2015

CITY OF TUSCALOOSA

Floodplain Management Plan

Tuscaloosa, Alabama

Prepared under the direction of the
City of Tuscaloosa Floodplain Management Planning Committee

With the support of the City of Tuscaloosa

Office of the City Engineer

By:

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URBAN AND ENVIRONMENTAL PLANNING

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April 12, 2016

2015 City of Tuscaloosa Floodplain Management Plan

City of Tuscaloosa Floodplain Management Planning Committee

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Public Representatives:		
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Abner Patton, PG	President	Patton Geologics, Inc.
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Mary Wallace Pitts	Instructor	University of Alabama
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Rick Deerman, PE, CFM	Civil Engineer	CFM Group

Other Participating Stakeholders

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John Powell Webb, PE, CFM	Assistant City Engineer	City of Northport
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April 12, 2016

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Chapter 1 – Introduction

1.1 Background

On December 13, 1819 Tuscaloosa (the town) was incorporated, exactly one day prior to Congress admitting the State of Alabama to the Union. It is located in West Alabama on the Black Warrior River and comprises 70.3 total square miles. Approximately 46% of the County's population resides in the City of Tuscaloosa, representing 96,122 people (U.S. Census Bureau, 2014 estimate). Preserving natural areas and improving access to recreation is a primary focus for the City and one that can be addressed through the development of this plan.

The National Flood Insurance Program (NFIP) maintains Flood Insurance Studies for Tuscaloosa County with detailed flood data and publishes Flood Insurance Rate Maps (FIRMs) that identify areas prone to flooding. These tools form the basis for the City's participation in the National Flood Insurance Program (NFIP). The City of Tuscaloosa has various water features, three of which have been mapped through the NFIP: Cribbs Mill Creek Tributary 1, 3, & 7; Moody Swamp Tributary 3; Rum Creek, Cypress Creek, and the Black Warrior River.

According to FEMA's most recent Flood Insurance Study (FIS) effective 1/16/2014 (FIS) most flooding in the City of Tuscaloosa occurs during the late summer or early fall, in conjunction with severe storms. Many streets and residential areas are inundated by flooding from Cribbs Mill Creek. The FIS for Tuscaloosa County indicates that a major flooding problem occurs "along the small streams, especially in the urban areas…channels and culvert entrances being obstructed by logs and debris jams during flooding, causing higher than usual elevations" (FIS, p. 14). In addition, "areas near McFarland Boulevard, Hackberry Lane, and the University of Alabama in the City of Tuscaloosa have experienced several severe floods in the past twenty years, including 1996, 1997, 1998, 2000, 2002, 2003, 2005, 2009, 2010, and 2011" (FIS, p. 15).

At a minimum, the NFIP requires adoption and enforcement of an approved flood hazard prevention ordinance to regulate building and development of mapped flood zones. The City of Tuscaloosa has participated in the NFIP since 1973, which entitles homeowners, renters, and businesses to purchase affordable flood insurance. NFIP-backed insurance is available to all properties, not just those located in flood zones.

The City applied for participation in the NFIP's Community Rating System Program ("CRS") as this plan was being prepared. Their participation will be effective May 1, 2016. The CRS is an incentive program whereby policy holders within a

participating jurisdiction receive reduced flood insurance rates. A community receives credits for its proactive flood hazard mitigation activities that exceed the NFIP minimum participation requirements: the more CRS credits, the higher the CRS Class.

One primary mechanism by which Tuscaloosa can receive CRS credits is through the development and implementation of this 2015 City of Tuscaloosa Floodplain Management Plan ("FMP"), which serves as a road map for improving the City's NFIP participation. The preparation of this Plan has been made possible by a FEMA Flood Mitigation Assistance (FMA) grant awarded to the City in October of 2014.

1.2 Purpose of Plan

Through a careful and inclusive planning process, the FMP will demonstrate the following benefits:

- Identify existing and future flood-related hazards and their causes;
- Ensure that a comprehensive review of all activities and mitigation measures is conducted so that the most appropriate solutions will be implemented to address the hazard;
- Ensure that the recommended activities meet the goals and objectives of the community, are in coordination with land use and comprehensive planning, do not create conflicts with other activities, and are coordinated so that the costs of implementing individual activities are reduced;
- Ensure that the criteria used in community land use and development programs account for the hazards faced by existing and new development;
- Educate residents and property owners about the hazards, loss reduction measures, and the natural and beneficial functions of floodplains;
- Build public and political support for activities and projects that prevent new problems, reduce losses, and protect the natural and beneficial functions of floodplains; and
- Build a constituency that wants to see the plan's recommendations implemented.

Chapters 3 through 6 in this Plan follow a four-phase planning approach -: I) The Planning Process, II) Risk Assessment, III) Mitigation Strategy, and IV) Plan Maintenance – and are further organized to address the ten CRS Planning Steps, as shown on the following table:

Table 1-1. Plan Organization and the CRS Planning Steps

FMP Chapters	CRS Planning Step
Chapter 1 – Introduction	
Chapter 2 – Community Profile	
Chapter 3 – The Planning Process	Step 1: Organize to prepare the plan Step 2: Involve the public Step 3: Coordinate
Chapter 4 – Risk Assessment	Step 4: Assess the hazard Step 5: Assess the problem
Chapter 5 – Mitigation Strategy	Step 6: Set goals Step 7: Review possible activities Step 8: Draft an action plan
Chapter 6 – Plan Maintenance	Step 9: Adopt the plan Step 10: Implement, evaluate, revise

1.3 CRS Program

The CRS Program is a voluntary incentive program that provides reduced flood insurance premiums to policyholders in a participating jurisdiction. The three primary goals of the CRS program are:

1. Reduce flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP; and
3. Encourage a comprehensive approach to floodplain management.

The CRS program credits floodplain management practices that go above and beyond the minimum requirements of regulating construction in designated flood zones. CRS credits are issued to communities who develop ways in which flooding threats can be reduced or minimized to existing construction, elevate new buildings above the minimum levels, protect non-NFIP mapped areas, and help insurance agents and community members with flood insurance issues, among other creditable mitigation activities.

CRS Communities can be included as one of the ten possible CRS Classes, with Class 1 receiving the most credits and providing the largest flood insurance premium reduction of 45% and Class 9 with a 5% reduction. Class 10 means the community does not participate in the CRS or has not earned the minimum required points. The CRS classes are based on completion of 19 activities organized into four categories: 1) Public Information; 2) Mapping and Regulations; 3) Flood Damage reduction; and 4) Warning and Response. The City of Tuscaloosa is a participant in the CRS program, effective May 1, 2016.

Chapter 2 – Community Profile

2.1 History and Geographic Setting

Source: blackwarriorriver.org

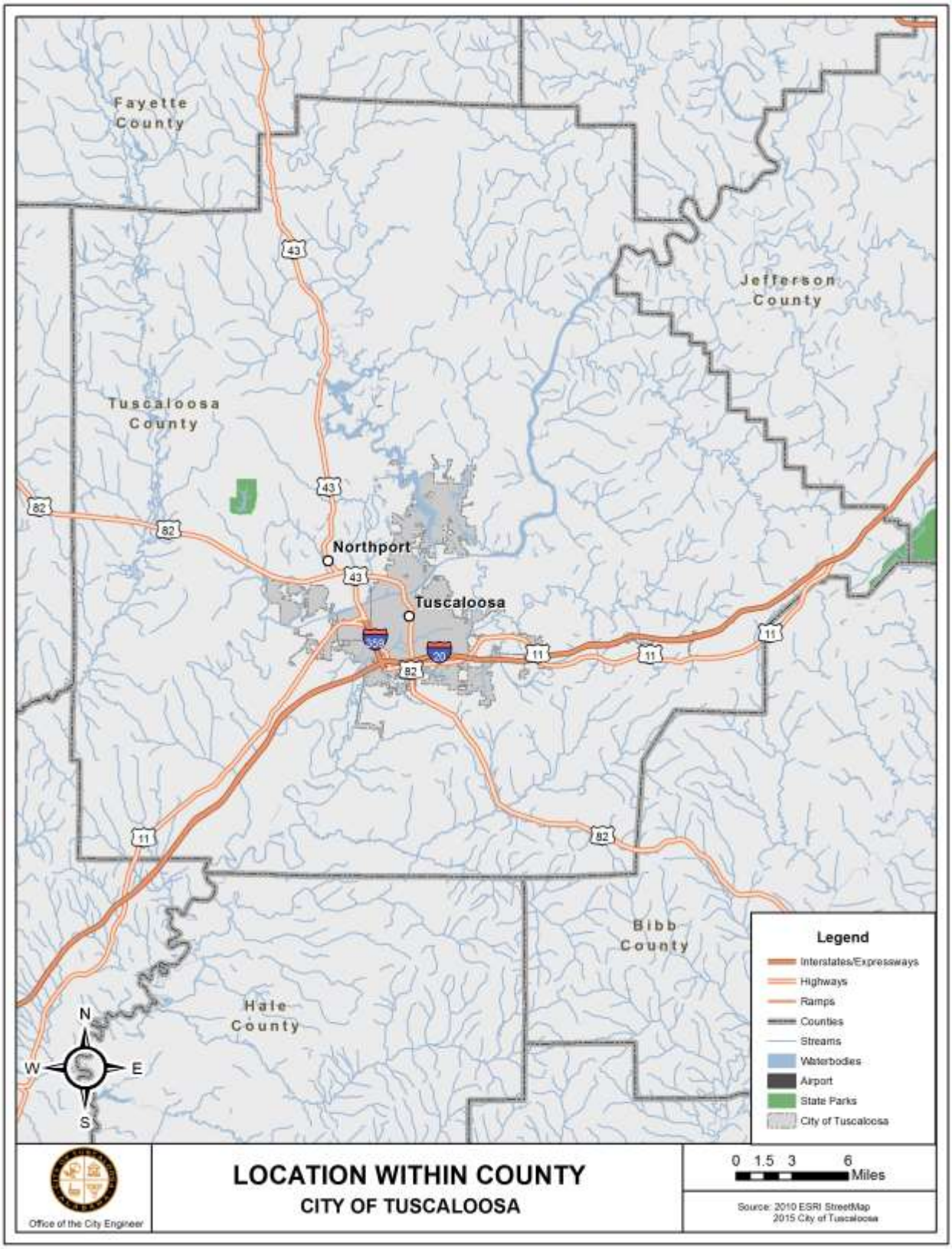
Founded at the northernmost location on the Black Warrior River, the City of Tuscaloosa is the largest city in Tuscaloosa County (fifth largest city in the state) with a population of 96,122 people (U.S. Census Bureau, 2014 estimate) and comprising 70.3 total square miles. Founded in 1819, the city was named after the legendary "Black Warrior," Native American chief who battled and was defeated by Hernando de Soto. The settlers named the place Tuscaloosa (from the Choctaw words "tushka" meaning warrior and "lusa" meaning black). The county seat originated in the town of Tuscaloosa in 1819, moved to New Town in 1822, and then back to Tuscaloosa not long after that. Tuscaloosa was Alabama's capital from 1826 to 1846, a time where New Town was made a part of Tuscaloosa. A tornado, during the 1840s, destroyed much of the original architecture in the area.

The location of the city on the Black Warrior River was chosen due to navigability for riverboats, which made it an important port in the early 1800's. Much of the population of west Alabama, in the 1800s, has relied on the river for employment purposes. Today, several industries benefit from the river, including Westervelt, Hunt Refining-Crude Oil and Refined Petroleum Products, Drummond Coal, Jim Walter Resources, and Nucor Steel.

Tuscaloosa is home to the University of Alabama, a world-renowned educational institution. Shelton State Community College and Stillman College are also located in the city. Tuscaloosa is also home to Mercedes-Benz U.S. International, Bama Theatre, various parks, Alabama Museum of Natural History, Children's Hands-On Museum, and many other cultural and entertainment venues. Maps 2-1 and 2-2 show the City's location within the state and within Tuscaloosa County.

Map 2-1. Location within State

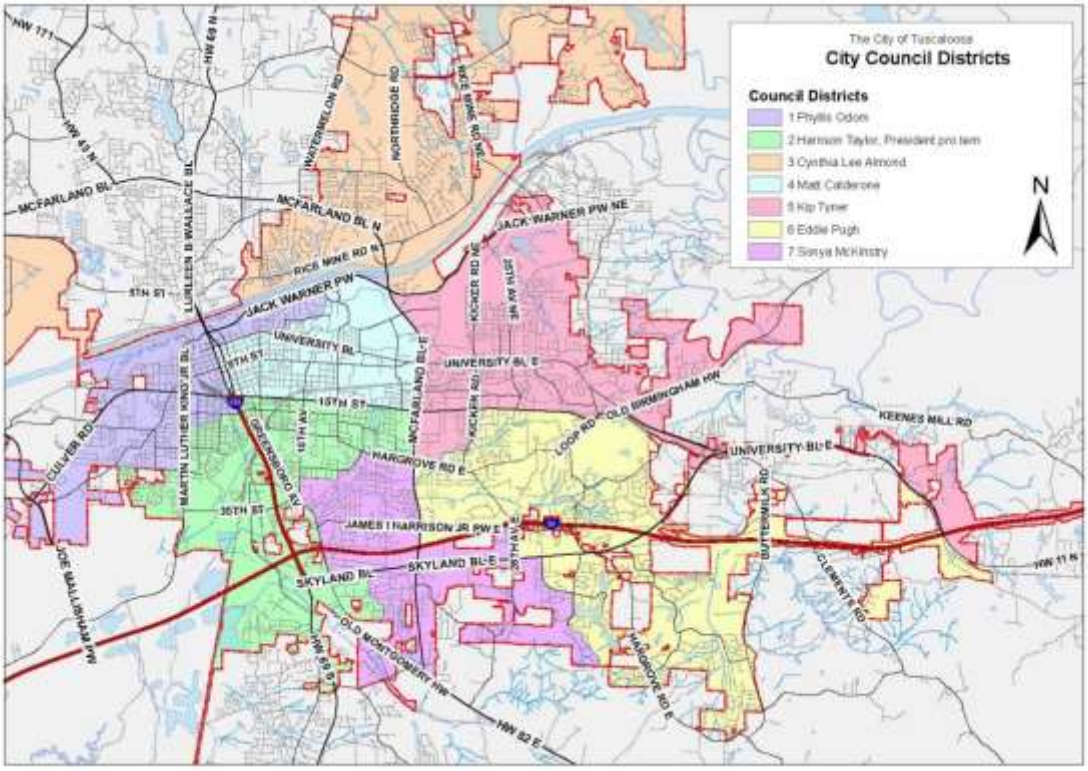
Map 2-2. Location within County



2.2 Government

The City of Tuscaloosa is the county seat and is governed by a mayor-council form of government. Seven council representatives are elected by district. In addition, city council committees assist in policy decision-making and legislative functions of the council. The city council meets regularly every Tuesday at 6:00 pm in the Council Chambers. Council committees meet Tuesday afternoons, beginning at 1:30 pm in various locations in City Hall. The map below shows the geographic boundaries of the city council districts.

Map 2-3. City of Tuscaloosa Council Districts

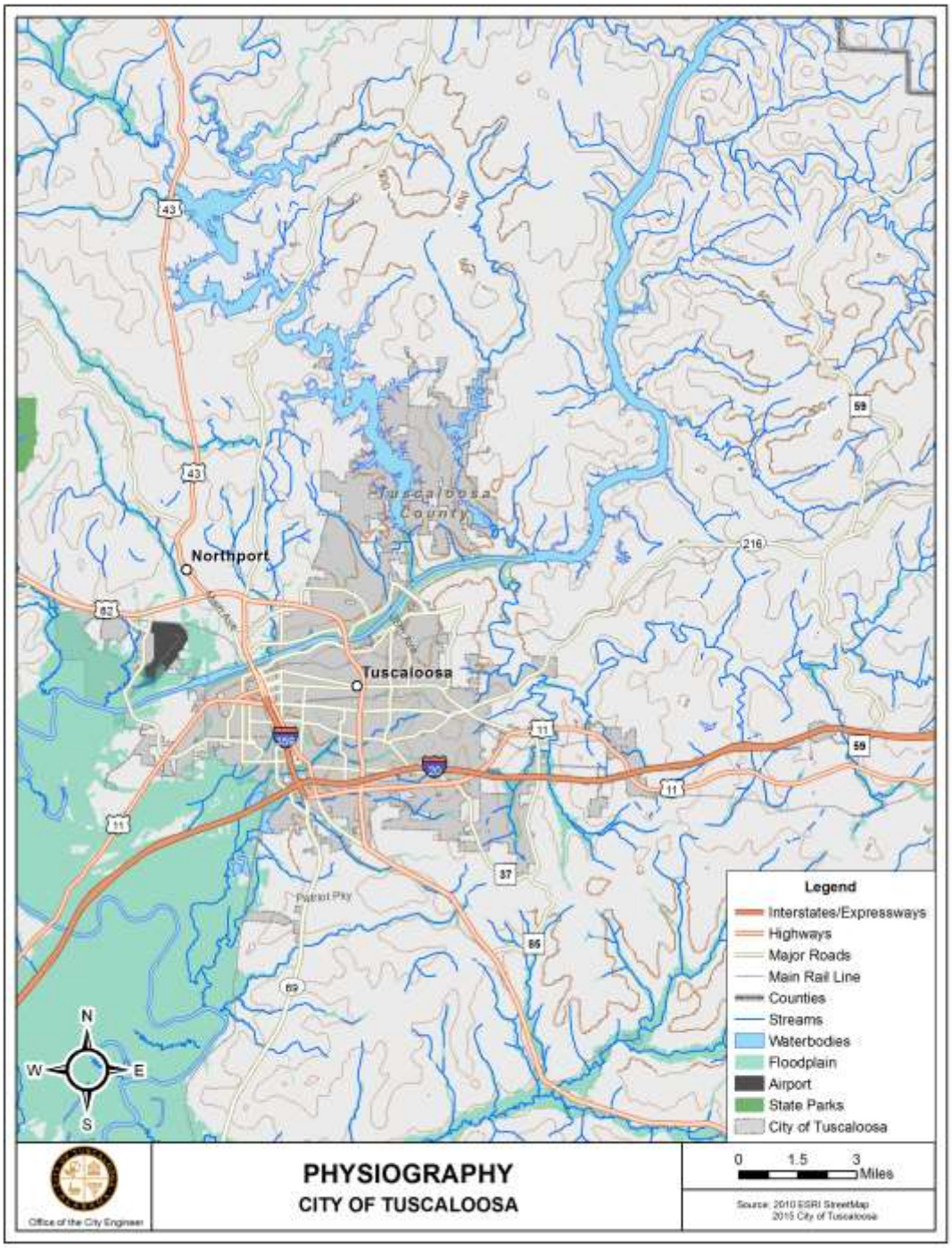


2.3 Physical Features

The City of Tuscaloosa encompasses a total of 70.3 square miles, of which 60.2 square miles is land. Lake Tuscaloosa and the Black Warrior River comprise the remaining 10.1 square miles of water. The City lies on the Black Warrior River, which is about 120 miles upriver from where it meets up with the Tombigbee River in Demopolis. The Black Warrior River's watershed covers 6,276 square miles in Alabama and contains approximately 16,146 miles of streams. In Tuscaloosa, "the river flows out of the rocky Cumberland Plateau and enters the sandy East Gulf Coastal Plain" (blackwarriorriver.org). The City is located on the boundary between the Appalachian Highland and Gulf Coastal Plain, indicating that the city's geography varies from marshy,

low-lying plains in the southwest to forested hills in the northeast. Map 2-4 "Physiography" shows the major physiographic features in the city, including waterbodies, floodplain, streams, and nearby state parks.

Map 2-4. Physiography



2.4 Climate

Tuscaloosa's climate is humid with warm summers and mild winters. Precipitation is likely during the spring, summer, and fall seasons. The average annual rainfall is approximately 53 inches. The mean temperature is 46.4 degrees Fahrenheit in the winter and 80.4 degrees Fahrenheit in the summer. Severe thunderstorms are relatively common and damaging tornadoes are possible. Tuscaloosa bore witness to the devastating tornadoes on April 27, 2011, whereby 44 people died and over 1,500 injuries were sustained. Table 2-1 depicts weather observations for the City of Tuscaloosa.

Table 2-1. Weather Observations

Category	Observation
Average Winter Temperature	46.4 °F
Average Winter Minimum Temperature	35.6 °F
Lowest Temperature (January 19, 1977)	-1 °F
Average Summer Temperature	80.4 °F
Average Summer Maximum Temperature	91.2 °F
Highest Temperature (July 24, 1952)	107 °F
Average Annual Precipitation	53.3 in
Heaviest One-Day Rainfall (September 5, 2011)	7.3 in
Average Season Snowfall	0.5 in

Source: SE Regional Climate Center, 2012

2.5 Demographics

Population Growth and Density

The City of Tuscaloosa has experienced an increase in population over the last decade (2000 to 2010). In 2010, the population of the County was 90,468, a 16% increase over the 2000 level of 77,906. Table 2-2 portrays population data for the City of Tuscaloosa in comparison to the City of Northport, Tuscaloosa County, and the State of Alabama. Even though the City of Tuscaloosa has experienced an increase in population, the City of Northport and Tuscaloosa County's population increase is greater, at 20% and 18%, respectively.

A 2014 population estimate of 96,122 shows a 6.2% increase in population from the 2010 Census count. Table 2-2 also shows population estimates for Northport, Tuscaloosa County, Baldwin County, Shelby County, and the State of Alabama. While Tuscaloosa County's growth is not as fast-paced as Shelby and Baldwin Counties, growth in the City of Tuscaloosa and the City of Northport is comparable (2010 to 2014).

Moreover, population projections from the Alabama State Data Center indicate that by the year 2030 Tuscaloosa County's population will increase by 16% (from 2014 population estimate). The Chamber of Commerce of West Alabama indicates that the city's population will increase to 105,494 by 2016, a 16.7% increase from 2010.

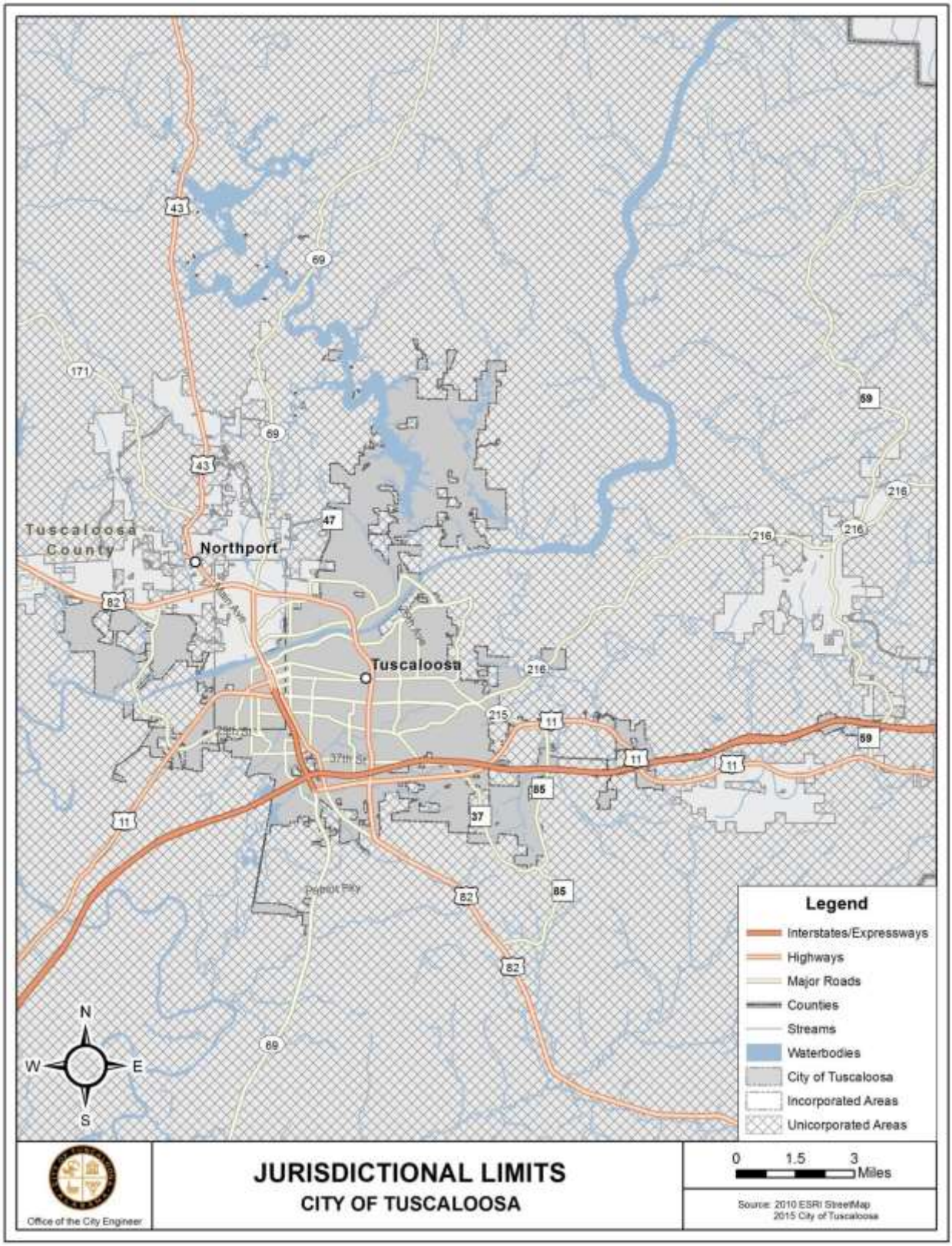
Table 2-2. Population Change, 2000 - 2014

Jurisdiction	2000	2010	Number Change	Percent Change	2014	Number Change	Percent Change
City of Tuscaloosa	77,906	90,468	12,562	16.1%	96,122	5,654	6.2%
City of Northport	19,435	23,330	3,895	20.0%	24,709	1,379	5.9%
Tuscaloosa County	164,875	194,656	29,781	18.1%	202,212	7,556	3.9%
Baldwin County	140,415	182,265	41,850	29.8%	200,111	17,846	9.8%
Shelby County	143,293	195,085	51,792	36.1%	206,655	11,570	5.9%
State of Alabama	4,447,100	4,779,736	332,636	7.5%	4,849,377	69,641	1.5%

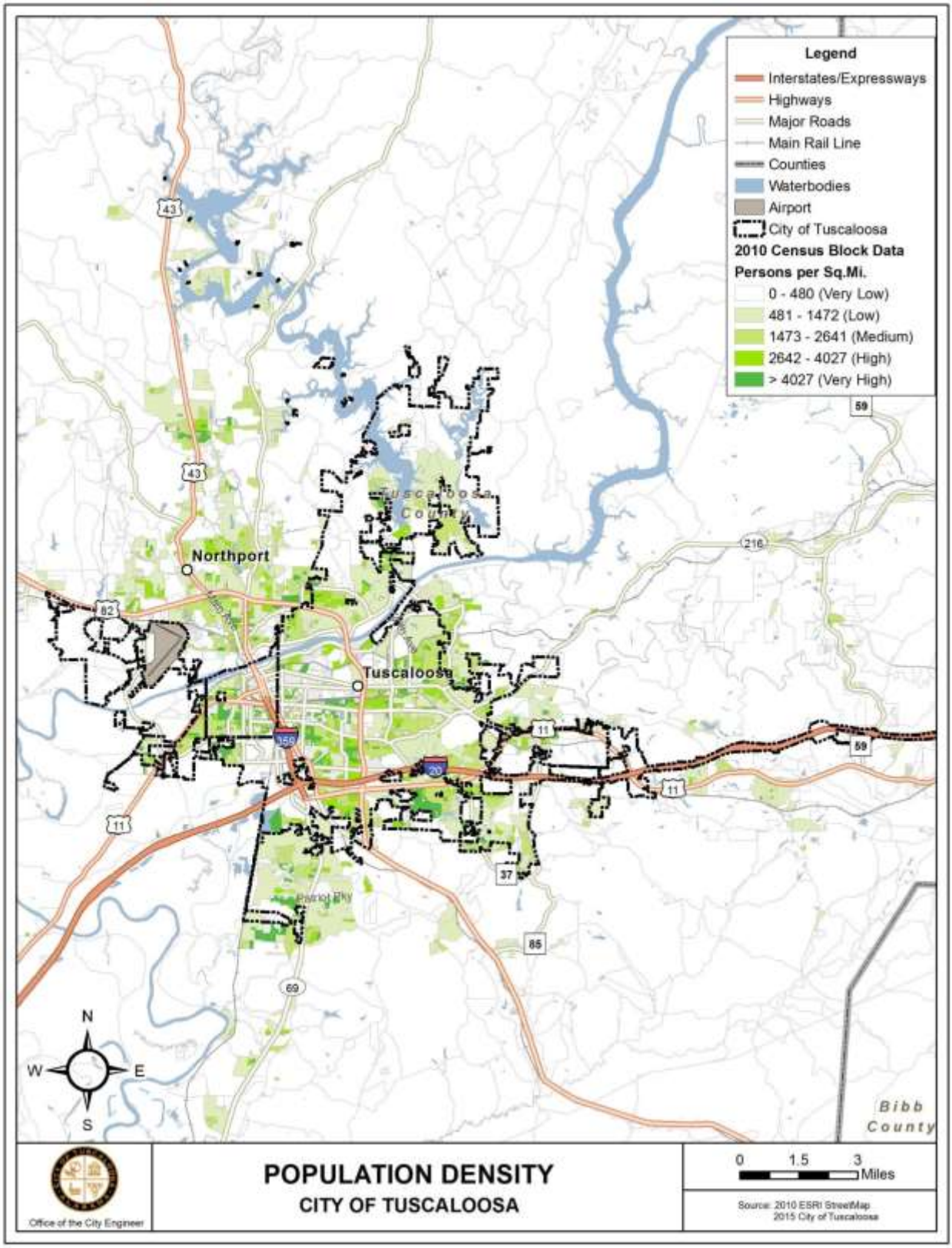
Source: U.S. Census Bureau, 2014

Map 2-5 "Jurisdictional Limits" highlights the study area in comparison to neighboring jurisdictions, such as Northport, as well as incorporated and unincorporated parts of Tuscaloosa County. Map 2-6 portrays population density for the City of Tuscaloosa (2010 U.S. Census block group) and neighboring jurisdictions. Higher density concentrations are dispersed throughout the city.

Map 2-5. Jurisdictional Limits



Map 2-6. Population Density



2.6 Economy

Business and Industry

Primary sources of employment in the City of Tuscaloosa include education, healthcare, and government. The University of Alabama is the largest employer in the City and in the region, with 10,722 employees. DCH Medical Center ranks second in number of employees, at 3,481. Aside from boards of education and governmental agencies, the City hosts manufacturing companies, such as The Westervelt Company, Phifer Wire Products, and McAbee Construction. Despite significant storm damage from the April 27, 2011 tornado, the City is rebuilding its major retail corridor, with more than $160 million in private investment and 400,000 square feet of new retail planned (The Chamber of Commerce of West Alabama).

Major employers in the City of Tuscaloosa, with 450 employees or more, are depicted in Table 2-3.

Table 2-3. Major Employers, City of Tuscaloosa

Company	Address	# of Employees	Industry
University Of Alabama	801 Campus Dr	10,722	Educational Services
DCH Regional Medical Center	809 University Blvd E	3,481	Health Services
Mercedes-Benz U.S. International	1 Mercedes Dr	3,400	All Activity Vehicles
The Westervelt Company	1400 Jack Warner Pkwy NE	2,780	Allied and Paper Products
Tuscaloosa County Board of Education	2314 9th St	2,034	Educational Services
Tuscaloosa City Board of Education	1210 21st Ave	1,370	Educational Services
City of Tuscaloosa	2201 University Blvd	1,366	Legislative, Executive and General Government other than Finance
Phifer Wire Products Inc.	4400 Kauloosa Ave	1,231	Fabricated Metal Products other than Transport and Machinery Equipment
US Veterans Medical Center	3701 Loop Rd	1,080	Health Services
Shelton State Community College	9500 Old Greensboro Rd	700	Educational Services
McAbee Construction, Inc.	5724 21st St	589	Fabricated Metal Products other than Transport and Machinery Equipment
Peco Foods	1020 Lurleen B Wallace Blvd N	541	Agricultural Production - Animal and Livestock Specialties
Tuscaloosa County	714 Greensboro Ave	515	Legislative, Executive and General Government other than Finance
Bryce Hospital	200 University Blvd	477	Health Services

Source: The Chamber of Commerce of West Alabama, 2014; Tuscaloosa County Industrial Development Authority, 2014

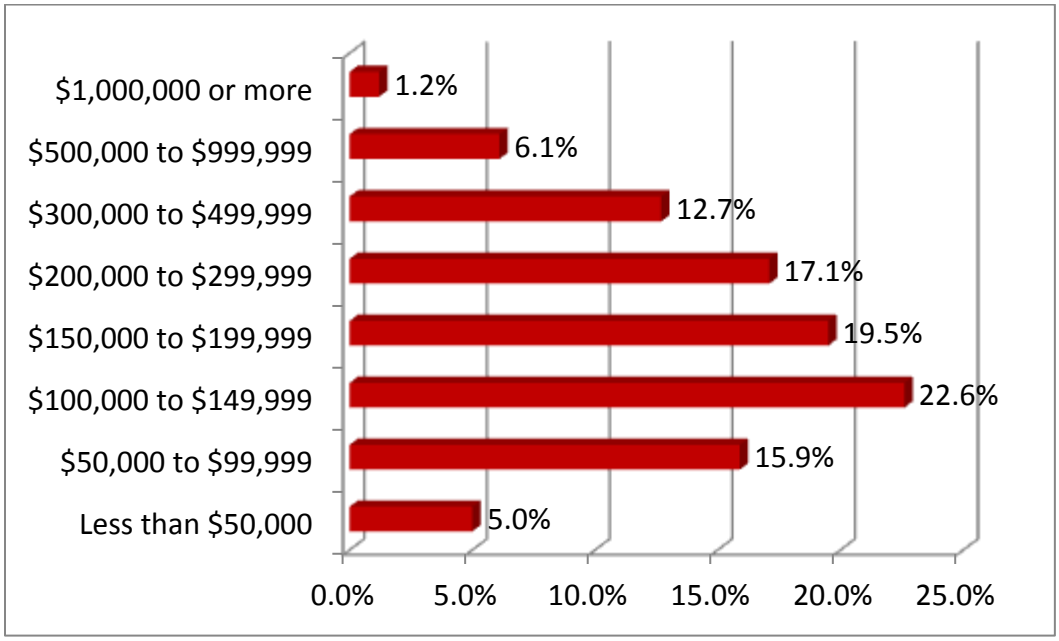
Income and Housing

Median household income for City of Tuscaloosa is $38,519, which is approximately $6,900 less than that of the County (2009-2013 American Community Survey 5-year estimates). The City has a significant percentage of families living below the poverty line, at 26.3%, also greater than the County's rate of 18.9%.

Approximately 43,468 housing units exist in Tuscaloosa. The majority of owner-occupied housing values fall within the $100,000 to $149,999 range, at 22.6%. About 20% of housing units are valued between $150,000 and $199,999, while 37.1% are valued at $200,000 or greater (see Chart 2-1). The median value for a home in Tuscaloosa is $163,500.

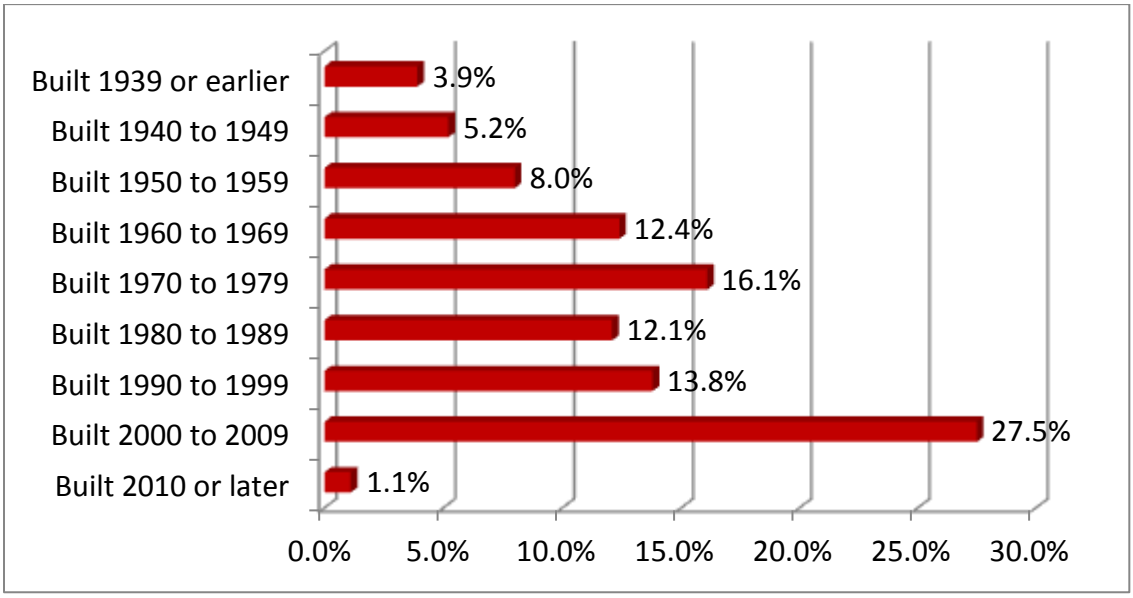
Chart 2-2 "Housing Stock by Age" shows that the majority of housing in Tuscaloosa was constructed between 2000 and 2009, comprising 27.5% of the total housing stock. The city has an almost equal representation of housing built from 1960 to 1969 (12.4%); 1970 to 1979 (16.1%); 1980 to 1989 (12.1%); and 1990 to 1999 (13.8%).

Chart 2-1. Housing Units by Value



Source: U.S. Census Bureau, 2009-2013 American Community Survey 5-year Estimates

Chart 2-2. Housing Stock by Age



Source: U.S. Census Bureau, 2009-2013 American Community Survey 5-year Estimates

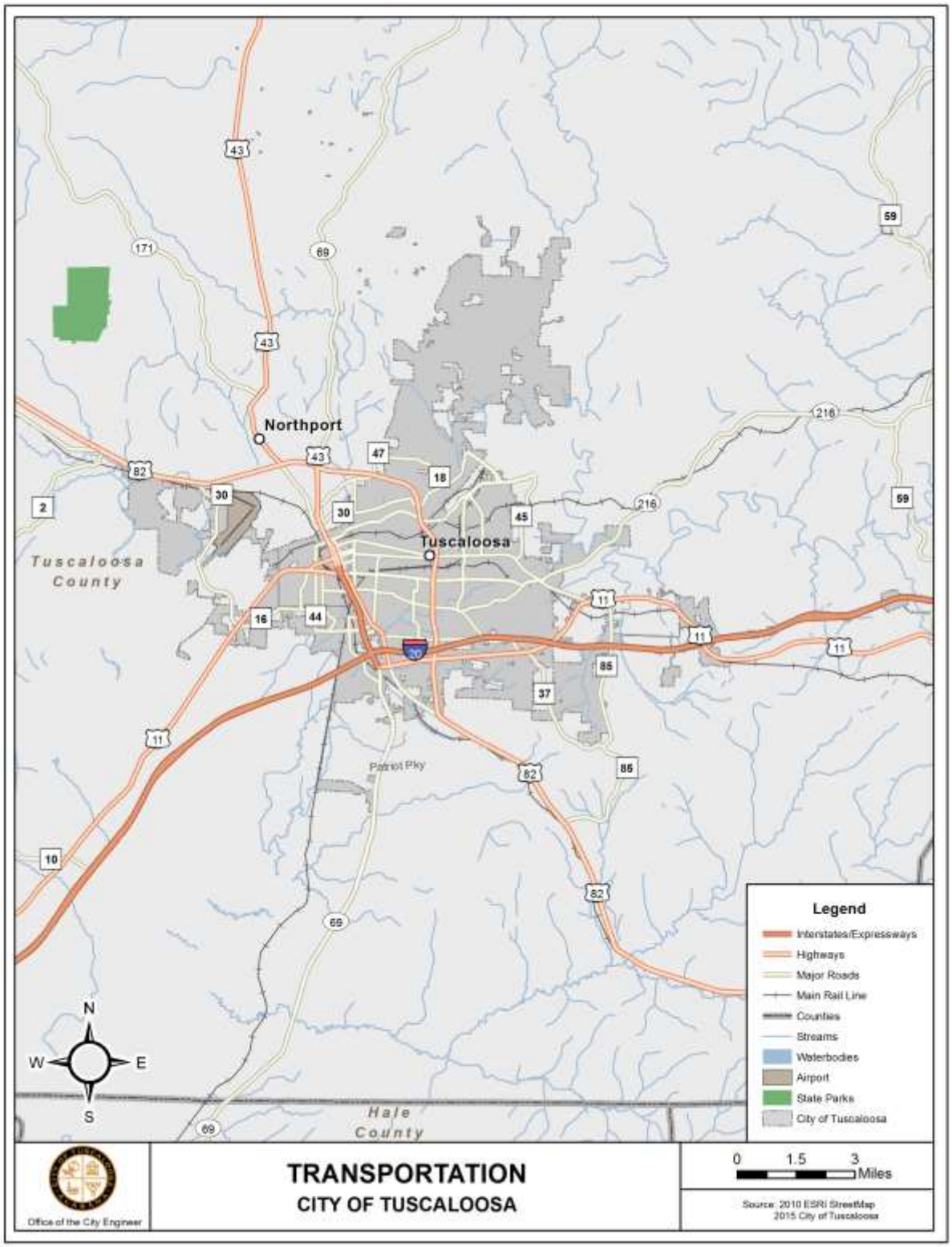
2.7 Transportation

The City of Tuscaloosa is served by Interstate 20/59, extending from the northeast to southwest and U.S. Highways 11, 43, and 82, which are being upgraded. And several state highways run through various parts of the City (facilities shown on Map 2-7). Rail service is provided by Kansas City Southern and Norfolk Southern. Amtrak provides passenger service on the Crescent Route – linking New York City to New Orleans.

The Tuscaloosa Municipal Airport, Van deGraaff Field, is the largest airport in the county with a 6,500-foot runway. The airport, located 3.5 miles northwest of the City's center, handles air freight and private air traffic. Commercial air service is provided in the nearby city of Birmingham. Transit service is provided by the Tuscaloosa Trolley (a scheduled bus passenger service), Crimson Ride (local bus service for UA students), Greyhound, and charter buses.

The Black Warrior River is a major navigable waterway in Tuscaloosa supporting various industries. Westervelt located their first paper mill in Tuscaloosa because of the proximity to the river. Hunt Refining-Crude Oil and Refined Petroleum Products are shipped via the river. Likewise, Drummond Coal, Jim Walter Resources and smaller coal mines utilize the river to ship coal to power plants and overseas customers. Nucor Steel receives scrap metal and other steel components from suppliers and ships finished steel plate and coils via the river. Other industries that have utilized the river in the past include Central Foundry, Reichold Chemical Company, Southern Ionics, and Empire Coke Company.

Map 2-7. Transportation



Chapter 3 – Planning Process

3.1 Organization

The 2015 City of Tuscaloosa Floodplain Management Plan (FMP) was developed in accordance with the National Flood Insurance Program's Community Rating System CRS Coordinator's Manual (FEMA, FIA-15/2013), Activity 510 "Floodplain Management Planning." The corresponding FMP chapters for each of the 10 CRS Planning Steps are described in the table below. Supporting documentation, Appendices A – H, accompany the main document and are noted throughout.

