Wahkiakum County
Hazard Mitigation Plan
XXX 2019

Encompassing the Following Jurisdictions:

Prepared By:

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Contents

Executive Summary

Plan Purpose

The original purpose of the Wahkiakum County Hazard Mitigation Plan is to provide guidance to substantially and permanently reduce Wahkiakum County and its communities' vulnerability to natural and technological hazards. The 2018 Wahkiakum County Hazard Mitigation Plan revision is twofold in its purpose. This plan revision encompasses the continuation and updating of its original mission as well as the incorporation of new GIS technologies, improved risk assessment methodologies, and additional best practices.

Photo Courtesy of BOLDplanning

The plan is intended to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the natural environment. This will be achieved by increasing public awareness and education, documenting resources for risk reduction and loss-prevention, and identifying and prioritizing activities and strategies guiding the community towards the development of a safer, more sustainable community.

Plan Organization

The Wahkiakum County plan is developed and organized within the rules and regulations established under the 44 CFR 201.6. This plan contains sections detailing the planning process, Wahkiakum County's communities and the planning area, a hazard vulnerability and risk assessment, capabilities assessment, and a mitigation strategy designed for the purpose of guiding Wahkiakum County and its participating jurisdictions to become more disaster-resilient communities.

Plan Financing

The Wahkiakum County Mitigation Plan has been financed by Wahkiakum County and a FEMA Pre-Disaster Mitigation Program Grant administered through the State of Washington. The federal grant provided 75% of the total plan's cost, 12.5% from the state while Wahkiakum County matched the remaining 12.5% with local funding.

Plan Participation

The Wahkiakum County Hazard Mitigation Plan was developed as the result of an ongoing collaborative effort between the full range of stakeholders in the planning area, local authorities, school districts, municipal jurisdictions, and the State of Washington.

Concerns, capabilities, interests and historical data were gathered through interviews with stakeholders from within the community, along with a number of electronic datasets, and ongoing planning committee work sessions. The public was granted opportunities to provide their input, influence, share knowledge, and be active participants in the plan's development. This was accomplished through a number of public outreach campaigns. All comments, questions, and discussions resulting from these activities were given consideration in the development of this plan.

Each participating stakeholder was invited to attend work group meetings, submit required data, assist in the development of mitigation strategies and initiatives, participate in a public review process, and submit an approved adoption resolution.

The Wahkiakum County Mitigation Planning Committee (MPC) was created during the development of Wahkiakum County's last FEMA approved mitigation plan. This committee and plan development were guided and assisted by consultants from BOLDplanning Inc. through the update process.

Photo Courtesy of BOLDplanning

The Mitigation Planning Committee was comprised of representatives from the following jurisdictions and agencies:

- Wahkiakum Public Utility District No 1
- Wahkiakum County Communications
- Cowlitz Family Health Center
- Wahkiakum County Public works
- Washington State Patrol
- Wahkiakum County Fire Protection District Number 1
- Wahkiakum County Department of Emergency Management
- Cathlamet Fire Department
- Wahkiakum County Fire Protection District Number 3
- Wahkiakum Diking District No 5

Hazards Identified

The state-wide analysis completed by the State of Washington's Emergency Management Division and criteria provided by FEMA identified nine natural and seven technological hazards for consideration. Through the planning process it was determined by historical record analysis, local concerns and interests, and forward thinking by the MPC that the community would best be served by addressing seven natural hazards, zero technological hazard, and the removal of two previously included hazards.

The following hazards were found to be the most prevalent and dangerous to the planning area and its communities:

- Earthquake
- Flood
- Landslide
- Wildland Fire
- Severe Storms
- Drought
- Volcano

Plan Goals & Objectives

This plan defines and establishes goals and objectives that are directly relevant to meeting the purpose of the plan. The following is a list of the three major goals and subsequent objectives identified and adopted by the participants of this plan. The specific adoption of these goals and subsequent objectives by individual participating agencies is also found in their respective sections.

Photo Courtesy of BOLDplanning

1. **Protect Life, Property & the Environment**
    a) Ensure code compliance
    b) Protect electrical infrastructure, transportation, communications, and water
    c) Improve structural and environmental resiliency to disasters

2. **Increase Public Awareness**
    a) Educate the public
    b) Expand use of existing information channels
    c) Target high risk populations

3. **Encourage Partnership and Enhance Planning Activities**
    a) Increase partnerships in developing business resiliency
    b) Develop activities to support public education
    c) Increase engagement of private sector in planning efforts

The MPC established the set of goals and objectives as guidelines for the plan's participants. These goals and objectives have been cross-referenced with the planning area's capabilities and priorities to yield a set of strategies in the form of activities and projects for implementation over the next five-year cycle. These activities include potential funding sources, lead departments and agencies, timelines, monitoring and evaluation indicators, and prioritization ranking.

Plan Implementation – Adoption

Pursuant to their respective governing statutes and regulations, the governing bodies of participating agencies and jurisdictions have the authority to adopt the Wahkiakum County Hazard Mitigation Plan. Dates that the plan was adopted by Wahkiakum County and the respective participating jurisdictions are listed in Appendix H – Adoption Resolutions.

Plan Implementation – Monitoring, Evaluation, Update, and Revision

The Wahkiakum County Mitigation Plan can be incorporated by reference into the respective comprehensive plans, development plans and other tools of Wahkiakum County. It can also be used to provide information and to serve as a basis for zoning and other regulatory tools to help guide the continued physical development of the Wahkiakum County and the participating jurisdictions. The Wahkiakum County Mitigation Plan shall be formally updated every five years. A detailed description of the processes is found in Section 3 of this plan.

Continued Public Involvement

The Wahkiakum County Mitigation Planning Committee is dedicated to the continued involvement of the public during any periodic review and the 5-year update as required by FEMA. Wahkiakum County has established strategies herein which will provide opportunity for continued public involvement. These strategies include a copy of the adopted plan to be placed at community locations, such as libraries, and on the Wahkiakum County Emergency Management website along with a phone number for the public to direct questions or comments regarding the plan to designated Emergency Management personnel.

Conclusion

Wahkiakum County and its participating agencies are fully aware that this plan is a living document that will grow along with the jurisdiction through the MPC, and the efforts made by the community. Additionally, they will continue to make a concentrated effort to not only focus on the mitigation efforts within the county but will strive to be inclusive of their neighboring jurisdictions, stakeholders and community-based organizations. Wahkiakum County will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding, including 2 CFR Parts 200 and 3002, and will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes.

Introduction to Mitigation

The Emergency Management Cycle & Mitigation

Understanding this cycle is the first step in effectively planning and operating in relation to all disaster related activities. The emergency management cycle is an open-ended and ongoing process. The four phases in the process are mitigation, preparedness, response, and recovery. Each phase of the cycle can last years or moments in length while different paths can exist simultaneously.

Mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural and human-caused hazards.

It is carried out as any sustained action to reduce or eliminate long-term risk to life and property from a hazard event. Mitigation encourages long-term reduction of hazard vulnerability. As is the goal of emergency management, the goal of mitigation is to save lives and reduce property damage.

The Disaster Mitigation Act of 2000 (DMA 2000)

In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. The Disaster Mitigation Act of 2000 became law on October 30, 2000 and amends the Robert T. Stafford Disaster Relief and Emergency Assistance Act (the “Stafford Act”) (Public Law 93-288, as amended). Regulations for this activity can be found in Title 44 of the Code of Federal Regulations Part 206, Subpart M.

This legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. This act establishes a pre-disaster hazard mitigation program and new requirements for the national post-disaster Hazard Mitigation Grant Program.

Section 322 of the act specifically addresses mitigation planning at the state and local levels. It identifies new requirements that allow HMGP funds to be used for mitigation planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive, enhanced mitigation plan prior to a disaster. States and communities must have an approved mitigation plan in place prior to receiving post-disaster HMGP funds. Local and tribal mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities.

DMA 2000 is intended to facilitate cooperation between state and local authorities, prompting them to work together. It encourages and rewards local and state pre-disaster planning and promotes sustainability as a strategy for disaster resistance. This enhanced planning network will better enable local and state governments to articulate accurate needs for mitigation, resulting in faster allocation of funding and more effective risk reduction projects. To implement the new DMA 2000 requirements, FEMA prepared an interim final rule, published in the Federal Register on February 26, 2002, at 44 CFR Parts 201 and 206, which establishes planning and funding criteria for states and local communities.

On October 31, 2007, FEMA subsequently published an Interim Rule in the Federal Register, which ensures the Flood Mitigation Assistance (FMA) program planning requirements are consistent with the mitigation planning regulations as cited in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 (44 CFR Part 201).

This interim rule established that local communities must comply with mitigation planning requirements to be eligible to apply for FEMA mitigation project grant funding, including FMA and FEMA's Severe Repetitive Loss Program. Meeting the requirements of the regulations cited above ensures participating jurisdictions in the planning area will be eligible to receive disaster assistance, including hazard mitigation grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P.L. 93-288, as amended.

The Wahkiakum County Department of Emergency Management (WCEM) has the responsibility to coordinate all local activities relating to hazard evaluation and mitigation, and to prepare and submit to FEMA a local hazard mitigation plan, following the criteria established in 44 CFR 201.6 and Section 322 of the Disaster Mitigation Act of 2000 (Public Law 106-390).

Current & Past Mitigation Activities

Planning is the key to making mitigation a proactive process, and pre-disaster planning is an essential element in building an effective mitigation program. Mitigation plans emphasize actions taken before a disaster happens to reduce or prevent future damages. Preparing a plan to reduce the impact of a disaster before it occurs can provide a community with a number of benefits. The following are examples of what WCEMA does and supports on a daily basis to increase the resiliency of the planning area:

- Enact and enforce building codes, zoning ordinances, and other measures to enhance their legal capability in an effort to protect life and property.
- Make the public aware of hazards that present risks to people and property and measures they can take to reduce their risk and possible losses.
- Comply with federal and other regulations that are designed to reduce disaster costs as well as preserve and protect natural, historical, and cultural resources.

Every community exists in a distinct natural, economic and social environment, the local hazard mitigation plan must reflect the unique needs, conditions and concerns of Wahkiakum County and its communities, agencies and organizations. Mitigation plans are designed to correspond with community goals in order to provide a plan which best suits the overall needs of that community. The plan must consider the local geography, demography, community size, economy, land uses, current community goals, and the hazards by which it is defined. Wahkiakum County's efforts must reflect the needs of the entire community, in order to safeguard all population groups within the community, all sectors, and take into consideration what vision the community has for the future.

Mitigation plans can cover numerous hazards. By conducting an assessment of community vulnerability and capability to deal with various hazards, communities can prioritize needs and develop potential solutions to current and potential problems. This evaluation provides a comprehensive strategy to contend with hazard preparation, response and recovery. Wahkiakum County's plan must fit into the work being done currently by the community and fit into the culture of those who will undertake the strategies to make it successful.

By properly mitigating and increasing resiliency, communities save on response and recovery operations by not having to allocate emergency resources and rescues operations after a disaster.

Additionally, properly mitigating decreases post disaster costs by reducing the cost and number of repairs to buildings and infrastructure.

Many disaster assistance agencies and programs, including FEMA, require pre-disaster mitigation plans as a condition for both mitigation funding and for disaster relief funding. Such plans must include a thorough evaluation of potential hazards and community readiness for potential disasters. Programs that require such a plan include the Hazard Mitigation Grant Program (HMGP), which is authorized by Section 404 of the Stafford Act and the Flood Mitigation Assistance Program (FMA) both of which are overseen by FEMA and managed by the state.

This plan reflects the requirements of the FEMA and Washington EMD regulations. It will also attempt to proactively support these initial and future mitigation planning efforts by looking beyond FEMA and Washington EMD funding, developing relationships with funding sources from private sector and other partnerships, and searching for alternative government resource support.

Section 1 – The Planning Process

Planning Process
- Plan Development
- Stakeholder Participation
- Community Involvement

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

Mitigation Strategy

1.1 – Plan Introduction

In the winter of 2017, under the leadership of the WCEMA, a number of public agencies in the county agreed to commit to the development of a county-wide multi-hazard mitigation plan update (hereinafter referred to as the Wahkiakum County Hazard Mitigation Plan (HMP)) and associated planning effort.

