City of Darlington, Wisconsin

Multi-Hazard Mitigation Plan

Adopted: July 1, 2014

VANDEWALLE & ASSOCIATES INC.
Shaping places, shaping change

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What is Hazard Mitigation Planning?

It is safe to say that "hazard mitigation" is not a term used by most people as they go about their lives. Still, hazard mitigation could be critical to people's basic health, safety, and welfare.

Simply put, hazard mitigation is defined as any action taken to reduce the chance of a natural hazard from happening, or to reduce a natural hazard's impact on people or property when it does happen. The City of Darlington can be affected by any number of natural and human-made hazards. These include major storms, flooding, extreme temperatures, and disease outbreaks.

Hazard mitigation planning helps communities to develop consensus around actions to reduce or eliminate the long-term risk to human life, health, safety, and property from hazards. **This Multi-Hazard Mitigation Plan is a collection of the various actions that the City of Darlington may take to mitigate hazards.** The actions fall into various categories and priority levels, cover different geographic areas, and address different types of hazards. The organization, contents, and data in the Plan are driven in part by the planning requirements of the Federal Emergency Management Agency (FEMA).

Accomplishments

Since embarking on hazard mitigation planning in 1994, the City of Darlington has implemented numerous recommendations. Recent accomplishments include:

- Acquired numerous repetitive loss structures—buildings that had reoccurring damage due to flooding.
- Relocated or floodproofed dozens of buildings.
- Built 150 Flood Shields to protect downtown buildings.
- Secured over $10 million in funding for planning and mitigation projects.
- Implemented a Flood Notification Plan to address impacted streets, businesses, and community facilities as flood waters rise.

City of Darlington's Planning Process

The City of Darlington embarked on hazard mitigation planning in 1994, with the completion of the State's first approved Flood Mitigation Plan (updated in 2000). In 2004, the City of Darlington completed an All-Hazard Mitigation Plan and updated it in 2009 (approved by FEMA in January 2010). The City also completed a Comprehensive Plan in 2004. The 2013 planning process was used to update the existing Plan to maintain compliance with the Disaster Mitigation Act of 2000 and to ensure the City remains eligible for grant funding for mitigation projects through FEMA. The Plan was updated in advance of its 5-year deadline due to the availability of federal grants to fund the project.

The City's Plan Commission, serving as the Hazard Mitigation Planning Committee, guided the development of this Plan. The Commission, its staff, and consultants also pursued public, government, and other stakeholder and expert input throughout the planning process. This included reaching out to local governments, state and federal agencies, property and business owners, and the general public. Chapter 1: Planning Process, of the Multi-Hazard Mitigation Plan further describes the public process.

Hazard Identification and Risk Assessment

Chapter 2: Planning Context of the Multi-Hazard Mitigation Plan begins by painting a picture of how natural and other hazards have affected the City. Key information is given regarding the City's geography, geology, climate, demographics, housing, employment, political jurisdictions, infrastructure, and emergency services. For instance, the City has one bridge across the Pecatonica River that averages several closings a year. This has a profound impact on the historic downtown businesses as well as the movement of goods, people, emergency services, and other community related services.

Based on historical research and reports from residents and agencies, the hazards that people and property are at risk of in the City of Darlington generally include:

- **Flooding**, particularly resulting from seasonal and sometimes unpredictable overflow of the Pecatonica River and its tributaries causing access issues when the only bridge within the City is closed due to flooding.
- **Severe storms**, including hail, lightning, tornadoes, and severe winds.
- **Severe winter storms**, including snow storms, ice storms, and blizzards.
- **Extreme temperatures**, including periods of extreme heat and extreme cold associated with City of Darlington's position in the nation's interior.
- **Drought**, which can significantly affect the City's strong farm economy and peoples' water supply.
- **Earthquakes**, which can sometimes affect the City.
- **Human-caused and disease-outbreak hazards**, like animal-borne diseases and possibly spill-over from incidents in nearby areas. Other human-caused hazards, such as poor access or limited preparedness in areas vulnerable to natural hazards, are addressed at length in the Plan.

Chapter 3: Hazard Identification and Risk Assessment includes a "risk assessment" for each of these identified hazards. This assessment helps determine how severe each hazard is, and how important hazard mitigation actions would be to address it. The risk assessment includes a history of hazard occurrences, a projection of the future probability of occurrences of each hazard, an assessment of the City's vulnerability to each hazard (e.g., how many people would be affected), and a projection of potential damages from future occurrences of each hazard.

Hazard Mitigation Goals

The City of Darlington reviewed the goals and strategies from the 2010 plan, to develop the goals based on the current views and situations impacting the City:

- **Prevent future loss of life and property**
- **Properly plan future land use and transportation systems to minimize hazards**
- **Care for public and environmental health**
- **Protect sensitive populations (elderly, children, low income families, tourists)**
- **Prevent future risks of hazards in highly vulnerable areas**
- **Help people protect themselves**
- **Promote the use of partnerships in hazard mitigation**

These goals were used to prioritize hazard mitigation actions and strategies to address each hazard. Other factors were also critical in identifying and prioritizing strategies. These included community support, whether the strategy was technically feasibility, where it would be cost-effective, and what groups would be available to carry it out. Chapter 4: Mitigation Goals and Strategies, further describes the goal-setting process and then outlines all proposed hazard mitigation strategies.

The rest of this summary covers some of the highest priority mitigation strategies that are identified in this Plan. Readers are encouraged to review the entire Plan for a more complete review of these and other strategies.

Priority Mitigation Strategies for Multiple Hazards

In the course of preparing the Plan, it became apparent that certain strategies could be carried out following Plan adoption to address nearly all of the hazards that affect the City. These strategies include:

- **Pursue Regular Community Outreach and Education**. Educational efforts will focus on encouraging simple changes in behavior that can minimize risks. Education needs to be constantly reinforced to be effective. City government can provide information about the effect of disasters, methods for preventing damages, seasonal updates on hazard warning systems, and the actions to take when disasters threaten.
- **Improve Coordination and Communication Among Emergency Responders and Regional Groups.** Disasters cross jurisdictional boundaries and affect numerous aspects of a community—from physical safety, to economic stability, to environmental conditions. The City intends to continue to work to improve

communication and coordination among the various emergency responders at all levels of government through various approaches. The City will particularly seek collaboration with the County in emergency response and funding.

- **Engage in Annual Tabletop Exercises to Review Hazard Protocols.** Tabletop exercises provide a low cost/low stress activity designed to simulate various emergency situations to key appointed/elected officials that play a role in emergency management situations. As part of the annual exercises, the City should review the Flood Notification Plan and associated hazard mitigation planning documents to ensure their relevance. These exercises should include all City responders as well as County partners.
- **Maintain and Augment Hazard Warning Systems**. The City will continue to maintain its hazard warning system, while also providing seasonal reminders to residents on how to interpret the hazard warning system (sirens). The City intends to explore other mechanisms to warn residents of impending hazards, potentially through the use of automatic e-mails, voice or text messages via phones, and/or an updated Web page. The City will encourage all institutions, businesses, and residents to have National Oceanic and Atmospheric Administration (NOAA) weather radios for up to date warnings and directions on pending hazards. The City will continue to explore the feasibility of incorporating a reverse 911 system.
- **Provide Adequate Emergency and Power Sources**. City emergency responders must be prepared to operate during natural hazards. The City will explore providing backup power and communication services for the City Emergency Operations Center (the Municipal Building). The City may also coordinate with the County in possibly seeking a joint grant for upgrading each Emergency Operations Center, which are positioned across the street from each other.
- **Improve Planning and Regulatory Practices**. As a first priority, the city's zoning and subdivision ordinances should be updated to advance hazard mitigation goals. Additionally, park, comprehensive, flood notification, emergency operations and hazard mitigation plans should be integrated and updated as appropriate.

Flood Hazard Mitigation: Build on Past Success

The Pecatonica River in the City of Darlington exceeds its banks during spring thaws and periods of very heavy rain on a fairly regular basis. In the City this leads to road and bridge closures, structural damage, economic disruptions, and threats to human lives and the environment. In 2008 alone, the only bridge in Darlington was temporarily closed on three occasions. Over the past two decades the City of Darlington has placed much effort toward reducing the impact of flood hazards, but flood hazards remain the largest threat to the City. The highest priority strategies for mitigating future flooding in the City include the following:

- **Pursue Regular Community Outreach and Education**, including information on floodplain regulations, floodproofing, distribution of flood shields, residents in the floodplain, and flood insurance. Outreach will include procedures for homeowners, residents, and tourists during flood events but will focus particularly on the coordination of emergency providers.
- **Creatively Enhance Stormwater Management and Erosion Control**, such as through removing obstructions along waterways, improving storm drainage and possibly incorporating shut off valve technology, directing development away from surface water and wetlands, and inspecting waterways to minimize the effect of flooding on private property and business activities. Updated subdivision regulations would better ensure water quality and quantity issues through steep slope protection, vegetative buffers, and enhanced stormwater storage—both within the City and within its one and a half mile extraterritorial jurisdiction.
- **Continue Removal of Structures from Floodplain, Focusing on Repetitive Loss Structures**. The City has initiated conversations with these landowners and intends to continue pursuing the acquisition of these properties.
- **Protect Critical Facilities and Infrastructure**, such as the Post Office, the Main Street bridge, and downtown businesses. It is critical to both ensure that these facilities are not themselves flooded, and that they remain accessible to serve the population in the event a natural hazard takes place.

- **Continue to Document, Analyze, and Learn from Flood Events,** including a review of flood depths, flood extent, road closures, location of debris, and temporal data to help maintain a comprehensive database of past flood events to help guide future decisions.
- **Promote Creation of Pecatonica River Watershed Alliance,** a bi-state alliance comprised of individuals representing local governments, hazard mitigation, economic development, recreation, and environmental interests. Given Darlington's past success in mitigation funding for flooding and its position in the watershed, the City could take a key role in organizing such a regional mitigation strategy. In the recently approved hazard mitigation plan in Stephenson County, Illinois (just below the state line), a regional flood mitigation strategy focusing on the Pecatonica River was included as a high priority mitigation strategy.

Severe Storms Mitigation: Protect Vulnerable Populations and Increase Preparedness

The City of Darlington has experienced harsh weather in the form of thunderstorms, straight line winds, tornadoes, and winter storms, though few have been severe. The City will be prepared to accommodate local residents, surrounding rural residents, and visitors in case of a large scale storm by ensuring reliable and multiple evacuation routes to shelters and saferooms. The City intends to pay special attention to vulnerable populations, which include the elderly, campers, attendees at the county fairgrounds, and young children. The comprehensive initiative recommended for severe storm mitigation includes the following strategies:

- **Pursue Regular Community Outreach and Education**, particularly towards operators of vulnerable properties such as the campground and fairgrounds; vulnerable populations such as the elderly and tourists; and during the most vulnerable times of the year, mainly summer.
- **Develop Reliable Evacuation Routes from Key Places of Assembly**, such as the campground and the fairgrounds. Evacuation routes should be connected with identified saferooms, and on-site shelters will be considered or promoted.
- **Promote Active Tree Management,** to reduce the potential for trees falling on or breaking power lines, damaging building, and obstructing waterways. Focus should be placed along the river corridor to minimize flooding especially with obstructions accumulating at the Main Street bridge or river bends.

Implementing the Plan: An Ongoing Program

The City has had proven success in plan implementation as evidenced in the millions of grant dollars allocated towards meaningful flood hazard mitigation over the past 15 or so years. The City has been referred to as a model community by FEMA and WEM in terms of the hazard mitigation planning and implementation. This updated Plan is intended to further advance community-supported mitigation strategies over the next five years. Additional work, analysis, and participation will be necessary before many of these strategies can be carried out through action. Chapter 5: Plan Adoption and Implementation details the City's implementation approach.

Also, the City and other stakeholders will need technical support to implement many of the local mitigation strategies. The City of Darlington Plan Commission will prioritize the City's mitigation efforts by focusing assistance on areas most vulnerable to the most significant hazards, and where there is visible and consistent community support for hazard mitigation. Focusing cooperation between the City and County will further enhance the City's emergency response.

Finally, many of the strategies recommended in this Multi-Hazard Mitigation Plan can occur only if outside financial support through FEMA and other sources is garnered. The Plan has been written to position the City for continued support, with full recognition and respect for the funding criteria of these agencies. The City will pursue funding for priority strategies identified in the Plan as opportunities present themselves.

This has been merely a summary of the City of Darlington Multi-Hazard Mitigation Plan. Interested persons are encouraged to review the entire Plan document—or focus on key sections of interest—for more information.

Chapter 1: Planning Process

Chapter 1 of the City of Darlington Multi-Hazard Mitigation Plan documents the process followed to develop the Plan, including how it was prepared and who was involved in the planning process.

PLAN DEVELOPMENT

The City of Darlington adopted its most recent hazard mitigation plan in September 2010. In order for the City to remain eligible for mitigation project grant funding through the Federal Emergency Management Agency (FEMA), it is required that the plan be updated every five years. In 2013, the City of Darlington initiated the development of its plan update after receiving a hazard mitigation planning grant from the Wisconsin Emergency Management office (WEM). With the successful completion of several flood mitigation plans and comprehensive plans in the recent past, the City was poised to efficiently and effectively identify and mitigate local hazards.

The City chose to hire Vandewalle & Associates to assist City staff in the development of this Plan. (Together, Vandewalle & Associates and City of Darlington staff are referred to as the "project team" throughout this document.) Work on the Plan began in March 2013, and the Plan was submitted to the WEM for review and approval on October 29, 2013. A Final Plan was approved by the City of Darlington on July 1, 2014.

Benefits of Hazard Mitigation Planning

Hazard mitigation planning serves as a very useful tool in that it allows a community to develop consensus around a plan of action to reduce or eliminate risk to human life and property from hazards. Specifically, the development of this Plan is intended to:

- Increase public awareness of risks of hazards in the City
- Establish hazard mitigation goals and priority mitigation strategies
- Establish priorities for the use of public resources to mitigate hazards
- Identify strategic partners to help implement the mitigation strategies
- Enable the City to remain eligible for grants from FEMA for both pre-disaster and post-disaster mitigation projects, and assist the City in positioning itself for other related grants

Additionally, implementation of this Plan will:

- Reduce the cost of recovering from natural hazards by decreasing damage
- Prevent injury and death to people exposed to hazards
- Speed emergency response to, and recovery from, disasters

Disaster Mitigation Act of 2000

The development of the City of Darlington Multi-Hazard Mitigation Plan is a response to the passage of the Disaster Mitigation Act of 2000 (DMA), which was signed into law on October 30, 2000, with the goal of reducing losses and future public and private expenditures, and improving response and recovery from disasters. This act, Public Law 106-390, amended the Robert T. Stafford Relief and Emergency Assistance Act.

The DMA establishes that by November 1, 2004, local governments and tribal organizations must prepare a multi-hazard mitigation plan in order to be eligible for funding from the FEMA Pre-Disaster Mitigation Assistance Program and Hazard Mitigation Program. If a plan was not prepared by November 1, 2004, and a major disaster is declared, a local government or tribal organization must agree to prepare a multi-hazard mitigation plan within one year to be eligible for funding from the Hazard Mitigation Grant Program. The City adopted its initial Plan in compliance with that Act in 2004 and completed its first required update in 2010.

The DMA requires that natural hazards, such as flooding or severe weather, be addressed in the risk assessment and vulnerability analysis sections of the multi-hazard mitigation plan. Assessment of human caused hazards, such as hazardous waste spills, is encouraged but not required.

Hazard Mitigation Projects and Eligibility

In order to better support the overall goal of reducing loss of life and property due to natural hazards, FEMA unified the following pre-disaster Hazard Mitigation Assistance (HMA) programs:

- Flood Mitigation Assistance (FMA) – Program to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other structures insured under the National Flood Insurance Program (NFIP).
- Repetitive Flood Claims (RFC) – Program to reduce or eliminate the long-term risk of flood damage to structures insured on the NFIP that have had one or more claim payments for flood damages. Priority is given to projects that create the greatest savings to the NFIP based on a benefit-cost ratio.
- Pre-Disaster Mitigation (PDM) – Program to fund hazard mitigation planning and the implementation of mitigation projects pre-disaster.
- Severe Repetitive Loss (SRL) – Program to reduce or eliminate the long-term risk of flood damage to severe repetitive loss residential structures insured under the NFIP. [1]

The Hazard Mitigation Assistance (HMA) programs provide mitigation grants annually on a competitive basis to state, territory, tribal, and local entities. The unified approach is intended to enhance the quality and efficiency of grant awards. One benefit under the new approach is that eligible applications not funded under a specific grant program can also be considered for other HMA programs. The following figure summarizes the HMA Eligible Projects.

Figure 1.1 Hazard Mitigation Assistance Programs Eligible Projects

Mitigation Project	PDM	FMA	RFC	SRL
PROPERTY ACQUISITION AND DEMOLITION OR RELOCATION ACTIVITIES				
Property Acquisition and Demolition or Relocation	X	X	X	X
Construction Activities				
Property Elevation	X	X	X	X
Mitigation Reconstruction				X
Localized Minor Flood Reduction Projects	X	X	X	X
Dry Floodproofing of Residential Properties		X		X
Dry Floodproofing of Non-Residential Structures		X	X	
Stormwater Management	X	X		
Infrastructure Protection Measures	X			
Vegetative Management/Soil Stabilization	X			
Retrofitting Existing Buildings and Facilities	X			
Safe Room Construction	X			
Non-Construction Activities				
All Hazard/Flood Mitigation Planning	X	X		

Table Adapted from: FEMA, 2008. Unified HMA Guidance. www.fema.gov/library/viewRecord.do?id=3309

[1] FEMA, 2008. Unified HMA Guidance. www.fema.gov/library/viewRecord.do?id=3309

PLANNING PROCESS

Process Overview

The first step in the planning process was to organize the resources available through local, state, and federal organizations, and to organize a Hazard Mitigation Planning Committee to bring together people in the City with interest and/or expertise in disaster response, disaster history, and hazard mitigation. The City's Plan Commission was designated as the Hazard Mitigation Planning Committee.

The local outreach effort included representatives of neighboring municipalities as well as local residents and other stakeholders to collect a thorough understanding of hazard vulnerability and history of disasters in the community. After the hazards were identified, the project team determined the potential damage and impact of each hazard.

Armed with an understanding of the risks posed by natural hazards and knowledge of vulnerable areas as identified by local residents, business owners, or the City of Darlington Plan Commission, the project team identified possible ways to avoid or minimize the damage to these areas through new as well as existing planning, education, and regulatory measures.

The project team then identified ways that the City could bring the Hazard Mitigation Plan to life. To ensure the Plan is successfully implemented, a process for future reviews and updates, and ways to measure the community's progress in decreasing damage caused by hazards, are identified in this Plan.

Hazard Mitigation Planning Committee

The Plan was prepared under the guidance of the City Plan Commission, serving as the City's Hazard Mitigation Planning Committee for purposes of this process. Mayor Breunig initiated the plan update. The Committee held three meetings during major junctures of the planning process at which public input was sought. The Committee assisted in identifying areas and populations vulnerable to hazards, setting mitigation goals, evaluating mitigation strategies, and developing the implementation approach. The Committee also reviewed and approved a Draft Plan prior to submittal to WEM.

Review of 2010 Hazard Mitigation Plan

A complete review of the City's 2010 plan was conducted to attain locally important and relevant data to be incorporated into this Plan updated. The Plan Commission was asked to review the locations of vulnerable populations, critical facilities, gathering places, and other hazardous material locations to refine the risk assessment and vulnerability map in this new Plan.

Most public/Commission time spent reviewing the 2010 plan was focused on existing goals, objectives, and strategies. On March 12, 2013, members of the Plan Commission and the project team completed an assessment of all the strategies from the 2010 plan. For each strategy the Plan Commission members identified whether the strategy was completed, ongoing, effective, or in need of revisions. This exercise provided the project team with useful background information in prioritizing strategies with the Plan Commission.

Also on March 10, the Plan Commission reviewed the list of goals from the 2010 Plan and determined they were still relevant. In addition, the Plan Commission suggested that protecting public infrastructure should also be a goal.

GOVERNMENT, PUBLIC, AND STAKEHOLDER INVOLVEMENT

Involvement of the Public and Key Stakeholders

Agency and Stakeholders Meeting

The project team extended an invitation for a meeting on March 12, 2013, to representatives of the Wisconsin Emergency Management (WEM), local Police and Fire Departments, Wisconsin State Assembly, UW Extension Lafayette County, Wisconsin State Patrol, Southwest Wisconsin Regional Planning Commission, emergency management personnel from neighboring counties in Wisconsin and Illinois, City Departments, and Lafayette County Departments. The purpose of this meeting was to discuss the goals of the City of Darlington Multi-Hazard Mitigation Plan, to discuss issues of hazard vulnerability in the region, and to discuss opportunities for cross-jurisdictional and intergovernmental mitigation efforts.

Meeting attendees included:

- Sgt. Luke Yahn, Wisconsin State Patrol
- Tom Lange, Jo Daviess County Illinois Emergency Management
- Farah Adams, Lafayette County Health Department
- Mayor Dave Breunig, City of Darlington
- Bev Anderson, City of Darlington Plan Commission
- Phil Risseeuw, City of Darlington Clerk-Treasurer
- Jeremy Williams, City of Darlington Director of Public Works
- Doug Lindstrom, City of Darlington Weed Commissioner
- Jason Jean and Ted McDermott, City of Darlington Fire Department

Project Kick-off - Plan Commission Meeting #1

The project team organized the first Plan Commission meeting associated with this process on March 12, 2013 (following the agency and stakeholders meeting) to provide the Commission with information about the purpose and benefits of this Plan and an overview of the planning process. Additionally, Commissioners and staff provided information on historical occurrences of disasters and areas of disaster vulnerability, ideas for goals for the Hazard Mitigation Plan, and initial thoughts on strategies that they wanted to be evaluated as part of the planning process.

Draft Mitigation Plan - Plan Commission Meeting #2 and #3

On May 22, 2013 and October 8, 2013, the Plan Commission conducted public meetings to review and comment on the draft of this Hazard Mitigation Plan.

Involvement of Adjacent Jurisdictions and Government Agencies

The Agency and Stakeholders Meeting was held on March 12, 2013, as described above. In May 2013, the draft Multi-Hazard Mitigation Plan was e-mailed to this same group and other stakeholders, seeking their input prior to the Plan undergoing the adoption process. The project team incorporated their comments as appropriate.

Public Review Process

Opportunities for public comment and Plan review were provided during the drafting stages and prior to adoption. The project team presented the Draft Plan to the Hazard Mitigation Planning Committee/Plan Commission on May 22, 2013. WEM received a copy of the Draft Plan October 29, 2013, and then completed its review of the Draft Plan. The City of Darlington adopted the Final Plan on July 1, 2014, and it was sent to FEMA for final approval.

INCORPORATED PLANS, STUDIES, REPORTS, AND TECHNICAL DATA

The following is a list of some of the primary references and data sources used for preparation of this Plan. Many other sources were used and are cited throughout the Plan.

- Flood Insurance Study - City of Darlington, Wisconsin (March, 1978)
- Lafayette County Hazard Analysis Report (December, 1983)
- Community Master Plan Update (May, 1992)
- Flood Hazard Mitigation Plan (1994)
- Flood Hazard Mitigation Plan (June, 2000 revision)
- FEMA Flood Insurance Study (FIRM) (November, 2003)
- City of Darlington Hazard Mitigation Plan (2010)
- City of Darlington Comprehensive Plan (2005)
- City Emergency Operations Plan (2013)
- City zoning and subdivision regulations
- National Oceanic and Atmospheric Administration (NOAA) National Database of U.S. Storm Events

Chapter 2: Planning Context

Chapter 2 of the City of Darlington Multi-Hazard Mitigation Plan provides geographic, demographic, and political context for the City. The information provided in this chapter provides a context for hazard mitigation strategies.

PHYSICAL GEOGRAPHY

The City of Darlington is located in south central Wisconsin and covers 880 acres. The City of Darlington is the county seat of Lafayette County, which is bordered on the west by Grant County, east by Green County, north by Iowa County, and south by Stephenson County, Illinois. The City of Darlington is situated in roughly the center of Lafayette County, 20 miles east of Platteville, 16 miles south of Mineral Point, and about 14 miles north of Shullsburg. Darlington Township is adjacent to the City on all sides.

The terrain in the Darlington area is gently rolling, with some steeper bluffs and deep valleys, especially around the Pecatonica River. This river, its tributaries, wetlands, and floodplain areas characterize the lower elevations. The City's landforms and topography are characteristics of the "Driftless Region," covering parts of southern Minnesota and Wisconsin, Northwestern Illinois, and Northeastern Iowa. The region derives its name from being unglaciated within a broader area that had many glacial episodes. Having escaped the leveling effect of continental glaciers, the land has been exposed to continuous weathering and erosion. This erosion carved a series of deep valleys into the gently tilted bedrock formations.

The most prominent natural feature in the City of Darlington is the Pecatonica River. The City of Darlington lies in the upper half of the Pecatonica River Watershed in the Driftless area of Wisconsin (see Map 1). The Pecatonica River then flows south and east towards Freeport, Illinois for about 120 miles before it joins the Sugar River about 8 miles west of Rockton, Illinois. In Rockton, the Pecatonica/Sugar River then merges with the Rock River before heading southwest towards the Mississippi River.

As the "Pearl of the Pecatonica," Darlington has a rich history and intimate connection to the river that crosses the City. Prone to flooding, the Pecatonica River has overflowed its banks in 1937, 1950, 1959, 1969, 1990, 1993, 2000, 2008, 2009, and 2013 often filling Main Street basements and first floors with floodwater. There are also a number of smaller tributaries to the Pecatonica in the Darlington area including the Ames Branch, Vinegar Branch, Wood Branch, and Otter Creek.

Adequately assessing flood hazards requires acknowledging that floods occur over geographical areas defined by a watershed which is not solely within the bounds of individual political jurisdictions. A watershed is an area that drains to a common waterway such as a river, wetland, lake, or ocean. The City of Darlington is located in the Pecatonica River Basin, which is subdivided into several smaller watersheds including the Middle Pecatonica River Watershed in which the City is located. The Middle Pecatonica River Watershed is predominantly agricultural in land use. There are also significant forested areas and some wetlands in the watershed. There are no large wetlands in the City, although there are some wetland areas east of the City that are part of the marshland that parallels the Pecatonica River.

Within the City, the highest elevation is 1014 feet near the High School on the City's south side and the lowest elevation is 804 feet at the Pecatonica River.[2] About 67 percent of the soils within the City are highly erodible. [3] The soil types in the City of Darlington include Palsgrove and Dubuque silt loam north of the river, and a variety of silt loam soils south of river including Lawson, Huntsville, Sogn, and Chaseburg. Tama silt loam comprises most of the Business Park area at the City's southwest corner. These soil types are deep, well-drained, and moderately to rapidly permeable.

[2] USGS, National Elevation Dataset, 2001
[3] USDA-NRCS Digital Soil Survey, 2005

Map 1

Regional Context

City of Darlington Multi-Hazard Mitigation Plan

- City of Darlington
- County Boundaries
- State Boundaries
- Pecatonica Watershed
- Other Watersheds
- Railroads
- Interstate, US, and State Highways
- Other Major Roads

Existing Land Cover (2008)

- Corn and Soybeans
- Grassland, Pasture, Shurbland
- Wooded
- Wetlands
- Developed Land
- Open Water

Date: 7/1/2014

Sources: US Census Bureau, USDA ESRI

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DEMOGRAPHICS

Due to physical constraints, the City of Darlington has experienced a relatively stable population over the past 40 years. In the years leading up to 1990, the City lost population, but between 2000 and 2010 the City of Darlington grew by 33 people (1.4 percent). This was higher than the City of Shullsburg and the City of Monroe. Darlington Township and the City of Platteville saw their populations increase substantially during the same period. Population estimates from the Wisconsin Department of Administration (DOA) from 2012 are also included in Figure 2.1. These show a stable population in the City and Darlington Township since 2010.

Figure 2.1: Population Trends, 1970 - 2012

	1970	1980	1990	2000	2010	2012*	Numeric Change 2000-2010	Percent Change 1990-2000
City of Darlington	**2,351**	**2,300**	**2,235**	**2,418**	**2,451**	**2,443**	**33**	**1.4%**
City of Shullsburg	1,376	1,482	1,236	1,246	1,226	1,226	-20	-1.6%
Darlington Township	949	842	867	757	875	884	118	15.6%
City of Platteville	9,599	9,580	9,862	9,989	11,224	11,338	1,235	12.4%
City of Monroe	8,654	10,027	10,241	10,843	10,827	10,811	-16	-0.1%
Lafayette County	17,456	17,412	16,076	16,137	16,836	16,897	699	4.3%
Wisconsin	4,417,731	4,705,767	4,891,769	5,363,675	5,686,986	5,703,525	323,311	6.0%

Source: U.S. Census, 1970-2000

** Population Estimates, Wisconsin Department of Administration, 2012*

As shown in Figure 2.2, the City of Darlington's population base is slightly younger than the surrounding area and the County. Overall, the percentage of residents who are school-aged is lower than in Darlington Township and the County. Statewide, the DOA projects that "baby boom" and elderly age cohorts are expected to double between 2010 and 2040, while the number of residents between the ages of 5 and 17 is expected to only slightly increase. 4 This projected change in age groups will have important planning implications for the future, including the recognition of the need to plan for elderly services, housing, and transportation needs to minimize risk during natural hazards.

Figure 2.2: Age and Gender Distribution, 2010

	Median Age	% under 18	% 65 and over	% Female
City of Darlington	**38.7**	**23.5**	**18.4**	**49.9**
Darlington Township	40.7	26.1	14.2	48.8
Lafayette County	40.4	25.8	15.4	49.0
Wisconsin	38.5	23.6	13.7	50.4

Source: U.S. Census, 2010

According to 2010 Census data, of the City's population age 25 and older, 79 percent attained a high school level education or higher. For comparison, the high school graduation rate for the County and State of Wisconsin was about 88 percent. Approximately 15 percent of this same age group in the City had attained a college level education (Bachelor's degree or higher).

[4] Wisconsin Department of Administration, 2012

According to 2011 American Community Survey Census data, the City's median household income was $45,772, an increase of 25 percent from $34,539 in 2000. For comparison, the median household income reported for the County was $49,850 ($37,220 in 2000) and statewide was $52,374 ($43,791 in 2000).

HOUSING

According to 2010 Census data, there were 987 housing units in City of Darlington. The City's average household size, 2.37, has remained fairly steady but is notably lower than the surrounding townships, the County, and the State (see Figure 2.3). Within the City of Darlington the number of single-person households (31.5 percent) is significantly higher than Darlington Township (18.5 percent), and Lafayette County (25.7percent). This is suggestive of a relatively high elderly population. In fact, 12 percent of all households in Darlington contain someone over the age of 65 living alone. Additionally, the number of households with anyone aged 65 and older is nearly 28 percent. The elderly are potentially more vulnerable to the effects of natural hazards than younger age groups due in part to mobility issues and, at times, due to isolation and some difficulty in using modern media to connect.

Figure 2.3: Comparison of Housing Stock Characteristics, 2010

	Total Housing Units	% Vacant	Average Household Size	% Single-Person Household	Median Value (owner occupied)
City of Darlington	**987**	**5.6%**	**2.37**	**31.5%**	**$97,100**
Darlington Township	349	5.7%	2.66	18.5%	$155,300
Lafayette County	7,167	8.8%	2.53	25.7%	$117,700
Wisconsin	2,593,073	12.3%	2.43	28.2%	$169,000

Source: American Community Survey U.S. Census, 2010

Of the City's 987 housing units in 2010, 932 were occupied. Of the 932 occupied housing units, approximately 72 percent were owner-occupied. The City's median home value is 11 percent less than the County, 30 percent less than Darlington Township, and 67 percent less than the State. Despite the lower home values, the City experienced nearly a 50 percent increase in home values between 2000 and 2010. Reasons for this may be the relatively tight housing market and the construction of a number of newer, more expensive homes during that period.

