

CITY OF MONMOUTH ADDENDUM

Purpose

This document serves as the City of Monmouth's Addendum to the Polk County Multi-Jurisdictional Natural Hazards Mitigation Plan (MNHMP, NHMP). This addendum supplements information contained in Volume I (Basic Plan) of this NHMP, which serves as the foundation for this jurisdiction's addendum, and Volume III (Appendices), which provides additional information (particularly regarding participation and mitigation strategy). This addendum meets the following requirements:

- Multi-jurisdictional **Plan Adoption** §201.6(c)(5),
- Multi-jurisdictional **Participation** §201.6(a)(3),
- Multi-jurisdictional **Mitigation Strategy** §201.6(c)(3)(iv), and
- Multi-Jurisdictional **Risk Assessment** §201.6(c)(2)(iii).

Plan Process, Participation, and Adoption

This section of the NHMP addendum addresses 44 CFR 201.6(c)(5), *Plan Adoption*, and 44 CFR 201.6(a)(3), *Participation*.

In the Fall of 2016, the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Community Service Center (CSC) partnered with the Oregon Military Department's Office of Emergency Management (OEM), and Polk County and cities, including Monmouth, to update their NHMP, which expired October 14, 2014. This project is funded through the Federal Emergency Management Agency's (FEMA) FY14 Pre-Disaster Mitigation Competitive Grant Program (PDMC-PL-10-OR-2014-002).

By developing this addendum to the Polk County NHMP, locally adopting it, and having it approved by FEMA, Monmouth will regain eligibility for FEMA Hazard Mitigation, Pre-Disaster Mitigation, and Flood Mitigation Assistance grant program funds.

The Polk County NHMP, and Monmouth addendum, are the result of a collaborative effort between citizens, public agencies, non-profit organizations, the private sector, and regional organizations. A project steering committee guided the process of developing the plan. For more information on the composition of the steering committee see the *Acknowledgements*, *Plan Summary*, and *Plan Process* (Volume III, Appendix A).

The Community Development Director of Monmouth is the designated local convener and will take the lead in implementing, maintaining, and updating the addendum to the NHMP in collaboration with the designated convener of the Polk County NHMP (County Planning Department).

Representatives from the City of Monmouth steering committee convened on the following occasions (see Appendix A for more information):

- July 27, 2016 - Polk County NHMP Kick-Off Meeting

- October 18, 2016 – Polk County NHMP Second Meeting
- April 3, 2017 – Review Draft Monmouth Addendum

The city’s addendum reflects decisions decided upon at the plan update meeting and during subsequent work and communication with OPDR.

The Monmouth Steering Committee was comprised of the following representatives:

- Convener, Mark Fancey, Community Development Director
- Russ Cooper, Monmouth Public Works Director
- Scott McClure, Monmouth City Manager
- Allen Risen, Western Oregon University Public Safety
- Michael Smith – Director Western Oregon University Facilities
- Ben Stange, Fire Chief, Polk County Fire District No. 1
- Darrell Tallen, Monmouth Chief of Police
- Chuck Thurman, Monmouth Power & Light Superintendent

Public participation was achieved with the establishment of the steering committee, which was comprised of city officials and special districts representing different organizations and sectors. The Steering Committee was closely involved throughout the development of the plan and served as the local oversight body for the plan’s development. In addition, community members outside of the steering committee were provided an opportunity for comment via the plan review process (see Appendix A for more information).

The Polk County NHMP was approved by FEMA on February 6, 2018 and the Monmouth addendum was adopted via resolution on January 16, 2018. This NHMP is effective through February 5, 2023.

Mitigation Strategy

This section of the NHMP addendum addresses 44 CFR 201.6(c)(3)(iv), *Mitigation Strategy*.

During the 2016/2017 Polk County update process OPDR re-evaluated the Action Items with the county and local steering committees. Following the review actions were updated, noting what accomplishments had been made, and whether the actions were still relevant; any new action items were identified at this time (see Appendix A for more information). Each jurisdiction developed a list of priority actions any actions that were not prioritized were placed in an Action Item Pool and will be considered during the annual Implementation and Maintenance meetings.

Priority Actions

The city is listing a set of high priority actions in an effort to focus attention on an achievable set of high leverage activities over the next five-years. The city’s priority actions are listed below in Table MA-1.

Action Item Pool

Table MA-2 presents a pool of mitigation actions. This expanded list of actions is available for local consideration as resources, capacity, technical expertise and/or political will become available.

The majority of these actions carry forward from prior versions of this plan.

Table MA-I Monmouth Priority Action Items

Action Item #	Description	Managing Department / Agency	Timeline	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility
Priority Actions					
Multi-Hazard Actions (MH)					
MH #1	Develop and incorporate city ordinances commensurate with building and fire codes to reflect survivability from wind, seismic, fire, and other hazards to ensure life safety.	Community Development Department, Building Department, Fire District	Ongoing	General Fund	BC: TBD TF: Yes
MH #2	Review ordinances and develop outreach programs to assure propane tanks are properly anchored and hazardous materials are properly stored and protected from known natural hazards such as seismic or flooding events.	Building Department, Fire District	Ongoing	General Fund, HMGP, HMA	BC: TBD TF: Yes
Earthquake Actions (EQ)					
EQ #1	Update the City Code to adopt, implement, and enforce current State of Oregon Building Codes.	Building Department	Ongoing	General Fund	BC: TBD TF: Yes
EQ #2	Retrofit important public facilities with significant seismic vulnerabilities (City Hall, etc.), such as unreinforced masonry construction. Consider structural and non-structural options.	City Manager, Central School District	Long Term (5+ Years)	General Fund, NEHRP, HMGP, SRGP	BC: TBD TF: Yes
Flood Actions (FL) - including erosion					
FL #1	Develop, or revise, adopt, and enforce storm water ordinances and regulations to manage run-off from new development, including buffers and retention basins.	Community Development Department, Public Works Department	Ongoing	General Fund, HMA	BC: TBD TF: Yes
FL #2	Identify and resolve areas of persistent stormwater flooding due to undersized, underperforming, stormwater infrastructure.	Public Works	Mid-Term (2-5 Years)	OWEB, General Fund, Grants, SDCs	BC: TBD TF: Yes
Winter Storm Actions (WT)					
WT #1	Implement and enforce the most current Uniform International, and State, Building Codes to ensure structures can withstand winter storm hazards such as high winds, rain, water, and snow.	Building Department	Short Term (0-2 Years)	General Fund	BC: TBD TF: Yes
WT #2	Develop and implement tree clearing mitigation programs to keep trees from threatening lives, property, and public infrastructure from severe weather events.	Public Works Department, Monmouth Power & Light	Short Term (0-2 Years)	General Fund, HMGP, HMA	BC: TBD TF: Yes

Source: City of Monmouth NHMP Steering Committee, 2017.
 MH=Multi-Hazard, EQ=Earthquake, FL=Flood, WT=Winter Storm

Table MA-2 Monmouth Action Item Pool

Action Item #	Description	Managing Department / Agency	Timeline	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility
Action Item Pool					
Drought Action (DR) - including expansive soils					
DR #1	Review construction codes to require non-absorbent fill soils that slope away from foundations for a minimum of five feet to prevent ponding and water retention.	Building Department	Short Term (0-2 Years)	General Fund	BC: TBD TF: Yes
Earthquake Actions (EQ)					
EQ #3	Encourage utility companies to evaluate and harden vulnerable infrastructure elements for sustainability.	Public Works Department Monmouth Power & Light	Mid-Term (2-5 Years)	General Fund, HMGP, Utility Co	BC: TBD TF: Yes
EQ #4	Disseminate FEMA pamphlets to educate and encourage homeowners concerning seismic structural and non-structural retrofit benefits.	Building Department	Short Term (0-2 Years)	General Fund, HMGP, NEHRP	BC: TBD TF: Yes
Flood Actions (FL) - including erosion					
FL #3	Develop and maintain GIS mapped inventory, and develop prioritized list of mitigation projects for residential and commercial buildings within 100-year floodplains.	Community Development Department	Mid-Term (2-5 Years)	General Fund, HMGP, HMA	BC: TBD TF: Yes
FL #4	Develop and maintain GIS mapped critical facility inventory for all structures located within 100-year floodplains.	Community Development Department	Short Term (0-2 Years)	General Fund, HMGP, HMA	BC: TBD TF: Yes
FL #5	Maintain and update erosion hazard locations, identify critical facilities potentially impacted, and develop mitigation initiatives such as bank stabilization or facility relocation to prevent or reduce the threat.	Community Development Department Public Works Department	Mid-Term (2-5 Years)	General Fund, HMGP, HMA, NRCS	BC: TBD TF: Yes
FL #6	Develop and provide information to all residents on riverbank erosion and methods to prevent it in an easily distributed format.	Public Works Department	Mid-Term (2-5 Years)	General Fund, NRCS, HMGP	BC: TBD TF: Yes
Landslide Actions (LS)					
<i>No specific actions identified; see multi-hazard actions.</i>					
Volcano Actions (VE)					
<i>No specific actions identified; see multi-hazard actions.</i>					

Source: City of Monmouth NHMP Steering Committee, 2017

DR=Drought, EQ=Earthquake, FL=Flood,

Table MA-2 Monmouth Action Item Pool (continued)

Action Item #	Description	Managing Department / Agency	Timeline	Potential Funding Source(s)	Benefit-Costs / Technical Feasibility
Action Item Pool					
Wildfire Action (WF)					
WF #1	Participate in the maintenance, implementation, and update of the Polk County Community Wildfire Protection Plan (2009).	PC SW Rural Fire District Polk County & City Manager	Ongoing	General Fund	BC: TBD TF: Yes
Windstorm Actions (WS)					
WS #1	Identify and prioritize critical facilities' overhead utilities that could be placed underground to reduce power disruption from wind storm / tree blow down damage.	Monmouth Power & Light	Short Term (0-2 Years)	General Fund, Utility Co	BC: TBD TF: Yes
WS #2	Enforce requirements to place utilities underground to reduce power disruption from windstorm / tree blow down damage when upgrading or during new development.	Community Development Department Building Department Monmouth Power & Light	Ongoing	General Fund	BC: TBD TF: Yes
Winter Storm Actions (WT)					
WT #3	Update or develop, implement, and maintain jurisdictional debris management plans.	Public Works Department Monmouth Power & Light	Mid-Term (2-5 Years)	General Fund, HMGP, HSGP	BC: TBD TF: Yes
WT #4	Develop and implement programs to coordinate maintenance and mitigation activities to reduce risk to public infrastructure from severe winter storms.	Public Works Department Monmouth Power & Light	Ongoing	General Fund, HMGP, HMA	BC: TBD TF: Yes
WT #5	Develop, implement, and maintain partnership program with electrical utilities to use underground utility placement methods where possible to reduce or eliminate power outages from severe winter storms.	Community Development Department Building Department Monmouth Power & Light	Ongoing	General Fund, Utility Co	BC: TBD TF: Yes
WT #6	Educate public regarding weather patterns associated with El Niño / La Niña.	Community Development Department	Short Term (0-2 Years)	General Fund, NOAA/ NWS, HMGP	BC: TBD TF: Yes