Table 3-1. 10-Step Planning Process

FMP Chapters	CRS Planning Step
Chapter 1 – Introduction	
Chapter 2 – Community Profile	
Chapter 3 – The Planning Process	Step 1: Organize to prepare the plan Step 2: Involve the public Step 3: Coordinate
Chapter 4 – Risk Assessment	Step 4: Assess the hazard Step 5: Assess the problem
Chapter 5 – Mitigation Strategy	Step 6: Set goals Step 7: Review possible activities Step 8: Draft an action plan
Chapter 6 – Plan Maintenance	Step 9: Adopt the plan Step 10: Implement, evaluate, revise

Floodplain Management Planning Committee

Prior to beginning the plan drafting process, the Tuscaloosa City Council adopted Resolution A15-0583 on May 12, 2015, which created the City of Tuscaloosa Floodplain Management Planning Committee (FMPC). (A copy of this signed resolution is in Appendix A). The Council resolution appoints 14 members to oversee the preparation of this plan and its ongoing implementation and maintenance. Among the 14 members, appointments include the City's Floodplain Administrator who serves as Chairman, the CRS Coordinator, and the Deputy Director for Land Use Controls of the Department of

Planning and Development Services, who is actively involved in the floodplain management planning process.

The FMPC is comprised of seven members from various City departments that will be assigned lead responsibility for plan implementation. They have expertise in the following six categories of floodplain management activities:

1) Preventive measures (e.g., land use and development codes and ordinances);
2) Property protection (e.g., building elevation and floodproofing);
3) Natural resource protection;
4) Emergency services;
5) Structural flood control projects; and
6) Public information.

In addition to the City Department Representatives, the City Council has appointed seven Public Representatives to represent the following special areas of interest:

1) Civic group;
2) Business owner;
3) Environmental organization;
4) Academia;
5) Realtor;
6) Home builders; and
7) Local engineer.

Although not formally appointed to the FMPC membership by the Council resolution, several stakeholders were asked to participate in the drafting of this plan, including representatives from the Tuscaloosa County EMA, the neighboring City of Northport, and Tuscaloosa County.

Table 3-2 “Floodplain Management Planning Committee” on the following page shows the initial membership and stakeholders that participated in the drafting phase of this plan. Their meeting attendance is documented in Appendix E. In some circumstances, the appointed FMPC member may designate an alternative member to attend the FMPC meeting.

Table 3-2. City of Tuscaloosa Floodplain Management Committee

Members

City Department Representatives	*Floodplain Management Activity*	*Position*	*Department*
Josh Yates, CFM, Chair, Floodplain Admin.	Structural Flood Control Projects	Storm Drainage Engineer	City Engineer
Kevin Turner, CFM, CRS Coordinator	Natural Resource Protection	Engr. Environ. Compliance Coord.	City Engineer
Philip O'Leary, AICP	Preventive Measures	Deputy Director	Planning and Development Services
Deidre Stalnaker	Public Information	Public Relations Coordinator	Public Relations
Kip Tyner	Public Information	Councilor	City Council
John Brook	Emergency Services	Deputy Chief	Fire & Rescue Services
LaParry Howell	Property Protection	Director	Federal Programs

Public Representatives	*Interest*	*Position*	*Organization*
Joseph A. Robinson, PE	Civic Group	Retired Tuscaloosa City Engineer	City Resident
Abner Patton, PG	Business Owner	President	Patton Geologics, Inc.
Anne Wynn, GISP	Environmental Organization	GIS Specialist	Geologic Survey of Alabama
Mary Wallace Pitts	Academia	Instructor	University of Alabama
Brienna Bayles	Realtor	Real Estate Agent	Duckworth Morris
Brock Corder	Home Builders	Member	Homebuilders Association
Rick Deerman, PE, CFM	Local Engineer	Civil Engineer	CFM Group

Other Participating Stakeholders

Participant	*Area of Interest*	*Position*	*Organization*
Rob Robertson	Emergency Management	Director	Tuscaloosa County EMA
John Powell Webb, PE, CFM	Neighboring Municipality	Assistant City Engineer	City of Northport
Katherine Holloway, PE	Tuscaloosa County	Civil Engineer	Tuscaloosa County Public Works

The process began with step 1 of the 10 step CRS planning process, which was conducted through the organization of the FMPC. The FMPC met five times throughout the drafting phase of the plan. All meetings were held at the Daugherty Conference Room in City Hall at 10:30 a.m. At each meeting, committee members would review and discuss plan materials presented by the planning team. The materials covered all of the key steps of the floodplain management planning process, as described in Table 3-3 below. Although the FMPC met to review and plan for all chapters of the plan, it was especially important that the key steps of the planning process, Steps 4-8 were sufficiently discussed. The table below shows at which meetings each of the key steps were covered.

Table 3-3. Key Steps at FMPC Meetings

FMPC Meetings	Chapters Reviewed	CRS Key Planning Steps
1. Thursday, May 14, 2015	1. Introduction; 6. Plan Maintenance	
2. Wednesday, July 8, 2015	2. Community Profile; 4 Part I. Risk Assessment	Step 4. Assess the hazard; Step 5. Assess the problem
3. Wednesday, September 16, 2015	4 Part II. Risk Assessment	Step 4. Assess the hazard; Step 5. Assess the problem
4. Wednesday, November 18, 2015	5 Part I. Mitigation Strategy	Step 6. Set goals; Step 7. Review possible activities
5. Tuesday, January 19, 2016	5 Part II. Mitigation Strategy; 3. Planning Process	Step 8. Draft an action plan

Meeting materials, including agendas, slide presentations, committee exercises, and supplemental information were made available to FMPC members and the general public via the project website. Appendix E includes meeting agendas and sign in sheets.

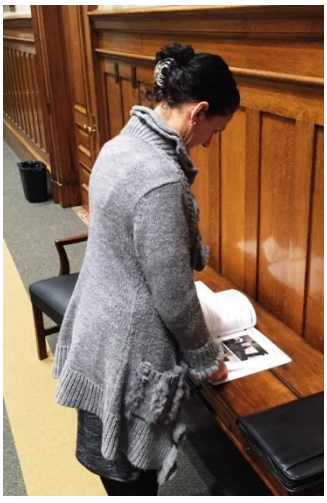
3.2 Public Involvement

As indicated in the previous section, the Floodplain Management Planning Committee included members of the public. Of the 14 total FMPC members, seven represented the public (see Table 3-2), which comprises half of the total representation. All of the five FMPC meetings were open meetings and well-advertised via the project website at tuscaloosa.floodplainmanagementplan.com. Public information is also provided on the City's Stormwater Management Program website at www.tuscaloosa.com/Government/Departments/City-Engineer/ttownstormwater; and via the City of Tuscaloosa Twitter feed (@tuscaloosacity).

Community Meetings

The first community meeting was held November 3, 2015 at 5 o'clock p.m. in the City of Tuscaloosa Council Chambers, during the drafting phase of the planning process.

The meeting's purpose was to allow interested citizens, especially those subjected to flooding or living in the floodplain, to provide input on areas that are susceptible to widespread or localized flooding. The project team made available maps portraying flood prone areas and asked citizens to identify potential issues or problem areas. In addition, community members were asked to complete a Community Survey (located in Appendix F) gauging interest and concern with flooding issues. Members of the Floodplain Management Planning Committee (FMPC) were in attendance and on hand to answer questions. Citizen input helps shape the plan and provides invaluable support to the planning process. A media release detailing this information was issued October 12, 2015 (copy in Appendix F), in conjunction with the meeting announcement via the City of Tuscaloosa's Twitter feed (@tuscaloosacity) and the plan website (tuscaloosa.floodplainmanagementplan.com).



Upon completion of the draft plan, the City held a second community meeting for the public to review the final plan and offer public comments. This public meeting was held in the Council Chambers on March 1, 2016 at 5 p.m. Once again, the City issued a media release and posted meeting announcements on social media and the plan website. The purpose of this second community meeting was to display the final draft plan and encourage for public review and feedback, Representatives from the Floodplain Management Planning Committee (FMPC) were available to answer questions. Attendees were encouraged to submit written comments on the Public Review Comments form (located in Appendix F).

Additional Public Outreach Efforts

In addition to the community meetings and open-forum FMPC meetings, the planning team created a website (tuscaloosa.floodplainmanagementplan.com) detailing the floodplain management planning process, providing up-to-date meeting information, as well as making available for download draft plan chapters, appendices, agendas, slide presentations, and other meeting materials. As previously mentioned, the Community Survey (located in Appendix F), distributed during the first community meeting and made available via the website, allowed for members of the public to document and submit their concerns and questions regarding floodplain management. During the second community meeting, attendees were likewise given opportunity to voice their concerns and encouraged to submit written comments to the FMPC.

3.3 Coordination

Coordination among the Floodplain Management Planning Committee (FMPC), and the lead City staff – the Floodplain Administrator and CRS Coordinator – with the planning consultant team was crucial to the successful development of this plan. The FMPC itself represents membership from widely diverse agencies and interests. Moreover, the FMPC involved the Tuscaloosa EMA, the neighboring City of Northport, and Tuscaloosa County in the planning process as stakeholders to contribute their valued feedback. These stakeholders completed the "Alternative Mitigation Measures Exercise" (Appendix G), along with the rest of the FMPC members. This exercise provided a means to review and evaluate potential floodplain mitigation measures to be selected for the Floodplain Mitigation Action Plan (Chapter 5). The Floodplain Mitigation Action Plan includes measures that are consistent with the six floodplain management activities recognized by the CRS Program and takes into consideration City funding and technical capabilities, among other considerations. (See Chapter 5 "Mitigation Strategy" for a complete discussion of the development of the Floodplain Management Action Plan).

In addition to coordination with various agencies, the planning team collected and reviewed applicable plans, studies and reports. Review of existing documents, data and technical information is very useful in the drafting of the plan, in that it supports the risk assessment and helps develop the mitigation strategy to further the goals of floodplain management planning. Specifically, in the drafting of Chapters 2 "Community Profile," 4 "Risk Assessment," and 5 "Mitigation Strategy" the planning team reviewed and incorporated information from the following plans and studies:

- 2014 Tuscaloosa County Hazard Mitigation Plan;
- Tuscaloosa 2020, A Consensus Strategic Plan (January 2005);
- City of Tuscaloosa Citywide Future Land Use Plan, Preliminary Review (Draft, August 2007);
- Tuscaloosa Forward, A Strategic Community Plan to Renew and Rebuild (August, 2011);

- FEMA Flood Insurance Study, Tuscaloosa County, Alabama and Incorporated Areas (January 2014);
- NFIP's Repetitive Loss Inventory;
- City of Tuscaloosa Subdivision Regulations;
- City of Tuscaloosa Zoning Ordinance;
- City of Tuscaloosa Stormwater Management Ordinance;
- City of Tuscaloosa Floodplain Management Ordinance; and
- City of Tuscaloosa Building and Technical Codes.

Other public outreach activities related to floodplain management planning typically falls under the umbrella of multi-hazard mitigation planning activities conducted by the Tuscaloosa County Emergency Management Agency (EMA). The Tuscaloosa County EMA oversees the preparation and implementation of the 2015 Tuscaloosa County Multi-Hazard Mitigation Plan and subsequent updates. The EMA holds mitigation classes, organizes broadcast and social media awareness efforts for severe weather and flooding issues (such as "Turn Around, Don't Drown"), presents at local emergency management meetings, and showcases mitigation projects (including floodplain management activities) at the annual "Be Ready Day" event. The Floodplain Management Planning Committee is fully supportive of and an active participant in these county-wide activities conducted by the Tuscaloosa County EMA.

Chapter 4 – Risk Assessment

4.1 Overview

This chapter details the Risk Assessment process for the development of the 2015 City of Tuscaloosa Floodplain Management Plan for the City's current incorporated limits, as well as adjacent unincorporated areas, which may be annexed over time, as the City grows. This assessment process is based upon the requirements of Steps 4 and 5 of the 10-step planning process outlined in the 2013 Community Rating System Coordinator's Manual.

Section 4.2 covers the first part of the risk assessment required by Step 4: Assess the Hazard. It presents a hazard profile, which includes the sources, frequency, extent, and causes of flooding and associated hazards. Step 5 of the risk assessment process – Assess the Problem - is presented in Section 4.3. It examines vulnerabilities of the population, structures, public infrastructure and critical facilities to flooding and related natural hazards, the economic impacts of flooding on the community, and the impacts on natural and beneficial floodplain functions.

4.2 Hazard Profile: Assessing the Hazard

In non-coastal locations, riverine flooding occurs when runoff from rainfall, snowmelt, or storm surge exceeds the capacity of the stream or river and overflows into the adjacent floodplain. Flooding can lead to injury or death due to drowning caused by swift currents of the flood waters. In addition, flooding can cause property damage as a result of inundation by sediment-laden water.

The severity of a flood is primarily dependent upon two factors: 1) rainfall intensity and 2) duration. A heavy rain over a short time span, such as a thunderstorm, can result in flash flooding. Flash flooding is typically defined as a rapid water level rise in a stream or creek beginning within six hours of the rainfall event. Most of the areas within the City of Tuscaloosa that have experienced past flooding are a result of flash flooding. Only those areas within the City along the Black Warrior River have a watershed response time greater than six hours. Extended periods of steady to heavy rainfall can also lead to flooding. This type of event is more commonly identified with a tropical storm moving inland from the Gulf of Mexico, but can also be associated with a slow moving or stalled front.

4.2.1 Special Flood Hazard Area

The Special Flood Hazard Area (SFHA) shown on the Flood Insurance Rate Map (FIRM) is the FEMA-designated area of land covered by the floodwaters of the base flood. The base flood is defined by FEMA as the flood having a one percent chance of

being equaled or exceeded in any given year. The base flood is also sometimes referred to as the "100-year flood." The SFHAs, as shown on the FEMA Flood Insurance Rate Maps (FIRMs), are depicted on Maps 4-1, 4-2, 4-3 and 4-4.

The City of Tuscaloosa's major water feature is the Black Warrior River and includes several tributaries and smaller streams that are susceptible to flooding. The FEMA Flood Insurance Study (FIS) for Tuscaloosa County identifies the following streams where a SFHA is defined within the City:

- Black Warrior River,
- Carroll Creek,
- Big Creek,
- Mill Creek,
- Tater Hill Creek,
- Black Warrior River Tributary No. 2,
- Black Warrior River Tributary No. 3A,
- Black Warrior River Tributary No. 3,
- North River,
- Yellow Creek,
- Bee Branch,
- Hurricane Creek,
- Cottondale Creek,
- Cottondale Creek Tributary No. 1,
- Rum Creek,
- Rum Creek Tributary No. 1,
- Cypress Creek,
- Cribbs Mill Creek,
- Cribbs Mill Creek Tributary No. 1,
- Cribbs Mill Creek Tributary No. 2,
- Cribbs Mill Creek Tributary No. 3,
- Cribbs Mill Creek Tributary No. 4,
- Cribbs Mill Creek Tributary No. 5,
- Cribbs Mill Creek Tributary No. 5A,
- Cribbs Mill Creek Tributary No. 5B,
- Cribbs Mill Creek Tributary No. 6,
- Cribbs Mill Creek Tributary No. 7,
- Moody Swamp Tributary 1,
- Moody Swamp Tributary 2, and
- Moody Swamp Tributary 3.

The Black Warrior River is the largest waterbody in size and drainage area within the City. This is a vital shipping route for many mining operations and industries located along the river. The watershed is a mixture of residential, commercial, industrial, agriculture, mining, and undeveloped areas. The floodplain is relatively narrow upstream of Oliver Lock and Dam. Below this point the topography flattens and the floodplain encompasses a significant area. All streams discussed below are direct tributaries or drain to the Black Warrior River.

The tributaries (Black Warrior River Tributaries 2, 3, and 3A) have a narrow floodplain with the surrounding land residential, undeveloped forest, or golf course. Each of these streams has a detailed study, base flood elevations, and floodway.

North River and Yellow Creek drain into the Black Warrior River from the North. Both streams have large impoundments: North River – Lake Tuscaloosa; and Yellow Creek – Lake Harris and Lake Nicol. North River is studied from the confluence with the Black Warrior River to a point downstream of State Road 69. Yellow Creek is mapped as a Zone "A."

Cribbs Mill Creek and its tributaries span a large region centrally located within the City. Much of the land near and adjacent to these streams is residential, but other areas include retail and institutional. Many of the streams have been improved to increase capacity by channelization and/or placement within a culvert.

Cypress Creek parallels Skyland Boulevard for much of its path. Springhill Lake is located at the head of Cypress Creek. Both commercial and residential areas border this creek through the City. Cypress Creek joins with Rum Creek before flowing into Moody Swamp on its way to the Black Warrior River.

Moody Swamp Tributary 3 has been the subject of recent flood mitigation projects to reduce the base flood elevation and floodplain. Several homes located in the floodplain of the upper reach were part of a FEMA and City of Tuscaloosa funded buyout project due to the frequency of flooding experienced in that area. In 2008, work began after award of FEMA Pre-Disaster Mitigation (PDM) funding to mitigate and reduce flood elevations for areas along Moody Swamp Tributary 3 downstream of 10th Avenue and upstream of the Norfolk Southern Railroad. The area in the vicinity of Moody Swamp Tributary 3 is predominantly residential upstream of 14th Avenue and commercial/industrial downstream of 14th Avenue. Moody Swamp Tributaries 1 and 2 are surrounded by residential neighborhoods with the campus of Stillman College located in between.

Several streams are adjacent to the city limits, or small isolated areas of the City are located within the Special Flood Hazard Areas. These include Big Creek, Mill Creek, Tater Hill Creek, Bee Branch, Hurricane Creek, Cottonmill Creek, and Carroll Creek. Most of these are located away from the city center and in the rural areas of Tuscaloosa; however, Tater Hill Creek and Mill Creek border the Tuscaloosa Airport.

The SFHA covers approximately 6,422 acres or roughly 16.3% of the City (Maps 4-1 through 4-4). SFHAs mapped as Zone "A," based on approximate methods, make

up only 696 acres or 9.2% of the total SFHA within the City. A major Zone "A" area is located along Yellow Creek (Lake Nicol and Lake Harris).

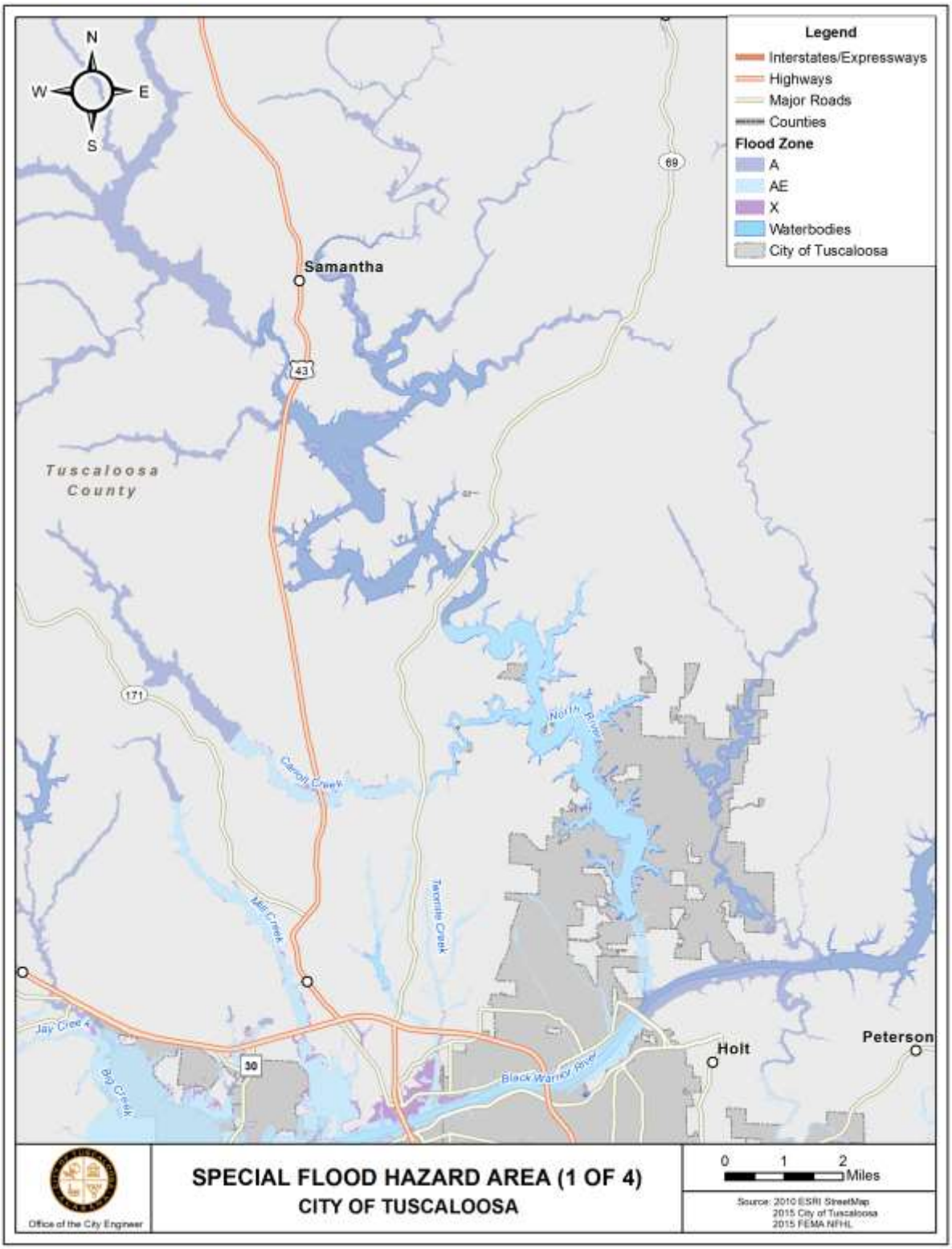
All of the streams previously discussed have detailed studies as part of the Tuscaloosa County Flood Insurance Study (FIS) with the exception of Yellow Creek. Revised or new detailed studies were recently completed for Mill Creek, Hurricane Creek, Carroll Creek, Black Warrior River, Big Creek, and Bee Branch and included in the Tuscaloosa County FIS, dated January 16, 2014.

Table 4-1. Known Flood Hazards

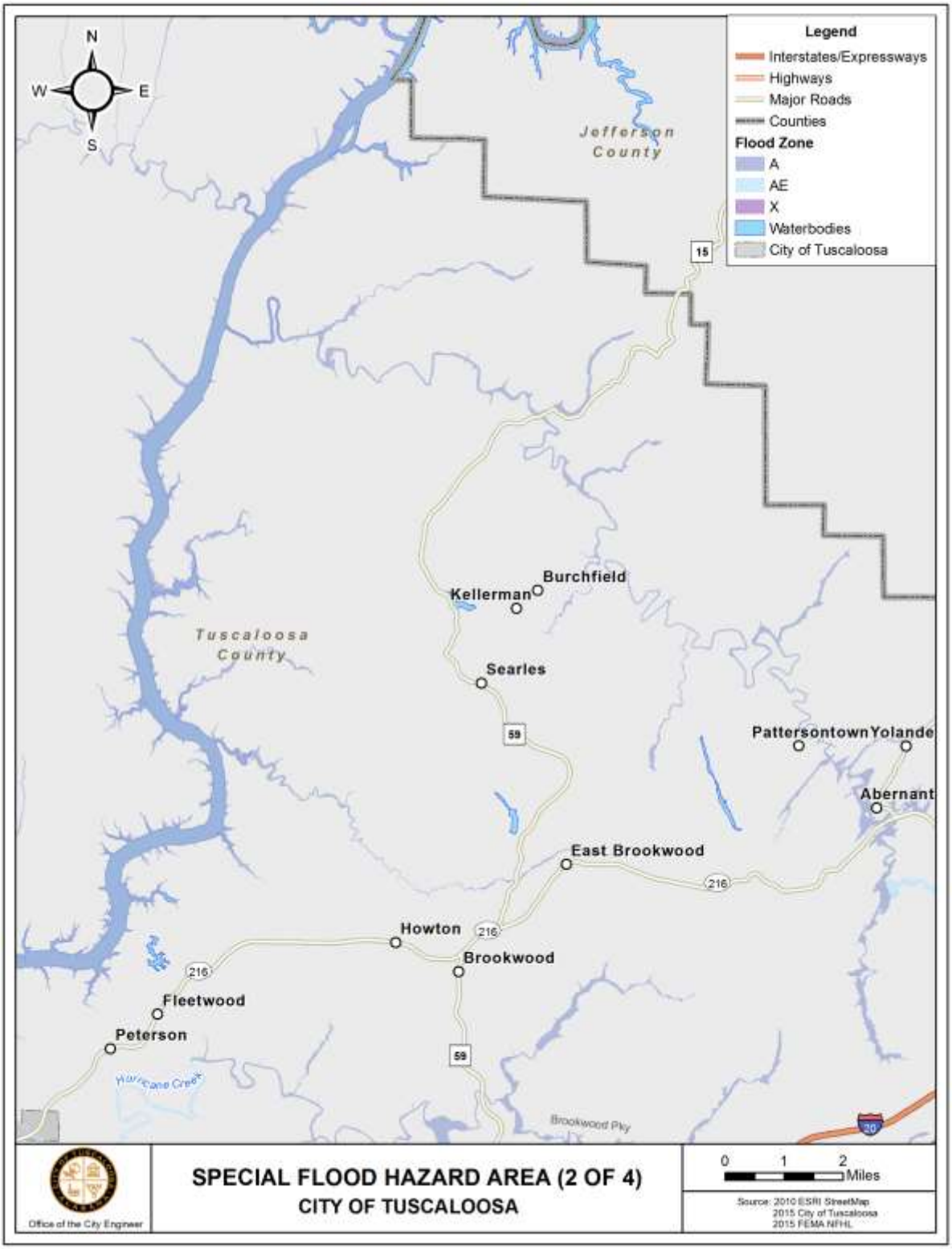
Source of Water	Depth of Flooding, ft	Average Velocity, ft/s	Approximate Warning Time, hrs
Black Warrior River	67	6.5	24-48
Carroll Creek	10	1.6	1-2
Big Creek	22	0.7	1-2
Mill Creek	12	1.2	1-2
Tater Hill Creek	13	0.3	<1
Black Warrior River Tributary No. 2	9	3.0	<1
Black Warrior River Tributary No. 3A	10	3.3	1
Black Warrior River Tributary No. 3	19	1.8	<1
North River	46	6.3	6-12
Yellow Creek	n/a	n/a[1]	n/a[1]
Bee Branch	6	5.0	1
Hurricane Creek	32	6.0	4-6
Cottondale Creek	20	1.9	1-2
Cottondale Creek Tributary No. 1	7	3.0	<1
Rum Creek	10	5.2	1
Rum Creek Tributary No. 1	7	2.1	<1
Cypress Creek	11	6.0	1
Cribbs Mill Creek	9	8.6	1
Cribbs Mill Creek Tributary No. 1	8	0.4	<1
Cribbs Mill Creek Tributary No. 2	12	3	<1
Cribbs Mill Creek Tributary No. 3	1	3.1	<1
Cribbs Mill Creek Tributary No. 4	4	4.7	<1
Cribbs Mill Creek Tributary No. 5	12	3.1	<1
Cribbs Mill Creek Tributary No. 5A	5	5.0	<1
Cribbs Mill Creek Tributary No. 5B	3	3.5	<1
Cribbs Mill Creek Tributary No. 6	9	3.3	<1
Cribbs Mill Creek Tributary No. 7	11	0.4	<1
Moody Swamp Tributary 1	5	2.2	<1
Moody Swamp Tributary 2	5	17.9	<1
Moody Swamp Tributary 3	8	1.2	<1

[1] – Not a studied stream. No detailed information available.

Map 4-1. Special Flood Hazard Area, 1 of 4

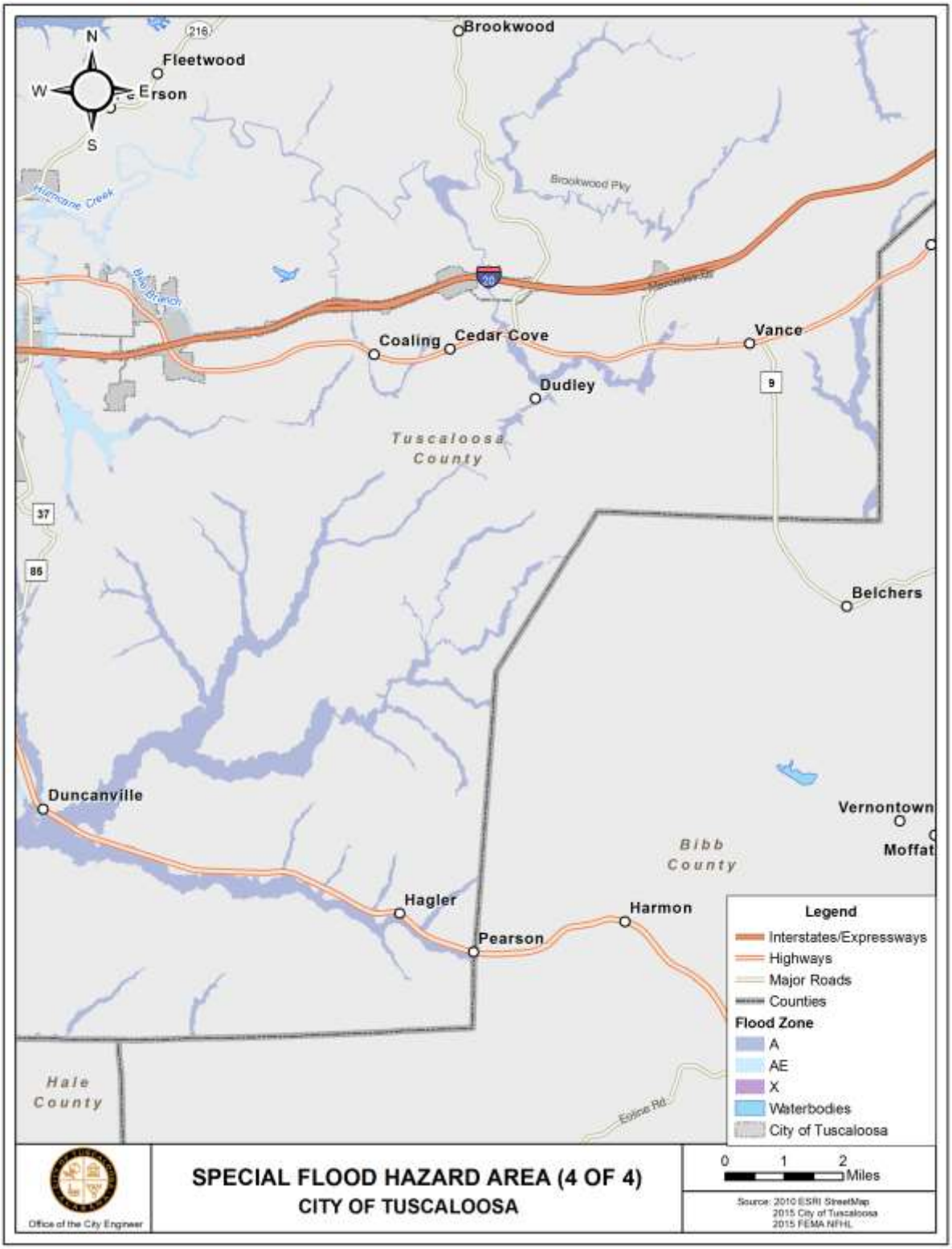


Map 4-2. Special Flood Hazard Area, 2 of 4



Map 4-3. Special Flood Hazard Area, 3 of 4

Map 4-4. Special Flood Hazard Area, 4 of 4

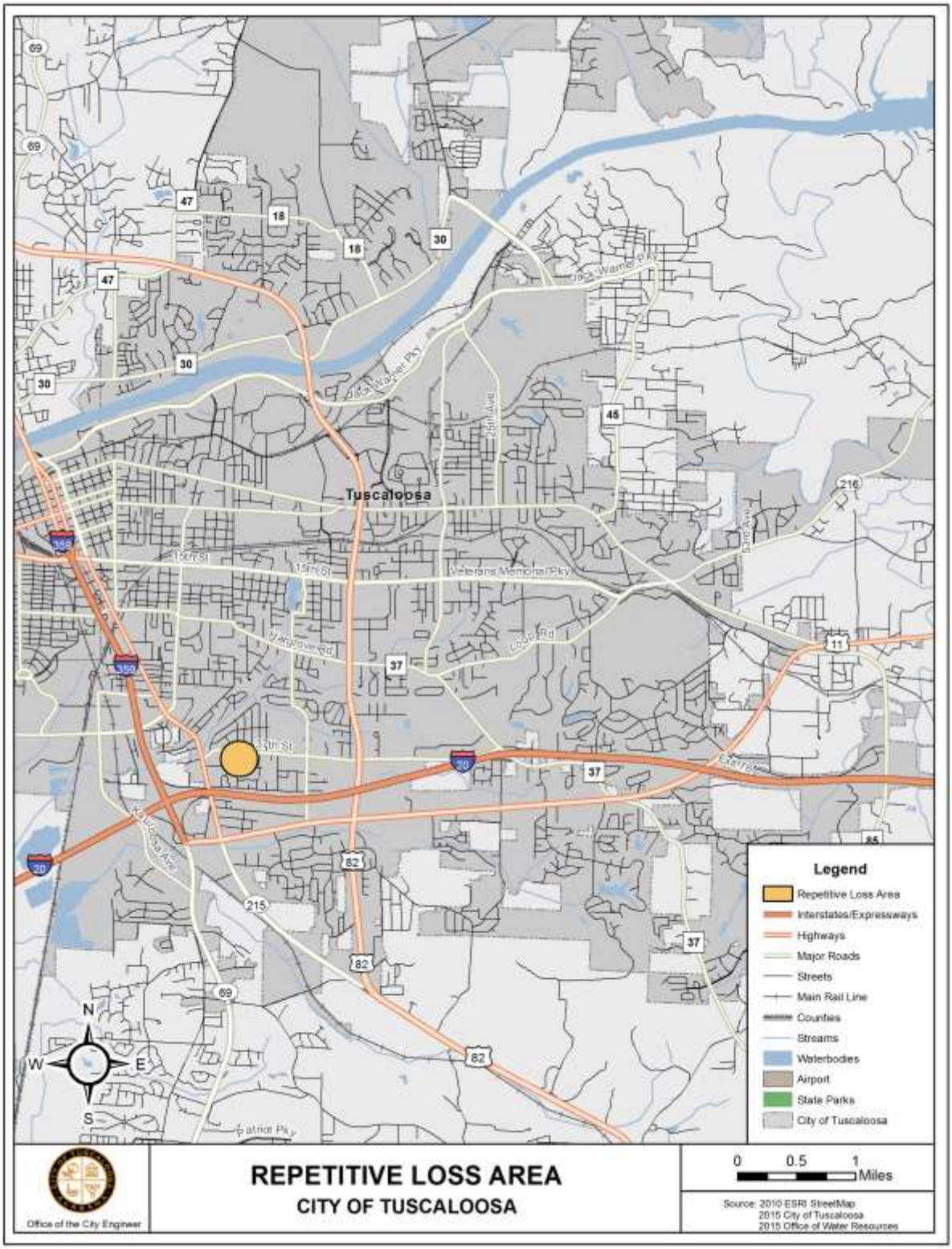


4.2.2 Repetitive Loss

The City of Tuscaloosa has one repetitive loss property, based on recent data provided by the State of Alabama Office of Water Resources. Repetitive loss properties are defined as those properties for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period. This property has experienced one flood loss within the last 10 years. Recent efforts by City personnel to update the repetitive properties list, resulted in the total number of properties listed to decrease from seven to one property.

The City's repetitive loss area is shown on Map 4-5.

Map 4-5. Repetitive Loss Areas



4.2.3 Other Areas of Flooding

Other than the SFHA, a few additional areas of flooding have been identified within the City. These additional areas of flooding were noted during the FMPC meetings and through the public meetings conducted during the planning process. Members of the FMPC and the public were asked to identify flood hazard areas, as part of a plan exercise. These additional areas subject to flooding are as follows: 1) University Boulevard between Kicker Road and Crescent Ridge Road; 2) Paul Bryant Drive near Tutwiler Hall; and 3) Kicker Road near Cross Creek Subdivision. These areas experience flooding due to local drainage issues and are not known to result in property damage. Flooding typically results in roads becoming inundated and potentially impassible for a period during and after the rain event. A review of other planning studies included no mention of other areas of flooding outside of the SFHA. Future revisions to this plan should note any additional areas (not currently within the SFHA), which experience flooding due to local drainage issues, riverine flooding, or other causes.

4.2.4 Flood-Related Special Hazards

Less-frequent flood hazards within the City include flooding from dams, levees, and land subsidence. This section includes an inventory of these potential flood hazards should they fail or, in the case of land subsidence, occur.

Dam Failures

The U.S. Army Corps of Engineers National Inventory of Dams (NID) lists 16 dams within the City (Table 4-2). Five of the dams listed are owned by the City of Tuscaloosa, four of which are used as a public water supply source and one of which is the wastewater treatment plant sewage lagoon. The Oliver Lock and Dam is owned and operated by the U.S. Army Corps of Engineers to aid in the navigation of the Black Warrior River. The remaining 10 dams are privately held and used primarily for recreation. One of the dams listed by the NID, McPherson Dam, appears to have been removed and the land redeveloped. Map 4-6 shows the locations of the dams listed in the NID.

Each dam was assessed to determine the potential flood hazard risk in case of failure. Factors considered in determining the risk include the height and storage of the dam and development downstream of the impoundment in the potential flow path. Lake Tuscaloosa Dam is the only dam identified as a high flood hazard risk. Although the land downstream of the dam to the Black Warrior River is largely undeveloped, the quantity of water within the lake and the development along the Black Warrior River between Holt Lock and Dam and Oliver Lock and Dam led to a high risk rating.

Lake Harris and Lake Nicol are two of the larger impoundments within the City. Both are classified as low flood hazard risk. Similar to Lake Tuscaloosa, these impoundments have essentially no development downstream of the dams to the Black Warrior River. However, the quantity of water was deemed insufficient to cause hazardous flooding along the Black Warrior River. Oliver Lock and Dam is classified as

a moderate risk due to the large industrial facilities located on the southern bank, immediately downstream of the dam. Several dams are classified as a moderate flood hazard risk, based on their location near and upstream of residential areas. These areas include Indian Hills Lake, East Lake, Forest Lake, and Springhill Lake. Table 4-3 summarizes the flood hazard risk for each dam listed in the NID and located within the City of Tuscaloosa.

Dam failures outside the city limits of Tuscaloosa, including Holt Lock and Dam, Bankhead Lock and Dam, and Smith Lake Dam, are also potential hazard risks. These dams are in series along the Black Warrior River upstream of the City of Tuscaloosa. Dam height and storage are significantly larger than the impoundments within the City of Tuscaloosa. These dams are considered high flood hazard risk due to height and storage of the dams, and their potential flow path through the developed areas along the Black Warrior River in the City of Tuscaloosa.

Table 4-2. National Inventory of Dams

Name	Owner Entity	Owner	Height (ft)	Storage (ac-ft)	Purpose
Mimosa Park Dam	Private	Dr. Joe Shamblin	17	568	Recreation
Indian Hills Lake	Private	E J Finnell	26	62	Recreation
East Lake Dam	Private	Pritchett Moore Co Inc	30	61	Recreation
Forest Lake Dam	Private	Forest Lake Club Inc	17	90	Recreation
Sewage Lagoon Dam North	Local Government	City of Tuscaloosa	16	76	Other
Little Reservoir Dam	Local Government	City of Tuscaloosa	40	106	Water Supply
Lake Harris Dam	Local Government	City of Tuscaloosa	58	3,526	Water Supply
Lake Tuscaloosa Dam	Local Government	City of Tuscaloosa	125	180,000	Water Supply, Recreation
Patton Lake	Private	Woodland Hills Found Inc	19	60	Recreation
Springhill Lake Dam	Private	Paver Land And Realty Co	27	153	Recreation
Canyon Lake Dam	Private	Judge Fred W Nicol	30	155	Recreation
Yacht Club Bay Dam Number 8	Private	Gulf States Paper Corp	41	28	Recreation
Lake Nicol Dam	Local Government	City of Tuscaloosa	82	10,349	Water Supply
McPherson Dam	Private	Houston McPherson	30	73	Recreation, Fish and Wildlife Pond
Yacht Club Bay Dam Number 15	Private	Gulf States Paper Corp	45	72	Recreation
William Bacon Oliver Replacement	Federal	CESAM	67	13,800	Navigation
Lewis Smith[1]	Public Utility	Alabama Power Company	300	1,670,600	Hydroelectric
John Hollis Bankhead Lock & Dam[1]	Federal	CESAM	111	296,000	Navigation
Holt Lock, Dam and Powerhouse[1]	Federal	CESAM	120	117,990	Navigation

[1] – Not within the City of Tuscaloosa.