The Wahkiakum County Government and WCEMA took the lead in beginning the process to update their HMP. Taking advantage of funding opportunities authorized by DMA2000, Wahkiakum County developed and distributed a Request for Proposals (RFP) to update their County-wide Multi-Hazard Mitigation Plan in June of 2017. After a selection process, Wahkiakum County entered into a contract with BOLDplanning Inc. to begin the mitigation plan update process.

In February of 2018, the WCEMA formally invited cities, special purpose districts, fire districts, schools, water districts and other public agencies in Wahkiakum County to take part in the mitigation plan update process.

The Wahkiakum County Hazard Mitigation Plan consists of one county, one town, and one school district. Each organization actively participated in the plan update process from its inception. Each organization provided at least one representative on the MPC.

MPC members attended meetings, solicited input from their communities, and ensured that any and all pertinent information was reflected in the plan update.

If a committee member was not able to attend a meeting, they were notified via telephone and email of the agenda. Any documentation presented at the meeting was supplied to the committee member for review. A detailed description of each participant's contributions by phase is provided in Section 1.2.2 – Participation while a complete list of the MPC is provided in Section 1.3 – Stakeholders.

1.2 – Plan Development

1.2.1 – Plan Drafting Stage

Wahkiakum County's revision process began in September of 2017, when the WCEMA was awarded a PDM grant through the WA EMD. Wahkiakum County was awarded the grant to begin the process of updating their previously approved hazard mitigation plan. Following the funding commitments, Wahkiakum County hired BOLDplanning to facilitate the plan's development.

Seven planning events were held throughout the planning process. Plan development kicked-off off on 06 March 2018. Two meetings were held that day in order to make the meeting accessible to both east and west sides of the county. The open community meetings were advertised over a month in advance and were held in tandem with the Wahkiakum County kickoff meetings. The stakeholder meeting was comprised of WCEMA, BOLDplanning, and community members. All participating jurisdictions actively participated in the planning process through soliciting input and participation in meetings. The final planning meetings were held on XXX of 2018. Planning events also included conference phone calls with municipal and agency officials who could not attend scheduled meetings.

Throughout the process the public was given opportunities to review HMP drafts, ask questions, and provide input on hazards. They were invited to provide feedback on mitigation project prioritization, hazard identification, and hazard ranking. Details and documentation of the public's participation can be found in Appendix C – Public Participation.

Planning Process Summary

1.) Each participating jurisdiction appointed a jurisdictional representative along with other stakeholders, WCEMA, and the BOLDplanning Mitigation Department.

2.) The WCEMA engaged BOLDplanning to provide staff support in facilitating the planning process and preparing the plan.

3.) Meetings were held with committee members to understand and agree on planning processes and steps required, including organizing resources, assessing hazards, developing a mitigation plan, implementing the plan and monitoring progress.

1.2.2 – Major Mitigation Planning Meetings

The Wahkiakum County MPC held various public meetings to discuss the mitigation plan update process as well as gain public support and input for the plan. The following is a brief synopsis of those meetings. Proof of meetings, sign in sheets, and public notification documentation can be found in Appendix C – Public Participation.

Stakeholder Kick-Off Meeting
3 January 2018
Each stakeholder organization from the last plan was invited to attend the kick-off meeting. They were invited by the WCEMA. The meeting was on-site in Wahkiakum County with Marilyn Nikolas from BOLDplanning available in person to answer any technical questions. The meeting consisted of explaining the benefits of having an update hazard mitigation plan and questions regarding the hazard risk assessment survey. Documentation for this meeting is located in Appendix C – Public Participation.

Public Information Meeting
6 March 2018
A public announcement ran for over a month on the WCEMA website. Public Meeting notices were also emailed, posted in the newspaper, and on flyers across the county. The public was invited to voice any concerns, ask questions, and provide input. These meetings were open the public. It was held on-site by Brittney Whatley and Marilyn Nikolas from BOLDplanning at the Johnson Park Community center and the River Street Meeting Room. The meetings consisted of an introduction to the company, hazard mitigation, and an overview of the planning process. Participation and expectations were discussed, and any questions or concerns were addressed. Documentation for this meeting is located in Appendix C – Public Participation.

Plan Draft Review Meeting
To Be Determined
The WCEMA held a public meeting in which this plan's draft was showcased to the public. Brittney Whatley from BOLDplanning were available by phone to answer any questions the public may have regarding the hazard mitigation plan.

Hazard Mitigation Plan Adoption Signing
To Be Determined
The Wahkiakum County Hazard Mitigation Plan adoption letters will be disseminated and signed by the participating jurisdictions. The signing of these resolutions codifies the adoption of the HMP by the participating stakeholders.

1.3 – Stakeholder Participation

The Wahkiakum County MPC is made up of individuals working together for the development and ongoing maintenance of this plan. The participants are grouped into three categories.

Municipalities and School Districts

This group consists of appointed representatives from municipal governments and school districts within the planning area.

Other Stakeholders

This group consists of representatives from the local community, regulatory authorities, emergency services, commercial interests, and other relevant organizations.

The Public

FEMA requires this planning effort to be open to constant input from interested citizens in compliance with the Sunshine Laws. In Washington, public meetings must comply with the Washington Open Meetings Law, unless established by statutory exemption. Therefore, any individual citizens who wish to be involved in this effort to mitigate future disasters are encouraged to attend MPC meetings and to solicit relevant comments to be included in the draft sections of the written plan.

Members of the MPC took part in periodic planning meetings, public meetings and events and individual meetings with BOLDplanning and WCEMA staff. Their specific involvement included activities such as collection and development of planning information, providing input into the planning process, reviewing draft editions of the plan and providing written documentation demonstrating their commitment to mitigation and intent to adopt the final approved plan.

Each participating organization was expected to attend a majority of the regular committee meetings, submit required data as requested, participate in the development of general information for the plan as well as their own individual planning information, mitigation strategies and initiatives, participate in a public review process, and submit the plan for formal adoption through their respective governing body. Information was kept on attendance, input and providing requested documentation.

The following table details the MPC members who participated in the hazard mitigation planning process. This list contains all relevant local and state agencies involved in hazard mitigation activities, agencies that have the authority to regulate development, and any appropriate neighboring communities.

Table 1: MPC Members and Partners

Table 1 – MPC Members and Partners			
Name	**Organization**	**Position**	**Collaboration/Invitation**
Principal Plan Developers			
Brittney Whatley	BOLDplanning	Mitigation Planner	Project Manager and mitigation specialist
Cassandra Wolff	BOLDplanning	GIS Analyst	GIS coordination and analysis
Local Governments			
Beau Renfro	Wahkiakum County DEM	Emergency Management Coordinator	Stakeholder representative
Chuck Beyer	Wahkiakum Co Public Works	Public Works Director	Represented jurisdiction and provided input
Mike Beutler	Washington State Patrol	Fire Division Manager	Represented jurisdiction and provided input
Vernon Barten	Cathlamet Fire Department	Corrections Officer	Represented jurisdiction and provided input
Kevin Maki	Wahkiakum Fire Department	Fire Department No 3	Represented jurisdiction and provided input
Tim	Wahkiakum Diking	Diking District No 5	Represented jurisdiction and provided input
Mike Linn	Wahkiakum Diking	Diking District No 5	Represented jurisdiction and provided input
Academia, Neighboring Communities, and Other Organizations			
David Tramble	Wahkiakum PUD	General Manager	Stakeholder representative
Dan Cothren	Wahkiakum Co Communication	Vice Chair for District #2	Stakeholder representative
Amanda Wisdom	Cowlitz Family Health Center	Clinic Manager	Stakeholder representative

1.4 – Community Involvement

The Wahkiakum County MPC provided the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested parties to be involved in the planning process. The public was notified of open meetings via flyers across the county, a local newspaper (The Eagle), and WCEMA's website.

Photo Courtesy of BOLDplanning

Additionally, participating jurisdictions were notified of MPC meetings via e-mail.

At the first two public information meetings, BOLDplanning presented and outlined the mitigation plan update process to the public. During the first stakeholder meeting, BOLDplanning presented and outlined the mitigation plan update process and discussed stakeholder participation and expectations. Community profile and risk assessment questionnaires were handed out as the first step in the plan update's data collection process. In all three meetings, the public and other stakeholders were encouraged to ask questions and provide their input. During latter public review meetings, concerned citizens and other parties were invited to review the most current draft, provide any input of feedback, and ask any relevant questions of the Wahkiakum County MPC and BOLDplanning.

Relevant federal, state, local, and tribal governments, private, non-profit, regional organizations, and agencies with the authority to regulate development were invited to provide input and technical expertise through the public notices. They were contacted directly when their expertise was deemed necessary to the success of the plan. The entities who volunteered to participate are listed below.

Table 2: Stakeholders and MPC Members

Table 2 – Partner Involvement by Entity		
Entity Classification	**Entity**	**Entity Input**
Federal Agencies	NOAA	Provided weather data and historical records
State Agencies	WA EMD	Provided state oversight and technical assistance.
Local Governments	Participating Fire Districts	Plan principles.
	Participating Municipalities	Plan principles.
	Participating Public Utility District	Plan principle.
	Participating Water Districts	Plan principles.
	WCEMA	Coordinating agency and plan authority.
Private Organizations	BOLDplanning	Primary plan developers.
	Participating Ports	Plan principles.
Academia	Participating School Districts	Plan principles.

Section 2 – Local Procedures & Resources

Planning Process

Local Procedures & Resources

- Available Resources
- Continued Public involvement
- Plan Maintenance Process

Planning Area

Hazard Risk Assessment

Mitigation Strategy

2.1 – Available Resources

2.1.1 – Documentation Resources

The MPC conducted a comprehensive review of Wahkiakum County and the participating jurisdictions to determine the availability of existing emergency management and preparedness information.

Wahkiakum County Hazard Mitigation Plan
Wahkiakum County is currently covered by a FEMA approved local hazard mitigation plan. The current plan has been reviewed and is incorporated throughout this plan per FEMA requirements.

Comprehensive Emergency Management Plan (CEMP)
This plan was completed in 2015 by Wahkiakum County Emergency Management Department and is applicable to the Town of Cathlamet and all Wahkiakum County participating public and private entities and organizations.

Wahkiakum County and town Municipal Codes
Each participating town's municipal codes contain provisions relevant to hazard mitigation and this document. More information on these can be found in Section 5 of this plan.

Sea Level rise and Coastal Flood Risk: Summary for Wahkiakum County
A summary and brief guide that integrates key findings, methods, interpretation and links from Climate Central's surging seas risk finder into one narrative.

2.1.2 – Fiscal Resources

The MPC conducted an assessment of their available funding options. The following is a list of federal, state, and local funding sources either available, or relevant to the Wahkiakum County HMP.

Biennial Municipal Storm Water Grants of Regional or Statewide Significance
The State of Washington Department of Ecology offers a series of storm water project grants for increasing storm water management systems capacities.

Coordinated Prevention Grants (CPG)
CPG protects human health and the environment by reducing human exposure to toxins, reducing waste, ensuring management of solid and household hazardous waste, and promoting energy and resource conservation. CPG provides funding assistance to local governments for planning and implementing programs in their local solid and hazardous waste management plans.

Hazardous Materials Emergency Preparedness Grant (HMEP)
HMEP provides funding for planning and training activities focusing on HAZMAT related transportation safety.

Integrated Planning Grants
These grants provide funding to local governments to conduct assessments of brownfield properties and develop integrated project plans for their cleanup and adaptive reuse.

Flood Mitigation Assistance Program (FMA)
The FMA program is designed to aid in the buyout of repetitive loss and severe repetitive loss properties as well as assist in the funding of flood mitigation projects and activities.

Floodplain Management Grants
The State of Washington Department of Ecology administers a floodplain management grant program that supports planning, mapping, and projects to reduce loss of life and property from riverine flooding.

Hazard Mitigation Grant Program (HMGP)
The HMGP is managed by FEMA and administered by WA EMD. Wahkiakum County does not have any HMGP funds available for mitigation planning.

Local Revenues & Budgets
Recognizing the importance of hazard mitigation planning, Wahkiakum County and its participating jurisdictions have self-funded the 25% match required by the FEMA HMGP grant.

Pre-Disaster Mitigation Grant Program (PDM)
PDM is managed by FEMA and is a nationally competitive grant program. The development of this plan has been funded by a PDM grant at a 75% match.

Public Participation Grants (PPG)
PPG provides funding to citizen groups and not-for-profit public interest organizations. PPG can be used for the investigation and cleanup of contaminated sites.

2.1.3 – Technical Resources

The Wahkiakum County MPC employed a variety of technical resources in its plan development. These technical resources were instrumental in completing an accurate vulnerability and risk assessment.

