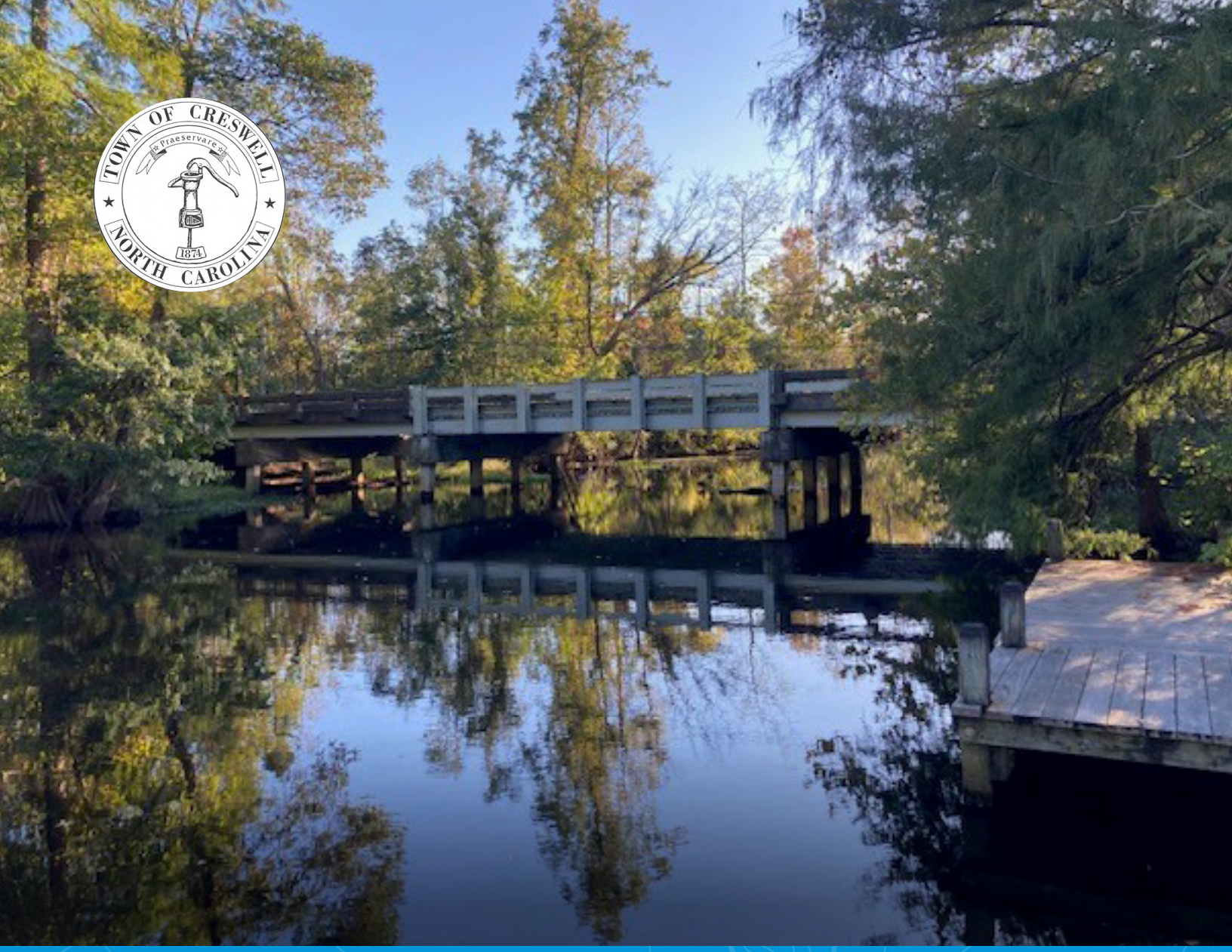

RESILIENT COASTAL COMMUNITIES PROGRAM

JUNE 2024

TOWN OF CRESWELL RESILIENCE STRATEGY

Phase 1 & 2 Report

PREPARED FOR:

North Carolina
Division of Coastal Management
and Town of Creswell

PREPARED BY:

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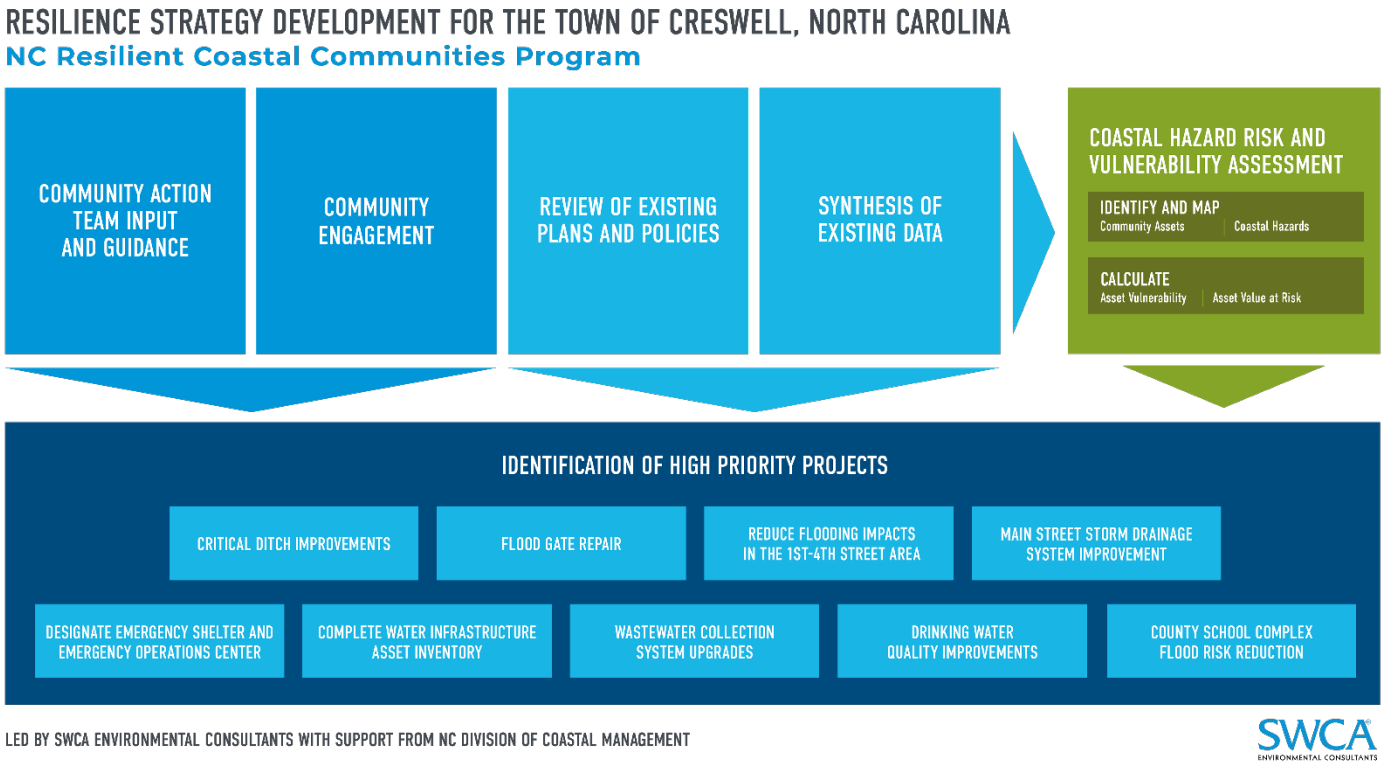
SUMMARY

The Town of Creswell faces elevated risks from coastal hazards such as flooding, storm surge, and sea level rise due to its low-lying position on the Albemarle-Pamlico Peninsula along the Scuppernong River. This Resilience Strategy was developed for Creswell under the North Carolina Resilient Coastal Communities Program by the North Carolina Division of Coastal Management. Planning consultants worked with a local Community Action Team to develop a resilience strategy that identifies high-priority projects that would help make the town more resilient to flooding and other coastal hazards.



1 INTRODUCTION

The Town of Creswell faces elevated risks from coastal hazards such as flooding, storm surge, and sea level rise due to its low-lying position on the Albemarle-Pamlico Peninsula along the Scuppernong River. This Resilience Strategy was developed for Creswell under the North Carolina Resilient Coastal Communities Program (Program) by the North Carolina Division of Coastal Management (DCM). Planning consultants, SWCA Environmental Consultants (SWCA), worked with a local Community Action Team (CAT) to develop a resilience strategy for the town. Note that a separate resiliency strategy is being prepared for Washington County. More information about the Program is available on the DCM website.

North Carolina Division of Coastal Management (DCM)

https://www.deq.nc.gov/about/divisions/coastal-management/coastal-resiliency

The purpose of the Program is to provide financial grants and technical assistance to support a proactive, locally driven, and equitable approach to coastal resilience planning and project implementation. The objectives of the Program are:

- ✓ Address barriers to coastal resilience at the local level;
- ✓ Assist communities with risk and vulnerability assessments;
- ✓ Help communities develop a portfolio of well-planned and prioritized projects;
- ✓ Advance priority projects to "shovel-ready" status;
- ✓ Link communities to funding streams for project implementation.

The Program provides a phased framework to assess coastal risks and vulnerabilities, engage community stakeholders, and develop projects to improve the resiliency of communities and their natural and built infrastructure. The Program includes four phases.

Phase 1: Community Engagement and Risk/Vulnerability Assessment

Phase 2: Planning, Project Identification, and Prioritization

Phase 3: Engineering and Design

Phase 4: Project Implementation

The NC Division of Coastal Management defines coastal resilience as:
ensuring all members and systems within a coastal community can better withstand major events and long-term stressors in a way that helps meet larger community goals.

This Resilience Strategy document includes the results of Phases 1 and 2: a risk and vulnerability assessment and a priority resilience project portfolio. This Resilience Strategy was developed between October 2023 and May 2024 and included five CAT meetings, community engagement, a community flood observations survey, and direct outreach to local stakeholders. Projects identified through this process are intended to build on and align with existing plans and ongoing studies, including the Hurricane Matthew Resilient Redevelopment Plan (2017), Northeastern NC Regional Hazard Mitigation Plan (2021), NC RISE Program Regional Climate Resilience Portfolio (2022), and Scuppernong Water Management Study (Albemarle 2024). After completing Phases 1 and 2, the Town is eligible to apply for additional funding through this Program to conduct engineering and design (Phase 3) and project implementation (Phase 4).

Community Overview

The town of Creswell is on the Albemarle Peninsula in eastern Washington County (Figure 1). The town is immediately south of U.S. Route 64 (U.S. 64). The intersection of Main and Sixth Streets is within the Creswell Historic District, which is listed on the National Register of Historic Places. South of town are Pettigrew State Park and the Scuppernong River. Other nearby points of interest include Lake Phelps, Pocosin Lakes Wildlife Refuge, Somerset Place Historic Site, and the Davenport Homestead. According to the 2020 Census, the population of Creswell is 207 (U.S. Census Bureau 2020).

Flooding within the northeastern North Carolina region can be attributed to riverine flooding, coastal flooding and associated storm surge, and flash flooding. Creswell is susceptible to storm surge flooding, which can propagate up the Scuppernong river from the Albemarle Sound. There were eight flooding occurrences within the county between 1999 and 2018, leading to deaths, property damage, and crop loss (North Carolina Emergency Management [NCEM] 2021). Flooding can lead to increased health risks and inability to access critical services due to impacts on local infrastructure during rain/flood events. Additionally, the rural nature of Creswell and the surrounding county creates barriers to engaging the residents and building a foundational level of resilience and storm preparedness.

In past flood events, there have been significant impacts on the town, which are compounded by aging/inoperable infrastructure and lack of available resources and support. The town is a low drainage spot for water moving south of U.S. 64 and water overflow from the Scuppernong River. U.S. 64 tends to act as a barrier/trap for water flow during rain/flood events. Flooding regularly impacts residences, schools, roadways, public sewer/water systems, and access to critical services for residents. Washington County, within which Creswell is located, is designated as Tier One (most distressed) in the state of North Carolina and is one of the 20 most distressed counties in the state, based on average unemployment rates, median household income, percentage growth in population, and adjusted property tax base per capita (North Carolina Department of Commerce 2023). The town is included within a designated Community Disaster Resilience Zone (CDRZ) by the Federal Emergency Management Agency (FEMA), which means they will be prioritized for targeted federal support (FEMA 2023). These designations demonstrate the need for building resilience to support the well-being of the county and those who live, work, and frequently visit there.

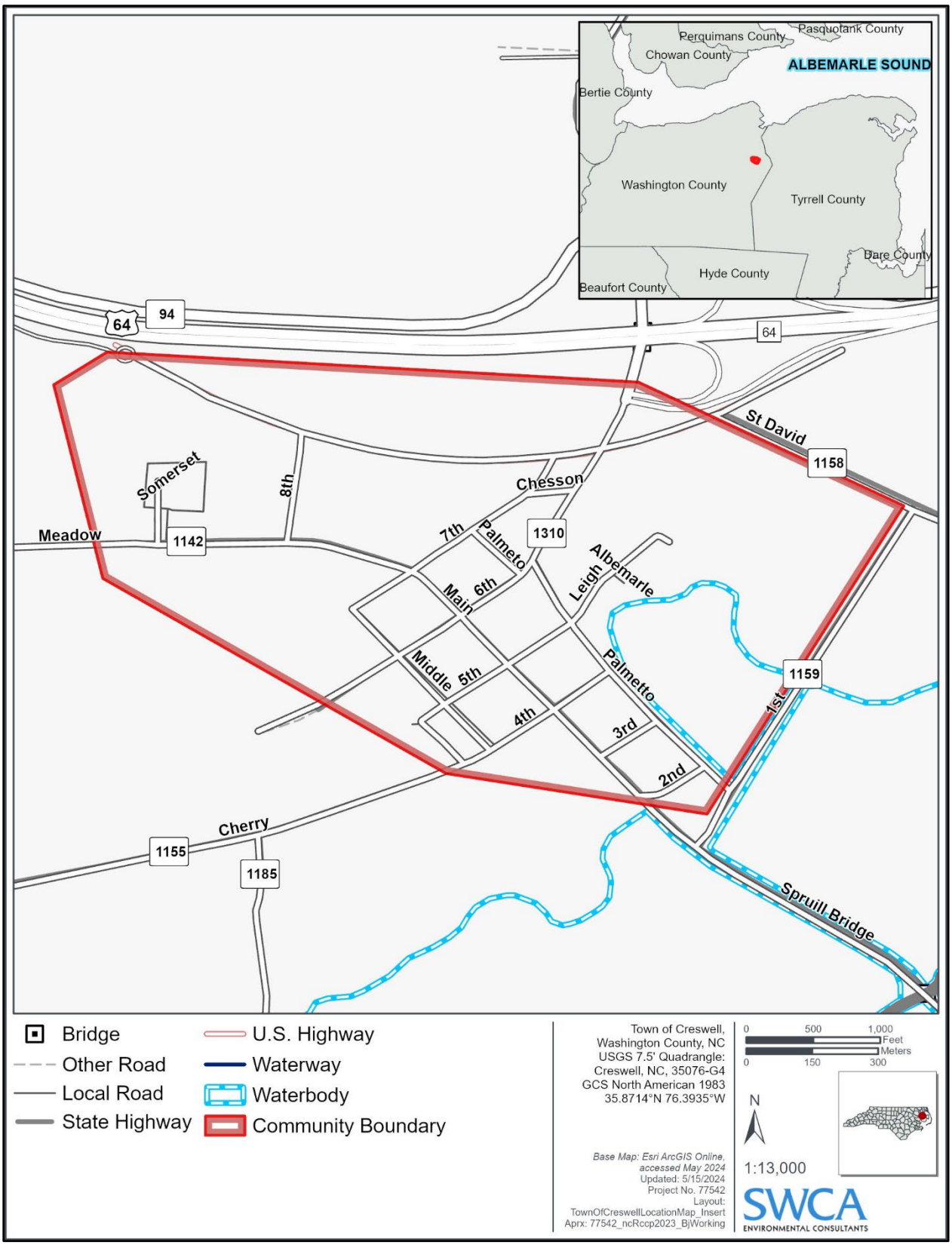


Figure 1. Map of Creswell in Washington County, North Carolina.

2 VISION

The Creswell CAT developed their vision for building resiliency in their community. The statement below focuses on where the community wants to be in the future (e.g., next 10 or more years) in relation to coastal hazards.

> "To promote the health and safety of our community through sustainable stormwater management solutions for present and future generations."

The high-priority projects identified by the CAT are intended to move Creswell toward realizing this vision.

3 REVIEW OF EXISTING LOCAL AND REGIONAL EFFORTS

Existing local and regional plans, ordinances, policies, and programs were reviewed to identify resilience strategies already in place, previously identified community assets (buildings, infrastructure, and other places of environmental, economic, or cultural value), previously identified coastal hazards, and potential resilience projects. Results of this review are summarized below in Table 1.

Table 1. Existing Documents Reviewed for Creswell

DOCUMENT NAME (YEAR)	INFORMATION GLEANED			
	ASSET LOCATIONS	HAZARD INFORMATION	POTENTIAL RESILIENCE PROJECTS	RESILIENCE STRATEGIES ALREADY IN PLACE
Washington County (2021) Land Use Plan		✓	✓	✓
Northeastern NC Regional Hazard Mitigation Plan (NCEM 2021)	✓	✓	✓	✓
North Carolina Climate Risk Assessment and Resilience Plan (State of North Carolina 2020)				✓
State of North Carolina Hazard Mitigation Plan (North Carolina Department of Public Safety [NCDPS] 2018)		✓		✓
Hurricane Matthew Resilient Redevelopment Plan – Washington County (NCEM 2017)			✓	✓
Climate Resilience Projects for the Albemarle Region (North Carolina Office of Recovery and Resiliency [NCORR] 2022)		✓	✓	✓
Water Management Plan and Environmental Assessment for Pocosin Lakes National Wildlife Refuge |(U.S. Fish and Wildlife Service 2023)		✓	✓	✓

4 COMMUNITY ACTION TEAM (CAT)

Creswell formed their CAT consisting of key stakeholders that could provide targeted input and champion the planning effort. The intention of the CAT is to be inclusive and diverse, with members that have existing knowledge of local coastal resiliency and what gaps may exist. Members are listed below.

- Ron Ambrose, Town Fire Chief
- Penny Chapman, Town Clerk

- Joel Harris, Town Commissioner
- Brenda Logan, Town Commissioner
- Thomas Patrick, Town Commissioner
- Ryan Swain, Creswell Water and Sewer Superintendent
- Alfredia Williams, Mayor

The CAT reviewed and provided feedback on the relevant coastal hazards, helped identify asset locations, identified additional local contacts with information about community assets, provided review and feedback on the vulnerability and risk assessment results, supported planning and hosting of public open-house meetings, agreed on criteria for prioritization of projects, contributed to definition of candidate projects, and reached agreement on the final list of high-priority projects included in this Resilience Strategy document.

Four CAT meetings were held between October 2023 and March 2024, and a joint CAT meeting between the Washington County CAT, Town of Creswell CAT, and Town of Plymouth CAT was held in late May to coordinate on priority projects. Notes from the CAT meetings are provided in Appendix A.

5 STAKEHOLDER ENGAGEMENT STRATEGY

The Program goals defined by the DCM for stakeholder engagement include:

- ✓ Equitable representation and outcomes for marginalized communities and vulnerable populations.
- ✓ Building trust, relationships, and diverse partnerships within communities.
- ✓ Providing feedback and validation of the Vulnerability Assessment (Phase 1, Step 6) developed by the CAT.
- ✓ Assisting with prioritizing projects for Phases 3 and 4 of the Program.

To achieve these goals, SWCA worked with the CAT to implement community engagement during Phases 1 and 2 of the Program that included the following elements and tools: **ongoing online engagement, public open houses, and direct outreach to individual stakeholders**. SWCA also coordinated with the Engagement Team for the Scuppernong River Water Management Study to align the engagement for this Program with engagement activities conducted as part of that study.

Ongoing Online Engagement

Online engagement was conducted through the project website (Appendix B). The website included the following specific elements:

Interactive flood hazard map – This online map showed all the asset locations and hazard layers and allowed users to pan and zoom and turn hazard layers on and off to create a custom view showing the location and hazards of interest to them.

Flood survey – The survey was developed with the Scuppernong River Water Management Study to serve that study and this Program. It was available online and provided in hard copy (see Appendix B) at the first public meeting and asked respondents to identify important places (assets) in the community and the location and time where they have observed flooding. The online survey included an option for respondents to upload photographs of the flooding.

Links to additional resources about risk reduction/preparedness – These included the Ready NC Hurricane Preparedness Guide (NCDPS 2021), guidance from the North Carolina Department of Health and Human Services on preventing and cleaning up mold/moisture, what to do with drinking water wells and septic systems in flooding conditions, and post-disaster resources from Legal Aid NC.

The website also included project contact information and information about upcoming public meetings.

Public Meetings and Events

SWCA and the CAT members shared information with the community about the Program and how to become involved at open-house meetings and community events. The attendee list is provided in Appendix B.
The purpose of the outreach was to listen to concerns and answer questions about coastal hazards, gather input on asset and hazard locations, gather input on potential projects, and collect contact information for interested parties to send updates.

Scuppernong Water Study Open House

Due to overlap in goals and target audience, the first community meeting was held in conjunction with the Scuppernong Water Study Community Kickoff Event, October 23, 2023, from 5:30 p.m. to 7:30 p.m. at the Eastern 4-H Center in Columbia. Dinner was provided at no charge, and free transportation was provided by the Gator Line. There was a kids' zone with watershed learning activity and a gift card raffle.

The goal was to gather information about assets and flood hazards and understand from the community where flooding happens and what leads to flooding while introducing them to the Program. Maps of flooding hotspots and community assets were presented for discussion. Residents provided input on what they value about the region. Attendees helped verify the asset and hazard information initially collected. About 100 people attended.

Poster used to advertise the community meeting.

Attendees at Christmas Parade discuss areas of flooding concern.

Creswell Christmas Parade

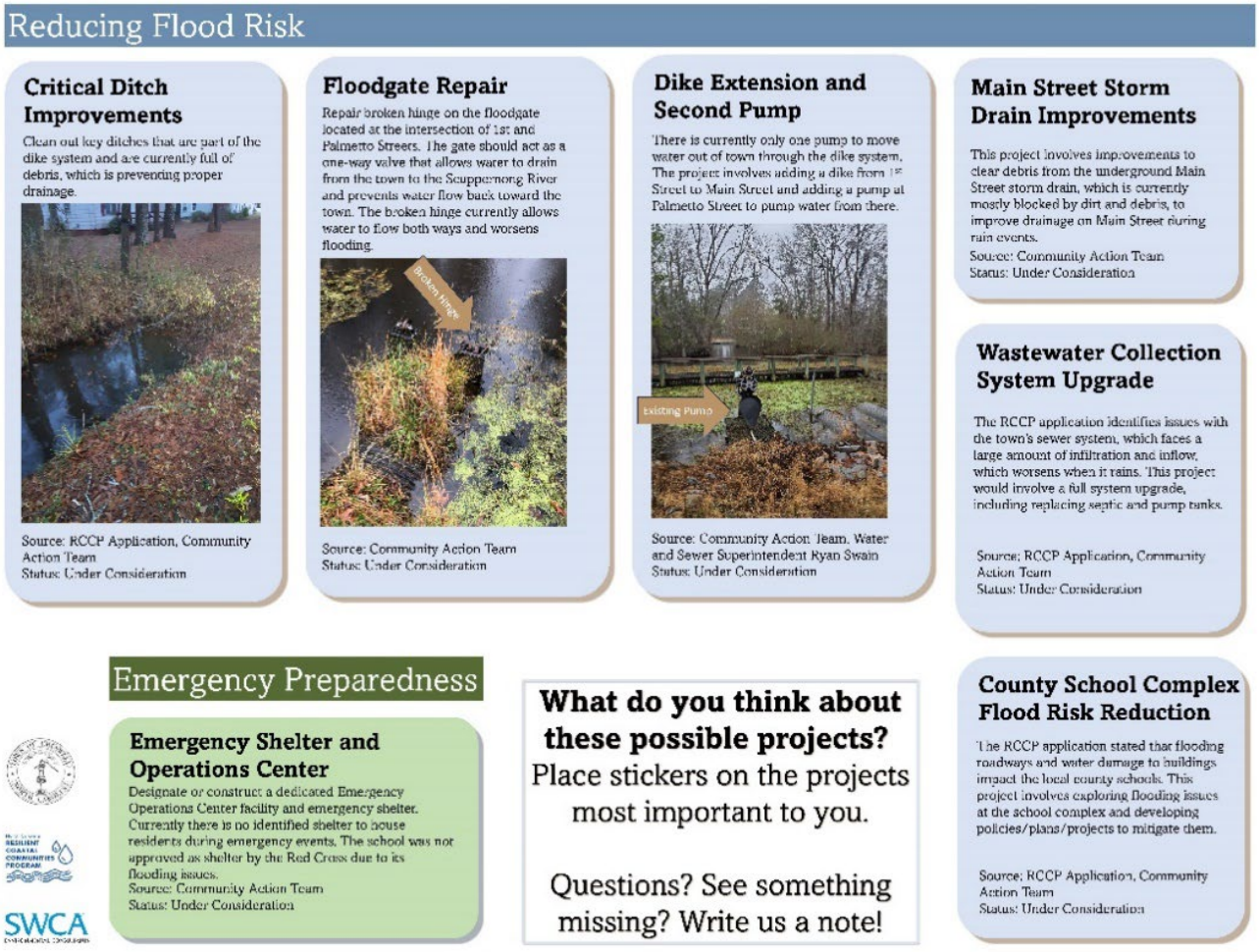
On December 9, 2023, SWCA and DCM hosted an informational booth at the Creswell Christmas Parade. The booth provided information about the Program, opportunity to point out areas of flooding concern in the Creswell area, and information about how to share flooding observations through the online survey. The team interacted with about 50 parade attendees at this event.

March Open House

Attendees at March Open House discuss potential projects.

SWCA and CAT members hosted a public open-house meeting on March 15, 2024 in Creswell at the Fire Station from 5:30 p.m. to 7:30 p.m. Free supper was provided, a kid's activity was available, and there was a gift card raffle.

The meeting had an open-house format with stations where attendees could learn about the Program planning process and discuss and share feedback on the projects under consideration. The meeting gave CAT members an opportunity to interact with the community, discuss projects, and hear their input. Posters depicted potential projects being considered, and attendees were able to indicate their preference for specific projects by placing stickers on the project posters. The meeting had approximately 31 attendees.



Poster depicting potential projects under consideration for the town of Creswell at the March Open House.

Direct Stakeholder Outreach

Information sharing also included individual outreach to key stakeholders.

Direct outreach was conducted via email and telephone from November 2023 to March 2024 to individual stakeholders who may have had key information to share. During this outreach, SWCA shared about the Program and asked questions to gather more specific information about potential projects and confirm asset and hazard information.

From November through March, outreach was conducted with the following stakeholders:

- Carl Spruill, Former Creswell Fire Department Chief
- Ryan Swain, Town of Creswell Water and Sewer Superintendent (subsequently added to the CAT)

Details of the strategies used to engage specific audiences during stakeholder engagement are provided in Table 2.