Map 4-6. Dam Hazard

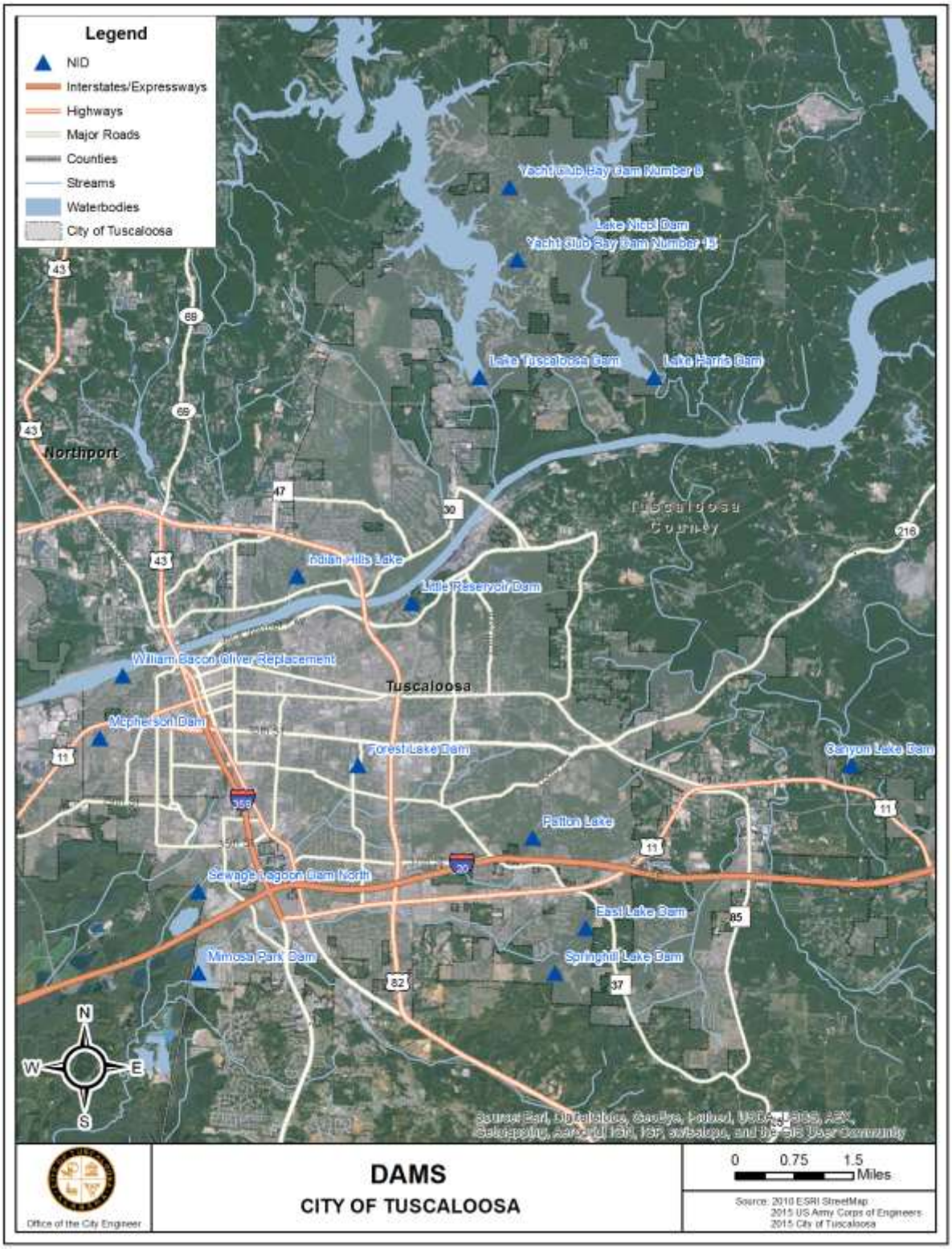


Table 4-3. Dam Failure Flood Hazard Risk Assessment

Name	Flood Hazard Risk[1]
Mimosa Park Dam	Low
Indian Hills Lake	Moderate
East Lake Dam	Moderate
Forest Lake Dam	Moderate
Sewage Lagoon Dam North	Low
Little Reservoir Dam	Low
Lake Harris Dam	Low
Lake Tuscaloosa Dam	High
Patton Lake	Low
Springhill Lake Dam	Moderate
Canyon Lake Dam	Low
Yacht Club Bay Dam Number 8	Low
Lake Nicol Dam	Low
McPherson Dam	N/A
Yacht Club Bay Dam Number 15	Low
William Bacon Oliver Replacement	Moderate
Holt Lock & Dam[2]	High
Bankhead Lock & Dam[2]	High
Lewis Smith Lake[2]	High

[1] – Flood Hazard Risk is based on the severity of flooding due to dam failure and probability of risk to life
[2] – Not within the City of Tuscaloosa

Levees

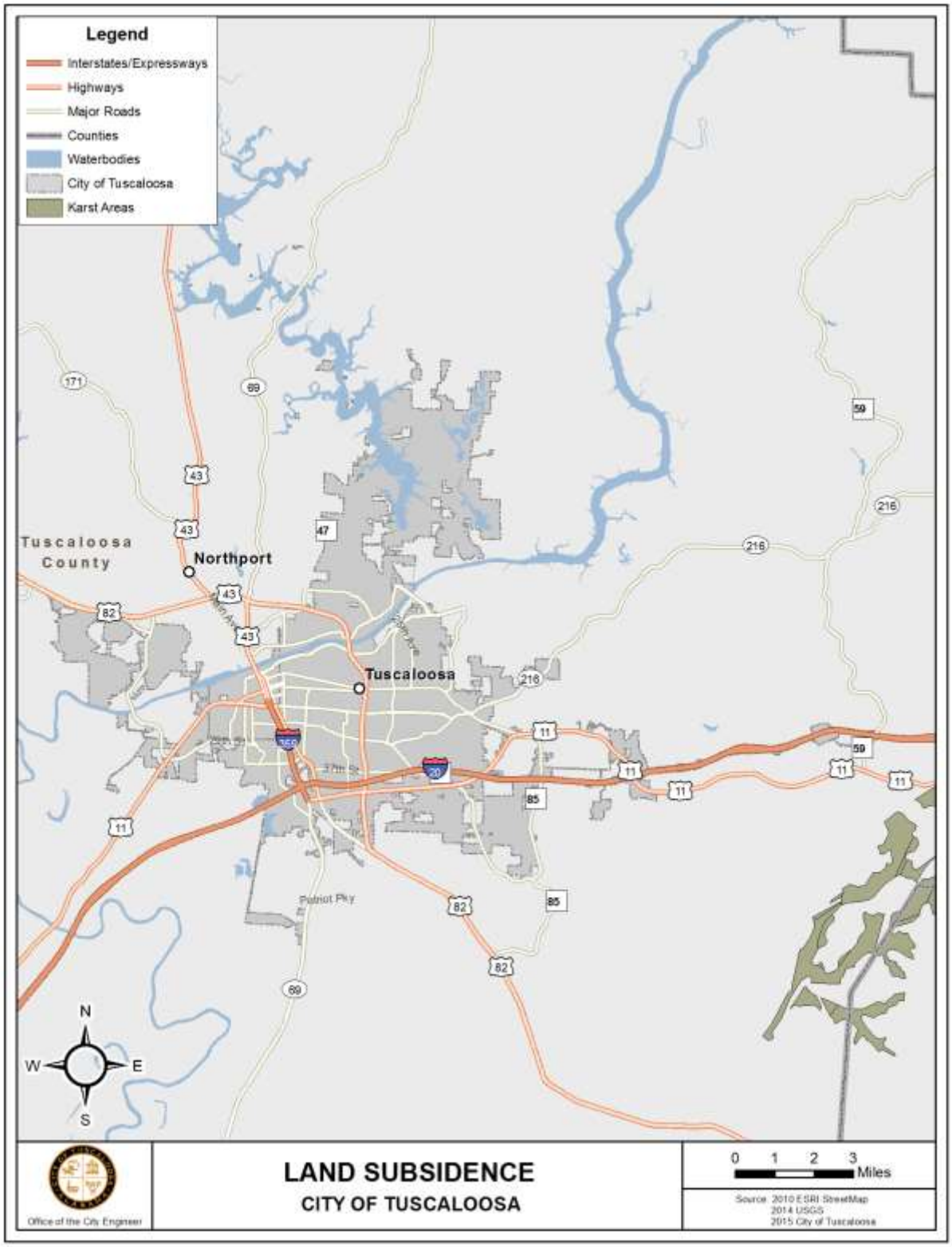
Levees are man-made structures that help contain or control the flow of water during a flood. It is important to note that levees reduce the risk of flooding; however, they do not eliminate the risk. A search of the U.S. Army Corps of Engineers National Levee database resulted in no known levees within the City. The City of Northport is protected by the Northport Levee System; however this levee system provides no benefit to areas within the City of Tuscaloosa.

Land Subsidence (Sinkholes)

The final hazard discussed in this section is land subsidence. Land subsidence occurs when large amounts of groundwater have been withdrawn from certain types of rocks. The rock compacts because the water contributes to structural integrity and when withdrawn, collapses in on itself. This area is subject to karst topography which is susceptible to land subsidence. Karst topography is a region where the terrain has been dissolved by the physical and chemical weathering of the bedrock. These areas are composed of carbonate rocks, such as dolomite and limestone, or have high concentrations of evaporates, such as salt and gypsum. Karst is characterized by surface and subsurface features ranging from sinkholes, caves, springs, and complex

underground drainage systems. A 2014 report from the USGS titled Karst in the United States: A Digital Map Compilation and Database by David Weary and Daniel Doctor, includes a GIS dataset of karst and potential karst areas in the contiguous United States. By mapping this dataset (Map 4-7), it appears that the mapped karst areas lie to the east of the City. Based on this information, it can be inferred that since no karst areas are within or adjacent to the City, the risk associated with land subsidence is low.

Map 4-7. Land Subsidence Hazard



4.2.5 Past Floods

The City of Tuscaloosa has experienced many significant flood events in the past. Recent events are listed in Table 4-4. In addition to the flood events listed in Table 4-4, Appendix B includes summary tables of past flash flooding events, flooding events, and hurricane and tropical storm events from the National Climatic Data Center. The Tuscaloosa area has been included in several Presidential Disaster Declarations. A table listing the flood hazard-related Presidential Disaster Declarations can be found in Appendix B, as well.

Table 4-4. Major Flood Events in the City of Tuscaloosa, 2004-Present

Date	Type	Description
September 16, 2004	Hurricane Ivan	Approximately 3.8" of rainfall from September 15 – 17
June 10, 2005	Tropical Storm Arlene	Approximately 3.5" of rainfall
July 10, 2005	Hurricane Dennis	Approximately 4.4" of rainfall. Roads and homes flooded and sustained minor damage
November 10, 2009	Hurricane Ida	Approximately 3.2" of rainfall
September 4, 2011	Tropical Storm Lee	Approximately 7.2" of rainfall from September 4 - 6
June 5, 2013	Flash Flooding	Flooded roads closed several streets mainly near the University of Alabama campus
April 28, 2014	Flash Flooding	Flooding along Hargrove Road on Cribbs Mill Creek
January 3, 2015	River and Flash Flooding	Some roadways were washed out and many others became impassable and were temporarily closed.
April 16, 2015	Flash Flooding	Flooding in the North Hampton neighborhood

Source: NWS Birmingham, News Media

4.2.6 Assessment of Future Flooding Locations and Problems

When assessing the flood hazard, it is imperative not only to study historic events and present day studies, but also to consider future factors that may affect the flooding magnitude and frequency. Three items that were considered and addressed in this plan and further discussed below, are: 1) development within the watersheds, 2) development within the floodplain, and 3) climate change.

Development within the Watershed

Due to the continued urban growth within the City of Tuscaloosa and surrounding area, it is expected that flooding may increase in magnitude and frequency in the future. Post-construction stormwater management practices and controls attempt to mitigate hydrologic changes due to development and help offset the increased flow and volume of runoff. Even with properly implemented stormwater management practices, increased development within a watershed will likely result in adverse hydrologic changes and increased flooding. A large number of the watersheds can be considered fully developed. Cribbs Mill Creek and its tributaries have moderate to low development potential due to the absence of developable land. The Black Warrior watershed, however, has significant tracts that are undeveloped and have potential for development or re-development. Portions of the Birmingham Metropolitan Area are located within the Black Warrior watershed. The new Interstate 22 corridor will likely contribute to further development within the watershed. A summary of the development potential for each watershed is indicated in Table 4-5. This summary is based on the planning team's professional knowledge of local conditions and growth trends.

Table 4-5. Watershed Development Potential

Watershed	Size (Square Miles)	Development Potential
Black Warrior River	4828.0	High
Carroll Creek	17.9	High
Big Creek	35.0	Moderate
Mill Creek	15.7	Moderate
Tater Hill Creek	2.0	Low
Black Warrior River Tributary No. 2	0.9	Low
Black Warrior River Tributary No. 3A	2.5	Moderate
Black Warrior River Tributary No. 3	3.7	Moderate
North River	425.0	High
Yellow Creek	33.3	Low
Bee Branch	7.4	Moderate
Hurricane Creek	116.6	Moderate
Cottondale Creek	19.1	Moderate
Cottondale Creek Tributary No. 1	5.6	Moderate
Rum Creek	6.5	Moderate
Cypress Creek	10.4	Low
Cribbs Mill Creek	11.9	Low
Cribbs Mill Creek Tributary No. 1	2.2	Moderate
Cribbs Mill Creek Tributary No. 2	0.5	Low
Cribbs Mill Creek Tributary No. 3	0.3	Low
Cribbs Mill Creek Tributary No. 4	0.6	Low
Cribbs Mill Creek Tributary No. 5	3.3	Moderate
Cribbs Mill Creek Tributary No. 5A	0.4	Low
Cribbs Mill Creek Tributary No. 5B	0.2	Low
Cribbs Mill Creek Tributary No. 6	0.8	Moderate
Cribbs Mill Creek Tributary No. 7	0.5	Moderate
Moody Swamp Tributary 1	0.7	Low
Moody Swamp Tributary 2	1.0	Low
Moody Swamp Tributary 3	2.2	Low

Development within the Floodplain

Similar to development potential for a watershed, an assessment of potential changes specifically within the floodplain was made for each waterbody. Development within a floodplain contributes to a loss of floodplain storage, increased velocities, and increased flows. This can result in downstream flood elevation increases. The Black Warrior River floodplain has undeveloped land along Rice Mine Road and Jack Warner Parkway. Given the amenity the river provides, the potential to develop within the

floodplain is high. Although development adjacent to Lake Tuscaloosa (North River) is expected to continue, due to the steep topography, however, the majority of the development is expected to occur outside of the regulatory floodplain. Table 4-6 summarizes the floodplain development potential for each waterbody within the City of Tuscaloosa.

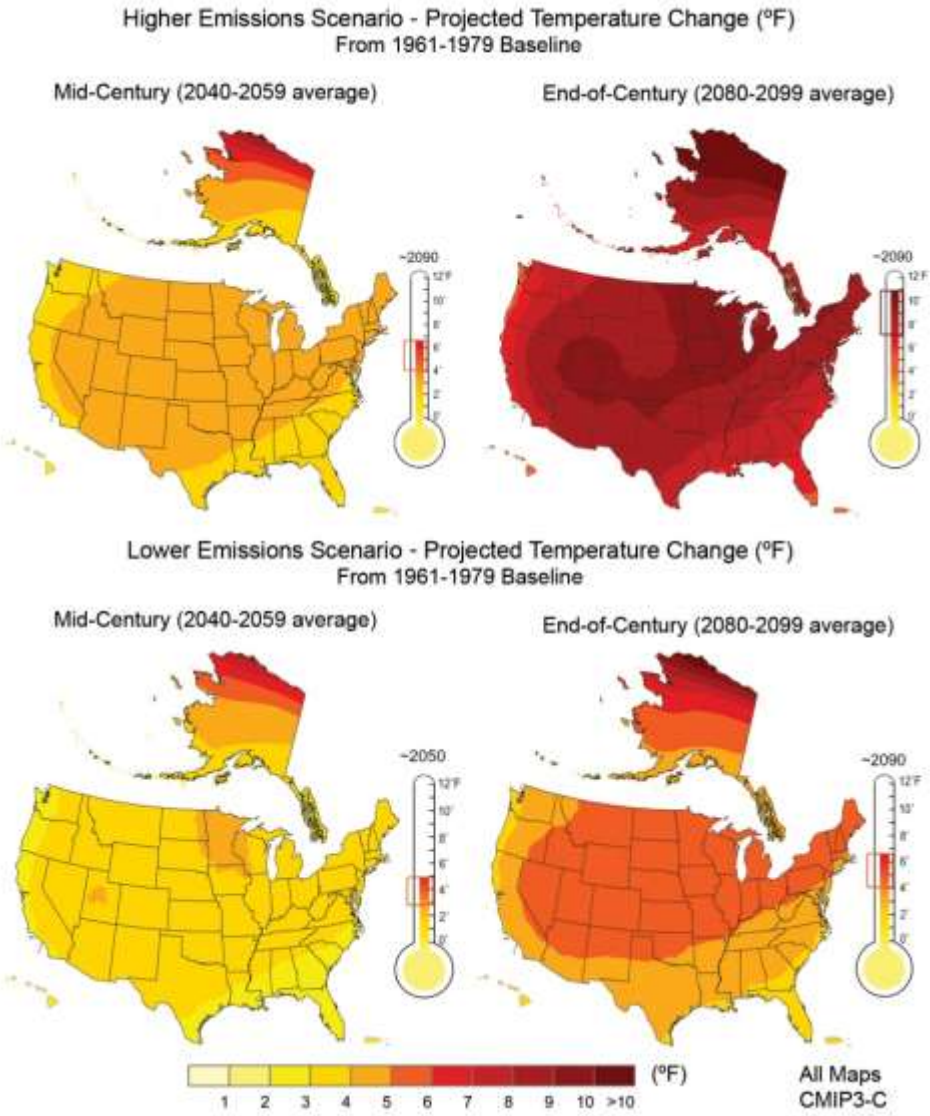
Table 4-6. Floodplain Development Potential

Watershed	Development Potential
Black Warrior River	High
Carroll Creek	Low
Big Creek	Low
Mill Creek	Low
Tater Hill Creek	Low
Black Warrior River Tributary No. 2	Moderate
Black Warrior River Tributary No. 3A	Moderate
Black Warrior River Tributary No. 3	Low
North River	Low
Yellow Creek	Low
Bee Branch	Moderate
Hurricane Creek	Moderate
Cottondale Creek	Low
Cottondale Creek Tributary No. 1	High
Rum Creek	Moderate
Cypress Creek	Moderate
Cribbs Mill Creek	Low
Cribbs Mill Creek Tributary No. 1	Moderate
Cribbs Mill Creek Tributary No. 2	Low
Cribbs Mill Creek Tributary No. 3	Low
Cribbs Mill Creek Tributary No. 4	Low
Cribbs Mill Creek Tributary No. 5	Moderate
Cribbs Mill Creek Tributary No. 5A	Low
Cribbs Mill Creek Tributary No. 5B	Low
Cribbs Mill Creek Tributary No. 6	High
Cribbs Mill Creek Tributary No. 7	Moderate
Moody Swamp Tributary 1	Moderate
Moody Swamp Tributary 2	Low
Moody Swamp Tributary 3	Moderate

4.2.7 Climate Change

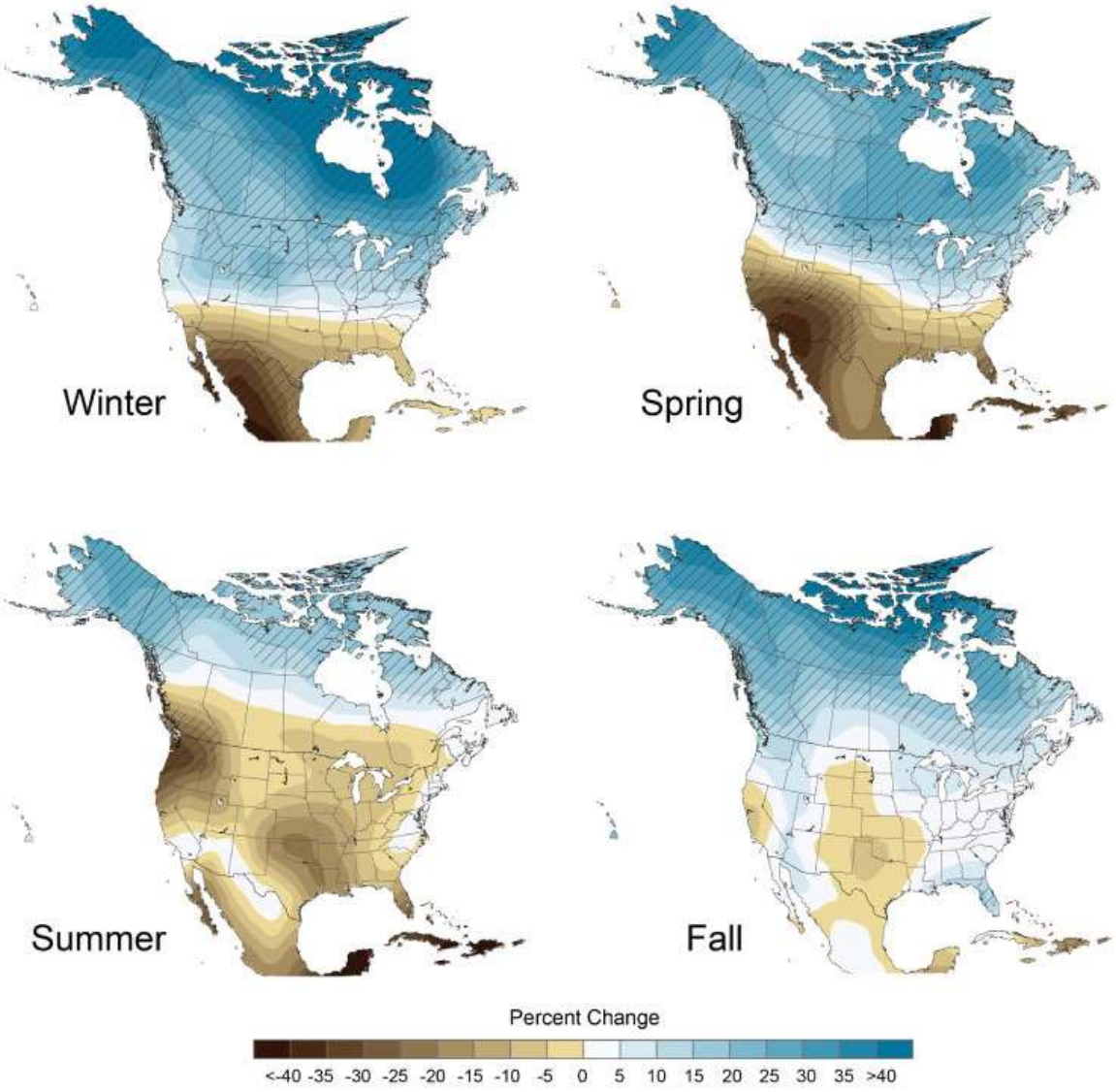
Based on climate change projections by the U.S. Global Change Research Program (USGCRP), average temperatures within Central Alabama are expected to increase by about 4°F to 7°F, depending on the emissions scenario and climate model (Map 4-8). The USGCRP also concludes that within the Southeast region, very heavy precipitation events have increased over recent decades and further increases are projected. Although heavy precipitation events are projected to increase, the seasonal precipitation in Central Alabama is projected to decrease up to 10% (Map 4-9).

Map 4-8. Projected Temperature Change



Source: USGCRP, 2009

Map 4-9. Projected Future Changes in Precipitation Relative to the Recent Past



Source: USGCRP, 2009

4.2.8 Other Natural Hazards

In addition to flooding, many other natural hazards affect the City of Tuscaloosa. The 2014 Tuscaloosa County Multi-Hazard Mitigation Plan identifies the additional hazards, listed in Table 4-7.

Table 4-7. Other Natural Hazards

Hazards	Associated Hazards
Tornadoes	High Winds Severe Storms Lightning Hail
Severe Storms	Thunderstorms Hail Lightning High Winds Tornadoes Floods Landslides Wildfires
Winter Storms / Freezes	Snow Storms Ice Storms Extreme Cold
Wildfires	
Hurricanes	Tropical Storms Tropical Depressions Severe Storms High Winds Floods Tornadoes
Droughts / Heat Waves	Extreme Heat Wildfires Sinkholes
Landslides	Mudslides
Earthquakes	Landslides

Tornadoes

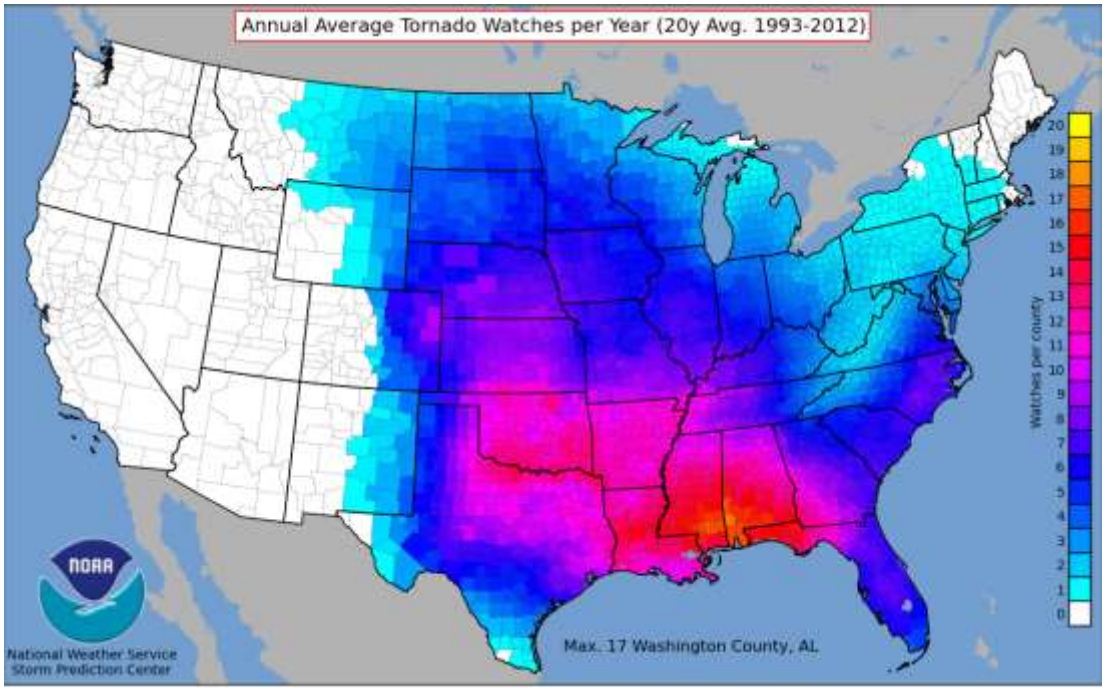
Tornadoes have frequently occurred within Tuscaloosa County, resulting in lost lives, destroyed homes, and utility interruptions. Based on an analysis of the National Weather Service severe weather data, Tuscaloosa County averages at least two tornadoes per year. Over the last 20 years, 48 tornado events have been reported in Tuscaloosa County. As shown on Map 4-10, Tuscaloosa County is placed under a Tornado Watch on average 13 times per year.

On April 27th, 2011, a mile-wide EF-4 tornado moved through Greene, Tuscaloosa, and Jefferson counties, downing trees, destroying homes and businesses, tossing debris, injuring 1,500 people and causing 65 fatalities. This was the deadliest and costliest tornado in Central Alabama and Tuscaloosa County to date.

Tuscaloosa County's location makes it more susceptible to tornadoes compared to southern counties in Alabama. However, within Tuscaloosa County, the locations of

tornadoes are largely random. All areas and jurisdictions in Tuscaloosa County are equally at risk.

Map 4-10. Annual Average Tornado Watches per Year



Source: National Weather Service Storm Prediction Center, 2015

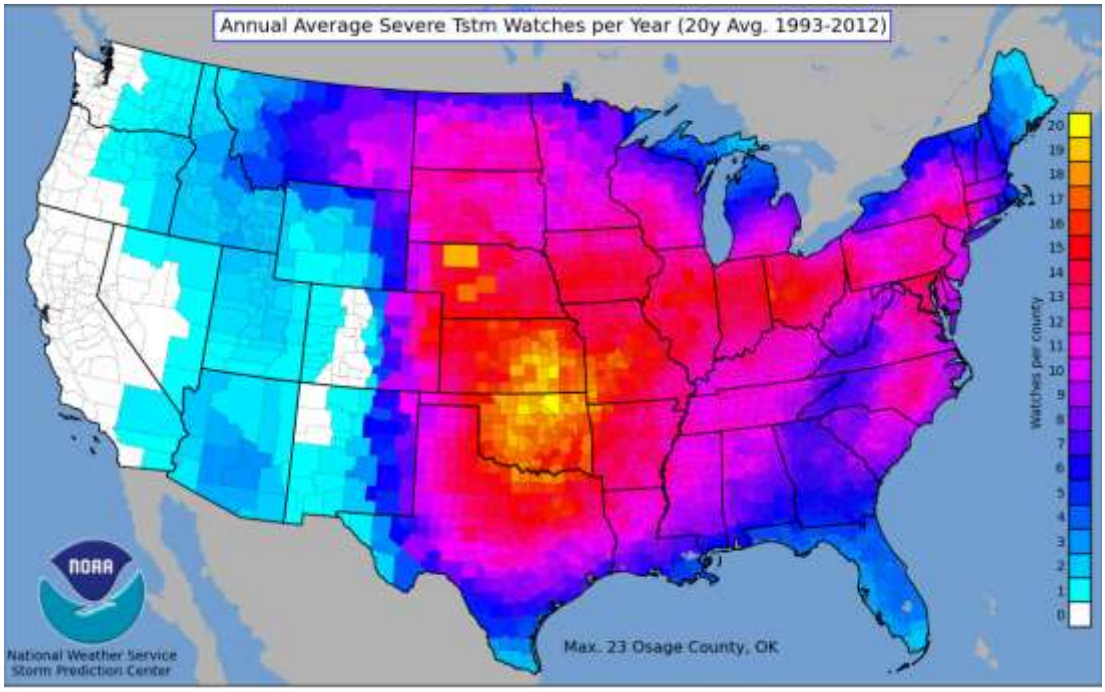
Severe Storms

Severe storms produce heavy rain, wind gusts, thunder, lightning, and hail. Tuscaloosa County can expect to see many severe storms each year, particularly in the spring, summer, and late fall. All areas of Tuscaloosa County have equal exposure to severe storms. According to the National Climatic Data Center, 222 severe storms occurred in Tuscaloosa County between 1995 and 2014 with an estimated $3.65 million in total damages. As shown on Map 4-11, Tuscaloosa County is placed under a Severe Thunderstorm Watch on average 10 times per year.

Unlike flooding and tornadoes, severe storms lack geographic centers and boundaries, and therefore cannot be substantively mapped. As noted in the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan:

"It is certain that severe storms will show annual occurrences throughout all of Tuscaloosa County jurisdictions. However, not every storm will exhibit all the hazards associated with severe storms; high winds are less frequent, and large damaging hail is rare."

Map 4-11. Annual Average Severe Thunderstorm Watches per Year



Source: National Weather Service Storm Prediction Center, 2015

Winter Storms

The risks associated with winter storms and freezes include deaths, power outages, crop damage, and road hazards. The average snowfall for Tuscaloosa County is 0.7 inches per year. Typical winter temperatures are above freezing, but temperatures below freezing do sometimes occur. Since 1995, there have been 15 recorded winter storm events (winter storm, heavy snow, ice storm, and winter weather) and 2 extreme cold events in Tuscaloosa County.

Tuscaloosa County can expect almost one winter storm event per year. Typical winter storms pose only a mild risk, but the infrequent, severe winter storms/freezes (e.g., blizzard of 1993, winter storm of 2014) can cause major transportation disruptions, lengthy power outages, substantial property damages, frostbite, and fatalities.

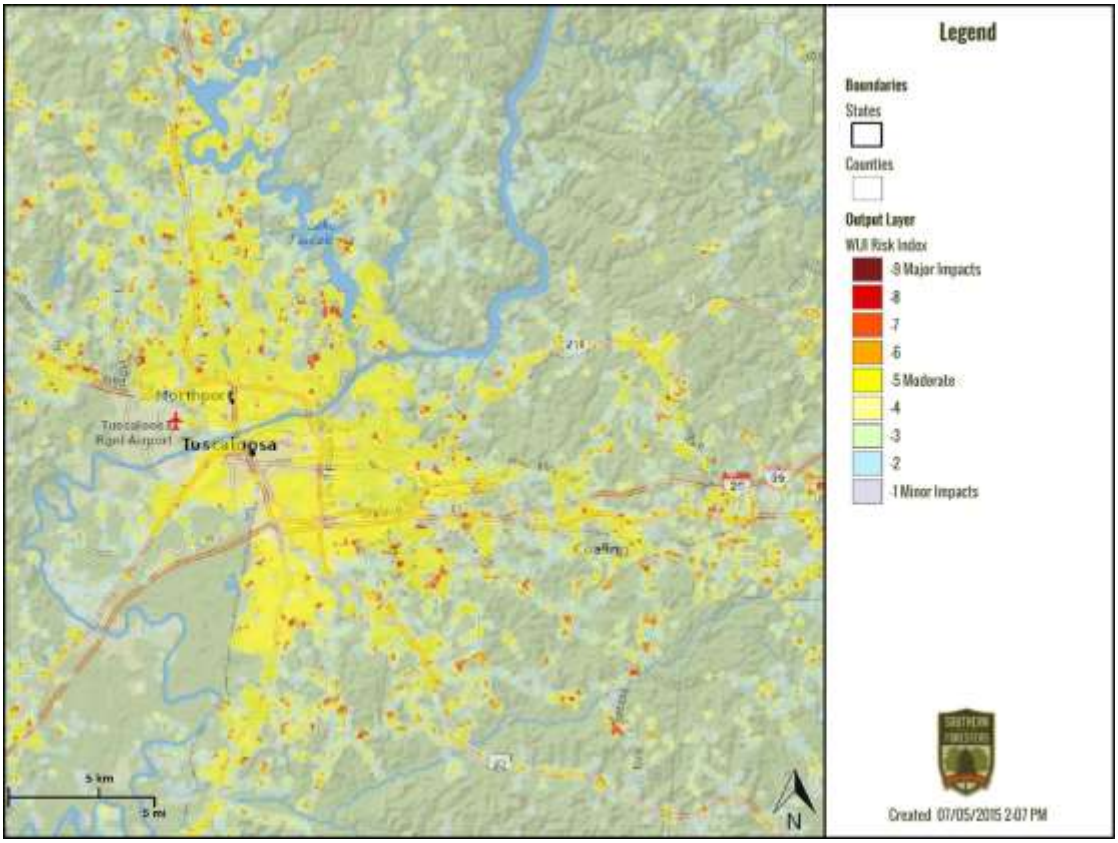
Wildfires

The two primary categories of wildfires in Tuscaloosa County are wildland fires and interface fires. Wildland fires feed on natural vegetation. Interface fires feed on both vegetation and human development. Interface fires are so named because they occur at the interface of nature and human developments.

Tuscaloosa is most susceptible to urban interface fires. The Wildland Urban Interface (WUI) Risk Index is a rating of the potential impact of a wildfire on people and their homes. The WUI Risk Index is based on housing density and proximity to rural areas. Map 4-12 below depicts the WUI Risk Index for Tuscaloosa and the surrounding communities. Most of the City is classified as Moderate Impacts in accordance to the

WUI Risk Index. Several, small, isolated pockets of increased impacts and higher risk are located throughout the City of Tuscaloosa, primarily outside of the city center.

Map 4-12. Tuscaloosa Wildland Urban Interface Risk Index



Source: Southern Group of State Foresters Wildfire Risk Assessment Portal, 2015

The Alabama Forestry Commission maintains a record of wildfire information. A total of 187 wildfires impacting 1,875 acres have occurred within Tuscaloosa County during the period of 2009-2014. On average, this equals 31 wildfires per year.

Hurricanes

Tuscaloosa is located approximately 200 miles inland of the Gulf of Mexico; however, it is still vulnerable to hurricanes and tropical storms. Table B-3 located in Appendix B lists 4 hurricane and tropical storm events that have affected Tuscaloosa County and the City of Tuscaloosa in the last 20 years (1995-2014).

The extent of hurricane damage in Tuscaloosa County depends primarily on wind speeds, tornado formation, and flooding. Defining the probability of future events is difficult as described in the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan:

"As is the case with most natural hazards, past records are no guarantee of the probability of future hurricane events affecting Tuscaloosa County. Given its inland location… Tuscaloosa County can expect the remnants of frequent Gulf Coast hurricanes and occasional direct impacts of tropical depressions."

Droughts/Heat Waves

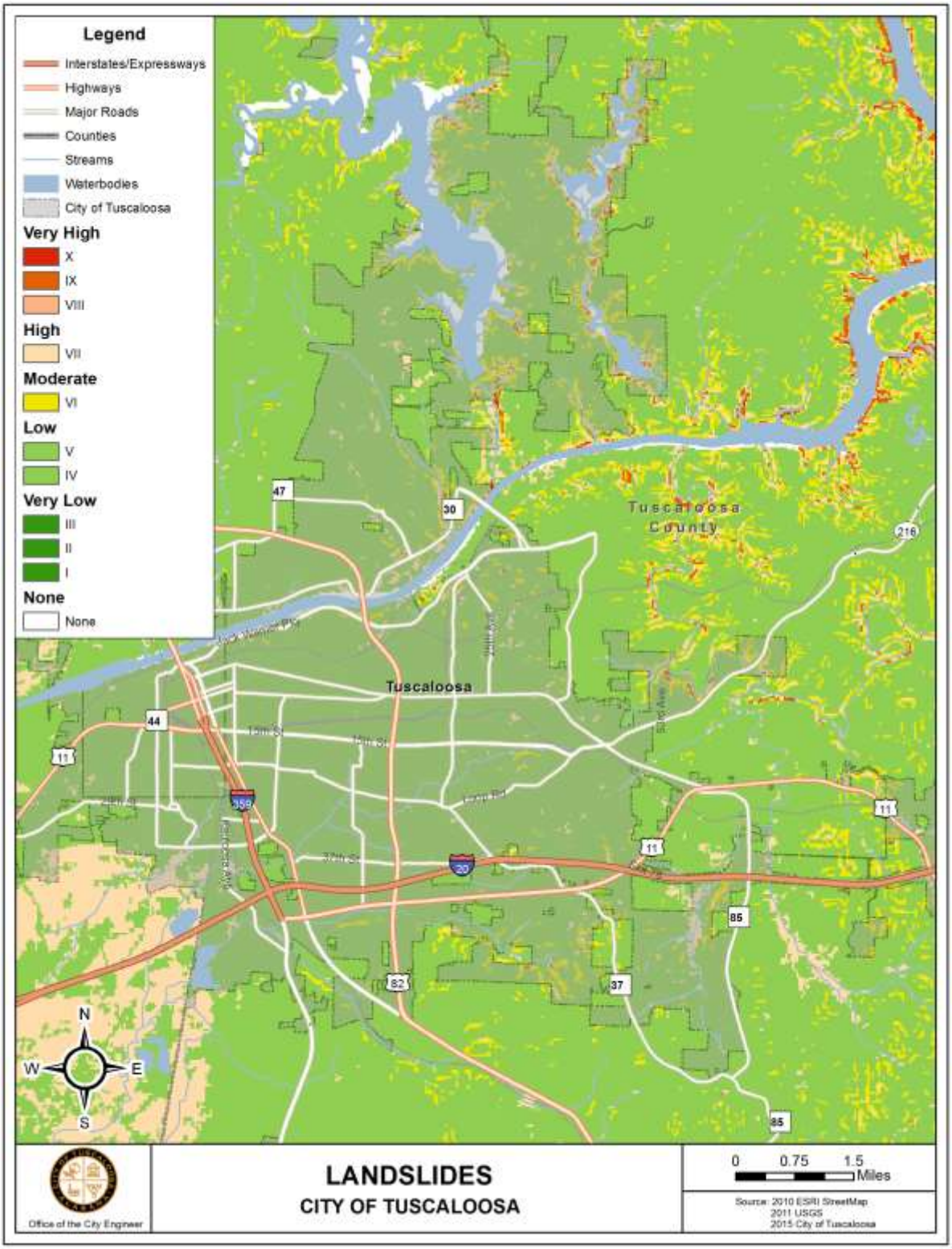
Tuscaloosa County experiences occasional droughts, which affect all jurisdictions with equal frequency. Droughts can cause widespread crop and pasture losses, wildfires, and severe shortages of water resources. According to the National Climatic Data Center Storm Event Database, Tuscaloosa County has experienced a drought event in four of the last twenty years (1995-2014). The most severe drought spanned 2006-2008. Based on historical data, Tuscaloosa County can expect, on average, one drought event per year.

Landslides

The impact from a landslide can include loss of life, damage to buildings, lost productivity, disruption in utilities and transportation systems, and reduced property values. According to the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan, Tuscaloosa County lies in an area of low landslide incidence, with a few areas of moderate susceptibility for landslides. Map 4-13, developed using landslide susceptibility data from the USGS seems to confirm this. The 2014 Tuscaloosa County Multi-Hazard Mitigation Plan also noted the following:

"Based on minimal evidence of previous occurrences, the probability of future landslides is minimal for all jurisdictions in Tuscaloosa County. Any future landslides are likely to be the result of construction activities and will be commensurately minor in scope. The risk of landslides is low compared to other natural hazards in Tuscaloosa County."

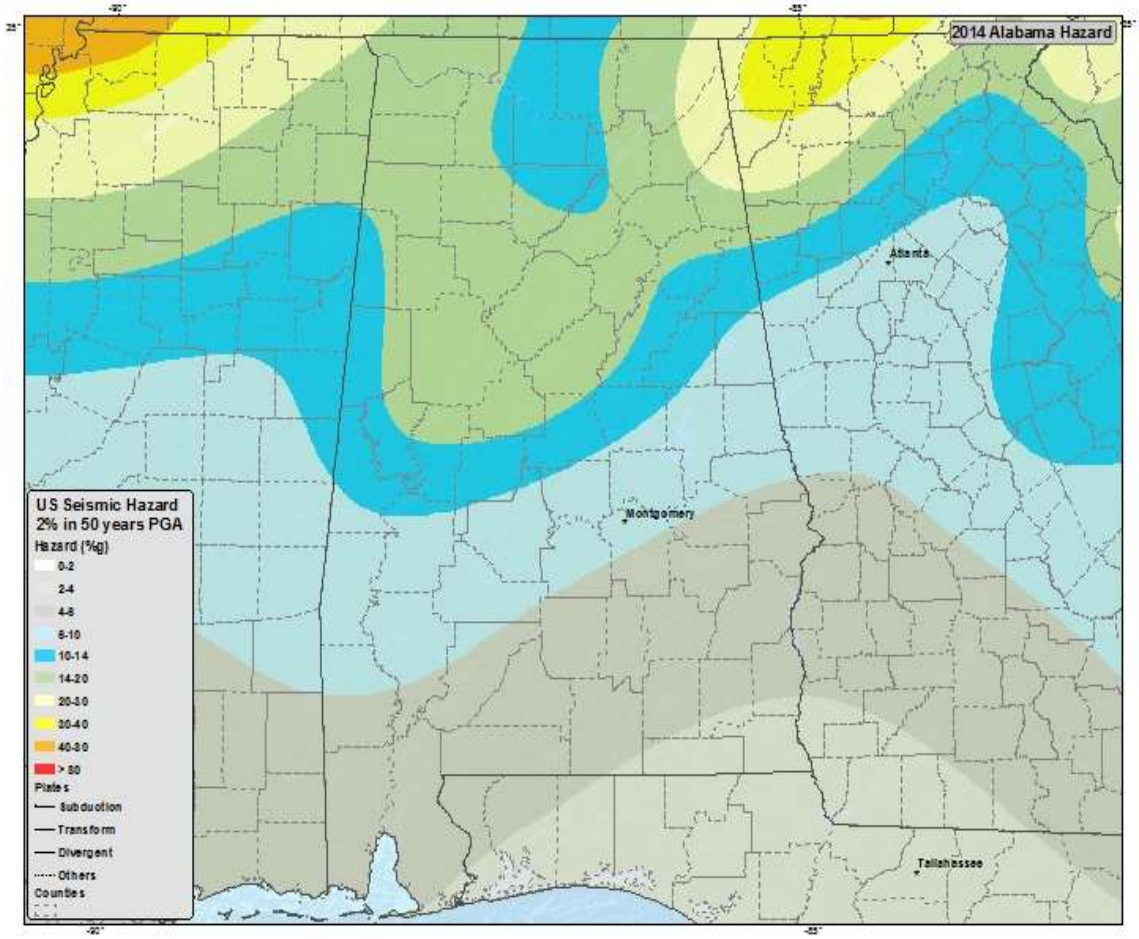
Map 4-13. 2011 Landslide Susceptibility Map



Earthquakes

Earthquakes are a rare occurrence in Tuscaloosa County. Since 1975, the Geological Survey of Alabama has a record of 11 earthquakes within Tuscaloosa County. A small magnitude 3.0 earthquake occurred on September 11, 1992 with the epicenter located near Skyland Blvd east of Memory Hill Garden. The USGS publishes national seismic hazard maps which show likelihood of exceeding a level of earthquake shaking in a given time period. The shaking intensity is measured in peak ground acceleration (PGA) which is acceleration (shaking) of the ground expressed as a percentage of gravity (%g), or as a percentage of 9.8 meters per second squared. Map data from the USGS Earthquake Hazards Program 2014 seismic hazard map (Map 4-14) shows the City of Tuscaloosa has a 2% chance of exceeding shaking above 14%g in the next 50 years.

Map 4-14. 2014 Alabama Seismic Hazard Map



Source: USGS, 2014

4.3 Vulnerabilities and Hazard Impacts: Assessing the Problem

Understanding the vulnerabilities and impacts of existing and future structures, critical facilities, and infrastructure to flooding and related hazards, provides a basis for establishing priorities for mitigation. The vulnerability assessment presented by this section is critical to planning and implementing responsive flood hazard mitigation measures.

FEMA's risk assessment software HAZUS-MH (version 2.2) was used to estimate flood losses for the study region, and the results have been integrated into this plan. HAZUS-MH provides an analytic, decision support tool to help communities make informed decisions regarding land use within their flood prone areas. A "Level 1 Analysis" of the 100-year flood event was modeled within HAZUS-MH. It utilizes the most recent datasets for the State of Alabama that is included in the software package. The HAZUS dataset includes 2010 Census data, such as demographic characteristics of the Tuscaloosa study region from the 2010 Census, square footage for different building occupancy types, and numbers and locations of bridges, in addition to other data from a variety of sources.

4.3.1 Summary of Vulnerability and Impacts

This risk assessment examines the City of Tuscaloosa's flood hazard vulnerabilities and impacts to the public health, safety and welfare, including impacts on populations, structures, critical facilities, the local economy, and other resources. A brief summary of impacts of flooding and related hazards can be found in Table 4-7 "Summary of Flood-Related Hazards and Community Impacts" below. This table is an abridged version, based upon the comparable Table 5-53 found in the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan. Table C-1 located in Appendix C of this document includes all other natural hazards identified in this plan.

For the purposes of summarizing the impacts and quantifying the risk associated with the various hazards, the following descriptions and measurements are used in Table 4-8:

Location. Location measures the geographic extent of the identified hazard in one of three ways, as follows:

1) *Community-wide* - the entire geographic area is affected;
2) *Partial* - a significant portion of the community is affected; or
3) *Minimal* - a negligible area is affected.