Source: City of Monmouth NHMP Steering Committee, 2017

WF=Wildfire, WS=Windstorm, WT=Winter Storm

Plan Implementation and Maintenance

The City Council will be responsible for adopting the City of Monmouth addendum to the Polk County NHMP. This addendum designates a coordinating body and a convener to oversee the development and implementation of action items. Because the city addendum is part of the county's multi-jurisdictional NHMP, the city will look for opportunities to partner with the county. The city's steering committee will convene after re-adoption of the City of Monmouth addendum on an annual schedule; the county meeting on a semi-annual basis and will provide opportunities for the cities to report on NHMP implementation and maintenance during their meetings. The Community Development Director will serve as the convener and will be responsible for assembling the steering committee (coordinating body). The steering committee will be responsible for:

- identifying new risk assessment data,
- reviewing status of mitigation actions,
- identifying new actions, and
- seeking funding to implement the city's mitigation strategy (actions).

The convener will also remain active in the county's implementation and maintenance process (see Volume I, Section 4 for more information).

The city will utilize the same prioritization process as the county (See Volume I, Section 4: Plan Implementation and Maintenance and Volume III, Appendix C: Economic Analysis of Natural Hazard Mitigation Projects for more information).

Implementation through Existing Programs

Many of the Natural Hazards Mitigation Plan's recommendations are consistent with the goals and objectives of the city's existing plans and policies. Where possible, the City of Monmouth will implement the NHMP's recommended actions through existing plans and policies. Plans and policies already in existence have support from local residents, businesses, and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, allowing them to adapt to changing conditions and needs. Implementing the NHMP's action items through such plans and policies increases their likelihood of being supported and implemented.

Monmouth's acknowledged comprehensive plan is the [Monmouth Comprehensive Plan](#). The Oregon Land Conservation and Development Commission first acknowledged the plan in 1978. The City last amended the plan in 2010. The City implements the plan through the [Monmouth City Code](#), which was last amended in 2017.

Monmouth currently has the following plans, programs, and policies that relate to natural hazard mitigation. For a complete list visit the city [website](#):

Table MA-3 Legal and Regulatory Resources Available for Hazard Mitigation

Regulatory Tool	Name	Effects on Hazard Mitigation
Plans	Emergency Operations Plan (2010)	Identifies emergency planning, policies, procedures, and response to extraordinary emergency situations associated with natural disasters, technological incidents, and national security emergencies.
	Comprehensive Plan (2010) Natural Hazards Element Map	Provides background and inventory information as well as policy direction.
	Urban Renewal Plan (2005) District Map	This plan may be used to identify Capitol Improvement projects that would mitigate future disaster damages.
	Building Inspection Program Operations Plan	Outlines Building Department procedures including plan review and inspections.
	Water Master Plan	Provides a description and analysis of water system and outlines planned improvements.
	Sewer Master Plan	Provides a description and analysis of sewer system and outlines planned improvements.
	Storm Drainage Master Plan	Provides a description and analysis of storm drainage system and outlines planned improvements.
	Transportation System Plan (2009)	Establishes the City's goals, policies, and action strategies for developing and improving the transportation system within the Urban Growth Boundary.
Parks System Master Plan (2008)	Provides guidance and recommendations on how to develop an interconnected and accessible park system.	
Programs	National Flood Insurance Program (NFIP)	Makes affordable flood insurance available to homeowners, business owners, and renters in participating communities. In exchange, those communities must adopt and enforce minimum floodplain management regulations to reduce the risk of damage from future floods.
Policies (Municipal Codes)	Monmouth City Code Title 15: Building and Construction	Adopts and enforces the Oregon Building Code.
	Housing Code	Provides health and safety standards for rental properties.
	Monmouth City Charter	No effect.

Regulatory Tool	Name	Effects on Hazard Mitigation
	Monmouth Sign Code	No effect.
	Monmouth City Code Title 18: Zoning Chapter 18.125: Floodplain Zone	Uses the FEMA Model Ordinance to regulate floodplain development and provide guidance for safe building location, practices, and review requirements.

Table MA-4 Administrative and Technical Resources for Hazard Mitigation

Staff/Personnel Resources	Department/Division Position
Planner(s) or engineer(s) with knowledge of land development and land management practices	Community Development Director: Mark Fancey
Engineer(s) or professional(s) trained in construction practices related to buildings and/or infrastructure	Building Official: Larry Thornton
Planner(s) or engineer(s) with an understanding of manmade or natural hazards	Community Development Director: Mark Fancey
Floodplain manager	Community Development Director: Mark Fancey
Personnel skilled in GIS and/or HAZUS-MH	Community Development Director: Mark Fancey
Grant Writer	Community Development Director: Mark Fancey
Director of Emergency Services	EOC / Depends on hazard
Finance (grant writers, purchasing)	City Finance Director
Public Information Officers	EOC / Depends on hazard

Table MA-5 Financial Resources for Hazard Mitigation

Financial Resources	Effect on Hazard Mitigation
General funds	Yes
Authority to levy taxes for specific purposes	(measure 5) w/ a cap w/ voter approval (cannot exceed cap)
Incur debt through general obligation bonds	No
Incur debt through special tax and revenue bonds	Yes
Incur debt through private activity bonds	Yes

Note: See Appendix D – Grant Programs for additional financial resources.

Continued Public Participation

Keeping the public informed of the city's efforts to reduce the city's risk to future natural hazards events is important for successful plan implementation and maintenance. The city is committed to involving the public in the plan review and updated process. See Volume I, Section 4, for more information.

Plan Maintenance

The Polk County Multi-Jurisdictional Natural Hazards Mitigation Plan and city addendum will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During the county plan update process, the city will also review and update its addendum. The convener will be responsible for convening the steering committee to address the questions outlined below.

- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?
- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the plan accurately address the impacts of this event?

These questions will help the steering committee determine what components of the mitigation plan need updating. The steering committee will be responsible for updating any deficiencies found in the plan.

Risk Assessment

This section of the NHMP addendum addresses 44 CFR 201.6(b)(2) - Risk Assessment. In addition, this chapter can serve as the factual basis for addressing Oregon Statewide Planning Goal 7 – Areas Subject to Natural Hazards. Assessing natural hazard risk has three phases:

- **Phase 1:** Identify hazards that can impact the jurisdiction. This includes an evaluation of potential hazard impacts – type, location, extent, etc.
- **Phase 2:** Identify important community assets and system vulnerabilities. Example vulnerabilities include people, businesses, homes, roads, historic places and drinking water sources.
- **Phase 3:** Evaluate the extent to which the identified hazards overlap with, or have an impact on, the important assets identified by the community.

The local level rationale for the identified mitigation strategies (action items) is presented herein, and within Section 2, *Risk Assessment*, and Appendix B, *Community Profile*. The risk assessment process is graphically depicted in Figure MA-1 below. Ultimately, the goal of hazard mitigation is to reduce the area of risk, where hazards overlap vulnerable systems.

Figure MA-1 Understanding Risk



Hazard Analysis Methodology

This NHMP utilizes a hazard analysis methodology that was first developed by FEMA circa 1983, and gradually refined by the Oregon Military Department’s Office of Emergency Management over the years.

The methodology produces scores that range from 24 (lowest possible) to 240 (highest possible). Vulnerability and probability are the two key components of the methodology. Vulnerability examines both typical and maximum credible events, and probability endeavors to reflect how physical changes in the jurisdiction and scientific research modify the historical record for each hazard. Vulnerability accounts for approximately 60% of the total score, and probability approximately 40%.

This method provides the jurisdiction with a sense of hazard priorities, or relative risk. It doesn't predict the occurrence of a particular hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can first be focused where the risk is greatest.

In this analysis, severity ratings, and weight factors, are applied to the four categories of history, vulnerability, maximum threat (worst-case scenario), and probability as shown in the table below. See Volume I, Section 2 (Risk Assessment) for more information.

Hazard Analysis

The Monmouth steering committee developed their hazard vulnerability assessment (HVA), using the county’s HVA as a reference. Changes from the county’s HVA were made where appropriate to reflect distinctions in vulnerability and risk from natural hazards unique to Monmouth, which are discussed throughout this addendum.

Table MA-6 shows the HVA matrix for Monmouth showing each hazard listed in order of rank from high to low. For local governments, conducting the hazard analysis is a useful step in planning for hazard mitigation, response, and recovery. The method provides the jurisdiction with sense of hazard priorities, but does not predict the occurrence of a particular hazard.

One catastrophic hazard (Cascadia Subduction Zone earthquake) and two chronic hazards (winter storm and flood) rank as the top hazard threats to the city (Top Tier). The crustal earthquake, windstorm, and drought hazards comprise the next highest ranked hazards (Middle Tier), while wildfire, landslide, and volcano hazards comprise the lowest ranked hazards (Bottom Tier).

Table MA-6 Hazard Analysis Matrix – Monmouth

Hazard	History	Probability	Vulnerability	Maximum Threat	Total Threat Score	Hazard Rank	
Earthquake - Cascadia	2	49	50	100	201	# 1	<i>Top Tier</i>
Winter Storm	8	56	25	60	149	# 2	
Flood - Riverine	4	28	20	70	122	# 3	
Earthquake - Crustal	2	7	20	80	109	# 4	<i>Middle Tier</i>
Windstorm	6	28	20	50	104	# 5	
Drought	2	7	5	80	94	# 6	
Wildfire (WUI)	4	7	5	10	26	# 7	<i>Bottom Tier</i>
Landslide	2	7	5	10	24	# 8	
Volcano	2	7	5	10	24	# 8	

Source: Monmouth NHMP Steering Committee, 2017.