Table 2. Engagement Strategies Used for Community Engagement in Creswell, North Carolina

STRATEGY	AUDIENCE AND TIMING	GOALS
***Two-County Public Meeting – Flooding Hotspots and Community Assets** • "Where I live and work" map at sign-in table • Input on what people value about the region • Big interactive maps for identifying assets and hazards • Collect questions for follow-up • Kids' zone with watershed learning activity	Local residents, Town and County staff, and business owners *October 23, 2023*	➢ Hear and answer questions about hazards ➢ Ground truth the asset and hazard information collected and gather input to inform the Risk and Vulnerability Assessment ➢ Collect contact information for interested parties for updates and follow-up
***Booth at Creswell Christmas Parade – Flooding Hotspots and Community Assets** • Program overview poster (English and Spanish translated) • Creswell Asset Map poster with icons • Half-page survey information sheet with QR code and survey link to handout • Full-page, write-in copy of survey and fact sheet to handout • Copy of Creswell asset list for folks to look at	Local residents, Town and County staff, and business owners *December 9, 2023*	➢ Distribute flooding survey handouts with links to complete survey ➢ Have in-depth conversations with interested residents to share about the Program ➢ Hear and answer questions about the Program ➢ Identify flooding areas and critical assets in town ➢ Collect contact information for interested parties for updates and follow-up
Direct Outreach to Individual Stakeholders Via email and telephone	People who may have key information to share *November 2023 – March 2024*	➢ Gather key information missing from asset list and hazard assessment ➢ Understand perspectives of people otherwise underrepresented in this process ➢ Consult relevant stakeholders when making decisions about project identification and prioritization
***Survey with Interactive Map** • Identifying specific locations on the map that have flooded in the past • Identifying how hazards have impacted assets and access to assets in the past • Online and linked on all public outreach materials • In hard copy at public meetings	Local residents and business owners, including those who were unable to attend the October open house *November 2023 – February 2024*	➢ Understand where and how often flooding occurs in the county ➢ Identify important places within the Scuppernong Watershed ➢ Collect contact information for interested parties for updates/follow-up ➢ Collect photos of flooding for use in Resilience Strategy and other future grant applications for the Town of Creswell

STRATEGY	AUDIENCE AND TIMING	GOALS
***Public Meeting No. 2 – Priority Projects** • Posters conveying preliminary project list • Collect additional project ideas and input on which projects to prioritize • Collect questions for follow-up • Collect comments to incorporate • Kid's coloring activity	Local residents, Town and County staff, and business owners *March 15, 2024*	➢ Review preliminary project list ➢ Learn about which projects the community considers highest priority, to assist with prioritizing projects
***Provide educational activities and opportunity for input for children at public meetings and events**	Youth *For both public meetings*	➢ Engage vulnerable and underrepresented populations
Provide Spanish translations of the Program handout and some risk preparedness materials	People with limited English proficiency *For both public meetings and Christmas Parade*	
Personal outreach through leaders trusted by the community	Racial and ethnic minority populations and people living in flood-prone areas *For both public meetings*	

*Indicates activities conducted in cooperation with the engagement team for the Scuppernong River Water Management Study.

6 RISK AND VULNERABILITY ASSESSMENT

To assess the overall coastal hazard risks and vulnerabilities that Creswell faces, SWCA identified important places in the community (assets) and types of coastal hazards that could impact the community (hazards), with input and oversight from the CAT. SWCA used this information to evaluate the key vulnerabilities and economic risks. The methods and results of this analysis are detailed below.

Identified Assets

Critical community assets were identified and mapped for Creswell. Critical assets may include:

1. Infrastructure (e.g., roads and evacuation routes, water and sewer lines, ditches, storm drains, floodgates)
2. Community and economic services (e.g., churches, cultural sites, open space, parks)
3. Government service offices (e.g., Town Hall, post office)
4. Education (e.g., schools)
5. Health services (e.g., hospitals, pharmacies)
6. Public safety or emergency services (e.g., fire department)
7. Natural assets (i.e., wetlands, forests, or floodplains that provide ecosystem services, such as creating a natural buffer and absorbing floodwaters)

After identifying critical assets and natural infrastructure, any additional locally significant assets or infrastructure with cultural, ecological, public health, social, and/or economic value to community members were identified.

An initial asset list and map were reviewed and revised by the CAT members and shared with other knowledgeable Creswell staff for additional feedback. Table 3 summarizes the types of assets identified. The final detailed list of these assets is provided in Appendix C.

Table 3. Summary of Asset Types

ASSET TYPE	NUMBER OF ASSETS REVIEWED
Community and Economic Services	21
Education	2
Government Service Offices	2
Health Services	0
Infrastructure	17
Natural Assets	1
Public Safety and Emergency Services	1

Identified Hazards

SWCA looked at coastal hazards identified as high risk hazards in the Northeastern NC Regional Hazard Mitigation Plan (2021) and applied appropriate datasets to represent these hazards at the local level. Hazards evaluated for Creswell include sea level rise (both along coast lines and in low-lying areas where increases in the water table can result in inland flooding), storm surge inundation (including coastal storm surge from increasing high tides during simulated storm events), and inland flooding resulting from high precipitation events (areas likely to be flooded, such as FEMA-defined 100-year and 500-year floodplains, as well as historical records of event flooding). Information used to represent these hazard areas and historical accounts includes both publicly available geospatial data and input from community members. Additionally, other hazards that exacerbate the effects of an asset's exposure to the primary hazards listed above were identified and used to a lesser extent in exposure calculations. Those hazards include soil erosivity and risk of wildfires, hail, and tornadoes. Datasets used to represent community hazards were selected after an extensive review of data documentation and similar reports in the region and are detailed in Appendix D.

Vulnerability Assessment

After assets and hazards were identified, a vulnerability assessment evaluated the extent to which assets are vulnerable to current and future impacts. The vulnerability of critical assets, natural infrastructure, or populations to a hazard is a function of exposure, sensitivity, and adaptive capacity (Figure 2). These are defined in the *Resilient Coastal Communities Program Planning Handbook* (Program handbook) (DCM 2023) as:

> **Exposure** – the presence of people, assets, and ecosystems in places where they could be adversely impacted by hazards. The overlap between asset and hazard locations were ranked from no exposure to high exposure (0 to 3).
>
> **Sensitivity** – the degree to which an asset is potentially affected when exposed to an impact ranked from no sensitivity to high sensitivity (0 to 3).
>
> **Adaptive Capacity** – the ability of the asset and/or population to adjust to potential impacts from hazards with minimal disruption or cost. Consider the feasibility of relocation, ability to retrofit, social vulnerability, and other criteria relevant to the community to rank from no adaptive capacity to high adaptive capacity (0 to 3).

Vulnerability can be calculated by adding exposure and sensitivity and subtracting adaptive capacity. A greater adaptive capacity score results in a lower vulnerability score overall, so if an asset has high exposure and vulnerability and a high adaptive capacity, it can still have a low vulnerability score. A lower adaptive capacity score results in a higher vulnerability score overall, so even if an asset has moderate exposure and sensitivity, but

it has no adaptive capacity, it will still yield a higher vulnerability score than the same asset would if it had some level of adaptive capacity.

ASSET ID	EXPOSURE SCORE	SENSITIVITY SCORE	ADAPTIVE CAPACITY SCORE	VULNERABILITY SCORE
Asset Name	0 = No Exposure 1 = Low 2 = Medium 3 = High	0 = No Sensitivity 1 = Low 2 = Medium 3 = High	0 = No Adaptive Capacity 1 = Low 2 = Medium 3 = High	0-2 = Low 3-4 = Medium 5-6 = High

Vulnerability = Exposure + Sensitivity – Adaptive Capacity

Figure 2. Determining asset vulnerability (NCDCM 2023).

SWCA and the CAT defined thresholds and criteria used to score assets as low, medium, or high for each vulnerability metric (exposure, sensitivity, and adaptive capacity). These were then used in the formula below to determine asset vulnerability.

Exposure Score

Exposure, ranked from 0 (no exposure) to 3 (high exposure), represents the combined hazard exposure to projected sea level rise, potential flood events (storm surge, floodplain inundation and reported event inundation) and other hazards (erosion, tornado, and hail).

$$\text{Exposure} = \frac{\text{Sea Level Rise Exposure} + \text{Flood Event Exposure} + \text{Additional Hazard Factor}}{2}$$

Sea Level Rise Exposure was calculated by assigning scores 0 to 5 to capture the likelihood of an asset being exposed to a hazard and the severity of that hazard, then classifying values using an exposure matrix (Figure 3) to classify the exposure as none (0), low (1), moderately low (2), moderate (3), moderately high (4), and high (5).

Precipitation Exposure was calculated similar to sea level rise, by classifying values using an exposure matrix of 0 to 5. The calculation included a Reported Event Inundation Factor to reflect known localized flooding during high-intensity storm events that may have been missing or underrepresented in the available modeled data.

The calculation also includes an additional hazard multiplier to account for the potential of exacerbating the effects of coastal hazards (increased soil erosivity) and increasing overall resource demand on assets (possible damage from other extreme weather events).

The final sea level and precipitation exposure scores were then processed using the three-class exposure matrix to get an exposure score of 0 to 3 required by the Program handbook. Additional information on how hazard severity and probability were assigned for Sea Level Rise Exposure, Floodplain Exposure, Reported Event Inundation Factor, Storm Surge Exposure, and Additional Hazard Factor is provided below.

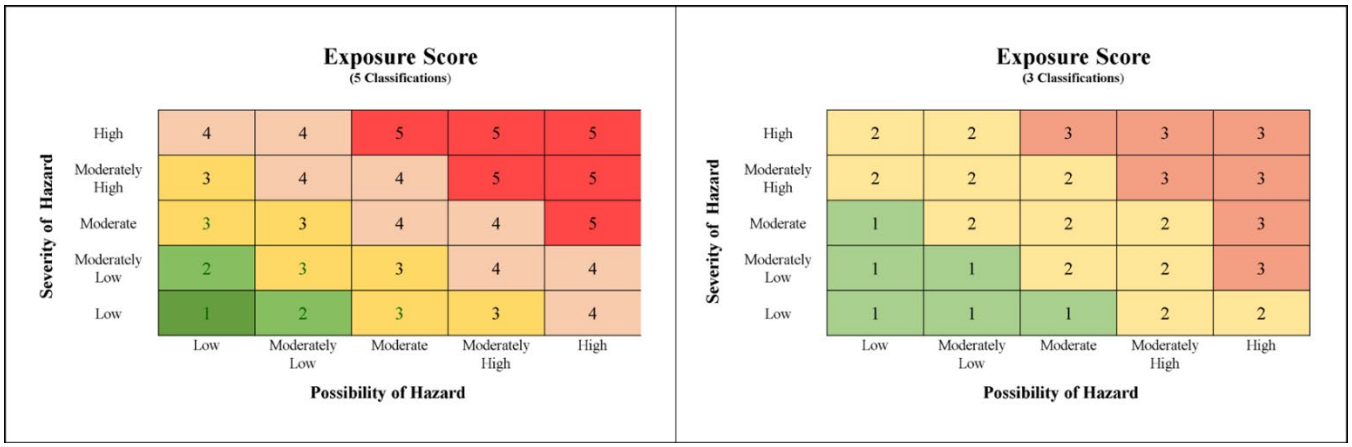


Figure 3. Exposure matrix.

- **Sea Level Rise Exposure** (Figure 4) – Maximum Sea Level Rise Exposure score calculated for the asset. This exposure rating evaluated potential inundation from encroaching coastal lines and inland flooding as a result of higher water tables under 1- to 10-foot National Oceanic and Atmospheric Administration (NOAA) sea level rise projections (NOAA Office for Coastal Management 2017). Scores for the probability of an asset being affected by sea level rise were calculated by grouping scenarios into the following categories based off projected sea level rise under different Intergovernmental Panel on Climate Change (IPCC) emission scenarios (IPCC 2023):
    - *High probability* – 1 to 3 feet of sea level rise expected under all scenarios
    - *Moderately high probability* – 4 to 5 feet of sea level rise expected under most scenarios
    - *Moderately low probability*– 6 to 7 feet of sea level rise expected under some scenario
    - *Low probability* – 8 to 10 feet of sea level rise expected under only the highest scenario

  The severity of sea level rise hazards was assigned considering the cumulative effects of subsequent increases in sea level. For example, under 1 to 2 feet of sea level rise an asset may have a moderately low severity, but under 3- to 4-foot sea level rise conditions that asset will see higher inundation levels and would have a severity score of moderate.
    - *Moderate severity* – at risk of 1 to 2 feet cumulative sea level rise
    - *Moderately high severity* – at risk of 3 to 4 feet cumulative sea level rise
    - *High severity* – at risk of 5 to 10 feet cumulative sea level rise
- **Floodplain Exposure** (Figure 5) – Current Floodplain Exposure was derived from FEMA Digital Flood Insurance Rate Map (DFIRM) data (North Carolina Floodplain Mapping Program 2020) and calculated as a function of the annual probability of precipitation flooding hazard *(moderately low*, 1% annual probability, for 100-year flooding or *low*, 0.2% annual probability, for 500-year flooding) and the severity of precipitation flooding hazard (*moderately high* for assets in the 100-year floodplain during a 100-year flood event, *high* for assets in the 500-year floodplain during a 500-year flood event, and *high* for assets in the 100-year floodplain during a 500-year flood event). To account for increases in precipitation due to climate change, low-lying areas (within an elevation range of 1 to10 feet above mean sea level, defined by reviewing current floodplain elevations) not currently listed as being in a floodplain were given a blanket Floodplain Exposure score of 1 to represent to represent that they are at risk of flooding despite not currently being within a designated floodplain. For areas with proposed changes to the floodplain type, the floodplain type with the highest corresponding exposure score was used.
- **Additional Hazard Factor** – Average of soil erosion, tornado, wildfire and hail risk. FEMA National Risk Index, U.S. Forest Service Fire Modeling Service, and U.S. National Soil Conservation Service predefined hazard risk data were converted from their original 1 through 5 risk scale to a 1 through 3

scale using the exposure matrix. The newly classified score was incorporated into the overall equation as an additive factor, not a standalone variable so that additional potential hazards were represented but sea level rise and flood inundation remain the primary drivers of hazard exposure scores.

- **Storm Surge Exposure** (Figure 6) – Maximum Storm Surge Exposure score calculated for the asset. High tide, coastal storm surges from National Hurricane Center SLOSH Model Simulated Category 1 through Category 5 storms (Zachry et al. 2015) were evaluated using the annual probability calculated from historical records for the state of North Carolina to assign probability values like Floodplain Exposure:
    - *High probability – Categories 1 and 2* storms, approximately 1 in 5 chance every year
    - *Moderate probability – Category 3* storm, approximately 1 in 20 chance every year
    - Low probability – Categories 4 and 5 storms, 1 in 100 chance every year

  Severity of exposure was calculated by categorizing simulated feet of inundation:
    - *Low* – 1 foot of storm surge inundation
    - *Moderately low* – 2 to 3 feet of storm surge inundation
    - *Moderate* – 4 to 5 feet of storm surge inundation
    - *Moderately high* – 6 to 7 feet of storm surge inundation
    - *High* – greater than 8 feet of storm surge inundation
- **Reported Event Inundation Factor** – Additive factor used to highlight areas of known flooding during large precipitation events as reported from historical satellite imagery (Schaffer-Smith 2020) or community engagement. For areas with a Floodplain Exposure score greater than 0, one point was added for each historical flooding event recorded for that area. For areas with a Floodplain Exposure score of 0 that were reported as having historical flooding, two points were awarded to areas with at least one reported flooding event, and one point was added for each additional storm event.

Sensitivity Score

Sensitivity, ranked from 0 (no sensitivity) to 3 (highly sensitive), represents the degree to which an asset is cumulatively impacted by hazards. Sensitivity is calculated by assigning a percent threshold and/or indicating a low, medium, or high need for that asset within the community. **Sensitivity Score** is the average of asset type sensitivity, geographic social sensitivity, and service type social sensitivity.

- **Asset Type Sensitivity** – Asset type sensitivity scores were assigned categorically using assumptions about how a hazard would affect the physical infrastructure and functionality of an asset, and whether the asset provides services to vulnerable populations, particularly during natural disasters. An asset that is less able to bounce back after a hazard and serves vulnerable populations was assigned the highest Asset Type Sensitivity scores. Vulnerable populations included the elderly (e.g., nursing homes, food distribution systems), chronically ill or physically disabled people (e.g. dialysis centers, medical facilities), less wealthy or food insecure individuals and families (e.g., food pantries, schools, public fishing access, local housing authorities), and historically marginalized groups (e.g., community organizations and cultural sites of significance, such as African-American cemeteries), people without adequate health insurance (e.g., EMS and Emergency Services), incarcerated individuals (e.g., correctional facilities), those experiencing abuse or violence (e.g., law enforcement, medical facilities), and youth and families (e.g., schools and childcare facilities, community centers, parks). For assets that were assigned multiple asset types because they serve multiple purposes, the highest categorical sensitivity score was used. Scores for asset types are as follows:
    - *High* (score = 3): City/County/Federal Government (offices, buildings, post office), Communications (towers), Community Centers, Electric utilities (substations, solar), Emergency Shelter, Fire Station, Food and Supplies (supermarkets, convenience stores), Gas utilities, Hazardous waste sites (EPA-permitted), Hospital or Local Clinic, Landfill, Law Enforcement or

Corrections, Pharmacy, Public health department, Roads (by section, route code, bridge structure numbers), Water and Sewer Utilities (wells, pipelines, pump stations).

- *Medium* (score = 2): Airports, Cultural Sites, Employers (large employers), Library, Nursing Home, Restaurants, Schools.
- *Low* (score = 1): Cemetery, Forest (parks/reserves), Open Space (County or Town designated), Parks and Recreation (trails, state parks, wildlife refuge), River (preserves, special areas), Wetlands (named/managed areas), Floodplain (undeveloped, easements, game lands, mitigation sites).

- **Geographic Social Sensitivity** – The geographic social vulnerability component of the vulnerability score reflects the relevance of an asset to socially vulnerable populations based on the asset's location. To ensure assets within socially vulnerable communities and assets that serve socially vulnerable communities were both represented, Social Vulnerability Index (SoVI) data (Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR) 2020 and Hazards and Vulnerability Research Institute (HVRI) 2011) were evaluated at two different spatial scales (asset location and asset service community). The asset service community was defined as all Census Blocks or Tracts that intersected a 1-mile radius of the asset. The score was averaged to create the final Geographic Social Sensitivity score. At both scales, Geographic Social Sensitivity was found by assigning threshold values to already calculated SoVI values as follows: top 10% of socially vulnerable areas (1), top 20% of socially vulnerable areas (0.75), top 30% of socially vulnerable areas (0.5), top 50% of socially vulnerable areas (0.25). This factor was calculated as an average of two measures of social vulnerability:
  - Asset Location Social Vulnerability Score, which measures the potential negative effects on communities caused by external stresses on human health (calculated by CDC ATSDR 2020 and HVRI 2011)
  - Asset Service Community Vulnerability Score, which measures how socially vulnerable the local population is relative to other areas around the country. The asset service community was defined as all Census Blocks or Tracts that intersected a 1-mile radius of the asset (this area was assumed sufficient as vulnerability data are at the Census Block and Tract scale). Social vulnerability of the asset location and community were found by assigning threshold values to already calculated SoVI values as follows: top 10% of socially vulnerable areas (1), top 20% of socially vulnerable areas (0.75), top 30% of socially vulnerable areas (0.5), and top 50% of socially vulnerable areas (0.25)

Adaptive Capacity Score

Adaptive Capacity, ranked from 0 (no adaptive capacity) to 3 (high), was assigned on an asset-specific basis based on input from CAT members and other stakeholders. Assets were looked at individually, as there is not a blanket formula to apply. Scores considered both the current condition of each asset and the resources available for it to adapt, as related to the following factors. Note that two assets in the town of Creswell (floodgate [CW-39] and Main Street storm drain [CW-40]) were given an adaptive capacity score of −1 due to their inoperable condition.

- Resources Available
  - Social vulnerability factors in the area. Are there functioning response procedures in place, such as communication networks, functioning shelters, and emergency services available when hazards occur?
  - Ownership of asset. A state- or federally owned asset was assumed to have more resources available compared to County/Town owned. An asset owned by a large multinational corporation was assumed to have more resources available for adaptation than one owned by a local business

or individual. Consideration was also given to whether the asset was in incorporated or nonincorporated boundaries.

- Condition:
    - Feasibility of relocation. Can this asset/infrastructure be relocated or is there an alternative nearby? What is the ability to retrofit/move/repair after a hazard? Are there any alternative options/routes for roadways or main thoroughfares?
    - Functionality of asset. Is the asset currently working as designed? Is anyone responsible for maintaining it?
    - Redundancy. Are any of the assets/infrastructure considered a single point of failure if they break or become inoperable?

All asset vulnerability scores, factors used to calculate asset vulnerability, and asset attribute data have been compiled into a holistic Asset List to provide additional details for planners and community members (see Appendix C).

More details regarding the specific datasets referenced in calculating each of these elements of the Vulnerability Index are summarized in Appendix D.

See Appendix E for detail maps showing assets and hazards in each of the numbered areas below (Figure 7).

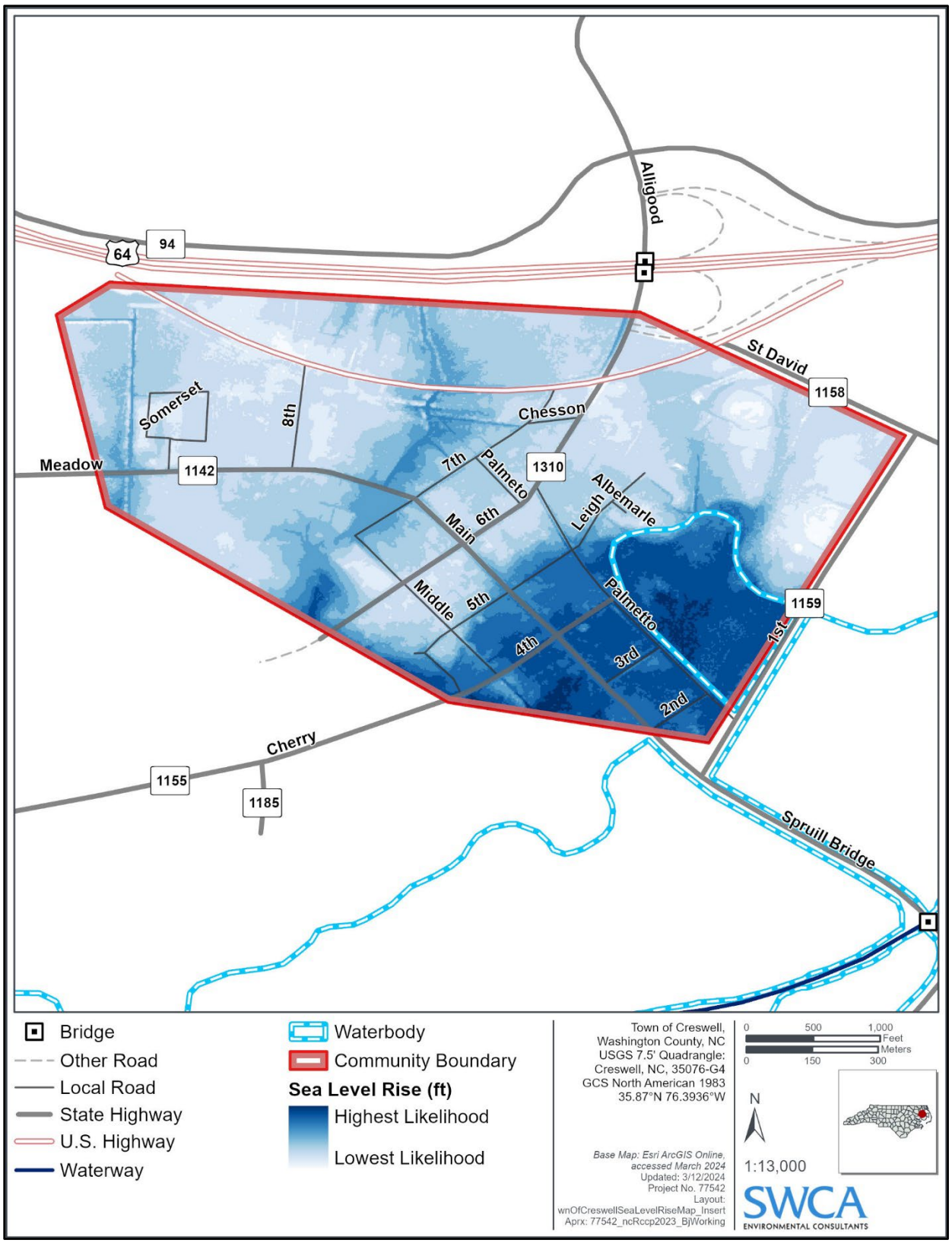


Figure 4. Areas at varying levels of risk from sea level rise from high likelihood (dark blue) to lower likelihood (light blue). Note that almost all of the land within the town boundary is at some risk.

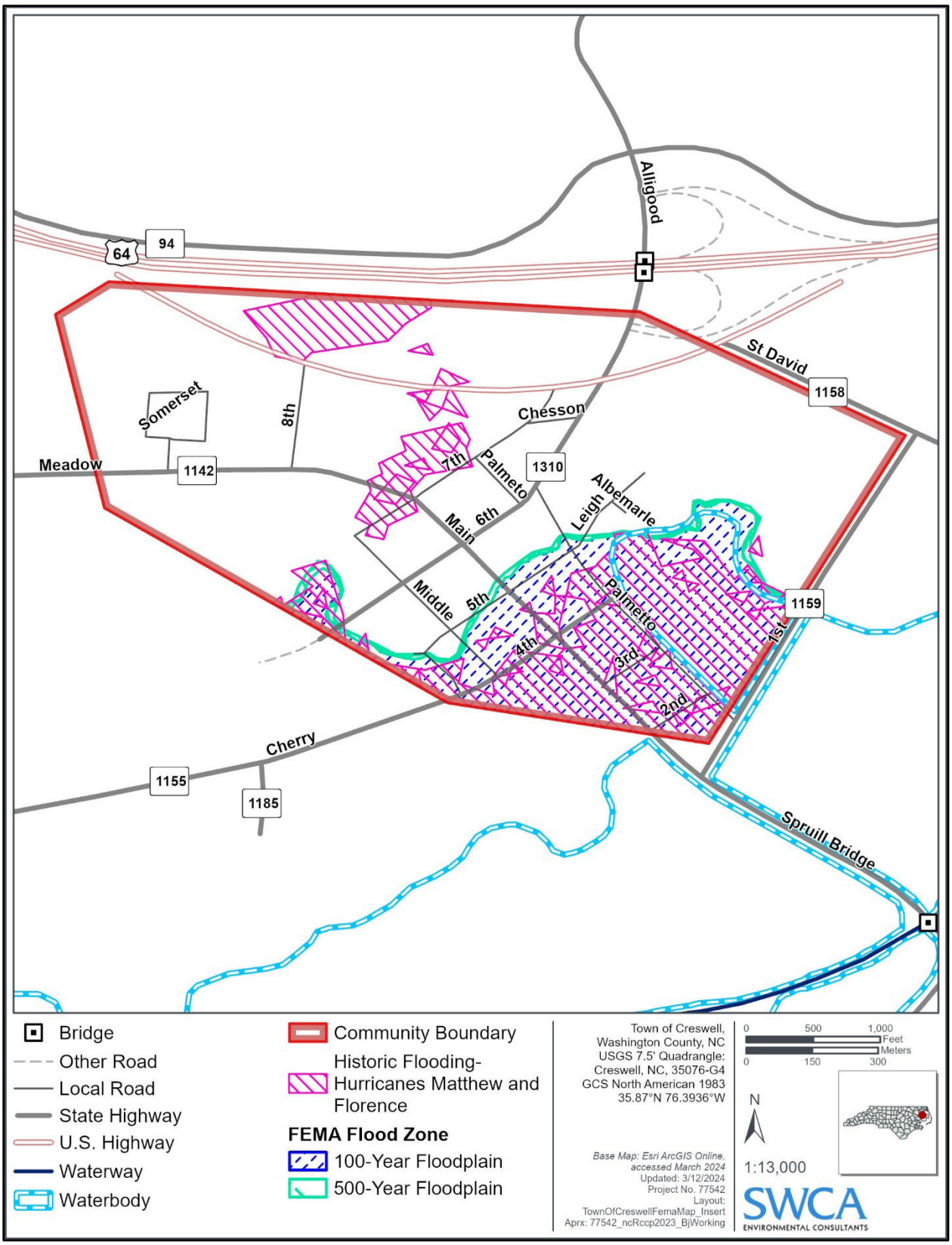


Figure 5. FEMA 100-year and 500-year floodplains and areas of historical flooding from Hurricanes Florence and Matthew.