Probability. Probability measures the likelihood of the hazard occurring within the community, based on historical incidence. The scale for frequency runs as follows:

1) *Very high* - annually;
2) *High* - every two to three years;

3) *Moderate* - every three to ten years;

4) *Low* - every ten years; or

5) *Very low* - rare.

Extent. Extent measures the severity of the hazard and its potential to cause casualties, business losses, and damage to structures. The scale utilized runs as follows:

1) Devastating - the potential for devastating casualties, business losses, and structure damage;

2) Significant - the potential for some casualties and significant, but less than devastating, business losses and structure damage;

3) *Moderate* – moderate potential for economic losses and structure damage; or

4) *Slight* – slight or minimal potential for economic losses and structure damage

Exposure. Exposure measures the percentage of structures within the community, including buildings, critical facilities, and infrastructure lifelines, that are exposed to the hazard. The classifications are defined as follows:

1) *High* - includes more than approximately 25 percent of the structures;

2) *Medium* - includes 10 percent to 25 percent of the structures; or

3) *Low* - includes less than 10 percent of the structures.

Damage Potential. Damage potential measures the damage that can be expected should an event take place. The classifications are defined as follows:

1) *High* - a hazard could damage more than 5 percent of the structures in a community;

2) *Medium* - a hazard could damage between 1 and 5 percent of the structures in a community; or

3) *Low* - a hazard could damage less than 1 percent of the structures in a community.

Table 4-8. Summary of Flood-Related Hazards and Community Impacts

Flood-Related Hazard	Community Impacts			Impacts to Vulnerable Community Buildings, Critical Facilities, and Infrastructure	
	Location (Geographic Extent of Hazard in the Community)	**Probability** (Frequency of Hazard Occurrence in the Community)	**Extent** (Magnitude of Severity of Hazard in the Event of Occurrence)	**Level of Exposure** (Degree of Structures Exposed to the Hazard)	**Level of Damage Potential** (Percentage of Likely Damage to Exposed Structures)
Floods	Partial	Very High	Significant	Medium	Medium
Dam/Levee Failures	Minimal	Low	Slight	Low	Low
Sinkholes (Land Subsidence)	Minimal	Moderate	Moderate	Medium	Low

4.3.2 Description of Impacts

Life Safety

Vulnerability to flood hazards includes the impacts to the social structure, such as, injury and death, and the psychological effects on the populous. Flood impacts to life safety can be a direct impact to life safety due to injury or death, but can also have impacts on public safety by limiting access to personal or emergency vehicles when transportation corridors are closed. Proper warning and evacuation procedures should be planned and implemented to reduce the risks to residents and visitors.

Within the risk assessment study region of the City of Tuscaloosa and its environs, HAZUS-MH reports a total population of 140,853 people (2010 Census Bureau data). Although HAZUS-MH does not provide estimates on injury or death, the software estimates that 3,785 households will be displaced due to a 100-year flood event. Displacement includes households evacuated from within or very near to the inundated area. Of those displaced, 9,361 people (out of a total population of 140,853) will seek temporary shelter in public shelters.

Public Health

Impacts due to flooding create hazards to public health during and after a flood event. Hazardous and toxic substances can be released into the flood waters where the public may come in contact with these substances. These substances include household, commercial and industrial chemicals, sanitary sewer overflows and pets or wildlife that may die during the event. Utilities, such as power, gas and water, may also be shut down during and after an event. This could cause potential health hazards to

the elderly with poor mobility or members of the public with special health care needs. Mold is another public health hazard after a flood event, when inundated structures sustain water damage and remain damp from flood waters.

Critical Facilities

Critical facilities are defined as those that are essential to the health and welfare of the community and are critical subsequent to hazard events. Examples include medical care facilities (hospitals and other care facilities), police and fire facilities, emergency management facilities, schools, and emergency shelters.

The 2014 Tuscaloosa County Multi-Hazard Mitigation Plan includes an inventory of critical facilities in Tuscaloosa County, based on classification. The inventory included in this plan has been condensed to show only those critical facilities within the City of Tuscaloosa. This information can be found in Tables 4-9 through 4-15 and Maps 4-15 through 4-21.

Table 4-9. Government Facilities in the City of Tuscaloosa

Agency	Address	SIC Description
Adult Vocational Rehab Services	1305 James I Harrison, Jr Pkwy East	Administration of Social and Manpower Programs
AL Alcoholic Beverage Control Board	6050 Mimosa Circle	Regulation, Administration of Transportation
AL Alcoholic Beverage Control Board	401 21st Ave.	Finance, Taxation, and Monetary Policy
AL Alcoholic Beverage Control Board	612 Lurleen B Wallace Blvd.	Regulation, Miscellaneous Commercial Sectors
Alabama Dept. of Human Resources	3716 12th Ave. E	Administration of Social and Manpower Programs
Alabama Dept. of Public Health Area 3, Administration	1101 Jackson Ave.	Administration of Social and Manpower Programs
Alabama Dept. of Public Health Area 3, Environmental	1200 37th St. E	Administration of Social and Manpower Programs
Alabama Dept. of Public Safety Drivers' License	2645 Skyland Blvd. E	Regulation, Administration of Transportation
Alabama Dept. of Revenue	518 19th Ave.	Finance, Taxation, and Monetary Policy
Alabama Dept. of Transportation	3702 Resource Dr. # 1	Legislative Bodies
Alabama Dept. of Transportation	620 14th St # A	Regulation, Administration of Transportation
Alabama Dept. of Transportation	2715 Skyland Blvd. E	Regulation, Administration of Transportation
Alabama Career Center	2202 Skyland Blvd. E	Finance, Taxation, and Monetary Policy
Alabama Health Network	921 3Rd. Ave. E	Administration of Public Health Programs
Alabama State Medicaid Agency	900 22nd Ave. E	Administration of Social and Manpower Programs
Alabama Unemployment Claims-Tax Office	220 222 14th St.	Finance, Taxation, and Monetary Policy
ARC of Tuscaloosa County	1330 University Blvd. E	General Government
Geological Survey of Alabama	420 Hackberry Lane.	Regulation, Miscellaneous Commercial Sectors
Tuscaloosa Career Center	Tuscaloosa Career Center	Administration of Social and Manpower Programs
Tuscaloosa City Dept. of Transportation	2201 University Blvd.	Regulation, Administration of Transportation
Tuscaloosa City Hall	2122 6th Street	Executive Offices
Tuscaloosa City Municipal Court	2122 6th St.	Courts
Tuscaloosa City Offices	2201 University Blvd.	Legislative Bodies
Tuscaloosa City Transit Authority	2450 Hargrove Rd.	Regulation, Administration of Transportation
Tuscaloosa County Cooperative Ext. System	2513 7th St.	Legislative Bodies
Tuscaloosa County Courthouse	714 Greensboro Ave.	Legislative Bodies
Tuscaloosa County District Attorney	714 Greensboro Ave.	Legal Counsel and Prosecution

Agency	Address	SIC Description
Tuscaloosa County Engineering	2810 35th St.	Legislative Bodies
Tuscaloosa County Health Department	2350 Hargrove Rd.	Administration of Public Health Programs
Tuscaloosa County Juvenile Court	6001 12th Ave. E	Legislative Bodies
Tuscaloosa County School System	1118 Greensboro Ave.	Legislative Bodies
Tuscaloosa City Board of Education	1210 21st Ave.	Legislative Bodies
Tuscaloosa Housing Authority	2117 Jack Warner Pkwy., NE	Housing Programs
Tuscaloosa Housing Counseling	2122 6th St.	Legislative Bodies
Tuscaloosa Lakes Division	3650 Lake Nicol Rd.	Legislative Bodies
Tuscaloosa PD Juvenile Program	3801 Trevor S. Phillips Ave.	Legislative Bodies
US Army Corps of Engineers	101 21st Ave.	National Security
US Army Corps of Engineers	12421 Deerlick Rd.	Land, Mineral, and Wildlife Conservation
US Bankruptcy Chapter 13 Trustee	701 22nd Ave.	Legislative Bodies
US Bankruptcy Chapter Trustee	1307 25th Ave.	Legislative Bodies
US Federal Aviation Administration	7508 Robert Cardinal Airport Rd.	Regulation, Administration of Transportation
US Federal Building & Courthouse	2005 University Blvd	Courts
US General Services Admin, Social Security, FBI	2005 University Blvd.	Social Security Administration
US Geological Survey	1912 6th St.	Air, Water, and Solid Waste Management
US Geological Water Resources	520 19th Ave.	Legislative Bodies
US Housing Authority Federal	570 60th St.	Housing Programs
US Natural Resources Conservation, USDA	3831 Palisades Dr.	Land, Mineral, and Wildlife Conservation
US National Weather Service	7504 Robert Cardinal Airport Rd.	Administration of General Economic Programs
USGS Alabama Water Science Center	411 Hackberry Lane, Biology Building	Air, Water, and Solid Waste Management

Map 4-15. Government Facilities in the City of Tuscaloosa

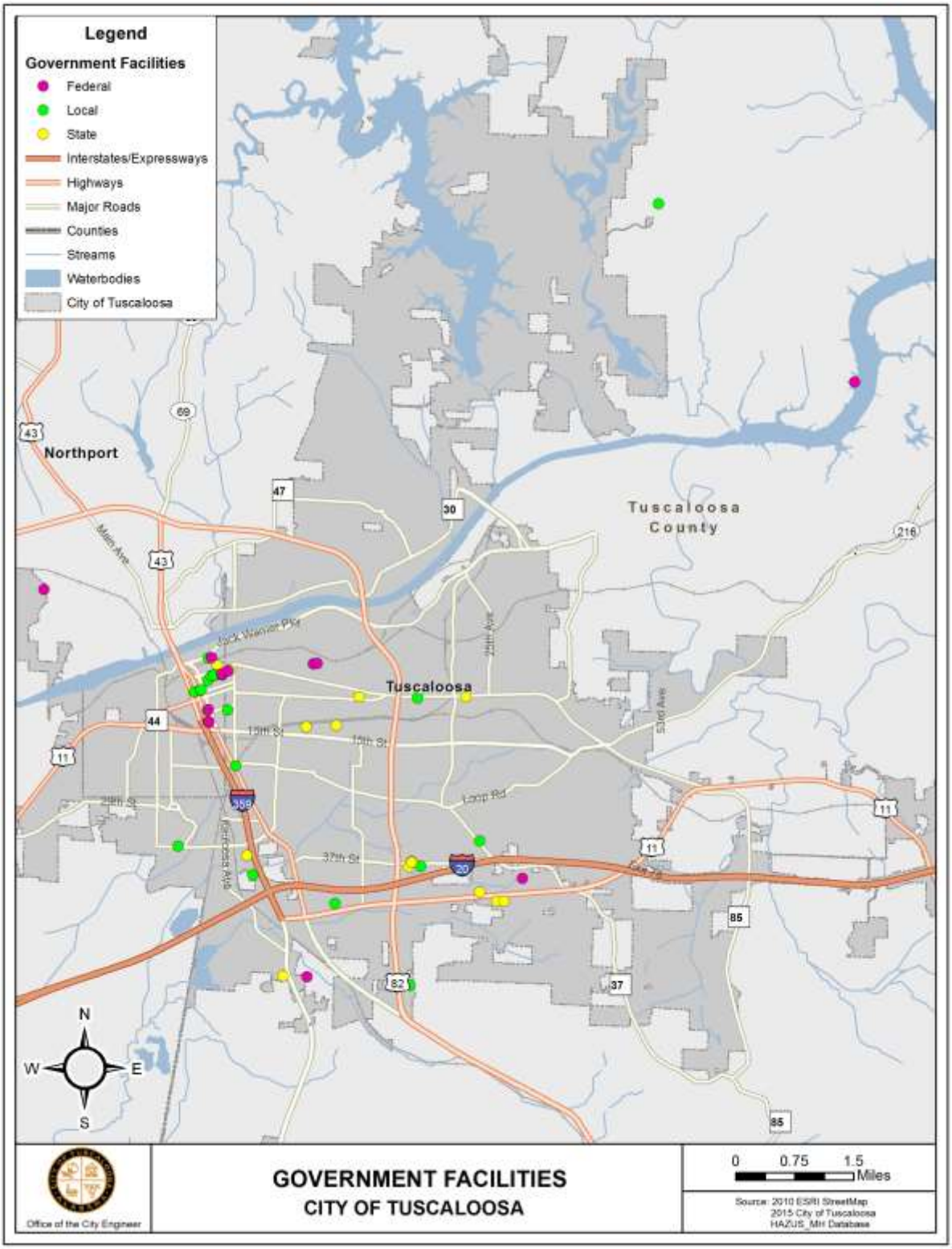


Table 4-10. Public Safety Facilities in the City of Tuscaloosa

Name	Address	Zip Code
Alabama State Trooper	2645 Skyland Blvd. E	35405
Nicole Volunteer Fire Dept.	14105 Old Lock 15 Road	35406
Tuscaloosa City Fire & Rescue Service	2201 University Blvd.	35401
Tuscaloosa City Fire Station #1 & #5	1501 Greensboro Avenue	35401
Tuscaloosa City Fire Station # 2	322 Paul Bryant Dr.	35401
Tuscaloosa City Fire Station # 3	202 Rice Valley Rd. NE	35406
Tuscaloosa City Fire Station # 4	717 21st Avenue East	35404
Tuscaloosa City Fire Station # 6	2001 Woodland Rd.	35405
Tuscaloosa City Fire Station # 7	127 Skyland Blvd	35405
Tuscaloosa City Fire Station # 8	2200 Eutaw Highway	35401
Tuscaloosa City Fire Station # 9	3942 Woodland Forest Dr.	35405
Tuscaloosa City Fire Station # 10	8201 New Watermelon Rd	35406
Tuscaloosa City Fire Station # 11	10293 Covered Bridge Rd	35453
Tuscaloosa City Fire Station # 12	7515 Robert Cardinal Airport Rd.	35406
Tuscaloosa City Police Dept.	3801 Trever S. Phillips Ave	35401
Tuscaloosa City Police Headquarters	3801 Millcreek Ave	35401
Tuscaloosa Police Dept. East Precinct	2201 University Blvd	35404
Tuscaloosa Police Dept. West Precinct	1501 Culver Road	35401
Tuscaloosa City Police Homicide Unit	714 1/2 Greensboro Ave	35401
Tuscaloosa City Police-Air Patrol	7505 Robert Cardinal Airport Rd.	35401
Tuscaloosa City Police-Firing Range	2101 New Watermelon Rd	35406
Tuscaloosa City Police-Traffic Ticket	2122 6th Street	35401
Tuscaloosa Co Communication District E911	2501 7th St.	35401
Tuscaloosa Co Corrections	3130 35th St.	35401
Tuscaloosa Co Emergency Management	2105 McFarland Blvd E	35404
Tuscaloosa Co Sheriff's Office	714 1/2 Greensboro Ave.	35401
Tuscaloosa County Jail	1600 26th Ave	35401
Tuscaloosa Sheriff's Office	714 1/2 Greensboro Ave.	35401
University of Alabama Police	1110 Jackson Ave.	35401
Yellow Creek Volunteer Fire Dept.	10722 Watermelon Rd	35406

Map 4-16. Public Safety Facilities in the City of Tuscaloosa

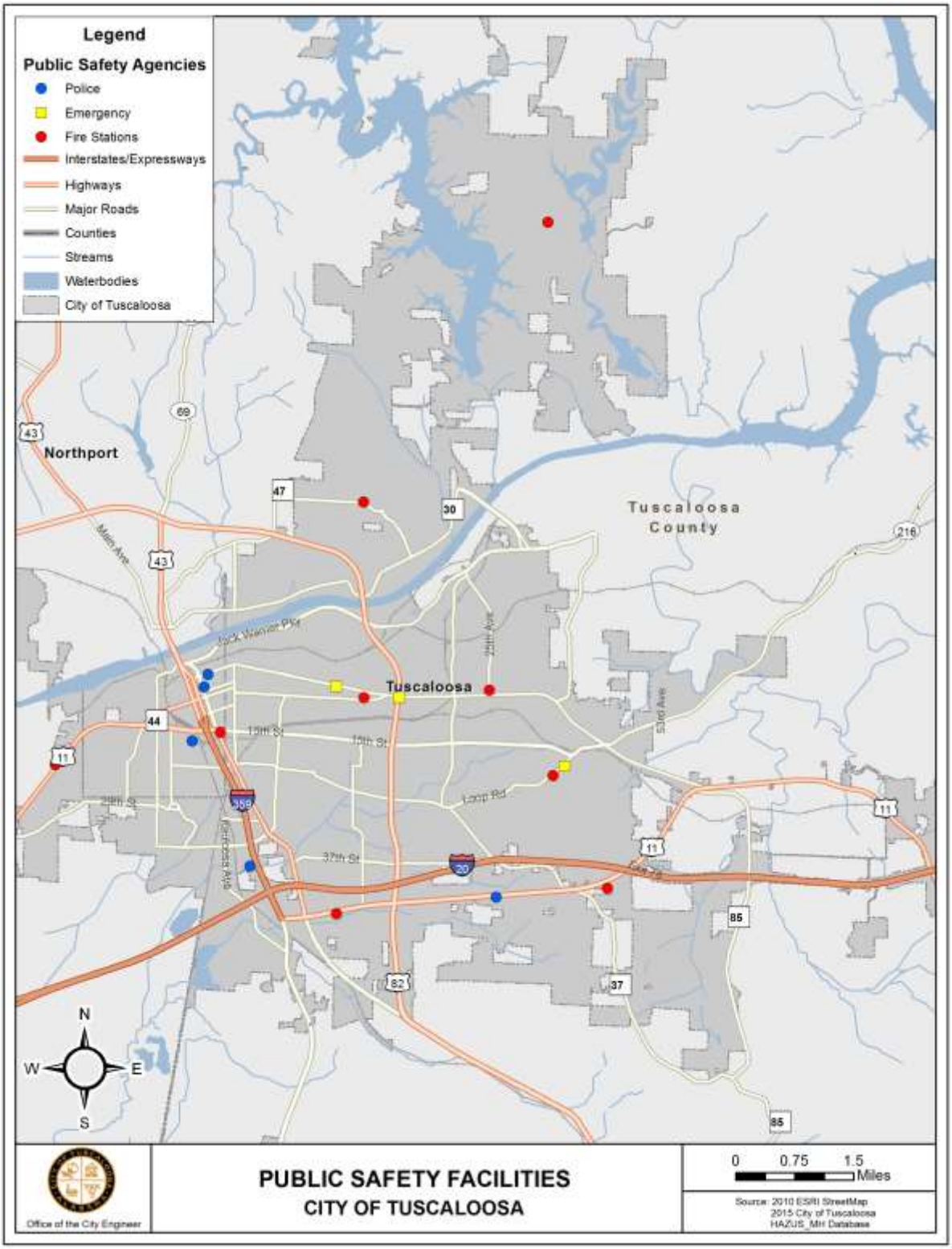


Table 4-11. Schools in the City of Tuscaloosa

Name	Address	Zip Code	# of Students
Alabama Fire College	2501 Phoenix Drive	35405	--
Alberta Elementary School	315 McFarland Blvd. E	35404	540
American Christian Academy	2300 Veterans Memorial Pkwy.	35404	892
Arcadia Elementary School	3740 Arcadia Dr.	35404	392
Brewer Porch Children's Center	2501 Woodland Rd.	35487	451
Capitol School The	2828 6th St.	35401	82
Centec Training Center	3401 Martin L King Jr Blvd.	35401	--
Central High School	905 15th St	35401	--
Central Primary School	1510 30th Ave.	35401	257
Eastwood Middle School	5000 Buttermilk Rd	35453	--
Holy Spirit Elementary School	601 James I Harrison Jr E	35405	242
Holy Spirit High School	711 James I Harrison Jr E	35405	555
Martin L King Jr Elementary School	2430 Martin L King Jr Blvd.	35401	444
Night High School	1715 Martin Luther King Jr Blvd.	35401	514
Northington Elementary School	1300 21St St. E	35404	379
Northridge High School	2901 Northridge Rd.	35406	1097
Oak Hill School	2501 Hargrove Rd. E	35405	129
Oakdale Primary School	5001 25th St.	35401	227
Open Door Christian School	1785 McFarland Blvd. N	35406	174
Paul Bryant High School	5350 Buttermilk Rd	35453	--
Rock Quarry Elementary School	2000 Rock Quarry Dr.	35406	526
Rock Quarry Middle School	2100 Rock Quarry Dr.	35406	--
Shelton State Community College	9500 Old Greensboro Rd.	35405	5307
Sherwood Forest Kindergarten	2928 Hargrove Rd. E	35405	--
Skyland Elementary School	408 Skyland Blvd. E	35405	571
Skyland SDA School	2211 Skyland Blvd. E	35405	7
Southview Elementary School	2601 Southview Dr.	35405	--
Southview Middle School	2605 Southview Dr.	35405	--
Stillman College	3601 Stillman Blvd.	35401	1072
Stillman Heights Elementary	3834 21st St.	35401	--
Tuscaloosa Academy	420 Rice Valley Rd. N	35406	349
Tuscaloosa Career & Technology Academy	2800 Martin L King Jr Blvd.	35401	514
Tuscaloosa Middle School	315 McFarland Blvd. E	35404	972
Tuscaloosa Regional Detention Center	6001 12th Ave. E	35405	514
University Of Alabama	400 Mcorvey Dr.	35487	34852
University Place Montessori School	2000 First Ave.	35401	610
University Place Middle School	2010 First Ave.	35401	--

Name	Address	Zip Code	# of Students
Verner Elementary School	2701 N Ridge Rd.	35406	542
Westlawn Middle School	1715 Martin L King Jr Blvd.	35401	528
Woodland Forrest Elementary School	6001 E Hargrove Rd.	35405	601

Map 4-17. Schools in the City of Tuscaloosa

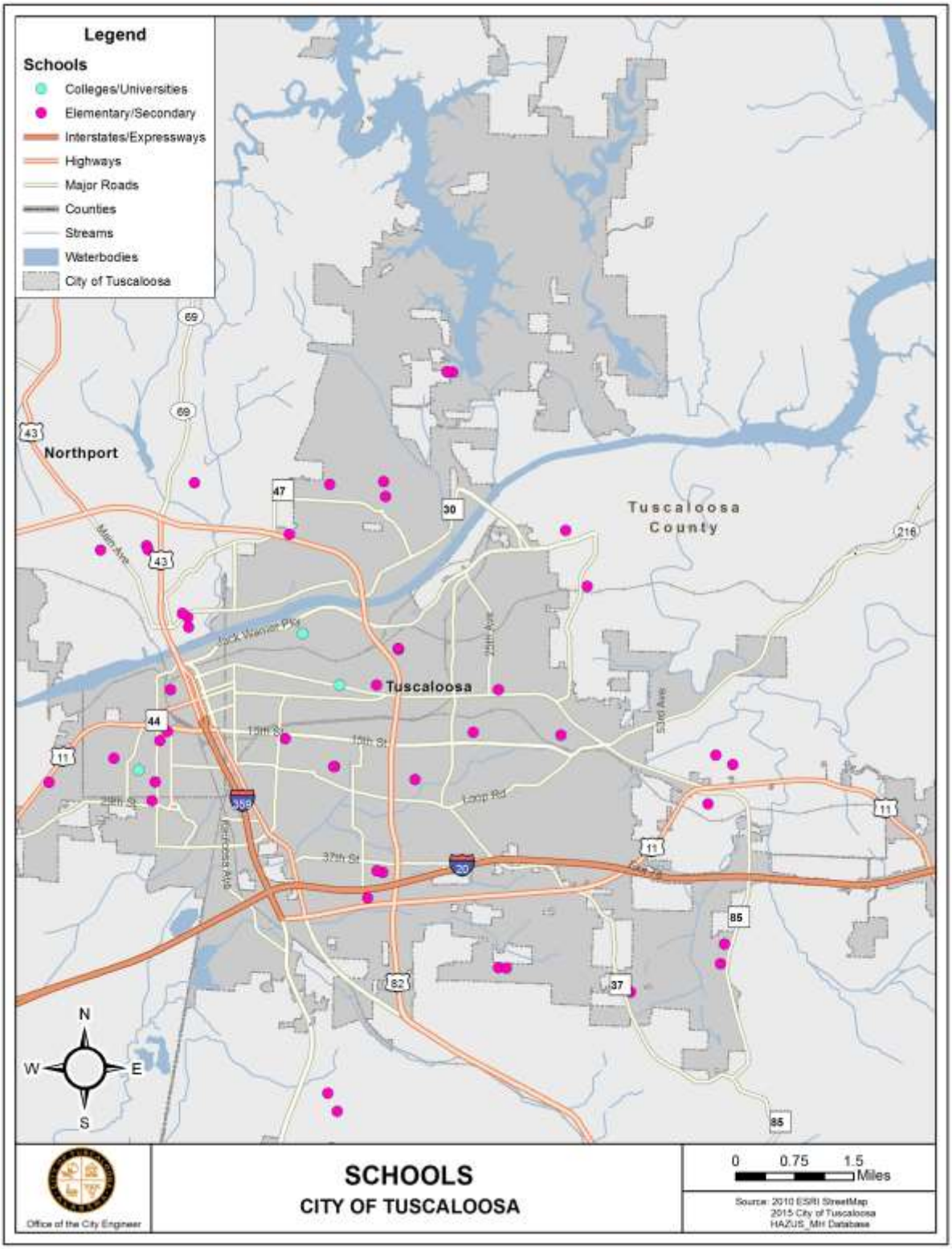


Table 4-12. Hospital and Elderly Care Facilities in the City of Tuscaloosa

Name	Description	Address	Zip Code
Alabama Comprehensive Treatment	Psychiatric Hospitals	661 Helen Keller Blvd. # B	35404
Alabama Tuscaloosa Treatment	Specialty Hospitals, Except Psychiatric	1001 Mimosa Park Rd.	35405
Andante Group Home	Psychiatric Care	532 Frank Thomas Ave	35401
Bradford Health Services	Chemical Dependency Treatment Facility	1918 University Blvd	35401
Bryce Hospital	Psychiatric Hospitals	1651 Ruby Tyler Pkwy	35401
Burton School Inc.	Residential Care	3807 1st Ave.	35405
Capstone Village	Dementia Unit/Assisted Living/Independent Living	601 5th Avenue East	35401
DCH Regional Medical Center	General Medical and Surgical Hospitals	809 University Blvd. E	35401
Hambrick Highlands Assisted Living	Assisted Living	755 55th Pl. E	35405
Harper Center	General Medical and Surgical Facilities	200 University Blvd	35401
Heritage Health Care & Rehab.	Skilled Nursing Care Facilities	1101 Snows Mill Ave.	35406
Hospice of West Alabama Inc.	Nursing and Personal Care	3851 Loop Rd.	35404
Indian Rivers Community Mental Health	Community Mental Health	2209 9th Street	35401
Magnolia Place	Mental Health & Substance Abuse Facility	3715 3rd Ave. E	35405
Morning Pointe of Tuscaloosa	Assisted Living Facility & Alzheimer's Memory Care	1801 Rice Mine Rd. N	35406
North River Village	Retirement Community/Assisted Living	5810 Rice Mine Rd. NE	35406
Northport Health Services	Skilled Nursing Care Facilities	931 Fairfax Park	35406
Pine Valley Retirement Community	Residential Care	800 Rice Valley Rd. N	35406
Regency Retirement Center	Alzheimer's Care & Services	5001 Old Montgomery Hwy	35405
Smithcare Inc	Mental Health & Substance Abuse Facility	6133 Birchwood Ave.	35405
Taylor Hardin Secure Medical Facility	Secure Medical -Mental Health	1301 Jack Warner Pkwy. NE	35404
The Phoenix House	Residential Care	700 35th Ave.	35401
Therapeutic Programs Inc.	Residential Care--Foster Care	3076 Palisades Ct.	35405
US Veterans Medical Center	Psychiatric Hospital/Diagnostic	3701 Loop Rd.	35404
William D Partlow Developmental Center	Psychiatric Hospital	1700 University Blvd E	35404
Wyatt Lynn Foster Home	Residential Care-Group Home	11643 S Rosser Rd	35405

Map 4-18. Hospital and Elderly Care Facilities in the City of Tuscaloosa

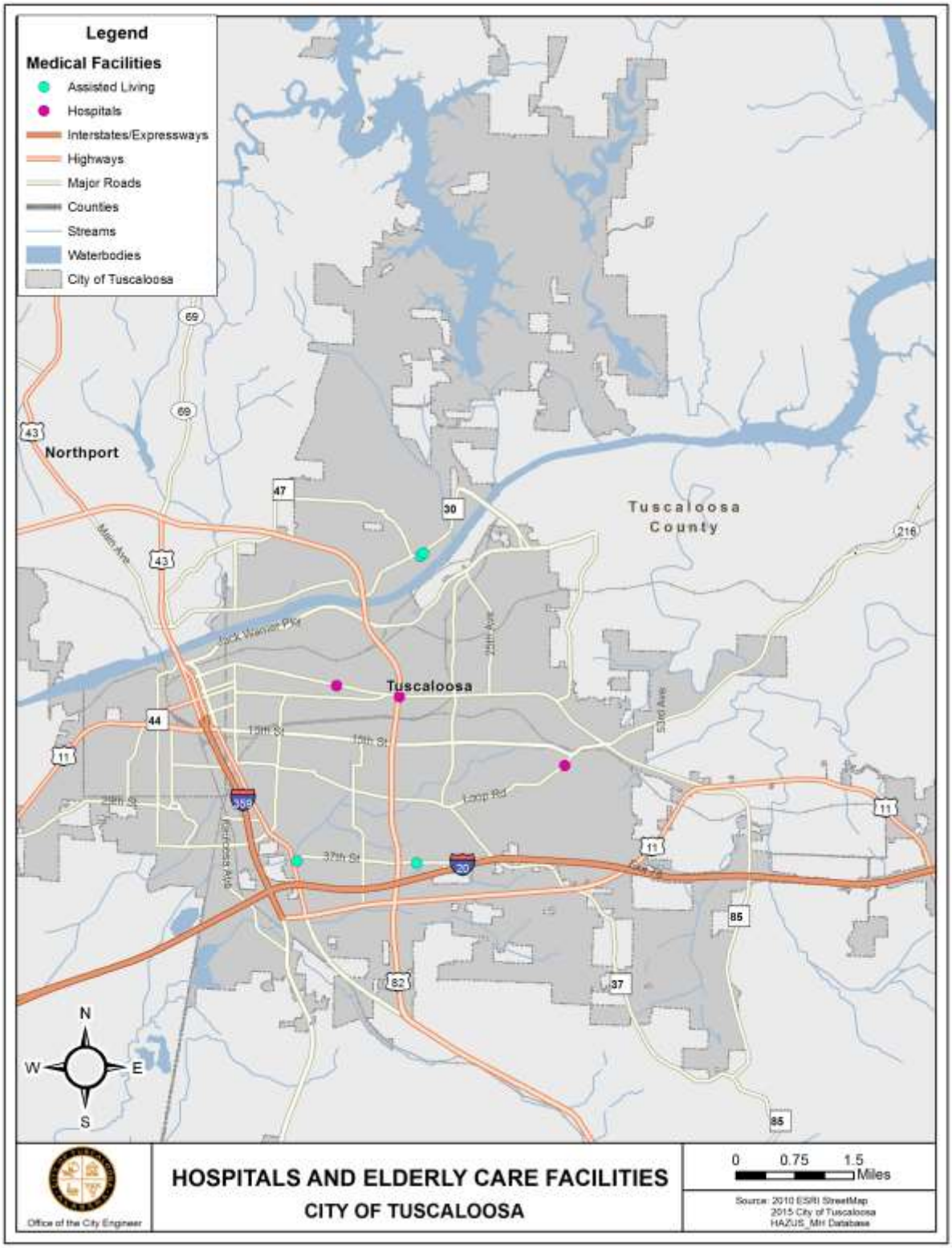


Table 4-13. Utilities for the City of Tuscaloosa

Name	Address	Facility Type
ABM Recycling	5901 12th Ave. E	Solid Waste
Alabama Power Company	2200 4th St.	Electric
Alabama Power Holt Hydro Plant	12117 Power Plant Rd.	Electric
Alabama Power-West Div. Garage	1301 Snows Mill Rd	Electric
Alagasco Operation Center	5220 Metro Park Dr.	Gas Oil
Blount Recycling LLC	6345 Old Montgomery Hwy.	Solid Waste
Cypress Creek Inc. Landfill	6315 12th Ave. E	Solid Waste
Dowdle Gas Co	2523 University Blvd	Gas Oil
Ed Love Filter Plant	1125 Jack Warner Pkwy NE	Water-Wastewater
Englewood-Hulls Water System	11276 Crocker Dr.	Water-Wastewater
Heritage Environmental Services	11264 Woodbank Pkwy.	Solid Waste
Hunt Refining Company	1855 Fairlawn Rd.	Gas Oil
Jerry Plott Water Treatment Plant	2101 New Watermelon Rd.	Water-Wastewater
Merichem Chemicals - Refinery Services	2701 Warrior Rd.	Gas Oil
Onyx Eagle Bluff Landfill	4701 12th St. NE	Solid Waste
Rumsey Environmental LLC.	5400 Kauloosa Ave.	Solid Waste
Rumsey Sanitation	1407 10th Ave.	Solid Waste
Southern Natural Gas	13493 Deerlick Rd.	Gas Oil
Tuscaloosa City Wastewater Plant	3900 Kauloosa Ave	Water-Wastewater
Tuscaloosa City Water & Sewer Dept.	2201 University Blvd.	Water-Wastewater
Tuscaloosa City Water & Sewer Dept.	2621 Old Kaulton Rd.	Water-Wastewater
Tuscaloosa City Water & Sewer Dept	2230 6th St.	Water-Wastewater
Tuscaloosa County Solid Waste Dept.	714 Greensboro Ave.	Solid Waste
Tuscaloosa Environmental Services	3440 Kauloosa Ave.	Solid Waste
Waste Management	3150 35th St.	Solid Waste
Waste Management	5404 Kauloosa Ave.	Solid Waste
West Alabama Sanitation	4223 Hargrove Rd. E	Solid Waste

Map 4-19. Utilities for the City of Tuscaloosa

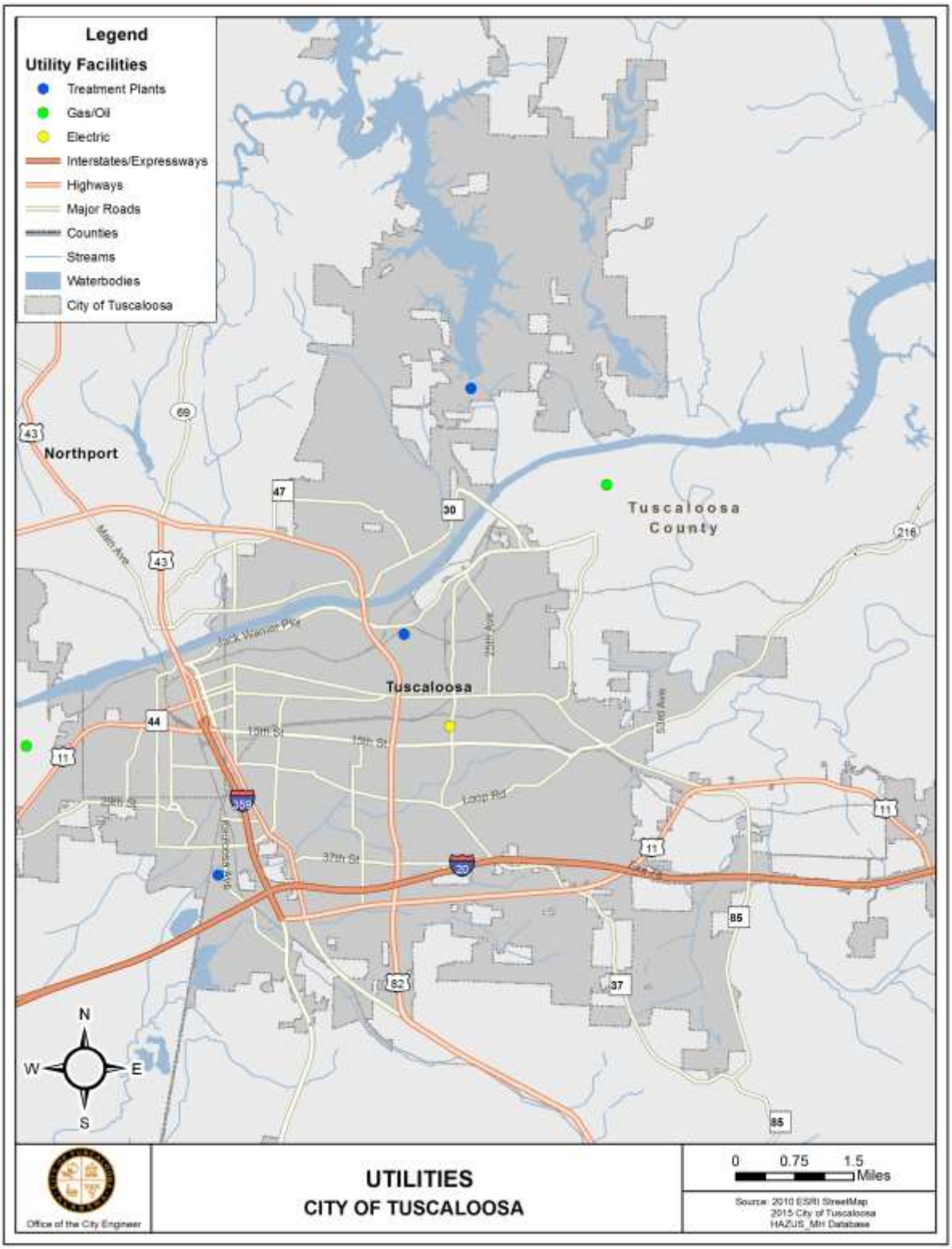


Table 4-14. Communication Facilities for the City of Tuscaloosa

Name	Address	Zip Code
Apex Communications Inc.	101 Springbrook	35405
Avaya Communication	3500 Skyland Blvd. E	35405
BellSouth	2101 7th St.	35401
Busby Communications Inc.	1700 Dauphine Dr.	35406
Charter Communications	440 Patriot Pkwy.	35405
Charter Media	2306 11th St.	35401
Comcast Cable	6000 McFarland Blvd. E	35406
Comcast Cable	700 14th St.	35401
Comcast Satellite Communications	1120 35th St Ste. C	35401
Earle Communications Cable TV	3115 25th Ave Ste. A	35401
Kubiszyn Communications LLC	1203 Dublin Cir.	35406
Lawson Radio of Tuscaloosa Inc.	7741 Woodlawn Cir.	35405
Lewis Communications Inc.	2318 University Blvd.	35401
News Media Corp	216 McFarland Cir. N	35406
Radio South Management	1800 McFarland Blvd. N	35406
Rives Monteiro Engineering LLC	2736 Southside Dr.	35401
Southern Telecom Group	5645 Montpelier Dr.	35405
WBEI FM 101.7/WANZ-FM 100.7	142 Skyland Blvd.	35405
WBRC-TV NBC 13	2330 University Blvd.	35401
WCFT-TV CH 33 ABC	2123 9th St.	35401
WDGM FM 991	5455 Jug Factory Rd.	35405
WQZZ	601 Greensboro Ave. # 507	35401
WRTR FM 288	3900 11th Ave.	35401
WTBC AM 1230	2110 McFarland Blvd. E	35404
WTUG-FM 225/WTSK AM 790	142 Skyland Blvd.	35405
WTXT FM 98.1	3900 11th Ave.	35401
WVUA TV	920 Paul W Bryant Dr.	35401
WWPG FM 104.3/AM 1280	601 Greensboro Ave.	35401

Map 4-20. Communication Facilities for the City of Tuscaloosa

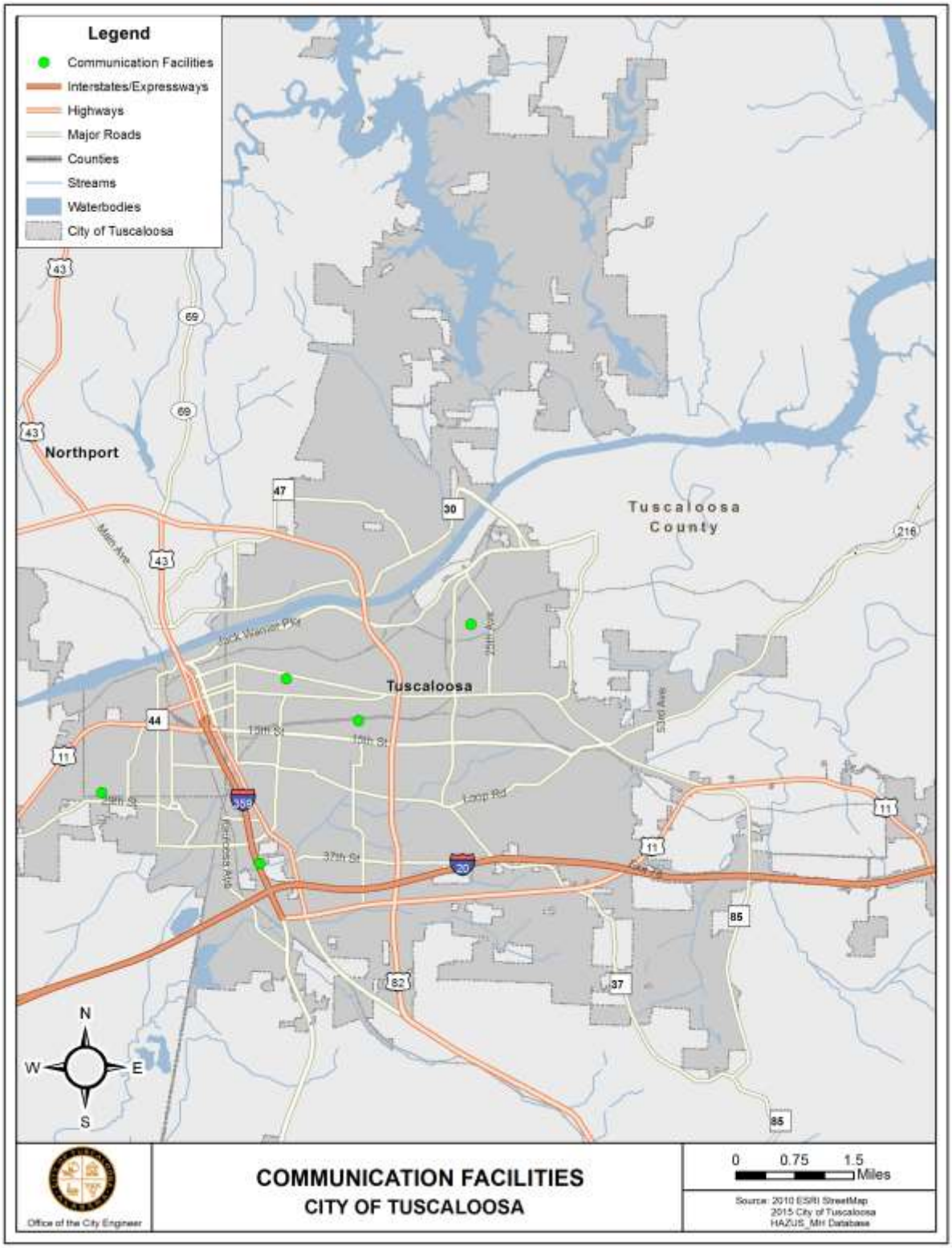
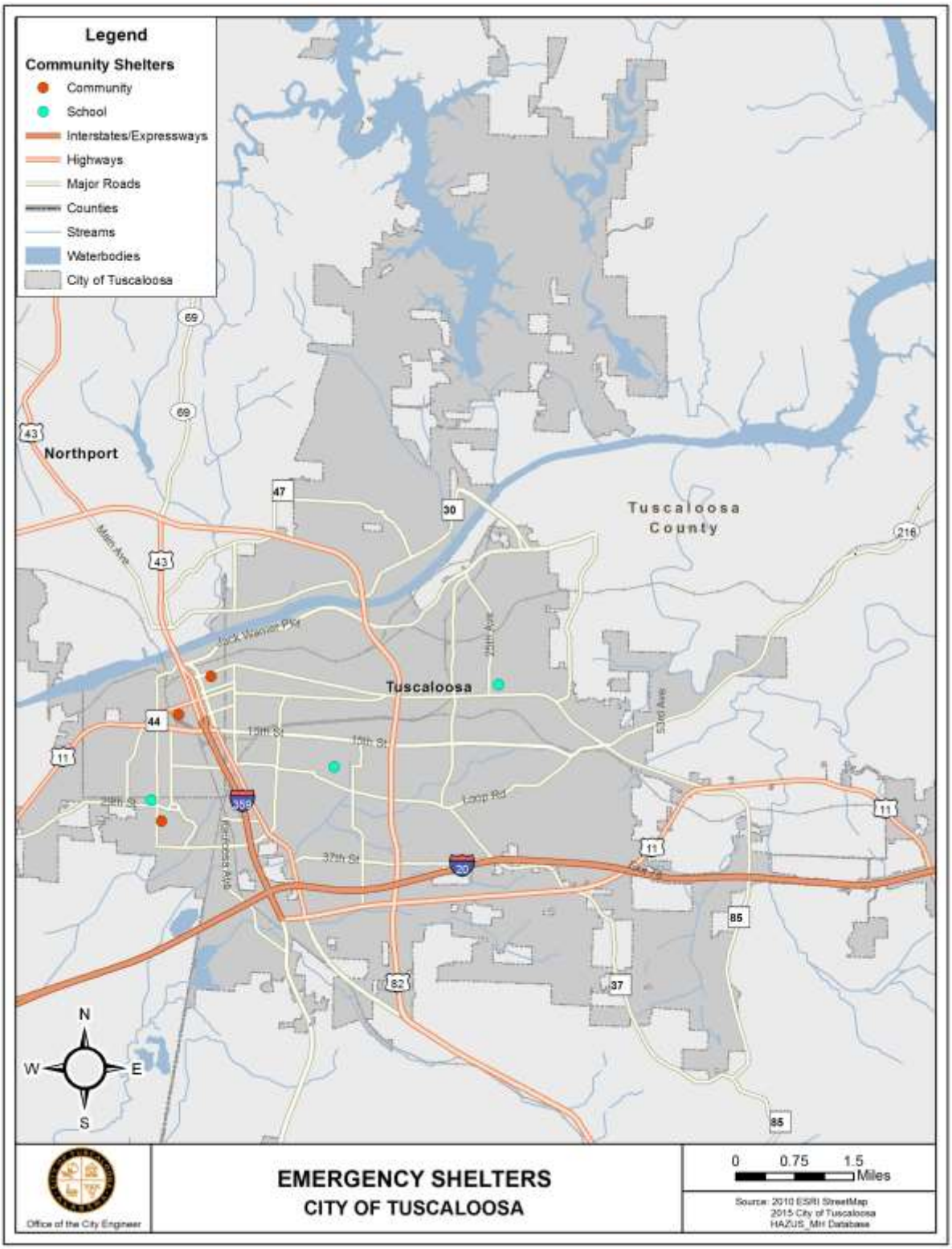


Table 4-54. Emergency Shelters in the City of Tuscaloosa

Name	Address	Zip Code
Alberta Elementary School	2700 University Blvd E	35404
City Hall Shelter	2201 University Blvd.	35401
McDonald Hughes Community Safe Room	3101 Martin Luther King, Jr. Blvd.	35401
T-DOT Shelter	1000 28th Ave.	35401
Tuscaloosa Career & Technology Academy	2800 Martin L King Jr Blvd	35401
University Place Montessori School	2000 First Ave	35401
Yellow Creek VFD Community Safe Room	16040 Yellow Creek Rd	35406

Map 4-21. Emergency Shelters in the City of Tuscaloosa



As previously stated, critical or essential facilities are crucial following a flood event to provide assistance and needed services to the public. It is important that these facilities are able to operate fully before, during, and after a flood hazard event. Table 4-16 contains an inventory of primary critical facilities and the expected damage from a 100-year flood event generated from the HAZUS model.

