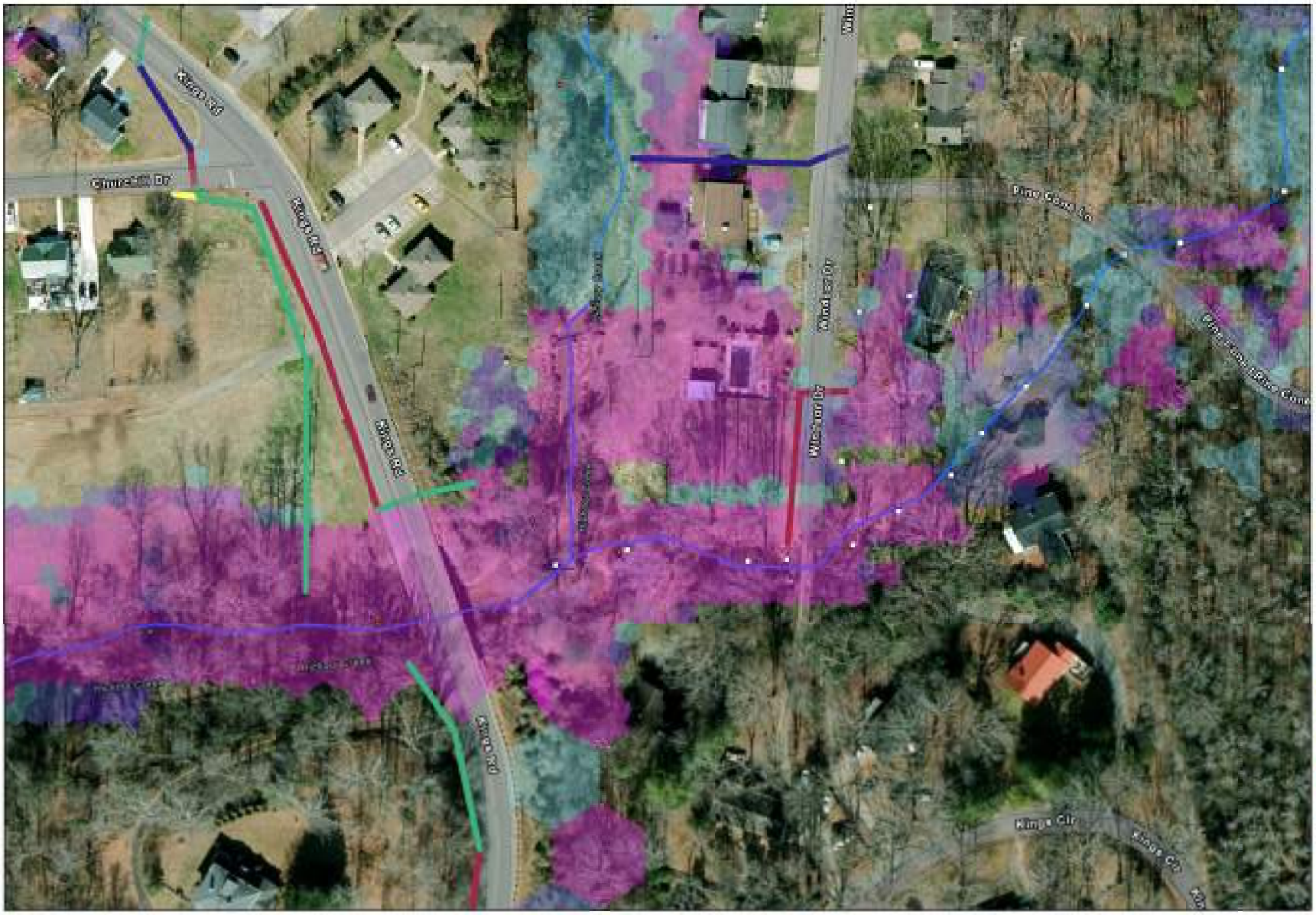
N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Stormwater Masterplan
Appendix E8
Future Conditions
100-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Asheville, NC 28801
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NC Firm License # C-0459



Shelby
Stormwater Masterplan
Appendix E.9
Future Conditions
10-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

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Shelby
Stormwater Masterplan
Appendix E.10
Future Conditions
25-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 32" Culvert
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 46" Pipe
- Existing 48" Pipe
- Existing 58" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

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0 0.02 0.04 0.08 0.12 0.16 Miles

Shelby
Stormwater Masterplan
Appendix E.11
Future Conditions
50-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 32" Culvert
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 54" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2' - 4'
- 4' - 6'
- 6' - 8'
- 8' - 10'
- 10' - 12'
- 12'+
- Stream Centerline

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Appendix E.12
Future Conditions
100-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Existing Infrastructure

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Inflows
- Junction
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 32" Culvert
- Existing 36" Pipe
- Existing 42" Pipe
- Existing 48" Pipe
- Existing 54" Pipe
- Existing Double Barrel 5' Culvert
- Existing 6' Culvert
- Existing 7' Culvert
- 2' - 4'
- 4' - 6'
- 6' - 8'
- 8' - 10'
- 10' - 12'
- 12'+
- Stream Centerline

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Appendix E.13
Future Conditions
10-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 3" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (S) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Inflows
- Junction
- Stream Centerline

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Stormwater Masterplan
Appendix E.14
Future Conditions
10-YR Event
AOC 1 - Carolina Ave. &
Suttle Street
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Proposed 24" Pipe
Proposed 30" Pipe
Proposed 60" Pipe
Proposed Swale Updating
Inflows
Junction
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
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Asheville, NC 28801
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Stormwater Masterplan

Appendix E.15
Future Conditions
25-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 3" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Inflows
- Junction
- Stream Centerline

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Stormwater Masterplan
Appendix E.16
Future Conditions
25-YR Event
AOC 1 - Carolina Ave. &
Suttle Street
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Proposed 24" Pipe
Proposed 30" Pipe
Proposed 60" Pipe
Proposed Swale Updating
Inflows
Junction
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
mcgill
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Asheville, NC 28801
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Shelby
Stormwater Masterplan

Appendix E.17
Future Conditions
50-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 3" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Inflows
- Junction
- Stream Centerline

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Appendix E.18
Future Conditions
50-YR Event
AOC 1 - Carolina Ave. &
Suttle Street
Alternative 2
MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)
DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023
N
Legend
2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing 48" Pipe
(3) Existing Pipe Culvert
Existing Swale
Existing 5' Box Culvert
Proposed Swale
Proposed 24" Pipe
Proposed 30" Pipe
Proposed 60" Pipe
Proposed Swale Updating
Inflows
Junction
Stream Centerline
0 0.02 0.04 0.08 0.12 0.16
Miles
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Stormwater Masterplan

Appendix E.19
Future Conditions
100-YR Event
AOC 1 - Carolina Ave. & Suttle Street
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 3" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (S) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Inflows
- Junction
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.20
Future Conditions
100-YR Event
AOC 1 - Carolina Ave. &
Suttle Street
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

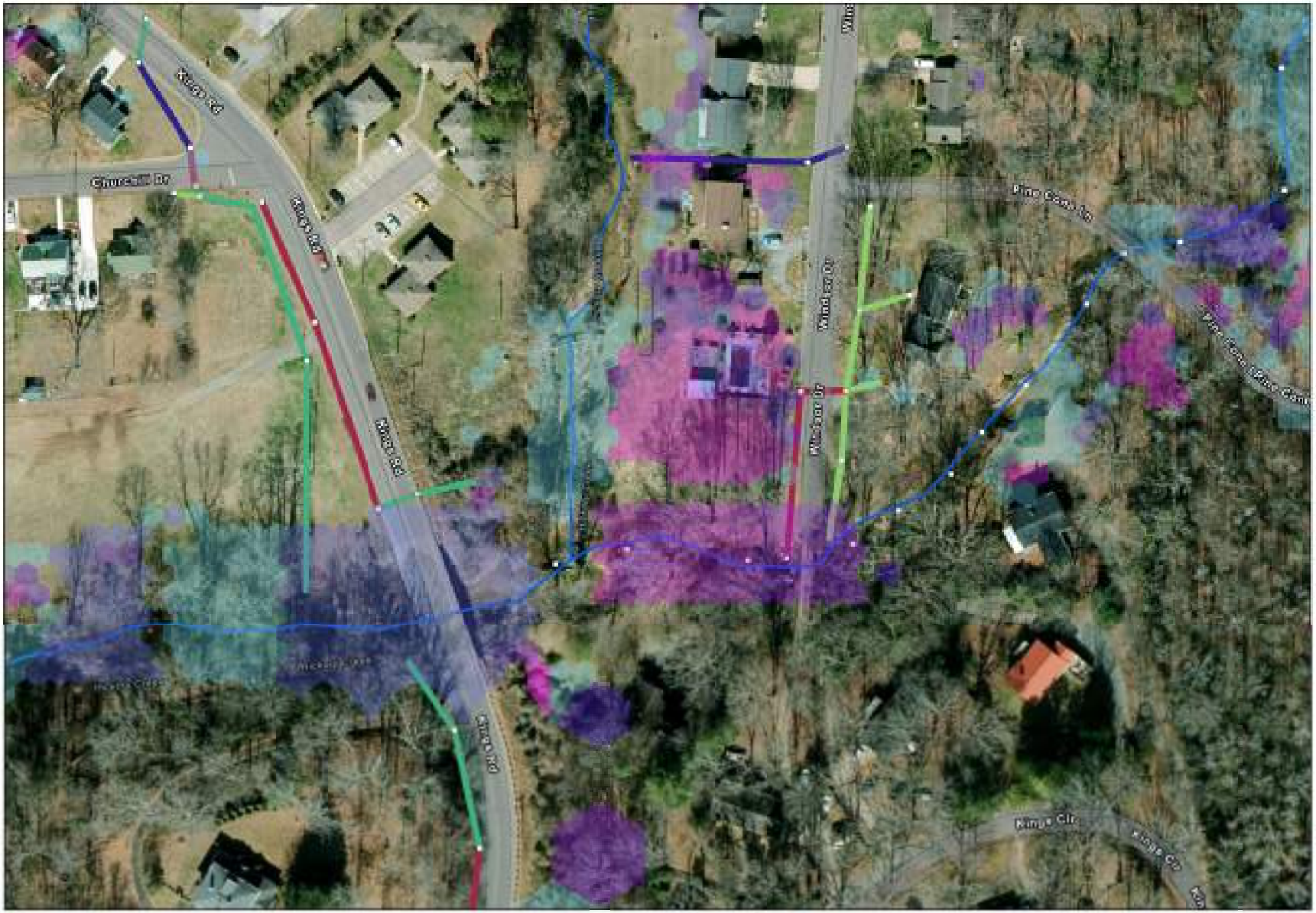
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REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 48" Pipe
- (3) Existing Pipe Culvert
- Existing Swale
- Existing 5' Box Culvert
- Proposed Swale
- Proposed 24" Pipe
- Proposed 30" Pipe
- Proposed 60" Pipe
- Proposed Swale Updating
- Inflows
- Junction
- Stream Centerline