Table MA-7 categorizes the probability and vulnerability scores from the hazard analysis for the city and compares the results to the assessment completed by the Polk County NHMP Steering Committee (areas of differences are noted with **bold** text within the city ratings). Notably, the city ranked their vulnerability to Cascadia Subduction Zone earthquakes higher than the county.

Table MA-7 Probability and Vulnerability Comparison

Hazard	Monmouth		County	
	Probability	Vulnerability	Probability	Vulnerability
Drought	Low	Low	Moderate	Moderate
Earthquake (Cascadia)	Moderate	High	Moderate	Moderate
Earthquake (Crustal)	Low	Moderate	Moderate	Moderate
Flood	Moderate	Moderate	High	Moderate
Landslide	Low	Low	High	Low
Volcano	Low	Low	Low	Moderate
Wildfire	Low	Low	Moderate	Moderate
Windstorm	Moderate	Moderate	High	High
Winter Storm	High	Moderate	High	High

Source: Monmouth NHMP Steering Committee and Polk County NHMP Steering Committee, 2017.

Between 2010 and 2015 the City grew by 95 people (1%) and median household income decreased by 19% (see Appendix B). New development was placed outside of the floodplain per the city’s floodplain ordinance (see Table MA-3) and complied with the seismic safety standards within the [Oregon State Building Code](#). As such changes in population, demographics, and development have had a negligible impact upon vulnerability. However, decreased household income within the community may be a signal that segments of the community may have a difficult time recovering from a natural hazard. See specific hazard sections below for more information.

Community Asset Identification

This section provides information on city specific assets. For additional information on the characteristics of Monmouth, in terms of geography, environment, population, demographics, employment and economics, as well as housing and transportation see Volume III, Appendix B, *Community Profile*. Many of these community characteristics can affect how natural hazards impact communities and how communities choose to plan for natural hazard mitigation. Considering the city specific assets during the planning process can assist in identifying appropriate measures for natural hazard mitigation.

Community Characteristics

Monmouth is located in the mid-Willamette Valley near the foothills of the Coast Range and is located on the Willamette River covering an area of about 2.2 square miles. The climate of Monmouth is moderate; the average monthly temperatures range from 49 – 82 degrees in July through August, and 33-47 degrees in December and January, and the city receives approximately 40 inches of rain each year¹. Monthly precipitation is about 4-7 inches during the wetter months of November through March, and average about 0.5-1.5 inches during the drier months of June - September. The city’s topography is relatively flat. The city abuts Independence to the east and is approximately 15 miles southwest of Salem.

¹ [Western Regional Climate Center, “Salem-McNary Field, Oregon \(357500\)”. Retrieved November 22, 2016.](#)

Economy

Monmouth benefits from its location to Salem which is the State Capital and a regional center for industrial technology, engineering, research, commerce, and health care. Monmouth has some manufacturing businesses, however, most employment is outside of the city.

Asset Inventory

Asset inventory is the first step of a vulnerability analysis. Assets that may be affected by hazard events include population, residential and nonresidential buildings, critical facilities, and infrastructure.

The asset inventory delineates the City's existing building and infrastructure assets and insured values and are identified in detail in Table MA-8 and Map MA-1 (Attachment A).

Table MA-8 Monmouth Critical Facilities and Infrastructure

Facility Type	Name / Number	Address	Value ¹
Government	Monmouth City Hall	151 W Main St	\$851,810
	Monmouth Library	168 Ecols St S	\$2,001,290
	Monmouth Post Office	437 Clay St E	\$367,600
	City shop #1	401 Hogan Rd	\$734,890
	Storage building #2	401 Hogan Rd	\$22,791
	Gas tanks	401 Hogan Rd	\$7,349
	Office trailer	401 Hogan Rd	\$10,300
	City Hall storage building	144 S Warren Street	\$190,550
	Volunteer Hall	144 S Warren Street	\$519,120
	Community Building		\$462,470
Educational	Monmouth Elementary School	958 E Church	\$3,256,780
	Ash Creek Intermediate School	1360 N 16 th St	\$10,137,690
	Western Oregon University	345 N Monmouth	\$185,943,598
Care Facility	Monmouth Senior Center	180 Warren St S	\$513,970
	Medical Center	512 Main Street	\$723,800
	Heron Pointe Assisted Living Center	504 Gwinn St E	\$5,432,430
	Total Health Care Center	180 Atwater Street N	\$269,530
Community	Southgate Park	Southgate Drive & Josephine Street	Unknown
	Whitesell Park	Catherine Court	Unknown
	Winegar Park	Ecols Street N. & Suzanna Avenue	\$2,440
	Cherry Lane Park	Cherry Lane	Unknown
	Gentle Woods Park Restrooms	Olive Way & High Street N.	\$19,410
	Gentle Woods Park picnic shelter	Olive Way & High Street N.	\$77,250
	Le Mesa Park	Heffley Street S. & Bentley Street E.	Unknown
	Madrona Park restrooms	Madrona Street E. & Edwards Road	\$30,098
	Main Street Park restrooms	Main Street W. & Warren Street S.	57,680
Main Street Park Splash Fountain	Main Street W. & Warren Street S.	\$210,000	

Facility Type	Name / Number	Address	Value ¹
	Main Street Park Amphitheater	Main Street W. & Warren Street S.	\$1,300,000
	Marr Park	Jackson Street W. & Marr Court	Unknown
	Monmouth Recreational Park	Hogan Road & Highway 51	\$83,640
	Baseball fields/skate park	540 Ridge Rd	\$235,870
	Baseball fields restroom	541 Ridge Rd	\$84,460
Emergency Response	Monmouth Police Department	450 Pacific Highway N	\$3,764,977
State and Federal Highways	US Route 99W	Traverses the entire community from north to south	\$1.93 miles
	US Route 51	Traverses the entire community from east to west	\$1.80 miles
Utilities	NE lift station	401 Hogan Road	208,160
	Chlorine building	401 Hogan Road	44,290
	Generator	401 Hogan Road	65,920
	S. Warren lift station		193,460
	NW lift station		145,230
	SE Teton lift station		124,630
	Fencing	Hogan Road	153,470
	WIMPEG Channel 17		76,220
	Communications Tower	Cupids Knoll	Unknown
	Water Tank #1	Cupids Knoll	475,860
	Water Tank #2	Cupids Knoll	1,492,470
	Water Tank #3	Cupids Knoll	\$1,114,460
	Water Tank #4	4th St (Independence)	\$999,698
	Sewer effluent pump	Riddell Road	\$168,920
	Effluent pump station	Riddell Road	\$26,780
	Sewer effluent pump	Hogan Road	\$439,810
	Sewer Plant pump building		\$296,640
	River Road pump house #1*		\$337,840
	River Road pump house #2*		\$491,870
	Pumphouse #1		\$33,990
Pumphouse #2		\$36,050	
Pumphouse #3		\$41,200	
Pumphouse #4	4 th St (Independence)	\$50,473	
North switch station		\$335,780	
South switch station		\$49,423	

Note: ¹Estimated and/or insured structural and/or Polk County Assessed value for critical facilities and estimated values for critical infrastructure in 2009 dollars. Items in **bold** have been revised to 2017 dollars.

* - River Road pump house facilities are located in Marion County.

See hazard sections below and Section 2, *Risk Assessment*, for potential hazard vulnerabilities to these facilities.

Hazard Characteristics

Drought

The steering committee determined that the city's probability for drought is **low** (which is lower than the county's rating) and that their vulnerability to drought is **low** (which is lower than the county's rating).

Volume I, Section 2, *Risk Assessment*, adequately describes the characteristics of drought hazards, as well as the location and extent of a potential event. Due to a cool, wet climate, past and present weather conditions have generally spared Polk County communities from the effects of drought; however, Polk County was included in a Governor declared drought declaration in 1992 and a Presidential drought declaration in 2015.

Monmouth's primary water supply comes from four individual groundwater wells, Marion County #1 and #2 are the city's primary water sources, wells #4 and #5 are secondary sources. Combined these sources are capable of providing 3.0 million gallons of water per day. Development of the Willamette River Well Field, three additional wells located south of Independence along the west side of the Willamette River, is underway.²The city has four (4) storage reservoirs totaling 6.20 million gallons of treated water storage capacity.³ Based on current population growth projections the city has adequate storage capacity through 2035. In general, the city's water supply is available and sufficient. Additional, drought-related community impacts are described within the county's Drought Hazard section (Volume I, Section 2). In general, water supply is available and sufficient. Additional, drought-related community impacts are described within the county's Drought Hazard section (Volume I, Section 2).

Expansive Soils

Volume I, Section 2, *Risk Assessment*, adequately describes the characteristics of drought hazards, as well as the location and extent of a potential event. The addition of moisture to any soil will cause a change in volume, which is referred to as a shrink-swell characteristic.⁴

Per the previous version of this plan the City of Monmouth has critical facilities and infrastructure located within areas of low, moderate and high risk; see Map MA-2 (Attachment A).

Low risk areas contain 2,959 residential structures (value \$391M), 10 government facilities (value \$5.2M), one emergency response facility (value \$3.8M⁵), three education facilities (value \$200M), four care facilities (value \$6.9M), 15 community facilities (value \$669K), two highways (value unknown), and 21 utilities (value \$5.9M). Moderate risk areas contain two community facilities (value \$97K), and two utility facilities (value \$440K).

² Water System Master Plan Update (2000), Monmouth, OR. 4B Engineering and Consulting, LLC

³ Ibid

⁴ US Department of Agriculture, Natural Resources Conservation Service (USDA NRCS). 2008. National Cooperative Soil Survey, Physical Soil Properties—Polk County, Oregon.

⁵ Value updated to 2017 dollars.

A comprehensive risk and vulnerability assessment is not available for the drought hazard. Statewide droughts have historically occurred in Oregon, and as it is a region-wide phenomenon, all residents are equally at risk. Structural damage from drought is not expected; rather the risks are present to humans and resources. Agriculture, fishing, and timber have historically been impacted, as well as local and regional economies.