BOLDplanning
With over 14 years of experience in hazard mitigation planning, BOLDplanning's Mitigation Department was the principle plan writer.

ESRI ArcGIS v10
Each map developed for this plan, and the HAZUS models, were developed using ESRI's ArcGIS v10.

FEMA Digital Flood Insurance Rate Maps (DFIRM) – Map Data Center
FEMA's National Flood Hazard Layer (NFHL) data was instrumental in mapping floodplain locations and estimating potential flood impacts and loss estimates.

National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC)
Weather data and historical events were primary provided by NOAA's NCDC.

United States Geologic Survey (USGS)
The USGS provided GIS and technical information relating to the seismic risk of the planning area.

2.2 – Continued Public Involvement

Wahkiakum County is dedicated to involving the public in the continual shaping of its hazard mitigation plan and development of its mitigation projects and activities.

The Wahkiakum County MPC will continue to keep the public informed about its hazard mitigation projects and activities through its EMA's website. Additionally, it will provide a "comments/suggestions" option for the public to submit their input through their website.

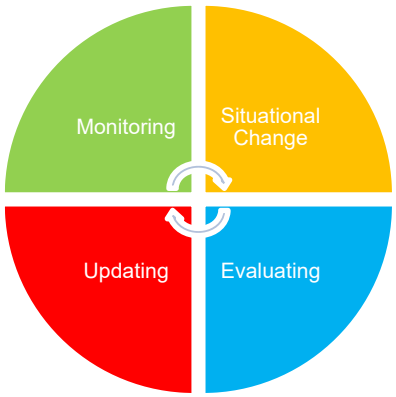
The public will also be invited to participate in annual MPC meetings to review and discuss the HMP events of the past year.

Copies of the Wahkiakum County Hazard Mitigation Plan will be available on their website and distributed to each participating jurisdiction.

Photo Courtesy of BOLDplanning

2.3 – Plan Maintenance Process

The Wahkiakum County MPC has developed a method to ensure monitoring, evaluation, and updating of its HMP. Upon adoption of the Wahkiakum County HMP, its Emergency Management Council will form a subcommittee on mitigation projects comprised of Wahkiakum County's EMA Chief Deputy and jurisdictional representatives from the MPC. The chair of the subcommittee will be determined by a vote in the subcommittee. Additional members may be added based on necessity. The sub-committee will submit an annual report to the Emergency Management Council.



Please see the Wahkiakum County HMP Quarterly Report form at the end of this section.

WCEMA may request a non-scheduled report on the monitoring, evaluation, or updating of any portion of the HMP due to irregular progress on mitigation actions and or projects, in the aftermath of a hazard event, or for any reason deemed appropriate.

2.3.1 – Plan Monitoring

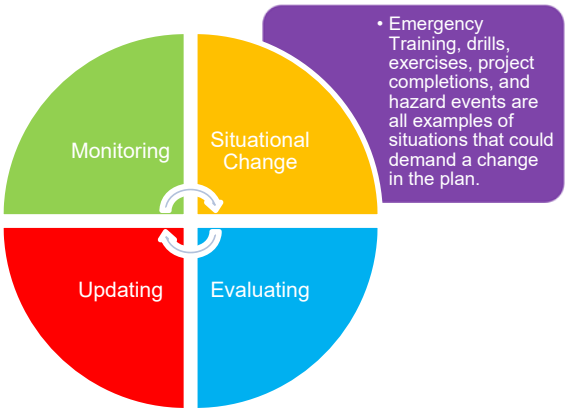
Plan monitoring can be defined as the ongoing process by which stakeholders obtain regular feedback on the progress being made towards achieving their goals and objectives. In the more limited approach, monitoring may focus on tracking projects and the use of the agency's resources. In the broader approach, monitoring also involves tracking strategies and actions being taken by partners and non-partners, and figuring out what new strategies and actions need to be taken to ensure progress towards the most important results.

A monitoring report will be written and submitted to the Emergency Management Council annually and after the annual MPC meeting or when triggered by a situation change. The monitoring report will answer the following questions:

- Is the mitigation project under, over, or on budget?
- Is the mitigation project behind, ahead of, or on schedule?
- Are there any changes in Wahkiakum County's capabilities which impact the HMP?
- Are there any changes in Wahkiakum County's hazard risk?
- Has the mitigation action been initiated or its initiation planned?
- If applicable, has participation in a mitigation action's collaboration been regular?
- If any, what plan updates occurred, why they occurred, and what is their impact?

The plan maintenance process is cyclical and maintenance items can operate simultaneously within the process.

2.3.2 – Plan Evaluating

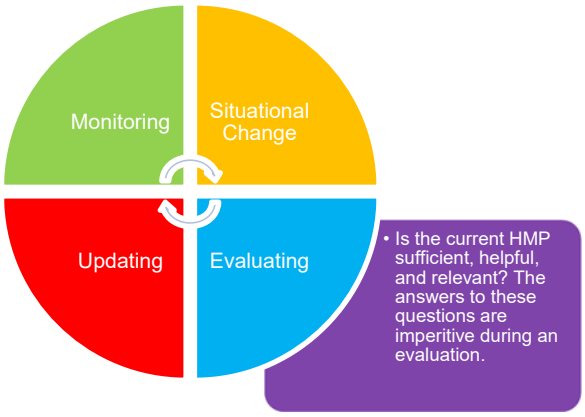


A plan evaluation is a rigorous and independent assessment of either completed or ongoing activities to determine the extent to which they are achieving stated objectives and contributing to decision making.

An evaluation report will be written and submitted to the Emergency Management Council when the situation dictates. The following situations are typical examples of when an evaluation will be necessary:

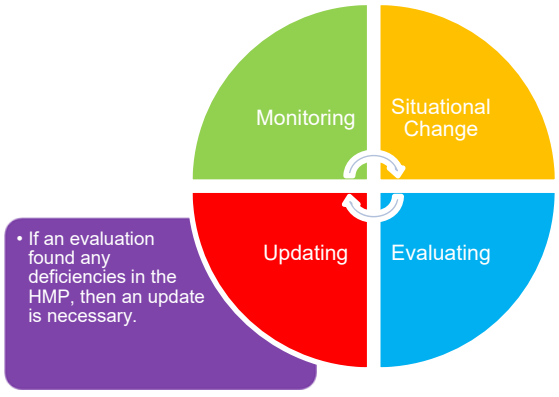
- Post hazard event
- Post training exercise
- Post tabletop or drill exercise
- Significant change or completion of a mitigation project
- Significant change or completion of a mitigation action

An evaluation report will ask the following questions in response to the previously listed events:



- Do the mitigation objectives and goals continue to address the current hazards?
- Are there new or previously unforeseen hazards?
- Are current resources appropriate for implementing a mitigation project?
- Was the outcome of a mitigation action/project expected?
- Are there implementation problems?
- Are there coordination problems?

2.3.3 – Plan Updating



Typically, an HMP update is initiated upon the completion of a plan evaluation and even then, only when the evaluation determines an update is appropriate. Additionally, when new hazard data becomes available it will be added to the HMP. New data will be confirmed or denied at annual MPC meeting.

For whatever reason, an HMP update can be written anytime it is deemed necessary by the WCEMA.

Wahkiakum County will begin their update process three years from this plan's adoption according to FEMA DMA2000 guidelines on local mitigation plan updates under the direction of the Chief Deputy of WCEMA.

Section 3 – Community Profile

Planning Process

Local Prodedures & Resources

Planning Area

- Demographics
- Climate
- Topology

Hazard Risk Assessment

Mitigation Strategy

3.1 – Demographics

The U.S. Census Bureau estimates as of 2016, Wahkiakum County has a total of 4,139 people residing within its boundaries. According to the most up to date, released Census Bureau projections, none of the participating jurisdictions have significant population growth (over 5%). Since none of the participating jurisdictions are experiencing significant growth, they also are not going to be experiencing an increase in hazard vulnerability due to demographic changes. Further, as it relates to demographics, the participating jurisdictions with declining populations are considered to have a decreased vulnerability to hazards.

The table below details the participating jurisdictions' demographic information. Jurisdictions with significant growth are highlighted in red while jurisdictions with significant declining growth are highlighted in orange.

Table3: Community Demographics

Table 3 – Community Demographics							
Jurisdiction	**Size (Sq. Mi.)**	**Population**			**% Population Change**		
		2000	**2010**	**2015**	**2000 - 2010**	**2010 - 2015**	**2000 - 2015**
Wahkiakum County	263.40	3,824	3,978	4,042	4.023%	1.61%	5.70%
Cathlamet	0.50	565	532	545	-5.84%	2.44%	-3.54%
School District	**Students**		**Staff**		**Total**		
Wahkiakum County School District	460		25		485		

**The data is from the U.S. Census Bureau.*

3.2 – Stakeholder Profiles

This section provides a general summary of this plan's participating jurisdictions, stakeholders, and their respective hazard history. It is designed to give a depiction of the social, economic, and geographic factors that later contribute to the hazard risk assessment and mitigation strategy.

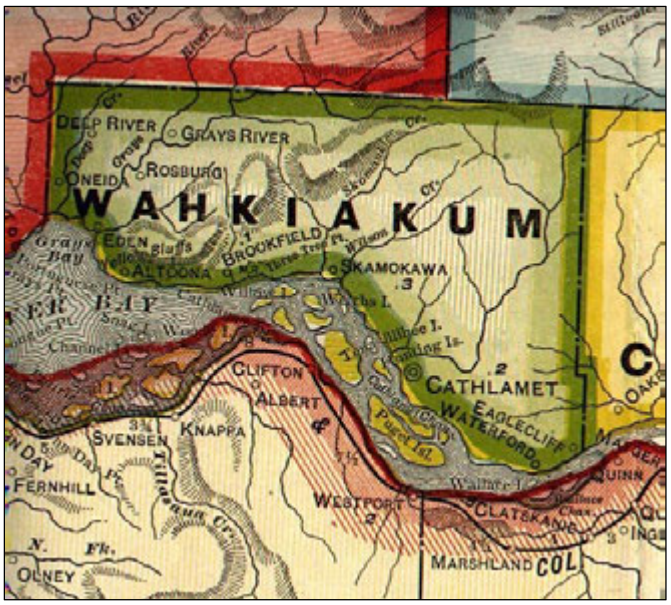


Photo Courtesy of USGenWeb Archives

3.2.1 – Wahkiakum County

Wahkiakum County was established in 1854 and is named for Chief Wahkiakum of the Chinook. Wahkiakum County has an area of 264 square. Major rivers and rough terrain encompass this small but beautiful county. The major ricers are Grays and Elochoman Rivers which both flow into the Columbia River. Wahkiakum has typical Pacific Northwest maritime climate. Snowfall is generally light and melts quickly. For a winter day, the average temperature is around 31 to 46 degrees and during the summer the average temperature is around 50 to 76. The largest industry in Wahkiakum County is timber and agricultural products. The soil, temperature and rainfall are beneficial to the timber and agricultural products; however, they also contribute to extensive occurrence of environmentally sensitive areas.