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Stormwater Masterplan
Appendix E.21
Future Conditions
10-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.22
Future Conditions
10-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Shelby
Stormwater Masterplan
Appendix E.23
Future Conditions
25-YR Event
AOC 2 - Montrose Dr. Near Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.24
Future Conditions
25-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

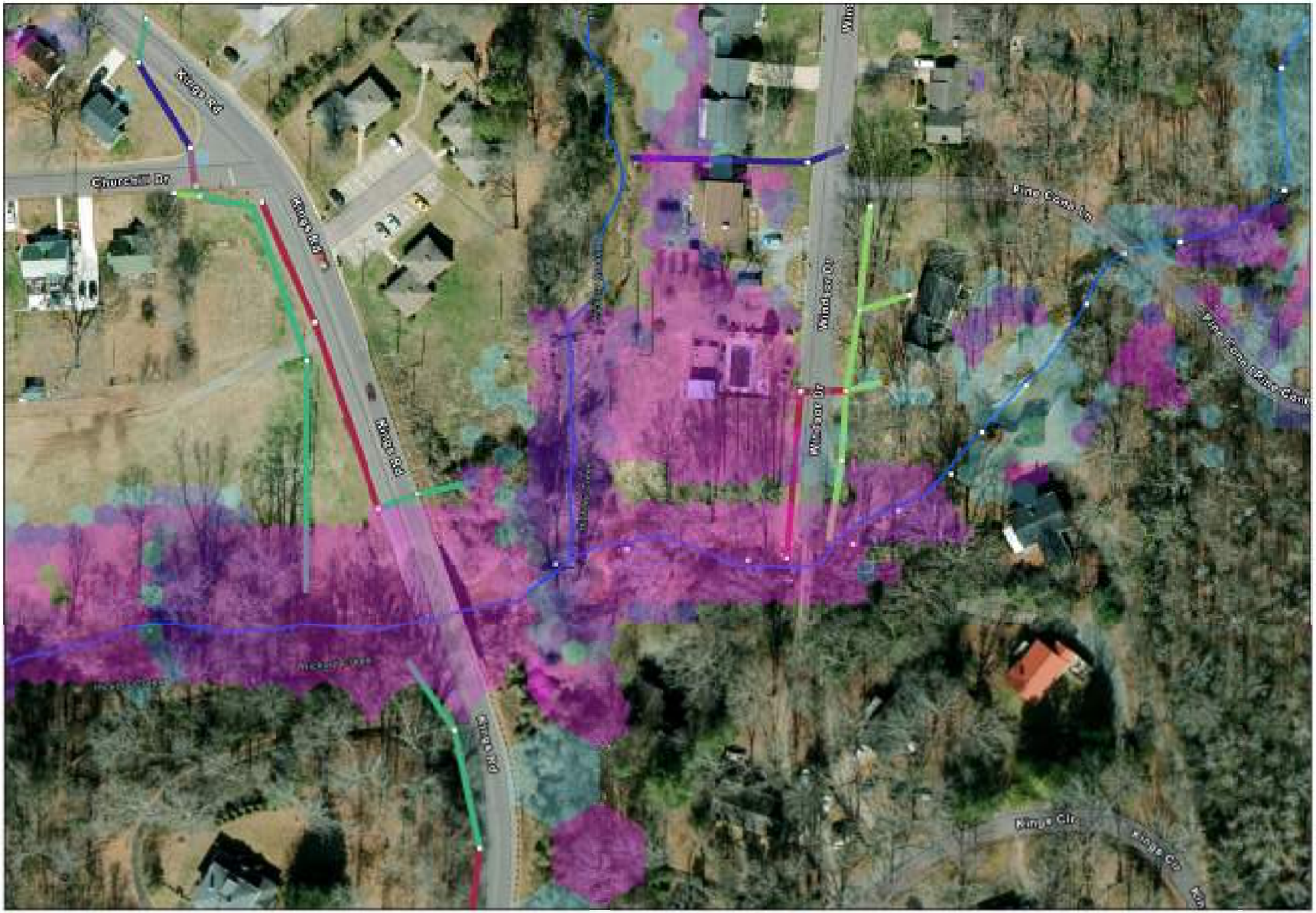
N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Shelby
Stormwater Masterplan
Appendix E.25
Future Conditions
50-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Stream Centerline

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NC Firm License # C-0459



Shelby
Stormwater Masterplan
Appendix E.26
Future Conditions
50-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

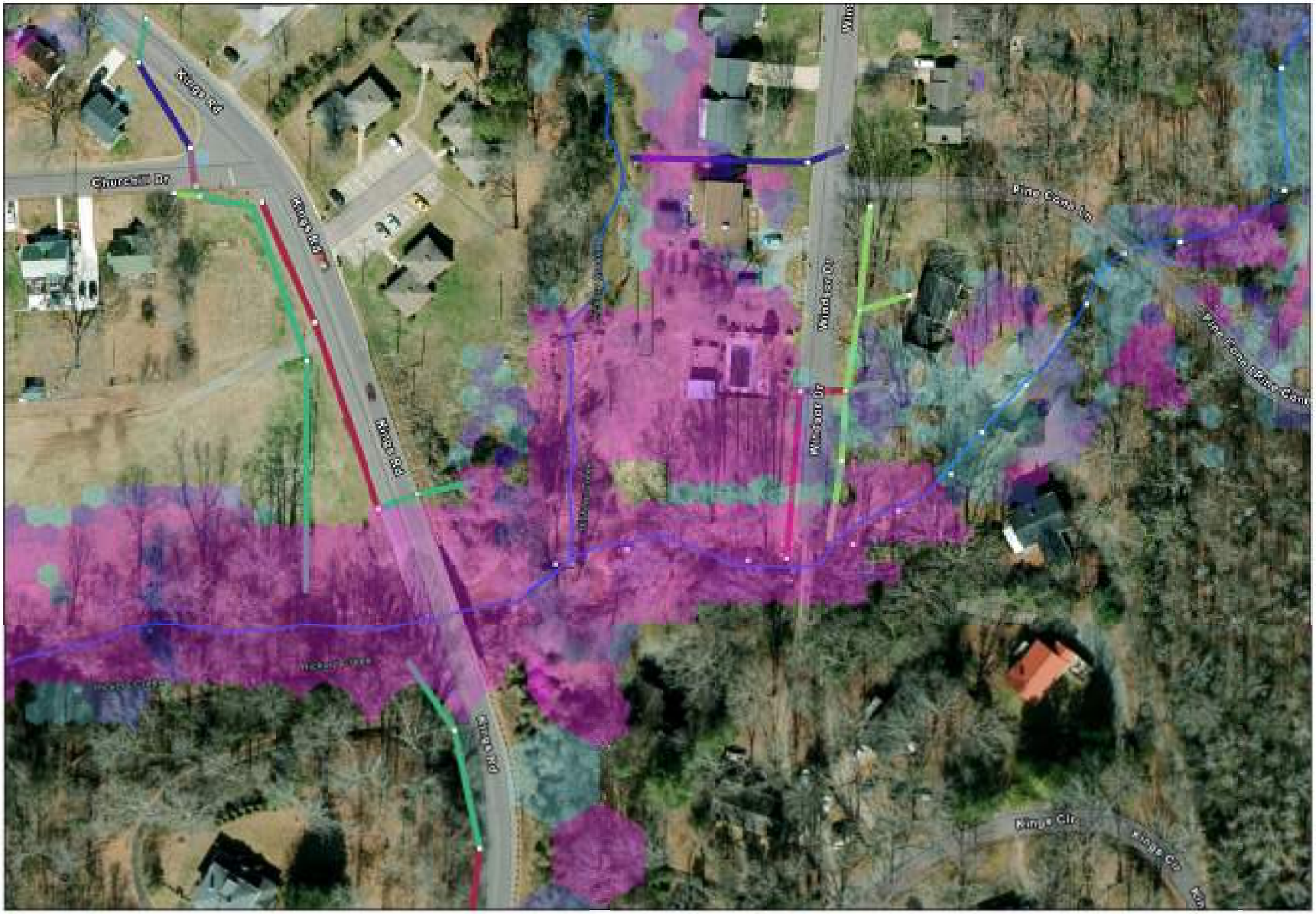
N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Stormwater Masterplan
Appendix E.27
Future Conditions
100-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. & Hickory Creek
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2020