Table 4-16. Expected Damage to Essential Facilities from a 100-Year Flood Event

Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	9	0	0	0
Hospitals	3	0	0	0
Police Stations	10	1	0	1
Schools	48	4	0	4

In addition to the above damage estimates above, the HAZUS model indicates that all available hospital beds remain available following the modeled 100-year return period flood event.

It is important to note that HAZUS-generated structure counts, such as those in the above table, and values are approximate; however, the estimates from HAZUS are useful for prioritizing mitigation measures by place, since the relative values of existing and future populations, building inventories and values, and rates of exposure are considered reasonable for these purposes.

Local Economy

Flood damage to homes and property, city infrastructure and local business create vulnerabilities to the local economy. Businesses without utilities may not be able to function; creating loss in income for the owner and community. Damaged buildings and infrastructure will require costly repair or replacement claims to property owners, insurance companies and municipal governments. Impacts due to transportation during flood events can also cause vulnerabilities to the local economy. Transportation routes can be closed for short periods of time while flood waters are present and for longer periods of time if the roads have sustained damaged from the flooding.

The HAZUS model defines the economic losses as building-related losses only. The building-related losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated cost to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of damage sustained during a flood. Business interruption losses also include the temporary living expenses for the people displaced from their homes because of the flood. This section focuses on the business interruption losses.

HAZUS estimates the total economic loss for the 100-year flood event scenario is $819.24 million, which represents 20.2% of the total replacement value of the scenario buildings. Of this total, $2.32 million or 0.3% of losses are categorized as business interruption losses. Table 4-17 below provides a summary of the economic losses associated with the building damage, both direct building losses and building interruption losses.

Table 4-17. Building-Related Economic Loss Estimates (millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	275.15	54.23	26.39	11.55	367.32
	Content	196.32	116.78	70.33	52.29	435.72
	Inventory	0.00	2.29	11.32	0.27	13.88
	Subtotal	**471.47**	**173.30**	**108.04**	**64.11**	**816.92**
Business Interruption						
	Income	0.00	0.56	0.01	0.13	0.70
	Relocation	0.25	0.11	0.1	0.06	0.43
	Rental Income	0.13	0.08	0.00	0.00	0.21
	Wage	0.01	0.51	0.01	0.45	0.98
	Subtotal	**0.39**	**1.27**	**0.03**	**0.64**	**2.32**
All	**Total**	**471.86**	**174.57**	**108.07**	**64.74**	**819.24**

Buildings

Many public and private buildings within the flood prone areas are subject to inundation during flood events. Older building infrastructure is especially vulnerable to damage in flood prone areas because they may have been constructed before flood ordinances required specific building construction criteria to prevent flood damage.

Within the risk assessment study area, there are an estimated 51,225 buildings with a total replacement value (excluding contents) of $14.9 billion (2010 dollars). Over 90% of the buildings are categorized as residential housing with a replacement value of $11.1 billion (74.74% of the total building value).

HAZUS estimates that approximately $4.1 billion or 27.2% of the aggregate total building replacement value is at risk during the 100-year return period flood scenario. The relative distribution of the value with respect to the overall occupancies generated by HAZUS for the modeled scenario is listed below in Table 4-18.

Table 4-18. Building Exposure by Occupancy Type for the 100-year Flood Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,151,554	77.8%
Commercial	493,406	12.2%
Industrial	271,668	6.7%
Agricultural	7,784	0.2%
Religion	88,414	2.2%
Government	6,697	0.2%
Education	32,240	0.8%
Total	**4,051,763**	**100.00%**

As shown in Table 4-17, building losses are the primary component in the total economic loss. The total building losses are $816.92 million. The residential occupancies make up 57.60% of the total building loss value, while commercial occupancies make up only 21.2% of the total building loss value.

HAZUS estimates that about 1,577 buildings will be at least moderately damaged during the 100-year return period flood event. This is over 20% of the total number of buildings in the scenario. In addition, HAZUS estimates 332 buildings will be completely destroyed. Table 4-19 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4-20 below summarizes the expected damage by general building type.

Table 4-19. Expected Building Damage by Occupancy

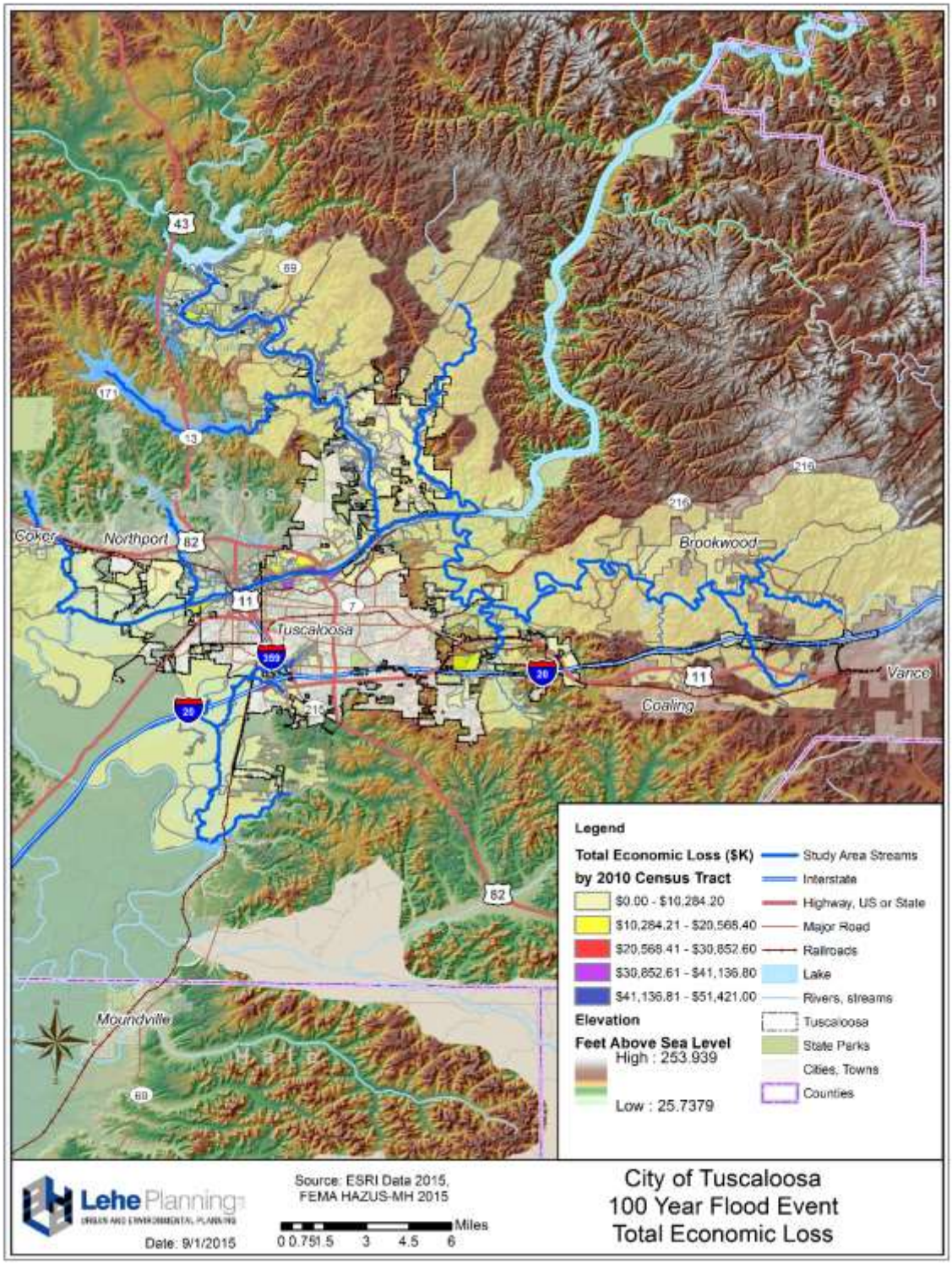
	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	2	13.33	6	40.00	4	26.67	2	13.33	1	6.67	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	15	83.33	1	5.56	2	11.11	0	0.00	0	0.00
Religion	0	0.00	2	66.67	0	0.00	0	0.00	1	33.33	0	0.00
Residential	1	0.06	40	2.59	342	22.15	207	13.41	622	40.28	332	21.50
Total	**3**		**63**		**347**		**211**		**624**		**332**	

Table 4-20. Expected Building Damage by Building Type

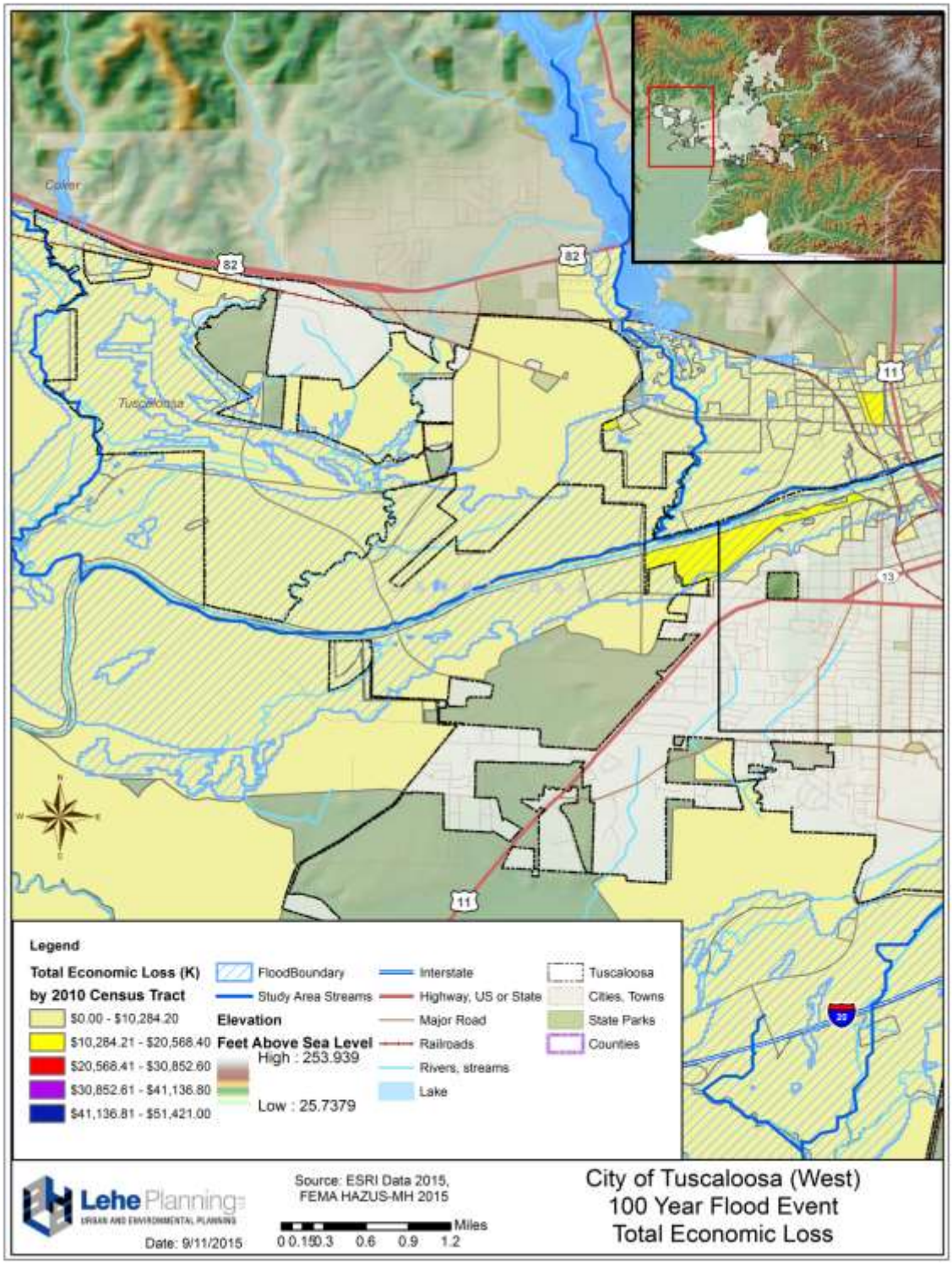
	1-10		11-20		21-30		31-40		41-50		Substantially	
Building Type	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	7	70.00	2	20.00	0	0.00	1	10.00	0	0.00
Manufactured Housing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	154	100.00
Masonry	0	0.00	8	13.79	6	10.34	3	5.17	34	58.62	7	12.07
Steel	1	3.85	17	65.38	3	11.54	3	11.54	2	7.69	0	0.00
Wood	0	0.00	29	2.19	333	25.11	205	15.46	590	44.49	169	12.75

Graphical representations of the HAZUS results (economic loss, residential loss, and water depth) for the modeled 100-year flood event scenario are shown in Maps 4-22 through 4-39, which follow.

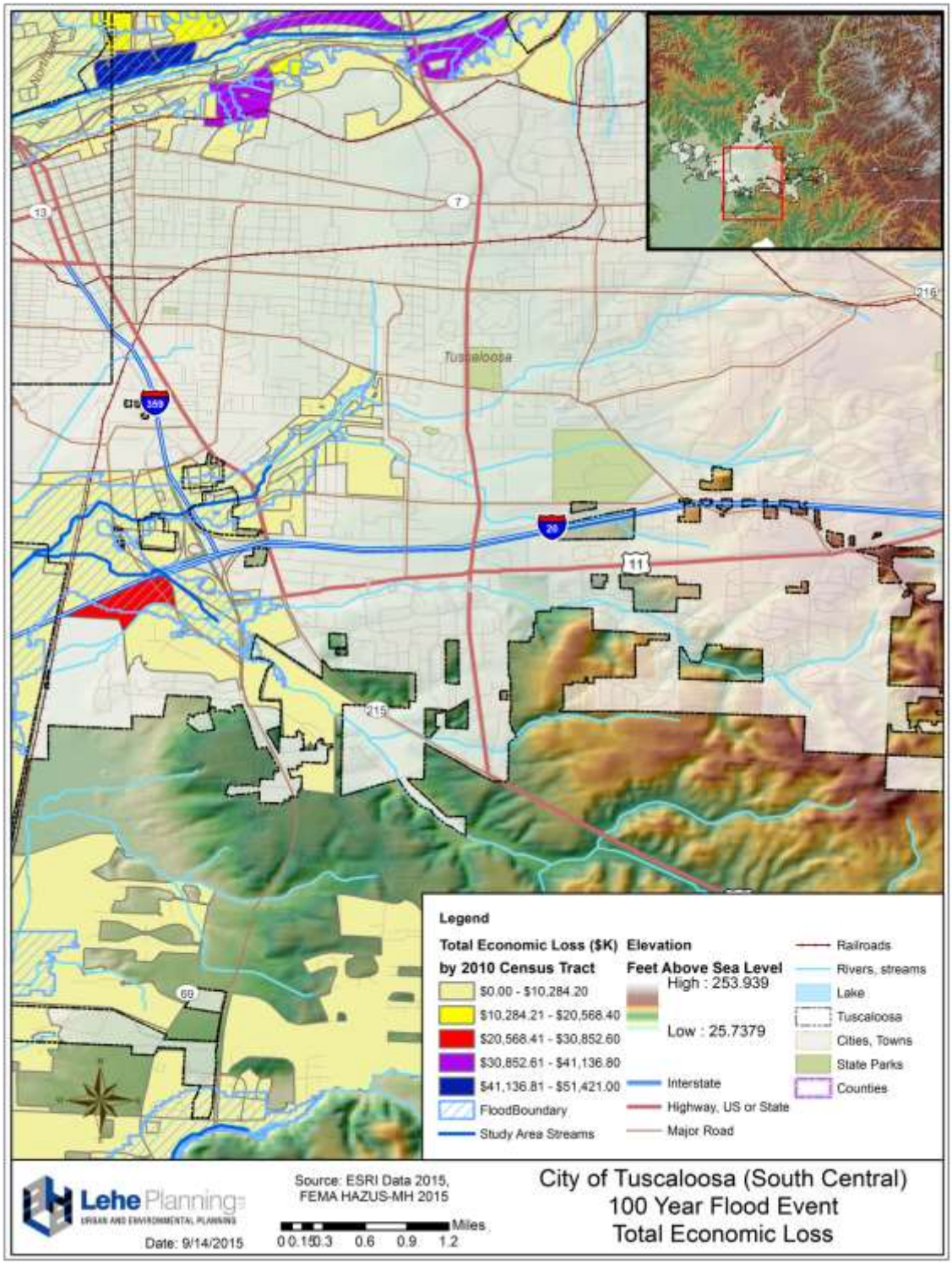
Map 4-22. Total Economic Loss from the 100-Year Flood Event 1 of 6



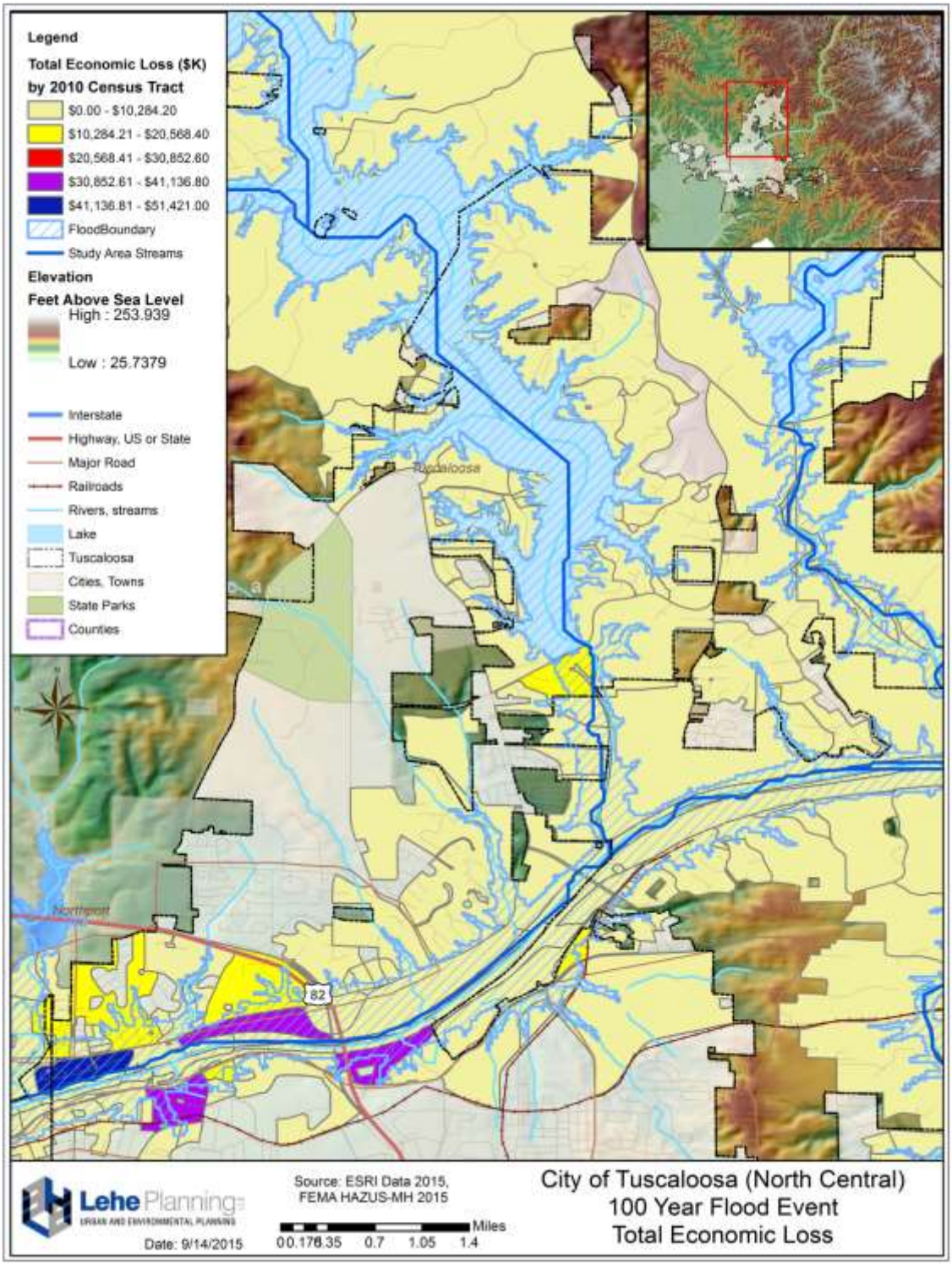
Map 4-23. Total Economic Loss from the 100-Year Flood Event 2 of 6



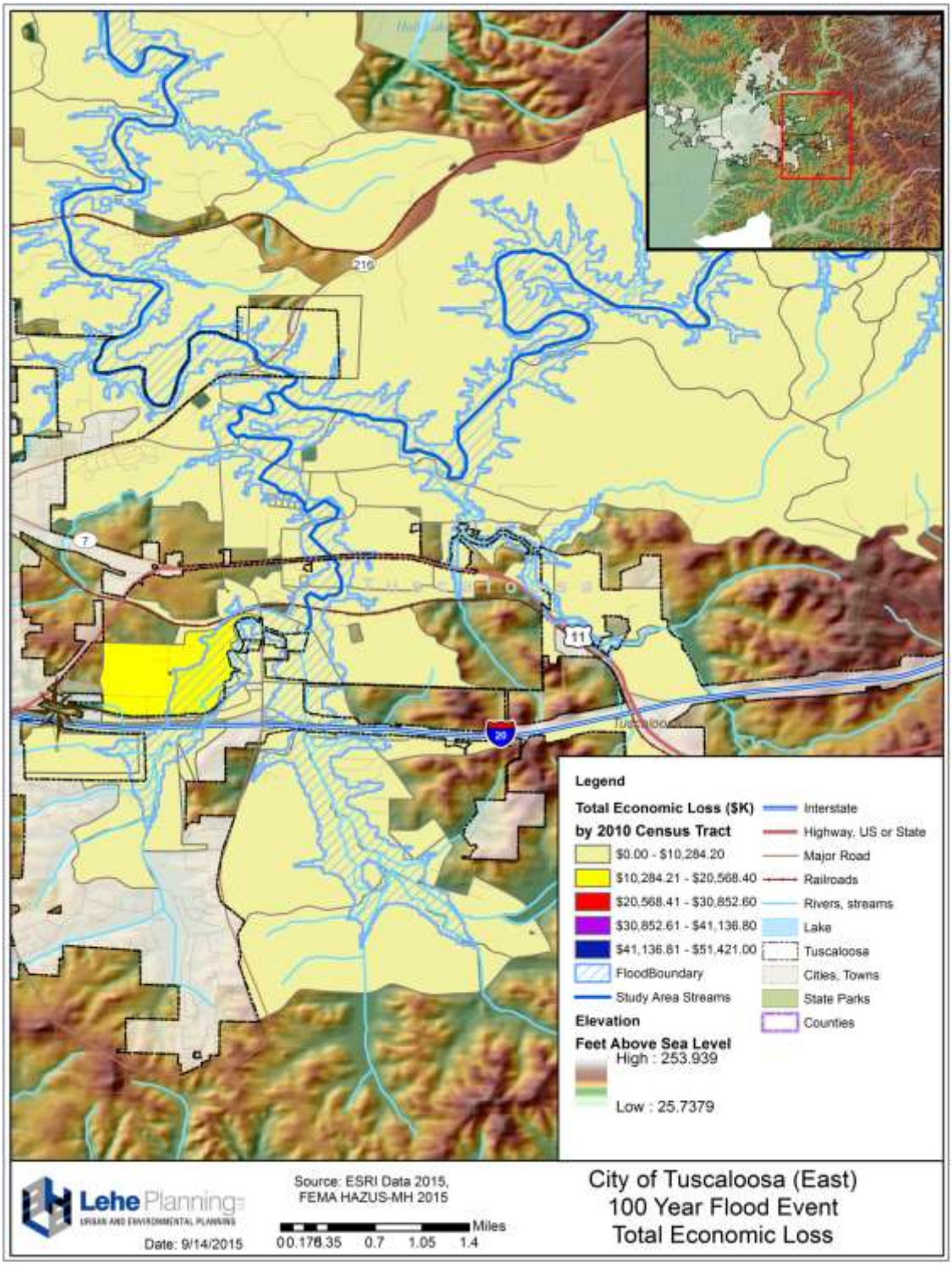
Map 4-24. Total Economic Loss from the 100-Year Flood Event 3 of 6



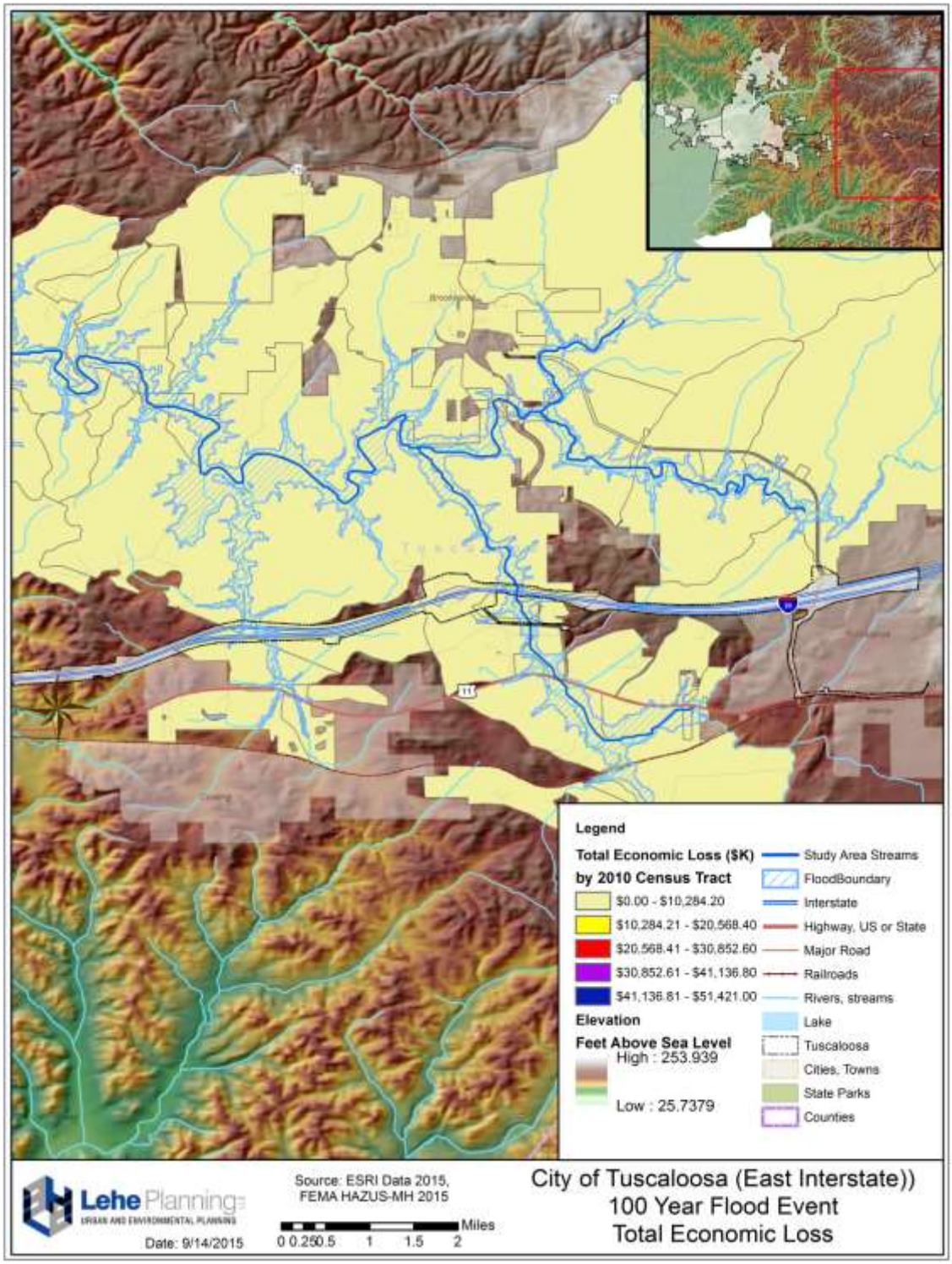
Map 4-25. Total Economic Loss from the 100-Year Flood Event 4 of 6



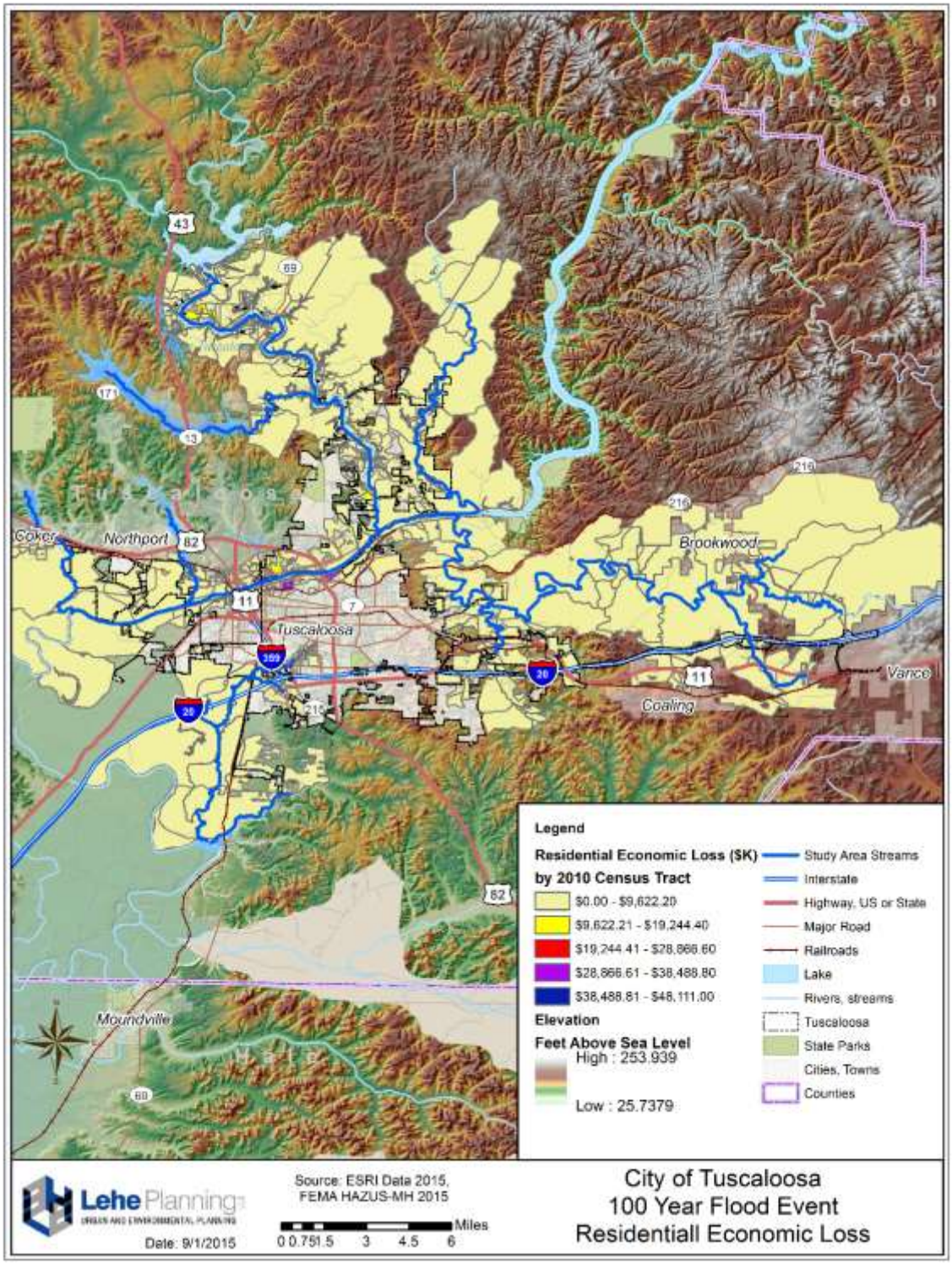
Map 4-26. Total Economic Loss from the 100-Year Flood Event 5 of 6



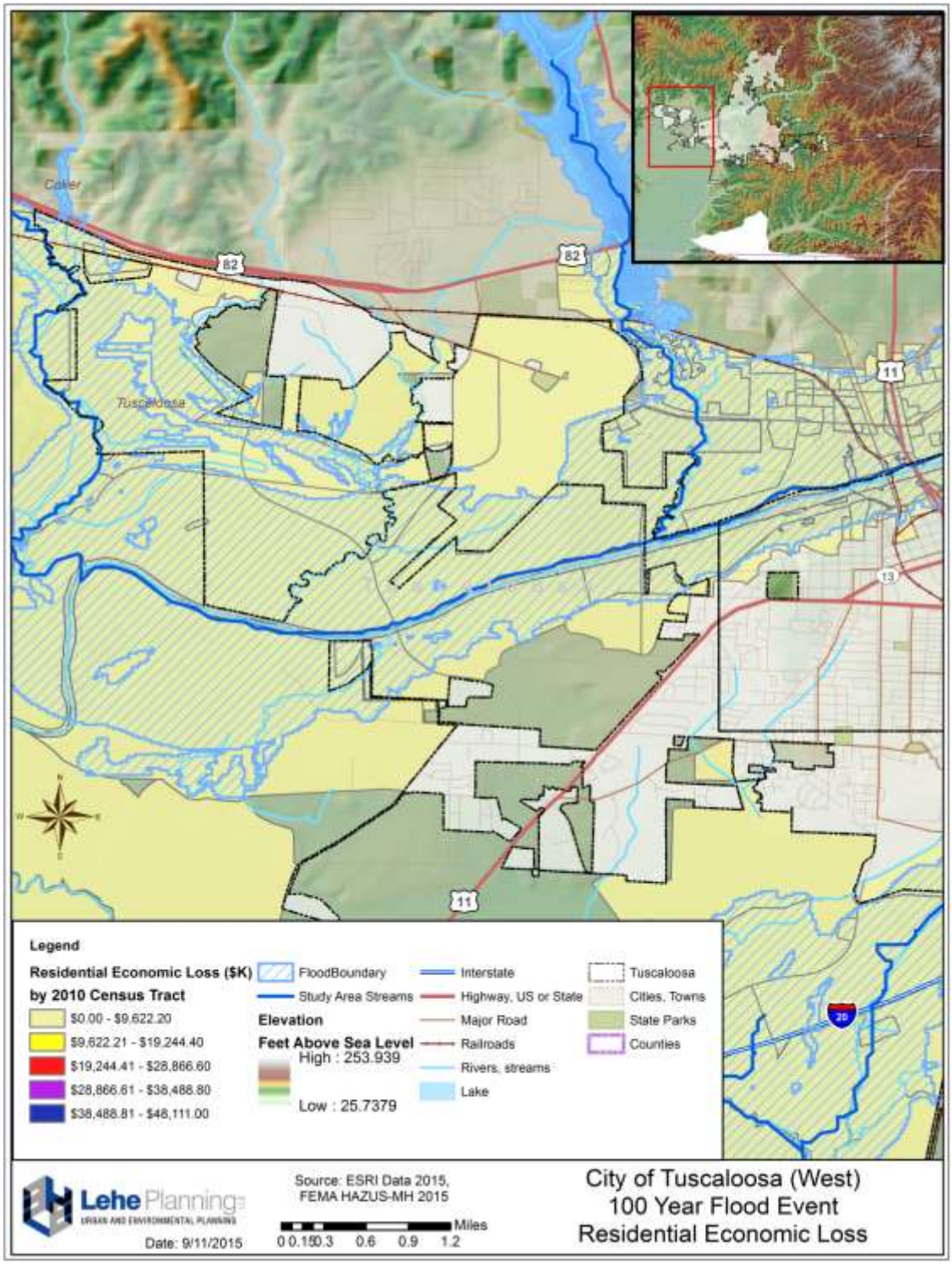
Map 4-27. Total Economic Loss from the 100-Year Flood Event 6 of 6