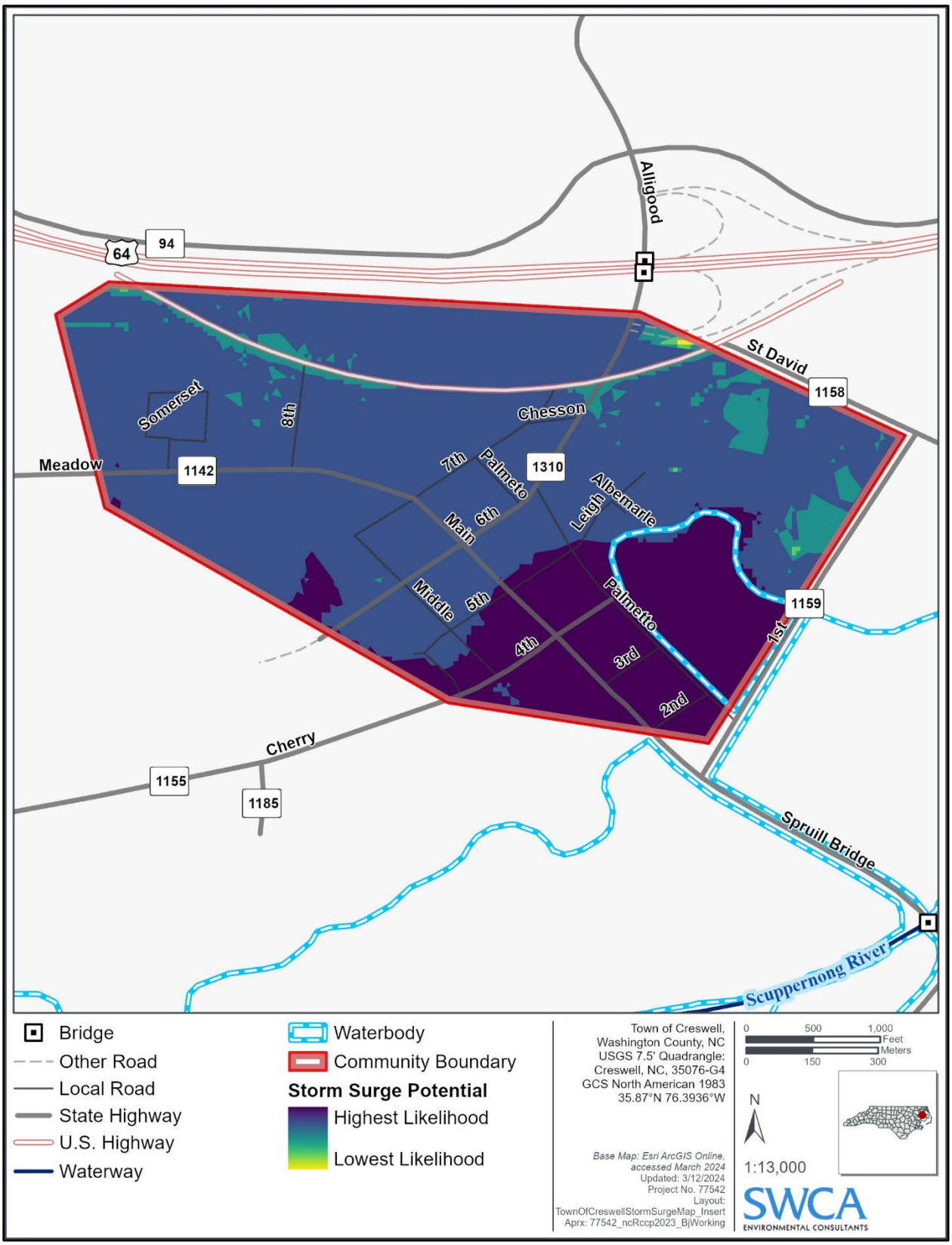


Figure 6. Areas at varying levels of risk from storm surge inundation. Note that all of the land within the town boundary is at some risk.

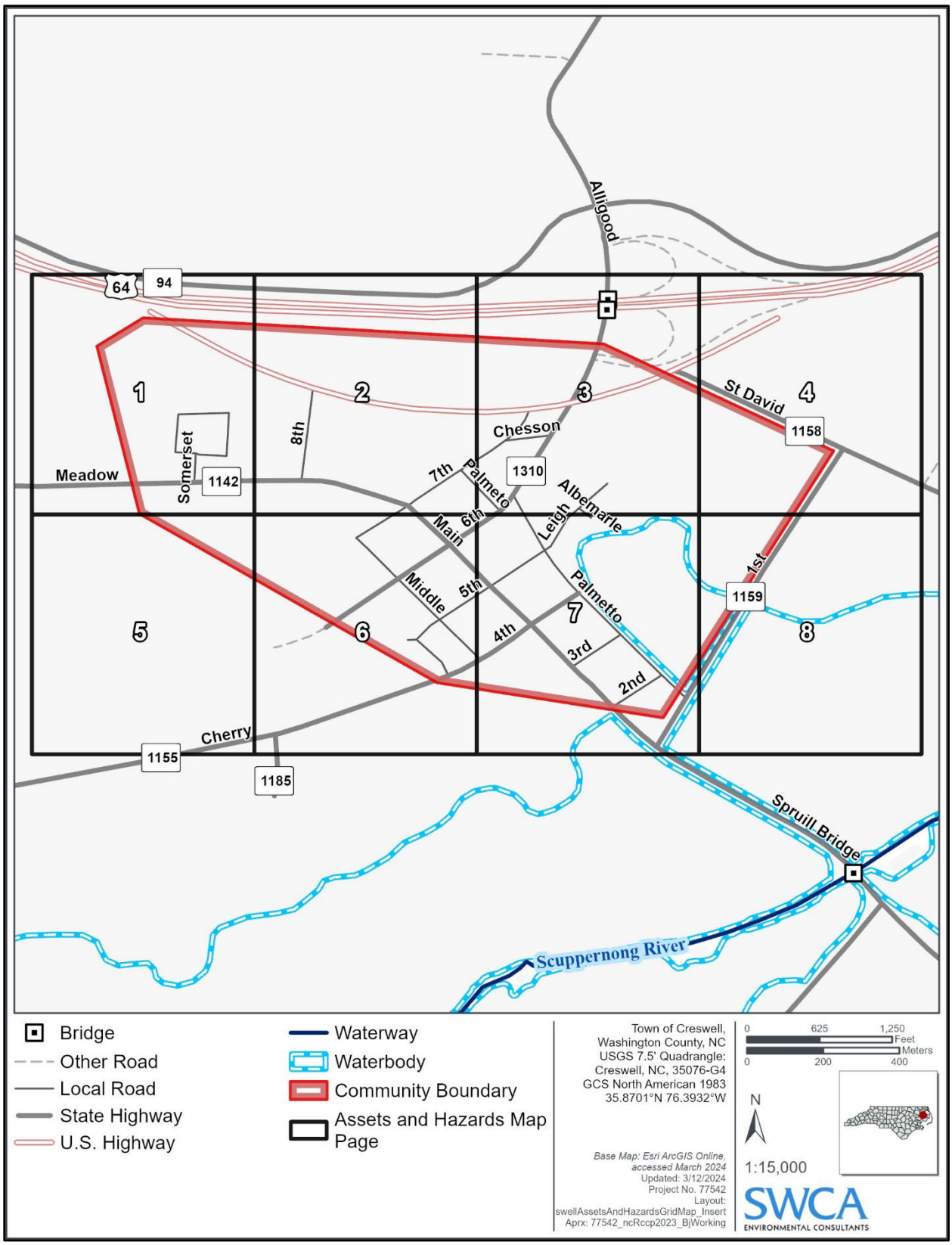


Figure 7. Map tile overview for maps showing details of assets and hazards. Individual maps are found in Appendix E.

Evaluation of Risk

To quantify the potential economic risk to assets within the town, Estimated Values for assets with a moderate to high value were summarized by asset type and ownership (Table 4 and Table 5). Estimated values were assigned by finding the maximum value (Parcel Value, Land Value, or Improvement Value) associated with an asset's parcel. This value was calculated by assuming the value of assets that overlap are reflected in the cost estimate of the larger asset area (i.e., the cost of a government building in a historic district would be captured in the overall estimated cost for the historic district). This assumption was carried over into grouped estimated value calculations, and spatial duplicates were removed within each category. Estimated values for each Asset Type should be considered independently since assets with multiple type designations were included in the evaluation of each of their assigned types (see Appendix C for individual asset details).

Table 4. Calculation of Total Asset Value at Risk by Asset Type

ASSET TYPE[1]	NUMBER OF ASSETS AT RISK	TOTAL ASSET VALUE AT RISK[2]
Highly Vulnerable (Value 3)[3]		
Roads	12 segments (approximately 1 mile of total roadway)	unknown
Schools	2	$5,840,100
Water and Sewer Utilities	3	$218,210
Food and Supplies	1	$162,100
Moderately Vulnerable (Value 2)[3]		
Food and Supplies	1	$0 unknown
Parks and Recreation	1	$21,506,870
Public Housing	1	$944,900
Parks and Recreation	1	$729,170
Church	1	$182,500
Water and Sewer Utilities	2	$111,100
Federal Government	1	$94,000
Restaurants	1	$89,000
Fire Station	1	$73,900
City Government	1	$64,300
Community Center	1	$41,600
Park and Recreation Area	1	$7,700

[1] Asset Type – Asset were categorized based on the services they provide. Those that provide multiple services were assigned a primary asset type (used in value summary) but were also assigned secondary asset types for consideration in their service to the community.

[2] Estimated Value – Assets were assigned monetary values at the parcel level (Estimated Asset Value = Land Value and Improvement Value) with the exception of churches and cemeteries that share the same parcel. For these assets, cemeteries were assigned the land value and churches were assigned the parcel improvement value discussed below. For Parcels that spanned multiple parcels the sum of parcel values was used. This process was selected to make conservative estimations—it is unlikely the full parcel will be affected by exposure event. However, estimates are subject to the currentness and completeness of parcel assessor records.

[3] Total Vulnerability = Hazard Exposure + Sensitivity Score – Adaptive Capacity

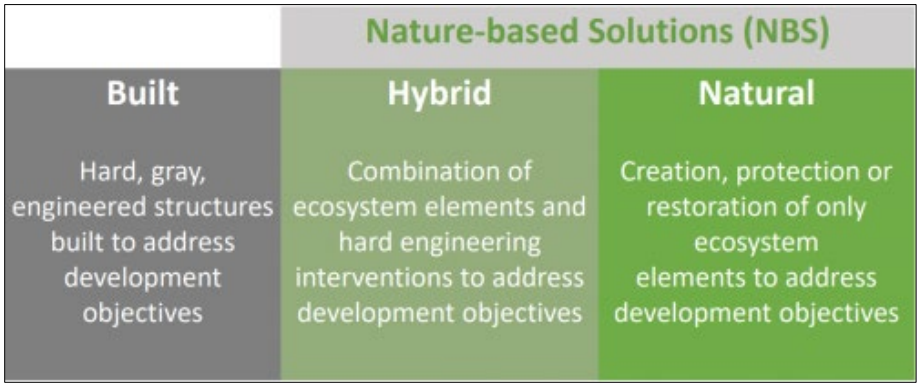
Table 5. Calculation of Total Asset Value at Risk by Ownership Type

OWNERSHIP CATEGORY	NUMBER OF ASSETS AT RISK	TOTAL ASSET VALUE AT RISK ($)
Highly Vulnerable (Value 3)		
Washington County	1	$5,022,000
Private, Unknown or Encumbrance	15	$980,200
Town of Creswell	2	$218,210
Moderately Vulnerable (Value 2)		
State – North Carolina Division of Parks and Recreation	1	$21,506,870
Private, Unknown or Encumbrance	6	$1,352,000
State – North Carolina Natural Heritage Program	1	$729,170
Town of Creswell	4	$249,300
Washington County	1	$7,700

7 PROJECT PORTFOLIO

The overall purpose of the Program is to support coastal communities in identifying, prioritizing, and pursuing resilience projects that reduce and minimize risks posed by coastal hazards. This project portfolio is intended to include traditional "hard" infrastructure projects, "soft" nature-based solutions, and "hybrid" solutions that include both hard and soft components and policy solutions.

Nature-based Solutions incorporate creation, protection, or restoration of ecosystem elements to improve resilience to natural disasters such as flooding. For example, projects that improve the functions of floodplains and wetlands can help alleviate flooding and improve water quality.



Built vs. Nature-Based Solutions

Identification of Resilience Projects

To develop a list of resilience projects for Creswell, a preliminary list of potential projects was created based on projects in existing plans such as the Hurricane Matthew Resilient Redevelopment Plan (2017) and Northeastern NC Regional Hazard Mitigation Plan (2021). The CAT reviewed the preliminary list of potential projects to remove projects already completed or no longer relevant to the community and add any additional projects for

consideration. CAT members in consultation with SWCA then added or refined project ideas keeping the following principles in mind. Projects should:

- ✓ Support essential community function that are critical for absorbing, adapting to, or rebounding from hazards
- ✓ Facilitate hazard preparedness, risk management, and mitigation actions that reduce hazard vulnerability
- ✓ Enable post-disaster community recovery and redevelopment that integrates community resilience objectives

Resilience projects in the portfolio are intended to reduce exposure and sensitivity to hazards as well as strengthen the adaptive capacity of community assets and vulnerable populations.

Project Prioritization

A shortened project list was reviewed at the March public meeting for feedback. All projects presented to the public at the March public meeting were retained in the project list, and CAT members made some additions and refinements to the list following that meeting, keeping in mind public input, the risk and vulnerability assessment results, and the following project selection criteria:

Project Impact

- ✓ Overall benefit to the community, reflects vision & goals statement
- ✓ Advances prior efforts/aligns with other plans
- ✓ Has potential co-benefits, e.g., provides a recreational amenity, contributes to local economy, preserves a habitat, strengthens resilience to non-climate stressors like pandemics
- ✓ Important for long-term resilience (i.e., taking climate change, sea level rise, and other future conditions into account)
- ✓ Reduces vulnerability of key assets to coastal hazards (or increases the adaptive capacity of a critical asset or vulnerable population)
- ✓ Reduces economic risk posed by coastal hazards in one or more sectors
- ✓ Supports social equity

Project Feasibility

- ✓ Capacity to implement and maintain
- ✓ Technical soundness
- ✓ Likely positive benefit-cost ratio
- ✓ Identifiable sources of funding

The high-priority projects agreed upon by the CAT are described in more detail in the tables below. Generally, these projects were understood by the CAT to have broad community-wide risk reduction benefits or to benefit vulnerable populations, to be feasible, to align with the community's long-term resilience goals, to build upon other plans, and to link to efforts already underway.

Priority Projects

The following projects were identified as high priority by the Creswell CAT. Projects are *not* listed in order of priority; they are all high-priority projects. Click the links below to jump to more details for each project:

Project 1: Critical Ditch Improvements

PROJECT DESCRIPTION	The town lies between the Scuppernong River and U.S. Route 64. The Program application identified issues with the dike that was built to redirect water. There are several ditches that are supposed to drain to the dike, then to the Scuppernong River. The ditches are full of debris/water and need to be cleaned out to properly drain to the dike. Scuppernong Study modeling may help pinpoint specifically which ditches will provide the best flood risk reduction for the money.
LOCATION	Ditches are located throughout the town and as part of the existing dike system, including from 4th Street at Cherry Road east to 1st Street, the south end of Main Street, and south crossing Main Street near the school building, and extending from the gate valve to the Scuppernong River and other areas associated with the dike system.
SOURCE	Program application, CAT meeting, public input, Water and Sewer Superintendent Ryan Swain
SCOPING QUESTIONS	Need clarification on barriers to cleaning out ditches/which areas or types of blockage the Town or County are allowed to clean out (e.g., vegetation vs. sediment, North Carolina State Park lands).
HAZARD(S) ADDRESSED	Precipitation-based flooding, storm surge, sea level rise
SUPPORTING FUNCTION	Transportation, public health and safety, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	1–5 years
RESPONSIBLE ENTITY	Town of Creswell, Private Landowners, North Carolina Department of Transportation (NCDOT)
POTENTIAL PARTNERS	Pettigrew State Park, Washington County, Soil and Water Conservation District, NCDOT
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	Streamflow Rehabilitation Assistance Program (StRAP) Grants
PROJECT ESTIMATED COST	Medium – $50,000–$1,000,000
ANTICIPATED BENEFIT	High – Action would have significant positive impact on the community, including reducing flooding that impacts residents.
PRIORITY RATING	High

Project 2: Floodgate Repair

PROJECT DESCRIPTION	Repair broken hinge on the floodgate at the intersection of 1st and Palmetto Streets (Figure 8). The gate should act as a one-way valve that allows water to drain from the town to the Scuppernong River and prevent water backflow toward the town (e.g., due to southerly winds from hurricanes/storms). The broken hinge currently allows water to flow both ways and worsens flooding.  *Image of broken hinge at 1st and Palmetto .*
LOCATION	Corner of Palmetto and 1st Streets
SOURCE	CAT, Water and Sewer Superintendent Ryan Swain
SCOPING QUESTIONS	Would improving the floodgate alone provide the protection needed, or does 1st Street also need to be raised to continue the function of the dike farther east? Does the current water level need to be drained to allow access to the hinge/gate for the repair?
HAZARD(S) ADDRESSED	Precipitation-based flooding, storm surge, sea level rise
SUPPORTING FUNCTION	Transportation, public health and safety, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	<1 year
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	N/A
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	North Carolina Department of Environmental Quality (NCDEQ) Water Resources Development Grant Program

PROJECT ESTIMATED COST	Low – About $5,000 (Estimate provided by Water and Sewer Administrator)
ANTICIPATED BENEFIT	High – Action would have significant benefit in the town to reduce flooding to residents' homes, which impacts public health and safety, accessibility, and transportation
PRIORITY RATING	High

Figure 8. Location of floodgate.

Project 3: Reduce Flooding Impacts in the 1st-4th Street Area

PROJECT DESCRIPTION	The area from 4th Street at Cherry Road east to 1st Street between Main Street and Palmetto Street experiences the worst flooding impacts in the town. This project proposes to evaluate the potential solutions that could help reduce flooding impacts in this area. Possible solutions include extending the dike from 1st Street to Main Street, adding an additional pump at Palmetto Street, and/or nature-based flood risk mitigation solutions (Figure 9). This evaluation would build on initial modeling under the Scuppernong Study to determine more specifically what solutions would be most effective to create the desired flood risk reduction. Based on this evaluation, the Town would then seek funding to pursue the recommended solution(s).
LOCATION	Palmetto Street, 1st Street, Main Street
SOURCE	Water and Sewer Superintendent Ryan Swain
SCOPING QUESTIONS	
HAZARD(S) ADDRESSED	Precipitation-based flooding, storm surge, sea level rise
SUPPORTING FUNCTION	Transportation, public health and safety, community resilience
TYPE OF SOLUTION	Structure and infrastructure
ESTIMATED TIMELINE	1–5 years
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	NCORR; Scuppernong Water Management Study; Kris Bass Engineering
EXISTING FUNDING	None identified by the CAT, but this project was submitted for Phase 3 RCCP funding
POTENTIAL FUNDING SOURCES	North Carolina Division of Water Infrastructure (DWI) Local Assistance for Stormwater Infrastructure investments (LASII) program, Golden LEAF Foundation, FEMA Building Resilient Infrastructure and Communities (BRIC)
PROJECT ESTIMATED COST	Medium – $100,000–$500,000
ANTICIPATED BENEFIT	High – Action would have significant benefit in the town to reduce flooding to residents' homes, which impacts public health and safety, accessibility, and transportation
PRIORITY RATING	High

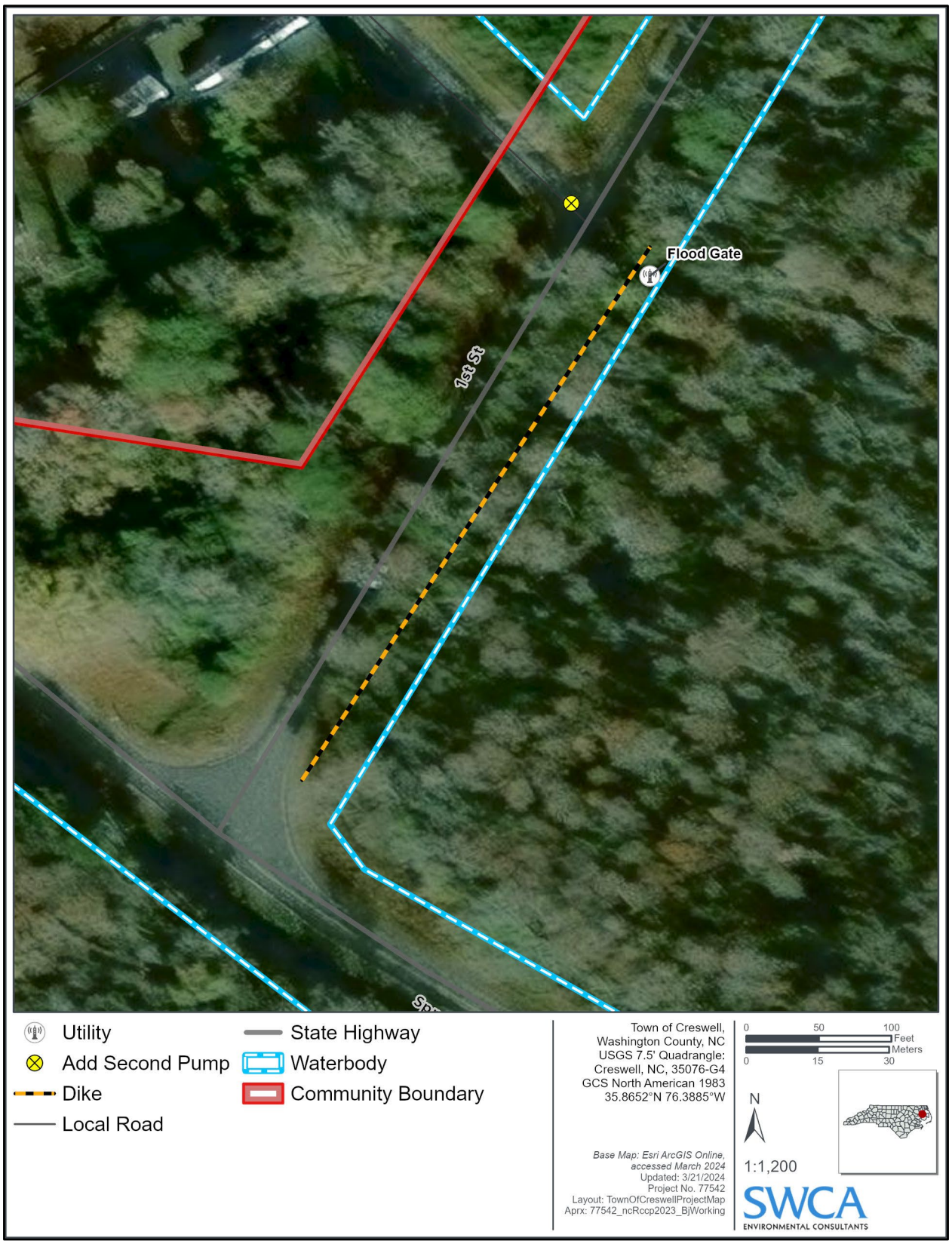


Figure 9. Location of potential second pump and dike extension.

Project 4: Main Street Storm Drainage System Improvement

PROJECT DESCRIPTION	There is a 48- to 60-inch stormwater drainage pipe that runs down Main Street (Figure 10). There are some catch basins, but they are almost completely full of dirt, limbs, etc., and only about 10 inches of free pipe remain for water flow. The Town needs to clear debris from the pipe to increase water flow throughout the system.
LOCATION	Main Street
SOURCE	Water and Sewer Administrator Ryan Swain
SCOPING QUESTIONS	Are there other parts of the stormwater system that would benefit from clearing out debris?
HAZARD(S) ADDRESSED	Transportation, public health and safety, flooding, community resilience
SUPPORTING FUNCTION	Transportation, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	<1 year
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	NCORR
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	Golden LEAF Grant, Streamflow Rehabilitation Assistance Program (StRAP) (includes debris removal), DWI LASII DWI Asset Inventory and Assessment (AIA) Grants
PROJECT ESTIMATED COST	Low – $10,000–$50,000
ANTICIPATED BENEFIT	High – Action would have significant benefit in the town to reduce flooding to residents' homes, which impacts public health and safety, accessibility, and transportation
PRIORITY RATING	High

Figure 10. Location of needed storm drain cleanout.