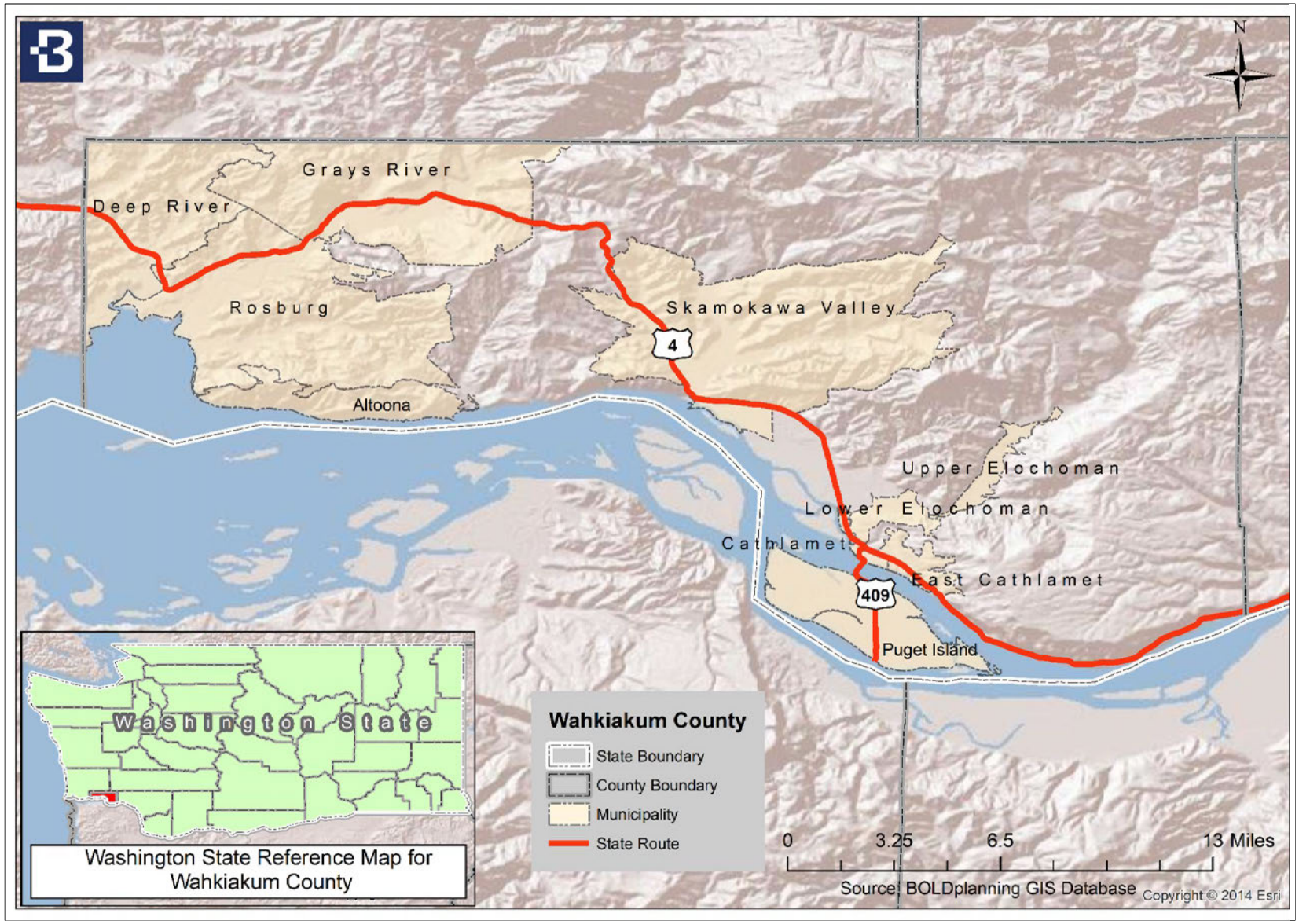
Cathlamet is the county seat and the only town in Wahkiakum County. The Town of Cathlamet is located in the Willapa Hills Province. The Elochoman River, Birnie Creek and other small creeks form the drainage system in the area. The Town of Cathlamet also houses the only school district located in Wahkiakum County.

Wahkiakum County School District has two campuses; the Julius A. Wendt Elementary/John C. Thomas Middle School and Wahkiakum County High School. According to former superintendent Bob Garrett, Wahkiakum school district has been around for over 100 years. As of 2018, the school district has 30 full time employees and 40 support staff.

Photo Courtesy of Wahkiakum County School District

Point of Contact:

Beau Renfro, Coordinator
PO Box 65
Cathlamet, WA 98612



Map 1 – Profile, Wahkiakum County

Map 2 – Profile, Wahkiakum County with Critical Facilities

3.3 – Land Use & Development Trends

The majority of land development and use is located in the rural river valleys, along the Columbia River and on the outskirts of the Town of Cathlamet. As of 2016, the U.S. Census Bureau reports there are 2,081 housing units. Of those 2,081 housing units, 80.1% are owner occupied. Furthermore, in 2016 there were 15 building permits issued. This shows that there are minimal future developments that will occur within Wahkiakum.

Photo Courtesy of BOLDplanning

Wahkiakum County as a whole has minimally increased in size from 2000-2015 by 6% even though the town of Cathlamet has decreased in size by 4% since 2000.

The slowly declining population of the Town of Cathlamet has the benefit of not increasing or creating new hazard vulnerabilities and risks. Presuming these development trends continue, or growth stabilizes, Wahkiakum County and its participating jurisdictions will be able to focus on tackling current vulnerabilities and risks by evaluating the value of increasing and enforcing zoning, building codes, NFIP and other flood standards. However, the overall increase of population in Wahkiakum County and the increase of building permits leads one to focus on the increased vulnerability of the county regardless of the population decrease within the Town of Cathlamet. A hazard specific analysis, as it pertains to land use and development trends, is covered under each hazard in Section 4 – Hazard Risk Assessment.

For hazards that affect the entire planning area, increased population growth increases a jurisdiction's overall vulnerability, while decreased population growth decreases it. It is difficult to quantify the exact change in vulnerability in either direction but can be depicted as generally directly proportional to the population change itself. For more information on hazards effects the entire planning area, see Section 4 – Hazard Risk Assessment.

For hazards which have easily measured extents, changes in vulnerability are more difficult to calculate. Over the past 5 years, dramatic improvements in available geographic data and improvements in risk assessment methodology make this plan update's risk assessment far superior to the previous plan. However, the downside of utilizing improved methodologies and data is that they are incapable of being directly compared to the previous plan's methods and data. For instance, the previous plan does not geographically and accurately depict the locations of the Wildland Urban Interface (WUI) or the WUI intermix. Without knowing where they existed in 2010, the current improved methodology does not allow for a comparison of vulnerability.

A hazard specific analysis, as it pertains to land use and development trends, is covered under each hazard in Section 4 – Hazard Risk Assessment.

Section 4 – Hazard Risk Assessment

Planning Process

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

- Identify Hazards
- Profiling Hazards
- Hazards
- Land Use & Development Trends
- Hazard Risk Summary
- Excluded Hazards

Mitigation Strategy

The goal of mitigation is to reduce the future impacts of hazards, including property damage, disruption to local and regional economies, and the amount of public and private funds spent to assist recovery. To be implemented correctly and efficiently, mitigation decision-making needs to be based on an accurate risk assessment.

This section builds the foundation for an ongoing review and analysis of the hazards and vulnerabilities facing the planning area. Data used in Wahkiakum County's previous HMP has been updated and the analysis has been expanded to include more improved methodologies. Additionally, local knowledge and expertise was incorporated into the risk assessment.

The profiling of Wahkiakum County hazards and risks will provide the foundation for a long-term, sustainable planning process and will serve the county and participating agencies at this time considering the county's disaster experience, currently available financial resources and potential sources of funding in the future. Community involvement played, and will continue to play, an important part in the hazard vulnerability process, especially in pursuing the analysis of structural vulnerabilities, land use and economic development. Another factor in this analysis was the consensus drawn from the participants during the planning process.

A history of declared disasters helps capture an overview of the hazards facing Wahkiakum County and its participating jurisdictions. Since 2006, Wahkiakum County and its participating jurisdictions have suffered from 11 federally declared disasters. A list of the declared disasters occurring in Wahkiakum County and its participating jurisdictions since 2006 is presented in the table below. Smaller disasters are more frequent and are not reflected in the table.

Table 4: Disaster Declarations

Table 4 – Disaster Declarations		
Designation	**Date**	**Incident Type**
DR-4309	4/21/2017	Severe Winter Storms, Flooding, Landslides and Mudslides
DR-4253	2/2/2016	Severe Winter Storm, Straight Line Winds, Flooding, Landslides, Mudslides, and a Tornado
DR-4249	1/15/2016	Severe Storms, Straight-line Winds, Flooding, Landslides, and Mudslides
DR-4056	3/5/2012	Severe Winter Storm, Flooding, Landslides, and Mudslides
DR- 1963	3/25/2011	Severe Winter Storms, Flooding, Landslides, and Mudslides
DR-1817	1/30/2009	Severe Winter Storm, Landslides, Mudslides, and Flooding
DR-1825	3/2/2009	Severe Winter Storm, Record and Near Record Snow
DR-1734	12/8/2007	Severe Storms, Flooding, Landslides, and Mudslides
DR-1682	2/14/2007	Severe Winter Storm, Landslides, and Mudslides
DR-1671	12/12/2006	Severe Storms, Flooding, Landslides, and Mudslides
DR-1641	5/17/2006	Severe Storms, Flooding, Tidal Surge, Landslides, and Mudslides

**The data are from FEMA.*
***These disasters did not impact or damage the life or property within the county but are declared due to overwhelming response and recovery operations.*

4.1 – Identifying Hazards

The first step in developing a hazard assessment is identifying the hazards with reasonable potential to strike Wahkiakum County or its participating jurisdictions. Identification allows appropriate and well-planned action to mitigate the extent and impact of a hazard event as well as facilitating emergency response and recovery operations. Not all disaster contingencies can be planned for, however, by using an all-hazards approach to planning. The mitigation process yields increased preparedness for unforeseen hazard events.

The table below lists the hazards profiled in the State of Washington Hazard Mitigation Plan and Wahkiakum County's previously approved HMP. Based on the research described above, nine of these hazards pose a risk to at least one of the participating jurisdictions. These are: earthquakes, floods, landslides, severe storms, and wildfire, drought and volcano.

Details for each hazard and their potential impact on Wahkiakum County are located in Section 4.2. The following tables compare the identified and profiled hazards as they relate to their previous plan and to the state's plan. Any hazards which affect the State of Washington or were profiled in the previous plan, but do not affect any of Wahkiakum County 's jurisdictions are listed as 'excluded.' An analysis of why a hazard has been excluded can be found in Section 4.6 – Excluded Hazards.

Table 5: State of Washington & Prior Plan Identified Hazards

Table 5 – State of Washington & Prior Plan Identified Hazards			
Hazards in State or Previous HMP	**Previous Inclusions**	**Status**	**Justification**
Droughts	Local & State	Included	Located in Prior Hazard Mitigation
Earthquakes	Local & State	Included	Prior Hazard History
Floods	Local & State	Included	Prior Hazard History
Landslides	Local & State	Included	Prior Hazard History
Severe Storms	Local & State	Included	Prior Hazard history
Volcano	Local & State	Included	Planning Area at Risk
Wildfire	Local & State	Included	Planning Area at Risk
Avalanches	State	Excluded	Planning area not at risk
Tsunami	State	Excluded	Planning area not at risk

4.2 – Methodology

4.2.1 – Description - Describes the hazards that can affect the planning area.

4.2.2 – Location & Extent - Contains information on location; the geographic areas in the planning area that are affected by the hazard, and extent; the strength or magnitude of the hazard, for each hazard.

4.2.3 – Previous Occurrences - Contains a history of previous hazard events for each of the identified hazards.

Methodology: Most of the historical hazard data used in the risk assessment originates from NOAA. In most instances, the hazard affects a large geographic area and thus the hazard data is reported at the county level. *This is the best available data for these hazards*. The calculations for Previous Occurrences and the Probability of Future Events is based on county level data.

4.2.3A – Probability of Future Events - Contains the likelihood of the hazard occurring. If quantitative calculations are performed, a discrete numerical probability is given that corresponds to the table below. In the event the nature of the hazard (dam failure for instance) does not allow such a calculation or there is not enough information to make a calculation, a qualitative probability will be given. This assessment is based from local knowledge and expertise.

Table 6: Probability Categories

Table 6 – Probability Categories	
Category	**Range (Per Year)**
Rare	Less than 1%
Occasional	1% - 25%
Likely	25% - 50%
Highly Likely	50% - 100%

4.2.4 – Vulnerability & Impact - Describes the potential impacts of the hazard for each participating jurisdiction and provides an overall summary of each jurisdiction's vulnerability to the hazard through structures, systems, populations, and community assets that are susceptible to damage and loss from the hazard.

4.2.4A – Infrastructure & Critical Facilities- When appropriate, this section details the infrastructure and facilities pertinent to the hazard.

4.2.4B – Land Use & Development Trends - Provides a general description of land use and development trends within the community.

4.2.4C – Unique, or Varied Risk - Assesses each jurisdiction's risk where it varies from the risks facing the entire planning area.

4.2.4D – Repetitive Loss Structures - Describes the types of facilities and estimates the number of repetitive loss properties exposed to the hazard when applicable.

County and Municipal Governments
Wahkiakum County and the participating municipal governments are assessed on a geographic basis. Their vulnerabilities are assessed according to their structures, populations, and systems.

School Districts
The participating school districts are assessed by campus on a geographic basis. Their vulnerabilities are assessed according to their structures and populations.