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Inflows
- Junction
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.28
Future Conditions
100-YR Event
AOC 2 - Montrose Dr. Near
Windsor Dr. &
Hickory Creek
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- Proposed 15" Pipe
- Proposed Swale
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 36" Pipe
- Inflows
- Junction
- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Stream Centerline

0 0.01 0.01 0.03 0.04 0.06 Miles

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Shelby
Stormwater Masterplan
Appendix E.29
Future Conditions
10-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

2" - 4"
4" - 6"
6" - 8"
8" - 10"
10" - 12"
12"+
Existing Channel
Existing 12" Pipe
Existing 15" Pipe
Existing 18" Pipe
Existing 24" Pipe
Existing 36" Pipe
Existing Double Barrel 5' Culvert
Existing 7' Culvert
Proposed 6'x12' Channel
Proposed Channel Modification
Inflows
Junction
Stream Centerline

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0 0.02 0.04 0.08 0.12 0.16 Miles

Shelby
Stormwater Masterplan
Appendix E.30
Future Conditions
10-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 7' Culvert
- Proposed 8'x14' Box Culvert
- Proposed 6'x12' Box Culvert
- Proposed Channel Modification
- Inflows
- Junction
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.31
Future Conditions
25-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2025

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- Existing Double Barrel 5' Culvert
- Existing 7' Culvert
- Proposed 6'x12' Channel
- Proposed Channel Modification
- Inflows
- Junction
- Stream Centerline

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0 0.02 0.04 0.08 0.12 0.16 Miles

Shelby
Stormwater Masterplan
Appendix E.32
Future Conditions
25-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- Existing 7' Culvert
- Proposed 8'x14' Box Culvert
- Proposed 6'x12' Box Culvert
- Proposed Channel Modification
- Inflows
- Junction
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.33
Future Conditions
50-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- Existing Double Barrel 5' Culvert
- Existing 7' Culvert
- Proposed 6'x12' Channel
- Proposed Channel Modification
- Inflows
- Junction
- Stream Centerline

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Shelby
Stormwater Masterplan
Appendix E.34
Future Conditions
50-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 36" Pipe
- Existing 7' Culvert
- Proposed 8'x14' Box Culvert
- Proposed 6'x12' Box Culvert
- Proposed Channel Modification
- Inflows
- Junction
- Stream Centerline

0 0.02 0.04 0.08 0.12 0.16 Miles

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Asheville, NC 28801
828.252.0575
NC Firm License # C-0459



Shelby
Stormwater Masterplan
Appendix E.35
Future Conditions
100-YR Event
AOC 3 & 4 - Royster Ave. & Broad St.
Alternative 1

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

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NC Firm License # C-0459



Shelby
Stormwater Masterplan
Appendix E.36
Future Conditions
100-YR Event
AOC 3 & 4 - Royster Ave. &
Broad St.
Alternative 2

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

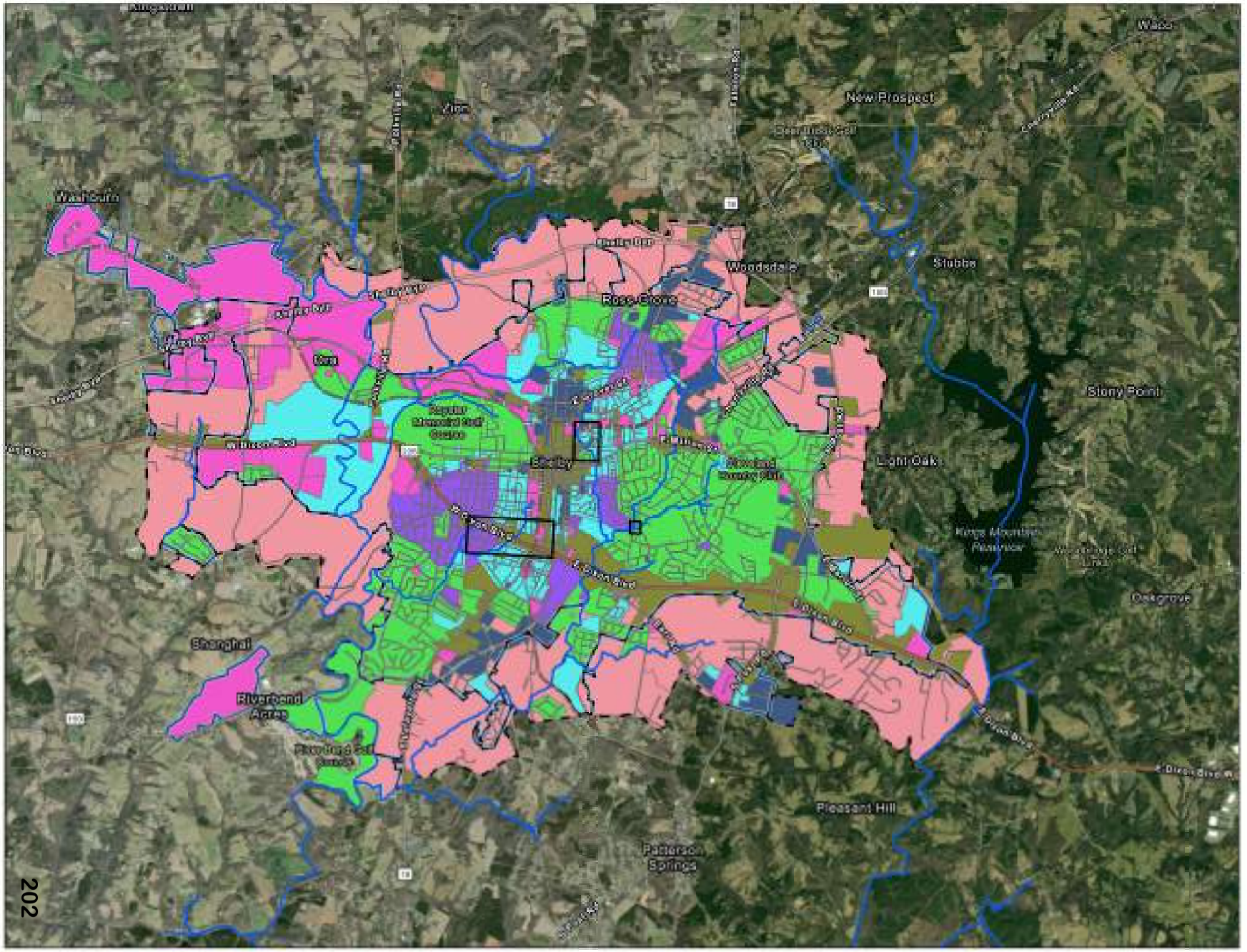
DESIGNER: MF
REVIEWER: DJ
DATE: NOVEMBER 2023

N

Legend

- 2" - 4"
- 4" - 6"
- 6" - 8"
- 8" - 10"
- 10" - 12"
- 12"+
- Existing Channel
- Existing 12" Pipe
- Existing 15" Pipe
- Existing 18" Pipe
- Existing 24" Pipe
- Existing 30" Pipe
- Existing 7' Culvert
- Proposed 8'x14' Box Culvert
- Proposed 6'x12' Box Culvert
- Proposed Channel Modification
- Inflows
- Junction
- Stream Centerline

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Shelby
Stormwater Masterplan

Appendix E.37
Changes to Curve Number (CN) for Future Conditions Modeling

MAP PROJECTION:
NORTH CAROLINA STATE PLANE (FEET)

DATUM:
NAD 1983 (HORIZONTAL)
NAVD 1988 (VERTICAL)

DESIGNER: MF
REVIEWER: DJ
DATE: June 2020

N

Legend

SheetSeries_Shelby
Name
AOCs
Stream Centerline
Shelby City Limits
Shelby ETJ
Future_Min_CN
70
75
80
85
87
92
No Change from Existing Condition

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Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
10-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.70	2.16	803.70	2.16	803.70	2.16
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	803.21	2.46	803.15	2.40	803.13	2.38
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	802.83	3.57	802.75	3.49	802.72	3.46
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.44	4.33	802.41	4.30	802.42	4.31
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.62	0.54	805.48	0.40	805.44	0.36
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.36	0.76	805.02	0.42	805.02	0.42
25-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.05	2.51	804.05	2.51	804.05	2.51
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	803.82	3.07	803.75	3.00	803.72	2.97
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.56	4.30	803.47	4.21	803.44	4.18
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.11	5.00	803.08	4.97	803.10	4.99
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.69	0.61	805.54	0.45	805.51	0.43
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.53	0.93	805.06	0.46	805.06	0.46
50-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.52	2.98	804.44	2.90	804.41	2.87
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	804.34	3.59	804.25	3.50	804.23	3.48
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	804.16	4.90	804.05	4.79	804.03	4.77
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.64	5.53	803.61	5.50	803.65	5.54
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.81	0.72	805.59	0.51	805.57	0.49
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.64	1.04	805.09	0.49	805.09	0.49
100-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	805.22	3.68	805.02	3.48	805.03	3.49
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00						
	Carolina Ave. - Downstream of Culvert	800.75	805.07	4.32	804.85	4.10	804.87	4.12
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	804.94	5.68	804.72	5.46	804.74	5.48
	Suttle St. - Upstream of Culvert (Road El.)	806.20						
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	804.37	6.26	804.24	6.13	804.33	6.22
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.86	0.78	805.69	0.61	805.66	0.58
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.71	1.11	805.12	0.52	805.18	0.58

Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
10-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.99	1.33	743.41	0.75	743.73	1.07
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.33	0.14	744.20	0.00	744.28	0.08
	315 Windsor Drive:House - NW of House	744.71	744.79	0.08	744.71	0.01	744.71	0.01
	315 Windsor Drive:House - SW of House	744.06	744.79	0.72	744.16	0.10	744.16	0.10
	315 Windsor Drive:House - West of House	744.07	744.79	0.71	744.18	0.11	744.18	0.11
25-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.31	1.64	743.82	1.16	744.18	1.51
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.53	0.33	744.29	0.09	744.41	0.21
	315 Windsor Drive:House - NW of House	744.71	744.89	0.19	744.72	0.01	744.72	0.01
	315 Windsor Drive:House - SW of House	744.06	744.89	0.83	744.19	0.12	744.35	0.29
	315 Windsor Drive:House - West of House	744.07	744.89	0.82	744.21	0.13	744.35	0.28
50-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.53	1.87	744.24	1.58	744.78	2.12
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.72	0.52	744.44	0.24	744.95	0.76
	315 Windsor Drive:House - NW of House	744.71	744.99	0.28	744.72	0.01	745.15	0.44
	315 Windsor Drive:House - SW of House	744.06	744.99	0.92	744.21	0.14	745.15	1.09
	315 Windsor Drive:House - West of House	744.07	744.98	0.91	744.22	0.15	745.15	1.08
100-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.83	2.17	744.60	1.99	744.64	1.97
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.97	0.78	744.81	0.61	744.84	0.64
	315 Windsor Drive:House - NW of House	744.71	745.23	0.53	745.04	0.33	744.72	0.01
	315 Windsor Drive:House - SW of House	744.06	745.22	1.16	745.04	0.97	744.43	0.37
	315 Windsor Drive:House - West of House	744.07	745.23	1.16	745.04	0.97	744.43	0.36

Design Storm	Point of Interest	Elevation (ft.)	Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)
10-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.27	8.95	813.96	7.64	813.26	6.94
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	808.22	9.37	807.67	8.82	810.38	11.53
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.40	6.30	799.08	3.98	799.07	3.97
	Broad St. - Upstream of Culvert (Road El.)	800.90						
25-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.23	8.91	814.05	7.73	815.51	9.19
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	809.85	11.00	808.52	9.67	813.87	15.02
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.57	6.47	801.11	6.01	801.18	6.08
	Broad St. - Upstream of Culvert (Road El.)	800.90						
50-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.26	8.94	814.03	7.71	815.79	9.47
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	810.91	12.06	809.64	10.79	814.33	15.48
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.59	6.49	801.42	6.32	801.46	6.36
	Broad St. - Upstream of Culvert (Road El.)	800.90						
100-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.35	9.03	813.95	7.63	815.77	9.45
	Royster Ave. - Upstream of Culvert (Road El.)	814.20						
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	812.04	13.19	810.60	11.75	814.42	15.57
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.76	6.66	801.56	6.46	801.55	6.45
	Broad St. - Upstream of Culvert (Road El.)	800.90						

*Note: Alternative 2 increases the Royster Ave. Road El. To 814.35'.

Design Storm	Point of Interest	Elevation (ft.)	Future Development						Existing Conditions					
			Existing Conditions		Alternative 1		Alternative 2		Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	FD-EC	WSEL (ft.)	FD-EC	WSEL (ft.)	FD-EC
10-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	803.70	2.16	803.70	2.16	803.70	2.16	803.30	0.40	803.30	0.40	803.30	0.40
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00												
	Carolina Ave. - Downstream of Culvert	800.75	803.21	2.46	803.15	2.40	803.13	2.38	802.88	0.33	802.84	0.31	802.80	0.33
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	802.83	3.57	802.75	3.49	802.72	3.46	802.52	0.31	802.44	0.31	802.40	0.32
	Suttle St. - Upstream of Culvert (Road El.)	806.20												
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	802.44	4.33	802.41	4.30	802.42	4.31	802.14	0.30	802.12	0.29	802.12	0.30
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.62	0.54	805.48	0.40	805.44	0.36	805.62	0.00	805.46	0.02	805.44	0.00
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.36	0.76	805.02	0.42	805.02	0.42	805.21	0.15	804.99	0.03	804.99	0.03
25-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.05	2.51	804.05	2.51	804.05	2.51	803.66	0.39	803.66	0.39	803.66	0.39
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00												
	Carolina Ave. - Downstream of Culvert	800.75	803.82	3.07	803.75	3.00	803.72	2.97	803.50	0.32	803.44	0.31	803.39	0.33
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	803.56	4.30	803.47	4.21	803.44	4.18	803.25	0.31	803.16	0.31	803.12	0.32
	Suttle St. - Upstream of Culvert (Road El.)	806.20												
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.11	5.00	803.08	4.97	803.10	4.99	802.83	0.28	802.79	0.29	802.81	0.29
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.69	0.61	805.54	0.45	805.51	0.43	805.67	0.02	805.52	0.02	805.51	0.00
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.53	0.93	805.06	0.46	805.06	0.46	805.45	0.08	805.03	0.03	805.03	0.03
50-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	804.52	2.98	804.44	2.90	804.41	2.87	804.15	0.37	804.08	0.36	804.04	0.37
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00												
	Carolina Ave. - Downstream of Culvert	800.75	804.34	3.59	804.25	3.5	804.23	3.48	804.01	0.33	803.93	0.32	803.88	0.35
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	804.16	4.90	804.05	4.79	804.03	4.77	803.81	0.35	803.72	0.33	803.69	0.34
	Suttle St. - Upstream of Culvert (Road El.)	806.20												
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	803.64	5.53	803.61	5.5	803.65	5.54	803.35	0.29	803.32	0.29	803.35	0.30
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.81	0.72	805.59	0.51	805.57	0.49	805.76	0.05	805.56	0.03	805.56	0.01
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.64	1.04	805.09	0.49	805.09	0.49	805.56	0.08	805.06	0.03	805.06	0.03
100-Year	Carolina Ave. - Upstream of Culvert (Stream El.)	801.54	805.22	3.68	805.02	3.48	805.03	3.49	804.78	0.44	804.64	0.38	804.64	0.39
	Carolina Ave. - Upstream of Culvert (Road El.)	808.00												
	Carolina Ave. - Downstream of Culvert	800.75	805.07	4.32	804.85	4.10	804.87	4.12	804.64	0.43	804.49	0.36	804.49	0.38
	Suttle St. - Upstream of Culvert (Stream El.)	799.26	804.94	5.68	804.72	5.46	804.74	5.48	804.50	0.44	804.33	0.39	804.34	0.40
	Suttle St. - Upstream of Culvert (Road El.)	806.20												
	Suttle St. - Downstream of Culvert (Stream El.)	798.11	804.37	6.26	804.24	6.13	804.33	6.22	803.98	0.39	803.89	0.35	803.96	0.37
	Suttle St. - West Side of Culvert (Road El.)	805.08	805.86	0.78	805.69	0.61	805.66	0.58	805.84	0.02	805.62	0.07	805.59	0.07
	Suttle St. - East Side of Culvert (Road El.)	804.60	805.71	1.11	805.12	0.52	805.18	0.58	805.66	0.05	805.09	0.03	805.10	0.08

Design Storm	Point of Interest	Elevation (ft.)	Future Development						Existing Conditions					
			Existing Conditions		Alternative 1		Alternative 2		Existing Conditions		Alternative 1		Alternative 2	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	FD-EC	WSEL (ft.)	FD-EC	WSEL (ft.)	FD-EC
10-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	743.99	1.33	743.41	0.75	743.73	1.07	743.36	0.63	743.36	0.05	743.36	0.37
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.33	0.14	744.20	0.00	744.28	0.08	744.20	0.13	744.20	0.00	744.20	0.08
	315 Windsor Drive:House - NW of House	744.71	744.79	0.08	744.71	0.01	744.71	0.01	744.71	0.08	744.71	0.00	744.71	0.00
	315 Windsor Drive:House - SW of House	744.06	744.79	0.72	744.16	0.10	744.16	0.10	744.70	0.09	744.13	0.03	744.13	0.03
	315 Windsor Drive:House - West of House	744.07	744.79	0.71	744.18	0.11	744.18	0.11	744.70	0.09	744.17	0.01	744.17	0.01
25-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.31	1.64	743.82	1.16	744.18	1.51	743.50	0.81	743.50	0.32	743.50	0.68
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.53	0.33	744.29	0.09	744.41	0.21	744.22	0.31	744.20	0.09	744.21	0.20
	315 Windsor Drive:House - NW of House	744.71	744.89	0.19	744.72	0.01	744.72	0.01	744.76	0.13	744.72	0.00	744.72	0.00
	315 Windsor Drive:House - SW of House	744.06	744.89	0.83	744.19	0.12	744.35	0.29	744.76	0.13	744.15	0.04	744.15	0.20
	315 Windsor Drive:House - West of House	744.07	744.89	0.82	744.21	0.13	744.35	0.28	744.76	0.13	744.19	0.02	744.19	0.16
50-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.53	1.87	744.24	1.58	744.78	2.12	743.80	0.73	743.58	0.66	743.76	1.02
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.72	0.52	744.44	0.24	744.95	0.76	744.29	0.43	744.20	0.24	744.29	0.66
	315 Windsor Drive:House - NW of House	744.71	744.99	0.28	744.72	0.01	745.15	0.44	744.78	0.21	744.72	0.00	744.72	0.43
	315 Windsor Drive:House - SW of House	744.06	744.99	0.92	744.21	0.14	745.15	1.09	744.78	0.21	744.17	0.04	744.17	0.98
	315 Windsor Drive:House - West of House	744.07	744.98	0.91	744.22	0.15	745.15	1.08	744.78	0.20	744.20	0.02	744.20	0.95
100-Year	Upstream Kings Road:North Side - Hickory Creek	742.66	744.83	2.17	744.60	1.99	744.64	1.97	744.20	0.63	744.64	-0.04	744.14	0.50
	Upstream Kings Road:South Side - Hickory Creek	744.20	744.97	0.78	744.81	0.61	744.84	0.64	744.40	0.57	744.84	-0.03	744.38	0.46
	315 Windsor Drive:House - NW of House	744.71	745.23	0.53	745.04	0.33	744.72	0.01	744.83	0.40	744.72	0.32	744.72	0.00
	315 Windsor Drive:House - SW of House	744.06	745.22	1.16	745.04	0.97	744.43	0.37	744.83	0.39	744.43	0.61	744.19	0.24
	315 Windsor Drive:House - West of House	744.07	745.23	1.16	745.04	0.97	744.43	0.36	744.83	0.40	744.43	0.61	744.22	0.21