As shown in Figure 2.4, the City's housing stock is predominately single-family homes (73.3 percent). Still, this proportion of single family homes is less than in the County (83.2 percent) and Darlington Township (84.5 percent), but greater than that of the state (70.6 percent).

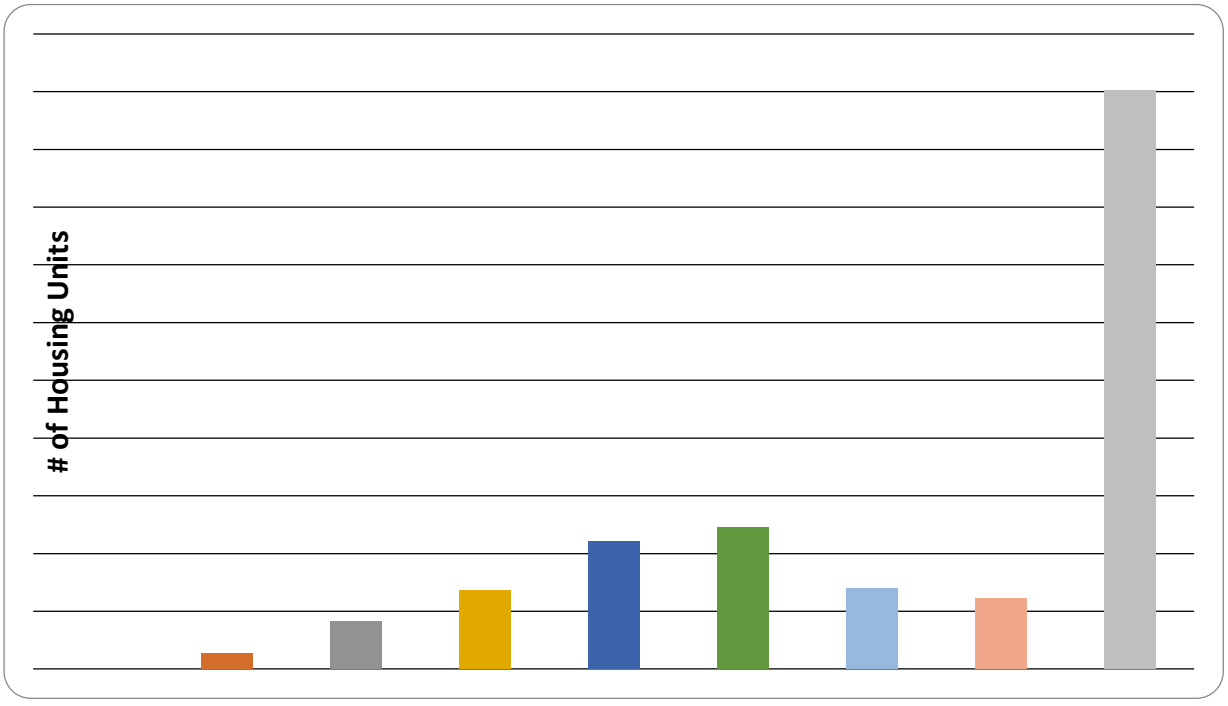
Figure 2.4: Composition of Housing Stock, 2010

	City of Darlington	Township of Darlington	Lafayette County	Wisconsin
Single Family	**73.3%**	83.2%	84.5%	70.6%
Two Family	**11.1%**	0.6%	3.5%	7.1%
3 or 4 Units	**6.8%**	0.0%	2.3%	3.7%
5 to 9 Units	**2.0%**	2.7%	0.9%	4.8%
10 or More Units	**3.0%**	0.0%	2.7%	9.9%
Mobile Home	**3.6%**	13.4%	6.1%	3.9%

Source: American Community Survey U.S. Census, 2010

Over fifty percent the City's homes as of the year 2010 were constructed before 1940 (see Figure 2.5). Homes built before 1959 (64 percent of the City's housing units) are probably in the greatest need of upgrading of major mechanicals, appliances, and components like re-roofing, and may be more vulnerable to natural hazards than others. The City does have a number of historically significant houses that add architectural interest and reflect the diverse history of the City. Attention and care should be given to both the older housing stock and historic landmarks to ensure proper protection from natural hazards.

Figure 2.5: City of Darlington Distribution of Housing Stock by Age, 2010



Source: American Community Survey U.S. Census, 2010

EMPLOYMENT

Lafayette County is the most agriculture-dependent county in Wisconsin. Dairy production and cheese processing form the basis of the County's economy. The City of Darlington has a fairly diverse economy centered on manufacturing, education, and retail trade. Manufacturing provides the largest portion of jobs in Darlington, with 26 percent of total jobs originating in this industry. Educational services and health care and social assistance and retail trade provide the second and third largest share of jobs in Darlington, with 19 percent and 18 percent respectively.

Much of the City of Darlington's remaining employers are smaller industries, generally located on the south side of the City, and small commercial businesses generally located in the downtown area and on the south side. Notable industries include Illinois Tool Works (ITW) and Merkle-Korff, located on the City's south side (south of the Pecatonica River). The City extended utility services in 2004 and 2005 to serve a greater portion of the south side with the intent to help spur additional development in the Business Park southwest of Highways 81 and 23.

About 44 percent of City of Darlington residents are employed outside of the City limits, with the mean travel time of 20.5 minutes in 2010, a slight increase from 19.8 minutes in 2000. Mean travel times in the 40 to 45 minute category increased 270 percent, indicating that City of Darlington residents are traveling farther for work, making an effective and reliable transportation network critical. Dubuque, Madison, and the Rockford-Beloit-Janesville areas are the likely destinations of some of these workers. The Swiss Colony cheese plant in Monroe is also a large employer of Lafayette County residents. Iowa County provides almost ten percent of all jobs in Lafayette County. The Lands' End company in Dodgeville is one of the largest private employers in the area.

Figure 2.6: Major Employers in Lafayette County

Establishment	Service or Product	Number of Employees (June 2010)
County of Lafayette	Executive & legislative offices, combined	250-499 employees
Lactalis USA Inc	Cheese manufacturing	100-249 employees
Darlington Community School District	Elementary & secondary schools	100-249 employees
Mexican Cheese Producers, Inc.	Cheese manufacturing	100-249 employees
Betin Inc	Cheese manufacturing	50-99 employees
Shullsburg Creamery II LLC	Dairy product merchant wholesalers	50-99 employees
School District of Black Hawk	Elementary & secondary schools	50-99 employees
Merkle-Korff Industries Inc	Motor & generator manufacturing	50-99 employees
School District of Argyle	Elementary & secondary schools	50-99 employees
Shullsburg Public School	Elementary & secondary schools	50-99 employees

Source: State of Wisconsin Department of Workforce Development "Lafayette County Workforce Profile," 2011

UTILITIES

"Lifeline" systems, including communication, transportation, power, water, and sewer, should be designed to be as hazard-resistant as economically possible. Damage to any one of these infrastructure components can cripple a community at any time and can make disaster recovery much more difficult.

The City of Darlington is serviced by a municipal water system that obtains its water from two deep wells. Approximately 40 percent of the 600,000-gallon storage capacity is currently utilized. The City's wastewater treatment plant was built in 1997, has capacity to treat 580,000 gallons of effluent daily, but presently treats only about 225,000 gallons.

Wisconsin Power & Light, a subsidiary of Alliant Energy, provides Darlington's electric services. Scenic Rivers provides electricity to the rural areas surrounding Darlington.

Just east of the City, a natural gas line operated by Northern Natural Gas travels from south to north.

High voltage power lines pass through the south side of the City of Darlington from east to west. One line is owned by American Transmission Company (ATC) and the other is owned by Dairyland Power Cooperative (DPC). Lines owned by ATC also travel from south to north on either side of the City.

Map 4 shows several of these lines.

TRANSPORTATION INFRASTRUCTURE

Several state and county highways radiate outward from the City of Darlington. The City is served by two main state highways. State Trunk Highway (STH) 23 is a north-south arterial connecting Darlington to the other communities in Lafayette County, including the City of Mineral Point and the major U.S. Highway 151 sixteen miles to the north. This is the region's primary traffic artery and is vital to the area's economy.

STH 81 is the major east-west road running through the southern portion of the City, connecting it with Platteville to the west and Argyle to the east. County Trunk Highways (CTHs) F, K and Z also connect the City with surrounding communities and countryside. CTH F runs northeast from the north part of the City towards Yellowstone Lake State Park and east from the southern part of the City. CTH K crosses STH 23 south of 81 and leads to Gratiot. CTH Z is the route to Belmont.

There are no airports in Lafayette County. The nearest larger airport is the Dubuque Regional Airport. The Iowa County Airport and the Platteville Municipal Airport can serve private jets and smaller commercial airplanes.

There is one former rail line running through the City of Darlington. It has been converted into the Cheese Country State Trail running from Monroe to Mineral Point. This multi-use trail is open to ATVs, motorcycles, bicycles, horse riders, and hikers from April 1 to November 15 while snowmobiles, skiers, and hikers can use it from December 1 through March 30.

EMERGENCY SERVICES

The City of Darlington Police Department has four officers and a Chief of Police and operates out of the Municipal Building. Darlington is also served by the Lafayette County Sheriff's Department. The Sheriff's Department operates out of the courthouse building in Darlington. The County Jail is also located in this building.

The City is served by the 30-plus member all-volunteer Darlington Community Fire Department. The Department serves all or portions of six townships around Darlington.

There are five ambulance service providers in Lafayette County, including the Rural Medical Ambulance Service on Louisa Street in Darlington, which serves the City of Darlington and seven townships in the County. Lafayette County is served by the excellent Memorial Hospital of Lafayette County on the east side of town and Lafayette Manor provides nursing home care for the elderly. There are three dental clinics in Darlington, one located across the street from the hospital, and the others located downtown. There are day care and child care facilities located in Darlington and the other urban areas throughout Lafayette County. These locations are documented on Map 5.

Chapter 3: Hazard Identification and Risk Assessment

Analyzing the hazards in the City is an important and necessary step to help identify potential risks and to prioritize mitigation projects that will minimize those risks. This chapter includes an assessment of the hazards that can affect the City of Darlington as well as an assessment of the risk of loss of life and property from hazards based on the future probability of and vulnerability to hazards.

HAZARD IDENTIFICATION

City of Darlington is at some risk for the following natural hazards:

1. Flooding
2. Severe Storms (including hail, lightning, tornadoes, and severe winds)
3. Severe Winter Storms
4. Extreme Temperatures
5. Drought
6. Earthquakes

Additionally, the City is more or less vulnerable to the following hazards that are either caused by humans or are disease outbreaks:

1. Civil Disturbances
2. Explosions
3. Hazardous Materials
4. Nuclear Energy/Nuclear Power Plants
5. Mass Causalities
6. Climate Change
7. Terrorism (including bomb threats, cyberterrorism, and agroterrorism, occurring either in the City of Darlington or nearby metropolitan areas)
8. Transportation Accidents (including aircraft, bus, rail, and trucking)
9. Energy shortages and blackouts
10. War (including nuclear and non-nuclear)

The sources that were used to identify the hazards addressed in this Plan include the following:

- City of Darlington Flood records
- Flood Hazard Mitigation Plan (1994)
- City of Darlington Hazard Mitigation Plan (2010)
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center
- City of Darlington Flood Notification Plan
- Hazard Analysis for the State of Wisconsin (2005, 2008)
- Hazard Mitigation Planning Committee members, local government representatives, and members of the public

This Plan covers each of the possible natural hazards in the City of Darlington but will place an emphasis on the most critical natural hazards identified by local officials and community members. From information gathered at the Agency and Stakeholders meeting and first Plan Commission meeting in March 2013, the most critical natural hazards for the City were identified as flooding, tornadoes, extreme temperatures, and other severe storms (including hail, lightning, and severe winds).

Human-made hazards were discussed but are not covered at length in this Multi-Hazard Mitigation Plan, except as they relate to responses to natural hazards. A clear example is how the Main Street bridge (and the lack of other river crossings) affects response during natural hazard events, like floods.

The City of Darlington has been the subject of six Presidential Disaster Declarations due to flooding—one each in 1978, 1990, 1993, 2000, 2004, 2008, and 2011. One Presidential Emergency Declaration is also on record as a result of a drought and ice storm in 1976.

Figure 3.1: Presidential Disaster and Emergency Declarations

Year	Type of Declaration	Disaster Event	Total Damages (State)
1976	Disaster Declaration	Ice Storm	Unknown
1976	Disaster Declaration	Drought	Unknown
1978	Disaster Declaration	Flooding/Tornadoes	Unknown
1990	Disaster Declaration	Flood	$21,000,000
1993	Disaster Declaration	Flood	$747,000,000
2000	Disaster Declaration	Flood	$63,000,000
2004	Disaster Declaration	Severe Storm/Flood	$87,000,000
2008	Disaster Declaration	Flood	$675,000,000
2011	Disaster Declaration	Severe Winter Storm	$9,819,137

Sources: FEMA, Wisconsin Natural Hazard Mitigation Plan, City of Darlington, WEM

Although the history of Presidential Disaster Declarations in the City of Darlington highlights the most severe disasters, it does not wholly capture the hazards that the community has experienced and to which it is vulnerable. The NOAA National Database of U.S. Storm Events identifies 265 severe weather events from 1950 through May 1, 2013. Figures 3.2a-c below summarizes events from 1950 to 2008, 2008-2013, and 1950-2013. Storm data are geographically categorized by county or by National Weather Service forecast zone. Smaller coverage events (Tornado, Thunderstorm and Winds, Flash Floods, and Hail) are collected by county and municipality, while larger scale events (Extreme Temperatures, Drought, Flood, and Winter Weather) are collected by forecast zone. As a result, there are fewer documented "Darlington specific" events and more county-wide events. The NOAA data suggests that the frequency of the total number of events in the County was higher in the last 5 years than in the previous 50 years. In storm events specific to Lafayette County and the City of Darlington, there are a total of four deaths and two associated injuries as listed by NOAA. Figures 3.2 attempts to define losses specific to Lafayette County and the City of Darlington, but in some instances it is difficult to separate out only local/City impacts because the database lacks full information on both the historical occurrences and impacts of disasters in the City. In general, local officials feel the reported damage amounts are much lower than what actually occurred. Consequently, this Plan supplements NOAA data with information from additional organizations and local residents to more fully understand the risk of disasters in the City of Darlington.

Figure 3.2a: Severe Weather in Lafayette County, 1950-2008

Hazard	# of Events	# of Events *(Darlington Specific)*	Reported Injuries	Reported Deaths	Reported Damage	Reported Damage *(Darlington Specific)*
Flood/Flash Flood	16	16	0	2	$7,653,800	$2,000,000 +
Severe Thunderstorms and Winds	51	7	2	1	$12,717,000	$1,700,000
Tornadoes	15	0	0	0	$4,400,000	$0
Hail	22	8	0	0	$2,400,000	$2,400,000
Winter Storms	49	0	0	0	$300,000	$0
Extreme Temperatures	28	0	0	1	$21,000	$0
Drought	3	0	0	0	$0	$0
Totals	**192**	**31**	**2**	**4**	**$24,748,000**	**$6,100,000 +**

Source: National Climatic Data Center: U.S. Storm Events Database, Vandewalle & Associates, City of Darlington

Figure 3.2b: Severe Weather, 2008-2013

Hazard	# of Events Lafayette County Zone	# of Events City of Darlington	Reported Injuries	Reported Deaths	Reported Damage Lafayette County Zone	Reported Damage City of Darlingt
Flood	0	0	0	0	$0	$0
Flash Flood	3	0	0	0	$80,000	$0
Severe Thunderstorms and Winds	21	5	0	0	$309,000	$12,000
Tornadoes/Funnel Clouds	5	0	0	0	$165,000	$0
Hail	8	1	0	0	$1,000,000	$0
Winter Storms	10	0	0	0	$0	$0
Extreme Temperatures	21	0	0	0	$0	$0
Drought	1	0	0	0	$0	$0
Totals	**73**	**6**	**0**	**0**	**$1,544,000**	**$12,000**

Source: National Climatic Data Center: U.S. Storm Events Database, Vandewalle & Associates, City of Darlington
Note: Flood, Winter Storms, Extreme Temperatures, and Drought are compiled at the County Zone level. Flash Floods, Tornados/Funnel Clouds, Severe Thunderstorm and Winds, and Hail are compiled at the City level.

Figure 3.2c: Severe Weather, 1950-2013

Hazard	# of Events Lafayette County Zone	# of Events City of Darlington	Reported Injuries	Reported Deaths	Reported Damage Lafayette County Zone	Reported Damage City of Darlington
Flood/Flash Flood	19	16	0	2	$7,733,800	$2,000,000 +
Severe Thunderstorms and Winds	72	12	2	1	$13,026,000	$1,712,000
Tornadoes/Funnel Clouds	20	0	0	0	$4,565,000	$0
Hail	30	9	0	0	$3,400,000	$2,400,000
Winter Storms	59	0	0	0	$300,000	$0
Extreme Temperatures	59	0	0	1	$21,000	$0
Drought	4	0	0	0	$0	$0
Totals	**265**	**37**	**2**	**4**	**$26,302,000**	**$6,112,000 +**

Source: National Climatic Data Center: U.S. Storm Events Database, Vandewalle & Associates, City of Darlington
Note: Flood, Winter Storms, Extreme Temperatures, and Drought are compiled at the County Zone level. Flash Floods, Tornados/Funnel Clouds, Severe Thunderstorm and Winds, and Hail are compiled at the City level.

RISK ASSESSMENT

The following section provides an assessment of risk associated with each of the hazards that have historically affected the City of Darlington. The risk assessment incorporates the following for each hazard:

- A description of the hazard
- An overview of historical occurrences of the hazard in the City
- An assessment of vulnerability to the hazard throughout the City
- A projection of the future probability of occurrences of the hazard in the City
- A projection of potential damages from future occurrences of the hazard in the City

Areas of hazard vulnerability are illustrated in the maps at the end of this chapter. Additional detail on historical occurrences of hazards in the City is provided in Appendix A.

Flooding

Flooding Hazard Overview

Flooding is defined as a partial or total inundation of normally dry land from the overflow of inland waters, or a rapid accumulation or run-off of surface waters from any source. Flooding severity is impacted by the amount of rainfall (or other source of water such as melted snow), duration of rainfall, topography, land cover, frozen soil, soil saturation, reservoir/mill pond capacity, river or stream levels, and frozen rivers or streams.[5]

Major floods in Wisconsin have primarily been confined to specific streams and rivers or to locations that receive intense rainfall in a short time. Such riverine floods tend to occur in the early spring when melting snow adds to normal run-off when the ground is often still frozen, or in the summer and early fall after intense rainfall. Spring flooding is characterized by a slow buildup of flow and velocity in rivers over a period of days. This buildup continues until the river or stream overflows its banks, for weeks to months, and then slowly recedes. Generally, the timing and location of this type of flooding is predictable and allows substantial time for evacuation of people and most personal property.

Another form of riverine flooding is ice jam flooding, which occurs when ice jams form in a waterway constricting downstream water flow. At these locations, water rises rapidly, extending upstream. When the jam is cleared, flooding occurs downstream. Tree blockage can also exacerbate flooding in a similar manner.

The primary form of flooding in City of Darlington is riverine flooding. The Pecatonica River exceeds its banks during spring thaws and periods of very heavy rain on a fairly regular basis. This mainly leads to temporary road closures, erosion, crop damage outside the City, and disruption of economic activity. It can also cause harm to human lives, health, and the environment. The steep topography of the region causes the Pecatonica River to respond rapidly to heavy rainfall—in other words, it rises quickly and sometimes unpredictably.

A major challenge associated with flooding in Darlington is river debris, particularly around the Fairgrounds. As the Pecatonica River floods, it picks up trees limbs, garbage, and other debris which impedes flow and presents health and safety concerns. Another challenge associated with flooding is flood water backing up in storm drains, especially in the 100 block of Main Street. This block has a large number of storm drains, compounding the problem.

Flood events constitute 90 percent of federal disaster declarations; their occurrence is frequent and response and recovery costs can be extremely high. Historical flooding events prove that the City of Darlington is no exception to this rule.

According to FEMA there are no flood control projects along the Pecatonica River. However, since 1969, there have been some improvements to the channel and overbanks, including streambank stabilization several years ago.

Historical Occurrences of Flooding

Flooding is the most costly natural disaster that affects the City of Darlington, resulting in millions of dollars of damage to property in the past century.

Notable floods with considerable damage occurred in the City of Darlington in 1950, 1969, 1990, 1993, 2004, 2007, and 2008. Figure 3.3 summarizes these severe floods.

[5] Wisconsin Emergency Management. 2002, *Hazard Analysis for the State of Wisconsin*.

Figure 3.3: Impact of Large Flooding Events on the City of Darlington

Date	Reported Damage (current $)	Flood Crest (ft)	Notes
July 1950	$1,015,800 ($22,781,788)	20.71	Pecatonica River rose 9 feet in less than 1 hour. Flow of 22,000 cubic feet per second.
June 1969		19.28	
June 1990	$2,800,000 - countywide	19.78	The Pecatonica River rose from a 1.80 foot stage to 19.80 foot stage in a 10 hour period.
July 1993	$350,000 and severe crop losses	18.22	Approximately 4 inches of rainfall in 8 hours.
June 2004	$1,500,000	13.80	Between 6 and 12 inches of rain fell on the County over one week in early June. Over 100 homes were severely damaged. Road closures, road washouts, and sandbagging were common across the southern half of the county where the rainfall was most intense. One injury was reported.
August 2007	20 homes had basement damage of $100,000 and $500,000 in crop damage	10.61	Flash flooding occurred in scattered locations between the northwest side of Darlington to the extreme northeast corner of Lafayette County. Just northwest of Darlington, a road was closed due to fast flowing water covering the road to a depth of one to two feet. Just east of Blanchardville, CTH H was closed due to fast-flowing water covering that road to a depth of one to two feet.
June 2008	Home damage of $200,000, business damage of $100,000, public sector damage of $162,000. Crop damage of $300,000	15.74	Heavy rains resulted in flash flooding from the Darlington area to Yellowstone Lake State Park. Water depths on road surfaces reached three feet or more and there were gravel washouts. There were several roads and bridges that sustained damage. A series of clusters of strong to severe storms ahead of a cold front moved east/northeast across southcentral and southeast Wisconsin.
TOTAL	**$4,307,800 ($27,089,588)**		

Damage from these events was focused on flooded basements, road washouts, road and bridge closures, business closures, and severely damaged structures.

The seven major flood events in Figure 3.3 that severely affected the City of Darlington resulted in $4,307,800 in damages. Overall, NOAA recorded 16 flooding events that occurred in the City of Darlington and the surrounding area since 1950. These 16 events have resulted in $5,293,800 in known damages to property and $2,360,000 in known damages to agricultural land—and that is only for events after 1990 (except for the 1950 flood estimates). Details on each of these events are provided in Table A1 in Appendix A.

Figure 3.4 summarizes the history of claims and number of flood insurance policies held in the City of Darlington under the National Flood Insurance Program (see also Table A1, Appendix A). As flooding damage to agricultural land is covered under crop insurance policies, this table only relates to non-agricultural properties. Comparing the actual property and content damage to that which was claimed by insurance is difficult because for the two largest flood events in 1990 and 1993 no specific damage totals were readily available for the City of Darlington.

Figure 3.4: History of National Flood Insurance Program Losses

Year	Total Losses	Structural Payments	Contents Payments	Total Payments
1978	1	$0.00	$151.20	$151.20
1990	18	$178,255.47	$144,347.31	$322,602.78
1993	22	$114,939.58	$31,459.19	$146,398.77
1994	2	$789.83	$0.00	$789.83
1997	1	$15,090.22	$225.80	$15,316.02
1998	1	$9,014.66	$655.16	$9,669.82
2000	1	$2,081.12	$8,412.82	$10,493.94
Total	46	$320,170.88	$185,751.48	$505,922.36

Source: FEMA, 2013

Flood Mitigation Efforts to Date

The Pecatonica River has impacted the City of Darlington many times with varying severity. Much of the downtown area is shown in FEMA designated floodplain (see Map 5). Development is strongly discouraged in floodplains to avoid both on-site and up- and downstream property damage. Mortgage lending requirements for flood insurance in designated floodplain areas may also increase the costs of conducting business in these areas. These facts have had a major impact on downtown Darlington and adjacent riverfront areas.

Following severe floods in 1950, 1969, 1990, and 1993, the City of Darlington took a more proactive approach to mitigating flood hazards. Flood mitigation strategies were included in the Community Master Plan Update from May 1992, with a goal of viewing the river as an asset to the community instead of a flood liability. After witnessing the destructiveness of the 1993 flood, business owners and residents were far more ready to accept creative solutions to the flooding problem. The City then developed a Flood Hazard Mitigation Plan in 1994, which included recommendations for floodproofing and/or acquisition and relocation of numerous downtown buildings, a riverfront park concept, and an economic development/recovery plan. Darlington's Flood Hazard Mitigation Plan became the first in the state of Wisconsin to be approved by FEMA and a model for communities interested in dealing with the effects of repetitive flooding.

Since adoption of the 1994 Flood Hazard Mitigation Plan, the City has been successful in capturing millions of dollars in state and federal grants to assist the City in avoiding or mitigating flood disasters. The City undertook the task to retain the historic nature of the downtown and to either flood proof buildings or remove them from the floodplain. The funds also helped buy land adjacent to the river, which was converted to parkland that now meets a variety of recreational needs. Figure 3.5 summarizes the historical grants. Figure 3.6 categorizes projects that have reduced the potential damage from flooding.

Figure 3.5: Flood Mitigation Grants Obtained by City of Darlington

Grantor	Program	Year	Grant Amount	Project
Wisconsin Department of Commerce	Community Development Block Grant Disaster Recovery Assistance Program	1994	$431,000	52 homes benefited from the program
State Historical Society	National Flood Insurance Program	1994	$57,000	Purchase dehumidifiers for flooded downtown buildings
FEMA	Hazard Mitigation Grant	1994	$1.9 million	40 businesses identified for floodproofing or relocating
State of Wisconsin	CDBG Grant Program	1994	$284,000	Architectural study completed
Federal/WisDOT	Darlington Bike/Ped trail	2000	$14,500	Planning bike/ped trail
WisDOT	Darlington Bike/Ped trail	2001	$325,600	Construction of bike/ped trail
DNR	Municipal Flood Control Grant Program	2002	$254,200	Relocation of Firehouse
FEMA	Flood Mitigation Assistance Program	2002	$145,800	Relocation of Firehouse
Economic Development Administration	Business Park	1996	$697,000	30 Acre Business Park to relocate businesses
Economic Development Administration	Water System	1996	$974,280	Expanded Water System
Rural Development	Wastewater Treatment Plant	1996	$2,747,000	Move WWTP out of floodplain
Wisconsin Department of Development	Flood Proofing	1996	$355,584	Engineering/remodeling
Wisconsin Department of Development	Flood Proofing	1996	$108,000	Upgrade of sewer system
Wisconsin Department of Development	Flood Proofing	1996	$19,000	Economic Development
Flood Mitigation Assistance Program	Building Acquisition	1998	$432,102	Acquisition of 2 buildings and remodeling
Wisconsin Department of Development	Building Acquisition	1998	$369,200	Acquisition of 2 buildings
FEMA/ DNR	Flood Mitigation Assistance Program Muni. Flood Control	1998 2000 2000	$147,000 $119,000 $125,000	Acquisition of Napa Property
FEMA	Pre-Disaster Planning Grant	2002	$14,700	Planning Grant
FEMA	Pre-Disaster Project Grant	2007	$48,750	Acquisition of Burke Property
DNR	ATV Project Grant	2007	$427,634	Restroom/Shower Construction
DNR	ATV Project Grant	2008	$46,433	AV Dump Station
FEMA	Pre-Disaster Planning Grant	2008	$20,000	Plan Update
FEMA	Flood Mitigation Assistant Project Grant	2009	$153,000	Acquisition/demolition of Craig Hardware Storage Building
FEMA	Municipal Flood Control Grant Program	2010	$555,357	Driver Opera House Floodproofing
FEMA	Pre-Disaster Planning Grant	2013	$16,000	Plan Update
TOTAL	**26 Projects**		**$10,787,140**	

Figure 3.6: Flood Hazard Mitigation Projects in Darlington

Project Type	Project Description
Utilities	
Wastewater Treatment Plant	Relocation of WWTP out of the floodplain
Major Utilities	Gas and electric lines were raised as much as eight feet off the ground
Flood Shields	
Shields Built	150 Flood Shields were built to protect business-district buildings
Storage Facility	Three-door garage at the bottom of Main Street was constructed to store shields
Floodproofing	
Commercial Buildings	19 buildings were floodproofed while preserving the historic storefronts
Residential Units	About 55 homes in neighborhoods adjacent to downtown/river were floodproofed
Relocations	
Diesel/Heating-Fuel Units	A site in the southeast portion of the city was cleaned and is now a new park
Commercial Properties	14 commercial properties were acquired and demolished, with several businesses moved to a new 33-acre business park on the City's southwest side

Source: FEMA, 2008; City of Darlington

Flood Awareness and Notification Efforts to Date

The City has undertaken additional efforts to prepare the community when flood events occur or are imminent. As a backdrop, Figure 3.7 provides a historical perspective of the largest flood events in recent history for the City of Darlington.

Figure 3.7: Pecatonica River Historical Flood Crests

	Year	Flood Crest		Year	Flood Crest
1	07/16/1950	20.71 feet	11	03/30/1960	16.06 feet
2	06/29/1990	19.80 feet	12	02/09/1955	16.00 feet
3	06/01/1969	19.28 feet	13	01/22/1954	15.79 feet
4	07/06/1993	18.22 feet	14	06/01/2000	15.77 feet
5	02/28/1948	17.65 feet	15	06/09/2008	15.75 feet
6	02/21/1937	17.60 feet	16	02/20/1994	15.75 feet
7	02/20/1953	17.47 feet	17	03/16/1943	15.73 feet
8	01/06/1946	17.18 feet	18	06/14/2008	15.65 feet
9	07/08/1951	16.61 feet	19	03/22/1975	15.64 feet
10	01/25/1967	16.47 feet	20	03/17/1963	15.38 feet

The City has used these historic Pecatonica River floods not only to guide mitigation activities, but also to learn the impacts of various flood levels on the community and how to best prepare the community when waters rise. Darlington developed a flood impact statement that summarizes the streets, businesses, and community facilities that are impacted as flood waters rise. Flood events for the Pecatonica River at Darlington are documented at the following levels:

- **Action Stage – 10 feet**: Low lying Riverside Park property begins to flood. Flooding at Fairgrounds on City's east side begins at 11 feet.
- **Flood Stage – 13.5 feet**: Water hits 100 block of Main Street as it starts to come out storm drains. Water hits Alice Street at Wells Street as it comes out of storm drains. Water hits River Street near Al's Trucking. Water hits Division Street at Ann Street. Water significantly impacts Fairgrounds. All low lying Riverside Park and fairground lands are flooded. No businesses are yet in danger. All streets are still passable.
- **Moderate Flood Stage – 15 feet**: Main Street must be closed due to water across the 100 block. Alice Street must be closed. Water will create islands out of some downtown area businesses but the water is not yet in the buildings that these businesses occupy. However, at 15.5 feet, more significant impacts occur. The Highway 23/Main Street bridge is closed. Water is on Galena Street and on River Street but not in homes there. Water has reached the Main Street/Alice Street intersection and the sidewalk in front of American Family Insurance but no Main Street businesses yet flooded. The Riverwood Restaurant and Caseys C-store properties are islands but no water yet inside the buildings. Bea's Auto Cleaning and Xtreme Clean are flooded. The Spot Tavern basement takes in water. Mike's Engine Works parking lot is flooded but no water inside building. Washington Street at Minerva Street is closed and covered in water. Water starts to come out of storm drains at the intersection of Louisa and Clay Streets. Water comes out of storm drains on Ohio Street just south of Ann Street but is still passable at slow speeds. Access to Piggly Wiggly and World of Variety is still possible through the back entrance to World of Variety or by driving slowly through the small amount of water on Ohio Street. Water is at the Ann/Washington intersection area but has not affected Ann Street businesses. Ann Street at Division Street is flooded with water up to the rock wall on Ann Street. Riverside Park is flooded including parking lots.
- **Major Flood Stage – 16 feet:** All of the above impacts, plus the 200 block of Main Street downtown begins to flood. At 19 feet, the lower portion of the 300 block of Main Street also begins to flood.