Map 4-28. Total Residential Economic Loss from the 100-Year Flood Event, 1 of 6

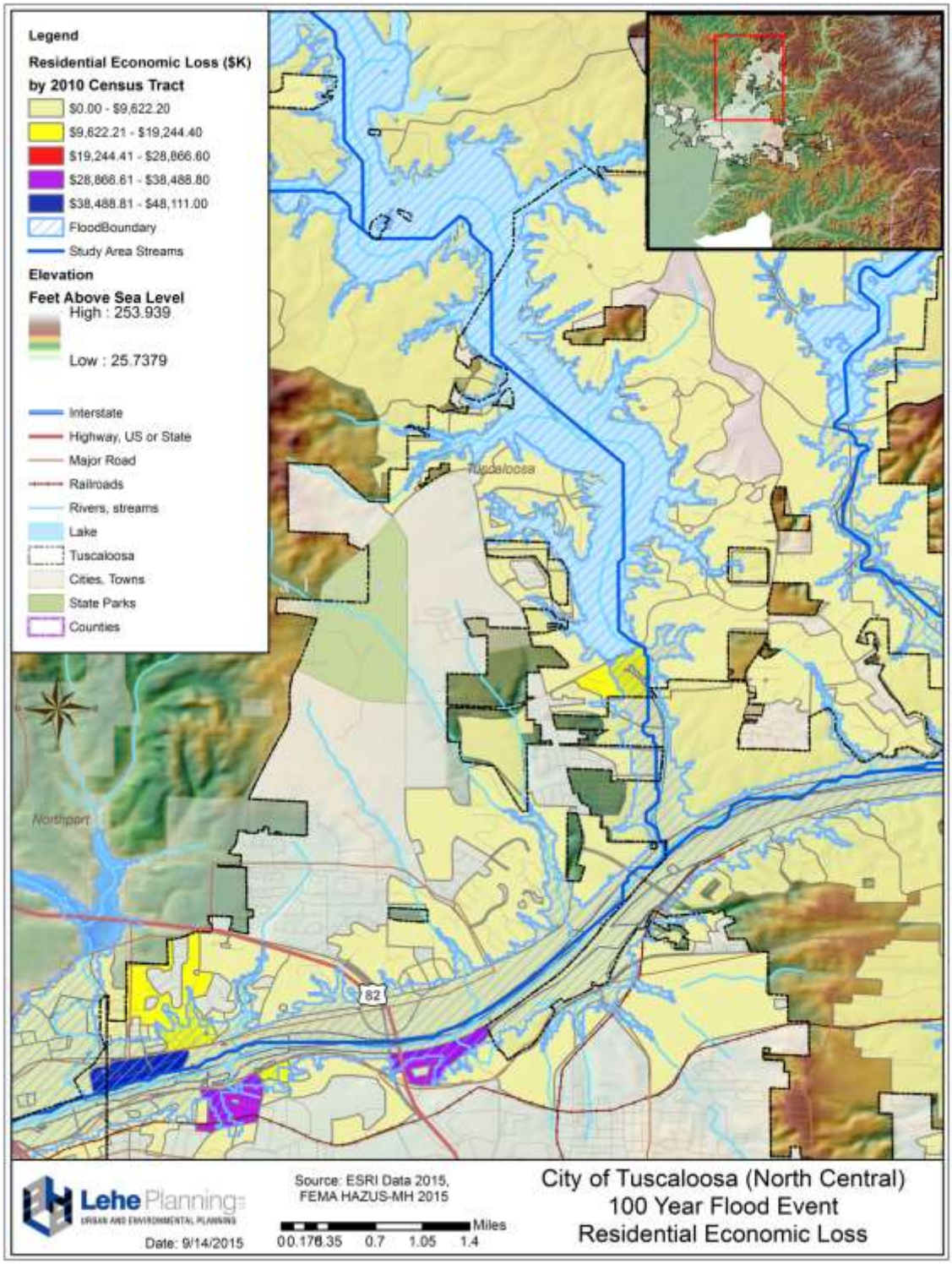


Map 4-29. Total Residential Economic Loss from the 100-Year Flood Event, 2 of 6

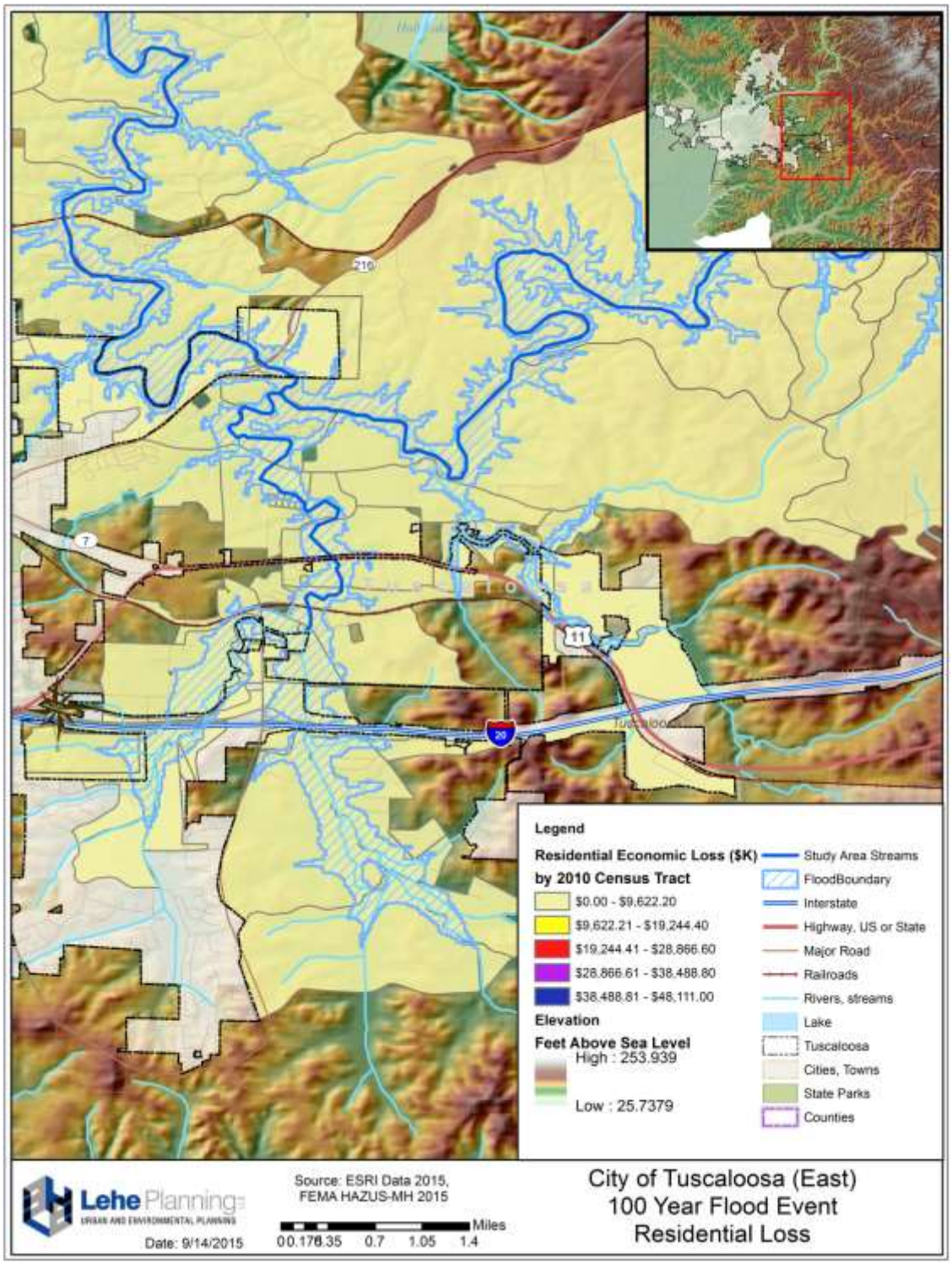


Map 4-30. Total Residential Economic Loss from the 100-Year Flood Event, 3 of 6

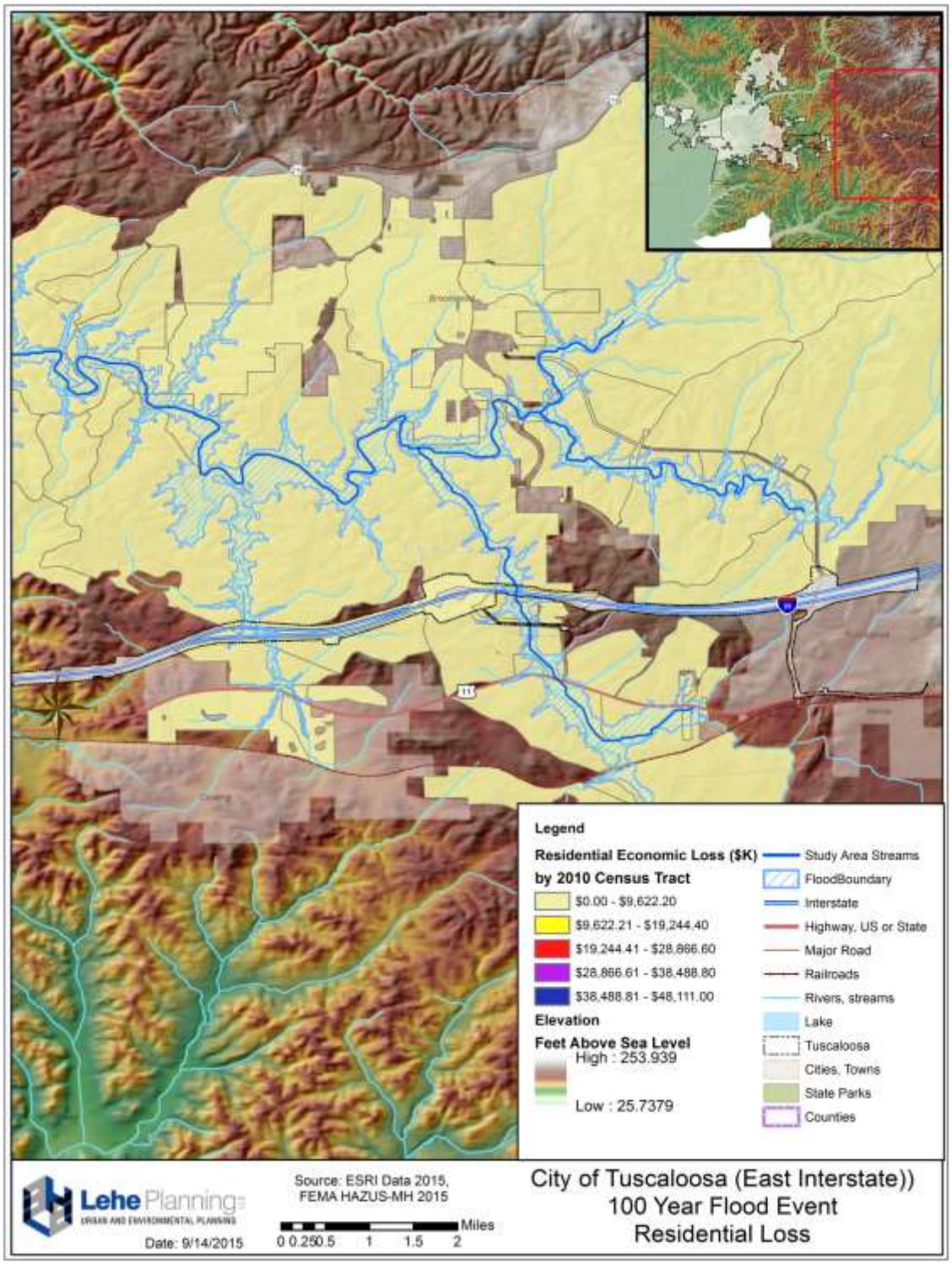
Map 4-31. Total Residential Economic Loss from the 100-Year Flood Event, 4 of 6



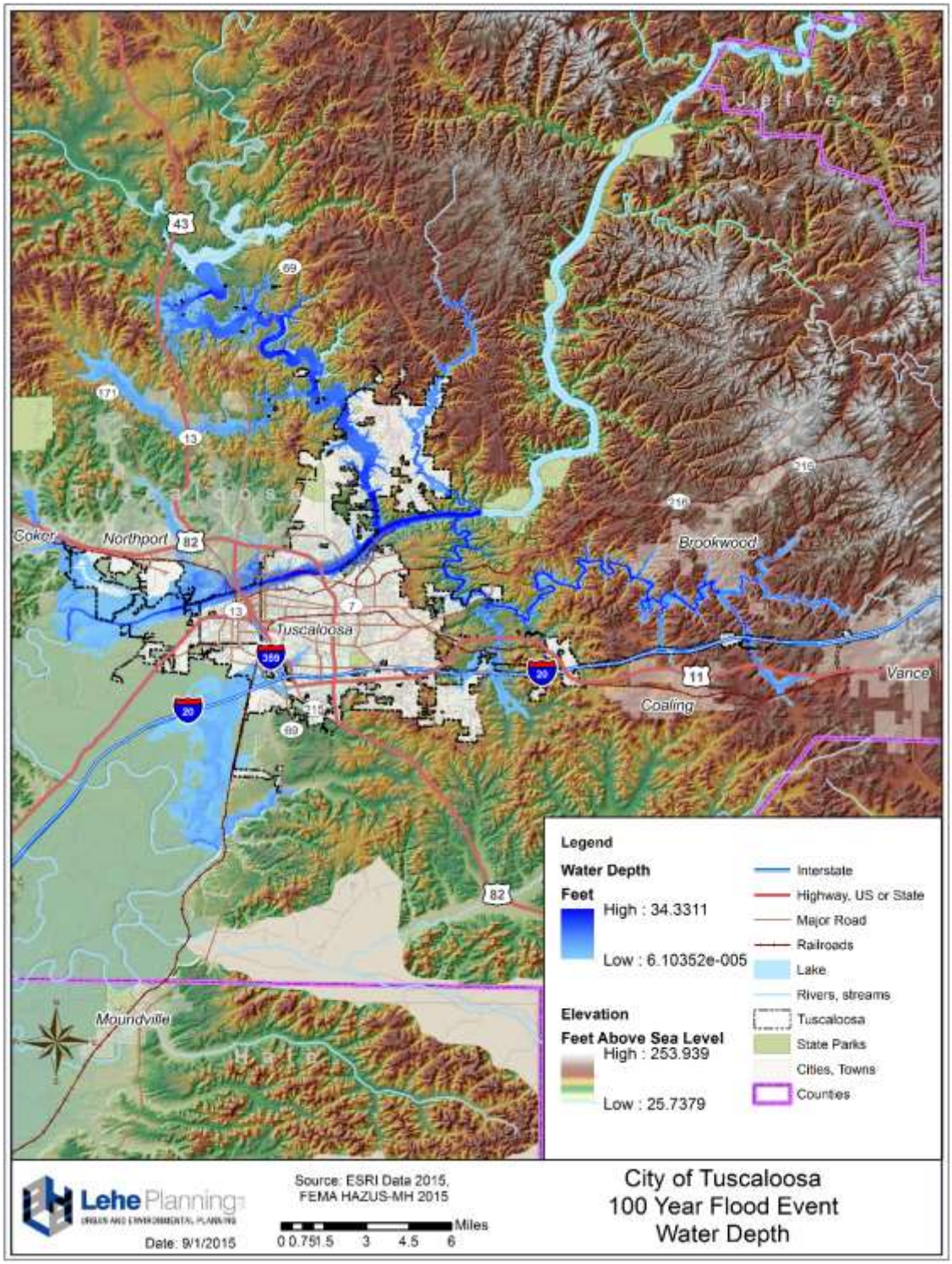
Map 4-32. Total Residential Economic Loss from the 100-Year Flood Event, 5 of 6



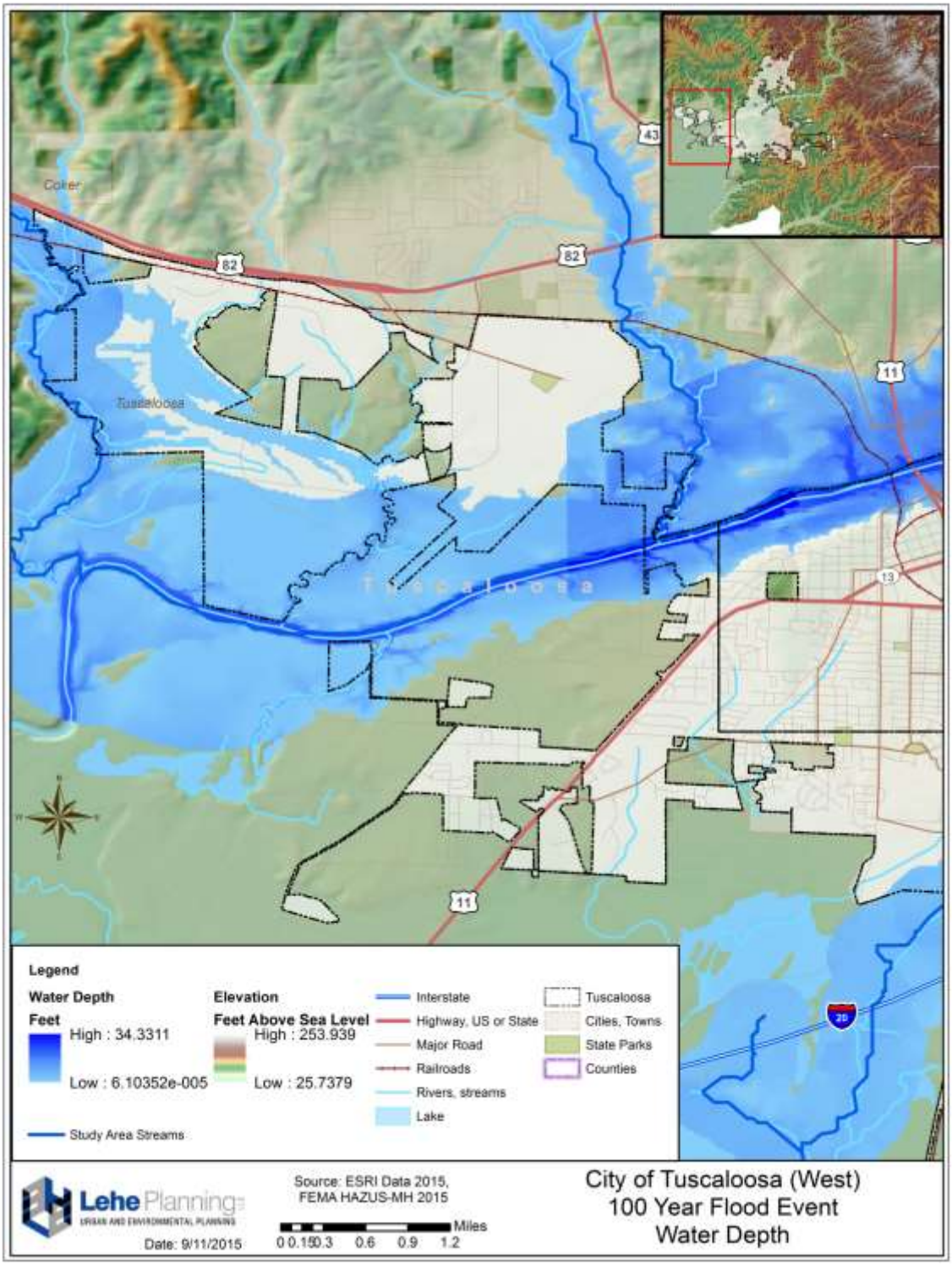
Map 4-33. Total Residential Economic Loss from the 100-Year Flood Event, 6 of 6



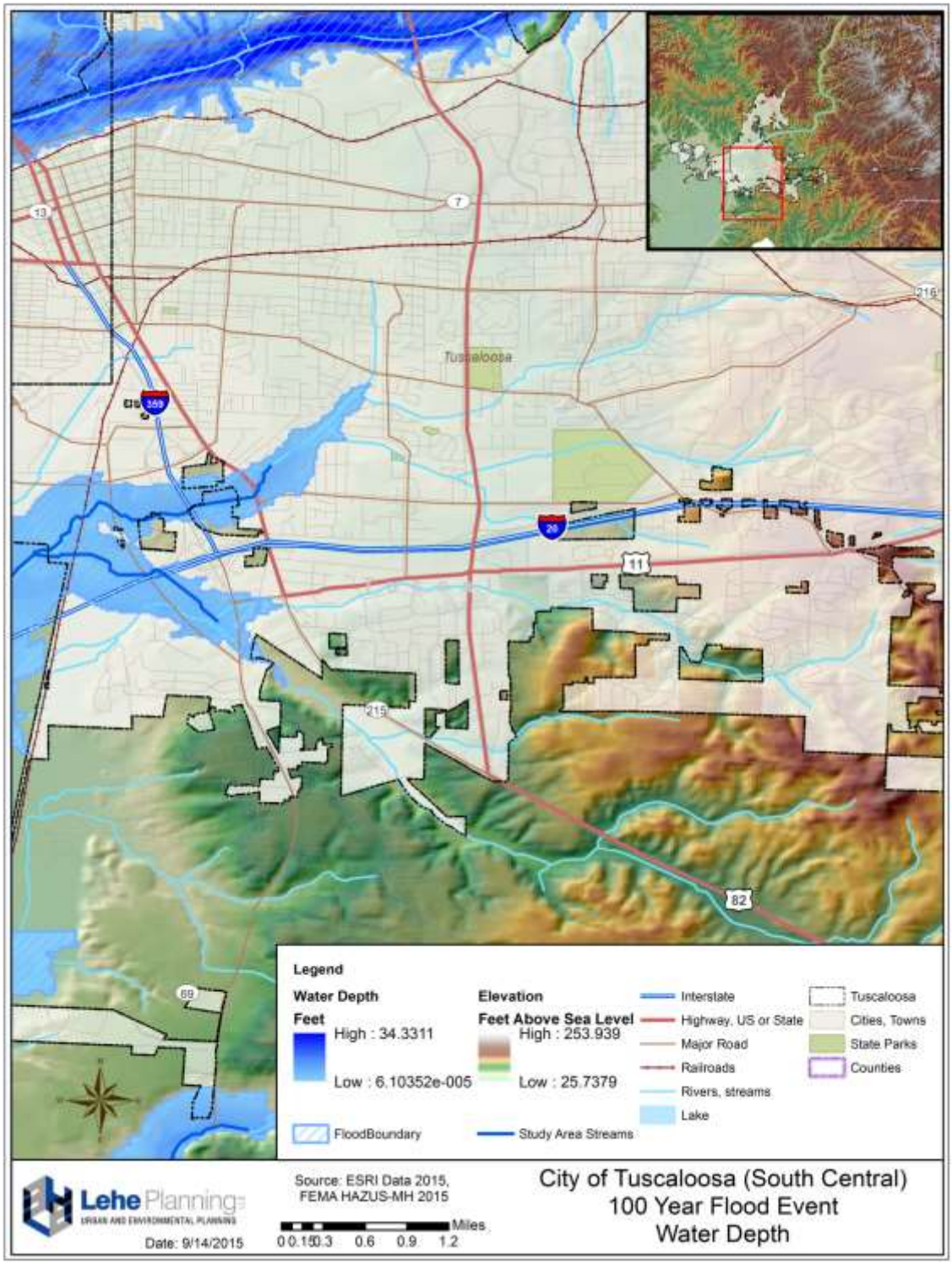
Map 4-34. Water Depth from the 100-Year Flood Event, 1 of 6



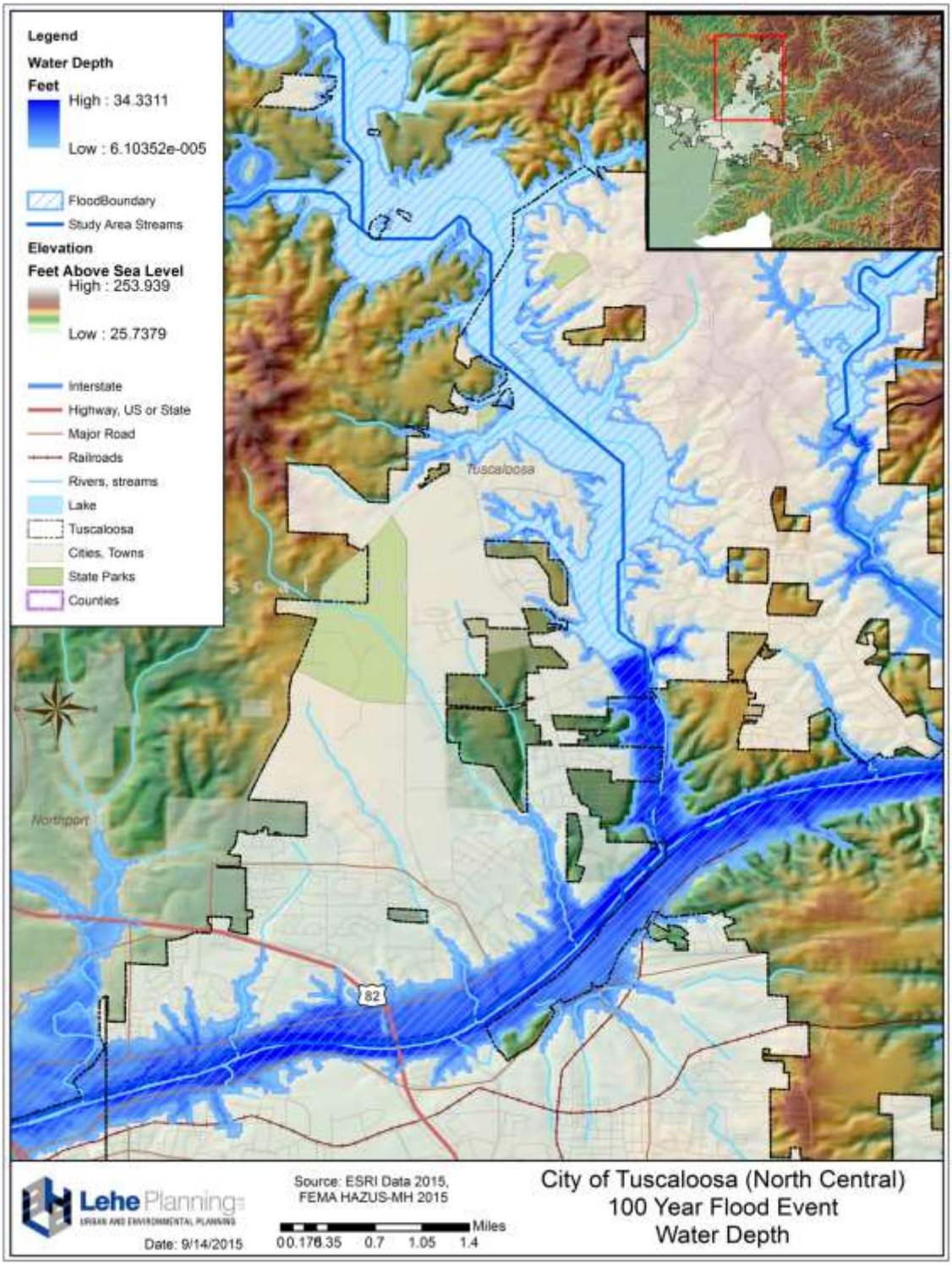
Map 4-35. Water Depth from the 100-Year Flood Event, 2 of 6



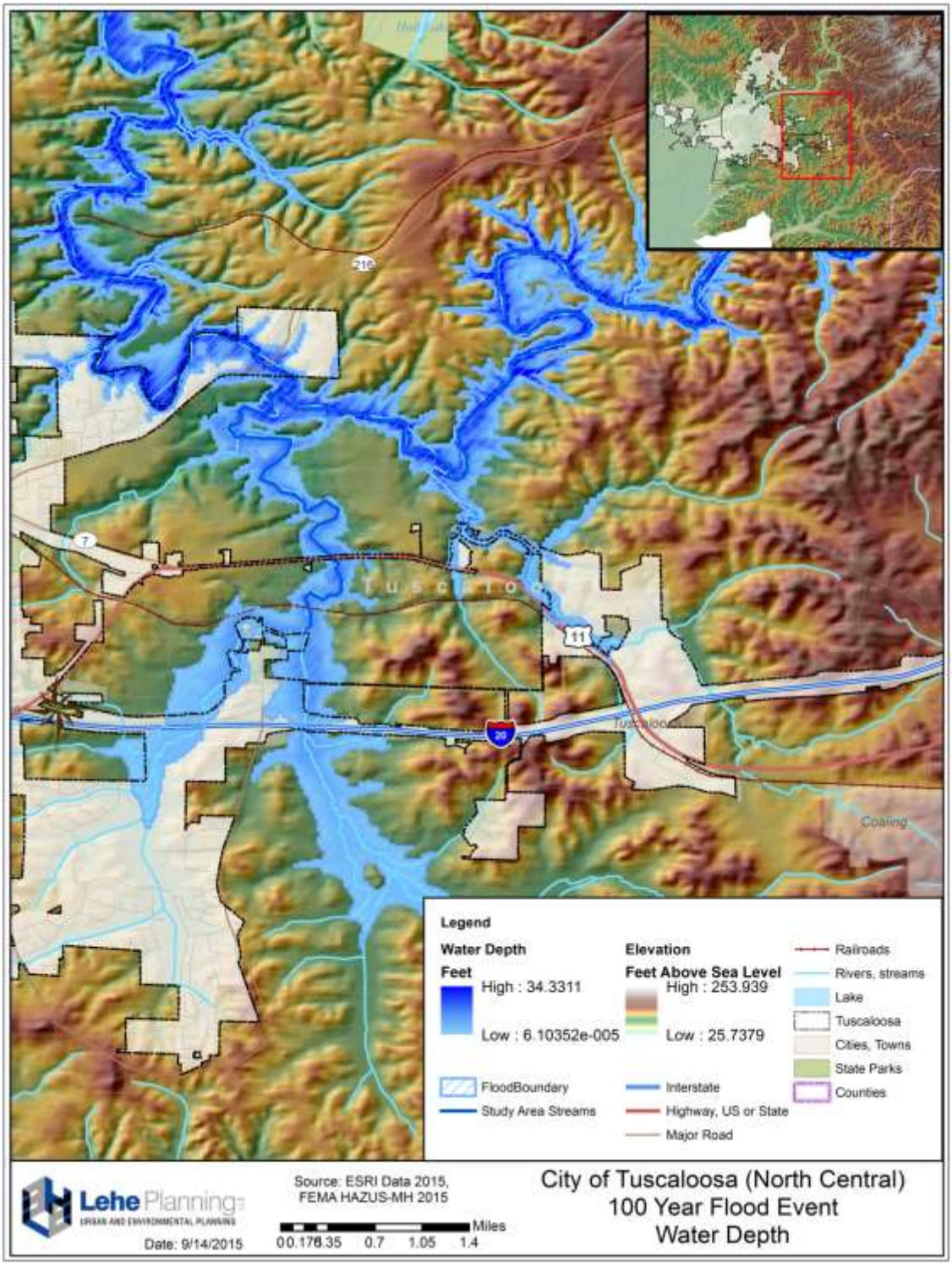
Map 4-36. Water Depth from the 100-Year Flood Event, 3 of 6



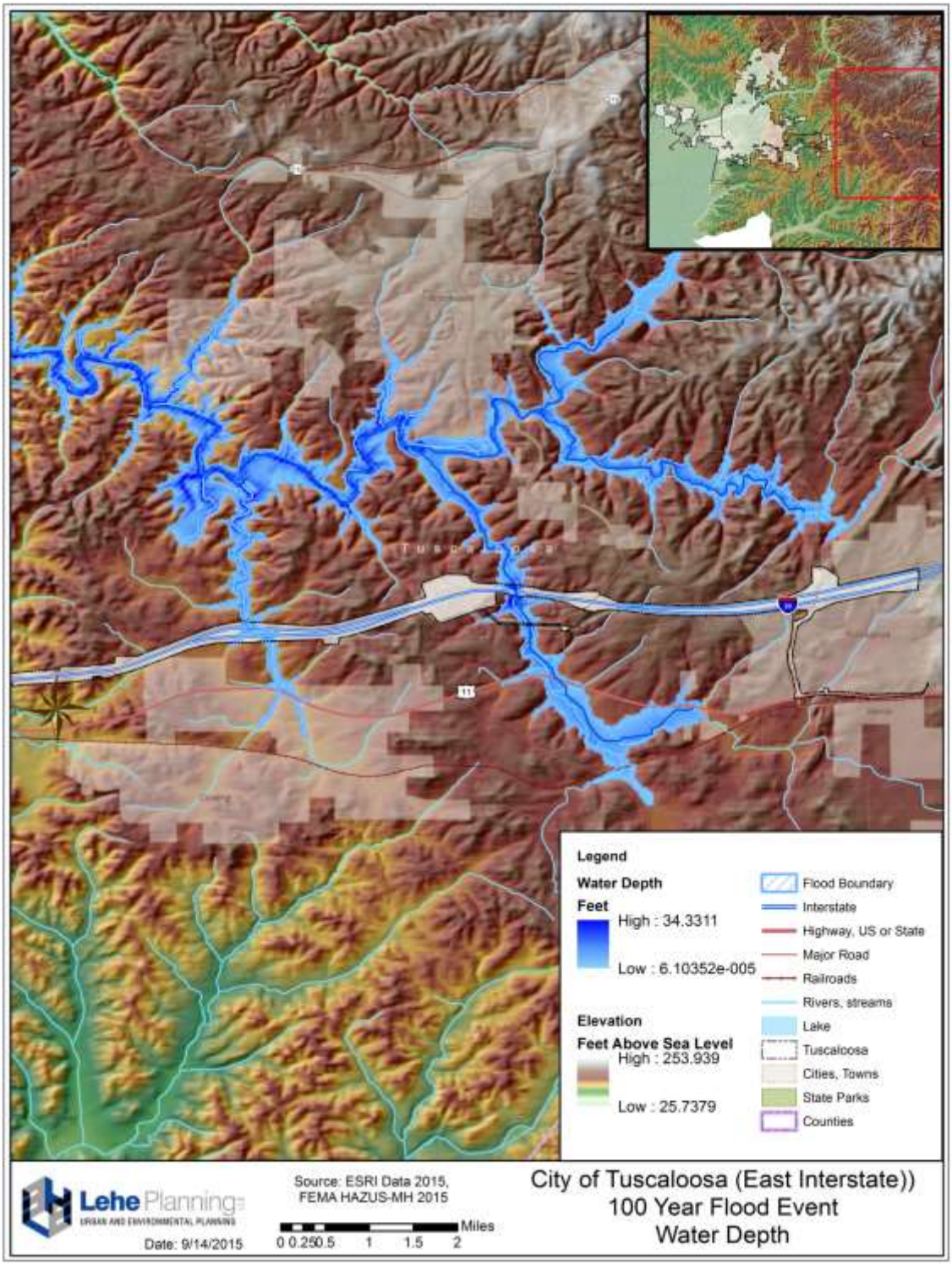
Map 4-37. Water Depth from the 100-Year Flood Event, 4 of 6



Map 4-38. Water Depth from the 100-Year Flood Event, 5 of 6



Map 4-39. Water Depth from the 100-Year Flood Event, 6 of 6



4.3.3 Historical Damage

Based on National Flood Insurance Program (NFIP) data obtained from the Alabama Office of Water Resources, the City of Tuscaloosa has 661 flood insurance policies held by residential and non-residential properties with a total insurance in force value of $129,537,900, as of March 31, 2015. The closed amount of paid losses to date is $1,177,698 from a total of 82 claims. Table 4-21 summarizes the policies and claims by building type, and Table 4-22 summarizes the policies and claims by insurance zone.

Table 4-21. Flood Insurance Claims by Occupancy as of 03/31/15

Building Type	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
Single Family	466	$359,190	$84,139,900	52	$395,528.25	$30,144.53
2-4 Family	43	$18,858	$3,104,800	6	$23,031.20	$4,975.00
All Other Residential	62	$38,936	$10,271,400	4	$79,762.87	$4,147.33
Non Residential	90	$143,476	$32,111,800	20	$679,375.55	$22,743.75
Total	661	$560,460	$129,537,900	82	$1,177,696.00	$62,009.00

Source: FEMA NFIP/Alabama Office of Water Resources

Table 4-22. Flood Insurance Claims by Insurance Zone as of 03/31/15, City of Tuscaloosa

Insurance Zone	Policies in Force	Premium	Insurance in Force	Number of Closed Paid Losses	$ of Closed Paid Losses	Adjustment Expense
A01-30 & AE Zones	460	$448,055	$84,114,100	38	$805,058.14	$36,481.08
A Zones	29	$23,785	$3,851,900	5	$35,799.84	$3,225.00
AO Zones	0	$0	$0	0	$0.00	$0.00
AH Zones	0	$0	$0	0	$0.00	$0.00
AR Zones	0	$0	$0	0	$0.00	$0.00
A99 Zones	0	$0	$0	0	$0.00	$0.00
V01-30 & VE Zones	0	$0	$0	0	$0.00	$0.00
V Zones	0	$0	$0	0	$0.00	$0.00
D Zones	0	$0	$0	0	$0.00	$0.00
B, C & X Zones						
Standard	29	$27,270	$4,723,900	15	$110,928.88	$7,155.00
Preferred	143	$61,350	$36,848,000	11	$203,659.85	$12,859.53
Total	661	$560,460	$129,537,900	69	$1,155,444.00	$59,720.00

Source: FEMA NFIP/Alabama Office of Water Resources

As shown in Table 4-22 above, the majority of the flood insurance claims come from properties within mapped A01-30 & AE Zones. It is interesting to note that a significant number of claims come from B, C, & X Zones that are areas designated as those of less frequent flood occurrence.

Repetitive loss properties account for almost 50% of the total paid claims to date. According to the information from the National Flood Insurance Program (NFIP) provided by the Alabama Office of Water Resources, all of the current repetitive loss buildings were constructed prior to the adoption of the initial FIRM (Flood Insurance Rate Map) for the community. The number of losses and claims are summarized in Table 4-23 below.

Table 4-23. Community Repetitive Losses

	Special Flood Hazard Areas			
	AE, A1-30, AO, AH, A	VE, V1-30, V	B, C, X	Total
RL Buildings (Total)	4	0	3	7
RL Buildings (Insured)	1	0	1	2
RL Losses (Total)	8	0	10	18
RL Losses (Insured)	2	0		4
RL Payments (Total)	$383,301.80	$0.00	$155,988.78	$539,290.58
Buildings	$319,279.43	$0.00	$74,676.96	$393,956.39
Contents	$64,022.37	$0.00	$81,311.82	$145,334.19
RL Payments (Insured)	$3,767.69	$0.00	$93,867.96	$97,635.65
Buildings	$3,767.69	$0.00	$74,676.96	$78,444.65
Contents	$0.00	$0.00	$19,191.00	$19,191.00

Source: FEMA NFIP/Alabama Office of Water Resources

4.3.4 Areas in the Floodplain that Provide Natural Functions

The Special Flood Hazard Area (SFHA) covers 6,422 acres within the City of Tuscaloosa. Much of the floodplain has been previously developed; however, portions remain undeveloped. Using the USGS National Land Cover Database 2011 and the FEMA National Flood Hazard Layer, an estimated 2,477 acres (38.6%) of the Special Flood Hazard Area (SFHA) remain undeveloped and provide natural and beneficial functions. These areas can be more effective at controlling or attenuating flooding as well as less expensive over the long term than traditional manmade flood control structures. Alteration of these areas within the floodplain can have an adverse impact on the magnitude and extent of flooding.

Natural and beneficial functions of floodplains include the following:

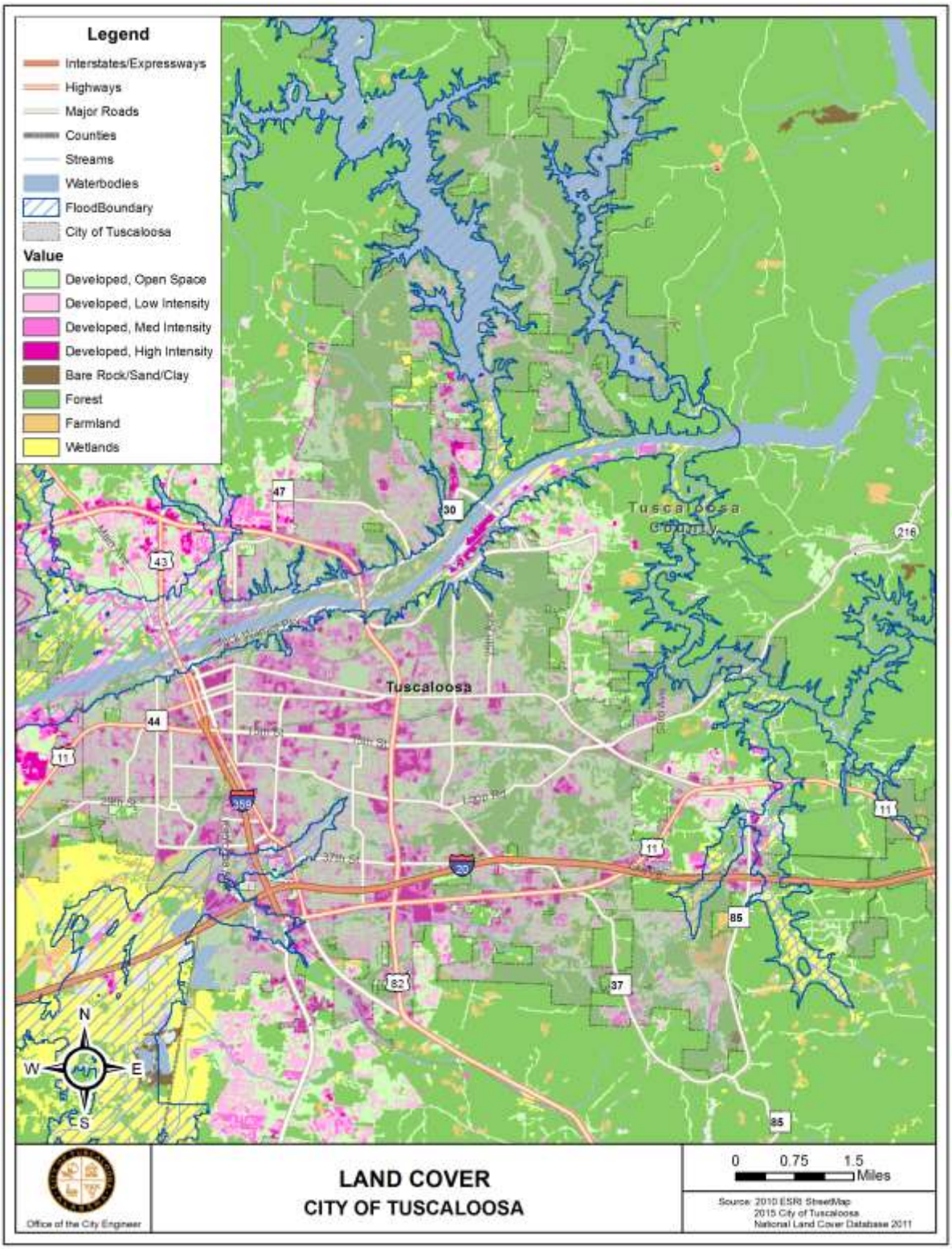
- **Water Resources**
  - *Natural Flood and Erosion Control*
    - Provide flood storage and conveyance
    - Reduce flood velocities
    - Reduce peak flows
    - Reduce sedimentation

- *Water Quality Maintenance*
  - Filter nutrients and impurities from runoff
  - Process organic wastes
  - Moderate temperature fluctuations
- *Groundwater Recharge*
  - Promote infiltration and aquifer recharge
  - Reduce frequency and duration of low surface flows

- **Biological Resources**
  - *Biological Productivity*
    - Promote vegetative growth through rich alluvial soils
    - Maintain biodiversity
    - Maintain integrity of ecosystems
  - *Fish and Wildlife Habitats*
    - Provide breeding and feeding grounds
    - Create and enhance waterfowl habitat
    - Protect habitats for rare and endangered species

Source: A Unified National Program for Floodplain Management, FEMA-248 (1994)

Map 4-40. Land Cover within the Floodplain



4.3.5 Future Development and Population Trends

The HAZUS model provided estimated losses to critical facilities and building-related losses from the 100-year return period flood event, based on current population and inventory values. Future development and population trends may alter the City's vulnerability due to flooding and types of impacts to expect.

Future Development

A review of the City of Tuscaloosa Citywide Future Land Use Plan, 2007, and Tuscaloosa Forward: A Strategic Community Plan to Renew and Rebuild, 2011, identified areas of future development. In addition, each of these plans specifically addresses development within the floodway and floodplain.

The Tuscaloosa Forward: A Strategic Community Plan to Renew and Rebuild focuses on the corridor heavily impacted by the April 27, 2011, tornado. Although almost entirely developed prior to the tornado event, this renewal plan promotes targeted redevelopment with emphasis on greenways and sustainable design. Although the density and imperviousness of the projected redevelopment along this corridor is expected to increase, the use of green infrastructure and current stormwater design standards may help offset any adverse hydrologic effects since first developed over 30 years ago.

The City of Tuscaloosa Citywide Future Land Use Plan was an update to a prior comprehensive City plan, Tuscaloosa 2020: A Consensus Strategic Plan, and provides details to anticipated growth areas. The April 2011 tornado and the renewal plan developed addressed the corridor affected by the tornado, but the overall concepts and growth areas discussed in the City's comprehensive plan are still valid outside of the tornado corridor. The City of Tuscaloosa Citywide Future Land Use Plan identifies the following areas as commercial corridors with growth potential:

- 10th Avenue/Interstate 359 corridor
- Rice Mine Road
- Mallisham Parkway

In addition to the commercial corridors listed above, the plan identifies several commercial activity centers. Commercial activity centers are defined as significant nodes or concentration of development, such as those typically located at intersections of major streets or interstate interchanges. Future commercial activity centers identified in the plan are shown below:

- Interstate 59/Eastern Bypass
- Southern Bypass/Highway 82
- Southern Bypass/Highway 69
- Mallisham Parkway/Culver Road
- Mallisham Parkway/Interstate 59

Residential growth areas are also identified in the City of Tuscaloosa Citywide Future Land Use Plan. These were selected based on "evaluation of recent and current growth patterns, proposed planned expansion of the City (annexation), short-term and long-term transportation project plans, and public school strategies." The five residential growth areas specified in the plan are as follows:

- The Lakes Area (three sub-areas) – north of Black Warrior River
- Jack Warner Parkway – east
- Fosters Ferry Road and Palmore Park - west
- South Central Tuscaloosa - south
- Southeast Tuscaloosa – southeast

Population Trends

New growth and expansion areas are needed as population increases. The population of the City of Tuscaloosa, as well as the entire Tuscaloosa Metropolitan Area, has continued to increase in recent years and is expected to continue to increase at a rapid pace. Tables 4-24 and 4-25 are from the Center for Business and Economic Research at the University of Alabama and provide current and projected population growth trends for the study region.

Table 4-24. 2010 to 2014 Population Estimates

	April 1, 2010		Population Estimates (as of July 1)			Change, 2010-2014	
	Census	Est. Base	2010	2012	2014	Number	Percent
Alabama	4,779,736	4,780,127	4,785,822	4,817,484	4,849,377	69,250	1.4
Tuscaloosa city	90,468	90,524	90,763	93,145	96,122	5,598	6.2

Source: U.S. Census Bureau, Population Division, and Center for Business and Economic Research, University of Alabama, May 2015.

Table 4-25. 2000-2010 Population and 2015-2040 Projections

	Census		Projection				Change 2010-2040	
MSA	2000	2010	2015	2020	2030	2040	Number	Percent
Alabama	4,447,100	4,779,736	4,931,768	5,096,521	5,373,294	5,587,919	808,183	16.9
Tuscaloosa Metro Area	203,009	230,162	242,786	253,190	268,977	282,822	52,660	22.9

Note: These projections are driven by population change between Census 2000 and Census 2010. Recent data on births and deaths from the Alabama Department of Public Health are used to derive birth and death rates for the state and each county. County projections are summed to their respective metropolitan areas. Table revised to include new Tuscaloosa metro definition (Hale, Pickens, and Tuscaloosa counties). Projections were revised in 2014 based on trends in population and development from 2010 to 2013.

Source: U.S. Census Bureau and Center for Business and Economic Research, University of Alabama, March 2015.

4.3.6 Future Flooding Conditions

With an increasing population and continued development within the City, changes to the flooding conditions can be expected. Based on the population estimates in Table 4-24, the population of the City of Tuscaloosa is expected to be approximately 130,500 by 2035. This is an expected increase in population of over 44% since 2010. With the increase in population, development will continue to expand to provide housing, commercial, and government facilities (schools, police, fire, etc.) to keep up with the ever-increasing demand.