Water Companies and Water Districts
The participating water companies and water districts are assessed on a geographic basis. Their structural vulnerability is assessed according to which local government their property is located within. As an integral system to the planning area, their vulnerability is also assessed as a system.

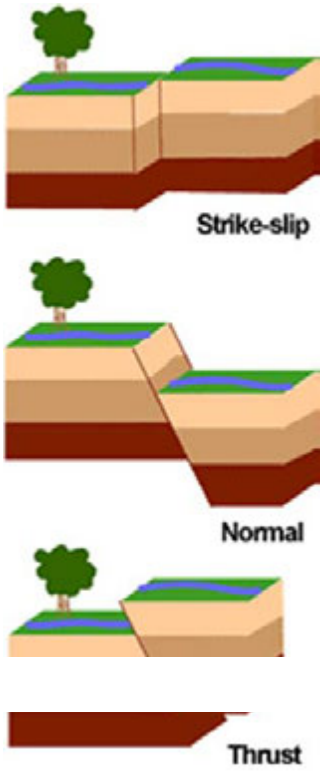
Fire Districts
The participating fire districts are assessed on a geographic basis. Their structural vulnerability is assessed as infrastructure and critical facilities. As an integral system to the planning area, their vulnerability is also assessed as a system.

Port Districts
The participating ports are assessed on a geographic basis. Their structural vulnerability is assessed according to which local government their property is located within. As an integral system to the planning area, their vulnerability is also assessed as a system.

Public Utility District #1
Public Utility District #1 is assessed on a geographic basis. Their structural vulnerability is assessed according to which local government their property is located within. As an integral system to the planning area, their vulnerability is also assessed as a system.

4.2EQ – Earthquakes

4.2.1 – Description



An earthquake is the result of a sudden release of energy in the Earth's crust that creates seismic waves. In the most general sense, the word earthquake is used to describe any event that generates seismic waves. Earthquakes are typically caused by the rupturing of geological faults. Occasionally, they are also caused by other events such as volcanic activity, landslides, mine blasts, tsunamis, and nuclear tests. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacement of the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity. The shallower an earthquake, the more damage to structures it causes, all else being equal.

Oceanic earthquakes have the ability to cause damage to property and threaten life in much the same as an earthquake with an epicenter below a continent. As previously mentioned, an oceanic earthquake has the potential to create a tsunami, compounding the negative effects and emergency operations after an event.

An earthquake's effect can be compounded by the soil type underlying a community's buildings and infrastructure. If the soil is not composed of bedrock and consists of clays, silts, and other types of sand, the pressure generated by an earthquake can force brittle soil and water up towards the surface. These upward forced materials will then destabilize buildings and infrastructure, causing damage anywhere from cracks in roadways to the full displacement and destruction of a building. Smaller upward forced materials can destabilize slopes and building foundations further compounding the potential damage to a community.

4.2.2 – Location & Extent

Based on USGS major fault lines do not run through Wahkiakum County. The State of Washington and Wahkiakum County lie east of the Cascadia subduction zone where the North American Plate collides with a number of smaller plates.

Earthquakes from the Cascadia subduction zone can strike suddenly and without warning, occur at any time of the year, and at any time of the day. There is not a definitive way of predicting an earthquake. The duration of shaking can last anywhere from a second to a period of minutes.

There are numerous characteristics measured when observing earthquake activity, however: its force, depth, peak ground acceleration, and the distance to the epicenter are the most influential factors in determining damage. Two scales are used when referring to earthquake activity; estimating the total force of the earthquake, the Richter Scale, and the observed damage from an earthquake, the Modified Mercalli Intensity Scale. Please see the figures on the following pages for both scales and their estimated matching equivalent index.

Earthquakes of magnitude 5.0 or greater are considered potentially threatening to Wahkiakum County and its jurisdictions, as this is the point at which structures can become unusable due to structural and foundation damage. Any earthquake felt at this magnitude or greater would likely be cause for cessation of operations until sight inspections can take place.

The entire planning area is at risk from the Cascadia subduction zone. Map 22 depicts the USGS's potential peak ground acceleration values in the event of a catastrophic earthquake. The northern portion of the planning area is in a USGS designated 20-25% peak ground acceleration value while most of the planning area is designated as likely to experience 15-20% peak ground acceleration. These values translate, via the tables on the following page, to a Richter Scale around 5.5 and a Mercalli Scale value of VII: General Alarm, Walls and Plaster Crack.

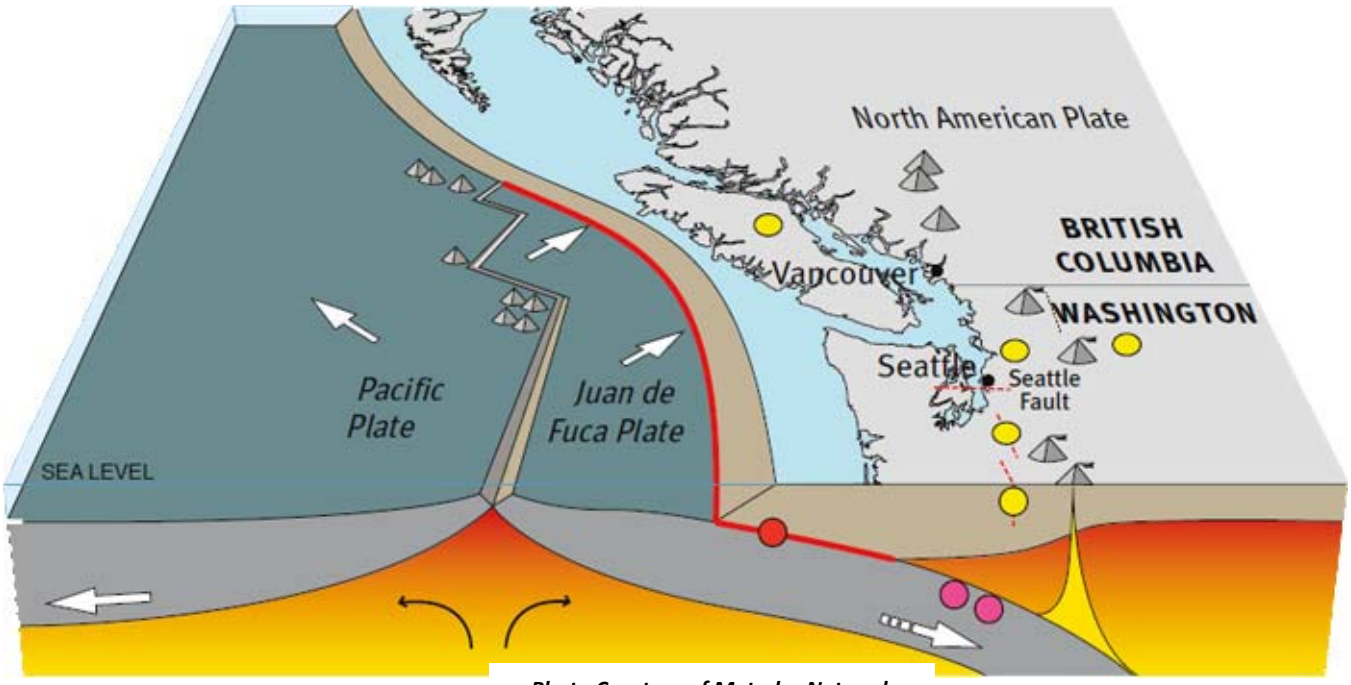


Photo Courtesy of Metador Network

Table 7 – Modified Mercalli Scale Vs. Richter Scale

Category	Effects	Richter Scale (approximate)
I. Instrumental	Not felt	1-2
II. Just perceptible	Felt by only a few people, especially on upper floors of tall buildings	3
III. Slight	Felt by people lying down, seated on a hard surface, or in the upper stories of tall buildings	3.5
IV. Perceptible	Felt indoors by many, by few outside; dishes and windows rattle	4
V. Rather strong	Generally felt by everyone; sleeping people may be awakened	4.5
VI. Strong	Trees sway, chandeliers swing, bells ring, some damage from falling objects	5
VII. Very strong	General alarm; walls and plaster crack	5.5
VIII. Destructive	Felt in moving vehicles; chimneys collapse; poorly constructed buildings seriously damaged	6
IX. Ruinous	Some houses collapse; pipes break	6.5
X. Disastrous	Obvious ground cracks; railroad tracks bent; some landslides on steep hillsides	7
XI. Very disastrous	Few buildings survive; bridges damaged or destroyed; all services interrupted (electrical, water, sewage, railroad); severe landslides	7.5
XII. Catastrophic	Total destruction; objects thrown into the air; river courses and topography altered	8

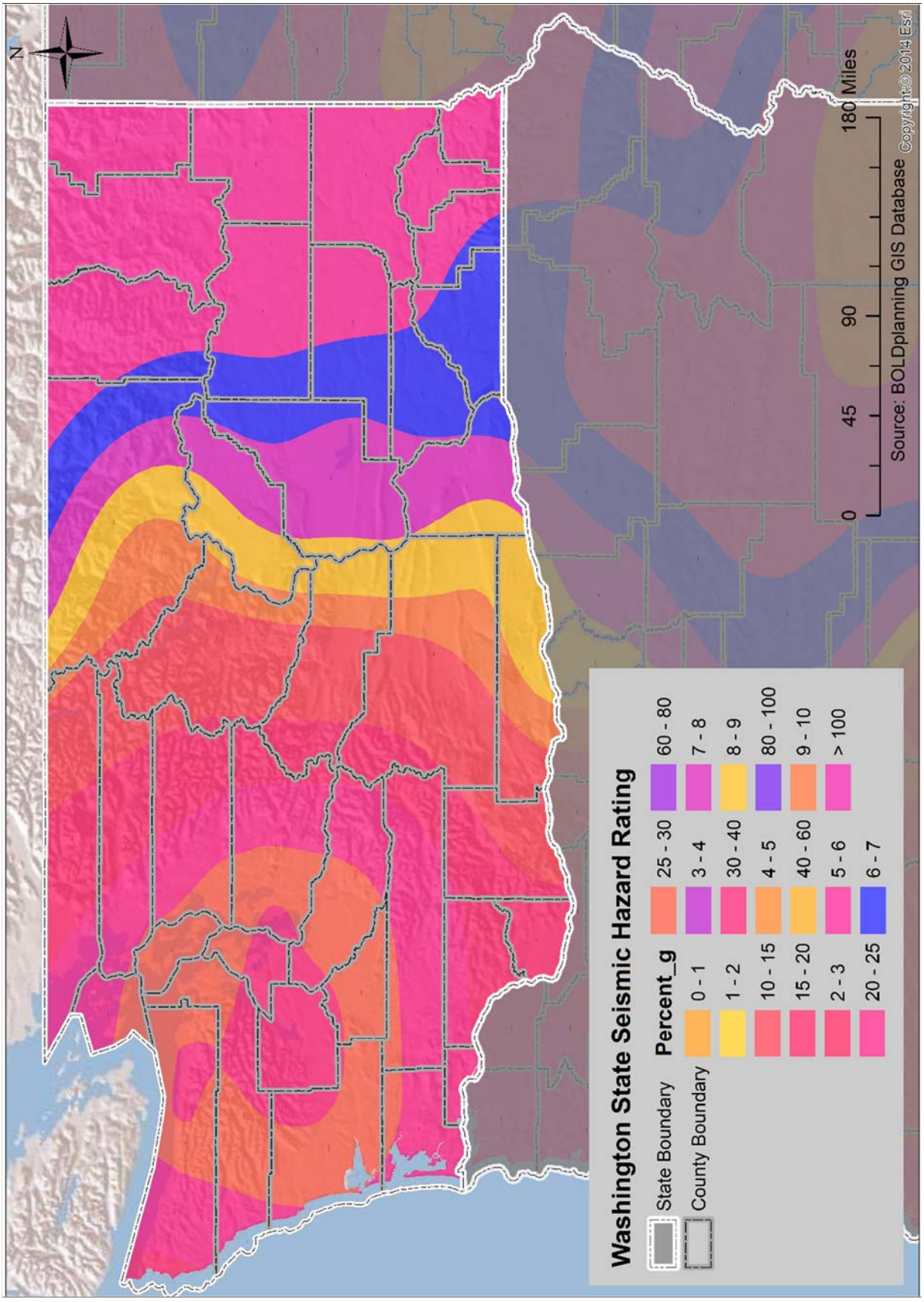
Table 8: Percent Peak Ground Acceleration Vs. Mercalli & Richter Scales