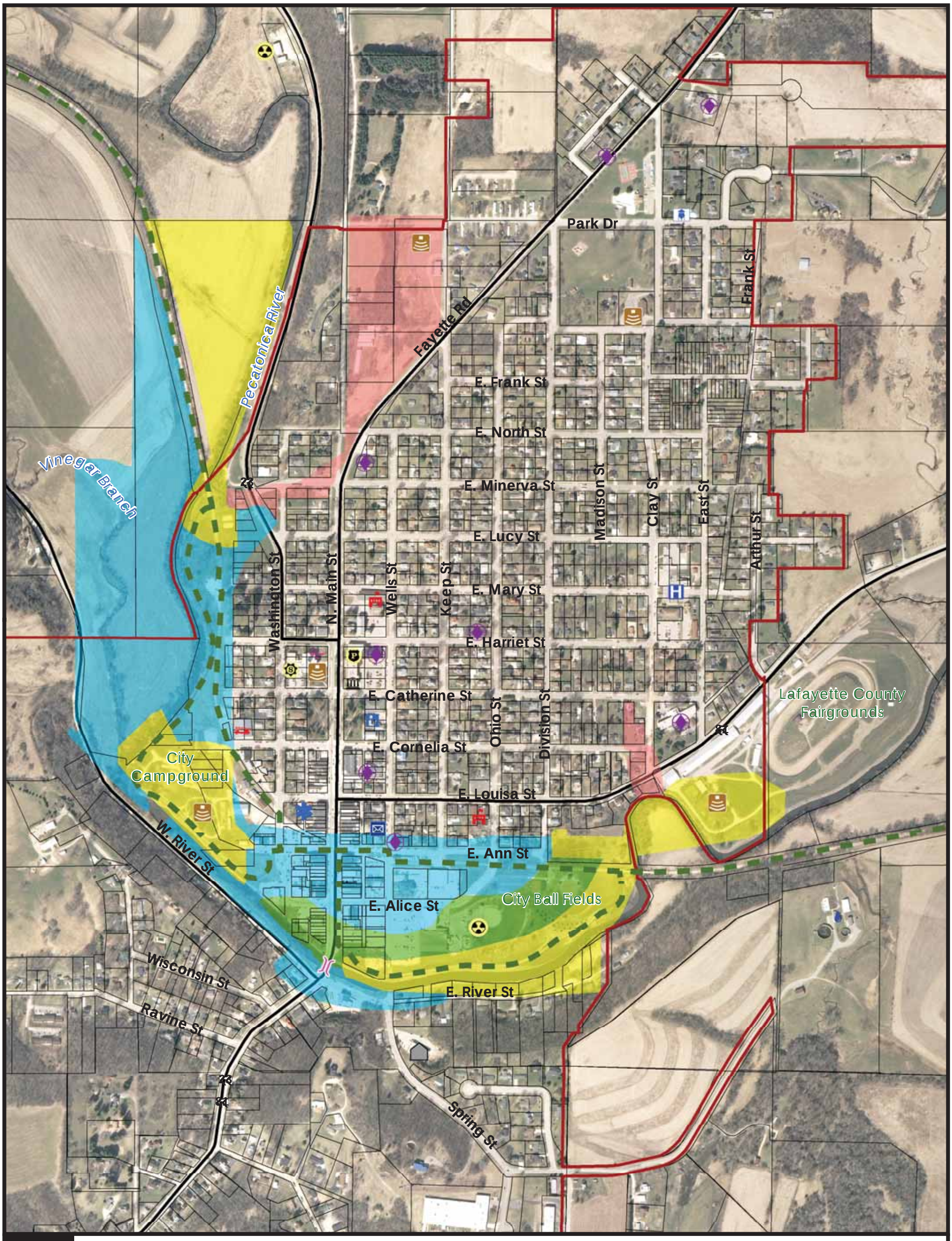
The City has also created a Flood Notification Plan, which serves as a guideline to be utilized during heavy rain or melting snow. The plan is summarized in Figure 3.8, with stage references depicted on Map 2.

Figure 3.8: City of Darlington Flood Notification Plan Summary

Flood Action	Road Impacts	Business Notifications	Residential Notifications	Local Official Notifications
Stage I (RED areas on Map 2)	-Water over W. Minerva St down to STH 23 area. -Water over Ravine and Galena St to south side of Bridge. -Intersection at E. Louisa and Clay St -Intersection of E. Alice and Wells St	- Wamsley's Auto - Car Wash - Taylor's Greenhouse	- SW intersection of W. Minerva and Main St - NW intersection of Ravine and Galena St	Chief of Police and Fire, Public Works Director, Park and Rec Director, Mayor, City Clerk
Stage II (YELLOW areas on Map 2)	-Low lying areas will be impacted	-Pecatonica River Trails Park and Black Bridge Park should remove people and visitors		Lafayette County Fair Secretary
Stage III (GREEN areas on Map 2)	-Water will back up to the 100 Block of Wells St -Water backups on E. River St	-Al's Trucking Company		
Stage IV (BLUE areas on Map 2)	-Lower 100 block of Main St will begin flooding at 13.5 feet	-Businesses in the downtown will be notified, evacuated, closed and sealed by flood shields at the discretion of local officials	-W. Minerva and W. Lucy St to install flood shields and activation of their backflow preventers	Fire Chief will notify Darlington Fire Dept. Public Works Dir. will distribute flood shields*

** Flood shields are available for properties in the 100 and 200 blocks of Main Street. The City stores the flood shield wagons; business and property owners are responsible for installation.*

The areas that are impacted by flooding as documented in the Flood Notification Plan are overlaid with the City of Darlington Risk Assessment Map and are summarized in Map 2.



Map 2

Flood Notification Plan

- City of Darlington Multi-Hazard Mitigation Plan -

- Municipal Boundary
- Major Roads
- Multi-Use Trails
- Main Street Bridge
- Hazardous Material
- Vulnerable Population
- Emergency Gathering Place
- School
- Municipal Building
- County Courthouse
- County Sheriff's Dept.
- Fire Station
- City Police Dept.
- Library
- City Garage
- Post Office
- Water Tower
- Healthcare Facility
- Volunteer Rural Medical
- Wastewater Treatment Plant
- 100-year Floodplain

Flood Notification Plan

- Stage I
- Stage II
- Stage III
- Stage IV

E

Date: 7/1/2014 Sources: US Census Bureau, ESRI, FEMA, City of Darlington, Lafayette County, WROC

0 250 500 1,000 Feet

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Remaining Flood Hazard Vulnerability

Even with these various flood mitigation and preparedness projects in Darlington, there remains vulnerability to the effects of flooding on the community. Given the frequency of flooding events and the significant economic and social impact of these flood events, it is economically logical to employ further mitigation techniques that lessen the impacts.

As part of this Plan, remaining areas and populations vulnerable to flooding hazards were determined based on the following:

- City of Darlington Floodplain Maps
- City of Darlington building structure type and location
- Records of historical occurrences and impacts of flooding
- Input from the Plan Commission, stakeholders, local officials, and area property owners and residents
- Aerial photographs
- Wisconsin National Flood Insurance Program Loss Statistics

The areas and populations most vulnerable to damage to life or property from flooding hazards in the City include the following, which are illustrated in the maps at the end of this chapter:

- Areas with residents and/or businesses within a mapped 100 year floodplain
- Flood-prone areas with residents and/or businesses outside of a mapped floodplain
- Populations that are particularly vulnerable to injury or death from flooding, including the elderly and residents of mobile home parks or campground visitors
- Steep slopes and surrounding agricultural land, which can endure significant damage, reduction of crop yields, and erosion from significant flooding

Repetitive Loss Structures

FEMA has identified 2 remaining non-residential repetitive loss structures in the City of Darlington. None of these properties are "Severe Repetitive Loss" properties as defined by FEMA. The "Severe Repetitive Loss" characteristics must meet one of the following criteria based on paid flood losses since 1978, regardless of ownership:

1. Four or more separate claim payments of more than $5,000 each (building and/or contents payments); or
2. Two or more separate claim payments (building payments only) where the total of the payments exceeds the current market value of the property.

The City of Darlington should place a priority on monitoring these 2 properties. The fact that no properties have had an insurance claim in over 12 years is positive news.

Properties Beyond the Repetitive Loss Structures

Floods in 1990 and 1993 caused extensive damage to properties within the City and were the initial impetus for extensive flood mitigation efforts. Even with these efforts, there remain a large number of developed properties within the floodplain in Darlington beyond just the repetitive loss structures described above. As a starting point, Figure 3.9 summarizes the total value of land and structures within the City.

Figure 3.9: Property Values within the City

Location	Property Values			Acreage	
	Land Value	Improvement Value	Total Value	Total Acres	Total # Parcels
City of Darlington	$13,929,700	$ 79,888,800	**$93,818,500**	**583****	**1,166**
Average Values	$13,204	$82,786*	**$88,927**		

Source: Lafayette Land Records Department, 2013
**Parcels with no value were excluded from the average values (111 such parcels with no total value, 90 with no improvement value, some land value).*
***Land in parcels only – not including right-of-way or gaps in data.*

The City of Darlington assessment data coupled with the 100 year floodplain boundary from FEMA were utilized to calculate the values in Figure 3.10. All parcels that intersected the 100 year floodplain were selected; aerial imagery was used to confirm the location of structures within the floodplain. Several parcels had a small portion within the 100 year floodplain, but the main structure was not within the 100 year floodplain; these parcels are not included in Figure 3.10.

Figure 3.10: Property Values within in the 100 year Floodplain in the City of Darlington

Location	Improvement Values			Land Values			Total Sum
	Total # Parcels	Total Improvement Value	Average Improvement Value	Total # Parcels	Total Land Value	Average Parcel Value	Total Property Value
City of Darlington Floodplain	145*	$8,596,100	$59,280*	153**	$1,234,300	$8,100	$9,830,400

Source: Lafayette Land Records Department, 2013
**Includes tax exempt parcels and excludes taxable parcels with no Improvement Values (8 parcels with no Improvement Values)*
*** Includes tax exempt parcels*

With about $8.6 million in improvement/structural value and $1 million of land value in the 100 year floodplain, the City of Darlington demonstrates significant vulnerability to property damage from flooding events. Approximately 14 percent (110 acres) of the City is within the 100 year floodplain. The properties within the mapped 100 year floodplain have an average improvement value that is 33 percent less than the average for the City as a whole, and parcel values that are 38 percent lower than those for the City. The lower values for the properties within the mapped 100 year floodplain may suggest devaluation of properties resulting from years of flood hazards.

Agricultural Lands

There is little in the way of agricultural production occurring within the City limits, so the impact of flooding on farmland in the City is minimal. However, farming practices in the Darlington area do have an impact on flooding in the community.

The City of Darlington is surrounded by active and productive agricultural lands. Agriculture is crucial to the region's economy. As farming activities intensified over the last 100 or so years, soil erosion and chemical run-off have negatively impacted water quality and increased flood hazards by filling up local streams and the Pecatonica River with sediment. More recently, conservation efforts—such as steam buffers, grass waterways, and contour farming—have been implemented to help keep the soil and chemicals on the fields and out of area surface water.

Still, stakeholders during this process have raised concerns in regards to the extent and effectiveness of such conservation practices, particularly given that the increased value of crops has created incentives to crop very near waterways and on steeper lands. Participants cited situations in which grassed swales were removed and put into crop

production, other land set aside for conservation was again in cultivation (such as along slopes), and crops were planted right up to the banks of area streams and rivers.

Such actions increase the amount of sediment in area streams and the Pecatonica River. This can increase the frequency and severity of floods by diminishing the river's carrying capacity, creating soil blockages at bridges, and increasing the deposition of mud and silt on properties when flooding does occur.

Major Roadways and Bridges

Road washouts and blocked access as a result of floods pose an additional vulnerability in the City of Darlington. The Pecatonica River splits the City of Darlington into two parts and can serve as a regional barrier during flood events. There is only one bridge connecting the north and south portions of the City—the Highway 23/Main Street bridge. In 2008 alone, the bridge was closed on three separate occasions because of high water. Even a temporary bridge closure creates a significant inconvenience for area residents, who must take a detour of 20 to 25 minutes to reach the other side of the community in such events, and impacts economic activity.

Whenever the bridge closes, emergency responders' ability to reach a flooded area, repair damaged infrastructure, or deal with non-flooding related emergencies can be compromised. The City has taken actions to minimize this vulnerability through its Flood Notification Plan, dividing emergency service vehicles on both sides of the City, and creating a second Emergency Operations Center on the south side of the City.

Projected Probability and Damages of Future Flood Events

A Hazard Mitigation Plan must estimate the probably of major hazards, like floods, and estimate damages from them.

The most commonly defined flood boundary is the 100 year floodplain. FEMA creates maps that illustrate the maximum extent of a 100 year flood. Still, a 100 year flood is a misleading term because it leads people to believe that such a flood happens only once every 100 years. The term "100 year flood" is really a statistical designation that indicates there is a 1-in-100 chance that a flood this size will happen during any year. FEMA's current 100 year floodplain is depicted on Map 5.

Historical records indicate that large floods in the City have occurred in fairly frequent intervals over the past 20 years. Since 1990, NOAA recorded 13 flood events in Darlington, which equates to about 3 floods every five years. This is significant. Despite all of the efforts to reduce the flood hazard risk, significant property loss from future floods remains a clear possibility in the City.

To quantify projected loss, a computer model was used to estimate loss during the FEMA-defined 100 year flood event. The HAZUS computer model was created by FEMA for the purpose of helping communities better understand the potential loss from natural disasters. The two major inputs to this model were 2000 statistics from the U.S. Census Bureau (at the time of writing, 2010 Census statistics were not yet incorporated into the model) and elevation data from the USGS. Additional local information was used in the location of critical facilities. FEMA included regional values for construction materials and type. As an example, Map 3 below illustrates the generated floodplain and water depth based on elevation data and displays home locations in Darlington. It is interesting to note that a 100 year flood, as modeled by FEMA HAZUS software, does not reach the FEMA 100 year floodplain boundary for parts of the downtown area. This issue is further addressed in Chapter 4, in the Flood Mitigation Strategies section.

The HAZUS model estimates that a 100 year flood would displace 97 individuals in the City of Darlington and require short term shelter for 20 people. The model also estimates over $2 million in residential loss, which includes building, contents, relocation, income, and rental loss (see Map 4 for areas with largest potential loss). The current property value in City of Darlington, as documented in Figure 3.10, is estimated to be around $94 million. The HAZUS model also estimated that the flood would create 622 tons of debris.

Map 3

100 Year Flood Depth (as modeled by FEMA Hazus Software)

- City of Darlington Multi-Hazard Mitigation Plan -

Park Dr
Frank St
Fayette Rd
Pecatonica River
E. Frank St
E. North St
E. Minerva St
Madison St
Clay St
East St
Arthur St
E. Lucy St
Vinegar Branch
23
Washington St
N. Main St
Wells St
Keep St
E. Mary St
E. Harriet St
E. Catherine St
Ohio St
Division St
81
Lafayette County Fairgrounds
City Campground
E. Cornelia St
E. Louisa St
W. River St
E. Ann St
E. Alice St
City Ball Fields
Wisconsin St
E. River St
Ravine St
23
81
Spring St

- Municipal Boundary
- Major Roads
- Multi-Use Trails
- Natural Gas Pipeline
- Electric Transmission Lines
- Main Street Bridge
- Repetitive Loss Structure
- Hazardous Material
- Vulnerable Population
- Emergency Gathering Place
- School
- Municipal Building
- County Courthouse
- County Sheriff's Dept.
- Fire Station
- City Police Dept.
- Library
- City Garage
- Post Office
- Water Tower
- Healthcare Facility
- Volunteer Rural Medical
- Wastewater Treatment Plant
- Buildings
- 100-year Floodplain

Elevation: 1050 ft – 800 ft

Flood Water Depth: High – Low

Date: 7/1/2014

Sources: US Census Bureau, ESRI, FEMA, USGS, City of Darlington, Lafayette County

0 250 500 1,000 Feet

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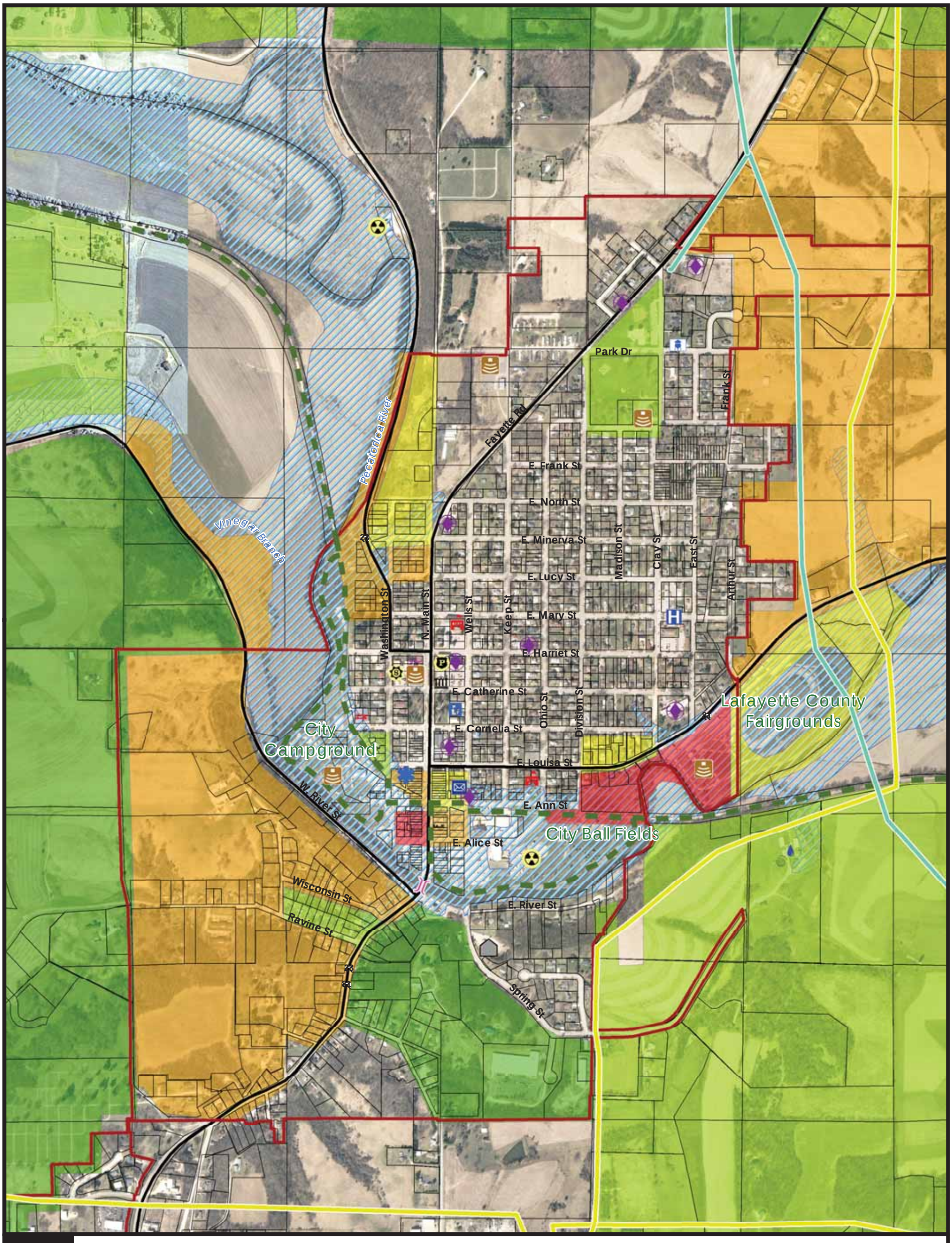

Map 4

100 Year Flood Building and Content Loss (as modeled by FEMA Hazus Software)

- City of Darlington Multi-Hazard Mitigation Plan -

- Municipal Boundary
- Major Roads
- Multi-Use Trails
- Natural Gas Pipeline
- Electric Transmission Lines
- Power Facility
- Main Street Bridge
- Repetitive Loss Structure
- Hazardous Material
- Vulnerable Population
- Emergency Gathering Place
- School
- Municipal Building
- County Courthouse
- County Sheriff's Dept.
- Fire Station
- City Police Dept.
- Library
- City Garage
- County Highway Dept.
- Post Office
- Water Tower
- Healthcare Facility
- Volunteer Rural Medical
- Wastewater Treatment Plant
- Buildings
- 100-year Floodplain

Loss by Census Block

- 0 - $10,000
- $10,001 - $40,000
- $40,001 - $80,000
- $81,001 - $200,000
- $200,001 and up

Date: 7/1/2014

Sources: US Census Bureau, ESRI, FEMA, NAIP, City of Darlington, Lafayette County, USGS, WROC

0 250 500 1,000 Feet

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In addition to these quantitative damage estimates, the following general potential damages from a 100 year flood are anticipated in the City based on data from the National Weather Service and input from the City, the Plan Commission, stakeholders, and residents:

- **Transportation Network:** washed out roads and bridges, undermined riverbanks, embankment failures, and debris cleanup. The strong current of water across roads can cause serious injuries and death when individuals attempt to drive or cross these flooded areas.[6] Also, blockages to major roads can interrupt economic activity.
- **Drainage Systems**: damaged and destroyed culverts and pipes and debris cleanup.
- **Public Property:** flooded public facilities such as schools and parks and damaged recreational amenities, lands, and historic sites.
- **Access to Critical Facilities:** Facilities like the post office in Darlington could potentially incur damage from a 100 year flood event.
- **Utilities:** downed transmission lines and poles, damaged transformers and telecommunication networks, damaged water treatment systems, diminished water quality from overflow and backup of sanitary sewer.
- **Residential Structures:** flooded basements, collapsed foundations, damaged septic systems, collapsed wells, and destroyed/severely damaged homes.
- **Agricultural Lands:** inundated cropland, injured livestock, soil erosion, delayed planting/growing season, washout of seed and agricultural chemicals into drainage systems, root and plant rotting, stunted crop growth, and decreased nutritional value.
- **Businesses:** inventory and revenue loss and permanent closure. According to FEMA, approximately 30 percent of flood-impacted businesses do not reopen following a disaster. These closures result in restricted access to goods and services as well as lost tax revenue that can lead to decreased services provided by local governments.
- **Local Economy:** additional public expenditures for response and recovery personnel, repair materials, and equipment; and lost revenue from closed businesses and destroyed cropland and livestock.

Severe Thunderstorms and Windstorms

Severe Thunderstorms and Windstorms Hazard Overview

The National Weather Service defines a severe thunderstorm as a storm event that produces any of the following: downbursts with winds of 58 miles per hour (50.4 knots) or greater, hail of ¾ of an inch or greater, or a tornado. Any given county in Wisconsin may experience ten or more thunderstorms per year.[7] A thunderstorm cell travels approximately 30 to 50 miles per hour and generally runs its course of creation and dissipation within 30 minutes. In Wisconsin, heavy rain, lightning, hail, tornadoes, and severe winds occur separately and in combination during severe storm events.[8] Thunderstorms can occur throughout the year with the highest frequency between May and September between noon and midnight.

The following is a description of the characteristics and risks associated with severe thunderstorms and windstorms.

Lightning

Lightning travels between and among the ground, clouds, and tall structures. Lightning can cause death and injury to humans and animals, set fire to buildings, and cause damaging surges within the power and communications grids. Lighting is responsible for the death of more people in the U.S. each year than tornadoes or hurricanes. People are at greatest risk of fatality and injury from lightning when at outdoor recreation events or near trees.[9]

[6] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.
[7] Ibid
[8] Ibid.
[9] Ibid.

Hail

Hail is developed when there are sufficiently strong and persistent up-draft wind speeds and water has accumulated in a super-cooled state in the upper parts of the storm. Although injury and loss of life is rarely associated with hailstorms, property damages can be extensive. Hail ranges in size from barely visible to the size of softballs and larger, and tend to fall in swaths of 20 to 100 miles. The hail season peaks between April and June, and occurs primarily between noon and midnight.

Severe Windstorms

In Wisconsin, thunderstorm winds actually cause more damage year-to-year than tornadoes, and this is no exception in the City of Darlington, which particularly in its highest elevations (e.g., the high school property) is a very windy place. Severe winds (58 mph or greater) are most common between April and September, peaking in June. The following terms are used to describe causes and types of severe winds:[10]

- **Straight-line wind:** A straight-line wind includes any thunderstorm wind that is not associated with rotation, differentiating them from tornadic winds. Straight-line winds can be difficult to detect on radar. Most straight-line winds are a result of outflow generated by a thunderstorm downdraft. Straight-line winds can produce damage equivalent to an F0 or F1 tornado.
- **Downdraft:** A downdraft is a small-scale column of air that rapidly sinks toward the ground.
- **Downburst:** A downburst occurs when a strong downdraft wider than 4 km (2.5 miles) results in an outward burst of damaging winds on or near the ground. Downburst winds sometimes begin as a microburst and spread out over a wider area, sometimes producing damage similar to a strong tornado.
- **Microburst:** A microburst is a small, concentrated downburst less than 4 km (2.5 miles) that produces an outward burst of damaging winds at the surface. Microbursts generally last five to ten minutes, with maximum wind speeds up to 168 mph.

Source: ALAC Weather - Barneveld Tornado, 1984.

Tornadoes

A tornado is a violently rotating, funnel shaped column of air that may or may not touch the ground. Average winds in a tornado are 175 to 250 miles per hour and may produce winds in excess of 300 miles per hour. Most Wisconsin tornadoes travel southwest to northeast or west to east, travel speeds average around 20 to 40 mph, and persist for less than ten minutes with a path length of less than five miles.[11] The destructive power of a tornado lies primarily in its high wind velocities and sudden changes in pressure, which are thought to account for over 90 percent of resulting damages. Tornadoes are associated with storm systems and therefore usually are accompanied by hail, torrential rain, and intense lightning. Tornadoes can strike anywhere and cause extensive damage.

Tornadoes can occur in any month but are most common from March through August, between 3:00p.m. and 7:00p.m.[12] Wisconsin lies along the northern edge of "tornado alley," which spans from Texas to Michigan.

In the U.S., tornadoes were historically classified using the Fujita Scale into six intensity categories, F0 to F5. These categories are based on the estimated maximum wind speed occurring within the funnel. Since February 2007, the Enhanced Fujita Scale has been used, ranging from EF0 to EF5. The new EF-Scale improves upon the F-Scale by

[10] National Oceanic and Atmospheric Administration. *National Severe Storms Laboratory Website*. http://www.nssl.noaa.gov/primer/wind/wind_basics.html

[11] National Weather Service, Milwaukee/Sullivan, WI. http://www.crh.noaa.gov/mkx/flyers/flyertor.php

[12] Wisconsin Emergency Management. (2002) *Hazard Analysis for the State of Wisconsin.*

estimating the strongest three-second wind gust based on the degree of damage to one or more of 28 classes of trees or structures. Figure 3.11 illustrates the damage experienced for each EF class as well as the average percentage of each class of tornado from the National Weather Service. In Wisconsin about 80 percent of tornadoes are between 50 and 110 mph, 19 percent are rated as strong with speeds of 110 to 205 mph, and only one percent is violent with winds speeds in excess of 205 mph. [13]

Figure 3.11: Tornado Wind and Damage Scale

Tornado Scale	Wind Speeds (mph)	Damages	National Average Frequency of Occurrence
EF0	65-85	(Light Damage) Chimneys are damaged, tree branches are broken, shallow-rooted trees are toppled.	29%
EF1	86-110	(Moderate Damage) Roof surfaces are peeled off, windows are broken, some tree trunks are snapped, unanchored manufactured homes are over-turned and attached garages may be destroyed.	40%
EF2	111-135	(Considerable Damage) Roof structures are damaged, manufactured homes are destroyed, debris becomes airborne (missiles are generated); large trees are snapped or uprooted.	24%
EF3	136-165	(Severe Damage) Roofs and some walls are torn from structures, some small buildings are destroyed, non-reinforced masonry buildings are destroyed and most trees in forest are uprooted.	6%
EF4	166-200	(Devastating Damage) Well-constructed houses are destroyed, some structures are lifted from foundations and blown some distance, cars are blown some distance and large debris becomes airborne.	2%
EF5	Over 200	(Incredible Damage) Strong frame houses are lifted from foundations, reinforced concrete structures are damaged, automobile-sized debris becomes airborne and trees are completely debarked.	Less than 1%

Source: NOAA

Historical Occurrences of Severe Thunderstorms and Windstorms

Lightning

In recent history, lightning has caused $10,000 in damage from a storm in June of 1997 in the City of Darlington.

Hail

Between 1969 and 2013, the City of Darlington and surrounding areas experienced 30 occurrences of severe hail causing $2,400,000 in property damages in the City and no recorded crop damage. On April 13, 2006, a very destructive hailstorm struck nine counties in southern Wisconsin. Based on partial insurance claims of about $158.55 million, this storm is the most costly hailstorm to affect Wisconsin. Lafayette County experienced approximately $4.73 million in damages, whereas the City of Darlington alone suffered $2.4 million in damages. Large hailstones over an inch in size damaged vehicles, roofs, and windows; dented sheet metal; and killed many water birds. Refer to Table A3 in Appendix A for a full list of these historical events.

[13] National Weather Service, Milwaukee/Sullivan, WI. http://www.crh.noaa.gov/mkx/flyers/flyertor

Severe Windstorms and Tornadoes

There have been 72 reported occurrences of severe thunderstorms and winds in Lafayette County between 1950 and 2013, with seven such storms causing damage within the City of Darlington. These events have caused a reported $13,026,000 in damages throughout the County of which $1,712,000 occurred in the City of Darlington. Refer to Table A2 in Appendix A for a full list of these historical events.

Tornadoes most frequently occur between April and September, in late afternoon and early evening hours. This is true in Lafayette County, as all recorded tornadoes occurred between April and September. Since 1950, 19 tornadoes have been recorded in the Lafayette County by the National Weather Service—four F0 (light damage), eight F1 (moderate damage), five F2 (considerable damage), and two F3 (severe damage) on the old Fujita Scale. There was also one occurrence of a funnel cloud in Lafayette County in 2011. Total known damages from these events are about $4,600,000. In recent history, the City of Darlington has been spared from the damaging impact of tornadic activity. There have been no recorded tornadoes in Lafayette County since 1988. Refer to Table A4 in Appendix A for a full list of these historical events.

Severe Thunderstorms and Windstorms Hazard Vulnerability

Based on review of the historic patterns of thunderstorms and associated hail, lightning, wind, and tornado events, the entire City is vulnerable to damages from severe storms and tornadoes. In Wisconsin hail events represent 20 percent of all severe weather events, straight-line winds make up 72 percent, and tornadoes add about eight percent.[14] In most of Wisconsin there are approximately 30 thunderstorm days per year but in extreme southwest corner of the State, including Lafayette County, there are on average 40 thunderstorm days per year. [15]

The City of Darlington and surrounding areas are particularly vulnerable to the impacts of severe storms. The City of Darlington is the county seat, the largest city in the area, and supplies services to the surrounding rural populations. Critical facilities and vulnerable populations within the City are both documented on Map 5.