The population increase will increase the pressure to develop properties within floodplains and other less desirable sites. Unless these areas are obtained by the City for preservation or regulations changed to make development of these areas prohibitive, future development within the floodplain will have an adverse effect on flooding due to loss of floodplain storage, increased flows, and higher velocities. Moreover, the more developed each watershed becomes, the greater the increase in flows; consequently, higher flood elevations and more frequent flooding can be expected.

Chapter 5 – Mitigation Strategy

5.1 Floodplain Management Goals

5.1.1. Purpose and Basis for Goals

The Vision

The goals that guide this Mitigation Strategy for floodplain management have been developed to help achieve the City's long-range vision for flood disaster resistance and community resiliency. Ultimately, the City aims to achieve active resistance to the threats of flooding and related natural hazards to human life and property through publicly-supported mitigation actions with proven results. The City embraces a long-term commitment to reduce the exposure and risks to flooding and related hazards within its jurisdiction. The City plans to activate all of its available resources through cooperative governmental and private sector initiatives, augmenting public knowledge and awareness, and enhancing local mitigation capabilities to maximize community resiliency.

Consistency with Adopted County Plan

The vision and goals of this plan are fully consistent with the vision statement and goals set forth in the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan, which has been adopted by the City of Tuscaloosa. The first five goals mirror those of the Tuscaloosa County plan, and the sixth Emergency Services Goal supplements the County goals.

5.1.2. Goals for Floodplain Management

To attain its vision, the City of Tuscaloosa hereby establishes the following goals to guide its floodplain management activities:

1. **Preventive Goal.** Manage the development of land and buildings to minimize risks of loss due to flooding and related natural hazards.

2. **Property Protection Goal.** Protect structures and their occupants and contents from the damaging effects of flooding and related natural hazards.

3. **Public Education and Awareness Goal.** Educate and inform the public about the risks of flooding and related natural hazards and the techniques available to reduce threats to life and property.

4. **Natural Resources Protection Goal.** Preserve and restore the beneficial functions of floodplains and the natural environment to promote sustainable community development that balances the constraints of nature with the social and economic demands of the community.

5. **Structural Projects Goal.** Apply engineered structural modifications to natural systems and public infrastructure to reduce the potentially damaging impacts of flooding and related natural hazards, where found to be feasible, cost effective, and environmentally suitable.

6. **Emergency Services Goal.** Improve the efficiency, timing, and effectiveness of response and recovery efforts for flooding and related natural disasters.

5.2 Review of Floodplain Management Activities

5.2.1 Review of Current CRS Floodplain Management Activities

A CRS Verification Visit was conducted on May 19, 2015 by the Insurance Services Office, Inc. (ISO) in response to a new application by the City of Tuscaloosa to participate in the Community Rating System (CRS) Program. On September 28, 2015, the ISO issued its Verification Report that documented 747 points and recommended to FEMA that the City enter the CRS Program as a class 9 community.

A summary of the ISO findings of the credit points for each of the current activities are organized according to the goals of this plan, as follows:

1. **Preventive Activities.**

   - Activity 310 – Elevation Certificates: The Building Department maintains elevation certificates for new and substantially improved buildings. (38 points)
   - Activity 320 – Map Information Service: Credit is provided for furnishing inquirers with basic flood zone information from the community's latest Flood Insurance Rate Map. The service is publicized annually and records are maintained. (30 points)
   - Activity 430 – Higher Regulatory Standards: Credit is provided for enforcing regulations that require freeboard for new and substantial improvement construction, cumulative substantial improvement, and local drainage protection. Credit is also provided for the enforcement of building codes. (177 points)
   - Activity 440 – Flood Data Maintenance: Credit is provided for maintaining and using overlay maps in the day to day management of the floodplain. Credit is also provided for maintaining copies of all previous FIRMs. (100 points)

- Activity 450 – Stormwater Management: The community enforces regulations for stormwater management, soil and erosion control. (84 points)

2. **Property Protection Activities**

   - Activity 520 – Acquisition and Relocation: Credit is provided for acquiring and relocating 25 buildings from the community's regulatory floodplain. (75 points)

3. **Public Education and Awareness Activities**

   - Activity 330 – Outreach Projects: Credit is provided for general outreach projects that include presentations to civic organizations. Credit is also provided for targeted outreach projects to repetitive loss areas. These projects are disseminated annually. (66 points)
   - Activity 340 – Hazard Disclosure: Credit is also provided for community regulations requiring disclosure of flood hazards. Real estate agents provide a brochure advising prospective buyers about insurance and checking property flood hazards enhanced by. (13 points)
   - Activity 350 – Flood Protection Information: Documents relating to floodplain management are available in the reference section of the Tuscaloosa County Library. (7 points)

4. **Natural Resources Protection Activities**

   - Activity 420 – Open Space Preservation: Credit is provided for preserving approximately 10 percent of the Special Flood Hazard Area as open space. (157 points)

5. **Structural Projects Activities**

   No credit.

6. **Emergency Services Activities**

   No credit.

5.2.2 Review Criteria

STAPLEE Review

In addition to the current activities, which have been carried forward to the Action Plan, a range of other possible activities have been reviewed for effectiveness in preventing or reducing the severity of the problems identified in *Chapter 4. - Risk Assessment*. With the exception of certain activities that are clearly not feasible or inappropriate, all of the remaining activities described here have been evaluated for

possible inclusion in the Action Plan. These include a wide range of possible activities to assure all potential alternatives have been considered.

The pros and cons of each activity have been evaluated by applying the STAPLEE method, the same method applied to the evaluation of mitigation measures in the County plan. The STAPLEE method examines social, technical, administrative, political, legal, environmental, and economic considerations and provides a ready method for rating and prioritizing each mitigation activity. To perform this evaluation, each measure must respond to many of the questions presented below for each of the areas of consideration:

Social Considerations.

- *Environmental justice.* Will the proposed measure be socially equitable to minority, disadvantaged, and special needs populations, such as the elderly and handicapped?
- *Neighborhood impact.* Will the measure disrupt established neighborhoods or improve quality of life for affected neighborhoods?
- *Community support.* Is the measure consistent with community values? Will the affected community support the measure?
- *Impact on social and cultural resources.* Does the measure adversely affect valued local resources or enhance those resources?

Technical Considerations.

- *Technical feasibility.* Is the proposal technically possible? Are there technical issues that remain? Does the measure effectively solve the problem or create new problems? Are there secondary impacts that might be considered? Have professional experts been consulted?

Administrative Considerations.

- *Staffing.* Does the City have adequate staff resources and expertise to implement the measure? Will additional staff, training, or consultants be necessary? Can local funds support staffing demands? Will the measure overburden existing staff loads?
- *Maintenance.* Does the City have the capabilities to maintain the proposed project once it is completed? Are staff, funds, and facilities available for long-term project maintenance?
- *Timing.* Can the measure be implemented in a timely manner? Are the timeframes for implementation reasonable?

Political Considerations.

- *Political support.* Do the Mayor and City Council support the proposed measure? Does the public support the measure? Do stakeholders support the measure? What advocates might facilitate implementation of the proposal?

Legal Considerations.

- *Legal authority.* Does the City have the legal authority to implement the measure? What are the legal consequences of taking action to implement the measure as opposed to an alternative action or taking no action? Will new legislation be required?

Environmental Considerations.

- *National Environmental Policy Act (NEPA).* Will the measure be consistent with Federal NEPA criteria? How will the measure affect environmental resources, such as land, water, air, wildlife, vegetation, historic properties, archaeological sites, etc.? Can potentially adverse impacts be sufficiently mitigated through reasonable methods?

- *State and local environmental regulations.* Will the measure be in compliance with State and local environmental laws, such as flood plain management regulations, water quality standards, and wetlands protection criteria?

- *Environmental conservation goals.* Will the proposal advance the overall environmental goals and objectives of the community?

Economic Considerations.

- *Availability of funds.* Will the measure require Federal or other outside funding sources? Are local funds available? Can in-kind services reduce local obligations? What is the projected availability of required funds during the timeframe for implementation? Where funding is not apparently available, should the project still be considered but at a lower priority?

- *Benefits to be derived from the proposed measure.* Will the measure likely reduce dollar losses from property damages in the event of a hazard? To what degree?

- *Costs.* Are the costs reasonable in relation to the likely benefits? Do economic benefits to the community outweigh estimated project costs? What cost reduction alternatives might be available?

- *Economic feasibility.* Have the costs and benefits of the preferred measure been compared against other alternatives? What is the economic impact of the no-action alternative? Is this the most economically effective solution?

- *Impact on local economy.* Will the proposed measure improve local economic activities? What impact might the measure have on the tax base?

- *Economic development goals.* Will the proposal advance the overall economic goals and objectives of the community?

The STAPLEE method of evaluation also facilitates the prioritization of measures. If a measure under consideration is found to be financially feasible and has high ratings within other areas of consideration, it might be given a higher priority for implementation than measures that fell lower in the ratings. Moreover, a general economic evaluation can be performed as part of the STAPLEE method, as described above. Weighing potential economic benefits to reducing damages against costs make it possible to select among competing projects.

Especially important to the selection process is availability of funds through local, State, Federal, and private resources. Potential FEMA Hazard Mitigation Assistance (HMA) grant programs, such as FEMA's Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Grant Program (PDM), and the Flood Mitigation Assistance (FMA) Program are sometimes available to help fund eligible projects. The City has a very successful performance record with the implementation of mitigation projects funded through all of the FEMA HMA grant programs. As new sources of funding become available through the HMA grant programs, or other sources, the priorities for implementation of select projects may need to be reevaluated.

Another consideration for evaluating alternative mitigation measures is the capability of the City to implement the measures. Appendix D "Community Mitigation Capabilities Assessment" examines select capability measures.

5.2.3 Community Mitigation Action Program of the County Plan

The activities listed in this section are those related to the mitigation of flooding and related hazards that are included in the City of Tuscaloosa Community Action Program in the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan that has been adopted by the Tuscaloosa City Council. All of these activities have been considered for inclusion in the Floodplain Management Action Plan. Published as Volume II "Community Action Program" of the 2014 plan, the City's action program lists the goals, objectives and measures to be implemented over the five year planning cycle. For each measure, the action program identifies the hazards addressed, the priority, timeline, lead responsibility for implementation, estimated cost, and funding source.

1. Preventive Activities

- Develop, adopt and implement subdivision regulations that require proper stormwater infrastructure design and construction.
- Mark depths of flooding and storm surge immediately after each event. Enter and maintain these historical records in GIS.
- Carry out detailed planning and engineering studies for sub-basins in critical flood hazard areas to determine watershed-wide solutions to flooding.
- Consider large lot size restrictions on flood prone areas designated on Flood Insurance Rate Maps.
- Evaluate additional land use restrictions within designated flood zones, such as prohibition of storage of buoyant materials, storage of hazardous materials, and restrictive development of flood ways, among others.
- Require delineation of flood plain fringe, floodways, and wetlands on all plans submitted with a permit for development within a flood plain.
- Examine regulatory options and feasibility of requiring open space areas for recreation, landscaping, and drainage controls.
- Improve flood risk assessment by documenting high water marks post event, verification of FEMA's repetitive loss inventory, and revising and updating regulatory floodplain maps.
- Review and revise, as necessary, landscaping standards for parking lots that reduce the size of impervious surfaces and encourage natural infiltration of rainwater.

2. Property Protection Activities

- Evaluate elevation and culvert sizing of existing roadways in flash flood-prone areas to ensure compliance with current standards for design year floods, and develop a program for construction upgrades as appropriate.
- Identify problem drainage areas, conduct engineering studies, evaluate feasibility, and construct drainage improvements to reduce or eliminate localized flooding.
- Elevate certain buildings in flood prone areas where acquisition or relocation is not feasible, with emphasis on pre-FIRM buildings; where feasible, elevation is preferable to flood proofing.
- Repair, elevate, and weatherize existing homes for low- to moderate-income families.
- Flood proof pre-FIRM non-residential buildings, where feasible.
- Retrofit existing buildings, critical facilities, and infrastructure against potential damages from natural and manmade hazards.
- Promote the purchase of insurance coverage by property owners and renters for flood damages in high-risk areas.

3. Public Education and Outreach Activities

- Provide technical advisory assistance to building owners on available building retrofits to protect against natural hazards damages.
- Provide technical assistance to homeowners, builders, and developers on flood protection alternatives.
- Publicize the availability of FIRM information to real estate agents, builders, developers, and homeowners through local trade publications and newspaper announcements.
- Participate in the "Turn Around Don't Drown" program by purchasing and installing signs in known flash flood bridge overpass locations.

4. Natural Resource Protection Activities

- Promote the adoption/enforcement of storm water management regulations that maintain pre-development runoff rates.
- Develop, adopt, and implement subdivision regulations that require proper stormwater infrastructure design and construction.
- Establish an urban forestry program to help mitigate storm water runoff common in areas with large impervious surfaces.
- Increase open space acquisitions through the FEMA HMA Grant Programs and other flood plain acquisition efforts.
- Keep builders and developers informed of Federal wetlands permitting requirements of the Corps of Engineers.
- Adopt and/or enforce regulations prohibiting dumping and littering within river and stream corridors.
- Utilize technical assistance available from the Alabama Cooperative Extension System with Best Management Practices (BMP).

5. Structural Projects Activities

- Examine use of minor structural projects (small berm or floodwall) in areas that cannot be mitigated through non-structural mitigation techniques.
- Prepare and implement standard operating procedures and guidelines for drainage system maintenance.
- Construct drainage improvements to reduce or eliminate localized flooding in identified problem drainage areas.

6. Emergency Services Activities

- Perform vulnerability assessments of critical facilities to identify retrofit projects to improve the safety of occupants and mitigate damages from flooding.
- Maintain appropriate media relationships to ensure the public is informed of flood threats and means to mitigate property damages and loss of life.
- Upgrade siren-warning systems to provide complete coverage to all jurisdictions.

- Upgrade critical communications infrastructure.
- Require the installation of weather radios in all public buildings and places of public assembly.
- Distribute weather radios and emergency response instructions to municipal residents

5.2.4 Discussion of Alternative Mitigation Activities

The Floodplain Management Planning Committee (FMPC) reviewed the current activities credited under the Community Rating System (CRS) Program (see section 5.2.1 above), the activities endorsed by the City of Tuscaloosa in its Community Action Program, adopted as a component of the 2014 Tuscaloosa County, Alabama, Multi-Hazard Mitigation Plan and further evaluated a full range of alternative mitigation activities presented in this section. All of these potential mitigation activities were summarized and presented as an exercise completed by members of the FMPC and discussed at their January 19, 2016, meeting. The results of this exercise can be found in Appendix G "Alternative Mitigation Measures Exercise." The alternatives considered for inclusion in the Floodplain Management Action Program have been grouped according to the six goal areas, noted below. These activities have been evaluated according to the STAPLEE method for appropriateness, taking into account the pros and cons of each potential mitigation activity. Further, the City's funding and implementation capabilities have been carefully considered. A discussion of the evaluation results follows.

1. Preventive Activities

Existing Preventive Activities.

The City has a range of planning and regulatory tools available to manage development and reduce future flood losses, as discussed below. The Department of Planning and Development Services has primary responsibility for maintaining and enforcing these tools, with the support of the Office of the City Engineer.

The City has a longstanding record of active comprehensive planning. As discussed in Section 4.3.5 "Future Development and Population Trends," comprehensive plans adopted by the City over the past decades intend to manage future growth and development throughout the City, thereby reducing future flood losses. Tuscaloosa 2020: A Consensus Strategic Plan was approved as an amendment to the City's comprehensive plan in 2005. The comprehensive plan was later updated by the 2007 City of Tuscaloosa Citywide Future Land Use Plan. These comprehensive plans project future growth areas for residential and commercial development. The comprehensive plan identifies areas suitable for future development and floodplain and floodway development constraints. The principles laid out in these documents are still valid.

Following the April 27, 2011, tornado disaster, which devastated the City, Tuscaloosa Forward: A Strategic Community Plan to Renew and Rebuild focuses on the path of heaviest impact, which included previously developed areas within and outside the regulatory flood plains. This plan for renewal encourages greenways and sustainable design with targeted locations. The zoning and development controls enacted for redeveloping damaged properties within the affected corridor increase green infrastructure and apply strict stormwater design standards to improve pre-event hydrologic conditions.

The City administers the 2015 International Code Series of building and technical codes that establish minimum design and construction standards for all aspects of building construction. The codes are enforced through residential and commercial permitting systems and are integrated with other development controls, including floodplain management controls, through permitting systems and interdepartmental review processes.

Central to land use and development control is the Tuscaloosa Zoning Ordinance. The Zoning Ordinance lays out district land use, dimensional standards, and other development criteria in accordance with a zoning map of the land use districts. In turn, the comprehensive plan guides the mapping of zoning district. The Tuscaloosa Subdivision Regulations, work in concert with the Zoning Ordinance and other development controls to ensure minimum design and construction standard be met for major subdivisions, and the regulations set out the procedures for platting lots.

Following the 2011 tornado disaster, major amendments were made to the Zoning Ordinance, as recommended by the "Tuscaloosa Forward" planning process. New "Mixed Use Districts" and "Mixed Residential Districts" encourage sustainable and creative design practices with the targeted areas for redevelopment.

Article XII of the Tuscaloosa City Code established minimum design and construction standards for all land development activities. Enforced through its "Land Development Permit (LDP)" process, these standards include provisions for drainage, erosion and sedimentation control, and stormwater runoff quality. The drainage standards seek to maintain pre-development drainage conditions.

The Floodplain Management and Flood Damage Prevention Ordinance follows the model provisions recommended by the State NFIP Coordinator but exceeds the minimums required for participation in the NFIP. CRS Credit for 177 points is currently provided for higher regulatory standards. Credit is given for enforcing regulations that require a one foot freeboard (elevation) construction within the floodplain. Other points have been credited for cumulative substantial improvement provisions, local drainage protection, and the enforcement of building codes.

The FMPC considered many preventive options and determined that the City's floodplain management ordinance should be amended to include additional higher

regulatory standards to further reduce potential flood losses. Among other revisions, higher regulatory standards could increase the freeboard above one foot and restrict fill. Given the extents of the flood risks identified in Chapter 4 "Risk Assessment" and projected City growth, a review of all of the development controls discussed in this section would assure a more integrated program of floodplain management.

2. Property Protection Activities

As noted in Appendix G, the FMPC considered various property protection activities. Of those activities, only the promotion of flood insurance gained full planning committee support. This activity has no additional cost and has widespread community and political support. Acquisition and relocation of flood prone properties was found to be dependent on the availability of FEMA grant funds. The City had previously completed a buyout of flood prone homes through the FEMA Hazard Mitigation Grant Program but, without the FEMA funds, the project would not have been feasible. Other activities include building retrofits and elevations. These activities require property owner initiatives without City intervention. They were also found to be inappropriate due to cost and lack of community interest.

3. Public Education and Outreach Activities

Public outreach activities are low cost and popular. The FMPC offers full support of such efforts, which is reflected in the Floodplain Management Action Plan in Section 4.3.

4. Natural Resource Protection Activities

The renewal planning and development controls emanating from the 2011 tornado recovery demonstrate the City's support for natural resources protection. The FMPC supports continued activities to increase open space and restore the natural functions of flood plains. Increasing the minimum lot area for subdivision of floodplain lands, however, was rejected by the FMPC as lacking community and political support.

5. Structural Projects Activities

The City recognizes the benefits of comprehensive drainage system maintenance to reduce flood losses and would continue or improve upon its current practices. Furthermore, the City has continued to study problem drainage areas and identify structural remedies. The success of structural projects is best demonstrated by the success of the City's "MST3 Drainage Improvements" project funded, in part, through FEMA's Pre-Disaster Mitigation (PDM) grant program. The City's match was met through its "Noah's Ark" fund, a special bond issue to set aside funds for drainage improvement projects.

6. Emergency Services Activities

The Tuscaloosa County EMA has primary responsibility county-wide for emergency response to flooding and other natural disasters. The EMA fully endorses the use of automated gage technology to monitor and forecast flood threats. Implementation and ongoing maintenance of such technology, however, can be very costly, which is a major concern. More feasible alternatives within current operating budget levels include the strengthening of emergency response planning and operations and improving coordination with critical facility operators. Both of these activities have been recommended by the FMPC for the Floodplain Management Action Plan in Section 4.3.

5.3 Floodplain Management Action Plan

This section presents the Floodplain Management Action Plan recommended by the Floodplain Management Planning Committee and adopted by the Tuscaloosa City Council. This Action Plan is the culmination of the planning process and schedules implementation of the listed measures over the next five year planning cycle ending on December 31, 2020. The Action Plan is continually reviewed for progress towards implementation and may be updated and amended from time-to-time, in accordance with Chapter 6 "Plan Maintenance Procedures."

The following key explains the components of the Action Plan:

Key

- *"Mitigation Actions by Goal Area and Objective."* Each mitigation action has been grouped according to the six long-term planning goals. Within each goal area, the actions have been organized according to plan objectives.
- *"Implementation Responsibility."* This action plan assigns lead responsibility for implementation to a specific department or agency or position within the organization.
- *"Timeframe for Completion."* Timeframes are *Short-Range* (less than 2 years), *Mid-Range* (2-3years), *Long-Range* (more than 3 years) or *Ongoing*.
- *"Funding Source(s)." P*otential funding sources are identified. FEMA Hazard Mitigation Assistance (HMA) grant programs, where noted, include the Hazard Mitigation Grant Program (HMGP), the Pre-Disaster Mitigation (PDM) grant, and Flood Mitigation Assistance (FMA) grants. These are possible funding sources but are subject to final eligibility determination, including, among other eligibility criteria, a positive benefit/cost analysis and the availability of funds.
- *"Priority." Priorities are High, Medium, and Low.*
- *"TBD"* is to be determined.

Table 5-1. 2015-2020 Floodplain Management Action Plan

#	Mitigation Actions by Goal Area and Objective	Implementation Responsibility	Timeframe for Completion	Funding Source	Priority
1	***Goal for Prevention.*** ***Manage the development of land and buildings to minimize risks of loss due to flooding and related natural hazards.***				
1.1	**Elevation Certificates.** Maintain FEMA Elevation Certificates for buildings in the floodplain.				
1.1.1	Continue to maintain FEMA Elevation Certificates for all new construction, substantial improvements, and additions to existing buildings in the floodplain.	Office of the City Engineer	Ongoing	Existing City funds	High
1.1.2	To the furthest possible extent, maintain FEMA elevation certificates for all existing buildings in the floodplain, including all "post-FIRM" buildings constructed since the City entered the NFIP in 1973 and pre-FIRM buildings prior to 1973.	Office of the City Engineer	Ongoing	Existing City funds	Low
1.2	**Floodplain Mapping.** Keep accurate and current floodplain maps and data used for regulatory purposes.				
1.2.1	Develop new flood elevations, floodway delineations, and other regulatory flood hazard data for areas not mapped in detail by the most recent NFIP Flood Insurance Study (FIS).	Office of the City Engineer	Ongoing	TBD	High
1.3	**Higher Regulatory Standards.** Establish regulatory standards that exceed the NFIP minimums.				
1.3.1	Consider freeboard of more than one foot for minimum flood protection elevation.	Office of the City Engineer	Mid-Range	Existing City funds	Medium
1.3.2	Prohibit all new buildings and substantial improvements and additions to existing buildings in the floodway.	Office of the City Engineer	Mid-Range	Existing City funds	Medium
1.3.3	Protect critical facilities (police, fire, public utilities, schools, medical, etc.) to the 500 year flood elevation.	Office of the City Engineer	Mid-Range	Existing City funds	Medium
1.3.4	Consider requiring compensatory storage for fill.	Office of the City Engineer	Mid-Range	Existing City funds	Medium
1.3.5	Require elevation of hazardous materials storage indoors.	Office of the City Engineer	Mid-Range	Existing City funds	Medium
1.3.6	Maintain Certified Floodplain Managers (CFM) on staff for ordinance administration.	Office of the City Engineer	Ongoing	Existing City funds	High
1.4	**Flood Data Maintenance.** Maintain essential field data for floodplain management.				

#	Mitigation Actions by Goal Area and Objective	Implementation Responsibility	Timeframe for Completion	Funding Source	Priority
1.4.1	Maintain elevation reference marks.	Office of the City Engineer	Ongoing	Existing City funds	Low
1.5	**Stormwater Management.** Effectively manage stormwater to maintain water quality and minimize flooding.				
1.5.1	Continue to maintain stormwater management standards (design storm and size of development) for the regulation of new development to ensure that post-development peak runoff is no worse than pre-development conditions.	Office of the City Engineer	Ongoing	Existing City funds	High
1.5.2	Enact regulations to require the implementation of low impact development (LID) techniques to minimize the need for more traditional stormwater management controls (pipes, channels, and detention).	Office of the City Engineer	Long-Range	Existing City funds	Low
1.5.3	Continue to regulate new construction to protect or improve water quality.	Office of the City Engineer	Ongoing	Existing City funds	High
2	***Property Protection Goal.*** ***Protect structures and their occupants and contents from the damaging effects of flooding and related natural hazards.***				
2.1	**Acquisition and Relocation.** Remove flood-threatened buildings from high risk flood locations.				
2.1.1	Acquire and demolish flood-prone buildings and maintain the property as permanent open space.	Office of the City Engineer	Long-Range	FEMA HMA Grants	Low
2.2	**Flood Insurance Promotion.** Promote the purchase of flood insurance, especially for high risk properties in the flood plain.				
2.2.1	Perform a flood insurance coverage assessment of the City's current level of coverage and identify shortcomings.	TBD	Long-Range	TBD	Low
2.2.2	Prepare and implement a coverage improvement plan under the direction of a committee of local lenders and insurance agents.	TBD	Long-Range	TBD	Low
3	***Public Education and Awareness Goal.*** ***Educate and inform the public about the risks of flooding and related natural hazards and the techniques available to reduce threats to life and property.***				
3.1	**Map Information Service.** Provide flood map information to the public.				
3.1.1	Continue to provide Flood Insurance Rate Map (FIRM) information to people who inquire, and publicize this service.	Office of the City Engineer	Ongoing	Existing City funds	High
3.2	**Outreach Projects.** Regularly perform public outreach and education programs to inform the public of flood risks and mitigation alternatives.				

#	Mitigation Actions by Goal Area and Objective	Implementation Responsibility	Timeframe for Completion	Funding Source	Priority
3.2.1	Send information about the flood hazard, flood insurance, flood protection measures, and/or the natural and beneficial functions of floodplains to residents.	Office of the City Engineer	Ongoing	Existing City funds	Medium
3.2.2	Participate in the Tuscaloosa County EMA's annual “Be Ready Day” event by distributing information to the public on flood hazard mitigation	Office of the City Engineer	Ongoing	Existing City funds	High
3.3	**Hazard Disclosure.** Take steps to inform the public of flood hazards.				
3.3.1	Encourage real estate agents to advise potential purchasers of flood-prone property about the flood hazard.	Office of the City Engineer	Ongoing	Existing City funds	High
3.3.2	Support the National Weather Service/Tuscaloosa County EMA "Turn Around Don't Drown" program by installing signs at hazardous bridge crossings	Office of the City Engineer	Long-Range	TBD	Medium
3.4	**Flood Protection Information.** Distribute flood protection information to the general public.				
3.4.1	Maintain publications and reference materials at public libraries.	Office of the City Engineer	Ongoing	Existing City funds	High
3.4.2	Create a community’s website to disseminate flood protection information to the public.	Office of the City Engineer	Mid-Range	TBD	Medium
3.5	**Flood Protection Assistance.** Provide technical guidance for protection of buildings from flood damage.				
3.5.1	Give inquiring property owners technical advice on how to protect their buildings from flooding, and publicize this service.	Office of the City Engineer	Ongoing	Existing City funds	Medium
4	***Natural Resources Protection Goal.*** ***Preserve and restore the beneficial functions of floodplains and the natural environment to promote sustainable community development that balances the constraints of nature with the social and economic demands of the community.***				
4.1	**Open Space Preservation.** Preserve open space to restore the natural functions of the flood plain, where feasible.				
4.1.1	Preserve City-owned floodplain lands as permanent open space, kept free from development through deed restrictions.	Office of the City Attorney	Long-Range	TBD	Low
4.1.2	To the extent possible, maintain or restore City-owned flood plains to their natural condition.	TBD	Long-Range	TBD	Low
4.1.3	Provide zoning and subdivision incentives to set aside flood plains as permanent open space in new developments. Consider provisions for clustering and conservation subdivisions.	Planning & Development Services	Mid-Range	Existing City funds	Medium

#	Mitigation Actions by Goal Area and Objective	Implementation Responsibility	Timeframe for Completion	Funding Source	Priority
5	***Structural Projects Goal. Apply engineered structural modifications to natural systems and public infrastructure to reduce the potentially damaging impacts of flooding and related natural hazards, where found to be feasible, cost effective, and environmentally suitable.***				
5.1	**Drainage System Maintenance.** Maintain natural and manmade drainage systems to effectively discharge stormwater and reduce flooding.				
5.1.1	Conduct regular inspections and maintenance of all channels and conveyance facilities and remove debris as needed.	TDOT	Ongoing	Existing City funds	High
5.1.2	Regularly inspect all detention and retention facilities constructed pursuant to the City's stormwater management regulations and all city-owned facilities to ensure proper functioning.	TDOT	Ongoing	Existing City funds	High
5.1.3	Maintain a comprehensive GIS inventory of the conveyance system and storage basins.	Office of the City Engineer	Long-Range	TBD	Medium
5.1.4	Establish an annual capital improvements programming process for drainage system improvements.	Office of the City Engineer	Ongoing	Existing City funds	High
5.1.5	Enact and publicize no stream dumping regulations.	Office of the City Attorney	Mid-Range	Existing City funds	Low
5.2	**Flood Protection.** Implement structural improvements where deemed effective to reduce flooding.				
5.2.1	Continue to perform engineering studies that evaluate the feasibility of structural flood controls.	Office of the City Engineer	Ongoing	Existing City funds	High
5.2.2	Protect existing floodplain development by structural projects, where deemed feasible.	Office of the City Engineer	Ongoing	City Bond Funds/FEMA HMA Grants	High
6	***Emergency Services Goal. Improve the efficiency, timing, and effectiveness of response and recovery efforts for flooding and related natural disasters.***				
6.1	**Flood Warning and Response.** Apply advanced technological systems to monitor flood threats and warn the public.				
6.1.1	Establish an automated flood threat recognition and forecasting system to identify impending floods.	Office of the City Engineer	Long-Range	TBD	Low
6.1.2	Establish methods for early flood warnings to the public.	Tuscaloosa County EMA	Long-Range	Existing funds	Medium
6.1.3	Develop a detailed flood response operations plan keyed to flood forecasts for City Council adoption.	Tuscaloosa County EMA	Mid-Range	TBD	Medium

#	Mitigation Actions by Goal Area and Objective	Implementation Responsibility	Timeframe for Completion	Funding Source	Priority
6.1.4	Coordinate flood warning and response activities with critical facilities operators.	Tuscaloosa County EMA	Ongoing	Existing funds	High

Chapter 6 – Plan Maintenance Procedures

6.1 Scope and Purposes of Procedures

This chapter addresses the procedures for plan maintenance that ensure the 2015 City of Tuscaloosa Floodplain Management Plan ("Plan") remains a dynamic and effective document. These procedures, which have been developed in accordance with the currently effective National Flood Insurance Program CRS Coordinator's Manual (2013 Edition), establish a useful and ongoing planning process that is continuously monitored, evaluated, and updated to reflect changing conditions. This chapter describes how the adopted Plan will be implemented, reviewed, and updated, and provides procedures that, at minimum, provide for an annual review and a five-year update.

6.2 Plan Implementation Responsibilities

The City of Tuscaloosa's Office of the City Engineer, under the direction of the Floodplain Administrator assumes responsibility for overseeing the implementation and maintenance of this Plan. The Storm Drainage Engineer, who also serves as the City's Floodplain Administrator, serves as Floodplain Management Planning Committee ("FMPC") Chair. Plan implementation, however, is a combined effort among all FMPC members and all individuals representing agencies responsible for implementation of identified mitigation measures in the Action Plan. Those individuals and the entire membership of the FMPC should assume active roles throughout the ongoing plan implementation cycle.

To maintain a dynamic and useful Plan, the FMPC will remain an active component of the ongoing planning process throughout the five-year planning cycle. The FMPC may, at its own discretion, create subcommittees to oversee and evaluate plan implementation.

6.3 Plan Monitoring and Ongoing Review

The FMPC's ongoing review process should continually monitor the current status of the mitigation measures scheduled for implementation. The FMPC will conduct annual meetings. Ongoing progress reports should be reported to the FMPC by the agencies assigned implementation responsibilities for specific mitigation measures. Progress reports should include the following information:

- Actions that have been undertaken to implement the scheduled mitigation measure, such as, obtaining funding, permits, approvals or other resources to begin implementation;
- Mitigation measures that have been completed, including public involvement activities;
- Revisions to the priority, timeline, responsibility, or funding source of a measure and cause for such revisions or additional information or analysis that has been developed that would modify the mitigation measure assignment, as initially adopted in the plan; and
- Measures that the City no longer intends to implement and justification for cancellation.

6.4 Annual Evaluation Report

As a part of its ongoing implementation program, the City will perform an annual evaluation of the Floodplain Management Plan, which is also required for recertification in the CRS program. The City will develop an Annual Evaluation Report with support from the Planning Committee. The report will evaluate the City's progress towards achieving the Plan's goals and objectives and carrying out the measures presented in the Action Plan. Some potential questions by the FMPC during its annual review may address the following concerns:

- Are there any new potential flood hazards that have developed and were not addressed in the Plan?
- Have any flood disasters occurred that are not included in the Plan?
- Are there additional mitigation ideas that need to be incorporated into the Plan?
- What projects or other measures have been initiated, completed, deferred, or deleted?
- Are there any changes in local capabilities to carry out mitigation measures?
- Have funding levels to support mitigation actions either increased or decreased, including new opportunities for funding through FEMA Hazard Mitigation Assistance grant programs?

Reporting the implementation progress of the Action Plan and the FMPC's findings and recommendations annually is a minimum requirement. It not only reports on implementation progress, but also provides a framework for monitoring the Plan's effectiveness. The Annual Evaluation Report of the FMPC will be submitted to the City Council and made available to media outlets and the public for review and comment.

6.5 Plan Amendments

The ongoing review process may require adjustments to the selection of mitigation measures, priorities, timelines, lead responsibilities, and funding sources scheduled in the Action Plan. Annual adjustments should be made to the Action Plan, as needed, to reflect current implementation progress, priorities, capabilities, and funding resources. Moreover, goals, objectives, and mitigation actions may likewise need to be revised from year-to-year. In the event modifications to the Action Plan are warranted as a result of the annual review or other conditions, the FMPC will oversee and approve all amendments to the Plan by majority vote of a quorum of FMPC members. Conditions that might warrant amendments to this plan would include, but not be limited to, special opportunities for funding and response to a flood disaster.

6.6 Plan Evaluation following a Flood Disaster

Immediately following a significant flooding disaster event having a substantial impact on any part of the City, the FMPC will conduct or oversee an analysis of the event to evaluate the responsiveness of the Plan. An assessment of the event should examine the direct and indirect damages, response and recovery costs (economic impacts) and the location, type, and extents of the damages. The findings of the assessment should determine any new mitigation initiatives that should be incorporated into this Plan to avoid similar losses from future hazard events. The results of the assessment will be provided to City Council and the public for review. These results may also provide useful information when considering new mitigation initiatives as an amendment to the existing Action Plan.

6.7 Five-Year Plan Update

This Plan's adoption, by resolution of the City of Tuscaloosa City Council (Appendix H – "Adopting Resolution"), marks the beginning of the five-year planning cycle until the next major plan update becomes due.

The Plan must be updated at least every five years in accordance with the most current version of the CRS Coordinator's Manual (Activity 510 Floodplain Management Planning). The update will follow the CRS Ten-Step Planning Process to include a review of any new plans, studies, or reports, as well as any revised directives or goals for the City. The flood hazard risk profiles and vulnerability assessments will be updated to reflect best available data and information. The hazard assessments will account for any additional repetitive flood loss properties, impacts of completed flood mitigation projects, increased development in the floodplain, major floods or disasters and any other change in flooding conditions.

The Action Plan will be reviewed and revised to account for completed, changed, or removed mitigation goals, objectives, and mitigation measures. While the FMPC's membership may change, the committee will continue to be involved in the planning process for the plan update. Public meetings will be conducted and media releases will

be organized. The City Council will adopt the updated plan and publish it for public distribution.

Appendix A
Resolution Establishing the Planning Process

APPROVED AS TO FORM
GDW
Office of the City Attorney

Prepared By: GDW
Requested: Projects Cmte
Presentation on: 05/12/2015
Suspension of Rules: No

RESOLUTION

RESOLUTION REGARDING THE 2015 CITY OF TUSCALOOSA FLOODPLAIN MANAGEMENT PLAN
(A15-0583)

WHEREAS, the City of Tuscaloosa has been awarded a FEMA Flood Mitigation Assistance grant on October 14, 2014, to fund the preparation of the 2015 City of Tuscaloosa Floodplain Management Plan; and,

WHEREAS, a ten-step planning process for the preparation of the plan is hereby recommended to be in conformity with activity 510 of the Community Rating System Coordinator's Manual, 2013 Edition; and,

WHEREAS, the City Council desires to appoint certain members to a Floodplain Management Planning Committee to oversee the preparation of the plan; and,

WHEREAS, the City Council desires to appoint the Floodplain Administrator to be Chair of the Floodplain Management Planning Committee; and,

WHEREAS, the City Council and Mayor wish to have City staff from various departments authorized to provide staff support to the Planning Committee under the direction of the Chair; and

WHEREAS, the Floodplain Management Planning Committee is requested to complete the Plan within a period of performance ending on October 14, 2016, as required by the Flood Mitigation Assistance Grant conditions.

NOW, THEREFORE, BE IT RESOLVED BY THE TUSCALOOSA CITY COUNCIL that there be a ten-step planning process established for the preparation of the 2015 City of Tuscaloosa Floodplain Management Plan consistent with activity 510 of the Community Rating System Coordinator's Manual, 2013 Edition.

BE IT FURTHER RESOLVED BY THE TUSCALOOSA CITY COUNCIL that the following representatives of City Staff, City Council and the Public are hereby appointed as members of the Floodplain Management Planning Committee which is hereby created to oversee the preparation of the Plan:

Title	*Name*	*Representative Interest*
Chairperson:		
Floodplain Administrator	Josh Yates	Structural Flood Control Projects

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Committee Members:

CRS Coordinator	Kevin Turner	Natural Resource Protection
Deputy Director	Philip O'Leary	Preventative Measures
Public Information Officer	Deidre Stalnaker	Public Information
Public Safety	John Brook	Emergency Services
Director of Federal Programs	LaParry Howell	Property Protection
City Council Member	Kip Tyner	Public Information
	Joe Robinson	Civic Group
	Abner Patton	Business Owner
	Anne Wynn	Environmental Organization
	Mary Wallace-Pitts	Academia
	Brienna Bayles	Realtor
	Brock Corder	Home Builders Association
	Rick Deerman	Local Engineer

BE IT FURTHER RESOLVED BY THE TUSCALOOSA CITY COUNCIL that the Floodplain Administrator is hereby appointed Chair of the Floodplain Management Planning Committee and that City staff from the Office of the City Engineer, Planning and Development Services, Office of Federal Programs, Tuscaloosa Fire & Rescues Services and Mayor and Clerk Office are hereby authorized to provide staff support to the Floodplain Management Planning Committee under the direction of the Chair.

BE IT FURTHER RESOLVED that the Floodplain Management Planning Committee is hereby directed to complete the plan within the period of performance ending on October 14, 2016 as required by the Flood Mitigation Assistance Grant conditions.

FUNDING REQUIRED: ☐Yes ☐No

_____

By:_____
Finance Director

COUNCIL ACTION

Resolution _____
Ordinance _____
Introduced _____
Passed _____
2nd Reading _____
Unanimous_____
Failed _____
Tabled _____
Amended _____
Comments:_____

Adopted 5/12/15
Tracy B Coom
City Clerk

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Appendix B
Hazard Profile Data

App. B – Hazard Profile Data

1.0 Records of Previous Occurrences of Hazard Events

This appendix contains the detailed records of previous occurrences of hazard events reported in Section 4.3 “Previous Occurrence,” for events reported by the National Climatic Data Center. In addition, records of Presidential Disaster Declarations are included in this appendix.

Past Occurrences of Flooding

Table B-1. City of Tuscaloosa Flash Flooding Events, 1995-2014

Mag: Magnitude **Dth:** Deaths **Inj:** Injuries **PrD:** Property Damage **CrD:** Crop Damage

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
TUSCALOOSA	7/24/1996	16:00	Flash Flood		0	0	65.00K	0.00K
TUSCALOOSA	9/2/1996	17:30	Flash Flood		0	0	30.00K	0.00K
TUSCALOOSA	7/22/1997	4:15	Flash Flood		0	0	25.00K	0.00K
COUNTYWIDE	1/7/1998	9:30	Flash Flood		0	0	60.00K	5.00K
TUSCALOOSA	6/2/1999	14:25	Flash Flood		0	0	5.00K	0.00K
COUNTYWIDE	4/3/2000	6:00	Flash Flood		0	0	25.00K	0.00K
COUNTYWIDE	9/22/2002	6:30	Flash Flood		0	0	50.00K	0.00K
TUSCALOOSA	6/17/2003	18:00	Flash Flood		0	0	10.00K	0.00K
COUNTYWIDE	2/5/2004	20:30	Flash Flood		0	0	5.00K	0.00K
COUNTYWIDE	2/5/2004	23:30	Flash Flood		0	0	5.00K	0.00K
COUNTYWIDE	11/24/2004	4:45	Flash Flood		0	0	11.00K	0.00K
COUNTYWIDE	7/10/2005	20:00	Flash Flood		0	0	6.00K	0.00K
TUSCALOOSA	8/13/2005	16:29	Flash Flood		0	0	13.00K	0.00K
TUSCALOOSA	8/29/2005	16:00	Flash Flood		0	0	10.00K	0.00K
TUSCALOOSA ARPT	3/9/2011	6:30	Flash Flood		0	0	0.00K	0.00K
Totals:					**0**	**0**	**521.00K**	**5.00K**

Source: National Climatic Data Center

Table B-2. City of Tuscaloosa Flooding Events, 1995-2014

Mag: Magnitude **Dth:** Deaths **Inj:** Injuries **PrD:** Property Damage **CrD:** Crop Damage

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
TUSCALOOSA (ZONE)	5/8/2003	5:30	Flood		0	0	0.00K	0.00K
TUSCALOOSA (ZONE)	5/18/2003	23:00	Flood		0	0	0.00K	0.00K
TUSCALOOSA (ZONE)	4/1/2005	0:00	Flood		0	0	0.00K	0.00K
TUSCALOOSA (ZONE)	4/6/2005	0:00	Flood		0	0	0.00K	0.00K
MOORES BRIDGE	9/5/2011	17:30	Flood		0	0	0.00K	0.00K
Totals:					**0**	**0**	**0.00K**	**0.00K**

Source: National Climatic Data Center

Past Occurrences of Hurricanes

Table B-3. City of Tuscaloosa Hurricane and Tropical Storm Events, 1995-2014

Mag: Magnitude **Dth:** Deaths **Inj:** Injuries **PrD:** Property Damage **CrD:** Crop Damage

Location	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
TUSCALOOSA (ZONE)	7/10/2005	16:00	Tropical Storm		0	0	200.00K	0.00K
TUSCALOOSA (ZONE)	8/29/2005	17:00	Tropical Storm		0	2	5.500M	0.00K
TUSCALOOSA (ZONE)	8/23/2008	12:00	Tropical Depression		0	0	0.00K	0.00K
TUSCALOOSA (ZONE)	11/9/2009	14:00	Tropical Depression		0	0	2.00K	0.00K
Totals:					**0**	**0**	**7.700M**	**0.00K**

Source: National Climatic Data Center

Presidential Disaster Declarations

Table B-4. History of Tuscaloosa County Flood Hazard Related Events with Presidential Disaster Declarations

Federal Disaster Declaration	Incident Period	Declared Date	Description
DR-109	February 27, 1961	February 27, 1961	Floods
DR-369	March 27, 1973	March 27, 1973	Tornadoes, Flooding
DR-458	March 14, 1975	March 14, 1975	Severe Storms, Flooding
DR-578	April 18, 1979	April 18, 1979	Storms, Wind, Flooding
DR-856	February 3, 1990 to February 16, 1990	February 17, 1990	Flooding, Severe Storm, Tornado
DR-1070	October 4, 1995 to October 8, 1995	October 4, 1995	Hurricane Opal
DR-1322	March 10, 2000 to March 11, 2000	March 17, 2000	Severe Storms And Flooding
DR-1362	February 16, 2001 to February 17, 2001	March 5, 2001	Severe Storms & Flooding
DR-1466	May 5, 2003 to May 30, 2003	May 12, 2003	Severe Storms, Tornadoes and Flooding
DR-1549	September 13, 2004 to September 30, 2004	September 15, 2004	Hurricane Ivan
DR-1593	July 10, 2005 to July 16, 2005	July 10, 2005	Hurricane Dennis
DR-1605	August 29, 2005 to September 26, 2005	August 29, 2005	Hurricane Katrina
EM-3292	August 29, 2008 to September 3, 2008	August 30, 2008	Hurricane Gustav
DR-1971	April 15, 2011 to May 31, 2011	April 28, 2011	Severe Storms, Tornadoes, Straight-line Winds, and Flooding
DR-4176	April28, 2014 to May 5, 2014	May 2, 2014	Severe Storms, Tornadoes, Straight Line Winds, and Flooding

Source: National Climatic Data Center

Appendix C
Risk Assessment Data

App. C – Risk Assessment Data

1.0 Summary of Vulnerability and Impacts

Table C-1 summarizes the City of Tuscaloosa's vulnerability to flooding and other natural hazards. This table is an abridged version, based upon the comparable Table 5-53 found in the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan. Table C-1 includes a summary of all hazards identified in Section 4.2 of this plan. Community impacts include the following descriptions and measurements:

Location. Location measures the geographic extent of the identified hazard in one of three ways, as follows:

1) *Community-wide* - the entire geographic area is affected;
2) *Partial* - a significant portion of the community is affected; or
3) *Minimal* - a negligible area is affected.