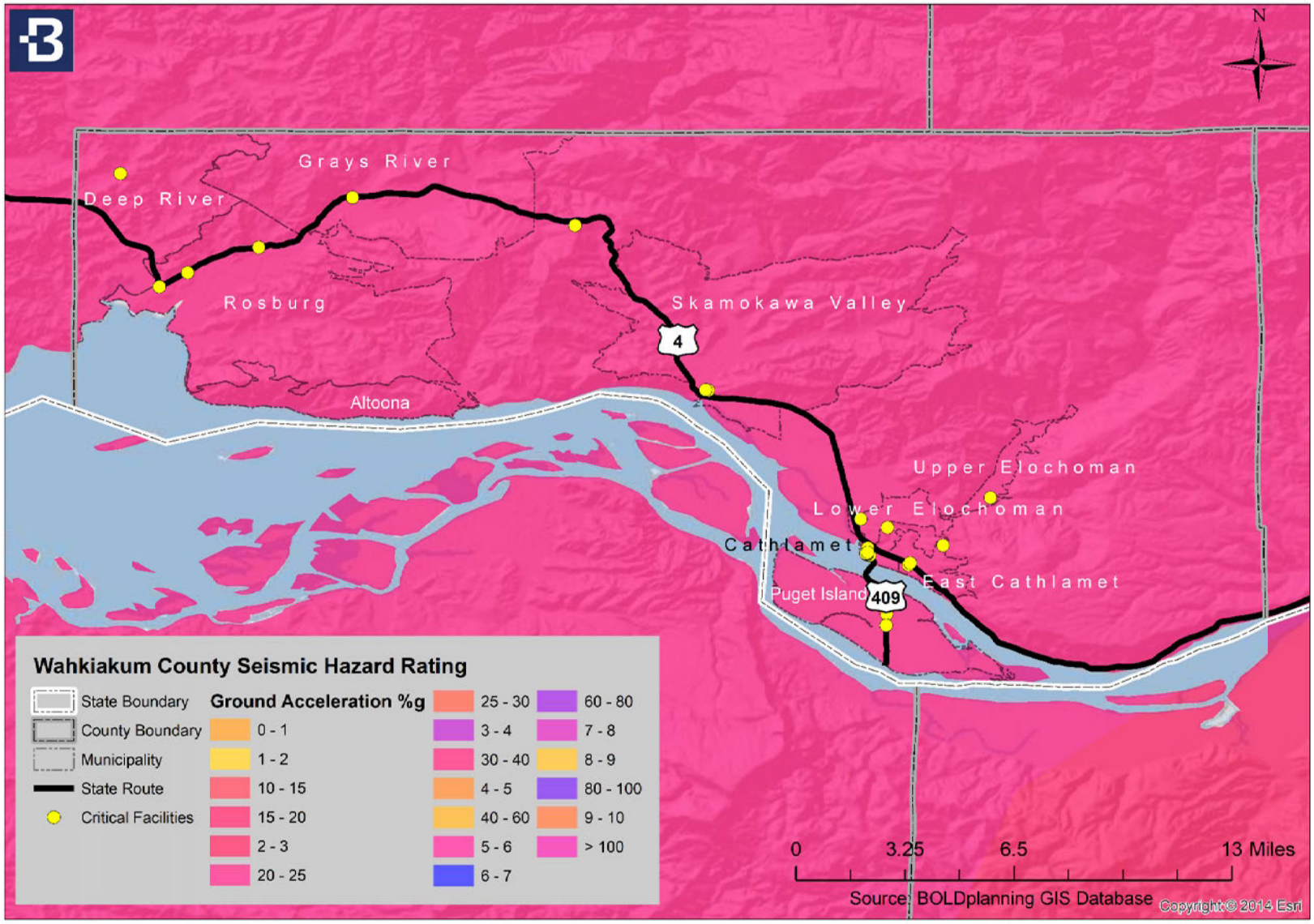
Table 8 – Percent Peak Ground Acceleration Vs. Mercalli & Richter Scales

Mercalli Scale Intensity	Richter Scale (Approximate)	Minimum %g	Maximum %g
I	1 - 2	0.00%	0.17%
II - III	3 - 3.5	0.17%	1.40%
IV	4	1.40%	3.90%
V	4.5	3.90%	9.20%
VI	5	9.20%	18.00%
VII	5.5	18.00%	34.00%
VIII	6	34.00%	65.00%
IX	6.5	65.00%	124.00%
X +	7 +	124.00%	-

**The table is from the USGS.*

Map 3 – Seismic Hazard Ratings, Washington





Map 4 – Seismic Hazard Ratings, Wahkiakum County

4.2.3 – Previous Occurrences

Wahkiakum County and its participating jurisdictions have experienced two minor earthquakes with epicenters inside their borders.

These earthquakes minorly effected Wahkiakum County so they were not cause for alarm. There is no historical data of an earthquake epi center in the participating jurisdictions area. More threatening earthquakes are likely to have epicenters far away from Wahkiakum County, but be of such a high magnitude that they affect the planning area.

Nisqually Earthquake – 28 February 2001

Commonly referred to as the "Ash Wednesday Quake," the Nisqually Earthquake occurred on February 28, 2001. The earthquake, magnitude 6.8, struck the Puget Sound area at 10:54 a.m. on February 28, 2001. The epicenter was below Anderson Island near the Nisqually River delta in Puget Sound. Ground shaking lasted about 45 seconds. Two minor aftershocks occurred near the epicenter of the main shock. This event was a slab earthquake; its depth calculated at 36.7 miles below the earth's surface in the Juan de Fuca plate. The area of most intense ground shaking occurred along the heavily populated north-south Interstate 5 corridor, not around the epicenter. This was due to the amplification of the earthquake waves on softer river valley sediments. Its effects were felt halfway into central Oregon and as far north as Vancouver and were reported to last a total of 45 seconds.

Although around 400 people were injured in Olympia and the total property damage and economic loss has been reported at $2,000,000, Wahkiakum County was lucky enough to feel minor shaking and not sustain any injury or damage.

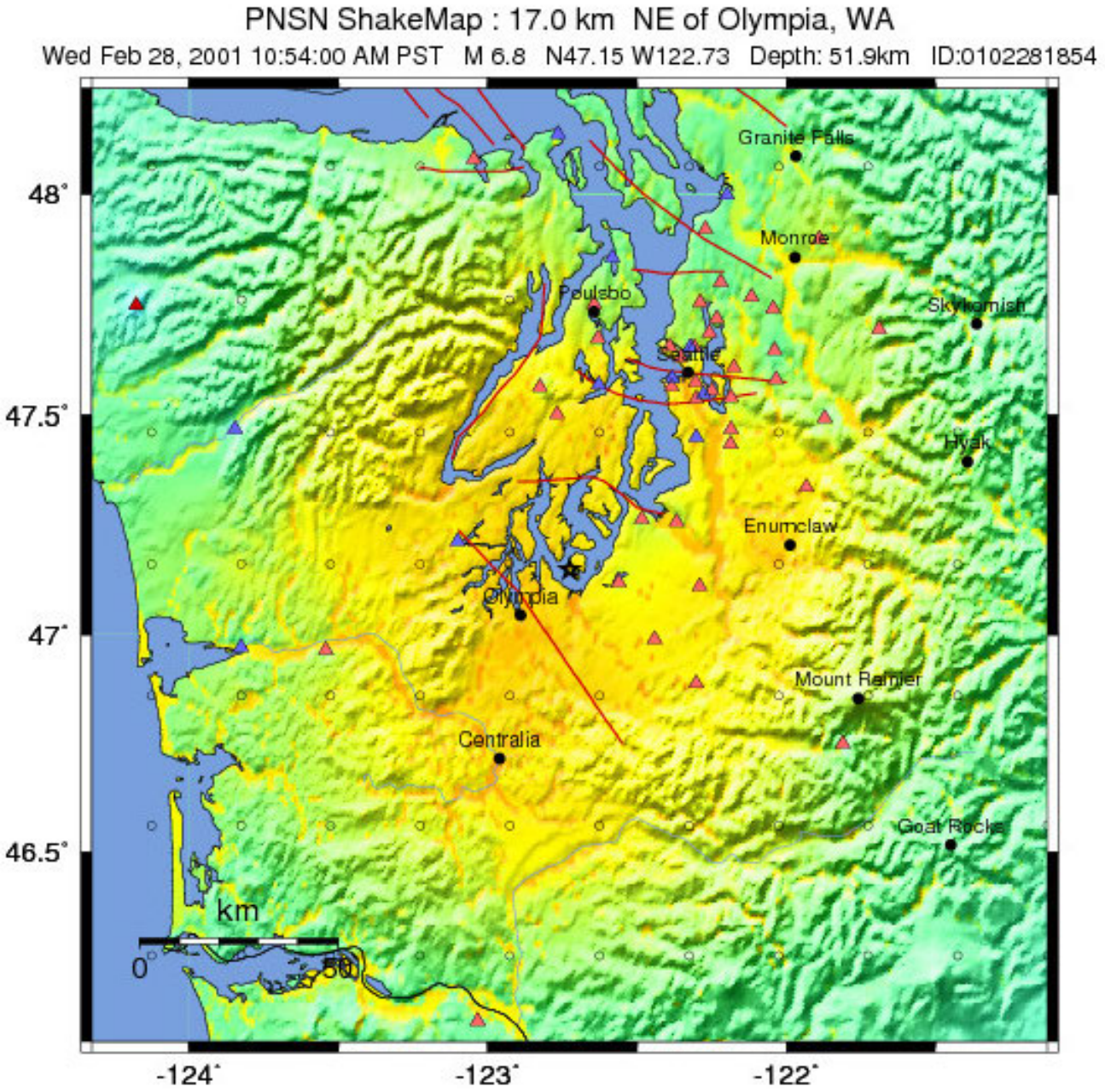
Map 24 depicts the USGS's official "shake map" of the incident. From this map, one can see the recorded peak ground acceleration experienced by Wahkiakum County and its participating jurisdictions was between 9.2 and 18, under the USGS's predicted potential peak ground acceleration 15-25.

There have been other large earthquakes in the State of Washington, such as the Seattle-Tacoma 6.5 magnitude earthquake in 1965, and an Olympia 7.1 magnitude earthquake originating around the same location as the Nisqually earthquake. However, the results and impacts where similar to those of the Nisqually earthquake.

4.2.3A – Probability of Future Events

Although minor earthquake activity occurs on a daily basis in the State of Washington, damaging earthquakes are infrequent. All participating jurisdictions in this plan have high vulnerability due to the fault lines existing in the surrounding area. Wahkiakum county was listed in the Washington State plan as one of the 24 counties most vulnerable to earthquakes. Wahkiakum County is also vulnerable to earthquakes due to a high percentage of the population being 65 or older (31%) which is higher than the state average (15%). The estimated probability of occurrence for an earthquake similar to the magnitude 6.5 Seattle-Tacoma event that occurred in 1965 is approximately once every 35 years. The probability of occurrence of an earthquake similar to the magnitude 7.1 Olympia earthquake that occurred in 1949 is once every 110 years. Considering the recurrence interval and history of earthquakes felt in Wahkiakum County and the participating jurisdictions, the probability of occurrence of a damaging earthquake is "rare."

Map 5 – USGS Shake map, Nisqually Earthquake



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	*<.17*	*.17-1.4*	*1.4-3.9*	*3.9-9.2*	*9.2-18*	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	*8.1-16*	*16-31*	*31-60*	*60-116*	*>116*
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

4.2.4 – Assessing Vulnerability & Impacts

Earthquake Impacts

A catastrophic quake from the Cascadia Subduction Zone could have extremely adverse impacts.

Nisqually Earthquake in 2001

A high magnitude earthquake in the Cascadia Subduction Zone would likely create a tsunami. If the potential tsunami enters the Columbia river, the tsunami will amplify due to the narrow area between the coast of Wahkiakum County and Puget Island. Earthquake intervals are hard to predict; therefore, we have to rely on past earthquake history. Going off historical evidence, 9.0 earthquakes have been separated by as many as 1,000 years and as few as 200 years. Therefore, the earthquake impact to Wahkiakum County is high even though the chances of the earthquake epi center being in Wahkiakum County is low.

Vulnerability of Facilities

Wahkiakum County and its jurisdictions' structural vulnerability to earthquakes vary based on the construction quality, construction material, soil and foundation, and earthquake resilience of each structure. The State of Washington has been incredibly pro-active in updating, increasing, and enforcing its seismic resilient building codes. However, a high magnitude earthquake will still damage or destroy structures.