The City's median age has been increasing over the past several decades and the percentage of individuals over the age 65 is about three percent higher than the County's average and five percent higher than the state. One can expect the number of elderly citizens to continue to grow. Both elderly and individuals with special needs require specialized assistance and care in case of an emergency. These groups of people are most at risk for injury or death from severe storms, tornadoes, or other severe windstorms.

In the past, two injuries were documented from severe thunderstorms, one each in 1997 and 1998. Additionally one death from an ATV accident was a result of downed trees in a 1998 storm.

Lightning

People are at greatest risk of fatality and injury from lighting when at an outdoor recreation event or near objects such as tall trees or water towers.[16] Between 1959 and 1999, lightning killed 49 people giving Wisconsin a rank of 29th in the nation and lightning injured another 230 people ranking Wisconsin 19th. [17]

Hail

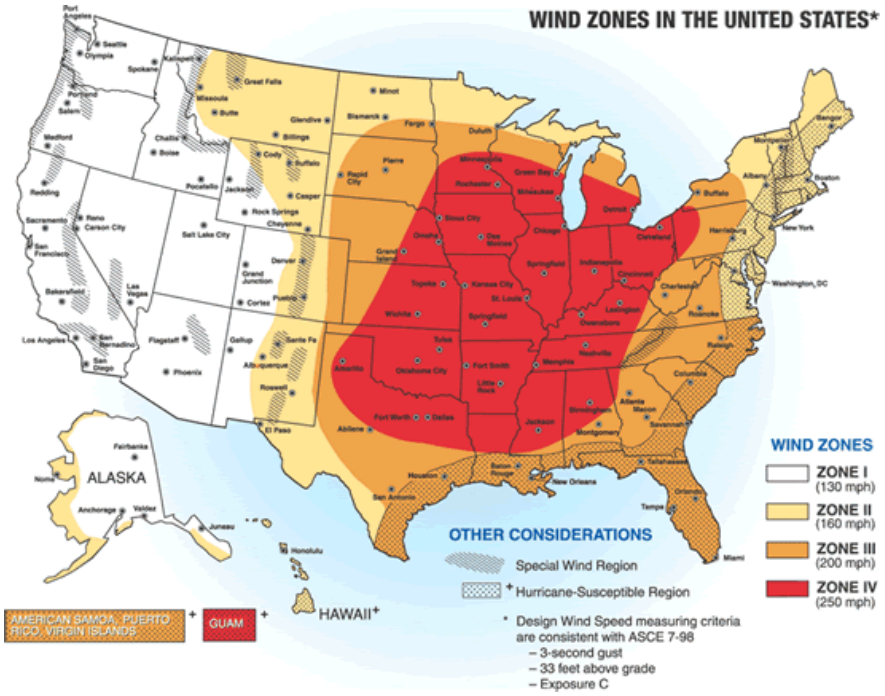
Building roofs, vehicles, and other outdoor objects of value are most vulnerable to hail damage. Livestock is also vulnerable to damage.

Tornadoes and Severe Winds

Overall, the City of Darlington is vulnerable to severe winds and tornadoes and is located in the most severe wind zone in the U.S. as illustrated in Figure 3.12.

[14] National Weather Service, Milwaukee/Sullivan, WI. http://www.crh.noaa.gov/mkx/flyers/flyerhail.php
[15] Wisconsin Emergency Management. (2005) *Hazard Analysis for the State of Wisconsin.*
[16] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin.*
[17] National Weather Service, Milwaukee/Sullivan, WI. http://www.crh.noaa.gov/mkx/flyers/flyertstm.php

Figure 3.12: Wind Zones in the United States



Generally, concentrated populations and individuals with special needs are most vulnerable to severe winds. In particular, mobile home parks, campgrounds and industrial parks are most vulnerable to damage from tornadoes and severe winds. Like mobile home parks, campers and pole-shed style industrial buildings do not provide protection against the wind velocities of a tornado, and often there is no shelter provided in the building or area.

Projected Future Probability of Severe Thunderstorms and Windstorms

Probability is described below for each of the hazards associated with severe storms.

Lightning

Between 1950 and 2013, the City of Darlington experienced one recorded occurrence of lightning that caused damage. These events do not appear to be a severe risk.

Hail

Between 1950 and 2013, Lafayette County experienced 30 events and the City of Darlington encountered 9 instances of hail. Based on this historic frequency, the County can expect a severe hailstorm about once every other year and the City should expect a hailstorm once every seven years.

Tornadoes and Severe Winds

There have been 72 reported occurrences of severe thunderstorm winds in the County and 12 within the City of Darlington between 1950 and 2013. Based on this, there is a likelihood of severe winds, not including tornadoes, occurring about once a year in the County and once every five years in the City.

Between 1950 and 2013, 19 tornadoes have been recorded in Lafayette County by the National Weather Service. Based on this, there is a 30 percent probability of a tornado occurring in Lafayette County in any given year. Figure 3.13 illustrates the probability of a tornado by magnitude based on past occurrences.

Figure 3.13: Probability of Tornadoes by Magnitude

	EF0	EF1	EF2	EF3	EF4	EF5
Number of Tornadoes Reported since 1950	1	7	5	2	0	0
Probability of each magnitude of tornado, when a tornado occurs – Lafayette County	6.7%	46.7%	33.3%	13.3%	< 1%	< 1%
Probability of each magnitude of tornado, when a tornado occurs – State of Wisconsin	80%		19%		1%	

Source: National Weather Service, Milwaukee/Sullivan, WI. http://www.crh.noaa.gov/mkx/flyers/flyertor

While no tornadoes over an EF3 magnitude have been recorded by the National Weather Service in Lafayette County, tornadoes up to EF5, the most severe, have occurred in Wisconsin. According to the Wisconsin Natural Hazard Plan, "every county in Wisconsin has had tornadoes and is susceptible to a tornado disaster."

Projected Future Damages from Severe Thunderstorms and Windstorms

In the past, severe thunderstorm events caused substantial property and infrastructure damage and it is logical to assume they will continue to do so. Potential damages from severe storms include the following:

- **Utilities:** downed and damaged electrical lines, poles, and antennae; damaged transformers, telephone lines, and interrupted radio communications
- **Transportation network:** debris cleanup and road damage
- **Drainage network:** debris cleanup, damaged and destroyed culverts and pipes
- **Residences:** damaged or destroyed houses, mobile homes, garages, trees, siding, roofs, and windows
- **Businesses:** closures and building and inventory damages
- **Agricultural lands:** damage or destroyed buildings, crops, and livestock; and soil erosion
- **Personal property:** damaged cars, trucks, and recreational vehicles
- **People and animals:** death and injury

Lightning

There have been no reported fatalities or injuries in Darlington due to lightning. However, lighting is responsible for the death of more people in the U.S. each year than tornadoes or hurricanes. Wisconsin is ranked 29th in the nation for lightning deaths and 19th for injuries.[18] Consequently, people in the City of Darlington are still at risk of injury and death from lightning.

Hail

Between 1969 and 2013, NOAA data reports that there have been 30 occurrences of severe hail in Lafayette County and 9 occurrences in the City of Darlington. The only damage recorded was from a storm in 2006, severely impacting the City of Darlington and causing $2,400,000 in damages.

Tornadoes and Severe Windstorms

Between 1950 and 2013, Lafayette County incurred 92 severe thunderstorms and tornadic events with damages ranging from $0 to $10,400,000 for a total of $17,591,000 and an average of $191,206 per storm. During the same time period, the City of Darlington experienced 12 documented storms, resulting in $1,712,000 in documented damages.

NOAA data indicates that tornadoes caused $4,565,000 of damage in the County from 1950 to 2013. Past impacts from tornado events have included downed utility lines, uprooted trees, destroyed and damaged homes, and damaged agricultural building. The average damage from a tornado is $228,250.

Damages from future tornadoes are projected to predominantly impact a one- to two-mile long area, 100 yards wide, as most tornadoes will be weak. However, it is possible that a strong tornado will occur, resulting in a path ¼ to ½

[18] National Weather Service, Milwaukee/Sullivan, WI. http://www.crh.noaa.gov/mkx/flyers/flyertstm.php

mile wide and 20 miles long. It is also possible that a violent tornado will occur, resulting in a one-mile wide path and extending greater than 20 miles.

Severe Winter Storms

Severe Winter Storms Hazard Overview

Winter storms include heavy snowstorms, blizzards, and ice storms. Winter storms cover broad geographical areas and one storm can impact entire regions of the state. The winter storm season in Wisconsin generally runs from October to March. However, severe winter weather has occurred as early as September and as late as April and the early part of May in some locations of the state. Historical events have resulted in problems of drifting snow and hazardous roadway conditions. According to the Wisconsin Natural Hazard Mitigation Plan, there are five categories of winter storms:

- **Blizzard:** The most dangerous of all winter storms, a blizzard combines low temperatures, heavy snowfall, and winds of at least 35 miles per hour reducing visibility to only a few yards.
- **Heavy Snowfall:** A heavy snow storm produces six inches or more of snow in a 12-hour period or eight inches or more in a 24-hour period.
- **Ice Storm:** An ice storm occurs when moisture falls and freezes immediately upon impact.
- **Freezing Drizzle/Freezing Rain:** Rain that falls upon surfaces 32 degrees Fahrenheit or below, freezing on impact.
- **Sleet:** Solid pellets or grains of ice that forms from rain freezing before hitting the ground or the refreezing of largely melted snowflakes.

Wisconsin experiences three to five days of freezing rain per year and a major ice storm occurs about once every other year.[19] Much of the snowfall in Wisconsin occurs in small increments between one and three inches per storm. Heavy snowfalls occur on average of five times per year throughout the state.[20] In addition to individual storm events, a severe winter storm occurs when an extremely cold period extends for over a month or when severe ice storms or heavy snowfall occur repeatedly for six weeks or more.

Historical Occurrences of Severe Winter Storms

NOAA reported 59 severe winter storm events in Lafayette County between 1993 and 2013. Refer to Table A5 in Appendix A for a full list of these historical events. These storms included heavy snow, ice storms, and blizzards. Extreme temperatures resulted in one death in 1996. As winter storms are typically widespread, data in the following sections will be discussed at the County level.

Severe Winter Storms Hazard Vulnerability

Winter storms present a serious threat to the health and safety of residents and can result in significant damages to property. Heavy snow and accumulated ice can cause structural collapse of buildings, downed power lines, and isolation of people from assistance and services, particularly in rural areas surrounding the City of Darlington. Research suggests that 70 percent of fatalities related to ice and snow occur in automobiles and 25 percent are people caught outside in the cold.[21]

Historic data indicate no specific pattern of incidents; therefore, all jurisdictions, structures, and critical facilities are equally vulnerable to damages due to severe winter storms. Potential impacts could include damaged roofs due to ice or snow-loading, frozen pipes, and downed electrical lines. A severe winter storm event could damage critical facilities, interrupt provision of water and electricity, and temporarily suspend public services.

The rural and aging population increases the City's vulnerability to winter storm hazards. Access to rural populations is often delayed or impossible during severe winter storms. Some of the most vulnerable populations to winter storms

[19] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.
[20] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.
[21] National Weather Service, Milwaukee/Sullivan, WI. *http://www.nws.noaa.gov/om/winter/winter1.htm*

are the elderly and those with special needs. Both elderly (a large and growing population in Darlington) and individuals with special needs require specialized assistance and care in case of an emergency, which can be delayed or temporarily suspended in winter weather. These groups of people are most at risk for injury or death from winter storms. The combination of the above factors creates the need for increased communication, education, and preparedness in the case of a severe winter storm.

Projected Future Probability of Severe Winter Storms

Based on historical frequency of 59 events over the 20-year period from 1993 to 2013, the City can expect three severe winter storm events per year.

Projected Future Damages from Severe Winter Storms

Damages and losses due to winter storms are generally minor and widespread. Increased automobile accidents and additional municipal expenditures for emergency response and snow removal are common, and such claims are not tracked. Potentially extreme impacts of winter storms usually involve ice storms. For the County, damages were only reported for one ice storm in 1996, which caused $300,000 in damages.

Possible damages that could occur from winter storms include the following:

- **Infrastructure:** temporarily closed/blocked roadways, additional hours and equipment for emergency services, and diminished operation of public facilities and schools.
- **Utilities:** downed power lines and frozen pipes. Most of the City of Darlington's power lines are above ground and power outages could severely impact City residents during a severe winter storm. The cost of burying power lines is often times cost prohibitive.
- **Private property:** damaged or collapsed roofs, ice damming, and damaged vehicles.
- **Businesses:** diminished profits due to closure or destroyed inventory.
- **Agriculture:** injured or killed livestock.
- **Injury and death:** people are at risk of injury or death in particular when driving conditions are hazardous due to slick road, winds, and decreased visibility from snow. Extremely cold temperatures accompanied by strong winds can result in temperatures that can cause frostbite, hypothermia, and death.

Drought

Drought Hazard Overview

Drought can be both agricultural and hydrologic. Agricultural drought is a dry period of sufficient length and intensity that markedly reduces crop yields. Hydrologic drought is a dry period of sufficient length and intensity to affect lake and stream levels and the height of the groundwater table. Agricultural and hydrologic droughts may, but do not necessarily, occur at the same time.

Drought conditions may vary from below normal precipitation for a few weeks to severe lack of normal precipitation for a couple of months to years. Additionally, the onset and end of a drought can be difficult to detect. Weather conditions, soil moisture, run-off, water table conditions, water quality, and stream flow affect drought conditions. Specifically, high temperature, high wind, and low relative humidity can all contribute to drought severity. [22]

Near the City of Darlington, agricultural land is the most vulnerable to drought, as the amount and timing of precipitation has a significant impact on crop production. Therefore, the severity of a drought must be measured in terms of crop yield as well as precipitation. Drought mitigation measures focus on conservation and preparation management.

[22] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.

Historical Occurrences of Drought

Wisconsin Emergency Management documented several regional droughts that impacted the City of Darlington. The most significant was from 1929 to 1934, following that was a drought from 1976 to 1977, which caused approximately $624 million dollars in agricultural loss. The drought of 1987 to 1988 was believed to be more severe than the 1976-77 drought, causing between 30 percent and 60 percent crop loss, with agricultural losses set at $1.3 billion for the region.

In recent history, NOAA documented droughts in 2002, 2003, 2005, and 2012. The 2002 drought resulted in over $4.4 million in agricultural loss statewide. In August 2003, Lafayette County farmers experienced 35 percent to 40 percent damage to corn, 50 percent damage to soybeans, and 35 percent damage to the hay crop due to the drought that year. The total crop damage was around $1 million. In 2005, drought conditions persisted through much of the growing season in southern Wisconsin, with severe dryness impacting Lafayette County crop yields. 23 In 2012, crop production decreased substantially in Wisconsin—corn production dropped by 16.7 percent compared to 2011. Soybean yield also decreased by 16 percent. However, 2012 crop revenue in Wisconsin was similar to 2011; the crop shortage resulted in high prices which made up for lesser yield. In addition, crop insurance subsidies from the government offset some farmers' loss.[24]

Drought Hazard Vulnerability

Agricultural areas of the County are most vulnerable to the impacts of drought—these are generally outside of the City limits. Still, municipal water systems have the potential to be impacted by drought. Substantial events can ruin cropland and result in great loss, hurting the local economy. Droughts also increase the risk of forest fires because of the extreme dryness. The loss of vegetation from a drought can result in flooding, even from an average rainfall. [25] So the impacts of drought on the City can be significant.

Projected Future Probability of Drought

WEM has documented six significant droughts in the state since 1930. Therefore, the future probability of a significant drought is about a ten percent in any given year. It appears that the frequency of droughts—significant and relatively minor—has increased over the past several years. For example, according to NOAA, four droughts between 2002 and 2013 have occurred. This suggests that the chance that a dry period classified as a drought has nearly a 50 percent chance of happening in any given year in and near Darlington.

Projected Future Damages from Drought

The specifics of past financial loss from drought for the City of Darlington are limited; therefore, it is difficult to quantify future damages on the City and its inhabitants from drought.

Extreme Temperatures

Extreme Temperatures Hazard Overview

Extreme heat is defined as temperatures that hover ten degrees or more above the average high temperature for several weeks. Additionally, high humidity contributes to extreme heat by retarding the body's ability to cool from evaporation of perspiration, causing the body to work much harder to cool down. Sunburn also slows the skin's ability to release heat. Stagnant atmospheric (humid and muggy) conditions and poor air quality can also induce heat-related illnesses. Another result of extreme heat is greater electricity demands for air conditioning systems, which can lead to power outages.

Extremely cold temperatures accompanied by strong winds can result in temperatures that can cause frostbite, hypothermia, and death.

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[23] US Department of Commerce. *National Climatic Data Center*. http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms

[24] Department of Agricultural and Applied Economics, UW-Madison and Cooperative Extension, UW-Extension. *Status of Wisconsin Agriculture, 2013*.

25 Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.

Historical Occurrences of Extreme Temperatures

NOAA data for temperature extremes in the City of Darlington are only recorded as far back as 1994, and are listed in detail in Table A6 in Appendix A. There have been 19 instances of extreme cold and 30 instances of extreme heat since 1994. In recent history, NOAA did not record any injuries, deaths, or financial loss from extreme temperatures in the City of Darlington.

The most severe instances of extreme temperature in the region were related to cold weather and harsh windchills in December 9, 1994, and February 1, 1996. In both storms, a total of six people died and 39 people were injured in the more densely populated areas around Milwaukee. The summer of 1995 produced two periods of prolonged heat in June and July. Between July 12 and 15, the extreme heat produced the greatest number of weather-related deaths in Wisconsin history. During this heat wave, 141 Wisconsinites died directly or indirectly from the heat.[26] At the end of July 1999, high humidity and temperatures in the 90s and 100s produced heat index values of 110 and 125. This heat wave alone accounted for 12 direct and eight indirect deaths statewide, according to the National Weather Service.

Extreme Temperatures Hazard Vulnerability

Populations that are particularly susceptible to illness, injury, and death from extreme temperatures include the elderly, low-income persons (particularly if they cannot afford sufficient heating or cooling), people in urban areas, young children, sick persons, overweight persons, persons with alcohol problems, and men in general (because they sweat more and become more quickly dehydrated). Usually the victims have been overexposed to heat or have over-exercised for their age and physical condition. Excessive heat also puts strain on a person's respiratory and cardiovascular system, particularly impacting toddlers and the elderly.

Heat waves kill more people in the U.S. on average than all other natural disasters combined.[27] Risk is particularly high in the most urbanized areas, such as the Milwaukee area, which experiences exacerbated heat due to the urban heat island effect, and also has a higher concentration of poor and elderly persons than most other parts of the state.

The City of Darlington has an aging population, and consequently its residents are becoming more vulnerable to extreme temperatures over time. The percentage of the City's senior population (aged 65 and older) was 18.4 percent, which was considerably higher than the state average of 13.7 percent. The City's elderly population is projected to increase over the next 20 or so years, therefore increasing the number of potentially vulnerable people.

Projected Future Probability of Extreme Temperatures

Based on NOAA accounts of extreme temperatures from 1994 to 2013, there is a likelihood of extreme cold occurring about once a year and extreme heat occurring about three times every two years in the City.

Projected Future Damages from Extreme Temperatures

Extremely high or extremely low temperatures pose significant threat to the health of people and animals. Although such extremes cannot be avoided, planning for their occurrence will minimize their impact.

There is no record of quantified damages to property due to severe temperatures in the City of Darlington. However, damages are possible, as described in the list of potential damages from extreme temperatures below:

- Human illness or death including heatstroke, respiratory problems, frostbite, and hypothermia
- Livestock and pet illness or death due to extended exposure to extreme temperatures
- Electricity outages due to high usage, causing interruptions in communications infrastructure and business productivity
- Buckling pavement
- Loss of water pressure when fire hydrants opened in urban areas
- Broken plumbing pipes resulting from freezing water

[26] Ibid.
[27] New York Times. *Most Deadly of the Natural Disasters: The Heat Wave*. August 13, 2002.

Earthquakes

Earthquake Hazard Overview

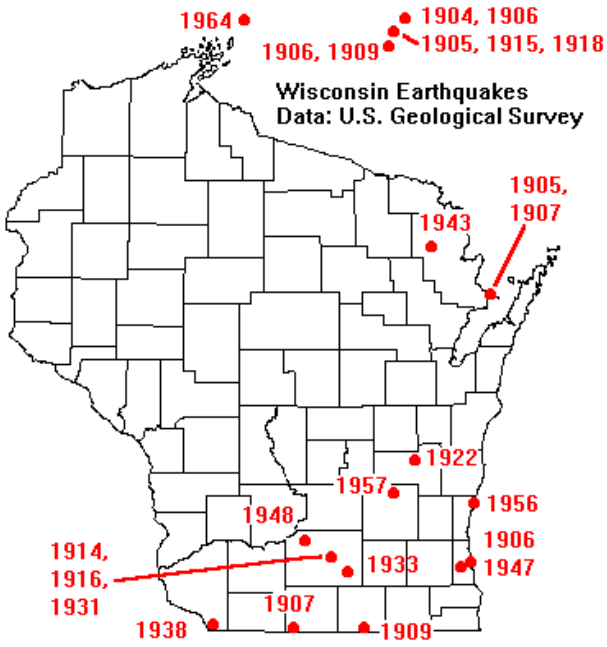
An earthquake is caused by slipping plates that make up the earth's crust. Earthquakes result in a sometimes violent shaking or trembling of the ground. An earthquake does not need to be of large magnitude to cause extensive damage. Areas that are less prone to this hazard event are usually less prepared, which can result in significant damage. In the U.S., earthquake intensity is monitored using the Modified Mercalli Scale on a scale of I, meaning relatively low intensity, to XII meaning very high intensity. Earthquake magnitude is measured by the Richter Scale of one to eight, with eight being the most severe. The Richter Scale measures an entire earthquake event whereas the Modified Mercalli Scale measures the effects of an earthquake at different sites.

Earthquakes in the Midwest originate at depths of 1 to 20 km below the earth's surface. Bedrock in the central U.S. is flat-lying, old, intact, and strong and consequently earthquake vibrations travel very far through this bedrock in comparison to the young, broken, weak bedrock of the west coast. Consequently, earthquakes in the central U.S. are felt and cause damage in an area 15 to 20 times greater than west coast earthquakes of similar magnitudes.[28]

Historic Occurrences of Earthquakes

The historical occurrence of earthquakes in Wisconsin varies depending on whether the earthquake was felt or whether it originated in state. The USGS lists 19 events and 11 more near the Upper Peninsula of Michigan which are illustrated in Figure 3.14. Additionally, Wisconsin Emergency Management lists 24 historic quakes in the past century.

Figure 3.14: Historical Earthquakes



Significant earthquakes that have been felt or that originated in Wisconsin include the following:[29, 30]

- December 1811 – February 1812: Strongest historic earthquakes in North America (estimated 8.3 to 8.7 on Richter Scale) occurred in the New Madrid Fault Zone near New Madrid, Missouri.
- May 26, 1909: 5.1 magnitude earthquake believed to originate in Aurora, Illinois, reached over 500,000 square miles and caused moderate damage to areas in southern Wisconsin.
- May 6, 1947: Center just south of Milwaukee near the shore of Lake Michigan caused minor damage and rattled windows in communities in a 4,000-square mile radius.
- November 9, 1968: The strongest earthquake in recent history occurred in south central Illinois, and the shock was felt in portions of 23 states including cities of Baraboo, La Crosse, Portage, Sheboygan, Beloit, and Milwaukee in Wisconsin.
- April 3, 1974: This magnitude 4.75 earthquake originated near the 1968 earthquake in southern Illinois, and was felt in most southern Wisconsin.
- April 18, 2008: A 5.2 magnitude earthquake originated in West Salem, Illinois, and was felt in Chicago, Milwaukee, Madison, Cincinnati, and Des Moines. Around 15 aftershocks followed this quake in the next several days with the strongest measuring 4.6. [31]

[28] Illinois Emergency Management Agency. *Illinois Natural Hazard Mitigation Plan.*
[29] USGS. Earthquake Hazards Program. http://earthquake.usgs.gov/regional/states/wisconsin/history.php
[30] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin.*
[31] MSNBC. *Earthquake Felt in Wisconsin.* http://www.msnbc.msn.com/id/24195355/

Earthquake Hazard Vulnerability

The threat to Wisconsin from earthquakes is considered to be low, with likely damage ranging from rattling windows to plaster cracking.[32] The quakes that have been felt are centered in Wisconsin and adjacent states. The cause of these earthquakes is not fully understood but believed to be a result of the continuing rebound of the earth's crust after the retreat of the last glacial ice.[33] In the event of an earthquake from the New Madrid Fault zone along the Mississippi River Valley in Missouri, southern portions of Wisconsin would experience very light to moderate damage. Another potential impact of a major New Madrid Fault earthquake could be damage to petroleum and natural gas pipelines that traverse regions near the fault zone.

Projected Future Probability of Earthquakes

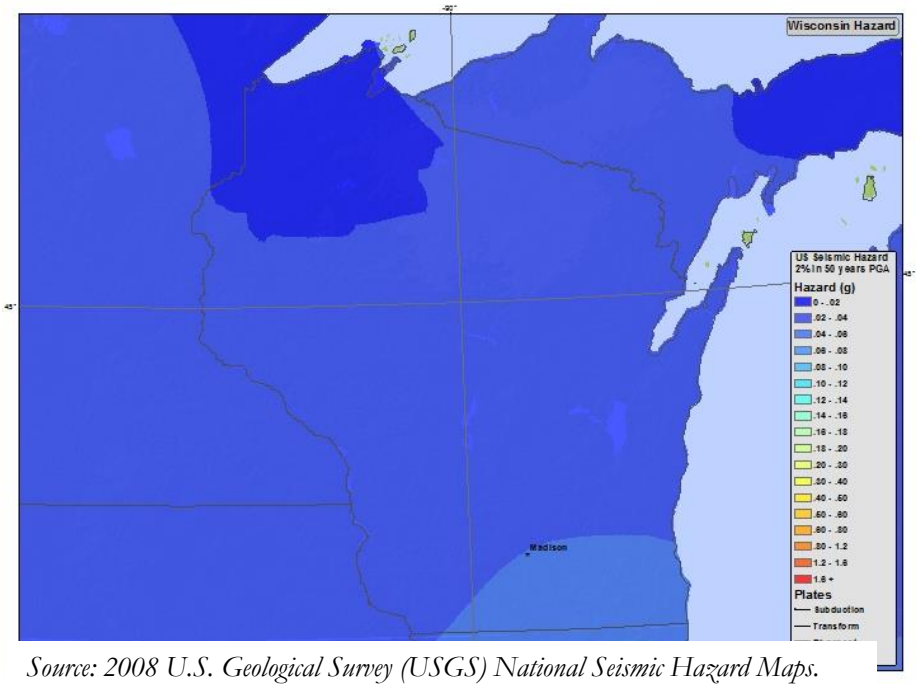
Most earthquakes that occur in Wisconsin are very low in intensity and occur once every few years.[34] According to Wisconsin Emergency Management, even an earthquake in the New Madrid Fault zone equivalent to the 1811 quake would only cause minor damage to counties in southeastern Wisconsin.

Within the past century, there have been no earthquakes that have originated in Wisconsin over a magnitude of 4.5.[35] The City of Darlington has only a one to two percent chance for an earthquake greater than 4.75 on the Richter Scale in 100 years. Figure 3.15 illustrates ground motions having a 2-percent probability of exceedance in 50 years. The USGS National Seismic Hazard Mapping Project developed these maps by incorporating information on potential earthquakes and associated ground shaking obtained from interaction in science and engineering workshops involving hundreds of participants, review by several science organizations and State surveys, and advice from two expert panels.

Projected Future Damages from Earthquakes

There is not a record of damages from past earthquakes experienced in the City of Darlington. Given the past history of earthquakes in Wisconsin, there is little risk except to structures that are poorly constructed.[36] A more likely concern is indirect effects such as the disruption of oil, gas, and electric transmission, as well as other goods and services from other, more highly affected areas.

Figure 3.15: Seismic Hazard



Source: 2008 U.S. Geological Survey (USGS) National Seismic Hazard Maps.

[32] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.
[33] Ibid.
[34] Ibid.
[35] Ibid.
[36] Wisconsin Emergency Management. *Hazard Analysis for the State of Wisconsin*.

Climate Change

Climate is the long-term average of weather conditions in a specific location. It is determined through statistical analysis of weather data collected over a long period of record. Climate change affects more than just a change in the weather; it refers to seasonal changes over a long period of time. These climate patterns play a fundamental role in shaping natural ecosystems and the human economies and cultures that depend on them.

The data in this section is from the *Wisconsin's Changing Climate: Impacts and Adaptations (2011)* report by the Wisconsin Initiative on Climate Change Impacts.

Historic Data

Wisconsin's climate is changing. Temperature and precipitation data from 1950 to 2006 indicate that, on average, our State has become warmer and wetter. In Wisconsin, the average temperature rose by about 1.1 degree Fahrenheit during that period. However, southwestern Wisconsin was one of the areas of the State that saw little change in annual temperature. In addition, the western half of Lafayette County saw the frequency of days per year over 90 degrees decrease by 2 to 4 days. This one degree increase statewide coincides with the shorter length of time that lakes remain frozen, the change in timing of some bird migrations, the emergence and flowering of certain plants, increase in the length of the growing season, and other effects that indicate milder winters and earlier springs. Annual precipitation over the same period has also increased statewide by 3.1 inches, an increase of approximately 10 percent. Average annual precipitation also increased in Lafayette County, but less than the state average, by one to 1.5 inches.

Vulnerability Assessment and Future Probability

According to this report, Wisconsin's warming trend will not only continue, it will increase considerably by the middle of the century. The report's projections show that Wisconsin's annual average temperature is likely to warm by 4 to 9 degrees by the middle of the 21st century, with winter temperatures increasing more than those of other seasons. Overall, the expected rate of warming is about four times greater than what we have experienced since 1950. At the same time, the number of days over 90 is expected to double to 25 in southwestern Wisconsin and the number of nights below 0 degrees is projected to decrease by 12. By mid-century, the growing season is projected to lengthen by 4 weeks.

Although future precipitation patterns are difficult to discern, Wisconsin climatologists say the State is likely to continue its trend toward more precipitation overall, with the greatest increase in winter, spring and fall. By midcentury, Wisconsin will likely have two to three more heavy rain events—at least two inches in a 24-hour period—per decade, about a 25 percent increase in frequency, with these changes concentrated in spring and fall. The heaviest rainfall events are projected to also increase slightly in magnitude. For example, the magnitude of a 100-year storm event is projected to increase by about 10 percent.

Potential Loss

Climate change trends will likely make the most common natural hazard events in the County more frequent and severe. For example, flooding, flash-flooding and landslides may be worse as a result of heavier rainfalls, which may cause more damage to roads, infrastructure and private

2013 FEMA report suggests significant increases in flood hazard areas

A 2013 report released by the Federal Emergency Management Agency (FEMA) predicts that areas at risk of flooding in the United States will increase by an average of 45% by 2100, primarily due to the effects of climate change. The Great Lakes region, including Wisconsin, is expected to see a higher rate of increased risk as compared to other parts of the United States.

These findings are of concern for all taxpayers, as FEMA's National Flood Insurance Program (NFIP) is funded by taxpayer dollars. According to the Natural Resources Defense Council, extreme weather caused $139 billion in damages in 2012, $96 billion of which was covered by taxpayers.

Currently the NFIP insures 5.6 million properties in flood hazard zones. These increased flood risks mean that the NFIP will have to insure 80% more properties than it currently insures. The average loss per property is predicted to rise as much as 90%, and the average premium per policy is projected to increase as much as 40% as a result of increased loss costs. The FEMA study, "The Impact of Climate Change and Population Growth on the National Flood Insurance Program through 2100," was undertaken in order to estimate the potential impacts of climate change on the NFIP.

property. A greater frequency of extreme temperatures could affect crops, livestock and forest fires if associated with drought. More extreme temperature occurrences may also disproportionately impact vulnerable populations, such as the elderly and young children.