Design Storm	Point of Interest	Elevation (ft.)	Future Development						Existing Conditions					
			Existing Conditions		Alternative 1		Alternative 2		Existing Conditions		Alternative 1		Alternative 2*	
			WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	Flood Depth (ft.)	WSEL (ft.)	FD-EC	WSEL (ft.)	FD-EC	WSEL (ft.)	FD-EC
10-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.27	8.95	813.96	7.64	813.26	6.94	814.99	0.28	813.88	0.08	810.75	2.51
	Royster Ave. - Upstream of Culvert (Road El.)	814.20												
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	808.22	9.37	807.67	8.82	810.38	11.53	807.46	0.76	807.33	0.34	807.84	2.54
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.40	6.30	799.08	3.98	799.07	3.97	799.23	2.17	798.95	0.13	798.96	0.11
	Broad St. - Upstream of Culvert (Road El.)	800.90												
25-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.23	8.91	814.05	7.73	815.51	9.19	815.20	0.03	813.96	0.09	815.47	0.04
	Royster Ave. - Upstream of Culvert (Road El.)	814.20												
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	809.85	11.00	808.52	9.67	813.87	15.02	808.57	1.28	808.12	0.40	812.29	1.58
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.57	6.47	801.11	6.01	801.18	6.08	801.42	0.15	799.18	1.93	799.97	1.21
	Broad St. - Upstream of Culvert (Road El.)	800.90												
50-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.26	8.94	814.03	7.71	815.79	9.47	815.24	0.02	814.01	0.02	815.74	0.05
	Royster Ave. - Upstream of Culvert (Road El.)	814.20												
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	810.91	12.06	809.64	10.79	814.33	15.48	810.14	0.77	808.84	0.80	813.57	0.76
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.59	6.49	801.42	6.32	801.46	6.36	801.52	0.07	801.35	0.07	801.45	0.01
	Broad St. - Upstream of Culvert (Road El.)	800.90												
100-Year	Royster Ave. - Upstream of Culvert (Stream El.)	806.32	815.35	9.03	813.95	7.63	815.77	9.45	815.23	0.12	814.00	-0.05	815.60	0.17
	Royster Ave. - Upstream of Culvert (Road El.)	814.20												
	Royster Ave. - Upstream of W. Dixon Blvd. Culvert	798.85	812.04	13.19	810.60	11.75	814.42	15.57	811.22	0.82	809.89	0.71	814.29	0.13
	Broad St. - Upstream of Culvert (Stream El.)	795.10	801.76	6.66	801.56	6.46	801.55	6.45	801.56	0.20	801.48	0.08	801.39	0.16
	Broad St. - Upstream of Culvert (Road El.)	800.90												

*Note: Alternative 2 increases the Royster Ave. Road El. To 814.35'.

Appendix F

Opinion of Probable Project Costs

City of Shelby Stormwater Master Plan
AOC 1: Suttle Street & Carolina Avenue - Alternative 1
Opinion of Probable Project Cost

November 14, 2025

Item No.	Description	Qty	Unit	Unit Cost	Total Cost
1	MOBILIZATION	1	LS	$ 1,450.00	$ 1,500.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 870.00	$ 1,000.00
3	EROSION CONTROL	1	LS	$ 870.00	$ 1,000.00
4	REMOVE & REPLACE SIDEWALK	6	SY	$ 122.00	$ 1,000.00
5	REMOVAL OF EXT CONC PVMT	18	SY	$ 58.22	$ 1,500.00
6	EXCAVATION	13	CY	$ 38.25	$ 1,000.00
7	4" CONCRETE PAVED DITCH	40	SY	$ 154.00	$ 6,500.00
8	TRENCH DRAIN COVER 45" SPAN	6	EA	$ 1,341.00	$ 8,500.00
9	FINE GRADING	101	SY	$ 3.00	$ 500.00
10	WHEEL STOPS	5	EA	$ 300.00	$ 1,500.00
11	PAVEMENT MARKING	1	LS	$ 2,000.00	$ 2,000.00
12	SEEDING AND MULCHING	0.3	AC	$ 2,623.24	$ 1,000.00
13	HAULING EXCESS MATERIAL	13	CY	$ 28.00	$ 500.00
14	EASEMENT ACQUISITION	1	LS	$ 5,000.00	$ 5,000.00
				Subtotal*	**$ 33,000.00**
	Contingencies (22%)				$ 7,260.00
	Utility Relocations (10%)				$ 726.00
	*Price Escalation Factor (5%)***				$ 1,650.00
				Construction Total*	**$ 43,000.00**
	Opinion of Probable Construction Cost Range*: $33,000.00 to $43,000.00				
	Design and Permitting (18%)				$ 5,940.00
	Construction Administration (5%)				$ 1,650.00
				Engineering Subtotal*	**$ 8,000.00**
				Project Total*	**$ 51,000.00**
	Opinion of Probable Project Cost Range*: $41,000.00 to $51,000.00				

Line item total cost rounded to the nearest $500

* Rounded to the nearest $1000

** Assumes bidding will occur in 2026

City of Shelby Stormwater Master Plan
AOC 1: Suttle Street & Carolina Avenue - Alternative 2
Opinion of Probable Project Cost

November 14, 2025

Item No.	Description	Qty	Unit	Unit Cost	Total Cost
1	MOBILIZATION	1	LS	$ 8,800.00	$ 9,000.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 5,280.00	$ 5,500.00
3	EROSION CONTROL	1	LS	$ 5,280.00	$ 5,500.00
4	REMOVE & REPLACE SIDEWALK	128	SY	$ 122.00	$ 16,000.00
5	REMOVAL OF EXT CONC PVMT	18	SY	$ 58.22	$ 1,500.00
6	BREAKING OF EXT ASPH PVMT	36	SY	$ 4.82	$ 500.00
7	REMOVAL OF EXT ASPHALT PVMT	36	SY	$ 14.07	$ 1,000.00
8	REMOVE & REPLACE 6" CONCRETE DRIVEWAY	14	SY	$ 160.00	$ 2,500.00
9	PIPE REMOVAL	220	LF	$ 31.34	$ 7,000.00
10	DRAINAGE STRUCTURE REMOVAL	1	EA	$ 900.00	$ 1,000.00
11	CHAIN LINK FENCE RESET	40	LF	$ 47.50	$ 2,000.00
12	EXCAVATION	13	CY	$ 38.25	$ 1,000.00
13	4" CONCRETE PAVED DITCH	40	SY	$ 154.00	$ 6,500.00
14	TRENCH DRAIN COVER 45" SPAN	6	EA	$ 1,341.00	$ 8,500.00
15	24" CLASS III RCP	10	LF	$ 134.92	$ 1,500.00
16	30" CLASS III RCP	90	LF	$ 165.00	$ 15,000.00
17	60" CLASS IV RCP	130	LF	$ 606.70	$ 79,000.00
18	TRAFFIC BEARING JUNCTION BOX (OVER-SIZED, HEAVY DUTY)	1	EA	$ 6,500.00	$ 6,500.00
19	JUNCTION BOX (STANDARD SIZE)	1	EA	$ 879.52	$ 1,000.00
20	INSTALL NEW CATCH BASIN	1	EA	$ 10,000.00	$ 10,000.00
21	FINE GRADING	223	SY	$ 3.00	$ 1,000.00
22	2" ASP CONC SURF CRS S9.5B OR S9.5C	4	TON	$ 87.81	$ 500.00
23	8" ASP CONC BASE CRS B25.0C	15	TON	$ 107.07	$ 2,000.00
24	WHEEL STOPS	5	EA	$ 300.00	$ 1,500.00
25	PAVEMENT MARKING	1	LS	$ 2,000.00	$ 2,000.00
26	SEEDING AND MULCHING	0.5	AC	$ 2,623.24	$ 1,500.00
27	HAULING EXCESS MATERIAL	67	CY	$ 28.00	$ 2,000.00
28	EASEMENT ACQUISITION	1	LS	$ 5,000.00	$ 5,000.00
				Subtotal*	**$ 196,000.00**
	Contingencies (22%)				$ 43,120.00
	Utility Relocations (10%)				$ 4,312.00
	*Price Escalation Factor (5%)***				$ 9,800.00
				Construction Total*	**$ 253,000.00**
	Opinion of Probable Construction Cost Range*: $196,000.00 to $253,000.00				
	Design and Permitting (18%)				$ 35,280.00
	Construction Administration (5%)				$ 9,800.00
				Engineering Subtotal*	**$ 45,000.00**
				Project Total*	**$ 298,000.00**
	Opinion of Probable Project Cost Range*: $241,000.00 to $298,000.00				

Line item total cost rounded to the nearest $500

* Rounded to the nearest $1000

** Assumes bidding will occur in 2026

City of Shelby Stormwater Master Plan
AOC 2: Montrose Drive Near Windsor Drive and Hickory Cr. - Alternative 1
Opinion of Probable Project Cost