Probability. Probability measures the likelihood of the hazard occurring within the community, based on historical incidence. The scale for frequency runs as follows:

1) *Very high* - annually;
2) *High* - every two to three years;
3) *Moderate* - every three to ten years;
4) *Low* - every ten years; or
5) *Very low* - rare.

Extent. Extent measures the severity of the hazard and its potential to cause casualties, business losses, and damage to structures. The scale utilized runs as follows:

1) *Devastating* - the potential for devastating casualties, business losses, and structure damage;

2) *Significant* - the potential for some casualties and significant, but less than devastating, business losses and structure damage;

3) *Moderate* – moderate potential for economic losses and structure damage; or

4) *Slight* – slight or minimal potential for economic losses and structure damage

Exposure. Exposure measures the percentage of structures within the community, including buildings, critical facilities, and infrastructure lifelines, that are exposed to the hazard. The classifications are defined as follows:

1) *High* - includes more than approximately 25 percent of the structures;
2) *Medium* - includes 10 percent to 25 percent of the structures; or
3) *Low* - includes less than 10 percent of the structures.

Damage Potential. Damage potential measures the damage that can be expected should an event take place. The classifications are defined as follows:

1) *High* - a hazard could damage more than 5 percent of the structures in a community;
2) *Medium* - a hazard could damage between 1 and 5 percent of the structures in a community; or
3) *Low* - a hazard could damage less than 1 percent of the structures in a community.

Table C-1. Summary of Hazards and Community Impacts

Hazard	Community Impacts			Impacts to Vulnerable Community Buildings, Critical Facilities, and Infrastructure	
	Location (Geographic Extent of Hazard in the Community)	**Probability** (Frequency of Hazard Occurrence in the Community)	**Extent** (Magnitude of Severity of Hazard in the Event of Occurrence)	**Level of Exposure** (Degree of Structures Exposed to the Hazard)	**Level of Damage Potential** (Percentage of Likely Damage to Exposed Structures)
Floods	Partial	Very High	Significant	Medium	Medium
Dam/Levee Failures	Minimal	Low	Slight	Low	Low
Sinkholes (Land Subsidence)	Minimal	Moderate	Moderate	Medium	Low
Tornadoes	Community-wide	High	Devastating	High	High
Severe Storms	Community-wide	Very High	Significant	High	Low
Hurricanes	Community-wide	Low	Moderate	High	Low
Winter Storms/Freezes	Community-wide	High	Significant	High	Low
Drought/Heat Waves	Community-wide	Moderate	Moderate	High	Low
Wildfires	Partial	Low	Slight	Low	High
Landslides	Minimal	Low	Slight	Low	Low
Earthquakes	Community-wide	Very Low	Slight	High	Medium

Source: 2014 Tuscaloosa County Multi-Hazard Mitigation Plan

2.0 HAZUS-MH: Flood Event Report

FEMA's HAZUS-MH risk assessment software was used to estimate losses due to flooding for the City of Tuscaloosa study area. The results of the modeled flood scenario are included in the following Flood Event Summary Report generated from HAZUS-MH, which have been integrated into this plan in Chapter 4. Risk Assessment.

Hazus-MH: Flood Event Report

Region Name: Tuscaloosa City Flood Event3

Flood Scenario: Tuscaloosa City Flood Event

Print Date: Thursday, August 27, 2015

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Flood. These results can be improved by using enhanced inventory data and flood hazard information.

Table of Contents

General Description of the Region

Hazus is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS). The primary purpose of Hazus is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Alabama

Note:
Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 778 square miles and contains 6,694 census blocks. The region contains over 56 thousand households and has a total population of 140,853 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 51,225 buildings in the region with a total building replacement value (excluding contents) of 14,897 million dollars (2010 dollars). Approximately 90.66% of the buildings (and 74.74% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 51,225 buildings in the region which have an aggregate total replacement value of 14,897 million (2010 dollars). Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	11,133,539	74.7%
Commercial	2,384,936	16.0%
Industrial	715,633	4.8%
Agricultural	38,575	0.3%
Religion	339,252	2.3%
Government	61,716	0.4%
Education	223,577	1.5%
Total	**14,897,228**	**100.00%**

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	3,151,554	77.8%
Commercial	493,406	12.2%
Industrial	271,668	6.7%
Agricultural	7,784	0.2%
Religion	88,414	2.2%
Government	6,697	0.2%
Education	32,240	0.8%
Total	**4,051,763**	**100.00%**

Essential Facility Inventory

For essential facilities, there are 3 hospitals in the region with a total bed capacity of 1,539 beds.
There are 48 schools, 9 fire stations, 10 police stations and no emergency operation centers.

Flood Scenario Parameters

Hazus used the following set of information to define the flood parameters for the flood loss estimate provided in this report.

Study Region Name:	Tuscaloosa City Flood Event3
Scenario Name:	Tuscaloosa City Flood Event
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Building Damage

General Building Stock Damage

Hazus estimates that about 1,577 buildings will be at least moderately damaged. This is over 20% of the total number of buildings in the scenario. There are an estimated 332 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		Substantially	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	2	13.33	6	40.00	4	26.67	2	13.33	1	6.67	0	0.00
Education	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Industrial	0	0.00	15	83.33	1	5.56	2	11.11	0	0.00	0	0.00
Religion	0	0.00	2	66.67	0	0.00	0	0.00	1	33.33	0	0.00
Residential	1	0.06	40	2.59	342	22.15	207	13.41	622	40.28	332	21.50
Total	**3**		**63**		**347**		**211**		**624**		**332**	

Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		Substantially	
	Count	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Concrete	0	0.00	7	70.00	2	20.00	0	0.00	1	10.00	0	0.00
ManufHousing	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	154	100.00
Masonry	0	0.00	8	13.79	6	10.34	3	5.17	34	58.62	7	12.07
Steel	1	3.85	17	65.38	3	11.54	3	11.54	2	7.69	0	0.00
Wood	0	0.00	29	2.19	333	25.11	205	15.46	590	44.49	169	12.75

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 1,539 hospital beds available for use. On the day of the scenario flood event, the model estimates that 1,539 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	9	0	0	0
Hospitals	3	0	0	0
Police Stations	10	1	0	1
Schools	48	4	0	4

If this report displays all zeros or is blank, two possibilities can explain this.

(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

Analysis has not been performed for this Scenario.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 3,785 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 9,361 people (out of a total population of 140,853) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the flood is 819.24 million dollars, which represents 20.22 % of the total replacement value of the scenario buildings.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the flood. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the flood.

The total building-related losses were 816.92 million dollars. 0% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 57.60% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	275.15	54.23	26.39	11.55	367.32
	Content	196.32	116.78	70.33	52.29	435.72
	Inventory	0.00	2.29	11.32	0.27	13.88
	Subtotal	**471.47**	**173.30**	**108.04**	**64.11**	**816.92**
Business Interruption						
	Income	0.00	0.56	0.01	0.13	0.70
	Relocation	0.25	0.11	0.01	0.06	0.43
	Rental Income	0.13	0.08	0.00	0.00	0.21
	Wage	0.01	0.51	0.01	0.45	0.98
	Subtotal	**0.39**	**1.27**	**0.03**	**0.64**	**2.32**
ALL	**Total**	**471.86**	**174.57**	**108.07**	**64.74**	**819.24**

Appendix A: County Listing for the Region

Alabama

- Tuscaloosa

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Alabama				
Tuscaloosa	140,853	11,133,539	3,763,689	14,897,228
Total	**140,853**	**11,133,539**	**3,763,689**	**14,897,228**
Total Study Region	**140,853**	**11,133,539**	**3,763,689**	**14,897,228**

Appendix D
Mitigation Capabilities Assessment

App. D – Mitigation Capabilities Assessment

1.0 Summary of Findings

The City of Tuscaloosa has exceptional capabilities for implementation of a full range of mitigation activities. This finding is based upon the five measures of capability identified below:

1. Planning and Regulatory Tools.

- *Hazard mitigation planning.* The City has a record of experience in hazard mitigation planning. It has been an active participant on the Tuscaloosa County Hazard Mitigation Planning Committee since it was first created in 2003. They participated in the planning processes for the initial 2004 plan and the 2009 update and adopted both editions of the plan. Most recently the City again participated in the 2014 plan update and adopted the 2014 Tuscaloosa County Multi-Hazard Mitigation Plan. This plan includes a Community Action Program of mitigation measures that respond to flooding and related natural hazards, in addition to other natural and manmade and technological hazards.

- *Comprehensive planning.* The City's first comprehensive plan, the General Development Plan for the City of Tuscaloosa, was developed in 1972 by the Tuscaloosa Area Council of Local Governments (now the West Alabama Planning and Development Commission). The 1972 plan formed the basis for a new City zoning ordinance adopted the same year. In 2003, the City launched a community-wide visioning process, which culminated with Tuscaloosa 2020: A Consensus Strategic Plan. The plan called for the "preservation of watersheds, floodplains, and improvement of water quality" through a series of activities. One of the recommended activities was to "(a)dhere strictly to requirements of the National Flood Insurance Program and revise existing ordinances to further enhance floodplain protection," among other floodplain management measures.

  The most recent comprehensive land use plan The City of Tuscaloosa Citywide Future Land Use Plan was prepared in 2007. "Green Infrastructure" is an important strategic development concept of the 2007 plan and promotes development balanced with the conservation of wetlands and floodplains to improve quality of life. The 2007 citywide

plan has been supplemented by a number of area and special plans, which address flooding issues where there is a concern.

Following the widespread devastation of the April 27, 2011, EF 4 tornado, the City embarked on Tuscaloosa Forward: A Strategic Community Plan to Renew and Rebuild to guide recovery. With much of the tornado path intersecting floodplains, this renewal plan recognizes the opportunity presented by the tornado impacts on the floodplains and makes a bold recommendation: "A greenway corridor tracing the floodways along the tornado path presents an opportunity to address these long-standing issues in a comprehensive and sustainable way that was not possible before." The Tuscaloosa Forward Generational Master Plan, endorsed by the City Council on April 24, 2012, provides the framework for implementation of the many infrastructure improvements recommended by the strategic plan. This follow up plan presents many details of the "greenway corridor," which has been named the "City Walk."

- *Zoning Ordinance.* The current Zoning Ordinance of the City of Tuscaloosa was adopted in 1972. It is a conventional zoning ordinance, which regulates land uses and development standards by district. Floodplain management provisions are included in a separate ordinance. The Department of Planning and Development Services administers and enforces the zoning ordinance.

- *Subdivision Regulations.* The Department of Planning and Development Services administers the City of Tuscaloosa Subdivision Regulations, which set forth platting requirements and design and construction standards, which include standards for drainage improvements.

- *Building Codes.* The City enforces the International Building Code, 2009 edition through the Department of Planning and Development Services.

- *Stormwater Management Ordinance.* The Office of the City Engineer administers the City's stormwater regulations for erosion and sedimentation control, stormwater discharge, and drainage improvements.

- *Floodplain Management Ordinance.* The Office of the City Engineer administers the Floodplain Management and Flood Damage Prevention Ordinance. This ordinance is based upon the model recommended by the Alabama State Floodplain Administrator. It includes a freeboard of one foot, and some higher regulatory standards have been added to the model.

- *Land Development Ordinance.* The land development ordinance supplements other City codes and ordinances through a land development permit (LDP). The LDP requires certain engineering design and construction standards, including drainage standards, be met for any land disturbance activity.

2. GIS Resources.

   - The City maintains GIS data and software by trained GIS technicians and provides full access for use by City staff.

   - Flood hazard maps and data are maintained in GIS, in addition to a complete inventory of other essential City attributes.

3. Staffing and Administrative Resources.

4. Fiscal Resources.

5. Public Education and Outreach Programs.

6. Insurance Services Office (ISO) Ratings.

Appendix E
Committee Meeting Documentation

App. E - Committee Meeting Documentation

1.0 Meeting Agendas and Sign-in Sheets

This section documents the FMPC's meeting activities during the drafting phase of this plan, including who was involved in these meetings. Included here are the meeting agendas and sign-in sheets.

Kick-off Meeting
2015 City of Tuscaloosa Floodplain Management Plan
City of Tuscaloosa
2201 University Blvd.
Tuscaloosa, AL 35401

Thursday, May 14, 2015
10:30 AM – 11:30 AM

I. Call to Order

II. Welcome and Opening Remarks

III. Floodplain Management Planning Committee (FMPC)

IV. Introduction of Consultant Team

V. Scope of Plan

VI. Organization of 2015 Plan

VII. Review Draft Sections

A. Chapter 1 Introduction
B. Chapter 6 Plan Maintenance
C. Appendix A – Resolution Establishing FMPC
D. Appendix F – Resolution Adopting 2015 FMP

VIII. FMPC Exercise – Flood Hazard Identification

IX. Meeting Dates and Topics

A. FMPC Meetings
B. Community Meetings

X. Internet Access

A. Website: http://tuscaloosa.floodplainmanagementplan.com
B. e-mail: tuscaloosa@floodplainmanagementplan.com

XI. Questions and Answers

XII. Other Business

XIII. Adjourn

Tuscaloosa Floodplain Management Plan

Kick-off Meeting

May 14, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
Mary W. Pitts	UA Geog. Dept	mwpitts@ua.edu	205-310-0831
[illegible] Carter	The Builders Group	bcarter@thebuildersgroup.info	886-1011
Brienna Bayles	Realtor Duckworth Morris	brienna.bayles@gmail.com	205-239-7979
Rick Dearman	CFM Group	rick.dearman@cfmgroup.com	205 752-4037
Philip O'Leary	City of Tuscaloosa	POLEARY@TUSCALOOSA.com	205-248-5134
Gene Holcomb	TFRS	ghollcomb@Tuscaloosa.com	205-245-5420
Deidre Stalnaker	Mayor	dstalnaker@tuscaloosa.com	248-5704
Abner Patton	Patton Geologics	apatton@pattongeologics.com	391-9900
Kip Tyner	Council	ktyner@tuscaloosa.com	394-8375
Margaret Jones	OFP	mjones@tuscaloosa.com	205-248-5092
Anne Wynn	Sassafras Center and GSA	awynn@gsa.state.al.us	205-247-3671

Tuscaloosa Floodplain Management Plan

Kick-off Meeting

May 14, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
[illegible]	City of Tuscaloosa	[illegible]@tuscaloosa.com	205-[illegible]
Josh [illegible]	City of Tuscaloosa	[illegible]@tuscaloosa.com	205-[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
WILLIAM THOMAS	SCHOEL ENGINEERING	WTHOMAS@SCHOEL.COM	205-323-6160

FMP Meeting
2015 City of Tuscaloosa Floodplain Management Plan
City of Tuscaloosa
2201 University Blvd.
Tuscaloosa, AL 35401

Wednesday, July 8, 2015
10:30 AM – 11:30 AM

I. Call to Order

II. Welcome and Opening Remarks

III. Review Draft Sections

A. Chapter 2 Community Profile
B. Chapter 4, Part I: Risk Assessment: Flood Hazard Profile
C. Appendix B – Hazard Profile Data

IV. Meeting Schedule

V. Coordination with Tuscaloosa County Multi-Hazard Mitigation Plan

VI. Questions and Answers

VII. Other Business

VIII. Adjourn

Tuscaloosa Floodplain Management Plan Meeting

July 8, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
Brienna Bayles	Duckworth Morris	brienna.bayles@gmail.com	205-239-7979
Brock Corder	The Builders Group	bcorder@thebuildersgroup.info	205-886-1011
Joe Robinson	Retired	jrobins1950@yahoo.com	205-752-9206
John Brock	Tuscaloosa Fire Rescue	jbrock@tuscaloosa.com	205-248-5420
Philip O'Leary	City of Tuscaloosa	Poleary@tuscaloosa.com	205-248-5134
Mary W. Pitts	University of AL	mwpitts@ua.edu	205-310-0831
Abner Patton	Patton Geologics	apatton@pattongeologics.com	205-391-9900
Rick Deerman	CFM Group	rick.deerman@cfmgroup.com	205-752-4037
William Thomas	SCHOEL ENGINEERING	WTHOMAS@SCHOEL.COM	205-313-1150
Jim Leke	Leke Plumbing	jleke@lekeplumbing.com	205-975-3655
Laparry Howell	City of Tuscaloosa	lhowell@tuscaloosa.com	(205) 248-5069

Tuscaloosa Floodplain Management Plan Meeting

July 8, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
Josh Yates	City of Tuscaloosa	JDYATES@TUSCALOOSA.Com	(205)248-5380
Kevin Turner	City of Tuscaloosa	Kturner@tuscaloosa.com	205-248-5388

FMP Meeting
2015 City of Tuscaloosa Floodplain Management Plan
City of Tuscaloosa
2201 University Blvd.
Tuscaloosa, AL 35401

Wednesday, September 16, 2015
10:30 AM – 11:30 AM

I. Call to Order

II. Welcome and Opening Remarks

III. Review Draft Sections

A. Revisions to Ch. 4, Part I: Assessing the Hazard
B. Chapter 4, Part II: Assessing the Problem
C. Appendix C – Risk Assessment Data

IV. Meeting Schedule

V. Questions and Answers

VI. Other Business

VII. Adjourn

Tuscaloosa Floodplain Management Plan Meeting

September 16, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
Brock Corder	Home Builders Assoc.	bcorder@thebuildersgroup.info	205-886-1011
Joe Robinson	Retired	jrobins1950@yahoo.com	205-246-7898
Abner Patton	Business	apatton@pattongeologics.com	205 351 9900
Rick Deerman	Engineer	rick.deerman@ctm-grp.com	205 752 4037
Deidre Stalnaker	City PR	dstalnaker@tuscaloosa.com	248-5704
Philip O'Leary	City PDS	POLEARY@TUSCALOOSA.com	248-5134
Erin Tidwell	City PDS	etidwell@tuscaloosa.com	248-5011
Brienna Bayles	Duckworth-Morris	brienna.bayles@gmail.com	205-239-7979
James Leke	Leke Planning	jeleke@lekeplanning.com	205-978-3633
WILLIAM THOMAS	SCHOEL ENGINEERING	WTHOMAS@SCHOEL.COM	205-323-6166
John Brook	City of Tuscaloosa	jbrook@tuscaloosa.com	205 248-5420
Anne Wynn	Geological Survey of AL Sassafras Center	awynn@gsa.state.al.us	247-3671
Kevin Turner	City of Tuscaloosa	kturner@tuscaloosa.com	248-5385
Josh Yates	City of Tuscaloosa	JOYATES@TUSCALOOSA.COM	248-5387

FMP Meeting
2015 City of Tuscaloosa Floodplain Management Plan
City of Tuscaloosa
2201 University Blvd.
Tuscaloosa, AL 35401

Wednesday, November 18, 2015
10:30 AM – 11:30 AM

I. Call to Order

II. Welcome and Opening Remarks

III. Review Draft Sections

A. Chapter 5A, Mitigation Strategy
B. Appendix D – Mitigation Capabilities Assessment

IV. Alternative Mitigation Measures Exercise

V. Questions and Answers

VI. Other Business

VII. Adjourn

Tuscaloosa Floodplain Management Plan Meeting

November 18, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
John Powell Webb	City of Northport	jwebb@cityofnorthport.org	339-7000
Jim Lehe	Lehe Plng	jelehe@leheplng.com	978-3637
William Thomas	Schoel Engineering	wthomas@schoel.com	323-6166
Anne Wynn	Geological Survey of AL	awynn@gsa.state.al.us	205-247-3671
Mary W. Pitts	UA	mwpitts@ua.edu	205-310-0831
Abner Patton	Patton Geologics	apatton@pattongeologics.com	341 4900
Philip O'Leary	City Tuscaloosa	POLEARY@TUSCALOOSA.COM	205 248-5134
John Brook	City of Tuscaloosa	jbrook@tuscaloosa.com	205-248-5420
Rick Doersman	CFM Group	rick.doersman@cfm-grp.com	205 752 4031
Joe Robinson	Retired	jrobins1956@yahoo.com	205-752-9206
Katherine Holloway	Tuscaloosa County	Kholloway@tuscoal.com	205-345-6600

Tuscaloosa Floodplain Management Plan Meeting

November 18, 2015

Name	Jurisdiction/Organization	Email Address	Phone Number
[illegible]	[illegible]	[illegible]	[illegible]
Kevin Turner	City of Tuscaloosa	kturner@tuscaloosa.com	205-248-5388
Josh Yates	City of Tuscaloosa	JOYATES@TUSCALOOSA.com	205-248-5380
Deidre Stalnaker	City of Tuscaloosa	dstalnaker@tuscaloosa.com	205-248-5403

FMP Meeting
2015 City of Tuscaloosa Floodplain Management Plan
City of Tuscaloosa
2201 University Blvd.
Tuscaloosa, AL 35401

Tuesday, January 19, 2016
10:30 AM – 11:30 AM

I. Call to Order

II. Opening Remarks

III. Review Draft Sections

A. Remaining Sections of Chapter 5 Mitigation Strategy
B. App. G Alternative Mitigation Measures Exercise
C. Chapter 3 Planning Process
D. App. E Committee Meeting Documentation
E. App. F Community Involvement Documentation

IV. Next Steps:

A. Plan Adoption by City Council
B. Submittal to ISO for CRS Credits
C. Closeout with AEMA

V. Questions and Answers

VI. Other Business

VII. Adjourn

City of Tuscaloosa FMP Meeting
January 19th, 2016 10:30 - 11:30
Daugherty Room

Name	Organization	E-mail
Brianna Bayles	Realtor	brienna.bayles@gmail
Brock Corder	HBAT	bcorder@thebuildersgroup.info
JOE ROBINSON	RETIRED	jrobins1950@yahoo.com
ROB ROBERTSON	TC EMA	rrobertson@tusco.com
Tyler Dearman	TCEMA	tdearman@tusco.com
Philip Lowry	CITY TUSCALOOSA	PLOWRY@TUSCALOOSA.COM
Dave Stallworth	City	dstallworth@tuscaloosa.com
Anne Wynn	Geological Survey of AL	awynn@gsa.state.al.us
WILLIAM THOMAS	SCHOEL ENGINEERING	WTHOMAS@SCHOEL.COM
Jesse Leka	Leka Planning	jleka@lekaplanning.com
Josh Powell	City of Northport	jwebb@cityofnorthport.org
Josh Yates	City of Tuscaloosa	JDYATES@TUSCALOOSA.COM
Kevin Turner	City of Tuscaloosa	kturner@tuscaloosa.com

Appendix F
Community Involvement Documentation

App. F - Community Involvement Documentation

1.0 Documentation

This Appendix includes the following documentation of community involvement activities and opportunities:

- An image of the plan website at tuscaloosa.floodplainmanagementplan.com
- The media release for the November 2015 and March 2016 community meetings.
- A Twitter Feed image announcing the November 2015 community meeting.
- Sign in sheets documenting attendance at the community meetings.
- A community survey form.
- Public review comments form.
- Photos of the community meetings.

Figure F-1. Portion of Website at tuscaloosa.floodplainmanagementplan.com

Floodplain Management

Home Contact us

Photo courtesy of vhunt@el.com

City of Tuscaloosa 2015 Floodplain Management Plan

Goals of FMP

The City of Tuscaloosa is committed to creating and maintaining a flood-resistant community. The development of a Floodplain Management Plan (FMP) will help the City mitigate against the potential impacts of flooding. The Plan will provide an overall strategy, measures, and projects that aim to reduce the risk of flooding in the city. The following benefits are expected:

- Identification of existing and future flood-related hazards;
- Development of mitigation measures and activities related to flooding;
- Continuity with land use and comprehensive planning programs;
- Education for residents and property owners regarding flood loss reduction measures and natural function of floodplains;
- Increased understanding and support for activities and projects; and
- Participation in the Community Rating System (CRS).

Floodplain Management Planning Committee

The Floodplain Management Planning Committee (Planning Committee), in conjunction with the project partners, ensure that the FMP's goals and objectives are consistent with citywide programs and activities. The Planning Committee is comprised of experts from various departments addressing the following categories:

- Preventive measures;
- Property protection;
- Natural resource protection;
- Emergency services;
- Structural flood control projects; and
- Public information.

FMPC Meeting Schedule. The FMPC meets five (5) times throughout the development of the 2015 Plan, as announced here:

Kickoff Meeting: Thursday, May 14, 2015 at 10:30 am
City Hall - Daugherty Conference Room
2201 University Blvd.
Tuscaloosa, AL 35401

Community Rating System

The Community Rating System (CRS) encourages communities to create flood management plans and develop flood mitigation activities beyond that which is required by the National Flood Insurance Program (NFIP). Communities participating in the CRS receive reduced flood insurance premium rates and become eligible for other Federal assistance programs.

In order for a community to receive credit under the CRS, it must address the three goals and follow a 10-step planning process. Goals of the CRS:

1. Reduce flood damage to insurable property;
2. Strengthen and support the insurance aspects of the NFIP, and
3. Encourage a comprehensive approach to floodplain management.

Community Meetings

Public awareness and understanding of the FMP's purpose is critical to the success of the overall plan. During the planning process, project partners will conduct two public meetings. The public meeting schedule will be posted here:

Community Meeting #1: Thursday, November 3, 2015 at 5:00 pm in the Council Chambers at Tuscaloosa City Hall.

Click here for a survey to complete and drop off at the meeting.

Community Meeting #2: To be announced.

The 2015 Tuscaloosa Floodplain Management Plan

The plan elements listed below, with a hyperlink, are presented here for public review and comment, as they are completed. Please review the plan as it is drafted and send us your comments and suggestions.

Figure F-2. Media Release for November 2015 Community Meeting

For Immediate Release
October 12, 2015

Contact: Torrie Miers or Deidre Stalnaker, 205-248-5704, dstalnaker@tuscaloosa.com

City of Tuscaloosa to Hold Floodplain Management Plan Public Meeting

Tuscaloosa, Ala. – The City of Tuscaloosa's Floodplain Management Planning Committee will hold an informal public meeting on Tuesday, Nov. 3 at 5 p.m. in the Council Chambers to discuss the Floodplain Management Plan.

The goal of this meeting is to allow interested citizens, especially those subjected to flooding or living in the floodplain, to provide input on areas that are susceptible to widespread or localized flooding. Committee consultants will bring maps that will have flood prone areas identified and ask citizens to identify any issues or problem areas that have not been addressed. This input will be used in the development of the Floodplain Management Plan.

The Floodplain Management Planning Committee, which is made up of City of Tuscaloosa staff, local citizens and consultants, is tasked with developing a Floodplain Management Plan for the City of Tuscaloosa. This plan will identify existing and future flood-related hazards and their causes. The plan will also outline steps to educate residents and property owners about the hazards, loss reduction measures, and the natural and beneficial functions of floodplains.

Members of the Floodplain Management Planning Committee will be on hand to answer any questions and provide general information regarding the Floodplain Management Plan. For more information on the plan, visit tuscaloosa.floodplainmangementplan.com.

###

Stay up to date on all City of Tuscaloosa news via social media:
Twitter | @TuscaloosaCity
Facebook | City of Tuscaloosa – Government
Instagram | @TuscaloosaCity

Figure F-3. Twitter Feed Image Announcing the November 2015 Community Meeting

Figure F-4. Sign-in Sheets for November 2015 Community Meeting

Office of the City Engineer

Community Meeting Sign-In Sheet

City of Tuscaloosa Floodplain Management Plan

November 3, 2015

Name	City of Tuscaloosa Resident Y/N?	Address	E-mail
Josh Yates	Y	8831 Creekwood Lane, Cottondale, AL 35453	JDYATES@TUSCALOOSA.COM
Kevin Turner	N	15539 Cedar Ridge Dr Northport AL 35475	Kturner@tuscaloosa.com
ASHLEY CRITES	Y	2201 UNIV BL Tusc 35401	ACRITES@TUSC.COM
Deidre Stalnicker	Y	1714 St Charles Way Tusc, AL 35404	
Sonya McKinstry	Y	5520 20th Ave. East Tusc. Al. 35405	symckinstry@tuscaloosa.com
Chris James	Y	6511 Fenway Ln Cottondale Al. 35453	

Office of the City Engineer

Community Meeting Sign-In Sheet

City of Tuscaloosa Floodplain Management Plan

November 3, 2015

Name	City of Tuscaloosa Resident Y/N?	Address	E-mail
[illegible]	Y	[illegible]	[illegible]
WILLIAM THOMAS	N	301 EDGEWOOD BLVD BIRMINGHAM, AL 35209	WTHOMAS@SCHEELCO

Figure F-5. Community Survey Form

Office of the City Engineer

Community Survey

City of Tuscaloosa Floodplain Management Plan

1. How great of a threat is flooding to people and properties within the City of Tuscaloosa?
   - o Not a threat
   - o Slight threat
   - o Moderate threat
   - o Serious threat

2. How concerned are you with flooding within the City of Tuscaloosa?
   - o Not at all concerned
   - o Slightly concerned
   - o Moderately concerned
   - o Very concerned

3. What specific concerns about flooding, if any, do you have?

_____

_____

_____

_____

(You may add additional comments on the reverse side).

4. Do you have any recommended actions the City might consider to reduce the risks of flooding?

_____

_____

_____

_____

(You may add additional comments on the reverse side).

Be sure to keep abreast of the City's progress in developing its plan and offer your ideas and suggestions through our website at:
http://tuscaloosa.floodplainmanagementplan.com

Thank you for your participation in the planning process.

Figure F-6. Photos of the November 2015 Community Meeting

Figure F-7. Media Release for March 2016 Community Meeting

For Immediate Release
Feb. 26, 2016

Contact: Torrie Miers or Deidre Stalnaker, 205-248-5704, dstalnaker@tuscaloosa.com

City of Tuscaloosa to Hold Floodplain Management Plan Public Meeting, Address Personal Risks

Tuscaloosa, Ala. – The City of Tuscaloosa's floodplain management planning committee will hold an informal public meeting on Tuesday, March 1 at 5 p.m. in the City Hall Council Chambers to discuss the floodplain management plan.

The goal of this meeting is to allow interested citizens, especially those subjected to flooding or living in the floodplain, to provide feedback on the floodplain management plan. Copies of the plan will be available for review and public comments will be accepted.

"It's easy to immediately think of tornadoes and severe storms as weather-related dangers, but flooding is also a serious risk to personal safety and property damage," said Josh Yates, the City's storm drainage engineer and chair of the floodplain management planning committee. "It's crucial for citizens to voice opinions and concerns about the floodplain management plan to ensure we are taking the necessary steps to keep their families and homes safe."

The floodplain management planning committee, made up of City of Tuscaloosa staff, local citizens and consultants, is tasked with developing a floodplain management plan for the City of Tuscaloosa. This plan will identify existing and future flood-related hazards and their causes. The plan will also outline steps to educate residents and property owners about the hazards, flood loss reduction measures, and the natural and beneficial functions of floodplains.

Members of the floodplain management planning committee will be available to answer any questions and provide general information regarding the floodplain management plan. For more information on the plan and to view the plan, visit tuscaloosa.floodplainmanagementplan.com.

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Stay up to date on all City of Tuscaloosa news via social media:
Twitter | @TuscaloosaCity
Facebook | City of Tuscaloosa – Government
Instagram | @TuscaloosaCity

Figure F-8. Twitter Feed Image Announcing the March 2016 Community Meeting

Figure F-9. Sign-in Sheets for March 2016 Community Meeting

Office of the City Engineer

Community Meeting Sign-in Sheet

City of Tuscaloosa Floodplain Management Plan

March 1, 2016

Name	City of Tuscaloosa Resident Y/N	Address	Email
Brock Corder	Y	608 The Townes 35406	bcorder@thebuildersgroup.info
Mary W. Pitts	Y	2901 Glendale Gdns	mwpitts@ua.edu
Abner F. Patton	Y	400 Vantage Point	apatton@pattongeologics.com
Deidre Stalnaker	Y	1714 St Charles Way	dstalnaker@tuscaloosa.com
Kevin Turner	N	15539 Cedar Ridge Dr. Northport	kturner@tuscaloosa.com
Josh Yates	Y	8631 Creekwood Lane Cottondale	JDYATES@TUSCALOOSA.COM

Figure F-10. Public Review Comments Form

Office of the City Engineer

Public Review Comments
City of Tuscaloosa Floodplain Management Plan
Community Meeting
March 1, 2016

Name:_____Date:_____

Address:_____

Please review the plan document and offer your comments in the space provided below. All comments will be forwarded to members of the City of Tuscaloosa Floodplain Management Planning Committee.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(You may add additional comments on the reverse side).

Thank you for your participation in the planning process.

Appendix G
Alternative Mitigation Measures Exercise

Alternative Mitigation Measures Exercise
2015 Tuscaloosa Floodplain Management Plan

Summary of Results from Five Responses

- If no respondents suggested the measure should be eliminated from further consideration, it is not highlighted.
- If only one respondent suggested the measure should be eliminated from further consideration, it is highlighted in yellow.
- If two respondents suggested the measure should be eliminated from further consideration, it is highlighted in pink.
- If three or more respondents suggested the measure should be eliminated from further consideration, it is highlighted in red.
- *Respondent comments are noted in italics and underlined.*

Instructions. The purpose of this exercise is to narrow down the mitigation measures to be considered for the City's Five Year Action Plan component of the 2015 Floodplain Management Plan. Take into consideration the City's capabilities to carry out flood hazard mitigation measures (see appendix D) and the STAPLEE approach (Social, Technical, Administrative, Political, Legal, Economic, and Environmental considerations discussed in chapter 5). Given these considerations, please review the alternative mitigation measures described in this exercise. These measures have been grouped according to six categories that match the plan's goals.

Please eliminate those measures that are not appropriate and should not be further considered for the Five-Year Action Plan, by marking through them. At this step in the planning process, we are paring down the alternatives. The final selection of measures to be included in the Action Plan will be the next step. These activities have been identified in the CRS Coordinator's Manual, but the Action Plan can also consider activities that are not creditable under the CRS Program. Provide any comments or other suggested activities you might have in the space provided at the end of this exercise.

1. **Preventive activities** keep flood problems from getting worse through planning, permitting, and regulatory tools.

Activity 310 Elevation Certificates

- Maintain FEMA elevation certificates for all existing buildings in the floodplain, including all "post-FIRM" buildings constructed since the City entered the NFIP in 1973 and pre-FIRM buildings prior to 1973.
- Maintain FEMA elevation certificates for all "pre-FIRM" (prior to 1973) buildings constructed in the floodplain.

Comment: Continue to maintain elevation certificates on all new construction.

Activity 410 Floodplain Mapping

- Develop new flood elevations, floodway delineations, and other regulatory flood hazard data for areas not mapped in detail by the most recent NFIP Flood Insurance Study (FIS).
- Develop studies and maps that apply higher standards than the FEMA criteria.
- Establish a higher floodway standard.

Comment: Continue to update inaccurate/outdated flood mapping.

Activity 430 Higher Regulatory Standards

- Require additional freeboard than one foot for minimum building elevation and flood proofing
- Prohibit flood proofing and require flood protection by elevation only.
- Prohibit fill in the floodway.
- Prohibit septic tanks in the flood plain.
- Require foundations to be designed by a licensed engineer.

Comment: In floodplain?

- Lower the threshold for substantial improvements to less than 50% of the building value requires full compliance with floodplain management ordinance.
- Require that improvements, modifications, and additions to existing buildings are counted cumulatively for at least 10 years.
- Protect critical facilities (police, fire, public utilities, schools, medical, etc.) to the 500 year flood elevation.
- Require compensatory storage for fill.
- Prohibit outdoor storage of materials in the floodplain.
- Require elevation of hazardous materials storage indoors.
- Maintain Certified Floodplain Managers (CFM) on staff for ordinance administration.

Activity 440 Flood Data Maintenance

- Maintain elevation reference marks.

Comment: Possibly.

Activity 450 Stormwater Management

- Increase stormwater management standards (design storm and size of development) for the regulation of new development to ensure that post-development peak runoff is no worse than pre-development conditions.

Comment: Current requirement.

- Enact regulations to require the implementation of low impact development (LID) techniques to minimize the need for more traditional stormwater management controls (pipes, channels, and detention).

- Regulate new construction to protect or improve water quality.

2. **Property protection** activities are measures taken to permanently protect property from flood damage on a building-by-building basis.

Activity 520 Acquisition and Relocation

- Acquire and demolish flood-prone buildings and maintain the property as permanent open space
- Relocate flood-prone buildings so that they are out of the floodplain.

Comment: Encourage.

Activity 530 Flood Protection

- Retrofit existing non-residential flood-prone buildings by flood proofing.
- Protect existing flood-prone buildings by elevation above flood levels.

Activity 370 Flood Insurance Promotion

- Perform a flood insurance coverage assessment of the City's current level of coverage and identify shortcomings.
- Prepare and implement a coverage improvement plan under the direction of a committee of local lenders and insurance agents.

3. **Public information** activities advise people about the flood hazard, encourage the purchase of flood insurance, and provide information about ways to reduce flood damage. These activities also generate data needed by insurance agents for accurate flood insurance rating. They generally serve all members of the community.

Activity 320 Map Information Service

- Provide Flood Insurance Rate Map (FIRM) information to people who inquire, and publicize this service.

Comment: Continue to provide.

Activity 330 Outreach Projects

- Send information about the flood hazard, flood insurance, flood protection measures, and/or the natural and beneficial functions of floodplains to residents.

Activity 340 Hazard Disclosure

- Encourage real estate agents to advise potential purchasers of flood-prone property about the flood hazard.

Activity 350 Flood Protection Information

- Maintain publications and reference materials at public libraries.

- Create a community's website to disseminate flood protection information to the public.

Activity 360 Flood Protection Assistance

- Give inquiring property owners technical advice on how to protect their buildings from flooding, and publicize this service.

4. **Natural resource protection** activities preserve or restore natural areas or the natural functions of floodplain and watershed areas. They are implemented by a variety of agencies, primarily parks, recreation, or conservation agencies or organizations.

Activity 420 Open Space Preservation

- Preserve City-owned floodplain lands as permanent open space, kept free from development through deed restrictions.
- To the extent possible, maintain or restore City-owned flood plains to their natural condition.
- Provide zoning and subdivision incentives for to set aside flood plains as permanent open space in new developments. Consider provisions for clustering and conservation subdivisions.
- Restrict subdivision of flood plain lands to 5 or more acres.

5. **Structural projects** provided flood damage protection through activities designed to maintain drainage systems, retrofitting existing building to prevent flood damage, and structural flood control and drainage projects.

Activity 540 Drainage System Maintenance

- Conduct regular inspections and maintenance of all channels and conveyance facilities and remove debris as needed.
- Regularly inspect all detention and retention facilities constructed pursuant to the City's stormwater management regulations and all city-owned facilities to ensure proper functioning.

  Comment: The City should maintain and charge residents on their water bill.

- Maintain a comprehensive GIS inventory of the conveyance system and storage basins. .
- Establish an annual capital improvements programming process for drainage system improvements.
- Enact and publicize no stream dumping regulations.

Activity 530 Flood Protection

- Continue to perform engineering studies that evaluate the feasibility of structural flood controls.
- Protect existing floodplain development by structural projects, where deemed feasible.

6. **Emergency services** measures protect life and property during a flood, through flood warning and response programs during an emergency to minimize its impact. These measures are usually the responsibility of local emergency management staff and the owners or operators of critical facilities.

Activity 610 Flood Warning and Response

- Establish an automated flood threat recognition and forecasting system to identify impending floods.
- Establish methods for early flood warnings to the public.

Comment: Is this possible/realistic?

- Develop a detailed flood response operations plan keyed to flood forecasts for City Council adoption.

Comment: Work w/FRS.

- Coordinate flood warning and response activities with critical facilities operators.

Comments: These items (all of activity 610 measures) appear achievable but are dependent upon: (a) cost involved for monitoring of reporting system and (b) how elaborate are the requirements for each. Need to seek help from N.W.C.

Comments and Other Suggested Measures to be Considered:

Appendix H
Adopting Resolution

APPROVED AS TO FORM
GDW
Office of the City Attorney

Prepared By: GDW/fb
Requested: Projects Committee
Presentation on: 4-12-16
Suspension of Rules: No

RESOLUTION

RESOLUTION TO ADOPT THE 2015 CITY OF TUSCALOOSA FLOODPLAIN MANAGEMENT PLAN (A16-0404)

WHEREAS, the National Flood Insurance Program (NFIP) makes federally-supported flood insurance available for purchase to property owners and renters in communities that maintain minimum regulatory requirements for development in regulatory flood zones; and,

WHEREAS, the Community Rating System (CRS) reduces flood insurance premiums 5% for each improvement in CRS Class - from Class 9 through Class 1 - for NFIP policy holders in those CRS communities that do more than implement the minimum NFIP regulatory requirements; and,

WHEREAS, the City of Tuscaloosa desires to participate in the CRS Program and, in so doing, provide NFIP insurance premium reductions to policy holders; and,

WHEREAS, the Federal Emergency Management Agency (FEMA) awarded a planning grant funded through the FEMA Flood Mitigation Assistance (FMA) grant program to the City of Tuscaloosa to partially fund the preparation of the 2015 City of Tuscaloosa Floodplain Management Plan (Plan); and,

WHEREAS, the City of Tuscaloosa Floodplain Management Planning Committee directed the completion of the Plan, which assesses the risks of flooding and guides the City's ongoing flood hazard mitigation activities and participation in the NFIP and CRS; and,

WHEREAS, the Floodplain Management Planning Committee recommends that the Plan be adopted by the City Council; and

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF TUSCALOOSA, that the 2015 City of Tuscaloosa Floodplain Management Plan is hereby adopted and immediately made effective.

BE IT FURTHER RESOLVED that a copy of this resolution shall be maintained in the Office of the Clerk of the City of Tuscaloosa.

(C/M-y) T-absent
adopted 4.12.16
Debby K. Clement
acting City Clerk 20