Human-Caused and Disease Outbreak Hazards

Human-Caused/Disease Hazard Overview

Technological disasters and incidents of domestic and international terrorism on United States soil in recent decades have made it clear that community leaders, emergency managers, first responders, and planners must coordinate efforts and work together to prepare for the future. The City is vulnerable to the following hazards that are either caused by humans or are disease outbreaks:

1. Civil Disturbances
2. Explosions
3. Hazardous Materials
4. Nuclear Energy/Nuclear Power Plants
5. Mass Causalities
6. Weapons of mass destruction
7. Terrorism (including bomb threats, cyberterrorism, and agroterrorism, occurring either in the City of Darlington or nearby metropolitan areas)
8. Transportation Accidents (including aircraft, bus, rail, and trucking)
9. Energy shortages and blackouts
10. War (including nuclear and non-nuclear)
11. Epidemics
12. Food- or animal-borne illnesses

A thorough assessment of the risk in the City of Darlington for each of these hazards, and detailed strategies for addressing them, is beyond the scope of this Hazard Mitigation Plan. However, the following Hazard Vulnerability section provides an overview of the primary factors contributing to vulnerability to hazards caused by humans or disease outbreaks. At the time of writing, the City was in the process of updating its emergency operations plan. The recently formed Darlington Emergency Planning Committee is, among other tasks, working to develop plans for manmade disasters and how to respond.

Human-Caused/Disease Hazard Vulnerability

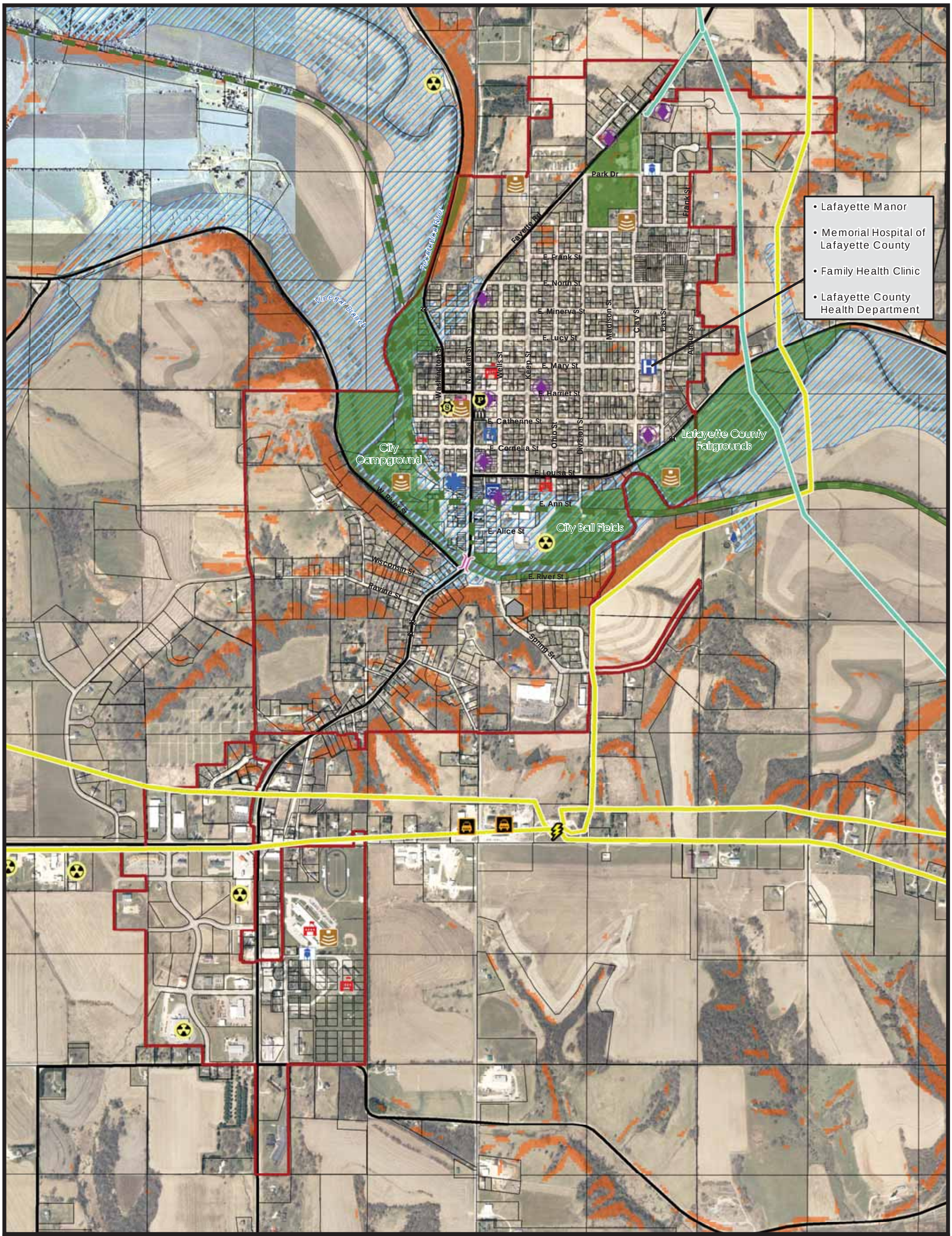
Generally speaking, hazards caused by humans or due to disease outbreaks cannot always be as easily predicted, and therefore mitigated, as naturally-occurring hazards. However, there are several factors that can put a community at greater risk of experiencing loss of life and property when these types of hazards become apparent or incidents occur as a result of them. The factors that contribute to the City's vulnerability to human-created or disease-based hazards include the following:

- *Hazard Detection and Response Preparedness*: Communication systems within the City and between the City and regional and national agencies greatly impact the City's ability to detect a hazard when it occurs or is expected to occur and then to respond quickly and effectively to the disaster. The City of Darlington recognizes that hazard detection and communication is an area that can use recurrent improvement and, therefore, the City continually updates and improves its communications systems.
- *Land Use, Economy, and Population Density:* The land use, population, and economic makeup of the City play a role in the City's vulnerability to certain man-made and disease outbreak hazards. Near the City of Darlington, agriculture and wooded lands are primary land uses and, consequently, play a role in the local

economy. This, therefore, makes the City more susceptible to loss of life and property from foreign animal disease outbreaks such as Foot and Mouth disease and insect infestations.

Conversely, the rural nature of the City reduces its risk of terrorism disasters as compared to more densely populated areas. That said, acts of terrorism can threaten a broader regional area, making it still a real risk. The City of Darlington is about an hour from Dubuque, one and one-half hours from Madison, and three and one-half hours from Chicago. Each city represents a greater threat to terrorism than the previous due their positions as major economic, political, and educational centers.

- *Standing Water:* Vulnerability of exposure to mosquitoes carrying West Nile Virus is greatly exacerbated by presence of standing water rich in organic content, such as water impounded at the bottom of catch basins/storm drains. Flood waters remaining stagnant for periods of time could also lead to greater mosquito populations.
- *Building Code, Fire, and Hazardous Materials Safety Regulations and Enforcement:* Vulnerability to explosions, fires, and hazardous materials incidents is greatly dependent on the strength and enforcement of ordinances regulating building construction, use of fire, and use and storage of hazardous materials. Knowing the locations of sites that manage hazardous materials—and contingency plans if there is a problem with containment—is also a key factor affecting vulnerability. The Risk Assessment map (Map 5) attempts to present the most recent record of these sites. There are two companies in Darlington that store large quantities of fertilizers, insecticides, and herbicides located on the southwest side of the City. These facilities are of particular concern since their evacuation area is up to ½ mile, which would encompass the industrial park and the Elementary School and High School.
- *Infrastructure Maintenance:* Vulnerability to road and air accidents is related both to weather conditions and the quality of transportation infrastructure. Consequently, improved transportation systems maintenance reduces vulnerability to this hazard.



Map 5

Risk Assessment

- City of Darlington Multi-Hazard Mitigation Plan -

- Municipal Boundary
- Major Roads
- Multi-Use Trails
- Natural Gas Pipeline
- Electric Transmission Lines
- Power Facility
- Main Street Bridge
- Repetitive Loss Structure
- Hazardous Material
- Vulnerable Population
- Emergency
- Gathering Place
- School
- Municipal Building
- County Courthouse
- County Sheriff's Dept.
- Fire Station
- City Police Dept.
- Library
- City Garage
- County Highway Dept.
- Post Office
- Water Tower
- Healthcare Facility
- Volunteer Rural Medical
- Wastewater Treatment Plant
- 100-year Floodplain
- Public Open Space

Steep Slopes

- 20% and greater

Date: 7/1/2014

Sources: US Census Bureau, ESRI, FEMA, WROC, City of Darlington, Lafayette County, USGS, NAIP

0 250 500 1,000 Feet

VANDEWALLE & ASSOCIATES INC.

Shaping places, shaping change

Chapter 4: Mitigation Goals and Strategies

Chapter 4 discusses mitigation strategies for the hazards that have occurred and are probable in the City of Darlington, as indicated in Chapter 3. This chapter also identifies parties that would be responsible for implementation of the strategies and potential partners that could provide assistance. At the core of these mitigation strategies is education and cooperation. Community members are more likely to embrace mitigation measures if they understand how those actions can limit the economic, social, and environmental impact of hazards. Further, governmental agencies and jurisdictions are more likely to develop information networks when there is a clearly understood common goal of decreasing the impact of disasters.

Following the outlaying of overall goals, mitigation strategies that are applicable to all hazards are discussed first, followed by disaster specific mitigation strategies.

HAZARD MITIGATION GOALS

The Plan Commission participated in an exercise to identify the highest priority goals for this Multi-Hazard Mitigation Plan. The project team presented goals and objectives from the 2010 plan; through discussion, goal statements were clarified and revised to better match the current needs of the City. These are the goal statements upon which this Plan is based:

1. **Prevent future loss of life and property**
2. **Protect critical facilities (fire, police, municipal operations) and infrastructure**
3. **Properly plan future land use and transportation systems to minimize hazards**
4. **Care for public and environmental health**
5. **Protect sensitive populations (elderly, children, low income families, tourists)**
6. **Prevent future risk of hazards in highly vulnerable areas**
7. **Help people protect themselves**
8. **Promote the use of partnerships in hazard mitigation**

HAZARD MITIGATION STRATEGY PRIORITIZATION PROCESS

The project team and members of the Plan Commission completed an assessment of ongoing or past mitigation strategies, and then used this information to revise, update, prioritize, and provide additional strategies. Additional guidance was attained from a FEMA State and Local Mitigation Planning How-To Guide.[37]

A five-stage process was undertaken to identify priority mitigation strategies in this Plan.

Stage One: Assessment of Existing Strategies

At the March 12, 2013, Plan Commission meeting, members of the Commission and the project team completed an assessment of all strategies from the 2010 plan. This assessment documented the current status of each strategy, whether it had been completed or was ongoing, and its overall effectiveness. Strategies with higher priority were emphasized during the worksession. Figure 4.1 documents the results of the worksession.

[37] Federal Emergency Management Agency. *State and Local Mitigation Planning How-To Guide: Developing the Mitigation Plan.* April 2003.

Figure 4.1a: Assessment of 2010 Hazard Mitigation Strategies – All Hazards

Strategies from 2010 Hazard Mitigation Plan	Completed?	Ongoing?	Notes and Future Changes
Pursue Regular Community Outreach and Education		X	
Improve Coordination and Communication Among Emergency Responders and Regional Groups		X	
Engage in Annual Tabletop Exercises to Review Hazard Protocols		X	
Maintain and Augment Hazard Warning Systems		X	
Provide Adequate Emergency and Power Sources		X	
Improve Planning and Regulatory Practices			
Integrate Flood Notification Plan, Emergency Operations Plan, and Hazard Mitigation Plan		X	
Pursue Joint Hazard Mitigation Plan and Comprehensive Plan Updates in 2014		X	
Adopt Zoning Code Amendments and Consistently Enforce Code		X	
Update Subdivision Ordinance and Consistently Enforce		X	
Update Comprehensive Outdoor Recreation Plan		X	
Maintain Effective Capital Improvement Planning		X	
Consider Partnering on Purchase of Conservation Easements or Development Rights		X	
Protect Critical Facilities and Infrastructure		X	

Figure 4.1b: Assessment of 2010 Hazard Mitigation Strategies – Flooding

Strategies from 2010 Hazard Mitigation Plan	Completed?	Ongoing?	Notes and Future Changes
Pursue Regular Community Outreach and Education			
Maintain List of Floodplain Property Owners		X	Police Department has current business list; the City will need to update the list based on the new floodplain boundary
Communicate Flood Mitigation Strategy		X	Consider preparing materials in Spanish
Enhance Awareness/Reminders of Procedures During Flood Events		X	Consider preparing materials in Spanish
Increase Awareness of Floodplain Regulations		X	
Creatively Enhance Stormwater Management and Erosion Control		X	Consider addressing the two inlets closest to the River
Continue Removal of Structures from Floodplain, focusing on Repetitive Loss Structures		X	Need to address debris in the River
Protect Critical Facilities and Infrastructure		X	
Continue to Document, Analyze, and Learn From Flood Events		X	
Promote Creation of a Pecatonica River Watershed Alliance		X	
Re-Review Official Floodplain Maps	X		
Pursue Targeted Approaches to Protect Water Quality		X	
Increase Access to and Effectiveness of Flood Insurance		X	

Figure 4.1c: Assessment of 2010 Hazard Mitigation Strategies – Severe Storms/Winter Storms

Strategies from 2010 Hazard Mitigation Plan	Completed?	Ongoing?	Notes and Future Changes
Pursue Regular Community Outreach and Education with Vulnerable Properties and Populations		X	
Develop Reliable Evacuation Routes from Key Places of Assembly		X	Revise to be an all-city evacuation plan
Promote Active Tree Management		X	Consider preparing a tree inventory
Protect Critical Facilities and Infrastructure		X	

Stage Two: Assembling Strategies

Following input from the project team and Plan Commission members on strategies from the City's 2010 plan, a new list of strategies was developed. This list included strategies discussed at previous Plan Commission meetings, a revised list of strategies from the project team/Plan Commission assessment of the 2010 strategies, and new strategies appropriate for the City of Darlington from FEMA's mitigation guide.

Stage Three: Strategy Review

With an understanding of hazard risks in the City, the Plan Commission's initial input on mitigation strategy priorities, and initial community and jurisdictional input on mitigation strategies from previous meetings, the project team presented a list of potential strategies for each hazard at the May 22, 2013, Plan Commission meeting. The project team facilitated a dialogue with participants to elicit input, questions, and concerns for each strategy. Participants were then asked to prioritize their top strategies.

Stage Four: Draft Strategy Prioritization

Armed with a more thorough understanding of benefits, drawbacks, and perceptions of each strategy based on input from the Plan Commission, the project team then evaluated the benefits and drawbacks/costs of each strategy to develop a preliminary prioritization. This analysis is summarized in Tables B1 – B6 in Appendix B.

The following ten criteria were considered when identifying the benefits and drawbacks of each strategy. Criteria three through ten are a part of a prioritization system developed by FEMA called STAPLEE (based on the first letter of each strategy, as highlighted below). In part of their hazard mitigation planning, some communities have used a purely quantitative process to score each strategy for each of the STAPLEE criteria. In the case of the City of Darlington, it was determined that a qualitative, holistic evaluation process would produce the most meaningful prioritization.

1. Ability to achieve one or more of the City of Darlington Hazard Mitigation Goals
2. Community support
3. Ability to be implemented (potential funding available)
4. **S**ocial impacts
5. **T**echnical feasibility
6. **A**dministrative requirements
7. **P**olitical support
8. **L**egality
9. **E**nvironmental impacts
10. **E**conomic impacts / costs of implementing

Stage Five: Draft Multi-Hazard Mitigation Plan

Based on the input provided from the Plan Commission and the above criteria, the project team then refined the list of priority mitigation strategies and also identified responsible parties, potential partners, and implementation timelines. These were incorporated into the first Draft Multi-Hazard Mitigation Plan in May 2013, and included later in this chapter.

PRIORITY HAZARD MITIGATION STRATEGY SUMMARY TABLES

The following figures summarize the mitigation strategies, responsible parties, potential partners, and implementation timelines for each potential natural hazard in the City. These strategies are then discussed in further detail following these figures.

Table B1 – B6 in Appendix B lists all of the potential mitigation strategies that were evaluated for each hazard and describes the benefits and drawbacks/costs of each strategy. The highest priority strategies are divided into two categories; First Priority and Second Priority for each hazard. Following the detailed description of the highest priority strategies, "other" strategies are listed as a possible larger menu of potential strategies that the City may employ as it advances implementation of this Plan.

A summary table lists all strategies in Figure 4.2, their priority, and the location the strategy addresses. This table provides an overview of strategies that are discussed later in this chapter.

Figure 4.2: Summary of Priority Hazard Mitigation Strategies

Mitigation Strategy	First Priority	Second Priority
All Hazards	Pursue Regular Community Outreach and Education	Protect Critical Facilities and Infrastructure
	Improve Coordination and Communication Among Emergency Responders and Regional Groups	
	Engage in Annual Tabletop Exercises to Review Hazard Protocols	
	Maintain and Augment Hazard Warning Systems	
	Provide Adequate Emergency Resources and Power Sources	
	Develop a City-Wide Evacuation Plan, with a Focus on Key Places of Assembly	
	Improve Planning and Regulatory Practices	
Flooding	Pursue Regular Community Outreach and Education	Pursue Targeted Approaches to Protect Water Quality
	Creatively Enhance Stormwater Management and Erosion Control	
	Continue Removal of Structures from Floodplain, Focusing on Repetitive Loss Structures	* Increase Access to and Effectiveness of Flood Insurance
	Protect Critical Facilities and Infrastructure	
	Continue to Document, Analyze, and Learn from Flood Events	
	Promote Creation of a Pecatonica River Watershed Alliance	
Severe Storms/ Winter Storms	Pursue Regular Community Outreach and Education	Promote Active Tree Management
		Protect Critical Facilities and Infrastructure
Drought	none	Pursue Regular Community Outreach and Education
		Promote Use of Best Management Practices for Yards and Agriculture
Extreme Temperatures	Pursue Regular Community Outreach and Education	Promote and Improve Use of Cooling Centers
Earthquakes	none	Pursue Regular Community Outreach and Education
		Protect Critical Facilities and Infrastructure
Human-Caused Hazard and Disease Outbreak	Improve Coordination and Communication Among Emergency Responders	Identify and Address Infrastructure Hazard Vulnerability
	Pursue Regular Community Outreach and Education	Promote and Implement Modern Hazard Warning Systems

***** Mitigation Strategies directly related to continued compliance with NFIP

Note: See Appendix B, Table B1 for list and description of all potential mitigation strategies.

Mitigation strategies are separated into priorities. First and Second Priorities are described in detail in this chapter. Additionally, future strategies for consideration for each hazard are included as "other" strategies.

- **First Priority:** Includes highest priority strategies; begin implementation in as soon as possible following adoption of Plan, and ideally complete within five years.
- **Second Priority:** Includes second-highest priority strategies; begin implementation following completion or at least initiation of First Priority strategies, or as unique opportunities may present themselves.
- **Other Potential Strategies:** Includes strategies that are not currently identified as priorities, but are included for future consideration as the City moves forward with implementation of this Plan.

The following acronyms are used in the identification of responsible parties and potential partners:

- FEMA Federal Emergency Management Agency
- WDOT Wisconsin Department of Transportation
- WEM Wisconsin Emergency Management
- WDNR Wisconsin Department of Natural Resources
- NRCS Natural Resources Conservation Service
- LCEM Lafayette County Emergency Management
- LCSWCD Lafayette County Soil and Water Conservation District
- UWEX University of Wisconsin-Extension
- USGS United States Geological Survey

PRIORITY MITIGATION STRATEGIES FOR ALL HAZARDS

The following mitigation strategies are applicable to all types of hazards. These strategies should be considered and implemented in a comprehensive approach addressing multiple hazards.

Strategy 1: Pursue Regular Community Outreach and Education

Local governments are best equipped to provide residents and property owners with information about the effect of disasters, methods for preventing damages, and the actions to take when disasters threaten the locality. Ideally, such information is distributed annually or at the beginning of each hazard season. Traditional points of contact between the local government and the community are effective means to provide information and resources. Such points of contact include the City meetings; building, zoning, and burning permitting processes; parks and recreation permitting processes; and school classrooms. Web sites, e-mail list-serves, local cable and radio stations, newspaper articles, and informational fliers (that could, for example, be included with utility or tax bill mailings) can also reach a large audience at little cost.

Often there are misconceptions about the costs, benefits, and implementation of hazard mitigation strategies. Governmental jurisdictions, agencies, and organizational partners should lead by example to educate the public about good practices and disaster resistance. Visual and economic proof that mitigation strategies reduce the economic and social impact of disasters is one of the most effective educational tools available. Elected officials and department heads should be educated on the financial and social impacts of disasters, mitigation strategies, and the need to work together in order implement this Multi-Hazard Mitigation Plan most effectively.

Educational efforts should focus on the simple changes in behavior that can minimize risks. Self-instigated mitigation strategies can be accomplished at the household level; for example, clearing dead and downed timber and other debris from drainage areas or storm sewer inlets, observing construction site and farmland soil conservation practices, and using construction methods that reduce damage from hazards. Insurance agencies and lenders can help disseminate information on household mitigation strategies, as damages due to hazards have a direct impact on a property owner's investment and possible insurance payouts.

Other specific examples of education and outreach tools include the following:

- **Web:** The City of Darlington may create a simple web page as part of the City's site that provides information on disaster preparedness and hazard mitigation. The page would target both government agencies and the public within the City.
- **Wisconsin Main Street Program:** The community's downtown Main Street program is an excellent tool to reach downtown businesses and property owners with information related to the City's hazard mitigation efforts. Coordination with the Main Street coordinator will be key. As part of the "welcome package" for new businesses, residents, and property owners in the downtown, the City/Main Street program could include information on hazard preparedness.
- **Elementary and Secondary School Curriculum:** Curriculum may be enhanced by programs such as the "Master of Disaster" Program from Red Cross or the Project WET program on the water cycle.
- **Public Access Television:** Local public or government access cable stations can be used to play mitigation videos developed by state and national organizations and agencies.
- **Construction Education:** Area contractors and instructors of building vocations should be provided up-to-date information on hazard resistant construction techniques. Part of this could be accomplished through the normal land development and building permit processes.
- **Severe Weather Awareness Week:** This week occurs in March as a tool to promote awareness of hazard preparedness and mitigation. This week is an opportunity for schools, businesses, individuals, and organizations to review their severe weather action plans.
- **Education Targeting Vulnerable Populations:** Education and outreach efforts should be balanced between efforts to communicate to people city-wide and focusing particular attention on high risk groups, such as people residing in the floodplain, the elderly, low-income persons, and people residing in mobile homes.
- **Real Estate Deed Disclosure:** Informational fliers that identify rights and requirements of buyers, sellers, and lenders, and provide resources to conduct additional research on properties, could prevent people from investing in problematic properties. Such prevention will benefit everyone, as tax dollars fund disaster assistance and subsidize floodplain insurance payments, and high-risk properties inflate insurance premiums.

Priority: First Priority
Location: Citywide, with a particular focus on the downtown/floodplain area
Responsible Parties: City of Darlington
Potential Partners: WEM, Main Street coordinator, local media, Darlington School District, realtors
Funding Source: City of Darlington budget, with potential assistance from FEMA mitigation grant, other public grant funds, and/or private sponsorship

Strategy 2: Improve Coordination and Communication among Emergency Responders and Regional Groups

Disasters cross jurisdictional boundaries and affect numerous aspects of a community, from physical safety to economic stability and environmental condition. Also, being aware of neighboring communities' plans for growth and development or infrastructure improvements and expansions can lead to better decision making regarding regional land use and hazard mitigation. Therefore, effective mitigation requires that mitigation strategies also cross jurisdictional boundaries to include Lafayette County and neighboring townships, villages, cities, and counties, as well as across department and agency lines.

Through the planning process, the project team observed opportunities for improved intergovernmental/interagency coordination. In particular, City-County coordination on hazard mitigation and disaster preparedness could be improved. More coordinated regional approaches would improve rapid and cost-effective delivery of emergency services, given that the majority of disasters cause physical, economic, and environmental impacts at the regional scale. Opportunities for efficiencies are also present. Minimally, more regular meetings among emergency management personnel at the City and County are advised.

Lafayette County was in the process of updating its hazard mitigation plan at the time of writing. As future hazard mitigation plan updates occur, the City and County can collaborate more on hazard mitigation to ensure the goals, objectives, and mitigation strategies properly align.

Priority: First Priority
Location: City of Darlington and surrounding areas
Responsible Parties: City of Darlington Emergency Management function
Potential Partners: County Sheriff's Department/LCEM, town governments
Funding Source: City of Darlington budget, with potential assistance from public grant funds and/or private sponsorship.

Strategy 3: Engage in Annual Tabletop Exercises to Review Hazard Protocols

A tabletop exercise is a low cost/low stress activity designed to simulate various emergency situations for key appointed/elected officials that play a role in emergency management situations. These exercises allow all participants the opportunity to openly discuss the various roles and actions that might result from a given situation.

The City of Darlington intends to conduct annual tabletop exercises to ensure all City staff, as well as elected and appointed officials, are aware of emergency management protocol. Annual exercises ensure that all new staff and officials are knowledgeable of emergency management. The City of Darlington will consider partnering with neighboring communities and the County to create a more comprehensive set of tabletop exercises. WEM provides guidance on conducting tabletop exercises for local communities.

As part of the annual exercises, the City will review the Flood Notification Plan and associated hazard mitigation planning documents to ensure their relevance.

Priority: First Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: WDOT, County Highway Department, Sheriff Department, Fire Department, EMS LCEM, neighboring communities
Funding Source: FEMA Mitigation Grant Program, City of Darlington, WDOT

Strategy 4: Maintain and Augment Hazard Warning Systems

The City intends to maintain its current hazard warning system (sirens), while also providing seasonal reminders to residents on how to interpret the hazard warning system. Unlike many other communities, the City's siren system is functional. Many among the City's stable, aging population will likely respond better to sirens than to some of the more modern systems.

Additionally, the City will promote the use of more modern hazard warning systems such as NOAA weather radios. NOAA weather radios continuously broadcast National Weather Service (NWS) forecasts, warnings, and other crucial weather information as well as provide direct warnings to the public for natural, man-made, or technological hazards 24-hours a day. This network of radio stations is the primary trigger for activating the national Emergency Alert System (EAS) on commercial radio, television, and cable networks. NWS broadcasts also include post-event information for natural and human caused hazards.

In addition to NOAA radios, the City may update and expand its system of warning the public and local governments about impending hazards. For example, a modern system of automatic e-mails, phone messages, or cell phone text messages to warn of a hazard event will be explored as well as continued exploration into reverse 911.

Priority: First Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: WEM, school district, owners/managers of facilities with vulnerable populations, LCEM
Funding Source: FEMA Mitigation Grant program, City of Darlington, with potential assistance from other public grant funds and/or private sponsorship

Strategy 5: Provide Adequate Emergency and Power Sources

Currently the City of Darlington does not have adequate facilities or equipment to operate the Emergency Operation Center (EOC) during the event of a natural hazard. The EOC is designated to the City Council chamber room in the Municipal Building, but this building lacks a generator for backup power and redundant communications systems. The City of Darlington will work to equip the entire building with backup power, secure an additional phone line, and enhance and introduce other communication tools including the internet and mobile devices. The City may coordinate with the County in possibly seeking a joint grant for upgrading the Emergency Operations Centers, each of which are positioned across from each other on Main Street. Other key buildings including the hospital, schools, and the fire station do have backup power.

The City intends to also be equipped to provide emergency power sources to rural residents with less reliable power sources. The City will work to ensure that shelters are adequately equipped with emergency services for up to two weeks.

Priority: First Priority
Location: City Emergency Operations Center in the City Hall
Responsible Parties: City of Darlington, Utilities,
Potential Partners: Sheriff Department, Fire Department, LCEM, School District
Funding Source: FEMA Mitigation Grant program, USDA-Rural Development (Community Facilities Program), City of Darlington, Local utility companies

Strategy 6: Develop a City-Wide Evacuation Plan, with a Focus on Key Places of Assembly

The efficient and appropriate evacuation of people during hazard events is crucial in maximizing safety. Darlington has an Emergency Operations Plan which outlines the municipal actions to a large-scale emergency requiring a controlled and coordinated response. In addition, the City intends to explore options to coordinate the evacuation of Darlington in the event of an actual disaster or the threat of imminent danger. The City may consider multiple types of evacuation including a precautionary evacuation when there is a credible threat, an emergency evacuation for sudden events, and a shelter-in-place strategy when it is safer to remain inside until the danger (like a hazardous material spill) has passed. Other issues may include evacuation routes, restricted routes, walking routes, and assembly areas for transportation pick-up.

Of critical importance are schools, large employers, campgrounds and parks, the County Fairground, and other concentrated populations are documented on the Risk Assessment map in Chapter 3. The City of Darlington intends to coordinate with the Fairground operator, the Darlington School District, and other key players to determine appropriate multiple, reliable, and safe evacuation routes.

Focus will be placed on places that lack appropriate shelter in severe storms, such as the campground in Riverside Park and the County Fairgrounds. Managers of these properties, through the assistance of the City, County, and Highway and Sheriff's Department, will identify the most appropriate evacuation routes. The City has identified the hospital, manor, schools, and fire station as appropriate shelter locations.

Priority: First Priority
Location: City of Darlington, particularly from Fairgrounds and Campground
Responsible Parties: City of Darlington, facility managers
Potential Partners: County Highway and Sheriff's Departments, LCEM
Funding Source: City of Darlington and County budget, with potential assistance from public grant funds or other resources

Strategy 7: Improve Planning and Regulatory Practices

This Multi-Hazard Mitigation Plan is an integral part of the City's planning and land use management efforts, since land use is a major factor in hazard vulnerability. The following specific examples of planning and regulatory practices will be a part of the City's multi-hazard mitigation strategy:

Integrate Flood Notification Plan, Emergency Operations Plan, and Hazard Mitigation Plan

The creation of this Hazard Mitigation Plan is most effective when it works in concert with other related planning efforts. The City has a completed Emergency Operation Plan that is currently maintained by the Police Chief. The City must ensure that the Emergency Operation Plan is regularly updated to properly provide City officials and staff with appropriate contacts and guidelines during an emergency. Additionally, the Flood Notification Plan provides data on flood elevations and which areas of the City are at risk during floods. This document should be updated as additional flood data is collected to ensure the flood warning levels are as accurate as possible. The City is considering combining both the Emergency Operations Plan and the Flood Notification Plan to create a more streamlined emergency management document in case of natural hazards, particularly flooding.

Consider Joint Hazard Mitigation Plan and Comprehensive Plan Updates

Comprehensive planning processes provide opportunities to integrate hazard mitigation strategies into daily planning and land use policy decisions. Land use planning establishes guidelines for the use and development of land, and is generally used to guide decisions on zoning changes and subdivisions. Land use planning also helps communities organize the use of lands and their resources according to the land's capabilities to best meet people's needs over time. Land that is prone to natural hazards, due to location, topography, soils, geology, or plant cover, will be identified as hazard-prone within the land use element of the comprehensive plan, which must be updated by 2015 under Wisconsin law. The Risk Assessment Map at the end of Chapter 3 will prove particularly useful when considering future land uses.

While hazard mitigation was generally considered when preparing the 2005 City of Darlington Comprehensive Plan, the City will consider combining both planning efforts in the future (perhaps into one document) which would result in improved efficiency, increase the potential for identifying joint grant opportunities to complete the plans, help further focus development away from high hazard areas, and in general arrive at paired land use/hazard mitigation strategies. Pursuing more sustainable community design techniques—such as progressive stormwater management, enhanced protection of steep slopes, and advancing alternative energy sources—through such an effort will also help to further minimize potential natural hazards.