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

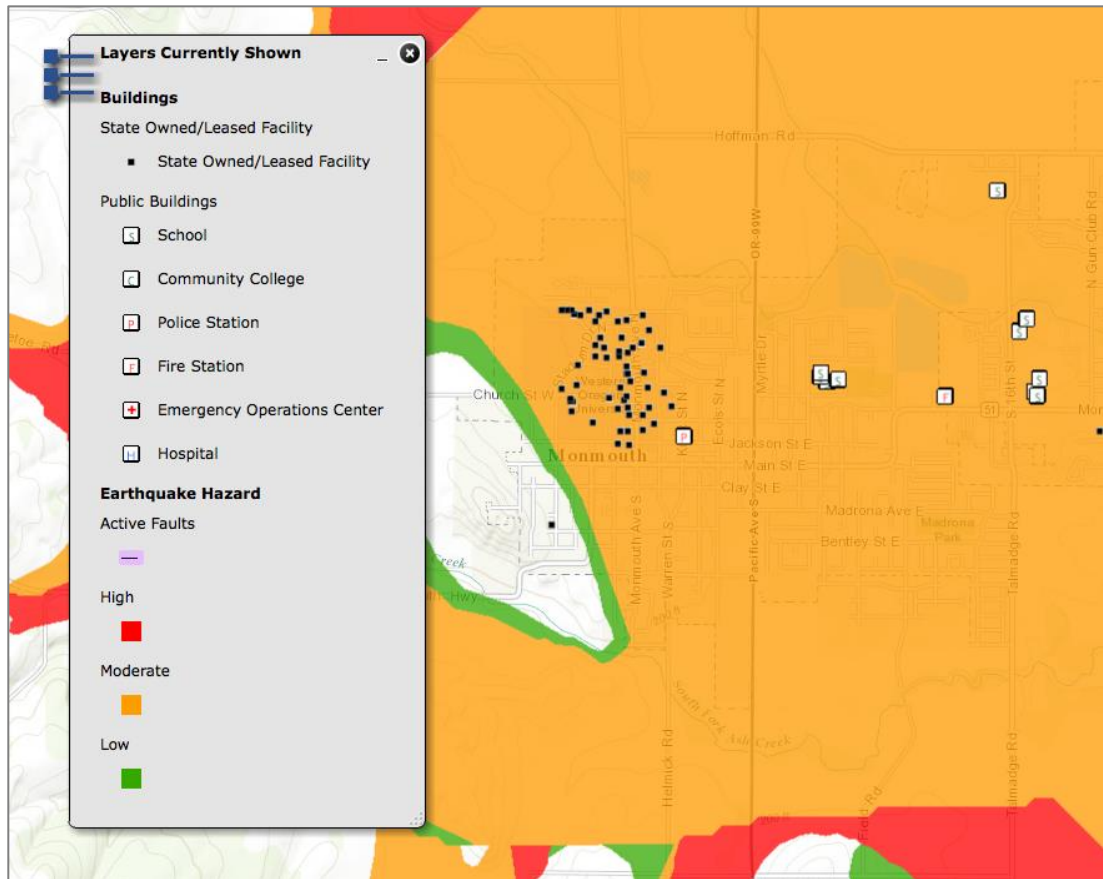
Earthquake

The steering committee determined that the city's probability for a Cascadia Subduction Zone (CSZ) Earthquake event is **moderate** (which is the same as the county's rating) and that their vulnerability to a Cascadia Earthquake event is **high** (which is higher than the county's rating). The steering committee determined that the city's probability for a Crustal Earthquake event is **low** (which is lower than the county's rating) and that their vulnerability to a Crustal Earthquake event is **moderate** (which is the same as the county's rating).

Volume I, Section 2, *Risk Assessment*, adequately describes the characteristics of earthquake hazards, history, as well as the location and extent of a potential event. Generally, an event that affects the county is likely to affect Monmouth as well. The causes and characteristics of an earthquake event are appropriately described within the county's plan, as well as the location and extent of potential hazards. Previous occurrences are well-documented within the county's plan, and the community impacts described by the county would generally be the same for Monmouth as well.

Earthquake-induced damages are difficult to predict, and depend on the size, type, and location of the earthquake, as well as site-specific building and soil characteristics. Presently, it is not possible to accurately forecast the location or size of earthquakes, but it is possible to predict the behavior of soil at any particular site. In many major earthquakes, damages have primarily been caused by the behavior of the soil. Figure MA-2 displays relative liquefaction hazards. As shown, the area of greatest concern are just outside of the city limits to the north and south (darker areas) and also the area that are adjacent to the Willamette River where the concentration of soft soils is the highest.

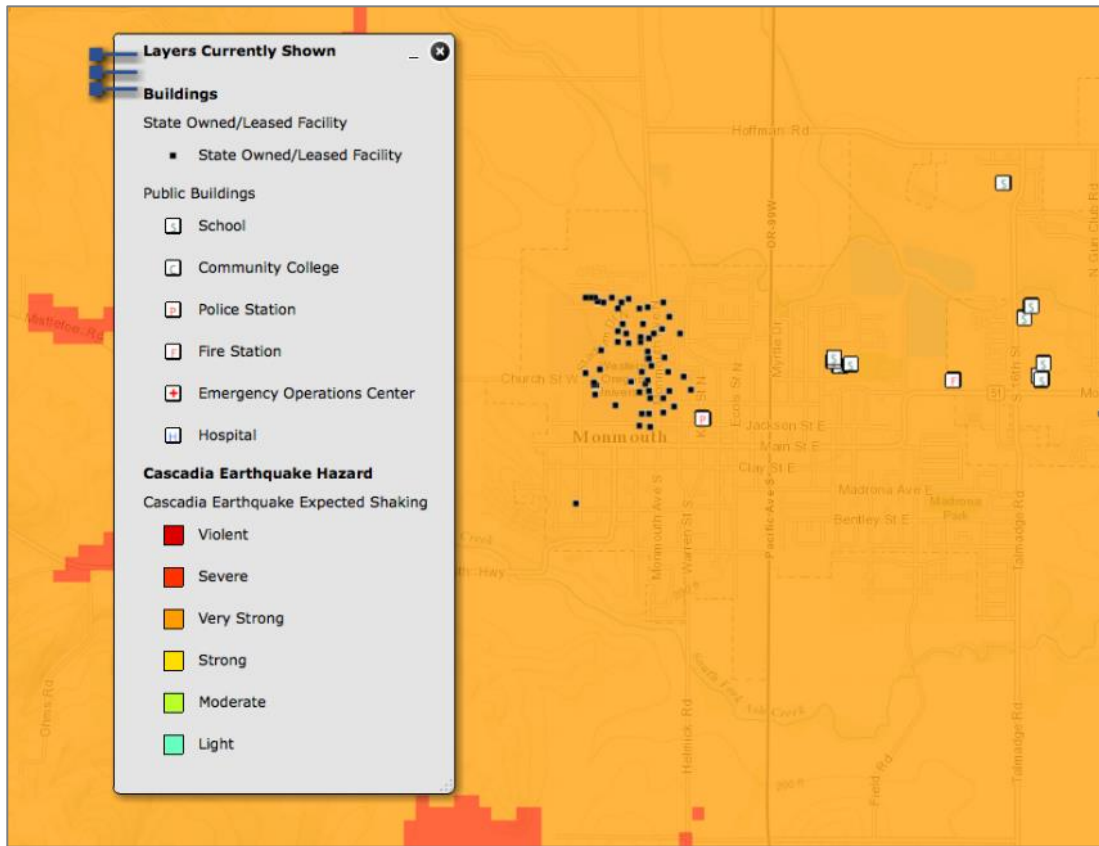
Figure MA-2 Active Faults and Soft Soils



Source: [Oregon HazVu: Statewide Geohazards Viewer \(DOGAMI\)](#)

Figure MA-3 below shows the expected shaking/ damage potential for Monmouth because of a Cascadia Subduction Zone (CSZ) earthquake event. The figure shows that the city will experience “very strong” shaking that will last two to four minutes. The shaking will be extremely damaging to lifeline transportation routes including Highway 99 and Interstate 5. For more information on expected losses due to a CSZ event see the [Oregon Resilience Plan](#).

Figure MA-3 Cascadia Subduction Zone Expected Shaking



Source: [Oregon HazVu: Statewide Geohazards Viewer \(DOGAMI\)](#)

As noted in the community profile approximately 54% of residential buildings were built prior to 1990, which increases the city’s vulnerability to the earthquake hazard. Information on specific public buildings’ (schools and public safety) estimated seismic resistance, determined by DOGAMI in 2007, is shown in Table MA-9; each “X” represents one building within that ranking category. Of the facilities evaluated by DOGAMI using RVS, none have very high (100% chance) collapse potential, and none have a high (greater than 10% chance) collapse potential.

In addition to building damages, utility (electric power, water, wastewater, natural gas) and transportation systems (bridges, pipelines) are also likely to experience significant damage.

Utility systems will be significantly damaged, including damaged buildings and damage to utility infrastructure, including water treatment plants and equipment at high voltage substations (especially 230 kV or higher which are more vulnerable than lower voltage substations). Buried pipe systems will suffer extensive damage with approximately one break per mile in soft soil areas. There would be much lower rate of pipe breaks in other areas. Restoration of utility services will require substantial mutual aid from utilities outside of the affected area.

Table MA-9 Rapid Visual Survey Scores

Facility	Site ID*	Level of Collapse Potential			
		Low (< 1%)	Moderate (>1%)	High (>10%)	Very High (100%)
Schools					
Monmouth Elementary (Central SD 13J) (958 E Church St)	Polk_sch04		X, X, X, X		
Ash Creek Intermediate (Central SD 13J) (1360 N 16th St)	Polk_sch07	X			
Public Safety					
Monmouth Police Department (238 E Jackson St)	Polk_pol04	X			

Source: [DOGAMI 2007. Open File Report 0-07-02. Statewide Seismic Needs Assessment Using Rapid Visual Assessment.](#)

“*” – Site ID is referenced on the [RVS Polk County Map](#)

A comprehensive risk and vulnerability assessment is not available. As of the publication of this NHMP FEMA is providing an opportunity for the county and city to participate in a Risk Mapping, Assessment, and Planning (Risk MAP) process that would generate additional data on risks and vulnerabilities. The Risk Report would provide a quantitative risk assessment that informs communities of their risks related to certain natural hazards (including earthquake). If pursued, once complete the city can incorporate the risk assessment into their addendum to provide greater detail to sensitivity and exposure to the earthquake hazard.