The planning area's most vulnerable structures are those which are older, have not been subject to new and improved building codes, are built over unstable soil, and those susceptible to secondary hazards such as landslides or tsunamis. Map 6 at the end of this section depicts the soil locations where the planning area is most susceptible to liquefaction.

According to the building and planning commission, Wahkiakum County abides by the state of Washington building codes. Since 2005 buildings have been built to seismic codes as well.

Vulnerability of Population

The vulnerability of the population in Wahkiakum Counties population is dependent on the facilities vulnerability. An earthquake has the potential to shake objects off a wall or shake off parts of a structure which has the potential to injure the population. Additionally, there is the risk of a facility partially or fully collapsing which would injure or kill the inhabitants. The population total of Wahkiakum County and its jurisdictions is 4,264. Any number of these residents are vulnerable in relation to the structures in which they live, work, and visit.

Historically, there are no recorded incidents of death or injury from earthquakes in Wahkiakum County nor any of its participating jurisdictions.

Vulnerability of Systems
It is highly likely that the entire planning area will be similarly damaged due to the geographic scale of the earthquakes. A high magnitude event would likely cripple the planning area, destroying buildings and infrastructure, starting fires, incurring widespread loss of power and basic services, and hampering local emergency management and response services from coordinating or providing the necessary assistance.

If a high magnitude earthquake originates from the Cascadia Subduction Zone it is likely the entire region will be dramatically affected and emergency services from local, regional, state, and the federal government will be spread thin among the region. A high magnitude earthquake will not only yield these direct and immediate effects but will likely hurt Wahkiakum County and its jurisdictions' economy and scar its population for years.

Fire Districts
The fire districts' services are an integral part to the planning areas emergency operations before, during, and after an event. The fire stations in Wahkiakum County are new and therefore built for seismic activity. However, participating fire districts are vulnerable to high magnitude earthquakes. An earthquake that damages the fire districts' capabilities will have dramatic negative effects on the planning area's ability to respond to and recover from the earthquake.

Ports
The ports of Skamokawa and Cathlamet are significantly vulnerable to earthquakes. Most of the docs located at Port #1 and Port #2 are wooden structures. They would severely be impacted. However, the office buildings located at port #1 are high off the ground, they would more than likely be able to with stand flooding and a mild earthquake. Any destruction of critical equipment, docks, or mooring facilities could shut down the port for weeks to months. Additionally, depending on what was damaged or destroyed, debris could fall into the water making the facility unusable . The communities of Wahkiakum County rely on these ports for commercial and economic stability and prosperity making them of extreme value in terms of mitigation and recovery.

Public Utility District #1
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid necessary to deliver electricity to the planning area. PUD #1's infrastructure is at significant risk to strong earthquakes, high winds and flooding. Power lines and delivery substations above ground can be damaged in the same way as any above ground structure. Power lines that are buried can become dislodged, disjoined, or broken due to shifts in the earth and soil. This poses a serious problem for response and recovery operations following a sizable earthquake.

Transportation & Wahkiakum Transit
The roadways and bus routes of Wahkiakum County are highly vulnerable to earthquakes. The complexity and multitude of valleys in which its roadways are constructed make it especially vulnerable to closures from landslides caused by earthquakes. This is covered in more detail in Section 4.2LS - Landslides. Additionally, movement from the earth can displace roadways, making any quick and easy repairs impossible. Damaged structures or other falling debris can block these roadways, further delaying any return to normal service of a roadway. Long term closures and restrictions from an earthquake have the potential to damage the local economy, hamper commerce, and limit the delivery of basic services.

Water Companies and Districts
The participating water companies and districts are significantly vulnerable to earthquakes. Some portions of the planning area house the water reservoirs that supply water to the planning area. Water pipes cross the bridge to service Puget Island. This could potentially be affected by earthquakes. On the west side of the county, the reservoirs are on a hill and are also vulnerable to earthquakes.

4.2.4A – Infrastructure & Critical Facilities
In large part, Wahkiakum County and its participating jurisdictions' critical facilities face the same risk to earthquakes. Grays river and areas surrounding Skamokawa are identified in "moderate to high" liquefaction susceptibility. For more detail on this risk please see 'Vulnerability of Facilities.' A list of infrastructure and critical facilities can be found in Appendix B.

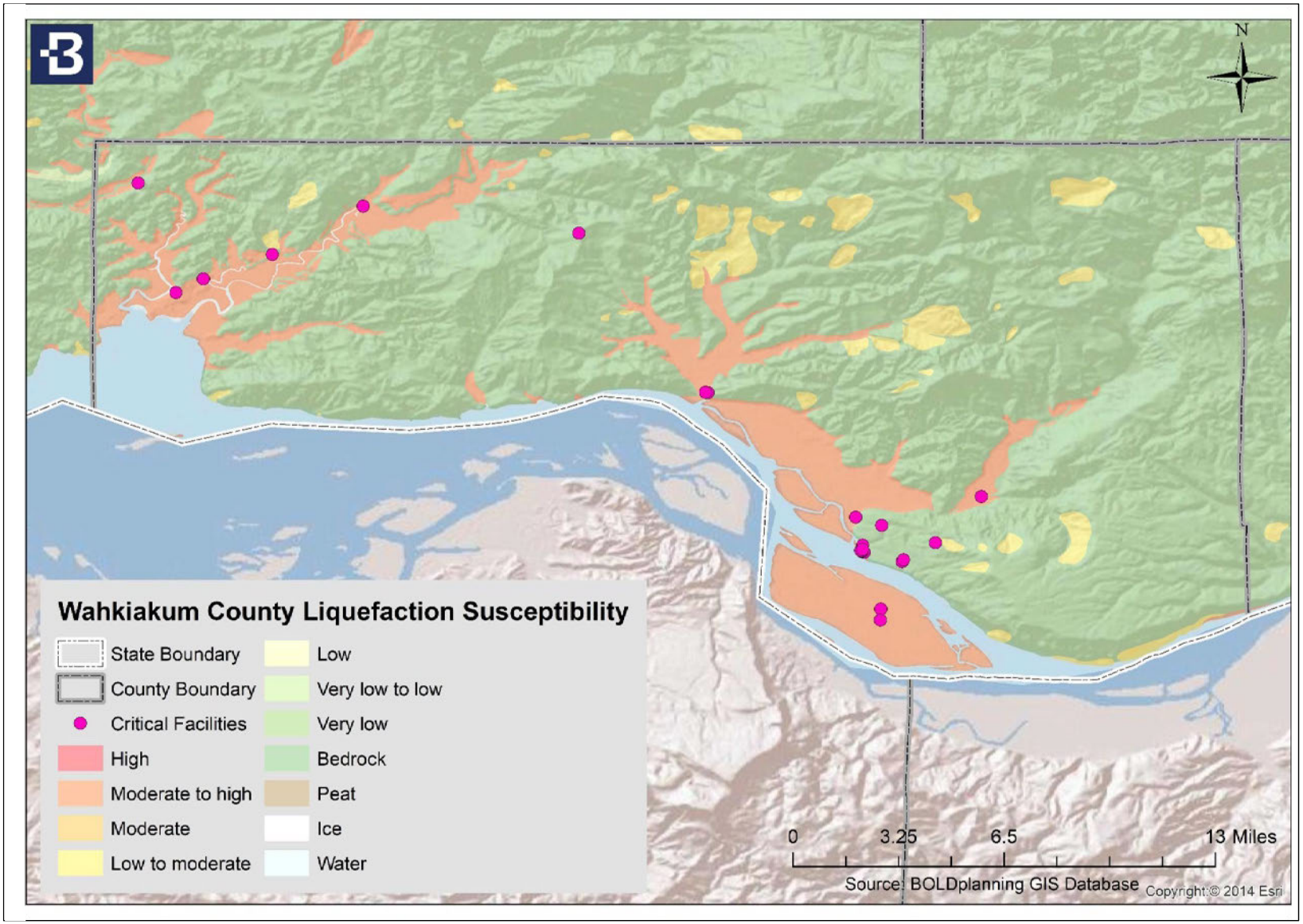
The courthouse located in Wahkiakum County recently has been retrofitted to sustain seismic activity. Given the mountainous topology throughout the county, all bridges are of prime concern as the collapse or loss of usability of any of them could severely hamper public services, commerce, and immediate response capabilities.

There are no hospitals located within Wahkiakum which decreases the vulnerable population and removes hospitals as a vulnerable critical facility. There are health clinics located in Wahkiakum County and they are not prepared to withstand any type of seismic activity. This would limit the residences ability to receive care and medicine if the health clinic was affected by the earthquake.

4.2.4B – Land Use & Development Trends
Wahkiakum County has seen a minimal incline in population since 2000, however the Town of Cathlamet has seen declining growth as detailed in Section 3.1.1 – Land Use & Development Trends thus there is minimal increase in their risk to earthquakes caused by new land use measures or development. Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of the designated seismic zones.

4.2.4C – Unique & Varied Risk
Based on the models and seismic analysis in this section, Wahkiakum County and its participating jurisdictions largely exist in the moderate to high liquefaction susceptibility zone. Grays river stemming towards Grays Bay have a high susceptibility to liquefaction. Similarly, slightly north of Skamokawa and southeast flowing towards Cathlamet Channel is also highly susceptible to liquefaction. The entire region of Puget Island is in the high susceptible liquefaction range. Based on this information, parts of Wahkiakum are highly susceptible to liquefaction due to earthquakes.

4.2.4D – Repetitive Loss Structures – There are no repetitive loss structures that are applicable to earthquakes.



Map 6 – Wahkiakum County Liquefaction Susceptibility

4.2F – Flooding

4.2.1 – Description

Photo courtesy of Chinook Observer

According to the Federal Emergency Management Agency, flooding accounts for about 40% of the Presidential declared disasters in the United States. Approximately 33% of the federally declared emergencies or disasters in Washington State since 1956 have involved flooding.

Flooding is the most prevalent and costly disaster in the United States. Flooding occurs when water, due to dam failures, rain, coastal swells, or melting snows, exceeds the absorptive capacity of the soil and the flow capacity of rivers, streams or coastal areas. At this point, the water concentration hyper extends the capacity of the floodway and the water enters the floodplain. Floods are most common in seasons of rain and thunderstorms. Floods can be associated with other natural phenomenon such as rainstorms, thunderstorms, hurricanes, coastal swells, earthquakes, tsunamis and rapidly melting snow.

Flooding is most common between the months of October through April, when storms from the Pacific Ocean (40 miles away) bring intense rainfall to the area. There are many rivers and valleys located in Wahkiakum County. Intense rainfall, and accompanying thunderstorms result in water flowing rapidly from higher elevations into valleys, collecting in and sometimes overtopping the low-lying streams. Various types of floods can happen quickly in the form of a flash flood. Riverine floods also happen quickly, accumulating and dissipating in a period of 24 hours. Flooding can occur anytime throughout the year but is typically associated with the winter season.

4.2.2 – Location & Extent

A variety of factors affect the severity of coastal, flash, and riverine flooding within the planning area. These include topography, weather characteristics, development, and geology. Intense flooding will create havoc in any jurisdictions affected. The predicative magnitude of coastal, flash, and riverine floods varies greatly.

Coastal Flooding

According to climate central, at 7 feet, 23% of Wahkiakum's population is at risk for coastal flooding. This is an estimated $118 million dollars are exposed in total. This level of sea rise has and will cause the closure of major roads and highways in Wahkiakum County. Wahkiakum County has been impacted by coastal flooding, please see section 4.2.3 for more information regarding past coastal events.

Flash Flooding

Flash flooding is unpredictable and can occur anywhere throughout the entire planning area. Wahkiakum County features several large rivers and small tributaries, or streams that are susceptible to annual flooding. These annual flooding events pose threats to life and safety and cause significant property damage.

Historically, Wahkiakum County and its participating jurisdictions have not been significantly impacted by flash flooding. Please see Section 4.2.3 for more information on the lack of historical impacts. However, flash flooding is unpredictable and could still pose a risk to Wahkiakum County.

Riverine Flooding

Riverine flooding throughout the county varies and is identified via FEMA's FIRM maps and designated flood zone classifications detailed below. The primary sources of riverine flooding are from the Grays River and Seal River.