Adopt Zoning Code Amendments and Consistently Enforce Code

When enforced, zoning is a powerful mitigation tool. A zoning ordinance is the set of rules that a local government adopts to regulate the future use of land, particularly when new development is proposed. Zoning ordinances may also include rules for certain qualities of new development such as site planning, landscaping, and signage. The City is responsible for enforcement and permit issuance within the City's municipal boundaries.

As rezoning of land is considered in the future, local officials should consider the potential impact that a zoning change could have on natural resources that could directly impact natural hazards. Further, the City's zoning ordinance should be updated, as necessary, to include the following requirements:

- Site plan review for larger projects and projects in flood-prone areas. A site plan is a map of a proposed development usually submitted as part of an application for zoning change, variance, or conditional/special use permit, and indicates site topography, drainage, vegetation, building location, parking, access, and utility locations.
- Preparation and submittal of a "site assessment checklist" that would identify natural features (and potential hazards) in and around a site before land is divided. The checklist could require that the developer compare the project to hazards shown on the Risk Assessment map in Chapter 3.
- Any new mobile homes must include anchored tie downs to protect these homes from severe storms.
- New or expanded mobile home parks, larger apartments, elderly care facilities, campgrounds, RV parks, and other similar facilities must provide a storm shelter.

- Modern environmental protection strategies, including on-site water infiltration and a requirement that all new development be kept out of the environmental corridor as mapped in the City's Comprehensive Plan, Planned Land Use map. The environmental corridor includes 100 year floodplain, wetlands, water bodies, and steep slopes.
- Containers of hazardous materials such as petroleum or chemicals must not be located in floodplain areas.
- The latest wetland and floodplain zoning models and standards to ensure that hazard-prone areas are considered in the process of obtaining a zoning or building permit.
- Utility lines should be installed underground wherever possible.

Update Subdivision Ordinance and Consistently Enforce

When including modern standards and consistently enforced, subdivision ordinances are effective hazard mitigation tools. A subdivision ordinance is the set of rules that a government adopts to regulate the division of larger parcels of land into smaller lots for sale and development. A subdivision ordinance typically defines requirements that the g must meet before lots may be sold. These may include requirements for lot sizes, roads, utilities, grading, and stormwater management.

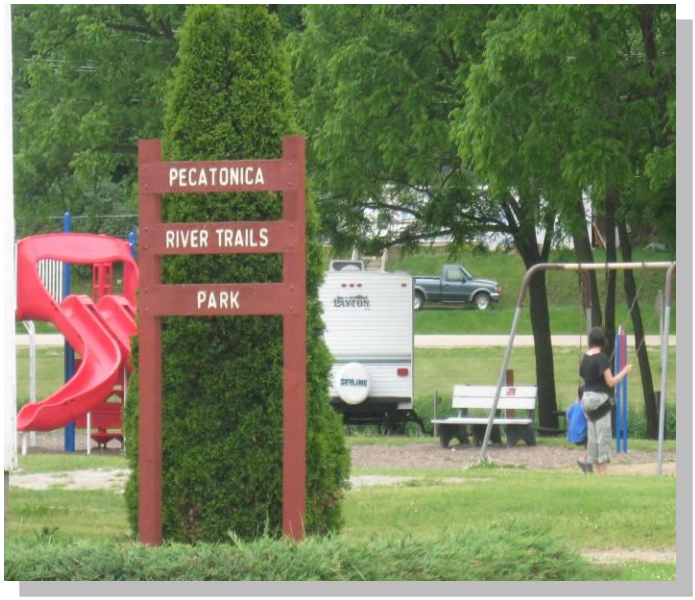
The City of Darlington will explore a complete subdivision ordinance re-write to incorporate more progressive methods to protect natural features and minimize natural hazards. The City's subdivision ordinance not only applies to the City of Darlington, but also to the 1.5 mile extraterritorial jurisdictional area (ETJ) beyond the City limits. Further, although the ordinance could be clearer, it is intended to apply to both larger subdivisions and certified survey maps for as few as one lot. Through a subdivision ordinance update, the City of Darlington can have the ability to improve land division to minimize erosion, stormwater, and other conditions that exacerbate flooding over a fairly large area.

An updated City subdivision ordinance should minimally include the following requirements, related to hazard mitigation:

- Land divider must provide, with preliminary submittals, a detailed "site assessment checklist" that would identify natural features (and potential hazards) in and around a site before land is divided.
- For each land division, submittal of detailed preliminary plats or certified survey maps with floodplain, wetland, steep slope, and other hazard-prone area boundaries clearly identified. At times, identification of these areas will require a detailed survey of the property, and its environmental features.
- Quantified stormwater management requirements that are based on the area of impervious surfaces, such as pavement and roofs, and Best Management Practices (BMPs) for stormwater management. BMPs are policies, practices, procedures, or structures that are recognized to be the most effective and practical means of managing a system, such as stormwater management or erosion control.
- All new buildable lots must be kept out of the environmental corridor as mapped in the City's Comprehensive Plan, Planned Land Use map. The environmental corridor includes 100 year floodplain, wetlands, water bodies, and steep slopes.
- Developers of mobile home parks, industrial parks, and campgrounds should provide a storm shelter.
- New utility lines must be installed underground.

Update Comprehensive Outdoor Recreation Plan

The purpose of a comprehensive outdoor recreation plan, more commonly referred to as a park and open space plan, is to guide the acquisition, preservation, and development of land for park, recreation, and related open space uses in an entire community. These plans enable communities to obtain grants for park and open space land acquisition, which may serve multiple recreation and hazard mitigation objectives. In fact, if prepared and updated once every five years, this type of plan enables communities to apply to the state Stewardship or federal Land and Water Conservation (LAWCON) programs to fund land acquisition for conservation and passive recreational purposes. Open space designation of disaster-prone areas can eliminate the opportunity for development that will continue to incur repetitive damages.



The City intends to update the plan (most recently updated in 2008) about every five years and to include joint recreation/open space/hazard mitigation projects within it.

Maintain Effective Capital Improvement Planning

Decisions to extend roads, waste water treatment facilities, or utilities into hazard-prone areas will increase the risk that additional public funds will be necessary at some point to repair damage. Additionally, public investment in, and expansion of, public infrastructure in an area implies that the area is "safe" for development and private investment and may inadvertently promote private developments in hazard prone areas. Expansion of existing capital improvements, or investment in new capital improvements should be evaluated for "disaster sustainability." Location and investment should be directed by risk assessment and best management land use practices, in addition to existing capital improvement criterion. This evaluation is extremely important in developing areas.

Consider Partnering on Purchase of Conservation Easements or Development Rights

By purchasing an easement, a local government, utility, or non-profit land conservation agency compensates an owner for partial rights to use a property. A common example is a utility easement: a property owner will provide the right to lay public utilities across their land and then agrees not to build in the area. As a hazard mitigation strategy, easements can prevent a property from being developed if to do so would not be in accordance with a community's land use plan. This is typically referred to as a conservation easement, or alternatively as a purchase of development rights. Purchasing development rights (easements) of vacant, hazard-prone properties is sometimes possible where fee simple acquisition is not practical or desired.

While not necessarily a tool within the City limits, the City may benefit from partnering with Lafayette County or other regional efforts to secure conservation easements or development rights purchases in other parts of the Pecatonica River watershed. For instance, the City and County can work with the USDA-NRCS to create a program to purchase agricultural easements on frequently flooded and/or particularly erodible farmlands along the Pecatonica River and tributary streams, creating greater flood storage and restoring native vegetation in those areas.

Priority: First priority for ordinance updates, second priority for others
Location: City of Darlington and its 1.5 mile extraterritorial jurisdiction as focus
Responsible Parties: City of Darlington, Lafayette County
Potential Partners: City of Darlington Plan Commission, LCEM, USDA-NRCS, WDNR, County Soil and Water
Funding Source: "Smart Growth" comprehensive planning/hazard mitigation planning grant funds, City of Darlington, USDA-NRCS (easement program)

Strategy 8: Protect Critical Facilities and Infrastructure

Protection of critical facilities is a vital hazard mitigation measure to ensure that emergency responders and their facilities are protected from disasters, so that they are able to respond quickly during hazard events. Critical facilities include emergency operations centers, police and fire stations, courthouses, rescue/ambulance services, medical facilities (hospitals, nursing homes, and clinics), utilities (water, sewer, electric, gas, and communications), and transportation facilities (critical roads, bridges, and airports). For Darlington, these critical facilities are illustrated on the Risk Assessment map in Chapter 3.

In addition to these critical facilities, major places of assembly should also be particularly prioritized in the event of disaster to protect these concentrations of people. Major places of assembly include schools, major employers, large multi-family housing complexes, auditoriums, campgrounds, the County Fairgrounds, and other large facilities. Protection of safe routes and communications to and from these places should be prioritized, as well as evacuation plans. Major places of assembly are also illustrated on the Risk Assessment map in Chapter 3.

Lastly, protection of critical infrastructure, including major roads and utilities, is essential to ensuring access to and from communities, neighborhoods, and places of assembly (e.g., fairgrounds) during disasters as well as providing needed services including water, communications, and power, to residents and businesses in the City. The City will work with WDOT, WDNR, and others on efforts to assure that this bridge remains open during natural hazard events.

Priority: Second Priority
Location: Citywide, and in key locations such as the Main Street Bridge
Responsible Parties: City of Darlington, utilities, fire department, police department
Potential Partners: School District, owners/managers of places of assembly, sheriff's department, County highway department, LCEM, WDOT, WDNR
Funding Source: City of Darlington, with potential assistance from public grant funds and/or private sponsorship; WDOT/federal transportation grants

PRIORITY FLOOD MITIGATION STRATEGIES

Strategy 1: Pursue Regular Community Outreach and Education

Strategy 1 under the "Priority Mitigation Strategies for All Hazards" section above provides an overview of the Community Outreach and Education strategy.

As it relates to flooding specifically, continual outreach with the community is critical to ensure that the objectives of the City's flood mitigation and preparedness programs are understood and that residents, businesses, and property owners have several mechanisms for getting accurate information, voicing opinions, and shaping actions. Specifically, the flood mitigation outreach and education should focus on communications in the following areas:

- **Maintain List of Floodplain Property Owners:** To better document flood hazards and maintain communications, the City created a list of all property owners that may be impacted by flooding as a result of the 2004 plan. The City continually updates this list to ensure contact information and property owners are accurate. The City will then utilize this list for multiple purposes related to flooding.
- **Communicate Flood Mitigation Strategy:** As the City and other partners work to implement this Multi-Hazard Mitigation Plan, it will be critical to keep the community continually up-to-date and treat community members as implementation partners on the objectives, details, and progress of the flood mitigation actions being proposed and executed. Updates will be explored through information shared with community organizations such as the Main Street program, community-wide meetings and direct project update mailings to residents, property owners, and business owners in areas vulnerable to flooding.
- **Enhance Awareness/Reminders of Procedures During Flood Events:** Coordination of appropriate procedures for emergency providers, as well as instructions for homeowners and residents, will help prevent and reduce loss to life and property during flood events. The City will look to the Emergency Operations Plan to determine the appropriate emergency management personnel. Additionally the Flood Notification

Plan will be used to guide the City in evacuations, flood shield distribution, and road/bridge closures. The possibility of combining the Emergency Operations Plan and Flood Notification Plan in one document will be explored. The City will ensure that new property owners in the floodplain are aware of the flood shields, their distribution, and their application; the Main Street program could be utilized to help distribute this information. The City intends to explore the possibility of developing a dedicated webpage on its site for up-to-date information. The City also intends to prepare information in Spanish for the City's growing Hispanic population. Finally, each spring, the City intends to work with the local media to publish a story reminding the area residents to be prepared for spring and summer flooding.

- **Increase Awareness of Floodplain Regulations:** Frequently, City residents and property owners do not understand the limitations to improvements that can be made to structures in the floodplain and floodway due to local, state, and federal floodplain regulations. The City can help allay these frustrations by providing published materials that explain the regulations in lay terms and also give clear definitions and examples of what does and does not constitute a "substantial improvement" to property; this threshold initiates stricter regulations. The City intends to prepare information in Spanish for the City's growing Hispanic population. The City also intends to work with the community to ensure current individuals enrolled in the program remain in good standing.

Priority: First Priority
Location: Citywide, particularly in flood prone areas identified on the Risk Assessment maps
Responsible Parties: City of Darlington
Potential Partners: Red Cross, Main Street program, Utilities, WEM, local media, local organizations and community groups, lenders, contractors
Funding Source: City of Darlington, Red Cross, with potential assistance from public grant funds and/or private sponsorship

Strategy 2: Creatively Enhance Stormwater Management and Erosion Control

The City of Darlington intends to pursue various initiatives to improve stormwater management and erosion control in and near the City. Improved stormwater management and erosion control practices have the potential to minimize the effect of flooding on private property and business activities. The range of approaches that the City may pursue includes:

- Incorporate progressive stormwater management and erosion control provisions in its recommended zoning and subdivision ordinance updates. (See Strategy 7 under "Priority Mitigation Strategies for All Hazards.") The effort would require progressive erosion control practices during private development site construction and ongoing stormwater management after construction for subdivisions and other larger projects to prevent flooding and protect water quality.
- Promote Best Management Practices for agriculture and open space to reduce stormwater run-off erosion and ensure existing practices remain in place. Examples of such practices include contour farming, planting hydrophyte crops that have a high water absorption rate, conserving crop residues after harvesting, limiting tillage depth and speed, extending crop rotations to reduce incidence of summer fallow, strip cropping, fertilizing with animal manure, and maintaining vegetative buffers along the Pecatonica River and its tributaries. While WDNR has no funds available for these types of project at the time of writing, the City should continue to monitor the availability of funding sources.
- Conduct regular inspections and clearance of culverts, ditches, and storm sewer inlets to assure that they are free from blockage.
- Consider storm sewer shut off valves that allow water to travel in one direction – down storm sewer inlets and away from the City. City officials document that some downtown flooding is a result of water backing up and then pouring up and out of certain stormwater inlets.

- Coordinate with others on the management of debris in the Pecatonica River and its tributaries. The City may coordinate with the County and the University of Wisconsin-Extension to organize an annual spring survey and removal of obstructions in the Pecatonica River and its tributary streams. Such a survey would allow the City and County to better understand the surface water system and repeat problem areas. The City may also encourage the Soil and Water Conservation Service and/or the University of Wisconsin-Extension to help educate property owners on river management techniques.
- Explore the possibility of partnerships for broader restoration projects along the Pecatonica River and its tributary streams to minimize flood impacts downstream, in part by reconnecting waterways with their natural floodplains (see second sidebar box).

East Branch Pecatonica Restoration

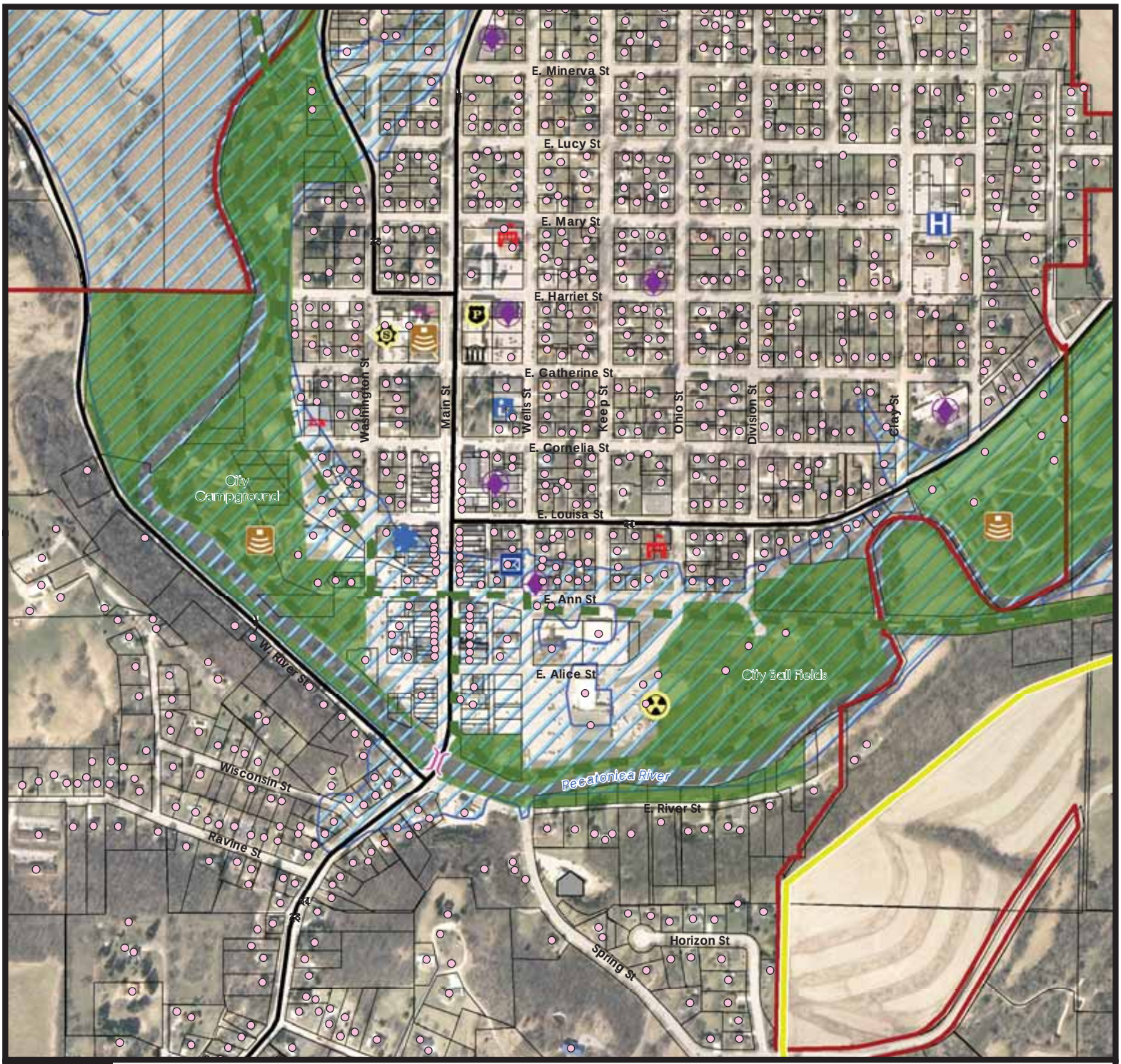
The Nature Conservancy—in partnership with WDNR, the Wisconsin Waterfowl Association, and UW-Madison—have restored two sections of the East Branch of the Pecatonica River on its land south of Barneveld in the past three years. The restoration work resulted in the removal of excess sediment from the stream bank that has prevented the waters of the Pecatonica from reaching its floodplain during flood events. The project is expected to double the amount of floodplain in this part of the river, so that it can store more water and retain nutrients that would otherwise contribute to flooding and pollution problems downstream. The projects have been very successful to date and have suggested a model for additional restoration work.

Priority: First Priority for ordinances, second priority for other listed efforts
Location: Citywide, and areas upstream
Responsible Parties: City of Darlington, Lafayette County Soil and Water Conversation District, NRCS, property owners
Potential Partners: LCEM, University of Wisconsin-Extension, the Nature Conservancy
Funding Source: FEMA Mitigation Grant Program, City of Darlington, WDNR stormwater planning grants, USDA-NRCS, The Nature Conservancy

Strategy 3: Continue Removal of Structures from Floodplain, focusing on Repetitive Loss Structures

Acquisition and relocation of buildings out of the floodplain is a mitigation strategy that offers the potential to *eliminate* vulnerability to flood hazards in heavily and repeatedly affected areas. The City of Darlington has secured millions of dollars in grant money to relocate businesses out of the floodplain. Only 2 non-residential repetitive loss structures remain within the 100 year floodplain; 9 former repetitive loss structures have been successfully mitigated. Advancing the purchase and relocation of these buildings will reduce flood damages and provide the City with new opportunities. Map 6 illustrates structures that remain in the floodplain.

Priority: First Priority
Location: Downtown City of Darlington
Responsible Parties: City of Darlington
Potential Partners: WEM, LCEM, Local institutions, community leaders
Funding Source: FEMA Flood Mitigation program, City of Darlington, State Stewardship or Federal LAWCON programs (where future is for park or open space preservation)



Map 6

Downtown Flood Areas

- City of Darlington Multi-Hazard Mitigation Plan -

Date: 7/1/2014

0 125 250 500 Feet

- Municipal Boundary
- Major Roads
- Multi-Use Trails
- Natural Gas Pipeline
- Electric Transmission Lines
- Power Facility
- Main Street Bridge
- Repetitive Loss Structure
- Hazardous Material
- Vulnerable Population
- Emergency
- Gathering Place
- School
- Municipal Building
- County Courthouse
- County Sheriff's Dept.
- Fire Station
- City Police Dept.
- Library
- City Garage
- Post Office
- Water Tower
- Healthcare Facility
- Volunteer Rural Medical
- Wastewater Treatment Plant
- Buildings
- 100-year Floodplain
- Public Open Space

Sources: US Census Bureau, ESRI, FEMA, City of Darlington, Lafayette County, USGS, WROC

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Strategy 4: Protect Critical Facilities and Infrastructure

Protection of critical facilities from flooding is a vital hazard mitigation measure to ensure that emergency responders and their facilities are protected from disasters so that they are able to respond quickly during hazard events. This strategy applies to all hazards and consequently is discussed in detail under the above "Priority All Hazards Mitigation Strategies" section.

As it applies specifically to flooding, protection of critical infrastructure, like emergency and protective services buildings and road and bridge access, is also an important strategy. For residents, it can be a matter of making sure people have a route to dry land and safety. For businesses, it is critical to have reliable property access to maintain cost-effective operations. Without such reliable access, businesses that rely on local roads for shipping and receiving, as well as customer and employee access, will suffer. Despite the efforts of the City to floodproof and relocate businesses, a threat remains to critical facilities, the Main Street bridge, and other infrastructure in the floodplain.

A particular focus in the protection of critical facilities will be placed on the Main Street bridge (the only bridge in the City and immediate surroundings), which is critical north/south connection across the Pecatonica River. The City's Flood Notification Plan indicates that the bridge closes once the river reaches 15.5 feet. Most recently the bridge closed three times in 2008. There may be no practical opportunities for constructing a second bridge across the Pecatonica in the City of Darlington. Therefore, the City advises completion of an engineering study to explore ways to better keep the Main Street bridge is open during flood events.

The City also intends to not only be prepared to re-route traffic in the event of a major flood, but will effectively communicate this information to people. The City intends to explore web-based technologies to display updated road and bridge closures and local hazard information.

Priority: First Priority
Location: City of Darlington, particularly focused on the Main Street bridge
Responsible Parties: City of Darlington, WDOT, fire department, police department
Potential Partners: Schools, WDOT, Sheriff's Department, County Highway Department
Funding Source: FEMA Mitigation Grant Program, WDOT/federal bridge aid and other transportation programs, City of Darlington

Strategy 5: Continue to Document, Analyze, and Learn From Flood Events

Through the years, the City of Darlington has maintained very good flood records for large flood events. This information has contributed greatly to the City's Flood Notification Plan, the City's flood mitigation efforts to date, and the City's understanding of the behavior of the river. Still, as land use, land management, climate, and river form continues to change, the characteristics of flood events and flood depths will vary. In addition, new City officials and emergency responders will continue to need education on flood patterns.

The City intends to continue to collect and maintain detailed and consistent data on flood events in the City. All historical data and new data should be made available to City residents via the City's website, as should the DFIRM maps and the Risk Assessment map from this Plan. This information will not only be useful to the residents of Darlington, but will serve as a concise database of information for future grant applications related to flood mitigation.

Documentation should occur both during and after flood events. In addition to documenting flood heights, detailed post-flood analyses will be conducted to determine the extent of damage, debris accumulation, and other key aspects of the flood. Understanding the location of debris accumulations and typical damage will increase cleanup efficiency.

Through observation of past flood events, the City has found that flood water is backing up in storm drains, especially in the 100 block of Main Street. This block has a large number of storm drains, compounding the problem. The City intends to explore the feasibility of addressing this problem. Potential options including installing shut off values on key storm drains that would prevent water from entering the storm drain and flooding Main Street, and storm sewer risers that would allow flood water to rise within a temporary pipe attached to the drain.

Priority: First Priority
Location: Citywide
Responsible Parties: City of Darlington government
Potential Partners: LCEM, WDOT, WDNR, LCSWCD
Funding Source: City of Darlington

Strategy 6: Promote Creation of a Pecatonica River Watershed Alliance

Participants in this planning process emphasized the importance of regional cooperation to help minimize the impact of flooding. Crossing municipal boundaries can be politically challenging, especially in the case of the Pecatonica River which not only flows through multiple counties but through the state of Wisconsin into Illinois. The University of Wisconsin-Extension maintains a Basin education group dedicated to the Pecatonica/Sugar River Basin. Still, it appears that little effort has been placed towards the middle and upper portions of the Pecatonica River, especially when compared to other rivers in southern Wisconsin (e.g., Yahara, Rock, Wisconsin).

The City intends to advance a bi-state Pecatonica River Watershed Regional Alliance to help fill this gap. This group would include representatives of local governments and people representing environmental, hazard mitigation, economic development, and recreation interests in the region. This alliance would help bring together diverse interests to work in partnership to promote the long-term health and vitality of the Pecatonica River watershed.

A regional approach provides numerous benefits including the ability to merge funding sources, gain collective experience and knowledge, and prioritize mitigation efforts. Though the focus of this organization should be on mitigating flood hazards there could be additional objectives such as promoting the natural resources of the region through tourism. Given the natural beauty of the Pecatonica River, the trail system, and the surrounding hills and rural areas communities will leverage the region as a tourist destination. An initial project for this group could be an annual river clean up day to remove debris from the River which would reduce hazards associated with tree limbs and garbage and improve flow during a flood event.

Priority: First Priority
Location: Pecatonica/Sugar River Watershed
Responsible Parties: City of Darlington, other local, county, and state governments within the watersheds, County Land and Water Conservation departments
Potential Partners: Southwestern Wisconsin Regional Planning Commission, WDNR, UW-Extension, Illinois DNR, USEPA, NRCS
Funding Source: Municipal governments within the watershed, Foundation grant support, USEPA grants, Southwestern Wisconsin Regional Planning Commission funding

Strategy 7: Pursue Targeted Approaches to Protect Water Quality

The City intends to pursue and support targeted approaches designed particularly to limit water contamination when flooding events do occur. These approaches may include the following:

- Adopt zoning measures to restrict the storage of petroleum or chemicals in the floodplain. If such a location is necessary, containers need to be anchored and sealed to limit the potential for water contamination and damaging effects of flooding by causing fires or explosions.
- Support remediation of the "old dump" identified on lands just east of the downtown near the ballfields. This site has been degassing for several years and poses a potential threat to public safety. This site and others like it are illustrated in Map 5 at the end of Chapter 3.
- Work with the County to encourage proper manure, nutrient, pesticide, and soil management near waterbodies and wetlands and along steep slopes. Utilization of grassed waterways, contours, and other conservation measures should be implemented and properly maintained to provide continued water quality benefits.

Priority: Second Priority
Location: City of Darlington and along nearby waterways and steep slopes
Responsible Parties: City, property owners
Potential Partners: WDNR, LCEM. LCSWCD
Funding Source: City of Darlington budget, USEPA and WDNR Brownfields Grants, USDA, individual landowners

Strategy 8: Increase Access to and Effectiveness of Flood Insurance

National Flood Insurance Program (NFIP) policies are available to all property owners and renters in communities that participate in the program. Communities that choose to participate in the NFIP must adopt ordinances that at a minimum meet base-level federal and state requirements, which Darlington has done. Properties do not have to be located in a floodplain to be eligible for flood insurance, and consequently, owners of properties in floodprone areas outside of mapped 100 year floodplains should consider purchasing NFIP insurance. Insurance against property damage due to flooding can help to prevent financial devastation when damaging flooding occurs. Although flood insurance does not prevent flood damage from occurring, it may help mitigate a property owner's financial exposure to flood damage.

FEMA created the initial flood hazard boundary maps (FHBM) October 26, 1973 and the initial flood insurance rate maps (FIRM) September 15, 1978. The current maps were effective November 5, 2003.

The City can help increase flood insurance program participation rates through the outreach and education efforts on the NFIP, such as through printed materials and workshops. According to FEMA, often insurance agents are either uneducated about the benefits and applicability of the NFIP, or simply do not inform customers of its availability because its processing costs are high, profit to the agent is low, and it requires significant paperwork. The City intends to work with local insurance agents as well as WEM, FEMA, and the NFIP to create and undertake an outreach and educational effort to enroll municipalities that currently do not participate in the program, and inform property owners of floodprone property of the availability of flood insurance and provide a guide to enrollment.

Property owners should be educated about both the opportunities and limitations of policies provided by private insurance providers as well as the NFIP. Often, coverage is inadequate to enable full recovery from a flood event. Consumers should also be aware of the documentation required in their private insurance policies in order to be

reimbursed for personal property and property improvements; without requisite documentation, insurance agencies can refuse payouts. There is also some local concern that the FEMA damage assessment process is inconsistent and underestimates damage reimbursements. The City advises that an audit team, made up of the Public Works Department, Plan Commission, and Police Chief, follow the FEMA assessment teams to survey the quality of residents' experience and evaluate the agency's damage estimates.

Increased access to flood insurance could be improved by reducing the cost of flood insurance. The best way to accomplish this may be for jurisdictions that participate in the NFIP to enroll in the Community Rating System (CRS). Depending on the amount of effort put forth by the City, flood insurance rates for landowners in the 100 year floodplain could be reduced by up to 40 percent. The CRS is a FEMA-sponsored program that rewards communities for taking flood mitigation actions above NFIP minimal requirements by reducing flood insurance premiums in the community. Conducting this hazard mitigation process earns the municipality points in the CRS, as will conducting ongoing outreach with residents, among other initiatives. Many aspects of this Plan could be utilized for credit towards the CRS rating. Additionally, many of the suggested mitigation strategies address opportunities to gain additional points towards a higher CRS rating. Specific actions that can be taken to reduce premiums include:

- Additional flood data (new flood elevations, floodway delineations, more restrictive mapping standards)
- Flood data maintenance
- Stormwater management
- Acquisition and relocation of floodprone structures
- Drainage system management (ensuring all channels and retention basis are clear of debris)

Priority: Second Priority
Location: City of Darlington
Responsible Parties: City of Darlington, property owners
Potential Partners: Insurance providers, WEM
Funding Source: FEMA Mitigation Grant Program, City of Darlington, real estate interests

PRIORITY SEVERE STORMS/ WINTER STORMS MITIGATION STRATEGIES

The City of Darlington is vulnerable to thunderstorms, severe wind (including tornadoes), and winter storms. Although the frequency, severity, and other characteristics of these different storms vary, the mitigation strategies associated with them are similar enough that they are grouped under this overall "Severe Storms" category.

Strategy 1: Pursue Regular Community Outreach and Education

Strategy 1 under the "Priority All Hazards Mitigation Strategies" section above provides an overview of the City's Community Outreach and Education strategy.

As it relates to storms specifically, continual outreach with the community is critical to ensure that residents, businesses, and property owners are sufficiently prepared to protect themselves and their property from damages due to storm events. Specifically, severe storm preparedness will focus on:

- **Vulnerable properties:** Mobile homes, campgrounds, certain industrial buildings (e.g. pole sheds), and camping trailers are most vulnerable to damage from severe storms. Additionally, certain elements of a building are most vulnerable to storm damage, including windows, doors, garage doors, and roofs, and consequently the City can educate property owners on structural retrofitting techniques.