According to the previous version of this plan approximately 2,959 residential structures (value \$391M), 10 government facilities (value \$5.2M), one emergency response facility (value \$3.8M⁶), three education facilities (value \$200M), four care facilities (value \$6.9M), 15 community facilities (value \$669K), two highways (value unknown), and 21 utilities (value \$5.9M) which would be impacted by such an event.⁷

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

Flood

The steering committee determined that the city’s probability for riverine flood is **moderate** (which is lower than the county’s rating) and that their vulnerability to flood is **moderate** (which is the same as the county’s rating).

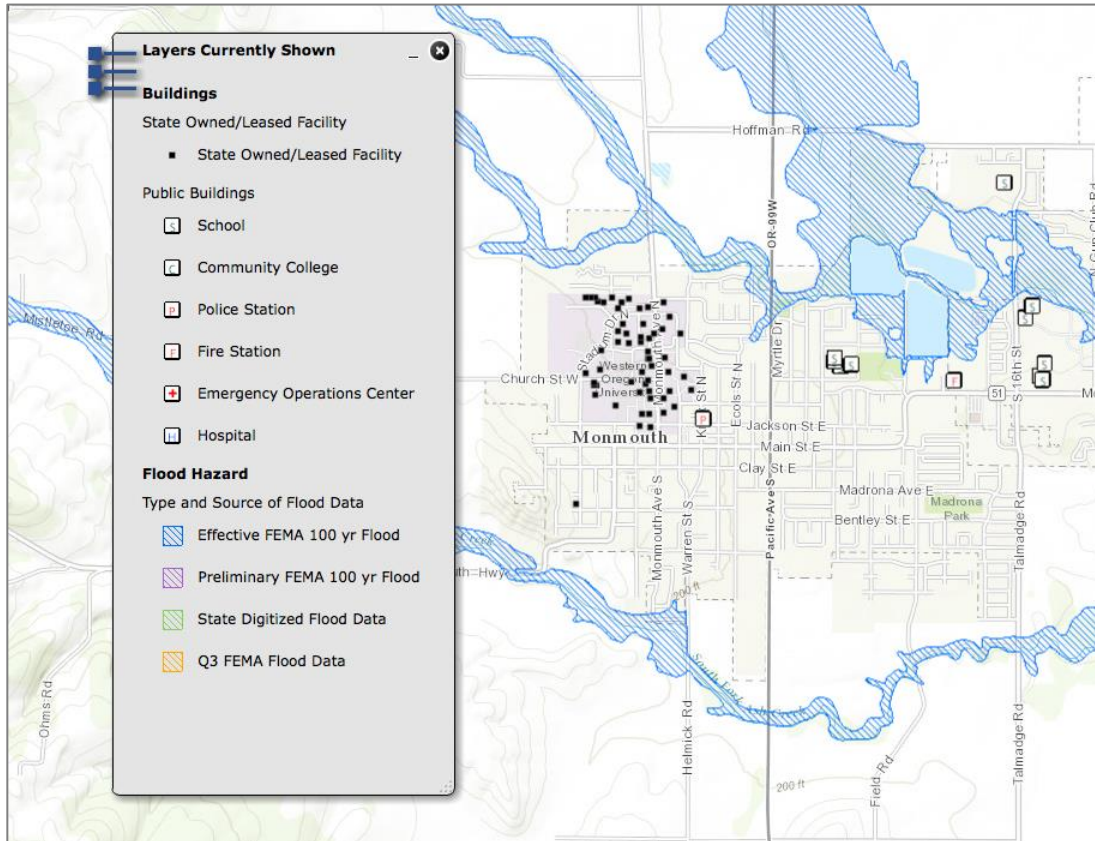
Volume I, Section 2, *Risk Assessment*, adequately describes the causes and characteristics of flooding hazards within the region, as well as previous flooding occurrences. General flood-related community impacts are adequately described within the Flood Hazard Annex of Polk County’s Natural Hazards Mitigation Plan. Portions of Monmouth have areas of flood plains (special flood hazard areas). These include areas along the Ash Creek and South Fork Ash

⁶ Value updated to 2017 dollars.

⁷ URS, 2009 Polk County Natural Hazards Mitigation Plan; values are in 2009 dollars.

Creek (see Figure MA-4 and Attachment A, Map MA-3). Furthermore, other portions of Monmouth, outside of the mapped floodplains, are also subject to significant, repetitive flooding from local storm water drainage. In general, the 100-year floodplain delineates an area of high risk, while the 500-year floodplain delineates an area of moderate risk.

Figure MA-4 Special Flood Hazard Area



Source: [Oregon HazVu: Statewide Geohazards Viewer \(DOGAMI\)](#)

A comprehensive risk and vulnerability assessment is not available. As of the publication of this NHMP FEMA is providing an opportunity for the county and city to participate in a Risk Mapping, Assessment, and Planning (Risk MAP) process that would generate additional data on risks and vulnerabilities. The Risk Report would provide a quantitative risk assessment that informs communities of their risks related to certain natural hazards (including flood). If pursued, once complete the city can incorporate the risk assessment into their addendum to provide greater detail to sensitivity and exposure to the earthquake hazard.

Per the previous version of this plan approximately four government facilities (value \$775K), four community facilities (value \$181K), and five utility facilities (value \$1M) lie within the 100-year floodplain. There are no facilities within the 500-year floodplain.⁸

For more information on flood risk see the [Polk County Flood Insurance Study \(2006\)](#).

⁸ URS, 2009 Polk County Natural Hazards Mitigation Plan; values are in 2009 dollars.

National Flood Insurance Program (NFIP)

FEMA modernized the Monmouth Flood Insurance Rate Maps (FIRMs) in December 2006. Table MA-10 shows that as of September 2016, Monmouth has 22 National Flood Insurance Program (NFIP) policies in force. Of those, four (4) are for properties that were constructed before the initial FIRM. The last Community Assistance Visit (CAV) for Monmouth was on April 20, 2004. Monmouth is not a member of the Community Rating System (CRS). The table shows that most flood insurance policies are for residential structures, primarily single-family homes. There have been zero paid claims. The Community Repetitive Loss record for Monmouth identifies no Repetitive Loss Properties⁹ and no Severe Repetitive Loss Properties¹⁰.

Table MA-10 Flood Insurance Detail

Jurisdiction	Effective FIRM and FIS	Initial FIRM Date	Total Policies	Pre-FIRM Policies	Policies by Building Type				Minus Rated A Zone
					Single Family	2 to 4 Family	Other Residential	Non-Residential	
Polk County	-	-	428	183	334	27	25	42	28
Monmouth	12/19/2006	4/5/1988	22	4	15	7	0	0	0

Jurisdiction	Insurance in Force	Total Paid Claims	Pre-FIRM Claims Paid	Substantial Damage Claims	Total Paid Amount	Repetitive Loss Properties	Severe Repetitive Loss Properties	CRS Class Rating	Last CAV
Monmouth	\$ 5,465,000	0	0	0	\$ -	0	0	-	4/20/2004

Source: Information compiled by Department of Land Conservation and Development, September 2016.

Riverine Erosion

Riverine erosion rarely causes death or injury. However, erosion causes significant destruction of property, development, and infrastructure. Erosion hazard data is not readily available; however, descriptions of several localized areas were identified during the development of this document and are identified only by location on Map MA-4 (Attachment A). Critical facilities that may be at risk of erosion were identified using a 300 foot-buffer in the areas identified as having historic erosion impacts to conservatively account for building footprints.

A comprehensive risk and vulnerability assessment is not available for the riverine erosion hazard. Per the previous version of this plan there are 417 residential structures (value \$55M), two (2) community facilities (value \$97K), and one (1) utility facility (value \$440K) considered at risk.¹¹

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

⁹ A Repetitive Loss (RL) property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

¹⁰ A Severe Repetitive Loss (SRL) property is a single family property (consisting of 1 to 4 residences) that is covered under flood insurance by the NFIP and has incurred flood-related damage for which 4 or more separate claims payments have been paid under flood insurance coverage, with the amount of each claim payment exceeding \$5,000 and with cumulative amount of such claims payments exceeding \$20,000; or for which at least 2 separate claims payments have been made with the cumulative amount of such claims exceeding the reported value of the property.

¹¹ URS, 2009 Polk County Natural Hazards Mitigation Plan; values are in 2009 dollars.

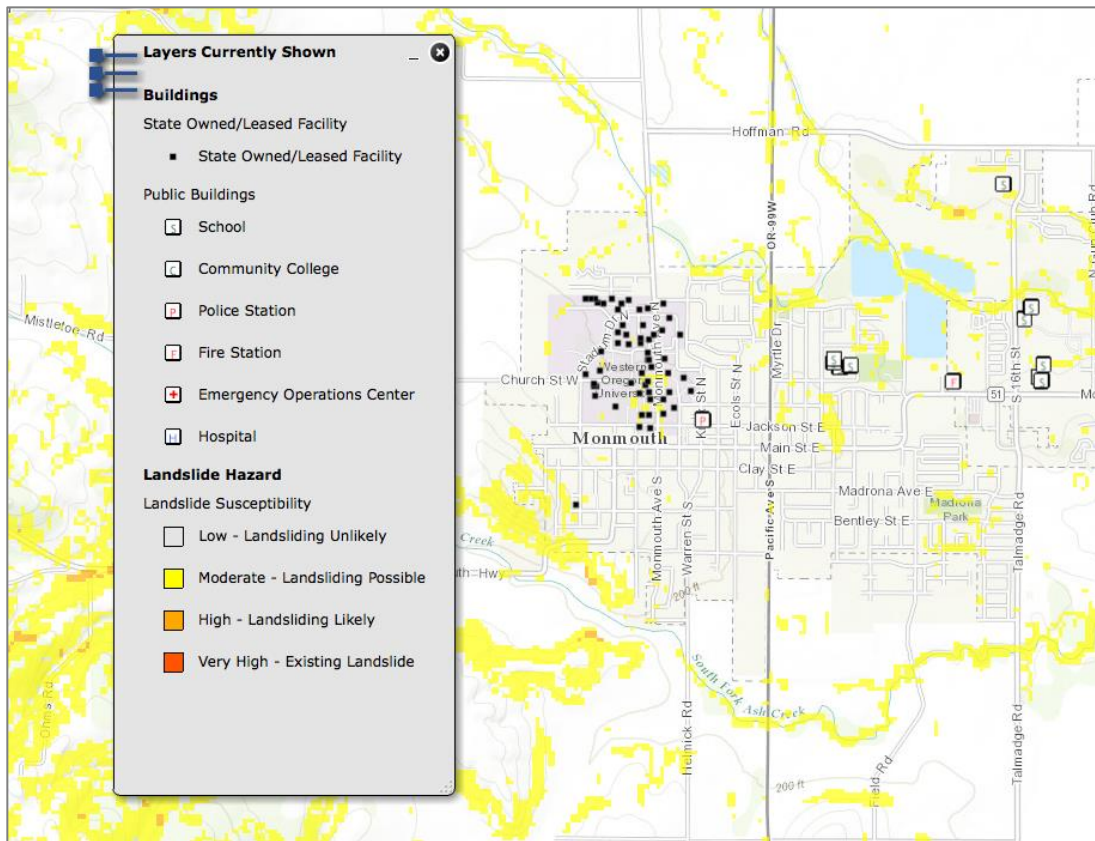
Landslide

The steering committee determined that the city’s probability for landslide is **low** (which is lower than the county’s rating) and that their vulnerability to landslide is **low** (which is the same as the county’s rating).