Project 5: Designate Emergency Shelter and Emergency Operations Center

PROJECT DESCRIPTION	Designate a dedicated Emergency Operations Center (EOC) facility and Emergency Shelter. Currently there is no identified shelter to house residents in flood events. The county school building is not approved as a shelter location by the American Red Cross due to flood risk. The Pocosin Charter School was suggested by the CAT as a possible location. To pursue this project, the Town needs to identify potential locations for the facility, confirm shelter criteria that will need to be met, and then take any steps necessary to create or outfit a facility that meets the criteria.
LOCATION	To be determined – possibly Pocosin Charter School on 1st Street
SOURCE	CAT Meeting
SCOPING QUESTIONS	Confirm requirements for emergency shelters
HAZARD(S) ADDRESSED	All hazards
SUPPORTING FUNCTION	Emergency preparedness and response, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	1–5 years
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	Washington County, Pocosin Charter School, American Red Cross
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	NCDPS Emergency Preparedness Grants, FEMA Emergency Management Performance Grant (EMPG) Program includes funding for both sheltering and EOC FEMA Pre-Disaster Mitigation (PDM) Program FEMA Emergency Operations Center Grant Program
PROJECT ESTIMATED COST	To be determined – Could be low if an existing facility qualifies.
ANTICIPATED BENEFIT	High – This action would improve emergency preparedness and response and enhance community resilience.
PRIORITY RATING	High

Project 6: Complete Water Infrastructure Asset Inventory and Assessment (AIA)

PROJECT DESCRIPTION	Apply for a NCDEQ DWI AIA Grant. The town of Creswell was included in a designated CDRZ by FEMA and was also designated as "distressed" by NCDEQ Viable Utilities Program. The Town attended training in the fall of 2023 and applied for an NCDEQ AIA grant. Funding from this grant would support the Town to inventory the existing water and/or sewer system and document the condition of inventoried infrastructure. This information could support future grant eligibility and future projects to address stormwater and wastewater/sewer infrastructure issues, such as those described in Project 7 and 8. Some basic information to support the AIA grant application is listed below.
	• Wastewater Collection System Upgrades (Program Project 7)
	  ○ 1. Benefits
	  ○ 1.i. Challenges
	  ○ The top challenge with this system is large amounts of infiltration and inflow, which causes a need for increased pumping and puts strain on the system. The system also processes water from Tyrrell County.
	  ○ Another challenge with the system is that is does not allow for growth in the Town. The capacity of the current system only allows for Industrial development in the area. To continue to sustain and grow the town, the system needs rehabilitation/replacement.
	  ○ 2. System Management
	  ○ 2A. Asset management team: Ryan Swain (Water and Sewer Superintendent)
	• Drinking Water System Improvements (Program Project 8)
	  ○ 1. Benefits
	  ○ 1.i. Challenges
	  ○ The drinking water in the town has a brown tint, which causes concern for the quality and safety of the drinking water. Although the water passes the required tests, further testing and investigation may be required to determine the cause of the discoloration.
	  ○ 2. System Management
	  ○ 2A. Asset management team: Ryan Swain (Water and Sewer Superintendent)

LOCATION	Town-wide
SOURCE	Meeting with NCDEQ Viable Utilities Department and NCORR.
SCOPING QUESTIONS	Identify top three challenges with water infrastructure systems, identify asset management team. Identify prior planning documents to use for grant application. Work with Albemarle Commission and NCORR for grant application support.
HAZARD(S) ADDRESSED	Flooding, water quality
SUPPORTING FUNCTION	Community resilience, public health and safety
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	1 year (Application for AIA assistance grant is due April 30, 2024)
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	NCDEQ Viable Utilities Department NCORR
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	NCDEQ's DWI AIA Grant
PROJECT ESTIMATED COST	About $150,000

ANTICIPATED BENEFIT	High – This project would have significant benefit to the town and help to identify critical information to move other projects forward that will help public health and safety and build community resilience.
PRIORITY RATING	High

Project 7: Wastewater Collection System Upgrades

PROJECT DESCRIPTION	The Town's Program application noted issues with the public sewer system, and in conversation with Water and Sewer Superintendent Ryan Swain, he confirmed the system faces a huge amount of infiltration and inflow. They pump about 35,000 gallons per day, but with even 1 inch of rain, that rate goes up to about 100,000 gallons per day. The system also processes wastewater from a separate collection system that services parts of Tyrrell County. This project would be a full system upgrade, which would involve the replacement of septic and pump tanks. The system is a Septic Tank Effluent Pumping (STEP) system, which means the treatment plant only processes gray water, and all solids are contained in a septic tank. This limits economic development options on lands serviced by the system.
LOCATION	Town-wide and areas serviced in Tyrrell County
SOURCE	Program application, conversation with Water and Sewer Superintendent Ryan Swain
SCOPING QUESTIONS	What are the most critical upgrades that are needed to the sewer system? (This could be determined through the AIA study outlined in Project 6 above)
HAZARD(S) ADDRESSED	Flooding, public health and safety
SUPPORTING FUNCTION	Public health and safety, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	1–5 years
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	NCDEQ Viable Utilities Department
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	NCDEQ DWI AIA Grant, NC DWI State Wastewater and Drinking Water Reserve Programs,
PROJECT ESTIMATED COST	High – $1,000,000–$3,000,000
ANTICIPATED BENEFIT	High – This action would improve resilience of the wastewater collection system and enhance public health and safety and could create new opportunities for economic development if the system can be upgraded to process solids.
PRIORITY RATING	High

Project 8: Drinking Water Quality Improvements

PROJECT DESCRIPTION	Many residents complain about the brownish color of the drinking water in Creswell and avoid drinking it. This project involves the Town researching and pursuing options to determine the cause of the observed water discoloration. One option could include pursuing funding to ice pig the water lines to improve clarity and water quality for the Town. Water and Sewer Superintendent Ryan Swain previously obtained a quote and presented this idea to the Town Board.
LOCATION	Town-wide but possibly more of an issue in some areas than others
SOURCE	Resident feedback, Water and Sewer Superintendent Ryan Swain
SCOPING QUESTIONS	What tests would be needed to determine the extent and cause of the water discoloration and which households are affected? Would this temporarily impact water services throughout the town? Are there any risks to conducting ice pigging?
HAZARD(S) ADDRESSED	Flooding, public health and safety
SUPPORTING FUNCTION	Public health and safety, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	1–5 years
RESPONSIBLE ENTITY	Town of Creswell
POTENTIAL PARTNERS	NCDEQ Viable Utilities Department
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	NCDEQ Viable Utilities Program NC DWI Drinking Water State Revolving Fund
PROJECT ESTIMATED COST	Medium to High – quote for ice pigging water lines was $75,000. Overall upgrades likely $1,000,000–$3,000,000.
ANTICIPATED BENEFIT	High – Action would improve public health and safety and build community resilience.
PRIORITY RATING	High

Project 9: County School Buildings Flood Risk Reduction

PROJECT DESCRIPTION	The Program application stated that flooding roadways and water damage to buildings impact the local County schools. This project involves exploring flooding issues at the school complex and developing policies, plans, or projects to mitigate them. The County is in the process of decommissioning these school buildings at the time of this report, so the fate of the buildings is unknown, but if they will continue to be used, then flood risk reduction steps should be explored.
LOCATION	High school building: Middle Street between 6th and 7th Streets, and elementary school building at the intersection of Middle and 7th Streets.
SOURCE	Program application, CAT meeting, Water and Sewer Superintendent Ryan Swain
SCOPING QUESTIONS	
HAZARD(S) ADDRESSED	Flooding, public health and safety
SUPPORTING FUNCTION	Public health and safety, community resilience
TYPE OF SOLUTION	Structure and Infrastructure
ESTIMATED TIMELINE	1–5 years
RESPONSIBLE ENTITY	To be determined – Depending on the future of the school buildings
POTENTIAL PARTNERS	Washington County, Pocosin Charter School
EXISTING FUNDING	None identified by the CAT
POTENTIAL FUNDING SOURCES	To be determined once project is better defined.
PROJECT ESTIMATED COST	To be determined once project is better defined.
ANTICIPATED BENEFIT	To be determined – Depending on the future of the school buildings
PRIORITY RATING	High

8 NEXT STEPS

This Resilience Strategy can be used to continue efforts in the town including:

- Maintaining a network of team members that continue planning and addressing future resilience concerns, including the Town of Plymouth and Washington County, which also participated in Program Phases 1 and 2
- Developing "shovel-ready" projects
- Integrating resilience strategies into the local Coastal Area Management Act land use plan and other policy documents
- Completing additional feasibility studies for existing or future resilience projects
- Leveraging the strategy and portfolio to apply for additional grant opportunities
- Providing feedback to the DCM about the Program and the strategy process

This Resilience Strategy will support the next phases in the Program:

- Phase 3: Engineering and Design
- Phase 4: Implementation

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APPENDIX A

COMMUNITY ACTION TEAM MEETING NOTES

Ctrl+Click to jump to the summary of a specific meeting:

Meeting Summary
Washington County and Town of Creswell Community Action Team (CAT) Meeting #1
Monday October 9, 2023 from 6:00 – 7:00 pm
In person at the Town of Creswell Meeting Room

Meeting Objectives

- Introduce the purpose, milestones, and schedule for the RCCP process
- Review and answer any questions about the role of the CAT members
- Review existing information available and gaps for consideration under RCCP, including:
    - Priority hazards for assessment
    - Initial discussion of assets to be mapped
    - Priority Projects
- Confirm next steps following this meeting

Participants

Town of Creswell CAT Members
Ron Ambrose, Town Mayor Pro-tem
Ray Blount, Town Mayor
Penny Chapman, Town Clerk
Joel Harris, Town Commissioner
Brenda Logan, Town Commissioner
Syble Spruill, Town Commissioner

Washington County CAT Members
Anne Keyes, County Commissioner
Carol Phelps, County Commissioner
Allen Pittman, Washington Co Planning Director

Facilitation and Support Staff
Kathryn Gardner, SWCA Environmental Consultants
Kara Giblin, SWCA Environmental Consultants
Robin Payne, Payne Consulting
Mackenzie Todd, NC Division of Coastal Management

Action Items

CAT Members

- Share additional information on hazards, assets, or project status with SWCA by Friday, Oct. 27
- Share media (Local Newspapers, Radio Stations, Town notification systems) that could be used to advertise potential public meeting at the Christmas Parade on Dec. 9
- Look for Creswell Drainage Committee files.

SWCA

- Update maps with new asset and hazard information
- Share updated hazards, assets and projects with CAT members – by Monday, Nov. 13

Summary of Key Points from Presentation and Discussion

Pre-Meeting Tour 5:30-6:00pm
Prior to the meeting at 6:00pm, Penny Chapman and Syble Spruill gave Kathryn Gardner, Kara Giblin and Mackenzie Todd a tour of the Town of Creswell and pointed out areas of flooding concern.

Program Overview
Kathryn Gardner, SWCA Environmental Consultants, introduced the four-phase Resilient Coastal Communities Program (RCCP). The four phases of the program are outlined Exhibit A at then end of this summary and explained in further detail in the Program Handbook:

Mackenzie Todd, Division of Coastal Management (DCM), explained that DCM will share information about how to apply for funding from the state for Phase 3 of the RCCP early next year. Once communities complete Phases 1 and 2, they become eligible to apply for Phase 3 funding. Phase 3 will fund the engineering and design work for one prioritized resilience project. After Phase 3, communities will have the opportunity to apply via a competitive proposal process for Phase 4 implementation and construction funds.

Community Action Team Role
Ms. Gardner explained the role of the CAT is to provide guidance and input for Phases 1 and 2 to ensure the Resilience Strategy developed by SWCA reflects the community's vision and goals and accurately reflects the issues and needs in the community.

CAT Members are encouraged to invite other community stakeholders as they see fit. The next CAT meeting is scheduled for Monday November 13 with a public meeting at the town Christmas Parade on December 9. These meetings will focus on continuing to gather information on hazards and assets. Additional CAT meetings and another public meeting will be held in early 2024 to finalize the project list and the Risk and Vulnerability Assessment process and results.

Review of Existing Materials
Kara Giblin, SWCA Environmental Consultants explained that the SWCA team has begun reviewing the existing materials related to resilience planning. She asked CAT members to review initial list of projects pulled from these resources and share any other existing information that might be relevant to SWCA's analysis. The following is a list of studies and plans SWCA is currently reviewing:

- RCCP applications
- Northeastern Regional Hazard Mitigation Plan April 2021
- Washington County Land Use Plan 8-16-21
- Washington County Hurricane Matthew Resilient Redevelopment Plan 2017
- Climate Resilience Projects for the Albemarle Region, RISE 2022

Discussion of Hazards
Initial information on flood areas was presented on maps. The areas below were discussed during the meeting and will be added to the list of risk areas:

- Ditch flooding at 5th and 4th Street prevents travel from Cherry to Creswell
- Main Street at 3rd Street floods during heavy rain events
- Ditch along Palmetto from 1st Street to 3rd Street remains full even after weeks of drought
- 4th Street at Palmetto closed due to sinkhole

- Flooding at school behind post office (ditch runs along school property). School cannot be used as emergency shelter
- Ditch at the end of paved road at 6th street also floods during heavy rain events
- Pump on Cherry Rd for levy/dike does not have a back-up generator and can only pump water out of town during moderate rain events. If water is too high, there is nowhere for the pump to send water
- Drainage ditches from two culverts under Hwy 64 funnel water south towards town bringing runoff from the highway into town instead of around town. Before the highway was built, water dispersed across farmland
- Pump Station and EMS have no permanent generators
- Washington County has flood zoning information by parcel on their GIS website

Discussion of Assets

The group identified a preliminary list of assets. SWCA will add these to the current map before the next meeting. Additional assets discussed were:

- Critical Facilities (full list sent by Allen Pittman)
- Fire Department, Town Hall
- Cherry Road is important for residents outside Creswell to be able to access groceries and supplies after a storm
- Mark's Supermarket & Dollar General
- 3 churches
- 4 restaurants
- Community Center, Ruritans
- Post Office
- Pump Station on Cherry Rd
- Red Cross location Pines Elementary/Washington Co Middle school at Hwy 64 and Hwy 45

Discussion of Projects

The group began discussing ideas for potential projects to address hazards:

- Generators for critical facilities including the pump station
- Additional pumps for redundancy
- Raising the road
- Risers to slow the flow of water flowing south under the highway towards town
- Soil and Water District previously told the town that a large retaining wall is needed
- Clean out ditches; Dredge or snag Scuppernong River, Alligator Creek

Next Steps

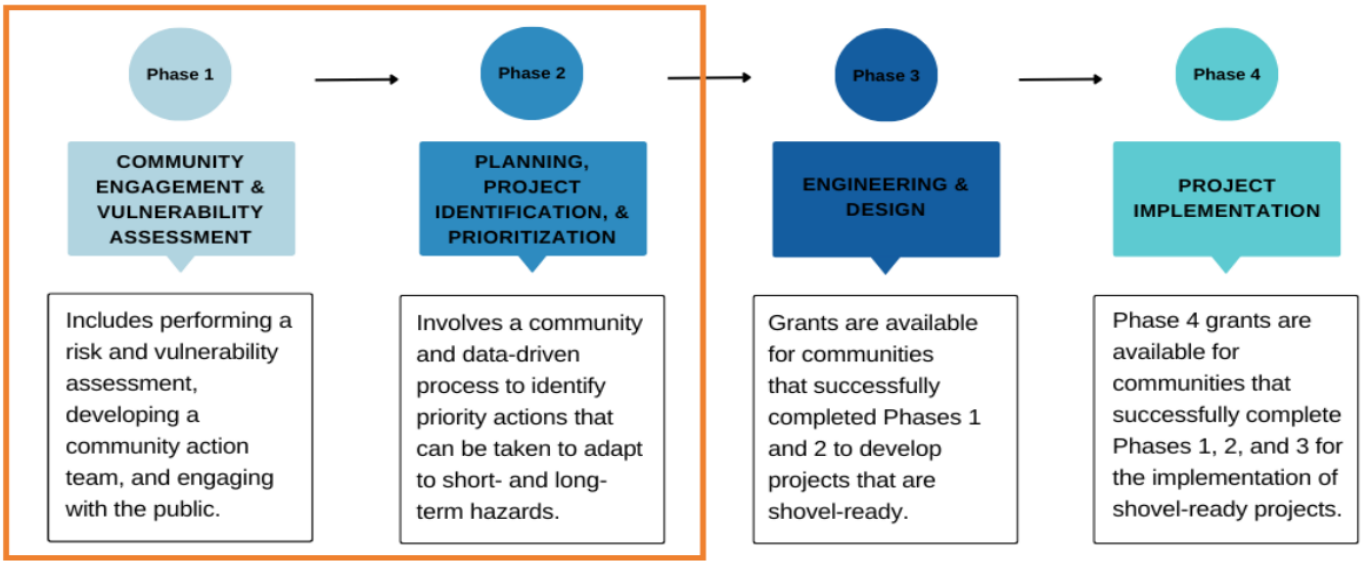
The hazards and assets discussed during this meeting will be added to Town and County maps by SWCA. We will continue to work together and build on information and prepare for the first public meeting at the Christmas Parade in December. The next meeting of the CAT is scheduled for **Monday, November 13 from 6:00 – 7:00 p.m. at the Town of Creswell Meeting Room.**

Exhibit A – Copy of Handout from Meeting

NC Resilient Coastal Communities Program – Town of Creswell and Washington County

First Community Action Team Meeting, October 9, 2023

Program Overview



Hazards Risk Assessment

Potential hazards

- Sea level rise
- Flooding (rainfall, tidal, and riverine)
- Damaging storms, tornadoes, and winds
- Storm surge
- Shoreline erosion
- Drought, Heat Waves, and Wildfire

Non-climate stressors

- Aging or potentially undersized infrastructure
- Population dynamics
- Economic shifts
- Increased subsidence
- Altered drainage patterns
- Land cover change (i.e., increased development and impervious surface area)

Assessment of Asset Vulnerability

Community assets will include at least:

- Roads/Evacuation Routes
- Water/Sewer lines (if the community has sewer)
- Government Buildings/Offices (e.g., City/Town Hall)
- Public Safety or Emergency Services (e.g., Police/Fire)
- Schools
- Health Services
- Natural Assets (e.g., natural areas, open spaces, parks, etc.)

Vision and Goals

Vision: The vision is an aspirational statement for where the community wants to be in the future (e.g., in the next ten years or more), particularly in relation to coastal hazards.

Goals: Specific, measurable goals will help the community identify steps that can be taken to achieve the vision.

Possible Components of a Vision Statement

Describing the Envisioned Community

- Resilient and vibrant
- Diverse and strong
- Culture of resilience
- Thriving and healthy

Who 'Community' Includes

- Residents
- Visitors
- Local businesses
- Neighborhoods

Resilience Goals

- Quickly rebound from hazard events
- Pro-active measures to prevent or minimize future damage
- Sustainable growth of population and economic base
- Connected community fabric
- Opportunities for all residents

Strategies

- Strategic investments
- Sound policy
- Strong/inclusive partnerships
- Protection of the natural environment
- Frequent communication with residents

Example Vision: "The Town of Hertford is a vibrant, diverse community committed to helping its residents thrive, celebrating its riverfront, history, culture, and distinctive character while promoting commercial and residential growth, showcasing the beauty and natural resources of the Perquimans River, and integrating coastal resilience practices to address adverse environmental impacts.

Meeting Summary
Town of Creswell Community Action Team (CAT) Meeting #2
Monday November 13, 2023 from 6:00 – 7:00 pm
In person at the Town of Creswell Meeting Room

Meeting Objectives

- Hear an update on hazard and asset mapping process
- Debrief Oct. 23 community event and discuss next steps for engagement
- Review and discuss example vision and goals statement
- Confirm next steps following this meeting

Participants

Town of Creswell CAT Members
Ron Ambrose, Town Mayor Pro-tem
Ray Blount, Town Mayor
Penny Chapman, Town Clerk
Joel Harris, Town Commissioner
Brenda Logan, Town Commissioner
Thomas Patrick, Town Commissioner Elect
Syble Spruill, Town Commissioner
Alfredia Williams, Mayor Elect

Facilitation and Support Staff
Molly Chamberlain, SWCA Environmental Consultants
Kathryn Gardner, SWCA
Meg Perry, Project Manager, SWCA
Mackenzie Todd, NC Division of Coastal Mgmt

Action Items

CAT Member	Action	Due by
All CAT Members	Review asset list from Meg and respond with any missing sites or sites that should be removed	Friday 12/8
Penny Chapman with CAT Members	Look for Creswell Drainage Committee Files (action item from meeting #1 that still needs progress)	Friday 12/8
CAT Members	Share photos of flood events for final report. Photo descriptions should include: Date of photo; location description; who took the photo. Option to use this Survey tool to upload photos:	Ongoing
Joel	Confirm parade vendor sign up with Meg	Completed

SWCA Staff	Action	Due by
Meg	Send current asset list to CAT via email	Friday 11/17
Meg	Share Scuppernong online survey tool with CAT members	Friday 11/17
Meg/Molly	Prepare booth materials for the Christmas parade and share with CAT members for feedback in advance	Friday 12/1
Meg/Molly	Reach out to local TV Station and request flooding photos and contact Ryan Swain for additional information about the water infrastructure issues in town	Friday 12/8

Summary of Key Points from Presentation and Discussion

Hazard and Asset Mapping Process

Meg Perry, SWCA Environmental Consultants, discussed the process and status of collecting asset and hazard information for the Town of Creswell. SWCA is developing a map of Creswell that includes assets grouped by category; known hazard risk areas; and potential project sites.

Assets are anything that is valued by the community for safety, shelter, resources, culture, and recreation. Examples of assets are grocery stores and gas stations for supply restocking after a storm; emergency evacuation shelters; schools; fire departments; water treatment plants; churches; community buildings; and parks. CAT Members are asked to contribute their knowledge of local assets so SWCA can make this list as complete and accurate as possible.

A draft hazard map was shared with the group. The RCCP program is evaluating hazards including flood risk (from hurricanes, heavy seasonal rain events, tidal flooding, sea level rise); drought; heat; and wildfire. If there are specific areas that are known to have frequent or severe flooding, CAT members are encouraged to point out those areas.

Assets will be scored as part of the process. This scoring information along with hazard locations will help prioritize potential projects.

Summary of Scuppernong Community Event on Oct. 23

Ms. Perry provided a summary of this public outreach event where SWCA collected information about community assets for the RCCP process in conjunction with broader outreach being conducted for the Scuppernong River Water Management Study. This event served as the first of two public outreach events required by the RCCP for Washington County.

Vision and Goals

Ms. Perry introduced the Resilience Vision and Goals concept to the group. The final document produced by SWCA in collaboration with the Creswell CAT will include a Vision and Goals statement for the Town of Creswell. The group will work jointly throughout the course of CAT meetings to formalize this statement.

Initial discussion of vision and goals included:

- Creswell will be a town where people want to invest and grow
- A community to raise a family in
- A strong sense of community (flooding isolates people), so being a place where help is nearby
- Long-term infrastructure resilience

Additional Topics

Currently there is no identified shelter to house residents in flood events. The school is not approved as a shelter location by the Red Cross due to its own flooding issues.

The town's infrastructure includes a pump station (but it lacks a generator). This pump system sends water to the other side of the levy, but only in moderate rain events. The levy and pump are not equipped to handle large/severe rain events. Keeping the holding area beside the levy dug out provides some extra holding capacity, but not enough in some cases.

There is one gate in town at the corner of Palmetto and First streets. This gate (when it was functional) acted as a one-way valve that let water out of town towards the river but would shut and not allow water back towards town. Currently the gate (installed in the 1980's) is blocked by debris and non-functional. Originally the Town wanted an additional pump at Palmetto and First but ran out of money.

Ryan Swain is the Public Water Works employee for Creswell and may have useful historical and operational knowledge of the water systems in town. The local TV station has documented flooding in town. They may be able to share photo information.

It will be important in engaging with the community to be very transparent and clear about what is certain/guaranteed through this RCCP process and what is uncertain or still unknown. This will help to avoid misunderstandings and establish trust with community members.

Next Steps

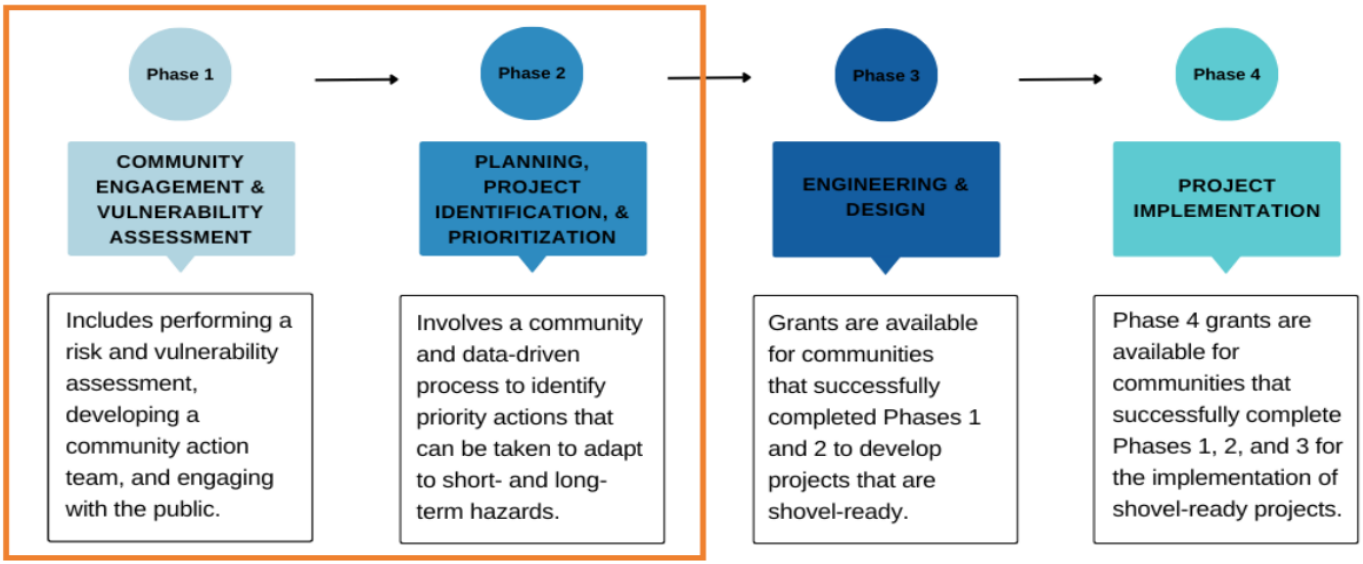
The Creswell Christmas Parade will serve as one of the public outreach meetings. The parade is scheduled for **Saturday December 9, 2023**, beginning at 11:00 a.m. The next meeting of the CAT is tentatively scheduled for mid to late January. Specific meeting details to follow.

Attachment A – Copy of Handout from Meeting

NC Resilient Coastal Communities Program – Town of Creswell and Washington County

First Community Action Team Meeting, October 9, 2023

Program Overview



Hazards Risk Assessment

Potential hazards

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Strategies

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Meeting Summary
Town of Creswell Community Action Team (CAT) Meeting #3
Monday, February 12, 2024 from 6:00 – 7:00 pm
In person at the Town of Creswell Meeting Room

Meeting Objectives

- Review risk & vulnerability assessment results
- Review initial project list and identify changes needed
- Review draft project selection criteria
- Discuss plans for the 2nd community engagement event
- Confirm next steps

Participants

Town of Creswell CAT Members
Ron Ambrose, Creswell Fire Chief
Penny Chapman, Town Clerk
Joel Harris, Town Commissioner
Brenda Logan, Town Commissioner
Thomas Patrick, Town Commissioner
Ryan Swain, Water and Sewer Superintendent

Facilitation and Support Staff
Molly Chamberlain, SWCA Environmental Consultants
Robin Payne, Robin Payne Consulting
Kasen Wally, NC Division of Coastal Mgmt.
Meg Perry, Project Manager, SWCA

Action Items

Who	Action	Due by
All CAT Members	Review vulnerability assessment assets and scores. Let us know if you have any feedback or see anything that requires update.	Friday 2/23
SWCA	Research criteria for Emergency Shelter certification info	Friday 2/16
SWCA	Update vulnerability assessment and project list with feedback from 2/13 CAT meeting	Friday 2/16
SWCA	Coordinate and confirm date (Monday, Feb 26, 6-7 or 7-8pm) for virtual meeting with the CAT in the next few weeks.	Friday 2/16
SWCA	Coordinate date (Friday, March 15th?) and confirm location (Fire Station bay- Ron Ambrose) for next Community Engagement event, begin planning.	Friday 2/23

Summary of Key Points from Presentation and Discussion

Welcome and RCCP Process Recap

Meg Perry, SWCA Environmental Consultants, discussed where we are currently in the RCCP process and the remaining project timeline and deliverables. SWCA aims to provide a draft of the Resilience Strategy Document to the CAT for review by early April. Between now and then the CAT will need to provide input on the vulnerability scores, project list, and plans for a community engagement event in March. The purpose of the community engagement event will be to share the project ideas the town is considering and gather input from residents on which projects they would like to see prioritized.

Risk and Vulnerability Assessment Results

Meg briefly reviewed the risk and vulnerability assessment process and introduced the vulnerability scoring process, which helps identify which community assets are most at risk. Molly Chamberlain, SWCA Environmental Consultants, provided more information on how exposure, sensitivity, adaptive capacity, and total vulnerability scores were calculated. Exposure, sensitivity, and adaptive capacity were scored on a scale of 0-3 and total vulnerability was a score of 0-6.

Exposure refers to the presence of people, assets, and ecosystems in places where they could be adversely impacted by hazards. We used a combination of data including storm surge, historic flooding, flood zone hazard mapping, and sea level rise to calculate exposure. A score of 0 means no exposure, 1 is low exposure, 2 is medium exposure and 3 is high exposure.

Sensitivity is defined as the degree to which an asset is potentially affected when exposed to an impact. We used data and performed scoring on multiple different sensitivity factors, including asset type sensitivity score, geographic social sensitivity, and asset service social sensitivity. Asset type sensitivity score was scored based on perceived ability of an asset type (such as hospital or school) to return to functioning after an impact or hazard. Geographic social sensitivity was calculated using the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index. Asset service social sensitivity was scored based on if that asset type serves a sensitive population or if it is critical for emergency response/recovery. A score of 0 means no sensitivity, 1 is low sensitivity, 2 is medium sensitivity and 3 is high sensitivity.

Adaptive capacity is the ability of an asset or population to adjust to potential impacts from hazards with minimal disruption or cost. We looked at two factors when scoring adaptive capacity, condition of asset, and resources available. For condition, we considered if the asset is currently functioning/operating as designed. If it is not- is it broken and causing additional problems? If it is functioning, is it new or is it one of many? For resources available, we looked at ownership and jurisdiction of the asset (if known) and perceived resources available to help with cost and restoration of an asset after an impact or hazard. A score of 0 means no adaptive capacity, 1 means low adaptive capacity, 2 is medium adaptive capacity and 3 is high adaptive capacity.