November 14, 2025

Item No.	Description	Qty	Unit	Unit Cost	Total Cost
1	MOBILIZATION	1	LS	$ 2,500.00	$ 2,500.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 1,500.00	$ 1,500.00
3	EROSION CONTROL	1	LS	$ 1,500.00	$ 1,500.00
4	CLEARING & GRUBBING	0	LS	$ 2,500.00	$ -
5	REMOVE & REPLACE CATCH BASIN	1	EA	$ 9,000.00	$ 9,000.00
6	INSTALL NEW CATCH BASIN	1	EA	$ 10,000.00	$ 10,000.00
7	REMOVE & REPLACE 6" CONCRETE	14	SY	$ 160.00	$ 2,500.00
8	BREAKING OF EXT ASPH PVMT	4	SY	$ 4.82	$ 500.00
9	REMOVAL OF EXT ASPHALT PVMT	4	SY	$ 14.07	$ 500.00
10	2" ASP CONC SURF CRS S9.5B OR S9.5C	1	TON	$ 87.81	$ 500.00
11	EASEMENT ACQUISITION	1	LS	$ 5,000.00	$ 5,000.00
12	INSTALL TIDE GATE	0	EA	$ 2,400.00	$ -
13	CLASS B RIP RAP 18" THICK	3	TON	$ 80.00	$ 500.00
14	GEOTEXTILE FOR DRAINAGE	70	SY	$ 2.86	$ 500.00
15	SEEDING AND MULCHING	0.5	AC	$ 2,623.24	$ 1,500.00
16	EXCAVATION	70	CY	$ 38.25	$ 3,000.00
17	GRADING	0	SY	$ 38.25	$ -
18	HAULING EXCESS MATERIAL	31	CY	$ 28.00	$ 1,000.00
19	15" CLASS III RCP	70	LF	$ 110.24	$ 8,000.00
20	PERMANENT DITCH WITH LINING	190	LF	$ 30.00	$ 6,000.00
21	FINE GRADING	70	SY	$ 3.00	$ 500.00
22	DRAINAGE DITCH EXCAVATION	31	CY	$ 21.00	$ 1,000.00
23	SLOPE MATTING	0	SF	$ 2.70	$ -
				Subtotal*	**$ 56,000.00**
	Contingencies (22%)				$ 12,320.00
	Utility Relocations (10%)				$ 2,710.40
	*Price Escalation Factor (5%)***				$ 2,800.00
				Construction Total*	**$ 74,000.00**
	Opinion of Probable Construction Cost Range*: $56,000.00 to $74,000.00				
	Design and Permitting (18%)				$ 10,080.00
	Construction Administration (5%)				$ 2,800.00
				Engineering Subtotal*	**$ 13,000.00**
				Project Total*	**$ 87,000.00**
	Opinion of Probable Project Cost Range*: $69,000.00 to $87,000.00				

Line items rounded to the nearest $500

* Rounded to the nearest $1000

** Assumes bidding will occur in 2026

City of Shelby Stormwater Master Plan
AOC 2: Montrose Drive Near Windsor Drive and Hickory Cr. - Alternative 2
Opinion of Probable Project Cost

November 14, 2025

Item No.	Description	Qty	Unit	Unit Cost	Total Cost
1	MOBILIZATION	1	LS	$ 5,425.00	$ 5,500.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 3,255.00	$ 3,500.00
3	EROSION CONTROL	1	LS	$ 3,255.00	$ 3,500.00
4	CLEARING & GRUBBING	1	LS	$ 2,500.00	$ 2,500.00
5	REMOVE & REPLACE CATCH BASIN	1	EA	$ 9,000.00	$ 9,000.00
6	INSTALL NEW CATCH BASIN	1	EA	$ 10,000.00	$ 10,000.00
7	REMOVE & REPLACE 6" CONCRETE	14	SY	$ 160.00	$ 2,500.00
8	BREAKING OF EXT ASPH PVMT	4	SY	$ 4.82	$ 500.00
9	REMOVAL OF EXT ASPHALT PVMT	4	SY	$ 14.07	$ 500.00
10	2" ASP CONC SURF CRS S9.5B OR S9.5C	1	TON	$ 87.81	$ 500.00
11	EASEMENT ACQUISITION	1	LS	$ 5,000.00	$ 5,000.00
12	INSTALL TIDE GATE	2	EA	$ 2,400.00	$ 5,000.00
13	CLASS B RIP RAP 18" THICK	3	TON	$ 80.00	$ 500.00
14	GEOTEXTILE FOR DRAINAGE	260	SY	$ 2.86	$ 1,000.00
15	SEEDING AND MULCHING	3	AC	$ 2,623.24	$ 8,000.00
16	EXCAVATION	290	CY	$ 38.25	$ 11,500.00
17	GRADING	420	SY	$ 38.25	$ 16,500.00
18	HAULING EXCESS MATERIAL	31	CY	$ 28.00	$ 1,000.00
19	15" CLASS III RCP	260	LF	$ 110.24	$ 29,000.00
20	PERMANENT DITCH WITH LINING	90	LF	$ 30.00	$ 3,000.00
21	FINE GRADING	70	SY	$ 3.00	$ 500.00
22	DRAINAGE DITCH EXCAVATION	11	CY	$ 21.00	$ 500.00
23	SLOPE MATTING	420	SF	$ 2.70	$ 1,500.00
				Subtotal*	**$ 121,000.00**
	Contingencies (22%)				$ 26,620.00
	Utility Relocations (10%)				$ 5,856.40
	*Price Escalation Factor (5%)***				$ 6,050.00
				Construction Total*	**$ 160,000.00**
	Opinion of Probable Construction Cost Range*: $121,000.00 to $160,000.00				
	Design and Permitting (18%)				$ 21,780.00
	Construction Administration (5%)				$ 6,050.00
				Engineering Subtotal*	**$ 28,000.00**
				Project Total*	**$ 188,000.00**
	Opinion of Probable Project Cost Range*: $149,000.00 to $188,000.00				

Line items rounded to the nearest $500

* Rounded to the nearest $1000

** Assumes bidding will occur in 2026

City of Shelby Stormwater Master Plan
AOC 3 & 4: Royster Avenue and Broad Street - Alternative 1
Opinion of Probable Project Cost

November 14, 2025

Item No.	Description	Qty	Unit	Unit Cost	Total Cost
1	MOBILIZATION	1	LS	$ 30,000.00	$ 30,000.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 18,000.00	$ 18,000.00
3	EROSION CONTROL	1	LS	$ 18,000.00	$ 18,000.00
4	CLEARING & GRUBBING	1	LS	$ 2,500.00	$ 2,500.00
5	CONTROL OF WATER/ DEWATERING	1	LS	$ 6,000.00	$ 6,000.00
6	BREAKING OF EXT ASPH PVMT	60	SY	$ 4.82	$ 500.00
7	REMOVAL OF EXT ASPHALT PVMT	60	SY	$ 14.07	$ 1,000.00
8	2" ASP CONC SURF CRS S9.5B OR S9.5C	8	TON	$ 87.81	$ 1,000.00
9	8" ASP CONC BASE CRS B25.0C	30	TON	$ 107.07	$ 3,500.00
10	CLASS B RIP RAP 18" THICK	30	TON	$ 80.00	$ 2,500.00
11	GEOTEXTILE FOR DRAINAGE	30	SY	$ 2.86	$ 500.00
12	SEEDING AND MULCHING	0.25	AC	$ 2,623.24	$ 1,000.00
13	EXCAVATION	100	CY	$ 38.25	$ 4,000.00
14	GRADING	1200	SY	$ 38.25	$ 46,000.00
15	HAULING EXCESS MATERIAL	37	CY	$ 28.00	$ 1,500.00
16	FINE GRADING	1200	SY	$ 3.00	$ 4,000.00
17	PRECAST BOX CULVERT	1	LS	$ 425,000.00	$ 425,000.00
18	DEMOLITION AND DISPOSAL	1	LS	$ 5,940.00	$ 6,000.00
19	CHANNEL RESTORATION/EXCAVATION	340	CY	$ 200.00	$ 68,000.00
20	SLOPE MATTING	10000	SF	$ 2.70	$ 27,000.00
				Subtotal*	**$ 666,000.00**
	Contingencies (22%)				$ 146,520.00
	*Price Escalation Factor (5%)***				$ 33,300.00
				Construction Total*	**$ 846,000.00**
	Opinion of Probable Construction Cost Range*: $666,000.00 to $846,000.00				
	*Easement Acquisition (50% of Tax Assessor Land Value)****				$ 4,252.00
	Design and Permitting (18%)				$ 119,880.00
	Construction Administration (5%)				$ 33,300.00
				Engineering Subtotal*	**$ 157,000.00**
				Project Total*	**$ 1,003,000.00**
	Opinion of Probable Project Cost Range*: $823,000.00 to $1,003,000.00				

Line items rounded to the nearest $500

* Rounded to the nearest $1000

** Assumes bidding will occur in 2026

***50% of theTax Assessor Land Value multiplied by the percentage of parcel impacted.

City of Shelby Stormwater Master Plan
AOC 3 & 4: Royster Avenue and Broad Street - Alternative 2
Opinion of Probable Project Cost