Volume I, Section 2, *Risk Assessment*, adequately describes the characteristics of landslide hazards, history, as well as the location, extent, and probability of a potential event within the region. Monmouth has a flat topography and the potential for landslide is low except for areas immediately adjacent to Ash Creek and South Fork Ash Creek.

Sedimentary rock underlies Monmouth. Sedimentary rock is primarily conglomerate, claystone, and siltstone with some sandstone. Sedimentary rock is less resistant to stream action. Landslide susceptibility exposure for Monmouth is shown in Figure MA-5. Approximately <1% of Monmouth has High, and approximately 9% Moderate, landslide susceptibility exposure¹².

Figure MA-5 Landslide Susceptibility Exposure



Source: [Oregon HazVu: Statewide Geohazards Viewer \(DOGAMI\)](#)

Potential landslide-related impacts are adequately described within the county’s plan, and include infrastructural damages, economic impacts (due to isolation and/or arterial road

¹² DOGAMI Open-File Report, O-16-02, Landslide Susceptibility Overview Map of Oregon (2016)

closures), property damages, and obstruction to evacuation routes. Rain-induced landslides and debris flows can potentially occur during any winter in Polk County, and highway and other major roads beyond city limits are susceptible to obstruction as well.

A comprehensive risk and vulnerability assessment is not available. As of the publication of this NHMP FEMA is providing an opportunity for the county and city to participate in a Risk Mapping, Assessment, and Planning (Risk MAP) process that would generate additional data on risks and vulnerabilities. The Risk Report would provide a quantitative risk assessment that informs communities of their risks related to certain natural hazards (including landslide). If pursued, once complete the city can incorporate the risk assessment into their addendum to provide greater detail to sensitivity and exposure to the earthquake hazard.

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

Volcano

The steering committee determined that the city's probability for volcanic event is **low** (which is the same as the county's rating) and that their vulnerability to volcanic event is **low** (which is lower than the county's rating).

Volume I, Section 2, *Risk Assessment*, adequately describes Monmouth's risk to volcanic events. Generally, an event that affects the county is likely to affect Monmouth as well. The causes and characteristics of a volcanic event are appropriately described within the county's plan, as well as the location and extent of potential hazards. Previous occurrences are well-documented within the county's plan, and the community impacts described by the county would generally be the same for Monmouth as well. Monmouth is very unlikely to experience anything more than volcanic ash during a volcanic event. When Mt. Saint Helens erupted in 1980, the city was not impacted.

A comprehensive risk and vulnerability assessment is not available for the volcano hazard. Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all residential and critical facilities and infrastructure within the City of Monmouth are at risk.

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

Wildfire

The steering committee determined that the city's probability for wildfire is **low** (which is lower than the county's rating) and that their vulnerability to wildfire is **low** (which is lower than the county's rating).

Volume I, Section 2, *Risk Assessment*, adequately describes the causes and characteristics of wildfires, as well as the county and city's history of wildfire events. There are no known large wildfire events in Monmouth. The location and extent of a wildfire vary depending on fuel, topography, and weather conditions. Weather and urbanization conditions are primarily at cause for the hazard level.

The potential community impacts and vulnerabilities described in the county's plan are generally accurate for the city as well. Polk County developed a Community Wildfire Protection Plan (CWPP) in 2009, which mapped wildland urban interface areas and developed actions to mitigate wildfire risk (see Attachment A, Map MA-5). The city is a participant in the CWPP and will update the city's wildfire risk assessment if the CWPP presents better data during future updates. In general, wildfire conditions are greatest in the populated areas adjacent to the interface area.

Irrigated agricultural land surrounds much of Monmouth, thereby reducing the risk to wildfire to the city.

A comprehensive risk and vulnerability assessment is not available. The Polk County CWPP provides some risk and vulnerability information related to Monmouth that has been incorporated into this plan as applicable.

Per the previous version of this plan Monmouth has critical facilities and infrastructure located within areas of moderate and high risk.¹³

Moderate risk areas contain nine government facilities (value \$4.7M), one emergency response facility (value \$3.8M¹⁴), three educational facilities (value \$200M), four care facilities (value \$6.9M), and 15 community facilities (value \$664K).

High risk areas contain four government facilities (value \$2M), two educational facilities (value \$196.1M), one care facility (value \$514K), four community facilities (value \$148K), and four utility facilities (value \$760K).

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

Windstorm

The steering committee determined that the city's probability for windstorm is **moderate** (which is lower than the county's rating) and that their vulnerability to windstorm is **moderate** (which is lower than the county's rating).

Volume I, Section 2, *Risk Assessment*, adequately describes the causes and characteristics of windstorms, as well as the location and extent of windstorm hazards. The region's (and city's) history of events is adequately described within the county's plan as well. Because windstorms typically occur during winter months, they are sometimes accompanied by ice, freezing rain, flooding, and very rarely, snow.

Polk County's plan adequately describes the impacts caused by windstorms, including power outages, downed trees, heavy precipitation, building damages, and storm-related debris. Additionally, transportation and economic disruptions result as well.

¹³ URS, 2009 Polk County Natural Hazards Mitigation Plan; values are in 2009 dollars.

¹⁴ Value updated to 2017 dollars.

A comprehensive risk and vulnerability assessment is not available for the windstorm hazard. Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all residential and critical facilities and infrastructure within Monmouth are at risk.

Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

Winter Storm (Snow/ Ice)

The steering committee determined that the city's probability for winter storm is **high** (which is the same as the county's rating) and that their vulnerability to winter storm is **moderate** (which is lower than the county's rating).

Volume I, Section 2, *Risk Assessment*, adequately describes the causes and characteristics of winter storms, as well as the location and extent of winter storm hazards. The region's (and city's) history of events is adequately described within the county's plan as well. Severe winter storms can consist of rain, freezing rain, ice, snow, cold temperatures, and wind. They originate from troughs of low pressure offshore that ride along the jet stream during fall, winter, and early spring months. Severe winter storms affecting the city typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from November through March.

Major winter storms can and have occurred in the Monmouth area, and while they typically do not cause significant damage, they are frequent and have the potential to impact economic activity. Road closures on major roads due to winter weather are an uncommon occurrence, but can interrupt commuter and large truck traffic.

A comprehensive risk and vulnerability assessment is not available for the winter storm (snow/ice) hazard. Due to the nature of the hazard, it is impossible to predict the location or extent of future events with any probability, although it can be assumed that all residential and critical facilities and infrastructure within Monmouth are at risk.

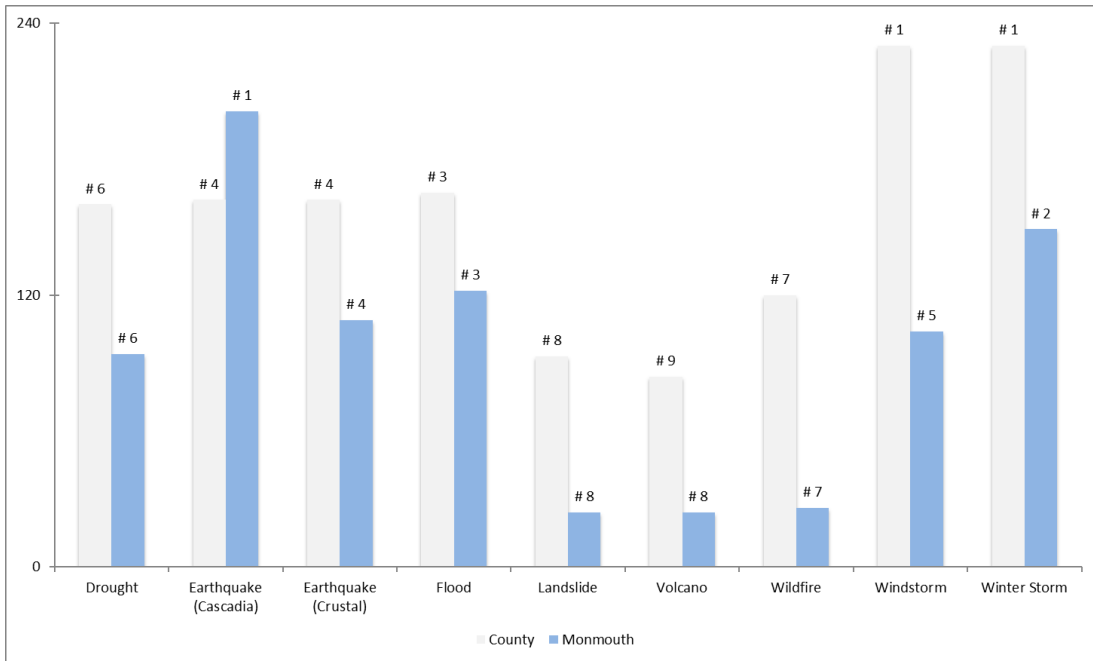
Please review the Risk Assessment (Volume I, Section 2) for additional information on this hazard.

Summary

Figure MA-6 presents a summary of the hazard analysis for the City of Monmouth and compares the results to the assessment completed by Polk County.

The city rated their threat to the Cascadia Subduction Zone earthquake higher than the county. The top four hazards for the city are Cascadia Subduction Zone earthquake, winter storm, flood, and crustal earthquake.