- **Vulnerable populations:** The following populations are most vulnerable to injury or death due to severe storms: people in automobiles; people that occupy vulnerable properties including mobile homes, campgrounds, industrial buildings, and camping trailers; the elderly; the very young; the physically or mentally impaired; people who may not understand a severe storm warning due to language barriers; and livestock. In order to best reach these groups, educational efforts can be directed to places such as schools, campgrounds, and driver's education courses.
- **Vulnerable times of year:** Educational efforts will be most concentrated at the beginning of the severe storm and winter storm seasons each year, and during the summer tourist season. Wisconsin has established a Lightning Safety Awareness Week in June and a Winter Weather Awareness Week in November.

The City of Darlington's Public Works Department and Police Department could team with local utilities and insurance agencies to provide household, tourist, and traveling preparedness information annually or with new accounts.

Priority: First Priority
Location: City of Darlington
Responsible Parties: City Public Works Department, Police Department,
Potential Partners: Chamber of Commerce/Main Street program, Utilities, WEM, local media, local organizations, WDOT, insurance agencies
Funding Source: City of Darlington budget, Red Cross, Tourism funding sources (room tax), with potential assistance from public grant funds or other resources

Strategy 2: Promote Active Tree Management

Tree pruning can reduce the potential for trees falling on and breaking power lines, damaging buildings, and obstructing waterways in the event of flooding. The City of Darlington intends to work with local utilities to educate property owners on the benefits of proper tree management. Additionally, the City could partner with the County to develop a larger outreach program that provides property owners with educational materials regarding the benefits of tree management, and provides a contact that can help with questions and concerns well before trimming activities take place. Annually, local utilities could distribute educational information regarding the benefits of tree management with customer bills, or when establishing a new account. The City could also promote tree management during the Canoe Festival the second weekend in June.

Priority: Second Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: LCEM, County Highway and Land Conservation, Utilities
Funding Source: City of Darlington, private utility companies, with potential assistance from public grant funds or other resources

Strategy 3: Protect Critical Facilities and Infrastructure

This strategy, as it relates to storms, focuses on protecting critical facilities (e.g., police and fire stations, emergency operations centers, and hospitals) and major roadways and utility lines from storm damage to ensure that emergency responders are able to respond quickly during hazard events. This can be accomplished in the following ways:

- **Active Tree Management:** Owners and operators of critical facilities should ensure that trees on or near critical facilities are well managed, therefore not posing a significant risk of damage during a major windstorm. Additionally, the City intends to work with local utilities to ensure active tree management along above-ground utility transmission and distribution lines. The City intends to prepare a tree inventory to assist in this effort.
- **Undergrounding Utilities:** When serving new development in the City, utilities in City of Darlington should be required to place new electric and communications infrastructure underground. Additionally, opportunities to place existing infrastructure underground should be explored as infrastructure improvements are made.
- **Structural Retrofitting:** Existing critical facilities that exhibit vulnerability to severe storms should undergo structural retrofitting such as bracing roofs, doors, and windows.

- **Maintenance of Winter Storm Equipment:** The City intends to prepare for severe winter weather by ensuring that plowing and sanding equipment is operational and prepared to handle potential emergencies.
- **Snow Fences:** Using snow fences or "living snow fences" (rows of trees or other vegetation) can limit blowing and drifting snow over critical segments of roads. Living snow fences are longer lasting than standard snow fences and are permanent so they do not require the time of municipal staff to seasonally install and dismantle them. The City intends to work with the County to prioritize areas for snow fences.

Priority: Second Priority
Location: City of Darlington and surrounding roads
Responsible Parties: City of Darlington, County Highway Department
Potential Partners: LCEM, WDOT, utilities
Funding Source: FEMA Mitigation Grant Program, City of Darlington or County Highway Department budget, private utility companies, with potential assistance from public grant funds or other resources

PRIORITY DROUGHT MITIGATION STRATEGIES

Strategy 1: Pursue Regular Community Outreach and Education

Drought is a long-term condition and therefore is best mitigated through improved water use and conservation practices that take time to understand and implement. Consequently, a priority drought mitigation strategy is community outreach and education to property owners, particularly surrounding agricultural land owners, to encourage implementation of the following strategies. The City will likely play only a support role on most of these efforts.

- **Agriculture and Irrigation Best Management Practices:** Area organizations that support agriculture should coordinate to provide educational materials and programs to farmers on Best Management Practices for agriculture and irrigation including erosion control techniques, use of drought-resistant crops, and irrigation practices to ensure that irrigation systems are used most efficiently and soil retains water most efficiently. These agencies include Lafayette County Soil and Water Conservation District, Natural Resources Conservation Service, University of Wisconsin-Extension, Lafayette County Farm Bureau, and the USDA Farm Service Agency.
- **Yard Irrigation Best Management Practices:** Area organizations that educate property owners on lawn and garden maintenance, such as University of Wisconsin Extension, should focus educational materials on Best Management Practices for yard irrigation. These practices include using native plants, capturing rainwater through cisterns or rain barrels, promoting stormwater infiltration through rain gardens, mowing at proper frequency, and watering in the evening.
- **Water Saving, Storage and Use Restrictions:** When the City and surrounding areas experience a drought, techniques to conserve water intend to be employed, including prohibiting use of water for certain non-essential activities such as washing vehicles, prescribing certain days of the week that lawns can be watered, etc.
- **Drought-Proofing Wells:** The City of Darlington can educate residents of unincorporated areas surrounding the City that rely on well water about drought-proofing wells. Drought-proofing entails either improving the pumping system within the well or digging a deeper well.
- **Emergency Assistance Programs:** Agricultural droughts typically trigger the availability of several USDA emergency assistance programs; the City will work with the organizations responsible for these programs to ensure that information is clear and readily available to farmers. These programs include Farmers Home

Administration loans, Agricultural Stabilization and Conservation Service disaster assistance payments, Natural Resource Conservation Service technical assistance, and Federal Crop Insurance Corporation loss claims.

Priority: Second Priority
Location: City of Darlington and surrounding areas
Responsible Parties: LCEM, County Soil and Water, Farm Bureau, UWEX
Potential Partners: City of Darlington, local media
Funding Source: Farm Bureau, with potential assistance from public grant funds or other resources, CRP and related programs on agricultural land around the City

Strategy 2: Promote Use of Best Management Practices for Yards and Agriculture

In addition to educating farmers and property owners on Best Management Practices for yards and agriculture (BMPs are described in Priority Strategy 1 above), the City can help to ensure the use of these practices by:

- **Passing a Water Conservation Ordinance:** Such an ordinance can reduce water consumption, thereby using community water systems more efficiently through provisions such as limiting lawn watering to early morning and evenings and on alternate days of the week and requiring that hoses for washing vehicles have automatic shut-off nozzles.
- **Using BMPs on Publicly-owned Land:** The City can set an example by using BMPs for lawns (drought resistant plants, rain gardens, etc.) on publicly-owned lands.
- **Providing Incentives for Use of BMPs on Privately-owned Land:** Incentives can be provided to encourage more efficient water use. For example, water utilities can provide a rebate on the purchase of rain barrels and high efficiency washing machines.

Priority: Second Priority
Location: City of Darlington and surrounding areas
Responsible Parties: City of Darlington, LCEM, County Soil and Water
Potential Partners: Farm Bureau, Lafayette County Soil and Water District, NRCS, UWEX
Funding Source: City of Darlington budget, with potential assistance from the County, public grant funds or other resources, CRP and related programs on agricultural land around the City

PRIORITY EXTREME TEMPERATURES MITIGATION STRATEGIES

Strategy 1: Pursue Regular Community Outreach and Education

Exposure to extreme temperatures poses a considerable risk of illness, injury, and even death, particularly for vulnerable populations. Armed with good information about the risks of exposure to severe temperatures and ways to avoid exposure, this risk can be avoided. Consequently, education and outreach are key strategies for mitigating extreme temperature disasters.

As described in the Hazard Identification and Risk Assessment chapter of this Plan, the following are populations most vulnerable to illness or injury from extreme temperatures and intend to be targeted in educational programs and materials:

- Elderly persons
- Low-income persons (at risk of not being able to afford sufficient heating or cooling)
- Young children
- Sick persons
- Overweight persons
- Persons with alcohol problems
- Men (due to higher rate of sweating and increased dehydration)
- People in urban areas (higher urban temperatures due to urban heat island effect)

Educational materials intend to provide information about:

- **Avoiding and Recognizing Illness/Injury from Extreme Temperatures:** These materials focus on steps to avoid overexposure to extreme heat or cold as well as warning signs for recognizing the onset of heat stroke, hypothermia, and other temperature-related illnesses.
- **Providing Cooling Centers:** Locations and hours of centers, transportation to and from centers, and rules (e.g. parents/guardians must accompany children, alcohol is not allowed, etc.)

Priority: First Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: LCEM, WEM, Red Cross
Funding Source: City of Darlington, with potential assistance from public grant funds or other resources, Red Cross, AARP

Strategy 2: Promote and Improve Use of Cooling Centers

Currently, the City has an agreement with the Manor to use the facility as cooling centers during periods of extreme temperatures. While the number of these centers is adequate, the use of them could be improved. Improved education and outreach about the availability and rules associated with these centers would improve their efficacy. Additionally, focusing outreach on vulnerable populations will improve the use of these facilities.

Priority: Second Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: LCEM, Red Cross, Utilities, WEM
Funding Source: City of Darlington with assistance from public grant funds or other resources, Red Cross

PRIORITY EARTHQUAKE MITIGATION STRATEGIES

Strategy 1: Pursue Regular Community Outreach and Education

Because earthquakes are so infrequent in the Midwest, the population tends to neither be aware of, nor prepared for, the potential impacts. And, as described in the Risk Assessment section of this Plan, the City of Darlington is at low risk of experiencing significant impacts of earthquakes due to its distance from the New Madrid fault.

That said, the City of Darlington has felt several earthquakes originating from different parts of the region. Consequently, the City of Darlington intends to include earthquake preparedness as part of a comprehensive hazard mitigation educational program. Specifically, education will focus on:

- **Having a home disaster kit and plan:** including a few days' supply of food and water, a fire extinguisher, smoke alarms, a properly equipped first aid kit complete with any necessary prescription medication in sufficient quantities to last a few days to a few weeks; organizing and testing a family emergency plan which would help ensure each family member's survival; having residents know how to turn off gas supply to building.
- **Eliminating/reducing earthquake hazards in properties:** such as free standing water heaters, stoves, and other gas or electric appliances which could move or fall during an earthquake; bookshelves or filing cabinets which are free standing or bookshelves with objects stored above head level; water or gas pipes which are not fastened well to walls or ceilings and large panes of glass which could fracture.
- **Taking steps to take in the event of an earthquake:** These steps include staying inside a building (if already inside), and ducking, covering, and holding. Find protection next to or under heavy furniture. Avoid running outside as falling building parts can fall. Avoid rooms with a lot of ceiling fixtures. Avoid large spans of windows. Avoid large rooms with open-span ceilings or roofs.

Priority: Second Priority
Location: City of Darlington and surrounding areas
Responsible Parties: City of Darlington
Potential Partners: LCEM, Red Cross, schools
Funding Source: City of Darlington budget, with potential assistance from public grant funds or other resources

Strategy 2: Protect Critical Facilities and Infrastructure

Public buildings, such as schools and community halls, are critical facilities not only because of the large and often-vulnerable population they accommodate, but also because they are often identified as shelter sites for a community. Therefore, it is essential that these buildings are safe and can function after a seismic event. The City could work to develop a survey procedure and guidance document to inventory structural and non-structural hazards in and near designated shelter sites. Survey results can be used to determine mitigation priorities that can be incorporated into capital improvement plans. Such surveys will take into account that existing shelter sites are often constructed of brick and mortar, which is intolerant of earth shaking movements.

Additionally, the City intends to evaluate access to communications and power utilities. This infrastructure will be "looped." That is, utility distribution lines will enter a community from at least two points so that if damaged on one end, the community is still served from the lines entering from the other location**.**

Priority: Second Priority
Location: City of Darlington
Responsible Parties: City of Darlington, utilities, fire, police
Potential Partners: LCEM, schools
Funding Source: City of Darlington budget; fire district budgets; with potential assistance from public grant funds or other resources

PRIORITY HUMAN-CAUSED HAZARD AND DISEASE OUTBREAK MITIGATION STRATEGIES

Strategy 1: Improve Coordination and Communication among Emergency Responders

One of the City's most critical hazard mitigation tools is an efficient communication and coordination system among emergency responders in the City as well as with agencies in the region and State. The City will continue to work with the County and neighboring communities in the distribution of resources and response. Methods to strengthen existing relationships will continue while exploring future measures to create regional and local communication and coordination. This strategy is discussed in further detail as Strategy 2 in the "Priorities Strategies for All Hazards" section of this Plan.

Priority: First Priority
Location: City of Darlington and surrounding areas
Responsible Parties: City of Darlington, Fire Departments, Police Departments, EMS
Potential Partners: WEM
Funding Source: City of Darlington, with potential assistance from public grant funds or other resources

Strategy 2: Pursue Regular Community Outreach and Education

Another key hazard mitigation tool for human-caused hazards and disease outbreaks is education and outreach. This strategy is discussed in further detail as Strategy 1 in the "Priorities Strategies for All Hazards" section of this Plan. Specifically, for human-caused hazards and disease outbreaks, education and outreach can play a role in educating people on:

- Family emergency plans and home emergency kits
- Safety guidelines and regulations, such as handling hazardous materials, traffic safety, and fire safety
- Signs for recognizing foreign animal disease outbreaks in livestock
- Ways to prevent vulnerability to disease outbreaks, such as personal hygiene

- Energy conservation strategies

Priority: First Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: LCEM, Red Cross, WEM, utilities, local media
Funding Source: City of Darlington, with potential assistance from public grant funds or other resources

Strategy 3: Identify and Address Infrastructure Hazard Vulnerability

Transportation, communications, and energy infrastructure are all critical tools for emergency response during disasters and, if not well maintained, can also increase the City's vulnerability to loss of life and property from disasters. The rural setting of Lafayette County and the City of Darlington enhances the need for well maintained power and water sources.

To reduce vulnerability to hazards from infrastructure, the City and public works staff will work with utilities to undergo periodic evaluations of infrastructure to identify areas of hazard vulnerability so that improvements can be incorporated in city, municipal, state, and utility upgrade plans.

Priority: Second Priority
Location: City of Darlington
Responsible Parties: City of Darlington (Public Works staff)
Potential Partners: LCEM, Railroads, airports, utilities, WDOT
Funding Source: City of Darlington with potential assistance from public grant funds or other resources

Strategy 4: Promote and Implement Modern Hazard Warning Systems

The City intends to continue efforts to encourage residents to have a National Oceanic and Atmospheric Administration (NOAA) weather radio on hand to provide up to date warnings and directions regarding hazard events. NOAA weather radios provide information on all hazards. Additionally, the City will continue to update and expand its system of warning the public and local governments about impending hazards. This strategy is discussed in further detail as Strategy 4 in the "Priorities Strategies for All Hazards" section.

Priority: Second Priority
Location: City of Darlington
Responsible Parties: City of Darlington
Potential Partners: WEM, LCEM
Funding Source: City of Darlington, with potential assistance from public grant funds or other resources

Chapter 5: Plan Adoption and Implementation

PLAN ADOPTION

This Plan serves as an update to the 2010 plan. This Plan will be adopted by the City of Darlington Plan Commission and City Council to ensure continued grant support from FEMA and WEM. Adoption of the City of Darlington Multi-Hazard Mitigation Plan accomplishes the following:

- Reconfirms the commitment of community leaders and citizens to mitigate the effects of disasters.
- Provides an updated definitive guide for community leaders and officials of the City of Darlington to initiate changes that will decrease damages incurred from disasters.
- Ensures the long-term continuity of mitigation policies and programs through changes in political leadership, City staff, and community decision makers.
- Provides confirmation to Wisconsin Emergency Management and FEMA that the Plan's recommendations were assessed and approved by the governing authority of City of Darlington.
- Gives the City legal authority to implement mitigation strategies and to enact ordinances, policies, and programs with the goal of reducing disaster related losses.

Before the City adopts the Plan, it is first reviewed by the Wisconsin Emergency Management (WEM) to ensure compliance with the Disaster Mitigation Act of 2000 and any additional state requirements. A Wisconsin State Hazard Mitigation Officer from WEM oversees the review process. Upon WEM's approval, the Plan is then ready for City approval. WEM then sends the plan to FEMA Region V for review and approval.

PLAN IMPLEMENTATION

Upon approval of the Plan, the City intends to inform and distribute copies of the Plan to all applicable departments, partner agencies in the region, and other key stakeholders. Additionally, the City intends to make the Plan available to the public by placing it on the City's website, which incidentally should continue to be expanded and enhanced to include information on hazard mitigation.

The City of Darlington Plan Commission and City Clerk intend to take the lead on Plan implementation, which would include making sure that the Plan is referenced by future planning efforts and is used to provide guidance on political decisions, public expenditures, grant applications, and policy directives. The City intends to monitor implementation progress and effects of mitigation strategies. Monitoring the Plan will help implement the recommendations put forth in the Plan.

As discussed in Chapter 4, education about self-initiated mitigation strategies that can be employed to reduce potential disaster-related damages can be a cost effective method of building local support for mitigation. The City intends to undertake creative outreach programs to community members, business owners, and non-profit personnel to encourage involvement in, and understanding of, local mitigation efforts, working in collaboration with existing groups like the Main Street program.

City of Darlington staff and elected officials intend to ensure that the recommended mitigation strategies in Chapter 4 are considered in budgets. In addition to the grant opportunities discussed in this Plan, as political will dictates, administrators and elected officials will attempt to use and access volunteer efforts, bonds, loans, fees, and taxes to finance high priority mitigation projects.

Summary of Potential Funding Sources and Implementation Tools

There are a number of potential funding sources available to help finance mitigation efforts, including but not limited to those listed below. It should be noted that funding amounts are limited and funds from many of these programs are subject to change due to fluctuations in federal, state, and local budgets. In some cases the City must provide a funding match, which can be challenging if not planned in advance. The City, in particular the Clerk-Treasurer, should

continually monitor potential grant opportunities and pursue partnerships with organizations on planning, development, and funding new facilities.

- Municipal Flood Control Grant Program (WisDNR)
- River Protection Planning & River Protection Management Grants (WisDNR)
- Knowles-Nelson Stewardship Program – Stream Bank Protection (WisDNR)
- Community Development Block Grant (Wisconsin Economic Development Corporation)
- Community Economic Recovery Guidebook for Local Disaster Resilience (Wisconsin Economic Development Corporation)
- Upper Mississippi River Watershed Fund (USDA Forest Service and NFWF)
- Preparedness (Non-Disaster) Grants (FEMA)
- Assistance to Firefighters Grants (FEMA)
- Hazard Mitigation Assistance Grants (FEMA)
- Disaster Grants (FEMA)
- United States Fire Administration Grants (FEMA)

Other tools available to the City include taxing authority, planning, regulation, and enforcement.

PLAN MONITORING, EVALUATION, AND MAINTENANCE

The City intends to work with staff and the Planning Commission to monitor and evaluate this Plan annually. The City of Darlington will continue to make periodic updates to ensure this Multi-Hazard Mitigation Plan remains current and applicable. Planning is an ongoing process, and for this Multi-Hazard Mitigation Plan to remain current and applicable, periodic updates will be necessary. The Disaster Mitigation Act of 2000 requires that local mitigation plans be evaluated and updated at least every five years. To expedite this process, the City should maintain a record of disaster related damages that will help to further hone the vulnerability and risk assessments and should track mitigation projects to determine implementation progress and results. Additionally, vulnerability, risk and mitigation recommendations should be reviewed following a disaster to determine if any changes are warranted based on degrees of damage and patterns of the event. The Plan Commission will guide all additions and updates to the Plan, and all updates should include public involvement and stakeholder outreach.

Appendices

APPENDIX A: DISASTER HISTORY TABLES

The tables on the following pages provide a detailed record of the history of disasters in the City of Darlington and Lafayette County. Note that these tables only include reported events and therefore should not be considered fully exhaustive.

Table A1: Historical Occurrences of Flooding: 1950 – 2013

Date	Location	Reported Property Damage	Reported Crop Damage	Notes
7/1/1950	Darlington	$1,015,800		Pecatonica River rose 9 feet in less than an hour.
4/1/1959	Darlington			
6/1/1969	Darlington			
6/1/1990	Darlington/ Countywide	$2,800,000		The Pecatonica River rose from a 1.80ft stage to 19.80 stage in a 10 hour period
4/1/1993	Countywide			
2/20/1994	Darlington	$5,000		
Winter 1995	Darlington			A combination of winter flooding, ice and snow caused a car to veer off a county road and two individuals died.
2/18/1997	Countywide	$5,000	$10,000	Rapid snow melt, frozen ground, and heavy rains contributed to this 2 to 5 year flood on the Pecatonica River in and near Darlington. Numerous roads north and south of the city were covered in water. Damage from cropland erosion as well as shoulder washouts occurred.
4/23/1999	Countywide	Basement and Garage Damage along the river. $26,000		The Pecatonica was between 1 and 3 feet above flood stage for several days as a result of the heavy rains.
5/16/1999	Regional	$250,000	$500,000	Flash flooding developed, with 5 to 7 inches measured in the southern third of Lafayette county during the overnight hours. Several Lafayette County roads had pavement or shoulder washouts, and several others were closed. Other counties experienced considerable damage.

Date	Location	Reported Property Damage	Reported Crop Damage	Notes
5/31/2000	Regional	Basement damage		An isolated severe thunderstorm dumped large hail in Lafayette County. However, several additional clusters of thunderstorms trained east/southeast across Lafayette and Green Counties, resulting in flash flooding. Many roads in these counties were covered with fast flowing water 1 to 3 feet deep that washed out gravel road shoulders. Also, many homes had basement flooding, and there were many reports of stranded vehicles which sustained flood damage.
6/4/2002	Darlington	$5,000		Torrential rainfalls associated with slow-moving thunderstorms resulted in gravel shoulder washouts near a bridge on State Highway 81 east of Darlington. The road was blocked off as a precautionary measure due to high water levels on the local river. There were several reports of mud and gravel washed down from driveways onto roads in the Darlington area east to Green County. The Darlington Wastewater treatment plant measured 3.97 inches of rain during the morning and early afternoon hours.
5/22/2004	Darlington	basement flooding $75,000		Lafayette and Green Counties were hit especially hard. Flash flooding in Benton (Lafayette) caused people to be evacuated from their homes. $100,000 in costs resulted. Flash flooding in Darlington (Lafayette) caused mudslides to occur in farmers' fields (destroying recently planted crops) and caused basements to flood, resulting in $75,000 in damage.
5/22/2004	Countywide	$50,000	$50,000	The East Branch Pecatonica River at Blanchardville rose above its flood stage of 11 feet on May 22 at 12:37pm CST. The river crested at 13.62 feet on May 24 at 3:45am CST, 2.62 feet above flood stage. At this crested level, minor flooding occurred. Damage to lowland crops and home basements was noted along the East Branch Pecatonica River. The river fell below flood stage on May 25 at 8:40am CST.
6/1/2004	Regional	$500,000	$1,000,000	Large flood event across much of Wisconsin resulted in over $35 million in property damage with $216 million in crop damage throughout the region.
8/18/2007	Darlington	At least 20 homes had some water damage. $100,000	Mudslides, soil erosion and crop loss were noted in the flood. $500,000	Flash flooding occurred in scattered locations between the northwest side of Darlington to the extreme northeast corner of Lafayette County. Just northwest of Darlington, a road was closed due to fast flowing water covering the road to a depth of 1 to 2 feet. Just east of Blanchardville, CTH H was closed due to fast-flowing water covering that road to a depth of 1 to 2 feet.

Date	Location	Reported Property Damage	Reported Crop Damage	Notes
6/12/2008	Darlington	Damage to homes $200,000; business $100,000; public sector $162,000 Total: $462,000	$300,000 in crop damage	Heavy rains resulted in flash flooding from the Darlington area to Yellowstone Lake State Park. Water depths on road surfaces reached 3 feet or more and there were gravel washouts. There were several roads and bridges that sustained damage. A series of clusters of strong to severe storms ahead of a cold front moved east/northeast across south central and southeast Wisconsin.
7/24/2009	Countywide	$30,000		Repeated heavy rains from a couple thunderstorms resulted in flash flooding in the area from New Diggings to southeast of Shullsburg. All rivers and streams in this area rose above flood stage, and many roads had water over them. Some roads had depths of 2 to 3 feet of fast-flowing water. Several of the gravel shoulders were washed out, and lots of vegetative debris was left on some roads.
7/27/2009	Countywide	$30,000		Heavy rains from severe thunderstorms produced flash flooding that washed out the gravel shoulders of roads in and near Belmont in Lafayette County. Damage due to the flash flooding totaled $30,000. Rainfall estimates from National Weather Service radar totaled 2 to 3 inches during this time.
8/9/2009	Countywide	$20,000	$50,000	The Shullsburg Fire Department and trained spotters reported fast-flowing water covered roads up to 1.5 feet deep. Also, gravel shoulders were washed out on a couple roads from the heavy rain in the area south and southwest of Shullsburg. There were also reports of small stream flooding as well as flooding of farm fields that damaged some crops.
2013 (2 events)	Darlington			Floodwater came into the parks and part way on Main Street but did not close traffic on the bridge. There were minimal cleanup costs and limited property damage in the parks (three lamp posts and two benches were damaged).
TOTAL		**$5, 373,800**	**$2,410,000**	

Source: National Climatic Data Center: U.S. Storm Event Database and City of Darlington

Table A2: Historical Occurrences of Severe Storms: 1955 – 2013

Date	Time	Location	Wind Speed (knots)	Reported Injuries/ Deaths	Property Damage	Notes
5/23/1955	2230	Countywide	0 kts.			
6/21/1956	1500	Countywide	0 kts.			
7/30/1961	2000	Countywide	0 kts.			
7/19/1962	1420	Countywide	0 kts.			
7/13/1970	1330	Countywide	0 kts.			
6/16/1973	1150	Countywide	0 kts.			
6/20/1974	1630	Countywide	0 kts.			
11/9/1975	2030	Countywide	0 kts.			
5/19/1978	2030	Countywide	0 kts.			
7/9/1980	330	Countywide	0 kts.			
3/29/1981	1800	Countywide	0 kts.			
3/29/1981	1835	Countywide	0 kts.			
7/19/1983	1930	Countywide	0 kts.			
8/10/1983	1610	Countywide	0 kts.			
8/10/1983	1620	Countywide	0 kts.			
8/10/1983	1630	Countywide	0 kts.			
8/10/1983	1640	Countywide	0 kts.			
8/10/1983	1650	Countywide	0 kts.			
9/5/1983	2300	Countywide	0 kts.			
9/5/1983	2300	Countywide	0 kts.			
6/17/1984	1705	Countywide	0 kts.			
5/12/1985	1610	Countywide	0 kts.			
5/12/1985	1610	Countywide	61 kts.			
5/14/1985	1620	Countywide	61 kts.			
5/8/1988	1530	Countywide	0 kts.			
8/22/1989	1830	Countywide	0 kts.			
3/22/1991	2045	Countywide	0 kts.			
8/25/1992	1510	Countywide	0 kts.			
4/14/1994	2259	Darlington	0 kts.			
5/23/1994	1535	Countywide	0 kts.		$5,000	
7/15/1995	1845	Darlington	0 kts.			
7/15/1995	1858	Darlington	0 kts.		$1,000	
4/5/1997	4:40 PM	Darlington	0 kts.	0	$400,000	Powerful thunderstorm winds ripped off the roof of the Darlington Municipal building, damaged a couple roofs of nearby homes, and flattened two farm sheds 4 miles south of Darlington.

Date	Time	Location	Wind Speed (knots)	Reported Injuries/ Deaths	Property Damage	Notes
4/6/1997	9:00 AM	Countywide	0 kts.	1 injury	$75,000	The high winds flipped over a pickup truck pulling a hay wagon about 3 miles northeast of Darlington. The driver was seriously injured in the rollover and was hospitalized. Elsewhere, the high winds blew over large trees in scattered parts of the county.
6/15/1997	11:40 PM	Darlington	N/A	0	$10,000	Lightning struck a home's roof, igniting a fire that damaged the roof and attic areas. In addition, there was water and smoke damage to the upper portion of the home.
5/31/1998	1:00 AM	Darlington	0 kts.	1 death	$875,000	Lafayette County: estimated peak wind gusts of 100 mph in a swath from near Belmont to southeast of Darlington where the worst damage occurred. Ten city blocks in Darlington were closed due to debris. A total of 10 residences had minor damage, 5 major, and 1 was destroyed. Two businesses sustained major damage. Fifteen farm buildings had minor damage, 5 major, and 15 were destroyed. The death of a 25 year-old man was indirectly related to the storm. He was riding an ATV vehicle on a trail around 8am CDT on June 1st in the Graitiot area when he rode into a tree that was felled earlier by the storm.
7/19/1998	2:05 AM	Countywide	0 kts.		$20,000	A warm front spawned severe thunderstorms in the early morning across southcentral and southeast Wisconsin, resulting in downburst winds which toppled numerous trees and power lines. In addition, a sawmill was destroyed near Livingston in Iowa County and a camper was damaged by felled trees in Yellowstone State Park in Lafayette County.
11/10/1998	9:00 AM	Countywide	0 kts.	0	$10,400,000	A large portion of the Darlington High School roof was ripped off around 11:30am. Elsewhere in the county, 15 farm buildings were damaged and another 5 destroyed. Five homes in the county sustained damage due to fallen trees, and one business suffered structural damage. Several county roads were blocked by tree debris.
5/24/2000	2:00 PM	Countywide	0 kts.	0	$3,000	

Date	Time	Location	Wind Speed (knots)	Reported Injuries/ Deaths	Property Damage	Notes
6/16/2000	12:00 AM	Countywide	0 kts.	0	$29,000	
4/7/2001	1:00 PM	Countywide	57 kts.	0		
10/24/2001	10:00 PM	Countywide	0 kts.			
12/5/2001	12:00 PM	Countywide	0 kts.	0	$105,000	
11/12/2003	12:00 PM	Countywide	39 kts.	0	$52,000	
3/14/2004	8:00 AM	Countywide	39 kts.	0	$52,000	Strong, gradient southwest winds were replaced with west to northwest winds after a cold front moved through southcentral and southeast Wisconsin. There were numerous reports of broken tree limbs, with some of them downing power lines. A few vehicles sustained minor damage due to tree-branch debris.
4/18/2004	8:00 AM	Countywide	43 kts.	0	$280,000	
12/12/2004	6:00 AM	Countywide	40 kts.	0	$34,000	
11/13/2005	1:30 AM	Countywide	55 kts.	0	$171,000	
1/24/2006	9:00 AM	Countywide	39 kts.	0	$100,000	Strong post, cold-frontal northwest winds, gusting to 39 to 44 knots (45 to 51 mph), affected southcentral and southeast Wisconsin. Scattered power outages were noted due to broken tree branches hitting power-lines. Some of the broken tree branches littered road surfaces, and the usual garbage cans across the street idea prevailed.
3/13/2006	10:00 AM	Countywide	39 kts.	0	$65,000	Strong, gusty west-southwest winds ranging up to 39 to 49 kts (45 to 57 mph) affected parts of southcentral and southeast Wisconsin during the daytime hours of March 13th. These strong winds were associated with a deep low pressure over Upper Michigan. The usual reports of scattered power outages due to broken tree branches were received.