The **total vulnerability** score was calculated using the following equation:

Vulnerability Score = (Exposure Score + Sensitivity Score) - Adaptive Capacity Score

Total vulnerability was scored from 0-6, with 0-2 being low vulnerability, 3-4 being medium vulnerability, and 5-6 as high vulnerability.

Meg asked the CAT members to please review the vulnerability assessment asset scores and let the SWCA team know if anything looks like it needs to be adjusted.

Discussion of Scuppernong Water Study

Meg discussed how the Scuppernong Water Study could be helpful to the Town of Creswell and could model scenarios such as how cleaning out certain ditches could help to remove water from certain areas of town. This could help provide the Town with information on which ditches could be prioritized for cleaning to have the biggest impact on reducing flooding. One member noted that cleaning out ditches will likely be at the top of the public's priority list since they see the ditches every day and it will make the largest/visual impact.

Project List Discussion

Meg introduced the current project list details for feedback from the CAT. The summary of the feedback/questions/comment from the discussion with the CAT is below:

- Project 1.5 New EOC/Resilience Hub:
  - What is the official criteria for certifying a location as a shelter?
  - In the past, the Fire Station was used a distribution site for emergency resources/supplies.
  - Could Pocosin Charter School in Creswell or Pines Elementary in Roper be used as a potential shelter?
  - Do the schools have functioning generators?
- Project 1.6 Septic Health Education/Program
  - Move this project to the County level. Town of Creswell is on a sewer system.
- Project 1.7 Wastewater Collection System Upgrades
  - SWCA question: Would this be a full system upgrade? Answer: Yes, would need to replace septic tanks and pump tanks.
  - SWCA will look into a similar project that Town of Hertford received Golden Leaf grant funding for.
- Other projects of interest that are not on this list include:
  - Projects to help residents with things like raising homes, retrofitting homes, providing resources for homes prone to mold/mildew. While these types of projects are not funded as part of the RCCP program, Kasen Wally from DCM will look into potential funding sources for these types of projects and SWCA will discuss on next RCCP contractor call.
- Importance of including any potential projects of interest on project list

Meg discussed the importance of identifying and including any potential projects of interest on the project list in the Resilience Strategy. Even if it is not feasible to accomplish these projects in the near term, it's good to include them to be able to reference the Resilience Strategy for justification for grant funding or letters of reference from DCM in the future.

Community Engagement Event #2

Meg asked the CAT for input for planning the next Community Engagement Event. Creswell Fire Station bay was recommended as the best location, and an event that provides food will likely draw the biggest crowd. Meg discussed the idea of giving a short presentation about RCCP and preparing multiple posters with pictures and information about the Town's project ideas. Commissioner Joel Harris recommended having a visual timeline of the project phases to help attendees better understand the RCCP process and when projects could begin being implemented.

Additional Topics

The discussion about Creswell school and bus route improvement project brought up the topic of the new school complex in Washington County and the future of the Creswell school buildings. The Creswell school buildings were slated to be demolished once the new school complex opened, but the County recently removed the demolition from the plans and the fate of those buildings is currently in dispute.

Commissioner Thomas Patrick asked for a copy of the RCCP Application, which will be distributed with the CAT Meeting #3 Summary.

The current maps do not show all of the canals in the Town or new road that runs on the East side of Pocosin Charter School. SWCA will look into updated imagery and historical maps to see if better visuals of canals are available.

Next Steps

SWCA will provide updates to the project list, answers to questions, and requested digital copies of the project list and vulnerability assessment results to the CAT with the CAT Meeting #3 Summary. SWCA will coordinate with the CAT to schedule a virtual meeting to plan the next Community Engagement Event.

Meeting Summary
Town of Creswell Community Action Team (CAT) Meeting #4
Monday, March 11, 2024 from 6:00 – 7:00 pm
Virtual meeting held via Zoom

Meeting Objectives

- Review project list/posters and identify any final updates
- Discuss plans for the 2nd community engagement event on Friday and confirm CAT member roles
- Confirm next steps

Participants

Town of Creswell CAT Members
Ron Ambrose, Creswell Fire Chief
Penny Chapman, Town Clerk
Brenda Logan, Town Commissioner
Thomas Patrick, Town Commissioner

Facilitation and Support Staff
Molly Chamberlain, SWCA Environmental Consultants
Kara Giblin, SWCA
Meg Perry, Project Manager, SWCA

Action Items

Who	Action	Due by
All CAT Members	Please continue to spread the word about the event and attend if you are able.	Friday 3/15
SWCA	Share poster of potential projects with CAT members	COMPLETED
SWCA	Check if river gauges measure features other than water elevation.	Friday 3/15
SWCA	Final preparations for public meeting on Friday, March 15 5:30-7:30PM at the Creswell Fire Station.	Friday 3/15

Summary of Key Points from Presentation and Discussion

Welcome and RCCP Process Recap

Meg Perry, SWCA Environmental Consultants, gave a brief introduction and review of the agenda for the meeting, including the schedule for the upcoming public meeting on Friday, March 15 from 5:30-7:30 at the Creswell Fire Station. Meg reminded the CAT members where we currently are in the RCCP process, that we are getting close to finalizing the project portfolio and gave a reminder that Phases 1 and 2 of the program will wrap up in May 2024. SWCA aims to provide a draft of the Resilience Strategy Document to the CAT for review by early April, and after the CAT reviews and provides feedback on the draft, there will be another round of updates prior to completing the final Strategy in May.

Meg also reminded the CAT members to keep in mind that for this process, there's no harm in adding potential projects to the list, even if they are not near term. The goal as part of this process is to have 5-10 priority projects identified, which we are currently close to. For the priority projects that are identified, SWCA will provide additional information as part of the Resilience Strategy, including project

cost estimates, potential funding sources, and other useful information to help make a strong case to funders.

Upcoming Community Engagement Event #2

Next, Meg discussed the upcoming community engagement event on Friday and that this is an opportunity to share more about the projects identified so far and gather feedback from the public. The meeting will be an open-house format with several stations for attendees to visit, and the most important one will be the poster with potential projects.

Mayor Williams asked SWCA to send a copy of the poster to the CAT so that she can take a look for potential grant funding. There was also a question about what parameters the river gauges measure. SWCA will confirm whether gauges could measure just water levels or also other metrics such as flow and salinity.

Ron Ambrose brought up the setup for the event on Friday in the Fire Station Bays and confirmed the meeting can utilize the whole front part of the station, including both bays, which are about 40x40ft.

Meg gave an overview of timing for the event. SWCA will plan to be there no later than 4:30PM, catering will arrive at 5PM to begin cooking at 6PM, and the event will end at 7:30PM. Meg also reminded the CAT that attendance and participation at the event is highly encouraged, as this meeting really belongs to the CAT members as an opportunity to share out the projects that have been identified and hear from residents about which ones could be prioritized. Mayor Williams and Patrick Thomas confirmed their attendance at the event on Friday and Molly will reach out to Ryan Swain to see if he will be able to attend.

Meg also gave a reminder to please advertise the event on social media channels, and Mayor Williams said it is currently posted on the Creswell website and she will try to spread the word about it. Meg also gave a reminder about the RCCP Public Meeting for Washington County on Thursday, March 14 at 5:30-7:30PM in Plymouth at the NC Cooperative Extension Office, 128 E Water St, Plymouth NC 27962.

Meeting Summary
Joint Community Action Team (CAT) Meeting
Thursday, May 23, 2024 from 3:00-4:30 pm

Meeting Objectives

- Review related RCCP projects with potential for collaboration
- Identify joint funding opportunities
- Confirm next steps to pursue projects together

Participants

Washington County CAT Members
Allen Pittman, Planning and Inspections Director
Ann Keyes, County Commissioner
Carol Phelps, County Commissioner
Chris Respess, Washington County Soil and Water Conservation District
Curtis Potter, County Manager
Jason Squires, Assistant County Manager
Lance Swindell, Emergency Manager, Wash. Co.

Town of Creswell CAT Members
Alfredia Williams, Mayor
Ryan Swain, Water & Sewer Superintendent
Thomas Patrick, Town Commissioner

Town of Plymouth CAT Members
Brian Roth, Mayor
Mike Wright, Public Works Director
Sarah Forner, CAT Member

Facilitation and Support Staff
Gordon Marsh, RK&K
Holly White, North Carolina Office of Recovery and Resilience
Jamie Heath, Mideast Commission
Kasen Wally, Division of Coastal Management
Mackenzie Todd, Division of Coastal Management
Molly Chamberlain, SWCA
Meg Perry, SWCA
Sarah Spiegler, NC Sea Grant
Tris Ford, RK&K

Action Items:

Backup Generators and Other Equipment for Critical Facilities

Who	Action	Due by
Washington County	Washington County add generators to the capital assets list in the Capital Improvement Plan at next opportunity so this can be prioritized for funding along with other county projects that may be submitted for funding from FEMA or other sources.	Next opportunity/ update to the CIP

Drainage Study Projects

Who	Action	Due by
WCSWCD/ Chris Respess	Work with Town of Plymouth for future StRAP applications to identify priority areas that weren't included in this year's application.	2025 StRAP applications

Drainage Projects/Maintenance Related Projects

Who	Action	Due by

WCSWCD/Chris Respess	Send project list to CAT for additional review and input	2025 StRAP applications

Relocation, Removal, and Retrofit Projects

Who	Action	Due by
Washington County	Continue to have follow-up conversations about the abandoned properties, develop list of properties and landowners if known and establish contact (work closely with Plymouth).	Ongoing, develop list by September 2024

Emergency Operations Projects

Who	Action	Due by
Creswell	Creswell representatives to contact a Red Cross representative to determine shelter criteria and schedule a visit to potential shelter site(s) in Creswell.	Summer 2024

Projects with Education/Public Outreach Component

Who	Action	Due by
Washington County, Creswell, Plymouth	Review policies during current/ongoing ordinance reviews, adjust rules and ordinances, and gather public feedback. The County and Towns coordinate on ordinances and use model ordinances as a guide. These projects should also be flagged for APNEP, as they may be a good future funding partner. If the Town of Plymouth's Phase 3 funding application is approved for the Stormwater Action Plan, work with Chris to develop messaging.	Summer 2024

Other County projects that may benefit from collaboration

Who	Action	Due by
Washington County	Keep Weyerhaeuser in mind as potential funding source for Broadband Project. Make connection with Giving Fund coordinator givingfund@weyerhaeuser.com for any questions.	Ongoing
SWCA	Meg will be coordinating with folks from the Scuppernong Study to discuss SECOORA funding and see if they can get additional gauges installed at key locations around the county. It will be important to confirm that the SECOORA funded gauges will be part of the FIMAN network for maximum data accessibility.	Summer 2024

NC Resilient Coastal Communities Program
Joint CAT Meeting

Summary of Key Points from Presentation and Discussion

Welcome and Announcements

The meeting started with introductions around the room and announcements. Mackenzie Todd reminded the team that applications for Phase 3 (Engineering & Design) and Phase 4 (Implementation of an engineered and designed project) are due Friday, May 31. Board signatures are required on the application, and there is flexibility to submit the application a few days late if needed. In response to a question, DCM staff confirmed that communities can apply for multiple rounds of Phase 3 Funding. Communities can also submit more than one application for the grant cycle but must indicate which of the applications is the priority project.

Holly White highlighted the Community Disaster Resilience Zone (CDRZ) designation that covers the northeastern part of the County and includes Roper and Creswell. She explained NCORR staff can assist with identifying projects and funding partners and support grant writing for any resiliency-related projects in CDRZ designated areas. Holly noted that if a project benefits a CDRZ zone but includes an area that is not classified as a CDRZ, such as the Town of Plymouth, NCORR can still provide support to pursue the project.

Meg Perry explained that the goal of this meeting is to help develop an action plan to advance projects identified through RCCP Phases 1 and 2. This meeting was intended to give the County, Town of Creswell, and Town of Plymouth an opportunity to identify projects that they may want to work together on, funding sources they may want to pursue together, and any projects that would be better pursued separately.

The meeting attendees then discussed whether to collaborate on a series of related projects excerpted from the Resilience Strategies for Washington County, Plymouth, and Creswell. Related projects that might benefit from collaboration were grouped as follows and provided as a handout during the meeting: [Backup Generator Projects, Drainage Study Projects, Drainage Projects, Relocation, Removal, and Retrofit Projects, Emergency Operations Projects, Site-Specific Infrastructure Projects, Projects with Education/Public Outreach Component, Other County Projects that May Benefit from Collaboration. The notes below include the excerpted descriptions of the projects in each grouping from the handout, followed by notes on the discussion around each project grouping, including action items and potential funding sources.

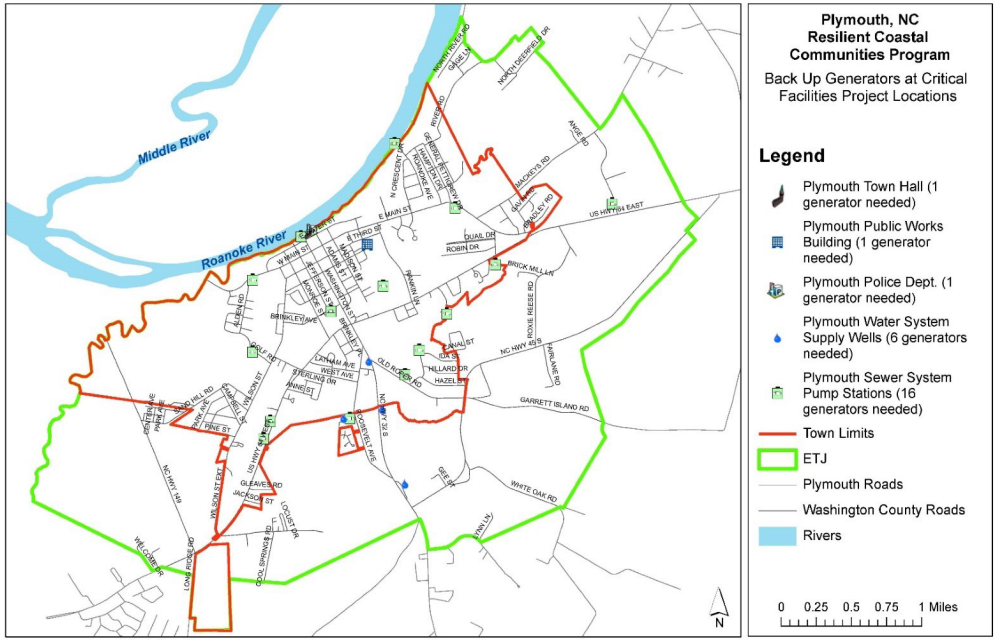
Backup Generator Projects

Washington County- Backup Generators or Other Equipment for Critical Facilities

PROJECT DESCRIPTION	Seek funding to ensure redundant power and equipment for critical facilities, including generators and backup water pumps or pump parts. Specifically: Create list of critical facilities that need a generator or other forms of redundant equipment or parts and acquire/maintain these to ensure that critical facilities and infrastructure remain operational during emergencies or power outages.
Potential Funding Sources	• FEMA Emergency Management Performance Grant (EMPG); • Generators for critical facilities are also eligible under the FEMA Pre-Disaster Mitigation (PDM) Program

Plymouth- Backup Generators at Critical Facilities

Project Scope	Acquire generators or other forms of redundant power supply to ensure that critical facilities and infrastructure remain operational where normal power supply is not available. Current generator needs include sewer lift stations (16), water supply wells (6), the Public Works building, the Police Dept., and Town Hall.
Potential Funding Sources	• Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) • Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Grant Program • Golden Leaf Disaster Recovery Grant



Backup Generator Projects

Meg asked the group if anyone has experience pursuing grant funding for generators. Ryan Swain said the Town of Creswell applied through FEMA right after Hurricane Matthew and it took 6-7 years to get the generator(s). Lance Swindell said that there are grant programs through the State that can be used, and these may be easier to pursue/obtain funding from rather than Federal funding. Lance also reminded the group that there needs to be a specific need for the generator. Commissioner Ann Keyes mentioned that applying together (e.g., Washington County and Plymouth) will be viewed more favorably.

Holly said she can talk to NC Emergency Management about potential opportunities.

Curtis Potter said that the County is looking to apply to the FEMA Facilities Grant (due in early June) for development of an Emergency Management Center, which will include generators. Curtis also said that the County should add generators to the capital assets included in the Capital Improvement Plan, which is updated every other year. Once these assets are included in the plan, they will be easier to justify need/ funding for in future grant applications. Generators should also be included for applications on current/future infrastructure, such as lift station upgrades. For FEMA grants, it may helpful to establish contact with the Federal representative.

Curtis also mentioned that a priority for the County would be a generator for the new school facility (this would be overlapping for the Town of Plymouth and County).

Brian Roth mentioned that the cost for the 25 generators that Plymouth has on their project list is roughly $900K for equipment alone.

Next steps:

- Washington County add generators to the capital assets list in the Capital Improvement Plan at next opportunity so this can be prioritized for funding along with other county projects that may be submitted for funding from FEMA or other sources.

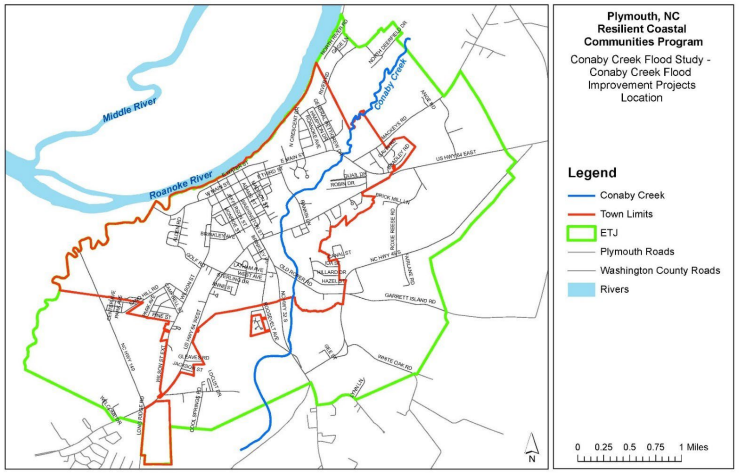
Drainage Study Projects

Washington County- Identify Strategic Drainage Improvements Outside of the Scuppernong Watershed

PROJECT DESCRIPTION	The Scuppernong Water Study will provide detailed hydrologic assessment for areas of flooding concern within the Scuppernong River watershed. This project would involve pursuing similar analysis in other areas of concern within the county that are not part of the Scuppernong Study. This analysis would help identify and prioritize areas where debris removal or other solutions, such as those mentioned in project 3, can be implemented.
POTENTIAL FUNDING SOURCES	• North Carolina Division of Water Infrastructure (DWI) Local Assistance for Stormwater Infrastructure investments (LASII) program • Golden LEAF Foundation • FEMA Hazard Mitigation Grant Program (HMGP)

Plymouth - Conaby Creek Flood Study- Conaby Creek Flood Improvement Projects

Project Description	Complete a detailed flood study and implement projects to relieve flooding from Conaby Creek. The effective FEMA model for the stream is outdated and this project will study projected rainfall, current landcover, and projected landcover. The project will then prioritize solutions and provide a final design for the solution chosen in partnership with the community.
Project Scope	Engineering/Design – Complete a detailed flood study for Conaby Creek. This study will focus on flood-prone areas, including the Highway 64 area, E. Main St. area, neighborhoods nearby Conaby Creek, and the crossings of Conaby Creek within the Town's jurisdiction. The study will evaluate conceptual projects to relieve flooding impacts from Conaby Creek. Then engineering/design will be completed for the chosen project.
Potential Funding Sources	• NC Resilient Coastal Communities Program Phase 3 (engineering), Phase 4 (implementation) • NC Environmental Enhancement Grant (EEG) • NC Land and Water Fund Grant • Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure in Communities (BRIC) Grant • Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure in Communities (BRIC) Capability and Capacity Building (C&CB) • Federal Emergency Management Agency (FEMA) Flood Mitigation Assistance (FMA) Grant • NC Department of Environmental Quality (DEQ) Water Resources Development Grant (WRDG)



Drainage Study Projects

Plymouth team members discussed Conaby Creek and how it causes consistent nuisance flooding and major flooding during named storms. The flood study project idea came from not knowing what type of solutions would be appropriate to address/relieve flooding, and the types of questions prompted by this type of project Where are the connectivity points to the Roanoke River?, what are the chokepoints?, what options are there to address flooding? are all questions that have been raised throughout the County.

Chris Respess mentioned that he in the process of applying for a StRAP grant that includes some of Conaby Creek, and will work with the Town of Plymouth for future StRAP applications to identify priority areas that were not included in this year's application.

The group discussed what approach would be the most helpful for pursuing drainage studies. Would a larger study, that included the Conaby Creek area, provide helpful information? Chris Respess expressed interest in a platform that could help determine which areas need the most support. Where there is opportunity to fund work in specific locations, that is preferred for some funders, though there is also value in having a large-scale study.

Commissioner Keyes mentioned that if the areas to be studied are included in the Hazard Mitigation Plan, that could help to qualify these types of projects for more funding sources.

Funding Sources Discussed: Land and Water Fund, StRAP, Golden Leaf Grant, and possibly in the future the NC Floodplain Blueprint

Drainage Projects

Washington County- Implement Key Drainage Improvements in Areas of Interest

Project Description	This could include several potential types of drainage improvement, which Project 2 above can help prioritize and site. For some areas of interest, maps helping depict potential work needed are included in Appendix F. Drainage improvement methods could include: • Remove debris from waterways and ditches, restoring hydraulic efficiency. • Resizing undersized culverts. • Two-stage ditch at Moccasin Canal – both as a drainage improvement and a demonstration project for landowners to see. • Water farming/wetland mitigation banks. Coastal farmlands could be converted to wetlands and established as conservation easements or mitigation banks in exchange for payments to landowners. • Aquatic weed spraying, clearing/snagging, and beaver control.
Potential Funding Sources	Pending StRAP grants applied for by WCSWCD, other sources to be determined based on projects selected.

Plymouth- Stream Debris Cleanout

Project Description	Complete stream cleanouts (snag and drags) with a focus on: 1. Conaby Creek from NC 32 to town limits boundary past E Main St. 2. Unnamed Tributary to Roanoke River from Bateman St. to W. Main St. 3. Unnamed Tributary to Roanoke River north of Plymouth High School (Plywood Rd. area)
Potential Funding Sources	• NC Dept. of Agriculture Streamflow Rehabilitation Assistance Program (StRAP) • NCDEQ Stream Debris Removal Program

Creswell- Critical Ditch Improvements

PROJECT DESCRIPTION	The town lies between the Scuppernong River and Interstate 64. The Program application identified issues with the dike that was built to redirect water. There are several ditches that are supposed to drain to the dike, then to the Scuppernong River. The ditches are full of debris/water and need to be cleaned out to properly drain to the dike. Scuppernong Study modeling may help pinpoint specifically which ditches will provide the best flood risk reduction for the money. Ditches are located throughout the town and as part of the existing dike system, including from 4th Street at Cherry Road east to 1st Street, the south end of Main Street, and south crossing Main Street near the school building, and extending from the gate valve to the Scuppernong River and other areas associated with the dike system.
POTENTIAL FUNDING SOURCES	• Streamflow Rehabilitation Assistance Program (StRAP) Grants

Plymouth- Neighborhood Drainage Improvement Projects

Project Description	Complete hybrid drainage improvement projects with priority areas at: 1. Riverside Plantation Community 2. 4th Street Community (including side streets such as Adams Street and Winesset Circle) 3. The block of Patton Court, Bradley Road, and Gavin Road 4. Madison Street Community
Project Scope	Engineering/Design – Design hybrid drainage improvement projects with priority areas at: 1.) Riverside Plantation Community, 2.) 4th Street Community (including side streets such as Adams St. and Winesset Cir.), 3.) The block of Patton Ct, Bradley Rd., and Gavin Rd., 4.) Madison St. Community. Implementation – Construct neighborhood drainage improvement projects based on the designs completed in the engineering/design phase. Projects could include pipe replacements (upsizing where needed), increasing the size and quantity of culverts and catch basins, redefining ditches, implementing backflow preventors, installing bioswales, bioretention cells, and other green and hybrid solutions.
Potential Funding Sources	• NC Resilient Coastal Communities Program Phase 3 (engineering), Phase 4 (implementation) • NC Environmental Enhancement Grant (EEG) • NC Land and Water Fund Grant • Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure in Communities (BRIC) Grant • NC Department of Environmental Quality (DEQ) Water Resources Development Grant (WRDG)

Drainage Projects/Maintenance Related Projects

These projects all involve drainage and maintenance. For the Creswell projects/areas mentioned, the Town is waiting to get information from the Scuppernong Study to pinpoint locations where projects would have the most benefit.

For Plymouth, a future round of StRAP funding could cover the areas that are mentioned in their project list and not included in the recent StRAP funding application. Plymouth is also exploring combining these types of projects with green infrastructure (for example, adding a bioswale), and this could be a good idea to broaden the type of grants that these projects could be eligible for. Holly also suggested potentially combining a storm drain maintenance activities in applications for stormwater infrastructure inventory funding.

Next steps: WCSWCD coordinate with Town of Plymouth on the next StRAP funding application.

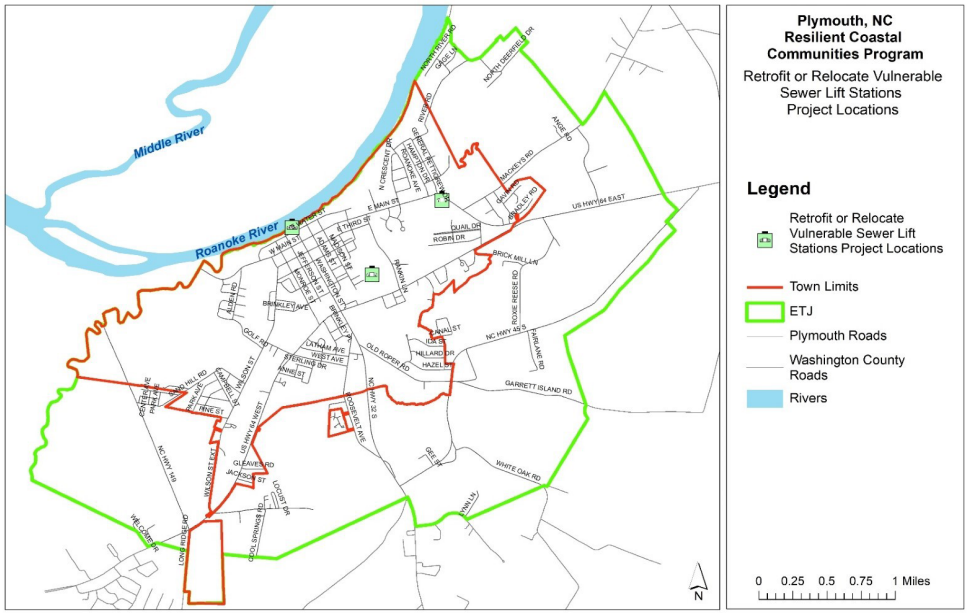
Relocation, Removal, and Retrofit Projects

Washington County- Remove Abandoned Structures and Critical Infrastructure from the Floodplain

PROJECT DESCRIPTION	Remove an estimated 75 abandoned structures/homes in the floodplain including unanchored utilities and other debris swept into floodway by Hurricane Matthew. Replace them with green space. Removal of critical infrastructure that supports services such as transportation, water, energy, communications, and medical services from the floodplain is currently underway, but there is more to be accomplished and will require assistance from Washington County Emergency Management. Some examples of specific projects that would be beneficial include: • Adding lift stations to sewer pipes in Roper that are currently at water level. • Planning ahead to relocate larger infrastructure, such as wastewater treatment facilities, when they need to be replaced due to age or repaired after a disaster. A first step would be to create a confirmed list and map of abandoned properties and identify critical infrastructure that would benefit from upgrades or replacement.
POTENTIAL FUNDING SOURCES	• FEMA Building Resilient Infrastructure and Communities (BRIC), FEMA Flood Mitigation Assistance (FMA) Program, • U.S. Department of Housing and Urban Development Community Development Block Grant – Neighborhood Revitalization (CDBG-NR) Program • County General Fund ($10k annually 10-4350-600)

Plymouth- Relocate or Retrofit Vulnerable Sewer Lift Stations

Project Description	Relocate or retrofit vulnerable sewer lift stations on Water Street, Johnson Court and East Main Street to improve risk of impacts from flooding.
Potential Funding Sources	• HUD Community Development Block Grant Mitigation Funds (CDBG-MIT) • NC Division of Water Infrastructure Programs (Clean Water State Revolving Fund, State Reserve Program, Viable Utility Reserve Program) • Golden Leaf Disaster Recovery Grant • Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure in Communities (BRIC) Grant • Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP) • Federal Emergency Management Agency (FEMA) Flood Mitigation Assistance (FMA) Grant



Relocation, Removal, and Retrofit Projects

Jamie Heath said that Plymouth had a project for removing abandoned structures but this project was moved off the priority project list due to lack of interest at the public meeting.