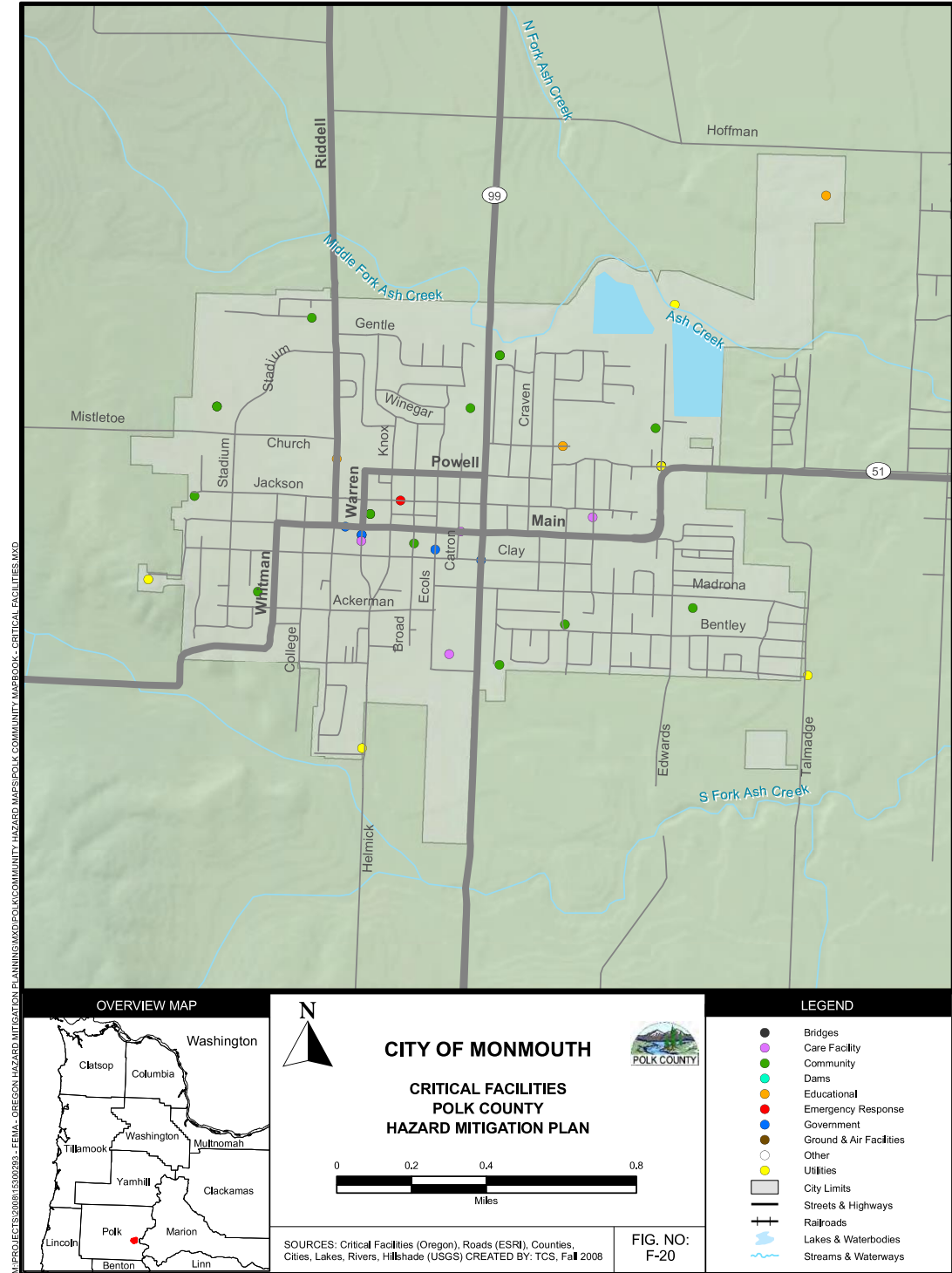
Figure MA-6 Overall Hazard Analysis Comparison –Polk County/ Monmouth



Source: City of Monmouth NHMP Steering Committee and Polk County NHMP Steering Committee

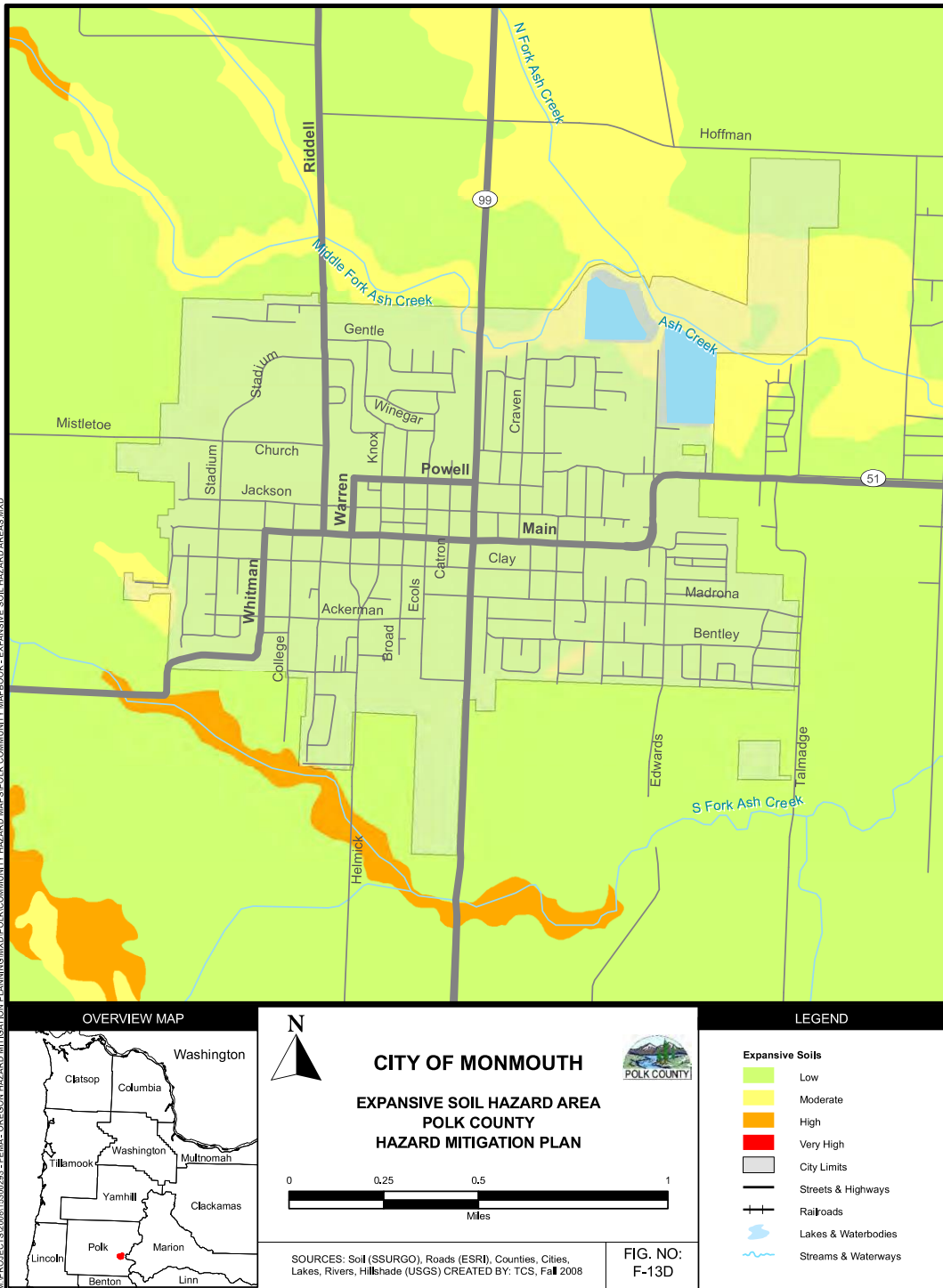
ATTACHMENT A - MAPS

Map MA-I Critical Facilities - Monmouth



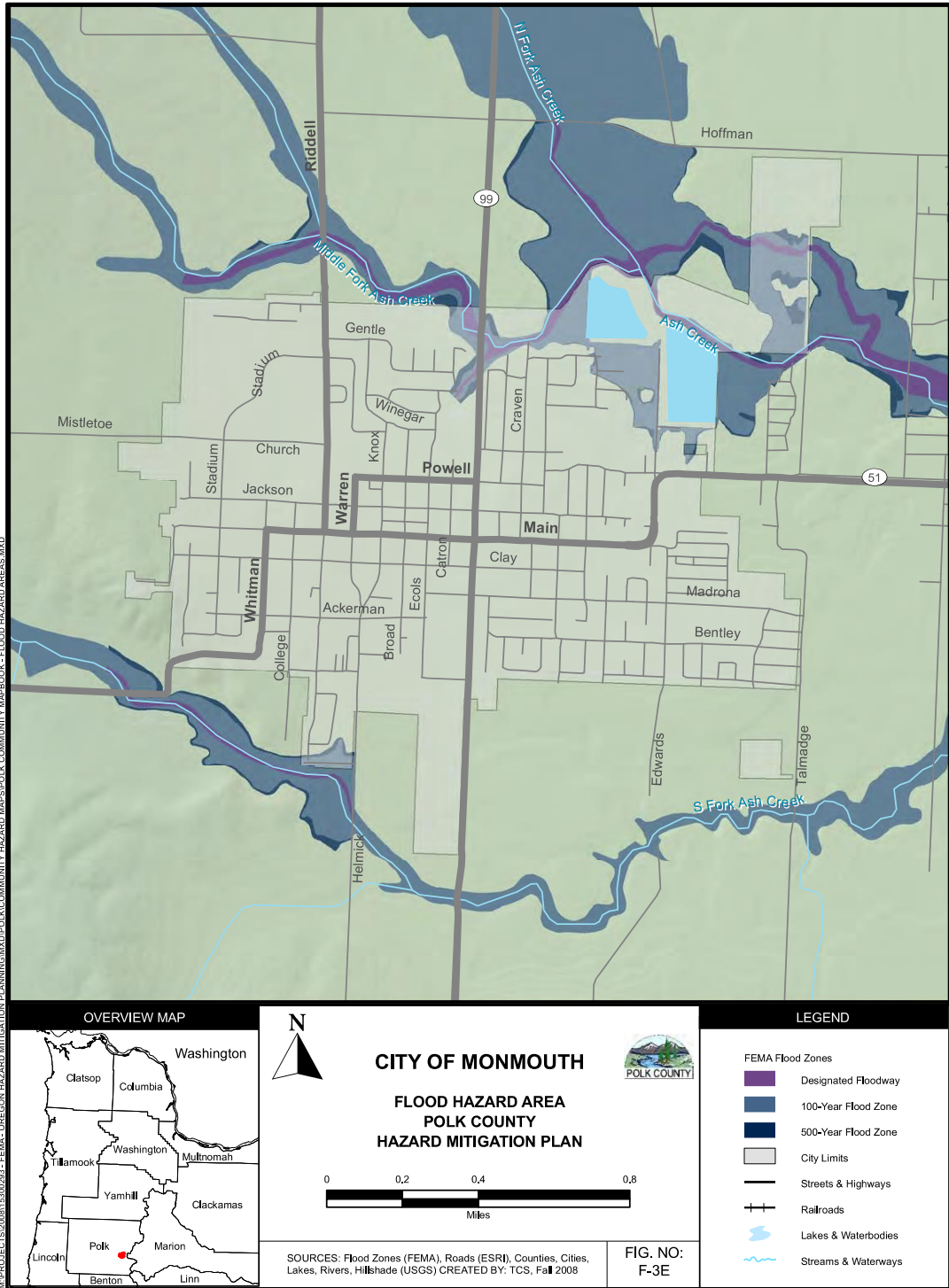
Source: Polk County NHMP (2009).