November 14, 2025

Item No.	Description	Qty	Unit	Unit Cost	Total Cost
1	MOBILIZATION	1	LS	$ 59,600.00	$ 60,000.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 35,760.00	$ 36,000.00
3	EROSION CONTROL	1	LS	$ 35,760.00	$ 36,000.00
4	CLEARING & GRUBBING	1	LS	$ 2,500.00	$ 2,500.00
5	CONTROL OF WATER/ DEWATERING	1	LS	$ 6,000.00	$ 6,000.00
6	BREAKING OF EXT ASPH PVMT	120	SY	$ 4.82	$ 1,000.00
7	REMOVAL OF EXT ASPHALT PVMT	120	SY	$ 14.07	$ 2,000.00
8	2" ASP CONC SURF CRS S9.5B OR S9.5C	16	TON	$ 87.81	$ 1,500.00
9	8" ASP CONC BASE CRS B25.0C	60	TON	$ 107.07	$ 6,500.00
10	CLASS B RIP RAP 18" THICK	60	TON	$ 80.00	$ 5,000.00
11	GEOTEXTILE FOR DRAINAGE	60	SY	$ 2.86	$ 500.00
12	SEEDING AND MULCHING	0.25	AC	$ 2,623.24	$ 1,000.00
13	EXCAVATION	200	CY	$ 38.25	$ 8,000.00
14	GRADING	2400	SY	$ 38.25	$ 92,000.00
15	HAULING EXCESS MATERIAL	74	CY	$ 28.00	$ 2,500.00
16	FINE GRADING	2400	SY	$ 3.00	$ 7,500.00
17	PRECAST BOX CULVERT	2	LS	$ 425,000.00	$ 850,000.00
18	DEMOLITION AND DISPOSAL	1	LS	$ 11,800.00	$ 12,000.00
19	CHANNEL RESTORATION/EXCAVATION	810	CY	$ 200.00	$ 162,000.00
20	SLOPE MATTING	11750	SF	$ 2.70	$ 32,000.00
				Subtotal*	**$ 1,324,000.00**
	Contingencies (22%)				$ 291,280.00
	Utility Relocations (10%)				$ 29,128.00
	*Price Escalation Factor (5%)***				$ 66,200.00
				Construction Total*	**$ 1,711,000.00**
	Opinion of Probable Construction Cost Range*: $1,324,000.00 to $1,711,000.00				
	*Easement Acquisition (50% of Tax Assessor Land Value)****				$ 25,602.00
	Design and Permitting (18%)				$ 238,320.00
	Construction Administration (5%)				$ 66,200.00
				Engineering Subtotal*	**$ 330,000.00**
				Project Total*	**$ 2,041,000.00**
	Opinion of Probable Project Cost Range*: $1,654,000.00 to $2,041,000.00				

Line items rounded to the nearest $500

* Rounded to the nearest $1000

** Assumes bidding will occur in 2026

***50% of theTax Assessor Land Value multiplied by the percentage of parcel impacted.

RESOLUTION NO. 77-2026

A RESOLUTION TO ACCEPT THE CITYWIDE STORMWATER MODELING, INFRASTRUCTURE ASSESSMENT, AND MASTER PLAN PREPARED BY MCGILL ASSOCIATES

WHEREAS, the American Rescue Plan Act (ARPA), funded from the State Fiscal Recovery Fund, was established in Session Law (S.L.) 2021-180 to assist eligible units of local government with meeting their drinking water and/or wastewater and/or stormwater infrastructure needs; and,

WHEREAS, the North Carolina Department of Environmental Quality (NCDEQ) has offered Local Assistance for Stormwater Infrastructure Investments (LASII) ARPA funding in the amount of $330,000 to perform the work detailed in the submitted application; and**,**

WHEREAS, in September 2023, the Shelby City Council approved Resolution 68-2023 to accept the LASII funding from NCDEQ and authorized the selection of McGill Associates through the qualifications-based selection process to perform professional civil engineering services for the Citywide Stormwater Modeling, Infrastructure Assessment, and Master Plan; and,

WHEREAS, McGill Associates completed the inventory and assessment of stormwater collection systems citywide, performed Hydrologic and Hydraulic models, evaluated alternative solutions at areas of concerns, and created a stormwater master plan; and,

WHEREAS, McGill Associates has performed this work and completed the scope of work that was provided in the grant application for the project; and,

WHEREAS, NCDEQ requires City Council approval and acceptance, along with an executive letter in order to close out the project and obtain reimbursement; and,

WHEREAS, City staff recommend acceptance of the Citywide Stormwater Modeling, Infrastructure Assessement, and Master Plan prepared by McGill Associates.

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SHELBY, NORTH CAROLINA:

Section 1. The City Council of City of Shelby hereby accepts the Citywide Stormwater Modeling, Infrastructure Asseseement, and Master Plan.

Section 2. That Justin Merritt, City Manager, and successors so titled, is hereby authorized and directed to furnish such information as the appropriate State agency may request in connection with this project; to make the assurances as contained above; and to execute such other documents as may be required by the North Carolina Department of Environmental Quality, Division of Water Infrastructure.

Section 3. This resolution shall become effective upon its adoption and approval.

Adopted and Approved this the 5th day of October 2026.

_____
O. Stanhope Anthony III
Mayor

ATTEST:

_____
Carol Williams
City Clerk

City of Shelby
Agenda Item Summary
October 5, 2026
City Hall Council Chambers

E. New Business

Agenda Item: E-1

1) Permanent closure of Eastfield Street:

a) Approval of a resolution declaring approval of the petition by the City Council of the City of Shelby for the permanent closure of Eastfield Street: Resolution No. 78-2026

b) Approval of a resolution declaring the intent of the City Council of the City of Shelby to consider the permanent closure of Eastfield Street: Resolution No. 79-2026

New Business Item: (Brian Burgess, Director of Planning and Development)

- Memorandum dated October 1, 2026, from Brian Burgess, Director of Planning and Development
- Agreement Regarding the Matter Concerning Eastfield St, Shelby, NC
- Survey Map
- Legal Description
- Resolution No. 78-2026
- Resolution No. 79-2026

City Manager's Recommendation / Comments

City staff have received a petition for the permanent closure of Eastfield Street, which is an unopened street right of way. These requests may be considered pursuant to NC General Statute 160A-299, which establishes the procedure for consideration. One component of consideration listed in 160A-299 is whether the closure would be "contrary to the public interest". The unopened right of way, formally known as Eastfield Street, serves as a dead-end driveway serving a single parcel along Elizabeth Avenue. City Staff have evaluated this request and have determined that it will not be contrary to the public interest, the petition is sufficient, reasonable and in harmony with the needs of City residents.

It is my recommendation that Resolution 78-2026 be approved, which would approve the request for closure of the unopened right of way known as Eastfield Street.

Should City Council approve resolution 78-2026, then an approval action would be necessary on Resolution 79-2026, which would instruct City staff to proceed with the required public notification and establish the date for the required public hearing.

It is my recommendation that Resolution No. 78-2026 and Resolution No. 79-2026 be adopted and approved by City Council at this time.

Memorandum

To: Justin Merritt – City Manager

From: Brian Burgess – Director of Planning & Development

Date: October 1, 2026

Subject: Request to close Eastfield Street

Executive Summary of issue – Background

The property owners adjacent to Eastfield Street have petitioned the City to close the right-of-way. A location map showing this site is attached. This is essentially a driveway- it's unclear if this was planned to be extended at some point in the past, but for several decades now has remained un-utilized.

Review and Comments

Pursuant to North Carolina General Statute 160A-299, the City may close a street or alley after passing a resolution of intent that establishes a public hearing for said closing. There are two resolutions attached: The first is a resolution of petition acceptance that addresses whether Council would like to move forward with the Resolution of Intent. The second is the Resolution of Intent. The public hearing for this street closing, as established by the resolution of intent, will be scheduled for November 2, 2026 if Council approves both resolutions.

Recommendation

Please place this item on the agenda for the October 5, 2026 City Council meeting.

Agreement regarding the matter concerning Eastfield Street, Shelby, NC 28150.

We Curtis K. Robinson, Curtis K. Robinson and Tonia H. Robinson, Tonia H. Robinson owners of the property located at 129 Elizabeth Avenue, hereby relinquish our rights to the portion of Eastfield Street and the right of way that is adjacent to our property.

Our decision to forgo our rights to the property gives Thomas E. Curtis and Victoria D. McSwain Curtis, the owners of the adjacent property located at 131 Elizabeth Avenue, full rights to Eastfield Street and the right of way.

WITNESSES

We, David Gosnell and Tiffaney Pruett,

Witnesses, sign our names to this instrument, being first duly sworn, and do hereby declare to the undersigned authority that the owners of 129 Elizabeth Avenue signs willingly, and that each of us witness to the signing, and that to the best of our knowledge that they are eighteen years of age or older, of sound mind and under no constraint or undue influence.

David Gosnell	10-21-25	165 Wisdom Cove Rd, Flat Rock
Witness	Date	Address
	10.21.25	1433 Cesar Landa ER RD Casar, NC 28020
Witness	Date	Address

NORTH CAROLINA

CLEVELAND COUNTY

Subscribed, sworn to and acknowledged before me by Thomas E. Curtis, Thomas E. Curtis and Victoria D. McSwain Curtis Victoria D. McSwain Curtis

property owners of 131 Elizabeth Avenue subscribed and sworn before me

by Wanda J. LaRhette and

_____, this 21

day of October, 2025.

WANDA J LARHETTE
NOTARY PUBLIC
CLEVELAND County
North Carolina
My Commission Expires JULY 21, 2029

MY COMMISSION EXPIRES: July 21, 2029

Wanda J. LaRhette

NOTARY PUBLIC

Legal description Deed Book 1879, Page 2554, Cleveland Springs Estates Plat Book 2 Page Block “S” Lot 11.

Beginning upon a Rebar located N26º59’56”W 910.85’from NC Geodetic Survey Monument “Cleveland”, N=569686.86’, E=1255457.65’, CF.:0.99983518, thence N80°47’85”W 47.45’to an Axle, thence N11°44’47”E 161.96’, to a Rebar, thence S80°47’56”E 49.61’,to a Rebar thence, S12°30’33”W 162.08’ to the beginning point, containing 7,852 ft2, 0.180 Acres.