Abandoned structures fall under the County Planning department, and the County does not currently have the funding or capacity to oversee this process. There are many factors involved, including voluntary participation of the landowner, otherwise the property will go through the condemnation process. Many of the abandoned properties may be heirs property, which can make taking action difficult if the owner is unclear. Often, tax foreclosure is the most efficient process. Mayor Roth said that a common way of removing abandoned structures is to use the structure for a fire training exercise and burn it down.

The question was brought up of if there is a creative way to fund these properties as conservation or open space? Commissioner Keyes said that if structures are in the floodplain, they will have to be converted to open space.

A comprehensive list of abandoned structures and landowners is needed. Commissioner Keyes mentioned that there is a map from 2010 that identified all abandoned structures, this could be used to determine which of those are located in the floodplain.

For repetitive loss properties, the County or Towns can work with FEMA to remove a property from the floodplain. FEMA and the State both have Strategic Buyout programs, which could be an option for properties where the owner is known. Also, if there's a cluster of homes or areas with a large concentration of abandoned homes, Holly said the County could work with the State representative to have a meeting about this.

One idea that was mentioned was bringing in a team to educate the town landowners about recurring loss and properties that fall in the floodplain.

For lift stations, funding for these should come from the enterprise fund in the CIP. Funding for these projects could fall under the Division of Water Infrastructure, Viable Utilities Unit. Holly said that Helene can look into the Viable Utilities funding to see if it applies to these projects.

Next steps: Continue to have follow-up conversations about the abandoned properties, develop list of properties and landowners if known and establish contact.

Emergency Operations Projects

Washington County- New Emergency Operations Center

PROJECT DESCRIPTION	Construct a new dedicated EOC facility. Washington County has been working toward establishing a new EOC for many years. The county will continue to look for opportunities to move forward with this project. The county's existing facility is minimally adequate and relies on shared space with county administration—there is a need for a new and dedicated facility.
POTENTIAL FUNDING SOURCES	• NCDPS Emergency Preparedness Grants, • FEMA Emergency Management Performance Grant (EMPG) Program includes funding for both sheltering and EOC • FEMA Pre-Disaster Mitigation (PDM) Program • FEMA Emergency Operations Center Grant Program

Creswell- Designate Emergency Shelter and Emergency Operations Center

PROJECT DESCRIPTION	Designate a dedicated Emergency Operations Center (EOC) facility and Emergency Shelter. Currently there is no identified shelter to house residents in flood events. The county school building is not approved as a shelter location by the American Red Cross due to flood risk. The Pocosin Charter School was suggested by the CAT as a possible location. To pursue this project, the Town needs to identify potential locations for the facility, confirm shelter criteria that will need to be met, and then take any steps necessary to create or outfit a facility that meets the criteria.
POTENTIAL FUNDING SOURCES	• NCDPS Emergency Preparedness Grants, • FEMA Emergency Management Performance Grant (EMPG) Program includes funding for both sheltering and EOC • FEMA Pre-Disaster Mitigation (PDM) Program • FEMA Emergency Operations Center Grant Program

Emergency Operations Projects

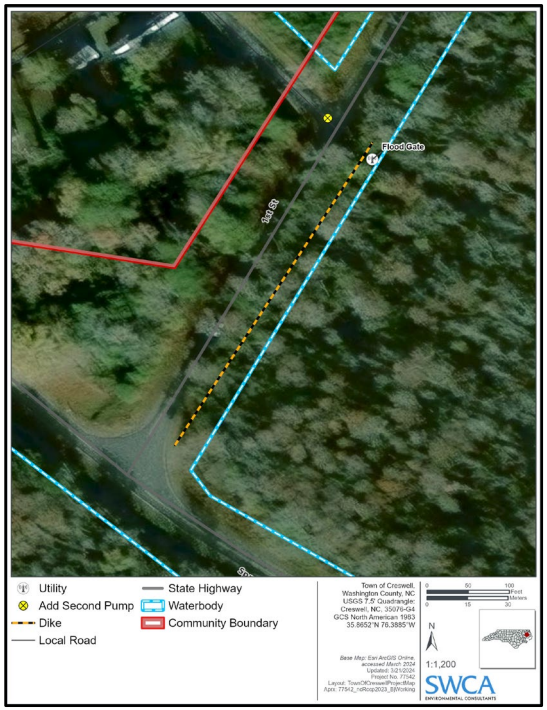
The county is already in the process of pursuing funding to upgrade the county Emergency Operations Center. Emergency Shelters and Emergency Operations Center facilities need be located outside of the floodplain to get grant funding. For a shelter in Creswell, choice of location will very important, because flooding can make parts of the town inaccessible (highwater vehicles have been used in the past to rescue people). When discussing potential shelter locations, Thomas Patrick mentioned that the area where he lives on 1st Street does not flood when other parts of the town are underwater.

Other important considerations for these projects are funding, staffing, and capacity. In order to get funding, facilities must be Red Cross approved. Commissioner Keyes said that a Red Cross representative can come out to evaluate and approve a property.

Next steps: Creswell representatives to contact a Red Cross representative to determine shelter criteria and schedule a visit to potential shelter site(s) in Creswell.

Creswell- Reduce Flooding Impacts in the 1st-4th Steet Area

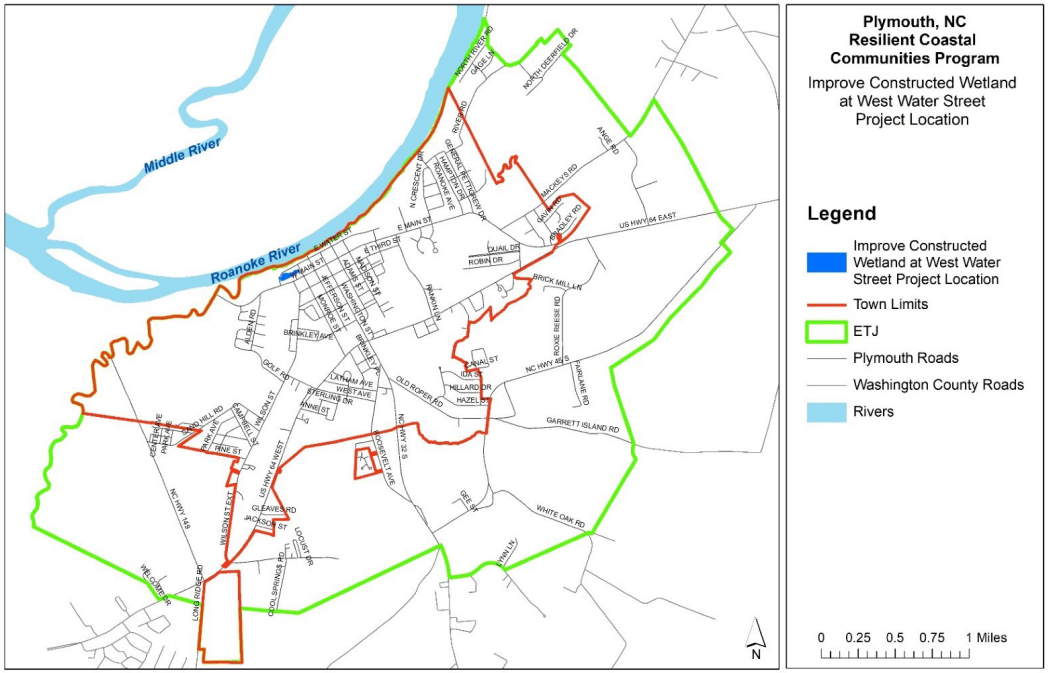
PROJECT DESCRIPTION	The area from 4th Street at Cherry Road east to 1st Street between Main St and Palmetto St experiences the worst flooding impacts in Town. This project proposes to evaluate what potential solutions could help reduce flooding impacts in this area. Possible solutions could include extending the dike from 1st Street to Main Street, adding an additional pump at Palmetto Street, and/or nature-based flood risk mitigation solutions. This evaluation would build on initial modeling under the Scuppernong Study to determine more specifically what solutions would be most effective to create the desired flood risk reduction. Based on this evaluation, the Town would then seek funding to pursue the recommended solution(s).
POTENTIAL FUNDING SOURCES	• North Carolina Division of Water Infrastructure (DWI) Local Assistance for Stormwater Infrastructure investments (LASII) program, • Golden LEAF Foundation, • FEMA Building Resilient Infrastructure and Communities (BRIC)



Site-Specific Infrastructure Projects

Plymouth- Improve Constructed Wetland at West Water Street

Project Description	Improve the function of the constructed wetland behind the senior public housing complex to address over street flooding of West Water Street.
Potential Funding Sources	• NC Resilient Coastal Communities Program Phase 3 (engineering), Phase 4 (implementation) • NC Environmental Enhancement Grant (EEG) • NC Land and Water Fund Grant • NC Department of Environmental Quality (DEQ) Water Resources Development Grant (WRDG)



Site Specific Infrastructure Projects

These projects were grouped together because they both involve infrastructure such as a gate or pump and may have similar funding sources. Plymouth and Creswell should stay in communication about where they are able to obtain funding for these projects in case the same source could be used for both.

Projects with Education/Public Outreach Component

Plymouth- Stormwater Action Plan- Stormwater System Upgrade

Project Description	Develop a Stormwater Action Plan combined with strategically upgrading the stormwater system through improved and expanded infrastructure. The project will establish mapping and condition assessments for stormwater system components and outfalls with a focus on known problem areas and areas identified via a desktop analysis. The project will promote proactive stormwater maintenance through development of interactive mapping tools and maintenance guidance. The project will encourage stormwater quality awareness through public outreach efforts and produce construction drawings for a priority project.
Potential Funding Sources	• NC Resilient Coastal Communities Program Phase 3 (Action Plan) • Federal Emergency Management Agency (FEMA) Building Resilient Infrastructure in Communities (BRIC) Capability and Capacity Building (C&CB) Grant • NC Department of Environmental Quality Water Resources Development Grant (WRDG)

Washington County- Develop Water Management Guide for Landowners, Homeowners, and Renters

PROJECT DESCRIPTION	Discussion with residents has shown that most people do not know for sure what they are expected to do to maintain ditches, storm drains, and other water management systems. What are they responsible for doing? And what are they allowed to do? How does what they do on their land impact downstream neighbors and the system as a whole? This project would be to develop and distribute information in the form of key talking points and summary information tailored to local audiences. Messaging should include compelling numbers that help explain how the water management system is interconnected and what people can do to help maintain it and not pass along negative impacts to their neighbors. The messages should also touch on what water management actions are handled by entities such as Washington County or other agencies.
POTENTIAL FUNDING SOURCE	Local Washington County General Fund advertising funds

Washington County - Share Information about Wetland Mitigation Banks and/or Water Farms with Landowners

PROJECT DESCRIPTION	Coastal farmlands could be converted to wetlands and established as conservation easements or mitigation banks in exchange for payments to landowners. Or similarly, certain lands could be designated as “water farms,” with payments to landowners for retaining water on the land under certain flood conditions. A first step toward this will be sharing information with landowners about this type of project and its benefits.
POTENTIAL FUNDING SOURCE	NC DWI Stream & Wetland Mitigation Program, NCDEQ Mitigation Sources

Projects with Education/Public Outreach Component

These projects all involve a public education component. Education around water management for landowners and stormwater quality awareness may help reduce local problems and provide collaboration opportunities. There is an education gap of what should be maintained, by whom, and when, and complex situations involving private property or multiple landowners should be considered.

Commissioner Keyes recommended identifying key leaders in the community because people have the tendency to listen to them, and holding community meetings with trusted ministers can help spread and gather information effectively.

Mayor Roth suggested an internal policy review prior to educating the public or developing and printed materials such as a management guide. They want to ensure that local policies and ordinances are clear and up to date before putting guidance out to the public. Washington County has a new intern who can review ordinances, and Creswell and Plymouth are currently reviewing theirs. This is a good time to collaborate.

Model ordinances from the state may be a helpful resource, and Holly said that NCORR is working on creating an ordinance for small communities that includes best practices.

Next steps: With ordinance reviews in progress, this is a great time for the County and Towns to review their current policies, adjust rules and ordinances, and gather public feedback. The County and Towns should coordinate on ordinances and use model ordinances as a guide. These projects should also be flagged for APNEP, as they may be a good future funding partner.

If the Town of Plymouth's Phase 3 funding application is approved for the Stormwater Action Plan, work with Chris Respess to develop messaging.

Other County Projects that May Benefit from Collaboration

Washington County- Identify and Upgrade Broadband for County Buildings and Other Critical Facilities Connected via Copper/Legacy Internet

PROJECT DESCRIPTION	Some internet/broadband services use copper wiring that is often susceptible to water intrusion and leads to unreliable service and outages during flooding events. Make a list of county buildings/assets and other critical facilities that use copper/legacy connections and connect them to a more reliable provider, such as the Microelectronics Center of North Carolina (MCNC) fiber network.
POTENTIAL FUNDING SOURCES	MCNC, NC Department of IT, Albemarle Commission

Washington County- Install River Gauges

PROJECT DESCRIPTION	There are currently only three gauges in the NCEM Flood Inundation Mapping and Alert Network countywide: one in Roper on Kendrick Creek, one in Plymouth on Conaby Creek, and one in Van Swamp along North Carolina Highway 32 South. This project would install additional gauges within the upstream portion of the county to help improve flood predictions and track flooding trends. The following potential locations have been identified for consideration: Eddiesmith Canal, Highland Canal, Kendrick Creek, Mackey's Creek, Main Canal, Scuppernong River, Swinson Swamp, Beaver Dam Branch. Part of this project would include confirming locations and functionality of existing gauges.
POTENTIAL FUNDING SOURCES	Southeast Coastal Ocean Observing Regional Association (SECOORA), National Weather Service, Washington County Drainage Fund

Other County projects that may benefit from collaboration

A potential funding source for Washington County's Broadband upgrade project is Weyerhaeuser. Their website includes information on the Rural Communities program Phase 2 (2023-2025), which mentions broadband expansion. The County has applied for their funding in the past.

For the River Gauge installation project, Meg will be coordinating with folks from the Scuppernong Study to discuss SECOORA funding and see if they can get additional gauges installed at key locations around the county. It will be important to confirm that the SECOORA funded gauges will be part of the FIMAN network for maximum data accessibility.

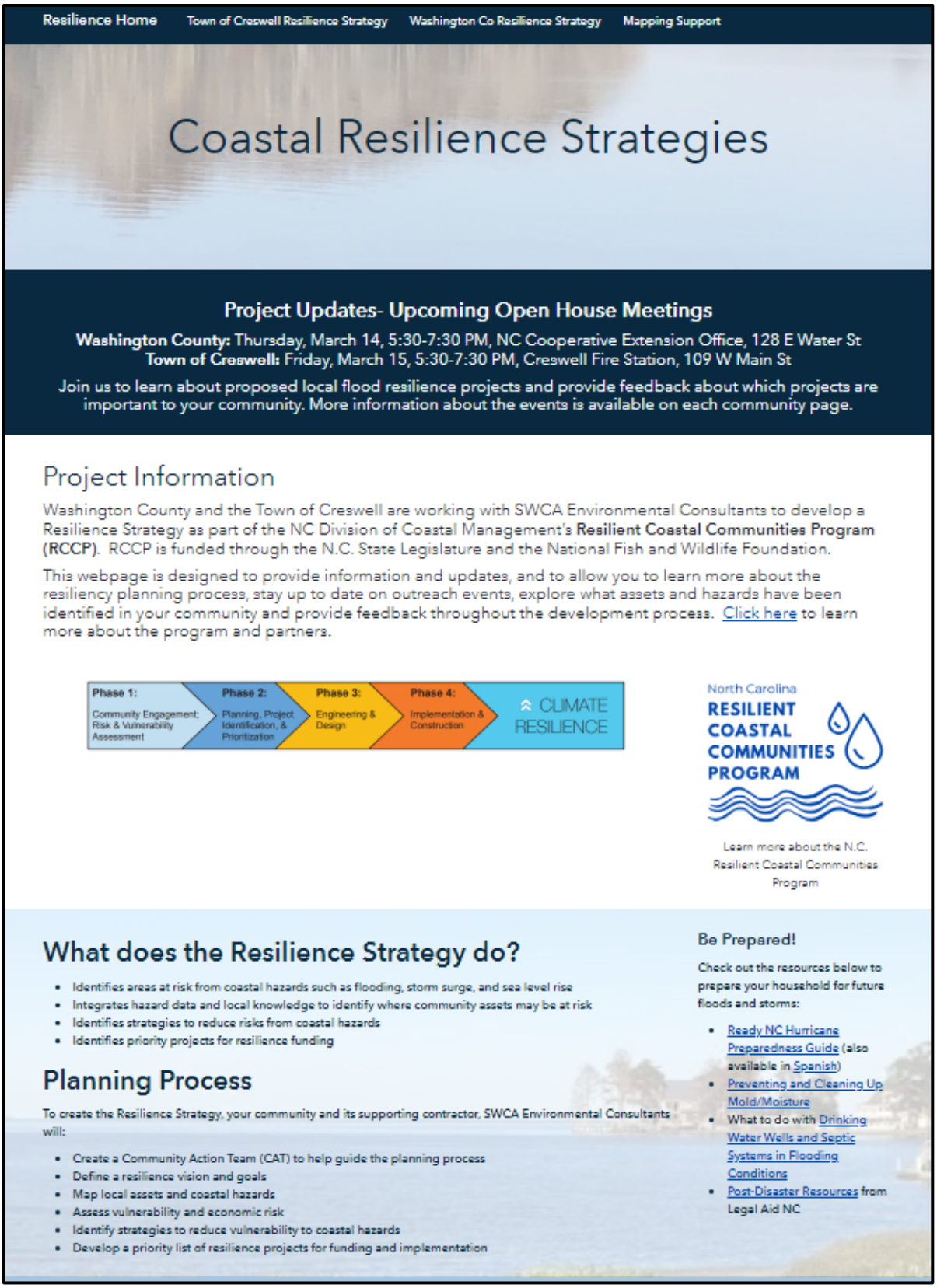
APPENDIX B

STAKEHOLDER ENGAGEMENT

Table B-1. Creswell Attendance at the Public Meetings Held in October 2023 and March 2024.

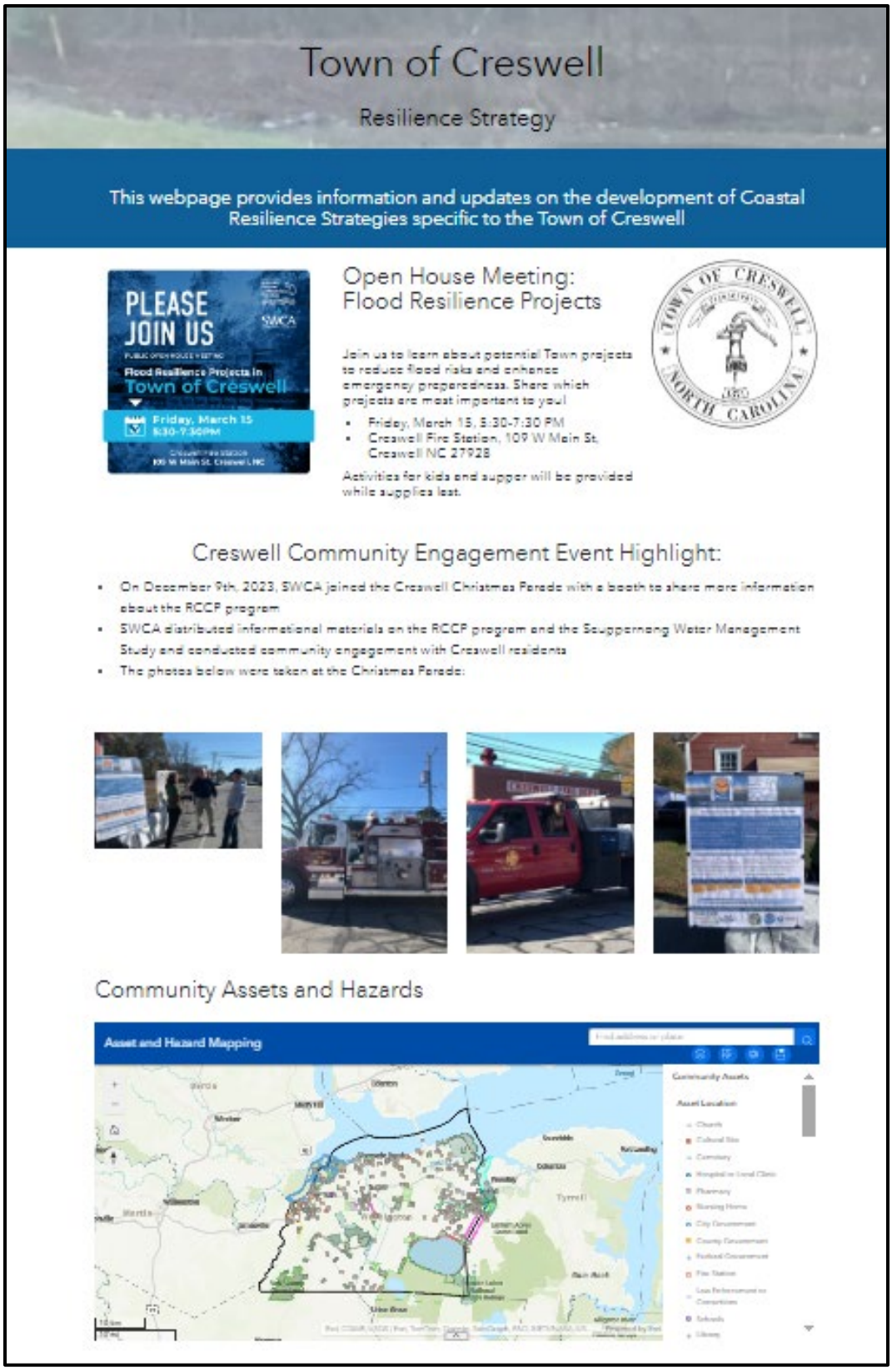
FIRST NAME	LAST NAME	AFFILIATION	OCTOBER 23	MARCH 15
Attendees				
Wade	Alexander	Creswell resident		X
Dennie	Biggs	Creswell resident		X
Ray	Blount	Creswell resident	X	
Glenn	Brickhous	Creswell resident	X	
Harvey	Brickhous	Creswell resident	X	
Charles	Broome	Creswell resident	X	
Penny	Chapman	Creswell CAT member	X	
Colby	Davenport	Creswell resident		X
Lindey	Davenport	Creswell resident		X
Tony	Davenport	Creswell resident	X	
Gordon	Deaver	Creswell resident	X	
Stacey	Feken	Albemarle-Pamlico National Estuary Partnership	X	X
Nellie	Flemming	Creswell resident		X
Bill	Forbes	Creswell resident	X	X
Jean	Furlough	Creswell resident	X	
Kenny	Furlough	Creswell resident	X	
Chris	Hardee	Creswell resident	X	
Joel	Harris	Creswell CAT member	X	X
Robin	Harris	Creswell resident		X
Riley	Harris	Creswell resident		X
Thomas	Holmes	Washington County resident		X
Rob	Maxwell	Creswell resident	X	X
Charlotte	Maxwell	Creswell resident	X	X
Betty	McCleese	Creswell resident	X	
Jeremy	Oliver	Creswell resident		X
Hailey	Oliver	Creswell resident		X
Sharon	Owens	Creswell resident	X	X
Ray	Owens	Creswell resident	X	X
Robbie	Owens	Creswell resident	X	
Thomas	Patrick	Creswell CAT member		X
Debra	Phelps	Creswell resident		X
Sherrial	Phelps	Creswell resident		X
Carol	Phelps	Washington County CAT member		X
Chuck	Phelyn	Creswell resident	X	
Gerald	Reed	Creswell resident		X

FIRST NAME	LAST NAME	AFFILIATION	OCTOBER 23	MARCH 15
Addie	Roberts	Creswell resident	X	
Lataya	Sawyer	Creswell resident		X
Alfreida	Simpson	Creswell resident	X	
Don	Spencer	Creswell resident	X	
Patty	Spencer	Creswell resident	X	
Lessel	Spruill	Creswell resident		X
Syble	Spruill	Creswell resident	X	
Katherine	Spruill	Creswell resident	X	
Ricky	Suxton	Creswell resident	X	
Ryan	Swain	Creswell CAT member		X
Anthony	Toler	Creswell resident		X
Tara	Toler	Creswell resident		X
Christal	Watkins	Creswell resident		X
Helene	Wetherington	NCORR		X
Holly	White	NCORR	X	X
Alfreida	Williams	Creswell CAT member, Mayor	X	X
Eroy	Williams	Creswell resident	X	
Program Support Staff				
Molly	Chamberlain	SWCA Environmental Consultants		X
Meg	Perry	SWCA Environmental Consultants	X	X
Mackenzie	Todd	DCM	X	X
Tancred	Miller	DCM	X	



https://nc-rccp-community-portal-2024-swcagis.hub.arcgis.com/

Figure B-1. Home page of the project website.

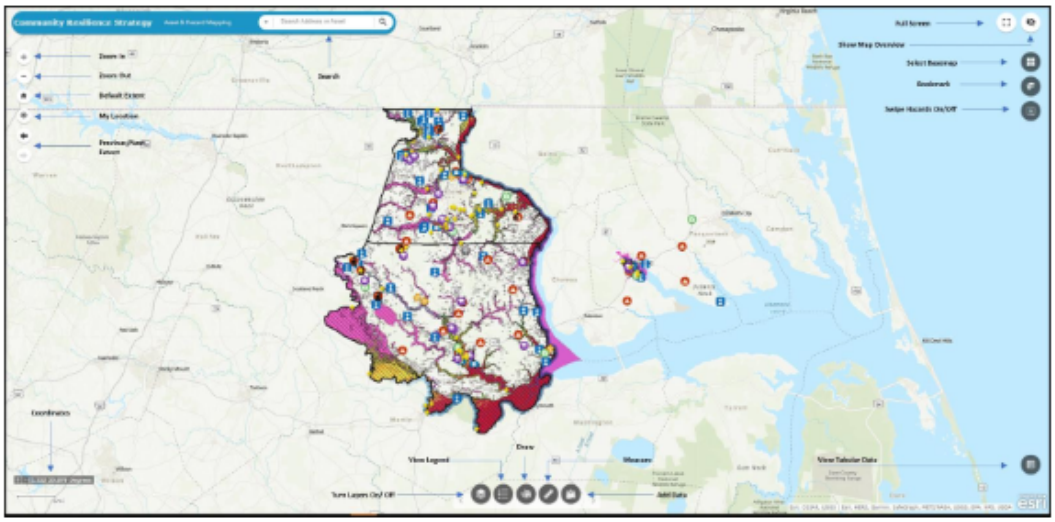


https://nc-rccp-community-portal-2024-swcagis.hub.arcgis.com/pages/creswell-resilience-strategy

Figure B-2. Creswell page of the project website.