Map MA-2 Expansive Soils Hazard Area - Monmouth



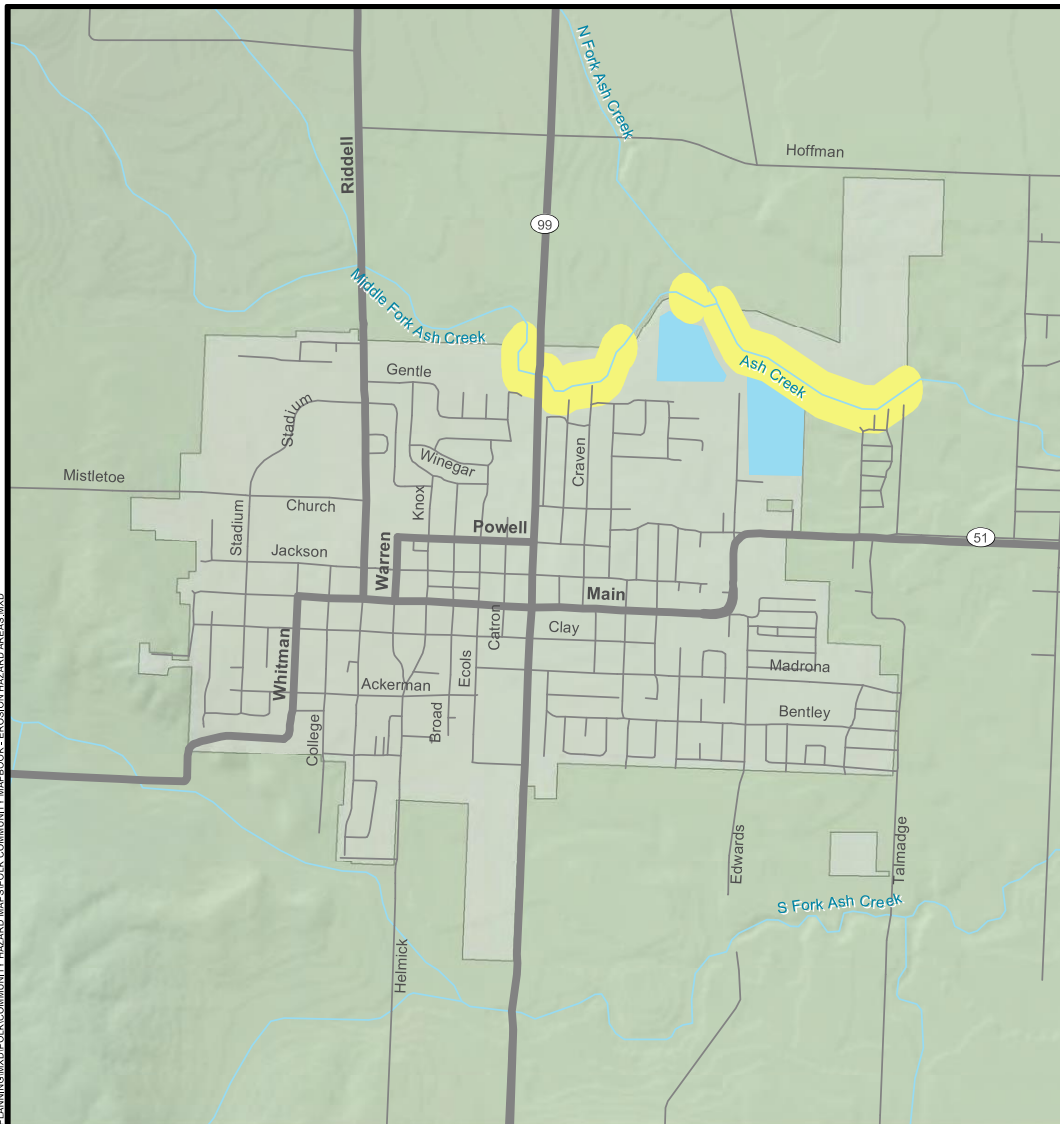
Source: Polk County NHMP (2009).

Map MA-3 Flood Hazard Area - Monmouth



Source: Polk County NHMP (2009).

Map MA-4 Erosion Hazard Area - Monmouth

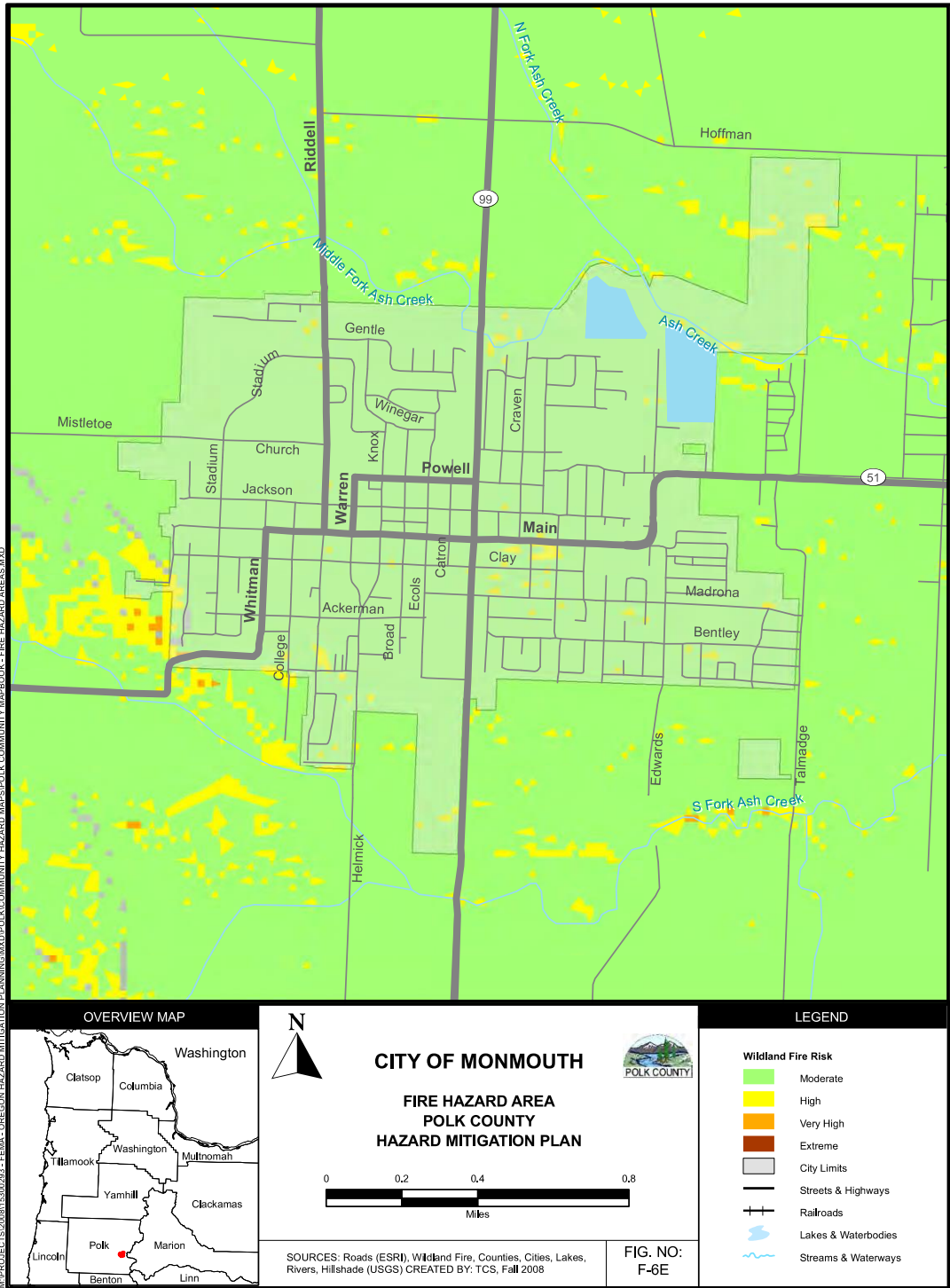


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<p>OVERVIEW MAP</p>	<p style="text-align: center;">CITY OF MONMOUTH</p> <p style="text-align: center;">EROSION HAZARD AREA</p> <p style="text-align: center;">POLK COUNTY</p> <p style="text-align: center;">HAZARD MITIGATION PLAN</p> <p style="font-size: small;">SOURCES: Roads (ESRI), Counties, Cities, Lakes, Rivers, Hillshade (USGS) CREATED BY: TCS, Fall 2008</p>	<p>LEGEND</p> <ul style="list-style-type: none"> Potential Erosion Hazard City Limits Streets & Highways Railroads Lakes & Waterbodies Streams & Waterways
<p style="font-size: x-small;">FIG. NO: F-12E</p>		

Source: Polk County NHMP (2009).

Map MA-5 Wildfire Hazard Area - Monmouth



Source: Polk County NHMP (2009).

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