Date	Time	Location	Wind Speed (knots)	Reported Injuries/ Deaths	Property Damage	Notes
3/31/2006	2:00 AM	Countywide	39 kts.	0	$40,000	Strong, gusty west-southwest winds affected parts of southcentral and southeast Wisconsin in the wake of a cold front. Maximum gusts peaked at 39 to 42 kts (45 to 48 mph). Scattered power outages were reported when broken tree branches hit power-lines.
7/27/2009	6:40 PM	Darlington	65 kts			Emergency management officials reported tree and crop damage due to severe thunderstorm wind gusts in a 100-yard wide swath.
6/23/2010	3:40 AM	Darlington	56 kts			Law enforcement reported trees down 1 mile north of Darlington.
7/24/2012	3:05 AM	Darlington	56 kts		$10,000	A strengthening low-level jet pushed over a stalled frontal boundary over southern Wisconsin with a very warm, moist and unstable air mass under very steep lapse rates provided the focus for strong to severe thunderstorms during the pre-dawn hours of July 24th. The severe thunderstorms produced a discontinuous swath of damaging wind gusts that downed trees and power lines.
7/25/2012	11:03 PM	Darlington	56 kts			A line of scattered to broken supercell thunderstorms formed along a cold front that was slicing into a very warm, unstable air mass over the Upper Midwest. The combination of wind shear and CAPE provided ideal conditions for the supercells to congeal into a bowing mesoscale convective system that roared west to east across southern Wisconsin during the late evening hours of July 25th and early overnight hours of July 26th. Damaging wind gusts from the severe thunderstorm complex produced numerous reports of downed trees, power lines and some property damage to homes and businesses.
9/4/2012	7:50 PM	Darlington	56 kts		$2,000	Law enforcement officials reported trees were blown down by damaging thunderstorm wind gusts estimated at 56 knots (65 mph) 7 miles northeast of Darlington.
TOTALS				2	$12,729,000	

Source: National Climatic Data Center: U.S. Storm Event Database

Table A3: Historical Occurrences of Hail Damage: 1969 – 2013

Date	Time	Location	Magnitude (in)	Property Damage
6/29/1969	1735	Countywide	2.5	
6/14/1974	1330	Countywide	1.75	
6/13/1980	1540	Countywide	1.00	
4/3/1981	2211	Countywide	1.75	
8/10/1983	1610	Countywide	2.00	
8/10/1983	1620	Countywide	2.00	
8/10/1983	1630	Countywide	1.75	
8/10/1983	1640	Countywide	2.00	
8/10/1983	1650	Countywide	2.00	
5/27/1987	1640	Countywide	1.00	
7/4/1990	1752	Countywide	1.25	
3/27/1991	1245	Countywide	0.75	
3/27/1991	1310	Countywide	2.75	
4/28/1991	1809	Countywide	1.75	
6/23/1996	6:30 PM	Darlington	1.25	
7/28/1999	9:10 AM	Darlington	1.00	
5/31/2000	8:40 PM	Darlington	0.75	
8/2/2003	12:55 PM	Darlington	0.75	
3/30/2005	12:35 PM	Darlington	0.75	
3/30/2005	12:50 PM	Darlington	1.25	
3/30/2005	12:56 PM	Darlington	1.00	
4/13/2006	7:55 PM	Darlington	2.00	$2,400,000
4/3/2011	7:55 PM	Darlington	1.75	
6/8/2011	7:10 AM	Countywide	0.75	
TOTALS				$2,400,000

Source: National Climatic Data Center: U.S. Storm Event Database

Table A4: Historical Occurrences of Tornadoes/Funnel Cloud: 1958 – 2013

Date	Time	Location	F-Scale	Length (miles)	Width (yds)	Reported Damages
5/31/1958	1430	Countywide	F2			$250,000
9/2/1963	1730	Countywide	F2			
9/2/1963	1830	Countywide	F1			$250,000
4/16/1967	1350	Countywide	F3			$2,500,000
6/11/1967	1430	Countywide	F1			$25,000
6/29/1969	1800	Countywide	F2			$250,000
9/9/1970	1900	Countywide	F2			$25,000
6/1/1971	1545	Countywide	F1			$25,000
7/25/1971	1600	Countywide	F1			$25,000
9/20/1972	1358	Countywide	F1			$25,000
6/7/1984	2330	Countywide	F2			$250,000
7/10/1984	1805	Countywide	F0			$25,000
8/16/1987	1650	Countywide	F1			$250,000
5/8/1988	1500	Countywide	F3			$250,000
5/8/1988	1510	Countywide	F1			$250,000
7/24/2009	1612	Countywide	EF0			$110,000
7/24/2009	1732	Countywide	EF0			$60,000
7/27/2009	1910	Countywide	EF0			$0
6/21/2010	1839	Countywide	EF1			$15,000
TOTALS						$4,585,000

Source: National Climatic Data Center: U.S. Storm Event Database

Table A5: Historical Occurrences of Severe Winter Storms: 1993 - 2013

Date	Time (CST)	Type	Estimated Damage	Notes
1/13/1993		Heavy Snow		
1/5/1994	12:00 PM	Heavy Snow		
1/26/1994	20:00 PM	Heavy Snow/ice Storm		
2/7/1994	16:00 PM	Heavy Snow		
2/22/1994	18:00 PM	Heavy Snow		
2/25/1994	6:00 AM	Heavy Snow		
4/30/1994	12:00 PM	Heavy Snow		
12/5/1994	21:00 PM	Heavy Snow		
1/19/1995	6:00 AM	Heavy Snow		
2/26/1995	21:00 PM	Ice Storm		
11/26/1995	20:00 PM	Heavy Snow		
12/8/1995	15:00 PM	Blowing Snow		
12/13/1995	10:00 AM	Ice Storm		
1/26/1996	12:00 AM	Heavy Snow		
1/29/1996	5:00 AM	Blizzard		
12/23/1996	12:00 AM	Ice Storm	$300,000	
12/25/1996	6:00 PM	Heavy Snow		
2/4/1997	3:00 AM	Heavy Snow		
3/8/1998	4:00 AM	Winter Storm		
1/2/1999	7:00 AM	Winter Storm		
3/8/1999	7:00 PM	Winter Storm		
2/17/2000	11:00 PM	Winter Storm		
4/7/2000	6:00 AM	Winter Storm		
12/11/2000	8:00 AM	Heavy Snow		
12/18/2000	2:00 PM	Heavy Snow		
2/3/2003	12:00 AM	Winter Weather/mix		
4/7/2003	6:00 AM	Winter Weather/mix		
12/10/2003	6:00 AM	Winter Weather/mix		
1/4/2004	12:00 PM	Winter Weather/mix		
1/16/2004	12:00 PM	Winter Weather/mix		
2/5/2004	2:00 AM	Heavy Snow		
2/8/2004	9:00 PM	Winter Weather/mix		
12/18/2004	6:00 AM	Winter Weather/mix		
1/6/2005	5:00 AM	Winter Storm		
1/22/2005	2:00 AM	Winter Storm		
11/15/2005	6:00 PM	Winter Weather/mix		

Date	Time (CST)	Type	Estimated Damage	Notes
2/16/2006	9:00 AM	Winter Storm		
2/24/2007	18:00 PM	Blizzard		
2/25/2007	3:51 AM	Winter Storm		
12/1/2007	9:00 AM	Winter Storm		
12/11/2007	5:00 AM	Winter Storm		
12/22/2007	21:00 PM	Winter Storm		
12/23/2007	18:00 PM	Winter Weather		
1/16/2008	22:00 PM	Winter Weather		
1/21/2008	6:00 AM	Winter Weather		
1/29/2008	12:00 PM	Winter Storm		
2/5/2008	16:00 PM	Winter Storm		
2/17/2008	12:00 AM	Winter Storm		
2/25/2008	18:00 PM	Winter Weather		
12/8/2008	5:00 PM	Winter Storm		
12/18/2008	9:00 PM	Winter Storm		
12/20/2008	9:00 PM	Winter Storm		
2/21/2009	12:00 AM	Winter Storm		
12/8/2009	2:00 PM	Winter Storm		
1/7/2010	12:00 AM	Winter Storm		
12/11/2010	4:00 PM	Blizzard		
2/1/2011	5:00 PM	Blizzard		
12/20/2012	10:00 AM	Blizzard		
1/30/2013	5:00 AM	Winter Storm		
TOTAL			**$300,000**	

Source: National Climatic Data Center: U.S. Storm Event Database

Table A6: Historical Occurrences of Extreme Temperatures: 1994 – 2013

Date	Time (CST)	Type	Reported Deaths	Reported Injuries	Notes
1/13/1994	600	Cold			
6/14/1994	1200	Heat Wave			
6/17/1995	1300	Extreme Heat			
7/13/1995	800	Extreme Heat			
10/12/1995	1400	Record Warmth			
12/9/1995	300	Cold			
1/30/1996	2:00 AM	Extreme Windchill	1		
1/31/1996	12:00 AM	Extreme Cold			
2/1/1996	12:00 AM	Extreme Cold			
1/17/1997	12:00 AM	Extreme Cold			
11/23/1998	12:00 PM	Excessive Heat			
12/1/1998	12:00 AM	Excessive Heat			
1/5/1999	12:00 AM	Extreme Cold			
7/4/1999	3:00 AM	Excessive Heat			
7/29/1999	8:00 AM	Excessive Heat			
11/8/1999	12:00 PM	Record Warmth			
11/13/1999	1:00 PM	Record Warmth			
7/31/2001	11:00 AM	Excessive Heat			
8/6/2001	11:00 AM	Excessive Heat			
4/15/2002	1:00 PM	Excessive Heat			
6/30/2002	12:00 AM	Excessive Heat			
7/1/2002	6:00 AM	Excessive Heat			
12/18/2005	12:00 AM	Cold/Wind Chill			
2/17/2006	6:00 PM	Cold/Wind Chill			
2/18/2006	6:00 PM	Cold/Wind Chill			
7/30/2006	6:00 PM	Heat			
8/1/2006	12:00 AM	Heat			
1/30/2008	2:00 AM	Cold/Wind Chill			
12/15/2008	3:00 AM	Cold/Wind Chill			
12/21/2008	2:00 AM	Cold/Wind Chill			
1/13/2009	7:00 AM	Cold/Wind Chill			
1/14/2009	10:00 PM	Cold/Wind Chill			
1/15/2009	6:00 AM	Extreme Cold			
1/24/2009	6:00 AM	Cold/Wind Chill			
6/23/2009	12:00 PM	Heat			
7/14/2010	4:00 PM	Heat			

Date	Time (CST)	Type	Reported Deaths	Reported Injuries	Notes
8/11/2010	11:00 AM	Heat			
1/21/2011	12:00 AM	Cold/Wind Chill			
6/07/2011	11:00 AM	Heat			
7/01/2011	11:00 AM	Heat			
7/17/2011	11:00 AM	Excessive Heat			
7/21/2011	2:00 AM	Heat			
6/28/2012	11:00 AM	Heat			
7/16/2012	11:00 AM	Heat			
7/18/2012	1:00 PM	Heat			
7/23/2012	1:00 PM	Heat			
7/25/2012	1:00 PM	Heat			
7/2/2012	10:00 AM	Excessive Heat			
1/21/2013	8:00 AM	Cold/Wind Chill			

Source: National Climatic Data Center: U.S. Storm Event Database

APPENDIX B: MITIGATION STRATEGIES PRIORITIZATION

Armed with a thorough understanding of benefits, drawbacks, and perceptions of each strategy based on input from the Plan Commission, local stakeholders, and the public, the project team evaluated the benefits and drawbacks of each strategy to develop a preliminary prioritization.

The following ten elements were considered when identifying the benefits and drawbacks of each strategy. Elements three through ten are a part of a prioritization system developed by FEMA called STAPLEE (based on the first letter of each strategy, as highlighted below). Some communities have used a quantitative process to score each strategy for each of the STAPLEE criteria. In the case of City of Darlington, it was determined that a qualitative, holistic evaluation process would produce the most meaningful prioritization.

1. Ability to achieve one or more of the City of Darlington Hazard Mitigation Goals
2. Community support
3. Ability to be implemented (potential funding available)
4. **S**ocial impacts
5. **T**echnical feasibility
6. **A**dministrative requirements
7. **P**olitical support
8. **L**egality
9. **E**nvironmental impacts
10. **E**conomic impacts / costs of implementing

The following tables summarize the resulting prioritization of mitigation strategies based on benefits and costs/drawbacks. These tables include all possible mitigation strategies for any given hazard. Mitigation strategies are separated into the following priorities:

- **First Priority:** Includes highest priority strategies; begin implementation in Years 1 through 3, following adoption of this Plan.
- **Second Priority:** Includes second-highest priority strategies; begin implementation in Years 1 through 5, generally after Priority One priorities are underway.
- **Other Potential Strategies:** Includes strategies that are not currently identified as priorities, but are included for future consideration as the City moves forward with implementation of this Plan.

Table B1: Flood Mitigation Strategies Prioritization Matrix

Mitigation Strategy	Benefits	Drawbacks/Costs
1st Priority		
Pursue Regular Community Outreach and Education	▪ Can be used to help achieve all mitigation goals, particularly 1) protect human lives, 6) help people protect themselves, and 7) promote partnerships in mitigation ▪ Community-supported strategy ▪ Cost and time required to implement can be minimal ▪ Opportunities to partner with several organizations	▪ Cost of materials, programs, and staff time
Creatively Enhance Stormwater Management and Erosion Control	▪ Can be used to help achieve mitigation goals, particularly 1) protect human lives and 3) protect human and environmental health ▪ Improve stream's and storm sewer's capacity to carry water flow when obstructions removed ▪ Reduced threat to roadway damage and incidents from soil erosion ▪ Improve City Codes and Ordinances ▪ Reduce erosion and threats to water quality from run-off ▪ Potential funding sources: HMGP, NRCS	▪ Cost of any new infrastructure needed ▪ Environmental cost, if any, of new stormwater projects ▪ Cost of maintaining existing infrastructure ▪ May be environmental regulations associated with removal of vegetation from waterways
Continue Removal of Structures from Floodplain, focusing on Repetitive Loss Structures	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives ▪ Gets residents permanently out of harm's way ▪ Eliminates risk to emergency responders who would otherwise evacuate people ▪ Focused in downtown area of the City ▪ Creates an opportunity to create open space amenities in the floodplain ▪ HMGP is a potential funding source	▪ Cost of acquisitions ▪ Landowners unwilling to cooperate ▪ Approach can be difficult for small communicates to act on
Protect Critical Facilities and Infrastructure	▪ Can be used to help achieve multiple mitigation goals, particularly 5) prevent future risks in vulnerable areas ▪ Can reduce/eliminate loss of productivity and sales at businesses that lose access to the highway/populations when roadways/bridges are flooded or compromised by flooding ▪ Protect community's ability to respond to disasters by protecting critical facilities used in disasters ▪ Reduce economic impacts from damages to critical facilities	▪ Cost of floodproofing or relocating facilities/infrastructure ▪ Often involves coordination among different levels of government (e.g. WDOT and County)

Mitigation Strategy	Benefits	Drawbacks/Costs
Continue to Document, Analyze, and Learn from Flood Events	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives 2) properly plan future land uses ▪ Provides critical information for emergency responders ▪ Provides information for tracking historic floods to project future flooding vulnerability	▪ Cost of documenting floods ▪ Consistency through time
Promote Creation of a Pecatonica River Watershed Alliance	▪ Can be used to help achieve multiple mitigation goals, particularly 5) Prevent future risks of hazards in highly vulnerable areas ▪ Funding sources available for planning activities ▪ Multiple goals can be accomplished including the promotion of tourism, water quality improvement, minimization of flooding, increased open space/trail systems	▪ Can sometimes meet resistance to planning and regulation by the public ▪ Costs to organize ▪ Time and political commitment to a regional alliance
2nd Priority		
Pursue Targeted Approaches to Protect Water Quality	▪ Can be used to help achieve multiple mitigation goals, particularly 3) protect human and environmental health ▪ EPA a potential funding source for brownfield cleanup	▪ Cost of relocating facilities that contain hazardous materials out of flood hazard area, or cost of floodproofing hazardous material storage areas, or cost of cleaning up contaminated sites ▪ Cost of maintaining sanitary sewer infrastructure ▪ Cost of protecting potable water infrastructure, wells
Increase Access to and Effectiveness of Flood Insurance	▪ Reduce amount property owners have to spend personally to recover from flood damages ▪ Enrollment in CRS reduces flood insurance for residents ▪ Proves increased accountability for flood related hazards to government agencies	▪ Staff time to enroll in CRS program ▪ No guarantee of insurance rate reduction ▪ Staff time to educate residents about benefit of flood insurance, host open houses with insurance providers
Improved Planning and Regulatory Practices	▪ Can be used to help achieve multiple mitigation goals, particularly 5) Prevent future risks of hazards in highly vulnerable areas ▪ Funding sources available for planning activities, particularly for open space preservation ▪ Can be used as a tool to prevent future development or activities that increase flood vulnerability	▪ Can sometimes meet resistance to planning and regulation by the public ▪ Costs to develop plans or improve regulations ▪ Time and political commitment to regulation enforcement, after new rules adopted.

Mitigation Strategy	Benefits	Drawbacks/Costs
Improve Coordination and Communication Among Emergency Responders	▪ Can be used to help achieve multiple mitigation goals, particularly 7) promote partnerships in mitigation ▪ Maximize use of limited resources by working together, maximizing the use of technology, and improving efficiency ▪ Potential funding sources available (but not HMGP) ▪ Community Supported Initiative	▪ Cost of improving/updating communication systems ▪ Time investment to improve coordination
Promote and Implement Modern Hazard Warning Systems	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Reduces resources to be expended by emergency responders if people get out of harm's way themselves ▪ City serves rural and increasingly elderly population ▪ Grant programs available for NOAA radios	▪ Cost of warning equipment, programs ▪ Staff time to educate people about use of hazard warning systems ▪ City of Darlington at the end of media market – little coverage ▪ Increased cell phone and computer usage among populations
Other Potential Strategies		
Promote Floodproofing of Buildings Where Appropriate and Cost-effective	▪ Can be used to help achieve mitigation goals 1) protect human lives, 5) Prevent future risks of hazards in highly vulnerable areas ▪ Protects property from damage ▪ HMGP is a potential funding source if cost feasible	▪ May still require evacuation of people during major floods, and business lost ▪ Cost of floodproofing can be high, depending on the technique (e.g. elevation)
Develop Emergency Water and Power Sources	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps serve the surrounding rural populations ▪ Potential coordination with the County	▪ Cost of providing emergency water and power ▪ Has not been a critical need to date ▪ Less of a long-term solution than protecting existing water and power infrastructure from flooding damages
Monitor Vulnerable Populations	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps to prioritize emergency response actions	▪ Staff time to maintain and update list
Secure funding to improve Main Street Bridge	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health properly plan future land uses ▪ Reduce bridge closure and allows for continued commerce and activity	▪ Low on grant funding list ▪ Can exacerbate flooding in other areas ▪ Cost of maintenance, repair

Table B2: Severe Storm, Tornado, and Winter Storm Mitigation Strategies Prioritization Matrix

Mitigation Strategy	Benefits	Drawbacks/Costs
1st Priority		
Pursue Regular Community Outreach and Education	▪ Can be used to help achieve all mitigation goals, particularly 1) protect human lives, 6) help people protect themselves, and 7) promote partnerships in mitigation ▪ Community-supported strategy ▪ Cost and time required to implement can be minimal ▪ Opportunities to partner with several organizations	▪ Cost of materials, programs, and staff time
Promote and Implement Modern Hazard Warning Systems	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Reduces resources to be expended by emergency responders if people get out of harm's way themselves ▪ Grant programs available for NOAA radios	▪ Cost of warning equipment, programs ▪ Staff time to educate people about use of hazard warning systems ▪ City of Darlington at the end of media market – little coverage ▪ Increased cell phone and computer usage among populations
Develop Emergency Water and Power Sources	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps serve the surrounding rural populations ▪ Possible cooperation with the County to fund upgrades	▪ Cost of providing emergency water and power ▪ Has not been a critical need to date ▪ Less of a long-term solution than protecting existing water and power infrastructure from flooding damages
2nd Priority		
Promote Active Tree Management	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives, 5) Prevent future risks of hazards in highly vulnerable areas, 6) help people to protect themselves ▪ Community and politically-supportable strategy ▪ Technically and financially feasible ▪ Potentially fundable through HMGP if protecting utilities	▪ Personnel time to implement ▪ Cost of materials and personnel time to educate property owners on tree management techniques and benefits
Protect Critical Facilities and Infrastructure	▪ Can be used to help achieve multiple mitigation goals, particularly 5) prevent future risks in vulnerable areas ▪ Can reduce/eliminate loss of productivity at businesses that lose access to the highway when roadways/bridges are blocked with storm debris ▪ Protect community's ability to respond to disasters by protecting critical facilities used in disasters	▪ Cost of structural retrofitting materials/labor ▪ Cost of materials and personnel time to educate critical facilities operators of structural retrofitting techniques and benefits ▪ Cost of bracing/undergrounding utilities

Mitigation Strategy	Benefits	Drawbacks/Costs
	▪ Reduce economic impacts from damages to critical facilities and infrastructure ▪ Reduce risk to safety and property of damaged aboveground utility lines/poles	
Improve Coordination and Communication Among Emergency Responders	▪ Can be used to help achieve multiple mitigation goals, particularly 7) promote partnerships in mitigation ▪ Maximize use of limited resources by working together and improving efficiency ▪ Potential funding sources available (but not HMGP)	▪ Cost of improving/updating communication systems ▪ Time investment to improve coordination
Other Potential Strategies		
Conduct Structural Retrofitting of Non-Critical Facilities	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives and 6) help people to protect themselves ▪ Can be implemented as part of routine building maintenance ▪ Reduces likelihood of damages to structures and personal property ▪ Fundable through HMGP	▪ Cost of retrofitting materials/labor ▪ Reduces, but does not eliminate risk to certain structures including mobile homes and industrial buildings ▪ Cost of materials and personnel time to educate property owners on structural retrofitting techniques and benefits
Monitor Vulnerable Populations	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps to prioritize emergency response actions	▪ Staff time to maintain and update list ▪ Some of this has already been completed through the HMP process
Advance the Construction of Shelters and Saferooms	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives and 6) help people to protect themselves ▪ Greatly reduces risk of injury/death of people in structures that are not hazard-resistant; in the case of mobile homes, reduces risk to lower income groups. ▪ Technically and financially feasible ▪ Construction fundable through HMGP	▪ Cost of constructing saferooms ▪ Cost of materials and personnel time to educate property owners on saferoom identification/construction techniques and benefits
Recruit additional Storm Spotters and Train Them	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps to prioritize emergency response actions	▪ Staff time to maintain and update list

Table B3: Drought Mitigation Strategies Prioritization Matrix

Mitigation Strategy	Benefits	Drawbacks/Costs
2nd Priority		
Pursue Regular Community Outreach and Education	▪ Can be used to help achieve all mitigation goals, particularly 6) help people protect themselves ▪ Community-supported strategy ▪ Cost and time required to implement can be minimal ▪ Opportunities to partner with several organizations	▪ Cost of materials, programs, and staff time
Promote Use of Best Management Practices for Yards and Agriculture	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health and 6) help people to protect themselves ▪ Offers a more sustainable approach to drought mitigation	▪ Personnel time to educate and encourage farmers and property owners to adopt BMPs.
Improve Planning and Regulatory Practices	▪ Can be used to help achieve multiple mitigation goals, particularly 3) protect human and environmental health ▪ Funding sources available for planning activities ▪ Offers a more sustainable approach to drought mitigation	▪ Can sometimes meet resistance to planning and regulation by the public ▪ Costs to develop plans or improve regulations ▪ Time and political commitment to regulation enforcement
Other Potential Strategies		
Increase Use of Crop Insurance	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health and 6) help people to protect themselves ▪ Reduce amount farm owners have to spend personally to recover from drought	▪ Personal costs of insurance ▪ Personnel time to educate farm owners about benefit of crop insurance ▪ Local efforts may not greatly improve upon state and federal efforts to increase use of crop insurance
Promote and Implement Modern Hazard Warning Systems	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Grant programs available for NOAA radios	▪ Cost of warning equipment, programs ▪ Staff time to educate people about use of hazard warning systems
Improve Hazard Threat Recognition	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Improves ability to implement mitigation actions in a timely manner, such as water conservation	▪ Personnel time to improve monitoring of drought forecasts and monitor local groundwater resources
Develop Emergency Water Sources	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health	▪ Cost of emergency water sources ▪ Has not been a critical need to date ▪ Less of a long-term solution than water conservation methods

Table B4: Extreme Temperatures Mitigation Strategies Prioritization Matrix

Mitigation Strategy	Benefits	Drawbacks/Costs
1st Priority		
Pursue Regular Community Outreach and Education	▪ Can be used to help achieve all mitigation goals, particularly 1) protect human lives, 6) help people protect themselves, and 7) promote partnerships in mitigation ▪ Community-supported strategy ▪ Increasingly elderly population is most susceptible ▪ Cost and time required to implement can be minimal ▪ Opportunities to partner with several organizations	▪ Cost of materials, programs, and staff time
2nd Priority		
Promote And Improve Use Of Cooling Centers (Possibly Similar Spaces As Saferooms)	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives and 6) help people to protect themselves ▪ Greatly reduces risk of illness/death of vulnerable populations.	▪ Cost of materials and personnel time to educate property owners on locations and hours of cooling centers
Other Potential Strategies		
Monitor Locations of Vulnerable Populations and Improve Access to Adequate Heating/Cooling	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps to prioritize emergency response actions ▪ Extreme temperatures are one of the greatest risks particularly to low-income and elderly and therefore monitoring those populations' access to adequate heating and cooling can have significant impact	▪ Staff time to monitor and educate vulnerable populations ▪ Cost to subsidize heating/cooling for vulnerable populations
Promote Home Weatherization	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health and 6) help people protect themselves ▪ Community and politically-supportable strategy ▪ Increased Grant Funding Available ▪ Technically and financially feasible	▪ Existing snow and utility programs ▪ Staff time/materials needed to strengthen home weatherization program
Promote and Implement Modern Hazard Warning Systems	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Reduces resources to be expended by emergency responders if people get out of harm's way themselves ▪ Grant programs available for NOAA radios	▪ Cost of warning equipment, programs ▪ Staff time to educate people about use of hazard warning systems

Mitigation Strategy	Benefits	Drawbacks/Costs
Improve Coordination and Communication Among Emergency Responders	▪ Can be used to help achieve multiple mitigation goals, particularly 7) promote partnerships in mitigation ▪ Maximize use of limited resources by working together and improving efficiency ▪ Potential funding sources available (but not HMGP)	▪ Cost of improving/updating communication systems ▪ Time investment to improve coordination
Increase Use of Crop Insurance	▪ Can be used to help achieve mitigation goal 6) help people to protect themselves ▪ Reduce amount farm owners have to spend personally to recover from damages from extreme temperatures	▪ Personal costs of insurance ▪ Personnel time to educate farm owners about benefit of crop insurance ▪ Local efforts may not greatly improve upon state and federal efforts to increase use of crop insurance

Table B5: Earthquake Mitigation Strategies Prioritization Matrix

Mitigation Strategy	Benefits	Drawbacks/Costs
2nd Priority		
Pursue Regular Community Outreach and Education	▪ Can be used to help achieve all mitigation goals, particularly 1) protect human lives, 6) help people protect themselves, and 7) promote partnerships in mitigation ▪ Cost and time required to implement can be minimal ▪ Opportunities to partner with several organizations	▪ Cost of materials, programs, and staff time ▪ Public may not take warnings seriously ▪ Earthquakes not expected to have a serious impact in the City
Protect Critical Facilities And Infrastructure	▪ Can be used to help achieve multiple mitigation goals, particularly 5) prevent future risks in vulnerable areas ▪ Can reduce/eliminate loss of productivity at businesses that lose access to the highway when roadways/bridges are blocked with storm debris ▪ Protect community's ability to respond to disasters by protecting critical facilities used in disasters ▪ Reduce economic impacts from damages to critical facilities and infrastructure ▪ Reduce risk to safety and property of damaged aboveground utility lines/poles	▪ Cost of structural retrofitting materials/labor ▪ Cost of materials and personnel time to educate critical facilities operators of structural retrofitting techniques and benefits ▪ Cost of bracing/undergrounding utilities
Promote and Implement Modern Hazard Warning Systems	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Reduces resources to be expended by emergency responders if people get out of harm's way themselves ▪ Grant programs available for NOAA radios	▪ Cost of warning equipment, programs ▪ Staff time to educate people about use of hazard warning systems ▪ Earthquakes not expected to have a serious impact in the City

Mitigation Strategy	Benefits	Drawbacks/Costs
Other Potential Strategies		
Promote Structural Retrofitting and Property Protection of Non-Critical Facilities	▪ Can be used to help achieve multiple mitigation goals, particularly 1) protect human lives, 5) prevent future risks in vulnerable areas and 6) help people to protect themselves ▪ Can be implemented as part of routine building maintenance ▪ Reduces likelihood of damages to structures and personal property ▪ Technically and financially feasible ▪ HMGP fundable	▪ Cost of retrofitting materials/labor ▪ Reduces, but does not eliminate risk to certain structures including mobile homes and industrial buildings ▪ Cost of materials and personnel time to educate property owners on structural retrofitting techniques and benefits
Improve Planning and Regulatory Practices	▪ Can be used to help achieve multiple mitigation goals, particularly 5) Prevent future risks of hazards in highly vulnerable areas ▪ Funding sources available for planning activities ▪ Can be used as a tool to improve hazard-resistance of new development	▪ Can sometimes meet resistance to planning and regulation by the public ▪ Costs to develop plans or improve regulations ▪ Time and political commitment to regulation enforcement
Improve Coordination and Communication among Emergency Responders	▪ Can be used to help achieve multiple mitigation goals, particularly 7) promote partnerships in mitigation ▪ Maximize use of limited resources by working together and improving efficiency ▪ Potential funding sources available (but not HMGP)	▪ Cost of improving/updating communication systems ▪ Time investment to improve coordination
Improve Hazard Threat Recognition	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves, and 7) promote partnerships in mitigation ▪ Provides critical information for emergency responders	▪ Cost personnel time and materials for storm spotter training/recruitment
Monitor Vulnerable Populations	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health ▪ Helps to prioritize emergency response actions	▪ Staff time to maintain and update list
Develop Emergency Water and Power Sources	▪ Can be used to help achieve mitigation goal 3) protect human and environmental health	▪ Cost of providing emergency water and power ▪ Has not been a critical need to date ▪ Less of a long-term solution than protecting existing water and power infrastructure from storm damages

Table B6: Human-Caused and Disease Outbreak Mitigation Strategies Prioritization Matrix

Mitigation Strategy	Benefits	Drawbacks/Costs
Priority 1 Priority		
Improve Coordination and Communication Among Emergency Responders	▪ Can be used to help achieve multiple mitigation goals, particularly 7) promote partnerships in mitigation ▪ Maximize use of limited resources by working together and improving efficiency ▪ Potential funding sources available (but not HMGP)	▪ Cost of improving/updating communication systems ▪ Time investment to improve coordination
Pursue Regular Community Outreach and Education	▪ Can be used to help achieve all mitigation goals, particularly 1) protect human lives, 6) help people protect themselves, and 7) promote partnerships in mitigation ▪ Community-supported strategy ▪ Cost and time required to implement can be minimal ▪ Opportunities to partner with several organizations	▪ Cost of materials, programs, and staff time
Priority 2 Priority		
Promote and Implement Modern Hazard Warning Systems	▪ Can be used to help achieve multiple mitigation goals, particularly 6) help people to protect themselves ▪ Reduces resources to be expended by emergency responders if people get out of harm's way themselves ▪ Grant programs available for NOAA radios (but not HMGP)	▪ Cost of warning equipment, programs ▪ Staff time to educate people about use of hazard warning systems
Identify and Address Infrastructure Hazard Vulnerability	▪ Can be used to help achieve multiple mitigation goals, particularly 5) prevent future risks to vulnerable areas ▪ Protect community's ability to respond to disasters by protecting critical facilities used in disasters ▪ Reduce economic impacts from damages to critical facilities and infrastructure ▪ Reduce risk to safety and property of damaged aboveground utility lines/poles	▪ Cost of structural retrofitting materials/labor ▪ Cost of materials and personnel time to educate critical facilities operators of structural retrofitting techniques and benefits