Resilience Home | Town of Creswell Resilience Strategy | Washington Co Resilience Strategy | Mapping Support

Utilize the Asset and Hazard Mapping Platform



Quick Tips and Tricks

- **Applications are supported in Internet Explorer but work best in Google Chrome.**
- Some data is scale dependent. Layers that are not visible at the map scale will appear light grey in the Turn layers On/Off widget and the View Legend widget will automatically update as you zoom in and out.
- Navigate the map faster: Use the customized Search tool that allows users to search by address, parcel number, asset name and asset ID.
- Utilize multiple tools at once- Applications can have as many as three tools from the bottom toolbar active at one time.
  - Click and hold the top of the active tool dialog box to move it around the application. Click the Minimize symbol at the top right corner of the tool dialog box to collapse (not close) the tool.
  - Active tool icons are elevated in the bottom toolbar; clicking the elevated icon will close the tool.
- Applications have a lot of data with complex symbology.
  - Use the Swipe Hazard tool to quickly compare an area with and without hazard data.
  - If you select an area with multiple features, arrows in the pop-up headers allow you to see information on each layer.
  - Use the Turn Layers On/Off tool, but be careful that all nested boxes are selected. Try only turning layers on/off at the highest or lowest nested level.
  - Open the Legend tool, move it to the side of the map, and leave it open to easily see what layers are visible on the map.
- The Turn Layers On/Off tool does more than turn layers on and off. Select the ellipsis by any layer name and zoom to layer, adjust transparency, or view the item's tabular data.

https://nc-rccp-community-portal-2024-swcagis.hub.arcgis.com/pages/mapping-support

Figure B-3. Mapping Support page of the project website.

HELP US UNDERSTAND FLOODING IN THE REGION

Scuppernong Water Study Phase 1 Community Survey

Please fill out this survey with your feedback and mail to the address below **by January 15, 2024.** Alternatively, you can provide your input through the online survey on the project website at bit.ly/scuppernongwaterstudy or using the QR code.

Mailing Address: Woody Webster, PO Box 262, Columbia, NC 27925

Submit Survey Online

Name: _____ **Do you live in the study area?** (Circle yes or no) YES NO

Who do you represent i.e. resident of Columbia, Creswell, Cherry, Washington County, Tyrrell County, or other?

_____

Do you want to be added to the project email list? Email: _____

What do you value about the Scuppernong River watershed? What makes it special? _____

_____

_____

What are the important places in the watershed? Please provide an address, cross streets, or identifiable landmarks. _____

_____

Please complete the sentence: "This project will be successful if _____**."**

Please indicate up to three locations on the map below where you know flooding occurs. Be specific with cross streets, addresses, or identifiable landmarks. For each location, please describe the following:

- When and under what conditions does flooding happen (wind, rainfall, large events, high water table, rainfall upstream, etc.)
- Other factors that make flooding worse (infrastructure issues, blocked roadways, drains more slowly than other areas, etc.)

1. _____

_____

_____

_____

2. _____

_____

_____

_____

3. _____

_____

_____

_____

How did you hear about the project?

- ☐ Flyer around town
- ☐ Social media
- ☐ From a friend or co-worker
- ☐ Other _____

Figure B-4. Community Survey.

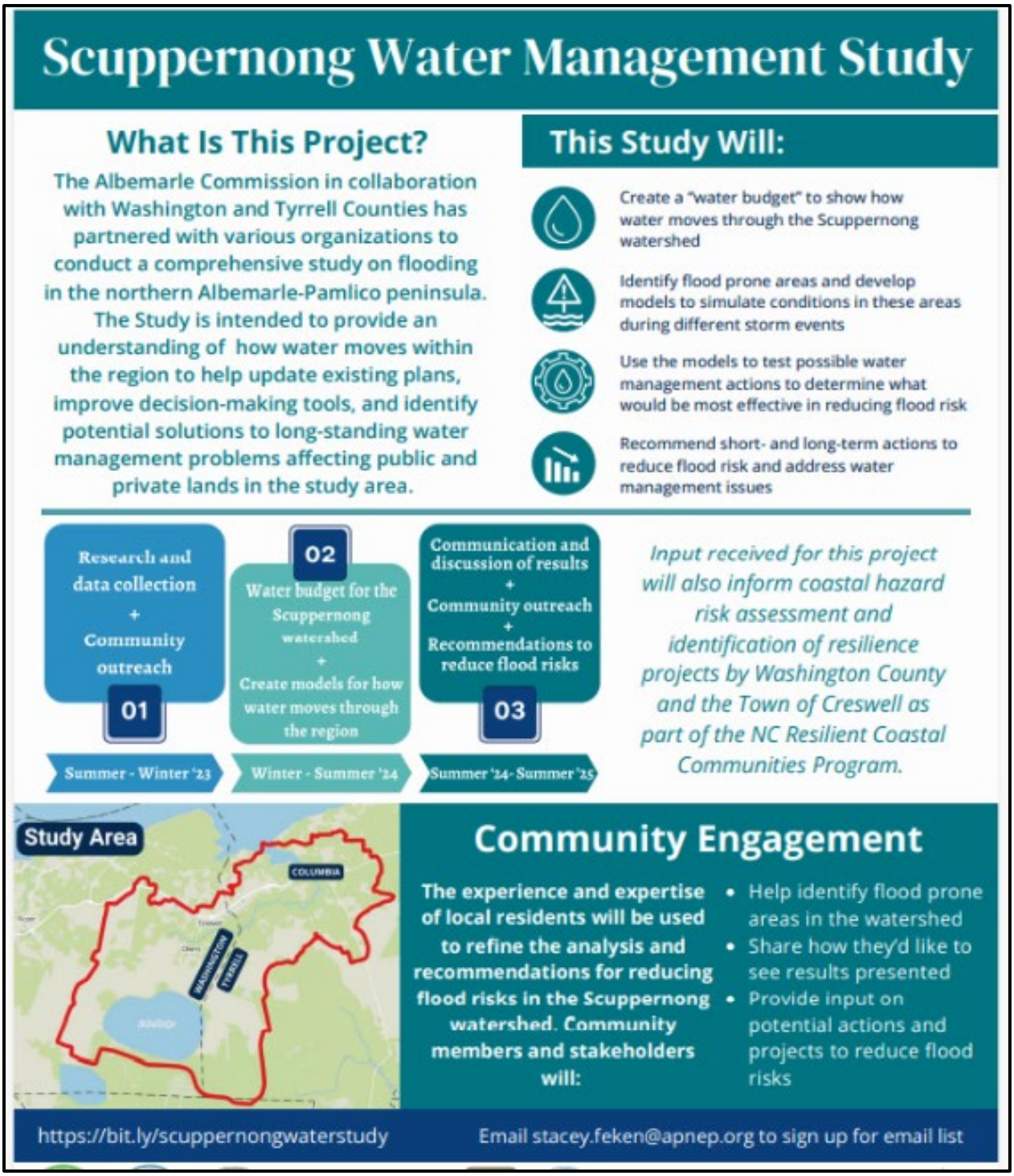


Figure B-5. Scuppernong study fact sheet.

APPENDIX C

IDENTIFIED ASSETS

Table C-1. Asset Information and Calculation of Vulnerability Index for Each Asset, Creswell, North Carolina. Assets are listed from highest vulnerability to lowest vulnerability index.

ASSET ID	ASSET NAME	PRIMARY ASSET TYPE	LOCATION	TOTAL ESTIMATED VALUE	AVERAGE SENSITIVITY SCORE	AVERAGE HAZARD EXPOSURE SCORE	AVERAGE ADAPTIVE CAPACITY SCORE	FINAL VULNERABILITY SCORE
CW-1	St. John Missionary Baptist Church Cemetery (African American)	Community and Economic Services	601 W Main St, Creswell, NC 27928	$35,200	2	2	1	1
CW-2	St. David's Episcopal Church Cemetery	Community and Economic Services	344 Saint David Rd, Creswell, NC 27928	$104,800	2	2	1	1
CW-3	Christ Episcopal Church	Community and Economic Services	100 S 6th St, Creswell, NC 27928	$125,800	2	2	1	1
CW-4	Creswell Baptist Church	Community and Economic Services	106 7th St, Creswell, NC 27928	$282,600	2	2	1	1
CW-5	Creswell United Methodist Church	Community and Economic Services	209 S 6th St, Creswell, NC 27928	$136,400	2	2	1	1
CW-6	Faith Christian Fellowship	Community and Economic Services	360 1st St, Creswell, NC	$182,500	2	3	1	2
CW-7	St. David's Episcopal Church	Community and Economic Services	344 Saint David Rd, Creswell, NC 27928	$111,600	2	2	1	1
CW-8	St. John Missionary Baptist Church	Community and Economic Services	601 W Main St, Creswell, NC 27928	$333,300	2	2	1	1
CW-9	St. Mark A.M.E. Zion	Community and Economic Services	201 N 6th St, Creswell, NC 27928	$91,600	2	2	1	1
CW-10	Town of Creswell	Government Service Offices	104 S Sixth St, Creswell NC 27928	$64,300	3	2	1	2
CW-11	Ruritain Club	Community and Economic Services	105 N 6th St, Creswell, NC 27928-943	$41,600	3	2	1	2
CW-12	Creswell Historic District	Community and Economic Services	Area south of West U.S. Hwy 64, north of W Main St between 8th St and 6th St	$1,735,800	2	2	1	1
CW-13	Post Office	Government Service Offices	201 W Main St, Creswell, NC 27928	$94,000	3	2	1	2
CW-14	Creswell Volunteer Fire Department Station #1	Public Safety or Emergency Services	109 W Main St, Creswell, NC, 27928	$73,900	3	2	1	2
CW-15	Dollar General	Community and Economic Services	117 U.S. Hwy 64 E, Creswell, NC 27928	$0	3	2	1	2
CW-16	Mark's Supermarket	Community and Economic Services	317 U.S. Hwy 64 W, Creswell, NC 27928	$162,100	3	2	0	3
CW-17	Washington County Open Space	Community and Economic Services	Cherry Rd	$7,700	2	3	1	2
CW-18	Pettigrew (Lake Phelps) State Park Registered Heritage Area including the Somerset Place Historic Site	Community and Economic Services	2252 Lake Shore Rd, Creswell, NC 27928,	$21,506,870	2	3	1	2
CW-19	Pettigrew State Park (Scuppernong River Section) Dedicated Nature Preserve	Community and Economic Services	Spruill Bridge Rd	$729,170	2	3	1	2
CW-20	Somerset Court	Community and Economic Services	101 Somerset Ct, Creswell, NC 27928	$944,900	3	2	1	2
CW-21	Barnyard Betsy Cheesesteak & Hoagies	Community and Economic Services	106 E Main St, Creswell, NC 27928	$77,700	2	2	1	1
CW-22	Big Blue 252 Coffee Bar	Community and Economic Services	109 E Main St, Creswell, NC 27928	$36,600	2	2	1	1
CW-23	Cahoon's Pizza and Wings	Community and Economic Services	316 US Hwy 64 W, Creswell, NC 27928	$89,000	2	2	0	2
CW-24	Mood Swings Restaurant	Community and Economic Services	410 US Hwy 64 W, Creswell, NC 27928	$74,300	2	2	1	1
CW-25	Cherry RD	Infrastructure	1500 feet of West of 5th St	$0	3	3	1	3
CW-26	E Main ST	Infrastructure	1700 feet of between 5th St and 1st St	$0	3	3	1	3
CW-27	E Palmetto ST	Infrastructure	1600 feet between Leigh St and 1st St	$0	3	3	1	3
CW-28	First ST	Infrastructure	1500 Feet starting at the intersection to Spruill Bridge Rd	$0	3	3	1	3
CW-29	N Fifth ST	Infrastructure	131 Feet of Route Code 3718720050624551	$0	3	3	1	3
CW-30	N Fourth ST	Infrastructure	391 Feet of Route Code 3718720050624556	$0	3	3	1	3
CW-31	Pudding RD	Infrastructure	445 Feet of Route Code 3718720050624577	$0	3	3	1	3
CW-32	S Fourth ST	Infrastructure	408 Feet of Route Code 3718720050624561	$0	3	3	1	3
CW-33	S Sixth ST	Infrastructure	150 Feet of Route Code 3718720050624558	$0	3	3	1	3
CW-34	Second ST	Infrastructure	439 Feet of Route Code 3718720050624569	$0	3	3	1	3

ASSET ID	ASSET NAME	PRIMARY ASSET TYPE	LOCATION	TOTAL ESTIMATED VALUE	AVERAGE SENSITIVITY SCORE	AVERAGE HAZARD EXPOSURE SCORE	AVERAGE ADAPTIVE CAPACITY SCORE	FINAL VULNERABILITY SCORE
CW-35	Spruill Bridge RD	Infrastructure	1600 Feet of Route Code 3718720050624578 and 3718720050624575	$0	3	3	1	3
CW-36	Third ST	Infrastructure	402 Feet of Route Code 3718720050624563	$0	3	3	1	3
CW-37	Creswell High and Elementary School	Education	115 Middle St, Creswell, NC 27928	$5,022,000	3	3	1	3
CW-38	Pocosin Innovative Charter School	Education	500 First St, Creswell, NC 27928	$818,100	3	3	1	3
CW-39	Floodgate	Infrastructure	Corner of 1st and Palmetto St	$20,580	3	3	0	3
CW-40	Main Street Storm Drain (3rd to 2nd)	Infrastructure	E Main St between 2nd St and 3rd St	$0	3	3	0	3
CW-41	Pump Station on Cherry Rd.	Infrastructure	South side of Cherry Rd between 5th St and Pudding Rd	$197,630	3	3	1	3
CW-42	Water Tower & Well #1 (Permit #NC0494020)	Infrastructure	110 Palmetto St, Creswell, NC 27928	$96,800	3	2	1	2
CW-43	Well #2 (Permit #NC0494020)	Infrastructure	213 N 6th St, Creswell, N, 27928	$14,300	3	2	1	2
CW-44	Scuppernong River Swamp Forest	Natural Assets	1590 Cherry Rd, Creswell, NC 27928	$8,188,590	2	3	2	1

APPENDIX D

DATA USED IN VULNERABILITY AND RISK ASSESSMENT

Table D-1. Data Used in Assessment of Asset Vulnerability and Risk

FIELD/VARIABLE	DATA USED TO DEFINE FIELD/ VARIABLE	DATA SUMMARY	USE IN RISK AND VULNERABILITY ASSESSMENT	ADDITIONAL INFORMATION ON SOURCE DATA
Flood Plain Exposure	North Carolina Preliminary and Effective Flood Zones (North Carolina Floodplain Mapping Program 2024a)	Areas representing the area within the flood mapping boundaries defined by the engineering models for the 100-year (1% annual chance), 500-year (0.2% annual chance) and floodway (river channel and adjacent land areas for flood discharge).	Floodplain type was categorized and used to assess current climate precipitation induced flood risk under varying conditions across the landscape.	Data were produced by NC Floodplain Mapping Program in 2020 at 6-m spatial resolution and updated in 2021
Flood Plain Exposure	High Resolution Elevation (DEM 20') (North Carolina Floodplain Mapping Program 2024b)	Elevation data were created using LiDAR collected by NC Floodplain Mapping Program	Elevation data were processed to find low-lying areas outside the current 500-year flood plains that have the potential for precipitation induced flood risk under future climate conditions across the landscape.	Data were produced by NCDOT in conjunction with the NC Floodplain Mapping Program in 2020 at 6-m spatial resolution
Reported Event Inundation Factor	Hurricane Matthew Inundated Areas (NC OneMap 2018a)	Areas that experienced flooding during Hurricane Matthew, based on aerial photographs taken October 8–16, 2016.	Inundated areas were used assess extreme precipitation event flood risk across the landscape.	Data were produced by the Center for Biodiversity Outcomes, Arizona State University in 2020 at 5-m spatial resolution
Reported Event Inundation Factor	Hurricane Florence Inundated Areas (NC OneMap 2018b)	Areas that experienced flooding during Hurricane Florence, based on aerial photographs taken September 18–22, 2018.	Inundated areas were used assess extreme precipitation event flood risk across the landscape	Data were produced by the Center for Biodiversity Outcomes, Arizona State University in 2020 at 5-m spatial resolution
Reported Event Inundation Factor	Community Flood Reporting Point	Areas outside of the 100- and 500-year floodplains that were identified by the public as having frequent or severe flooding during large precipitation events.	Point locations were converted to inundated areas based on the underlying elevation and topography. These inundated areas were used to assess extreme precipitation flood risk across the landscape.	Data were collected via analog maps at community stakeholder engagement meetings
Sea Level Rise Exposure	Sea Level Rise (SLR) Inundation Extent 1-foot to 10-foot Scenarios (NOAA Office for Coastal Management 2017)	Data represent where water would be present along coast lines and intertidal waterways (under normal, non-flood conditions) at increasing sea levels. This is based on a "modified bathtub model," which identified the areas of land that would be covered with water if you increased the water height by a specific amount. It does not address when or how quickly sea level might increase.	Simulated scenario data were combined with Sea Level Rise (Low) Inundation data and categorized into severity values 1 through 5 used to assess sea level rise risk under varying conditions across the landscape.	Data were produced by the NOAA Office for Coastal Management in 2017 at 10-m spatial resolution, updated 2023

FIELD/VARIABLE	DATA USED TO DEFINE FIELD/ VARIABLE	DATA SUMMARY	USE IN RISK AND VULNERABILITY ASSESSMENT	ADDITIONAL INFORMATION ON SOURCE DATA
Sea Level Rise Exposure	Sea Level Rise (Low) Inundation Extent 1-foot to 10- foot Scenarios (NOAA Office for Coastal Management 2017)	Data represent where water would be present in inland areas (under normal, non-flood conditions) at increasing sea levels. This is based on a "modified bathtub model," which identified the areas of land that would be covered with water if you increased the water height by a specific amount. It does not address when or how quickly sea level might increase.	Simulated scenario data were combined with Sea Level Rise (SLR) Inundation data and categorized into severity values 1 through 5 used to assess sea level rise risk under varying conditions across the landscape.	Data were produced by the NOAA Office for Coastal Management in 2017 at 10-m spatial resolution, updated 2023
Sea Level Rise Exposure	Duck Pier Local Sea Level Rise Scenario Statistics (NOAA Office for Coastal Management 2023)	Data list northern NC regional projected sea level rise in feet sea for five IPCC emissions scenarios.	Data were used to determine the likelihood of sea level rise inundation per emission scenario.	Data were produced by the NOAA National Weather Service in coordination with the IPCC in 2023
Storm Surge Exposure	Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Category 1-5 High Tide Simulations (NOAA National Hurricane Center 2024)	Data depict simulated storm surges from tropical cyclones, developed using tens of thousands of simulations of climatology-based hypothetical tropical cyclones.	Modeled data from Category 1 through 5 storms were combined and inundation depth was categorized into severity values 1 through 5 used to assess storm surge risk under varying conditions across the landscape.	Data were produced by the NOAA National Weather Service, National Hurricane Center in 2021 at 30-m spatial resolution
Storm Surge Exposure	Hurricane Landfall Statistics (NOAA NWS 2024)	Data list all recorded hurricanes by category that have made landfall in North Carolina since 1851.	Data were used to determine likelihood of storm surge exposure event by hurricane category.	Data were produced by the NOAA National Weather Service
Additional Hazard Factor	USA Wildfire Hazard Potential-Block Level (Fire Lab 2023)	Data integrate fire simulation and field collected data to depict the relative potential for wildfire that would be difficult for fire crews to contain.	Data were used to represent the likelihood of an area experiencing high-intensity fire behavior.	Data were produced by the U.S. Forest Service, Fire Modeling Institute in 2023 at the Block Level
Additional Hazard Factor	National Risk Index (FEMA 2018)	Data represent nationwide aggregated and normalized natural hazard data.	Data were used to represent a subset of additional hazards that could negatively impact assets in the community.	Data were produced by FEMA in 2023 at the Tract Scale
Social Vulnerability (geographic)	Social Vulnerability Index (SVI) 2018 (CDC ATSDR 2020)	Data represents a combination of socioeconomic factors that are used to identify and map the communities that will most likely need support before, during, and after a hazardous event.	Total SVI rankings were categorized using the flag approach and used to assess the most current socially vulnerable populations in the community.	Data were produced by the CDC ATDSR Geospatial Research, Analysis & Services Program (GRASP) in 2020 at the tract level
Social Vulnerability (geographic)	Social Vulnerability Index (SoVI) 2000 (HVRI 2011)	Data represents a combination of socioeconomic factors that are used to identify and map the communities that will most likely need support before, during, and after a hazardous event.	Total SoVI rankings were categorized using the flag approach and used to assess the socially vulnerable populations in the community at a localized scale.	Data were produced by HVRI, University of South Carolina in 2011 at the block group level

FIELD/VARIABLE	DATA USED TO DEFINE FIELD/ VARIABLE	DATA SUMMARY	USE IN RISK AND VULNERABILITY ASSESSMENT	ADDITIONAL INFORMATION ON SOURCE DATA
Estimated Cost	Assessor Parcel Boundaries (NC OneMap 2016)	Data represent county-level parcels with standardized attributes such as ownership, addresses and assessed monetary values	Monetary value fields such as Parcel Value, Land Value, and Improvement Value were used to calculate total estimated cost values for assets considered at risk.	Data were produced by the NC Geographic Information Coordinating Council in coordination with local government agencies and last updated 2023

APPENDIX E

DETAIL MAPS OF ASSETS AND HAZARDS

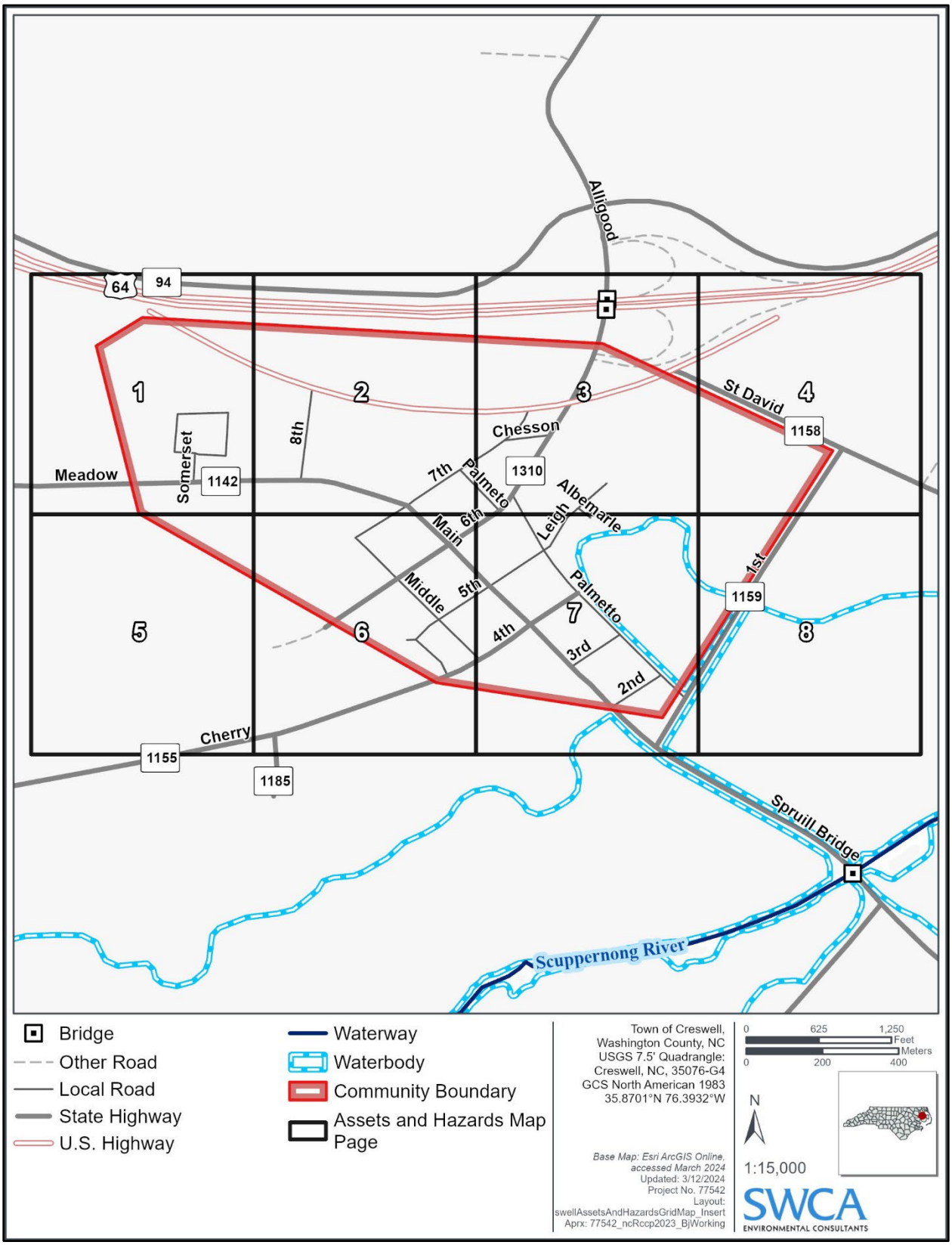


Figure E-1. Map tile overview for maps showing details of assets and hazards.

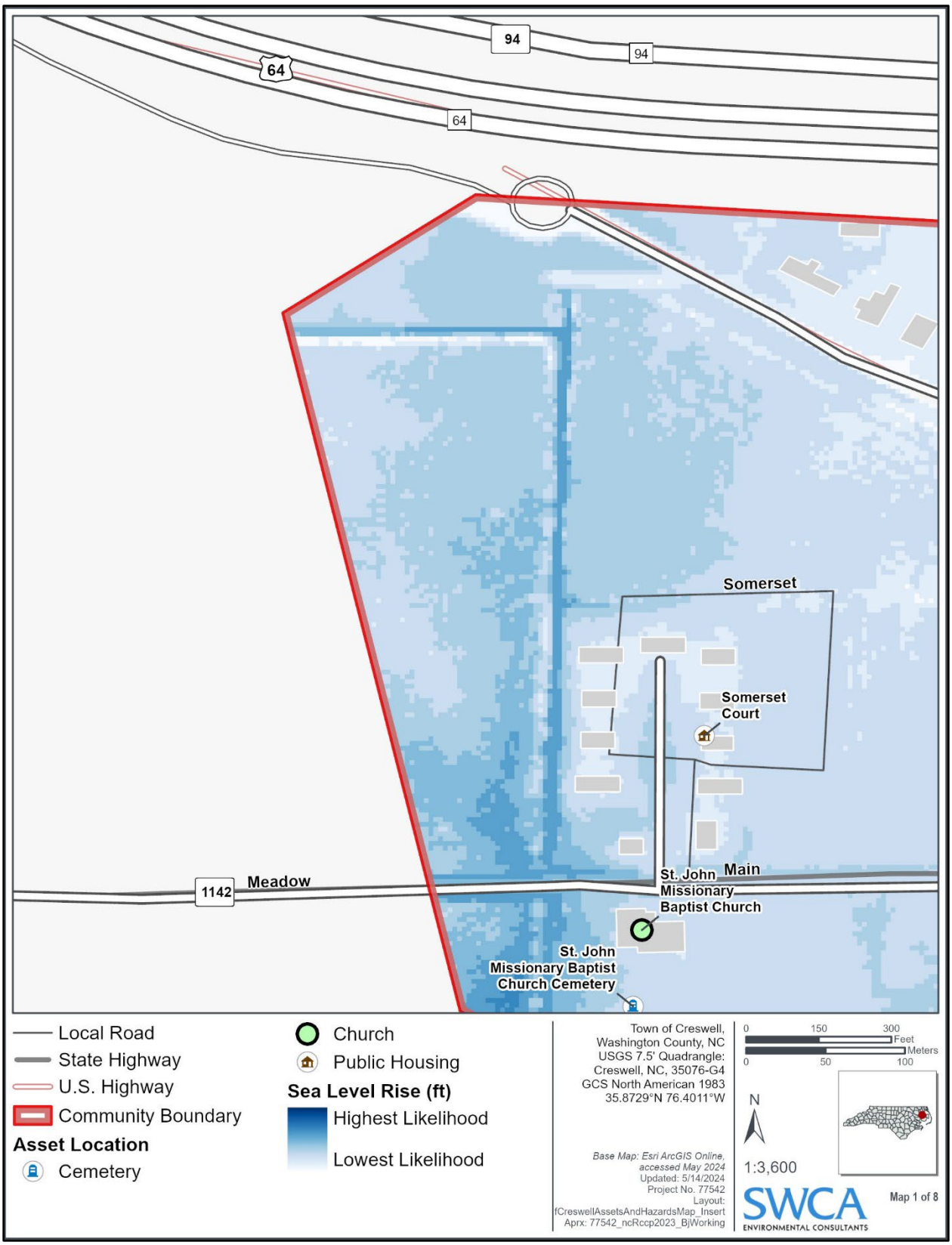


Figure E-2. Detail map 1 showing assets and hazards.