PRELIMINARY

E. STEVE SMITH
SURVEYING
3520 McKINNEY ROAD
MOORESBORO, NC 28114
ssmithpls@carolina.rr.com
704-434-5369
704-434-6682(fax)

NC GRID
NAD'83
(2011)

NOTES

SURVEY BASED ON PHYSICAL EVIDENCE FOUND ON DATE OF SURVEY

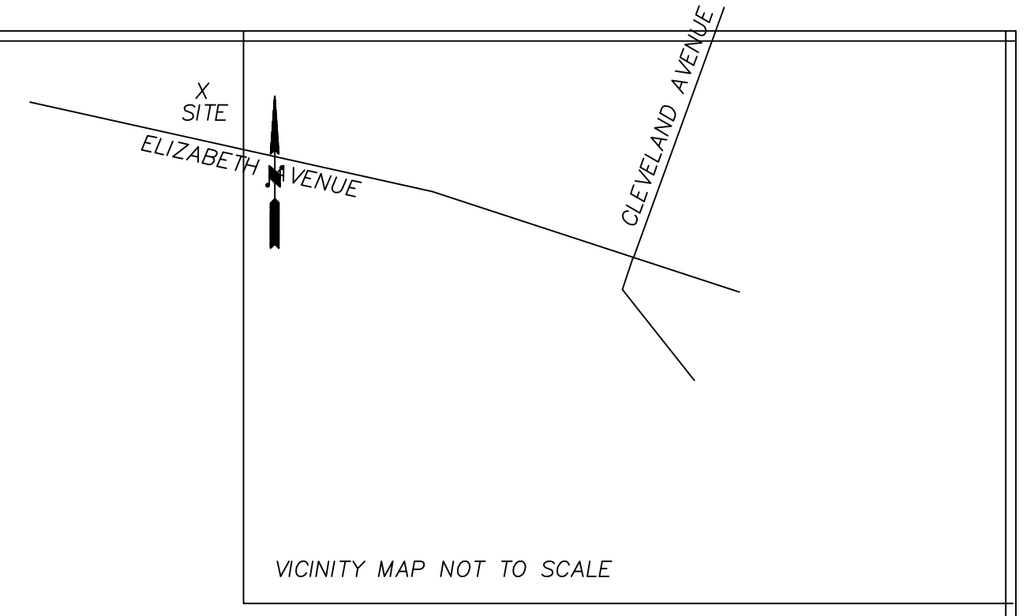
THIS PROPERTY (X)IS ( )IS NOT LOCATED WITHIN 2000 FEET OF A N.C.G.S./U.S.G.S. MONUMENT.

THIS PROPERTY MAY BE SUBJECT TO RECORDED OR UNRECORDED RIGHTS-OF-WAYS OR EASMENTS NOT OBSERVED.

THIS PROPERTY ( )IS (X)IS NOT LOCATED WITHIN A SPECIAL FLOOD HAZARD AREA AS DETERMINED BY THE DEPARTMENT OF HOUSING URBAN DEVELOPMENT.

ALL DISTANCES ARE HORZONTAL IN FEET.

THIS SURVEY IS OF EXISTING PARCELS, REF.: NCGS 47-30(f)11D.
LOT A IS AN NOW LOT 11 OF EASTFIELD SPRINGS ESTATES, NAMED EASTFIELD STREET, PORTION USED BY LOTB FOR INGRESS/EGRESS. REF.: DB18799, PG.2552.



VICINITY MAP NOT TO SCALE

Copyright © Smith Surveying. All rights reserved. Reproduction of this drawing, in whole or part without the written consent of the Professional Land Surveyor is prohibited. Only copies from the original doucment that are signed and sealed are valid.

PIPE

OWEN GERROLD
DB.1942, PG.1562

CCC MEMBER
DB.1792, PG.1946

N 70°34'05" W
206.33

N 40°34'30" E
190.96

IRON PIN

Lot 1
64,329 ft2
1.477 Acres

S 05°13'05" W
107.92

HOYT KEETER
DB.8A, PG.262

REBAR

N 80°27'42" W
106.61

PIPE

S 80°47'56" E
49.61

IRON PIN

REBAR

S 17°56'06" W
159.20(TIE)

9 | 10 | 11

0.18 ACRES

1.4ACRES

161.96

WOOD FENCE

162.08

Lot 1
7,852 ft2
0.180 Acres

A

CONCRETE DRIVEWAY

HOUSE

S 26°59'56" E
910.85(TIE)

NCGS "CLEVELAND"
N=569686.86
E=1255457.65
C.F.=0.99983618

CURTIS ROBINSON
DB.1879, PG.2552

N 11°44'47" E

VINYL FENCE

EASTFIELD STREET
(UNOPENED)

S 12°30'33" W

S 05°22'12" W
173.59

WILLIAM SHERWOOD
DB.1335,PG.265

B

REBAR

AXLE

S 80°47'39" E
47.45

REBAR

N 83°24'46" W
174.88

IRON PIN

60'R/W

CL

ELIZABETH AVENUE

60'R/W

LEGEND

- W — WATER METER
- P — POWER POLE
- (IPF) IRON PIN FOUND
- (IPS) IRON PIN SET
- (PNF) POINT NOT FOUND
- (CM) CONCRETE MONUMENT
- (UMP) UNMARKED POINT
- BOUNDARY LINE
- CENTERLINE
- EASEMENT LINE
- RIGHT OF WAY
- UNSURVEYED LINE
- POWER LINE

I, E. Steve Smith, PLS, certify that this plat was drawn under my supervision from an actual survey made under my supervision (deed description recorded in Book 1854, Page 1980); that the boundaries not surveyed are clearly indicated as drawn from information found in Book_____, Page_____; that the ratio of precision as calculated is 1:10,000; that this plat was prepared in accordance with G.S.47-30 as ammended. Witness my original signature, registration number and seal this 18 day of JUN, AD 2026

_____ L-4297
E. Steve Smith, PLS (Registration Number)

SCALE: 1"=30 FEET

0 15 30 60

CLEVELAND COUNTY, NORTH CAROLINA
FORMERLY TOWNSHIP #6
SURVEY FOR:
VICTORIA CURTIS
THOMAS E CURTIS
131 ELIZABETH AVENUE
DEED BOOK 1854, PAGE 1980
PROPERTY OF:
CITY OF SHELBY
EASTFIELD STREET
CLEVELAND SPRINGS ESTATES
PLAT BOOK 2, PAGE 22
JUNE 18, 2026

223

RESOLUTION NO. 78– 2026

A RESOLUTION DECLARING APPROVAL OF THE PETITION BY THE CITY COUNCIL OF THE CITY OF SHELBY FOR THE PERMANENT CLOSURE OF EASTFIELD STREET

WHEREAS, North Carolina General Statute § 160A-299 authorizes the City Council of the City of Shelby to permanently close public streets and alleys within its jurisdiction; and,

WHEREAS, the City has received a request and petition from abutting property owners to permanently close a portion of Eastfield Street; and,

WHEREAS, the City Council considers it advisable to consider the merits of the petition before moving forward with this consideration;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SHELBY, NORTH CAROLINA:

Section 1. The petition to permanently close Eastfield Street is deemed to be sufficient, reasonable, and in harmony with the needs of the residents of the City.

Section 2. The City Clerk is hereby directed to provide a Resolution of Intent to City Council for the consideration of this petition.

Section 3. The City Council will begin the process prescribed in N.C. Gen. Stat. § 160A to permanently close Eastfield Street upon the acceptance of a Resolution of Intent.

Section 4. This Resolution of Petition Acceptance shall become effective upon its adoption and approval.

Adopted and Approved this 5th day of October 2026.

_____
O. Stanhope Anthony, III
Mayor

ATTEST:

_____
Carol Williams
City Clerk

RESOLUTION NO. 79– 2026

A RESOLUTION DECLARING THE INTENT OF THE CITY COUNCIL OF THE CITY OF SHELBY TO CONSIDER THE PERMANENT CLOSURE OF EASTFIELD STREET

WHEREAS, North Carolina General Statute 160A-299 authorizes the City Council of the City of Shelby to permanently close public streets and alleys within its jurisdiction; and,

WHEREAS, the City has received a request and petition from abutting property owners to permanently close Eastfield Street; and,

WHEREAS, the City Council considers it advisable to conduct a public hearing for the purpose of giving consideration to this proposal;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF SHELBY, NORTH CAROLINA:

Section 1. That a public hearing on the matter will be held at 6:00 PM, on the 2nd day of November, 2026 in the Council Chambers at the City Hall in Shelby, North Carolina to consider an order closing Eastfield Street.

Section 2. The City Clerk is hereby directed to publish this Resolution of Intent once a week for four (4) successive weeks prior to the public hearing in *The Shelby Star*.

Section 3. The City Clerk is further directed to transmit by certified mail, return receipt requested, to each owner of property abutting on said street a copy of this Resolution of Intent and shall cause a notice of the Public Hearing to be prominently posted in at least two places along the subject street.

Section 4. This Resolution of Intent shall become effective upon its adoption and approval.

Adopted and Approved this 5th day of October 2026.

_____
O. Stanhope Anthony, III
Mayor

ATTEST:

_____
Carol Williams
City Clerk

City of Shelby
Agenda Item Summary
October 5, 2026
City Hall Council Chambers

Agenda Item F

City Manager's Report: Justin Merritt, City Manager

I will report to Mayor and Council on several ongoing projects and issues. The projects and issues reported upon are intended to be for your information and do not necessarily require action by Council.

Agenda Item: G

Council Announcements and Remarks

H. Adjournment:

To adjourn a meeting of City Council, a majority of the Council members must vote for a motion to adjourn.

1) Motion to adjourn