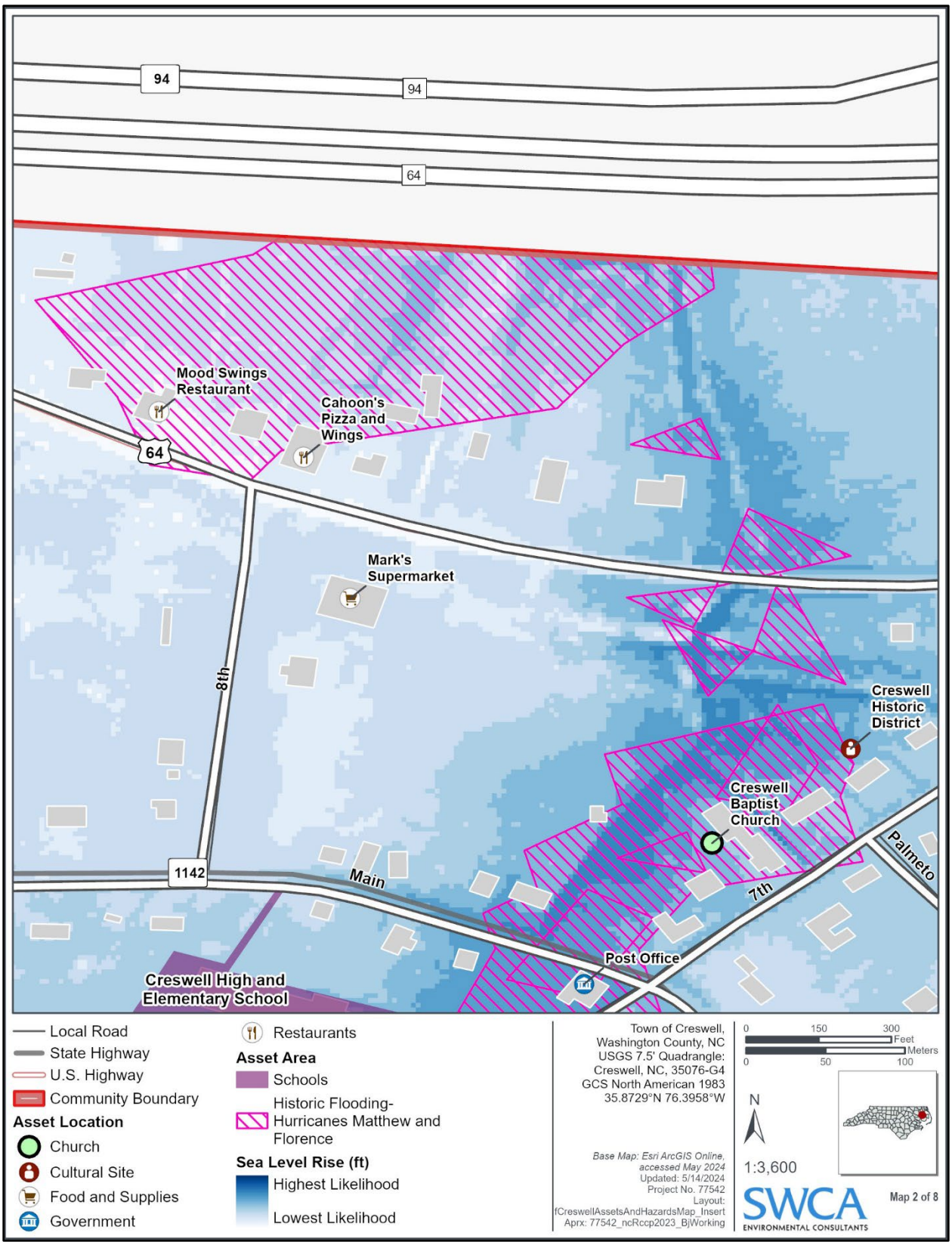


Figure E-3. Detail map 2 of assets and hazards.

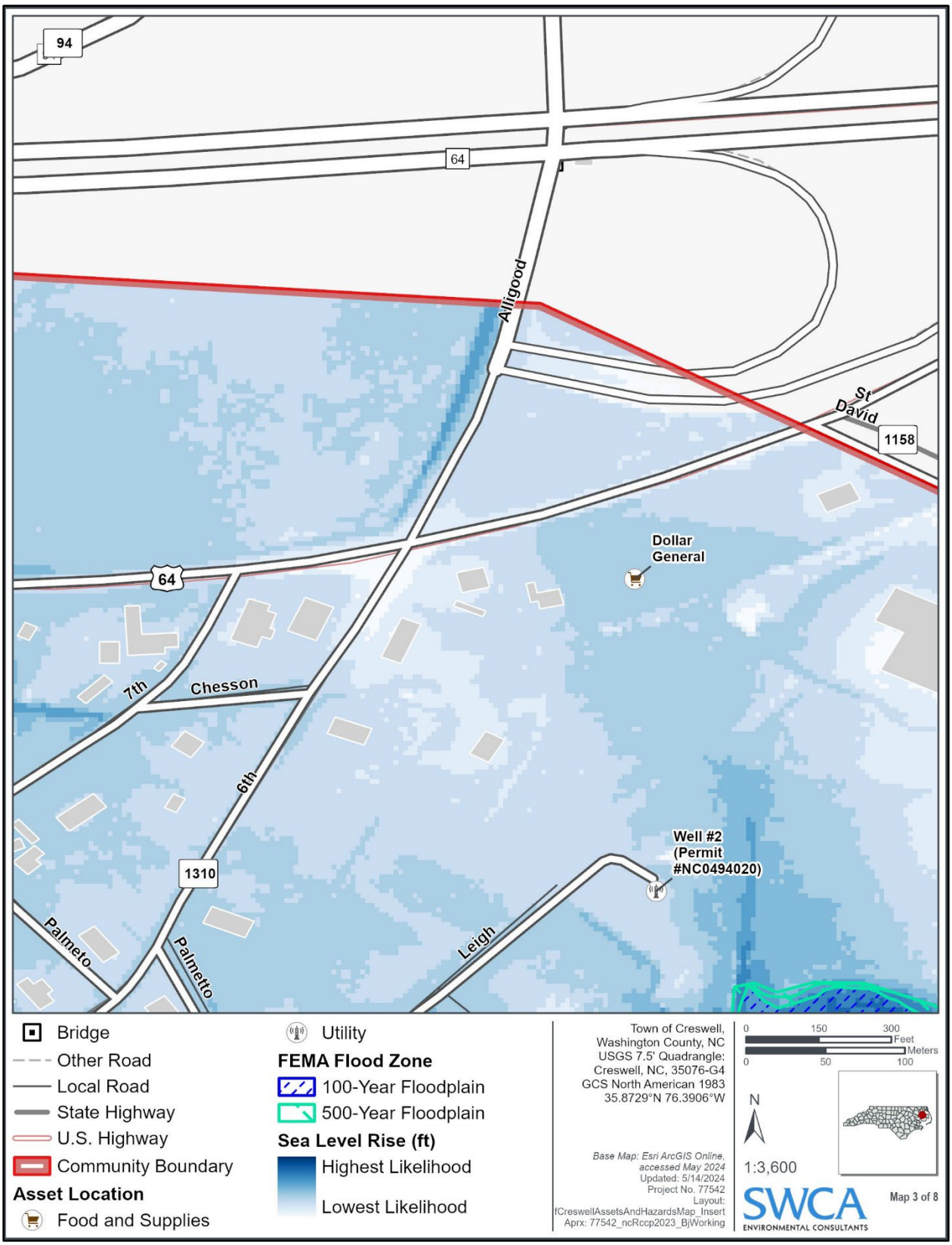


Figure E-4. Detail map 3 of assets and hazards.

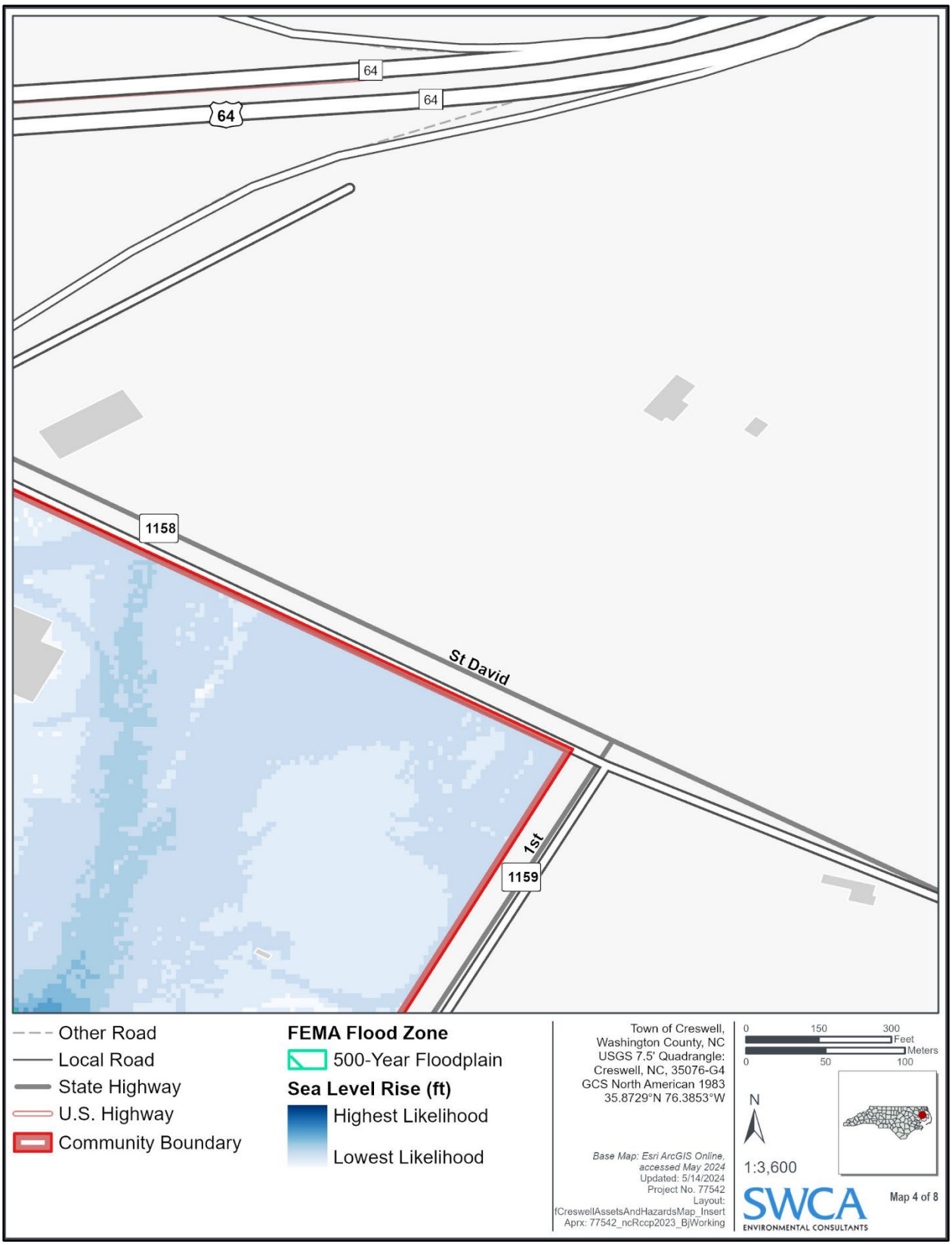


Figure E-5. Detail map 4 of assets and hazards.

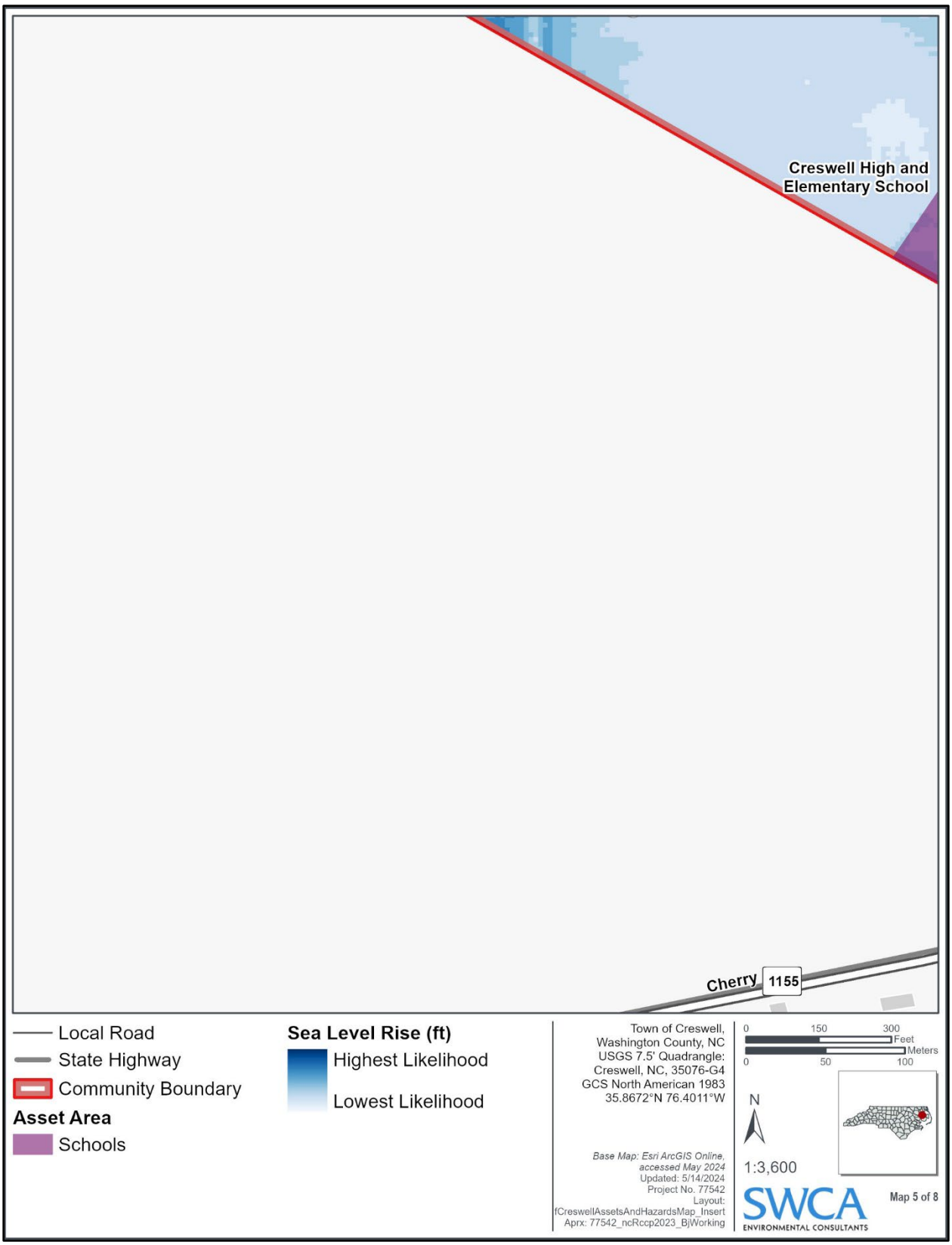


Figure E-6. Detail map 5 of assets and hazards.

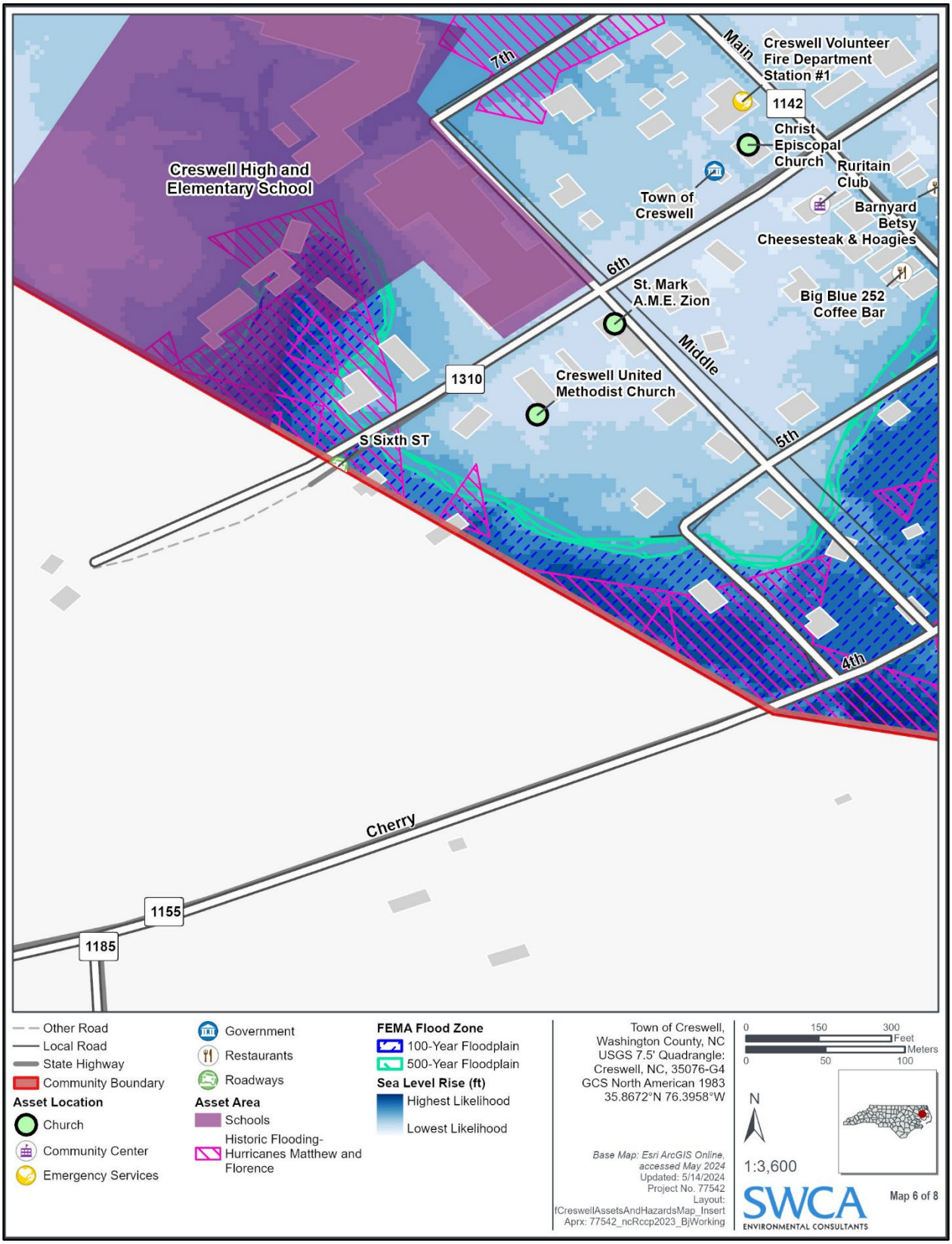


Figure E-7. Detail map 6 of assets and hazards.

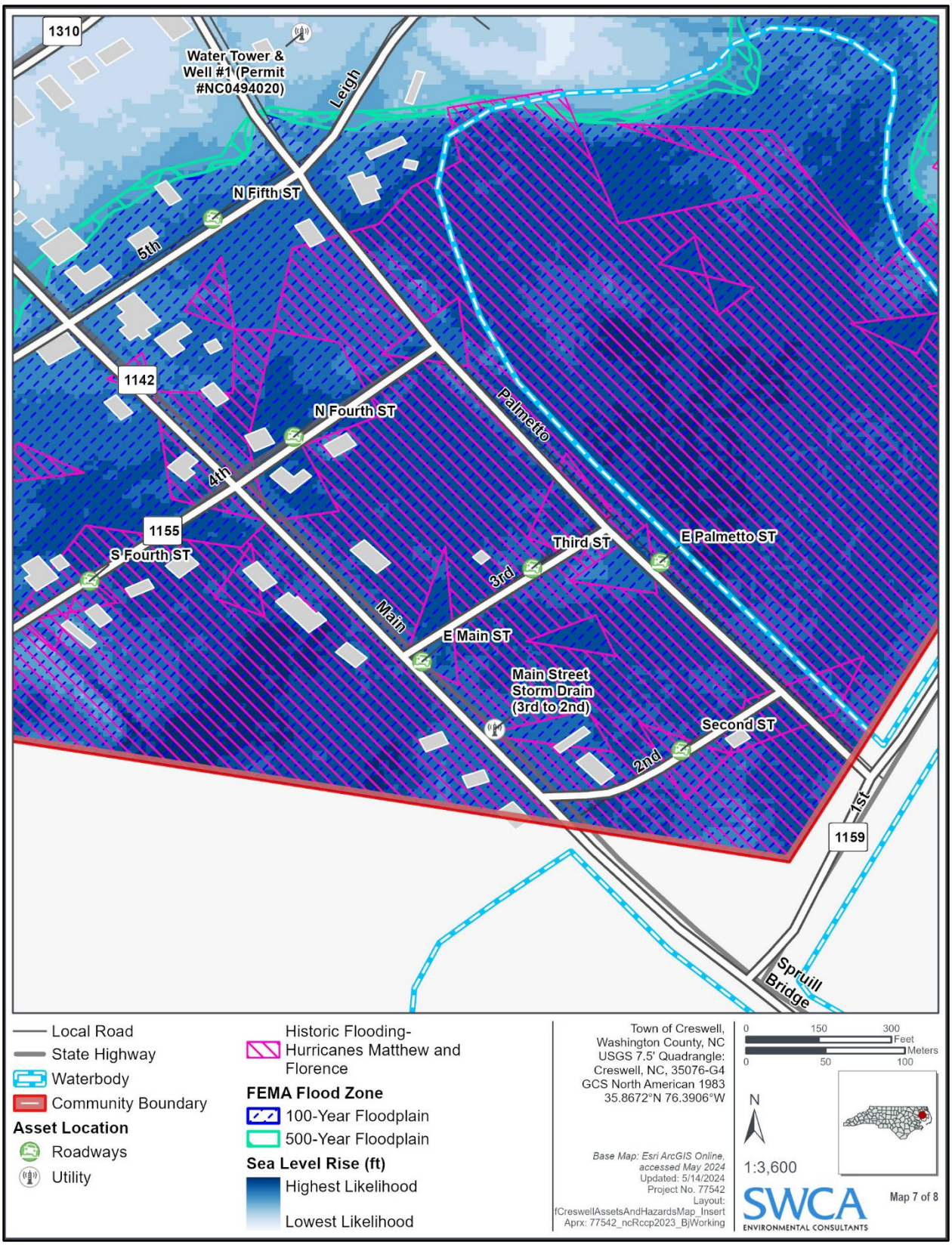


Figure E-8. Detail map 7 of assets and hazards.

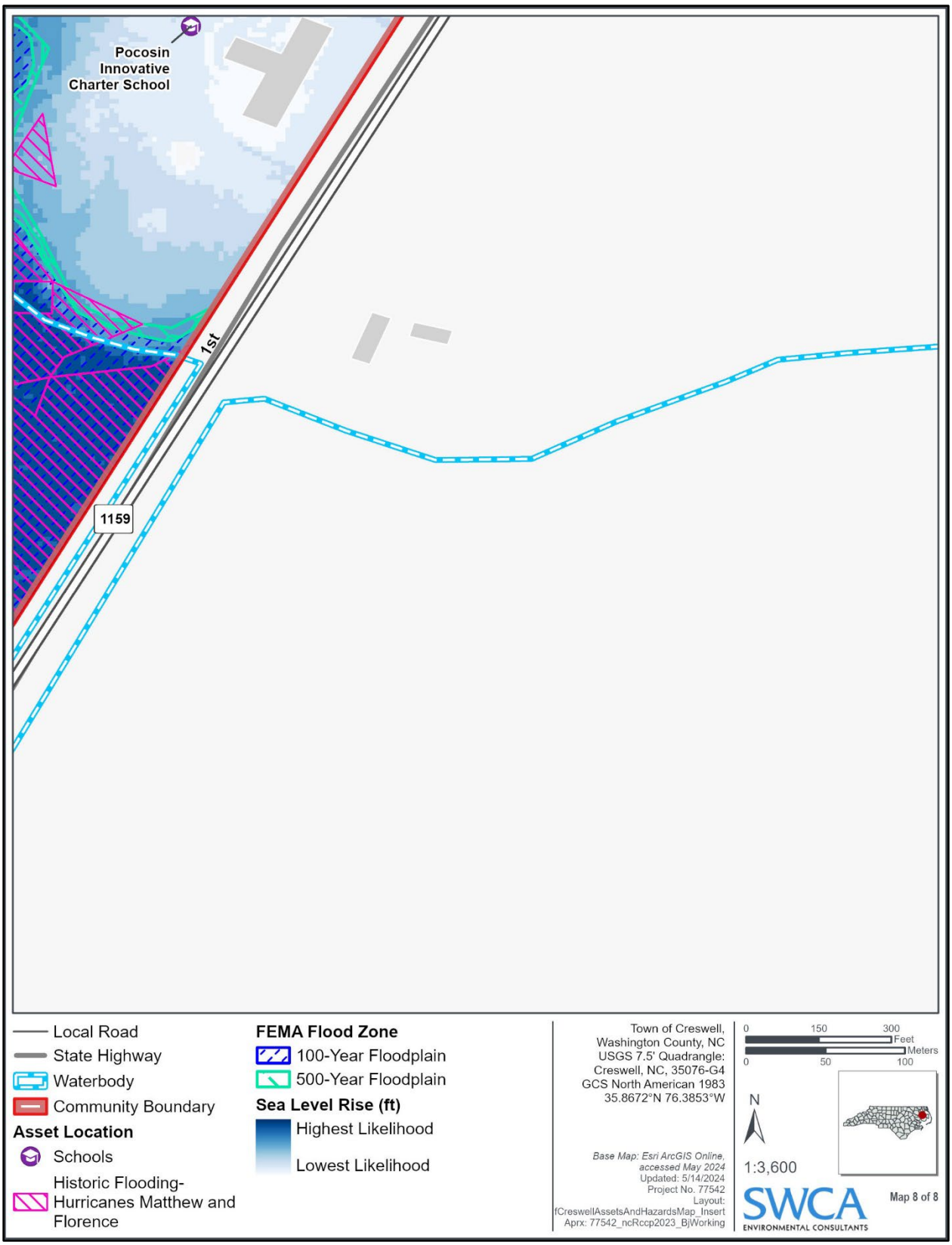


Figure E-9. Detail map 8 of assets and hazards.