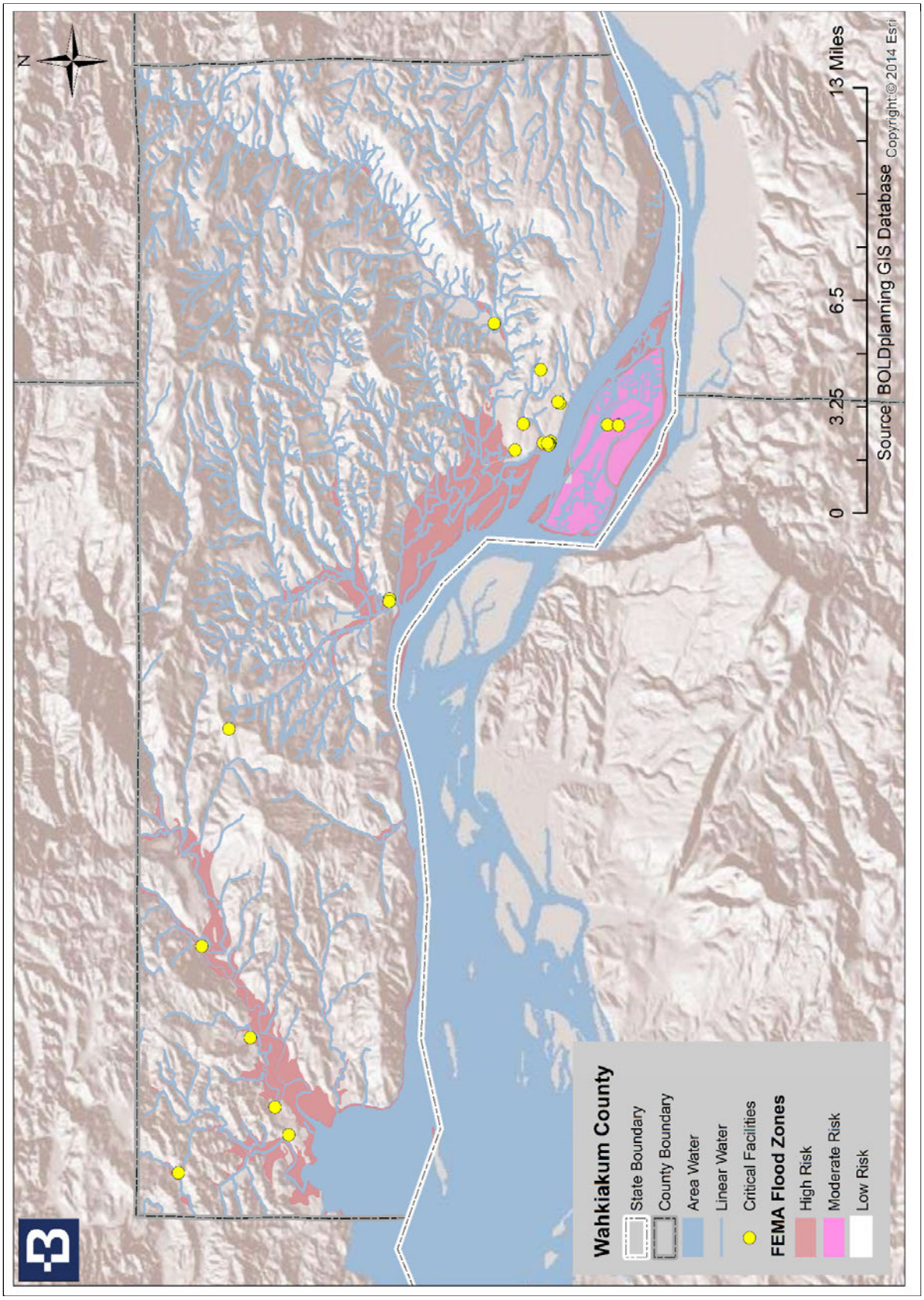
Wahkiakum County falls within the 100-year floodplain and has the greatest percentage over the other counties in the state sitting at 9.1. The maps have been generated below, to show flood zones. All information used to create the maps was provided by Wahkiakum County.

Table 9: Flood zone Classifications

Table 9 – Flood Zone Classifications	
Zone Class	**Description**
A	An area inundated by 1% annual chance flooding, for which no base flood elevations have been determined. (100 Year Floodplain)
AE	An area inundated by 1% annual chance flooding, for which BFEs have been determined. (100 Year Floodplain)
B	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood. An area inundated by 0.2% annual chance flooding.
V	Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage.

**For the following FEMA NFHL maps the A and AE zones have been combined as they are both considered 100-year floodplains.*

Map 7 – Wahkiakum County Flood Zones



4.2.3 – Previous Occurrences

Photo courtesy of The Wahkiakum Eagle

Since 1996, NOAA has recorded 42 riverine flood impacts in Wahkiakum County and its participating jurisdictions. Wahkiakum County and its participating jurisdictions have recorded 0 fatalities and 0 injuries relating to riverine flooding. These events have cost Wahkiakum County and its participating jurisdictions $1,280,000 in property damage.

Since 2006, NOAA has recorded 4 coastal flood impacts in NWS region including the lands of Wahkiakum County and its participating jurisdictions. Wahkiakum County and its participating jurisdictions have recorded 0 fatalities and 0 injuries relating to coastal flooding. These events have cost the NWS region including the lands of Wahkiakum County and its participating jurisdictions $5,265,000 in property damage.

NOAA and the NWS have not recorded any significant, damaging, or life-threatening flash floods within Wahkiakum County or its participating jurisdictions.

4.2.3A – Probability of Future Events

The definition of each flood zone's classification is used for the purpose of calculating the yearly probability of a riverine flood. Jurisdictions with property in a 100-year floodplain can expect a 1% annual chance of flooding within the designated areas. Jurisdictions with property in a 500-year floodplain can expect a 0.2% annual chance of flooding within the designated areas. Therefore, the likelihood of a coastal and riverine flood occurring in exposed jurisdictions is "occasional."

Wahkiakum County and its participating jurisdictions have not experienced significant flash flooding events but are still considered at risk from this hazard. The likelihood of this occurring is considered "rare."

4.2.4 – Assessing Vulnerability & Impacts

Photo courtesy of The Chinook Observer

Flood Impacts

Based on Map 5, and the future probability in Section 4.2.3.A, Wahkiakum County, has a 1 percent chance of flooding per year. The probability of flash flooding is equal through each participating jurisdiction.

The following table is provided as a best available estimate of what a typical coastal and riverine flood in the region may cause in terms of damage, injuries, and death.

Table 10: Historical Impacts, Floods

Table 10 – Historical Impacts, Floods		
Hazard	**Coastal Floods**	**Riverine Floods**
Count of Events	4	42
Impacts Per Year	0.30	0.52
Average Magnitude	-	-
Magnitude Range	-	-
Average Cost	$1,316,250	$30,476
Total Recorded Cost	$5,265,000	$1,280,000
Average Fatalities	0	0
Total Fatalities	0	0
Average Injuries	0	0
Total Injuries	0	0

**The data are from the NCDC Storm Events Database.*

Vulnerability of Facilities

Flooding can cause minimal or complete damage to any of these types of facilities, taking them offline for days to years depending on the resources available after an event. Wahkiakum County and its participating jurisdictions have in the past incurred damage from flooding. As seen in Map 5 (above) there are a few critical facilities that fall within FEMA flood zones.

Vulnerability of Population

If evacuation is not heeded, or flood waters rise quickly enough, Wahkiakum County and its participating jurisdictions' population can drown or become trapped on roadways or in valleys. Depending on the conditions, this will expose them to elements and deprive them of basic needs and services.

20% of Wahkiakum Counties population is 65 or older with a disability. Vulnerable populations can take longer to evacuate. Additionally, the potential presence of mold after a flood requires extra care to be taken before their population can re-inhabit facilities. Wahkiakum County and its participating jurisdictions do not have any recorded fatalities or injuries from coastal, riverine, or flash flood events.

Vulnerability of Systems

Critical facilities and infrastructure can be rendered unusable or permanently destroyed, having a significant impact on a jurisdiction's ability to conduct its day-to-day or current flood event operations. Significant damage to residential and or commercial structures can irrevocably damage a community and its economy, creating refugees and economic hardship. If a chemical facility is significantly impacted, it is possible the chemicals stored at the facilities can wash away with the flood waters and have detrimental effects on the local environment.

Fire Districts

The fire districts' services are an integral part of the planning area's emergency operations before, during, and after an event. The participating fire districts are vulnerable to flash flooding only. The random nature of flash flooding is unlikely to damage an entire fire district in a way that would significantly reduce its overall capabilities.

Ports
The ports of Skamokawa and Cathlamet are significantly vulnerable to riverine flooding. In the event flood waters rise, the ports' docks, machinery, heavy equipment, and vessels could be significantly damaged. The communities of Wahkiakum County rely on these ports for commercial and economic stability and prosperity making them of extreme value in terms of mitigation and recovery.

Public Utility District
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid necessary to delivery electricity to the planning area. PUD #1's energy grid is at minimal direct risk to flooding.

Transportation & Wahkiakum Transit
The roadways and bus routes of Wahkiakum County are highly vulnerable to riverine flooding. The complexity and multitude of valleys in which its roadways are constructed make it especially vulnerable to closures from flooding. Any major roadway closures can cut off communities from basic services. Additionally, long term closures from flooding have the potential to damage the local economy and hamper commerce for years.

Water Companies and Districts
The participating water companies and districts are slightly vulnerable to coastal, flash, and riverine flooding. Excess rain has the potential to cause an overflow of storage ponds causing contamination of their current stock. However, their main facilities are not vulnerable due to their location.

4.2.4A – Critical Facilities & Infrastructure
Wahkiakum County is located within the 100-year floodplain, therefore critical facilities have a varied vulnerability to flooding. Major and minor roadways throughout the planning area are routinely flooded and remain major concerns for the delivery of public and emergency services. A list of infrastructure and critical facilities can be found in Appendix B.

4.2.4B – Land Use & Development Trends
The Town of Cathlamet have seen a minor decrease in development trends. However, Wahkiakum County as a whole have seen an increase in growth, as detailed in Section 3.1.1 – Land Use & Development Trends. Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of the designated floodplains.

4.2.4C – Unique & Varied Risk

Due to the nature of flash flooding, each jurisdiction in the planning area has an equal risk to a flash flood impact. The variable risks to coastal and riverine flooding are detailed in the table below.

Table 11: Unique & Varied Risk, Coastal & Riverine Floods

Table 11 – Unique & Varied Risk, Coastal & Riverine Floods	
Jurisdiction	**Risk Characteristics**
Wahkiakum County	Parts of the jurisdiction are located in 100 year riverine and 100-year coastal floodplains.

4.2.4E – Repetitive Loss Structures

There are two (2) properties that qualify as a repetitive loss (RL) property and there are two (2) properties that qualify as severe repetitive loss (SRL) properties. Three properties mentioned above reside on the Grays River Watershed. The remaining property resides on the Skamokawa Creek Watershed. However, these properties have lapsed on their insurance policies. Therefore, the properties would not be eligible for Flood Mitigation Assistance Program (FMA) grant money if they were to flood again.

4.2LS – Landslides

4.2.1 – Description

Photo courtesy of BOLDplanning

Landslides are the downward and outward movement of slopes. Landslides include a wide range of ground movement, such as rock falls, deep failure of slopes, and shallow debris flows. Although gravity acting on and over steepened slopes is the primary reason for a landslide, landslides are often prompted by the occurrence of other disasters. Other contributing factors include the following: erosion; steep slopes; rain and snow; and earthquakes.

Slope material often becomes saturated with water and may develop a debris or mudflow. If the ground is saturated, the water weakens the soil and rock by reducing cohesion and friction between particles. Cohesion (which is the tendency of soil particles to "stick" to each other) and friction affect the strength of the material in the slope and contribute to a slope's ability to resist-down slope movement. Saturation also increases the weight of the slope materials and, like the addition of material on the upper portion of a slope, increases the gravitational force on the slope. Undercutting of a slope reduces the slope's resistance to the force of gravity by removing much-needed support at the base of the slope. Alternating cycles of freeze and thaw can result in a slow, virtually imperceptible loosening of rock, thereby weakening the rock and making it susceptible to slope failure. The resulting slurry of rock and mud can pick up trees, houses, and cars, and block bridges and tributaries, causing flooding along its path. Additionally, removal of vegetation can leave a slope much more susceptible to superficial landslides because of the loss of the stabilizing root systems.

4.2.2 – Location & Extent

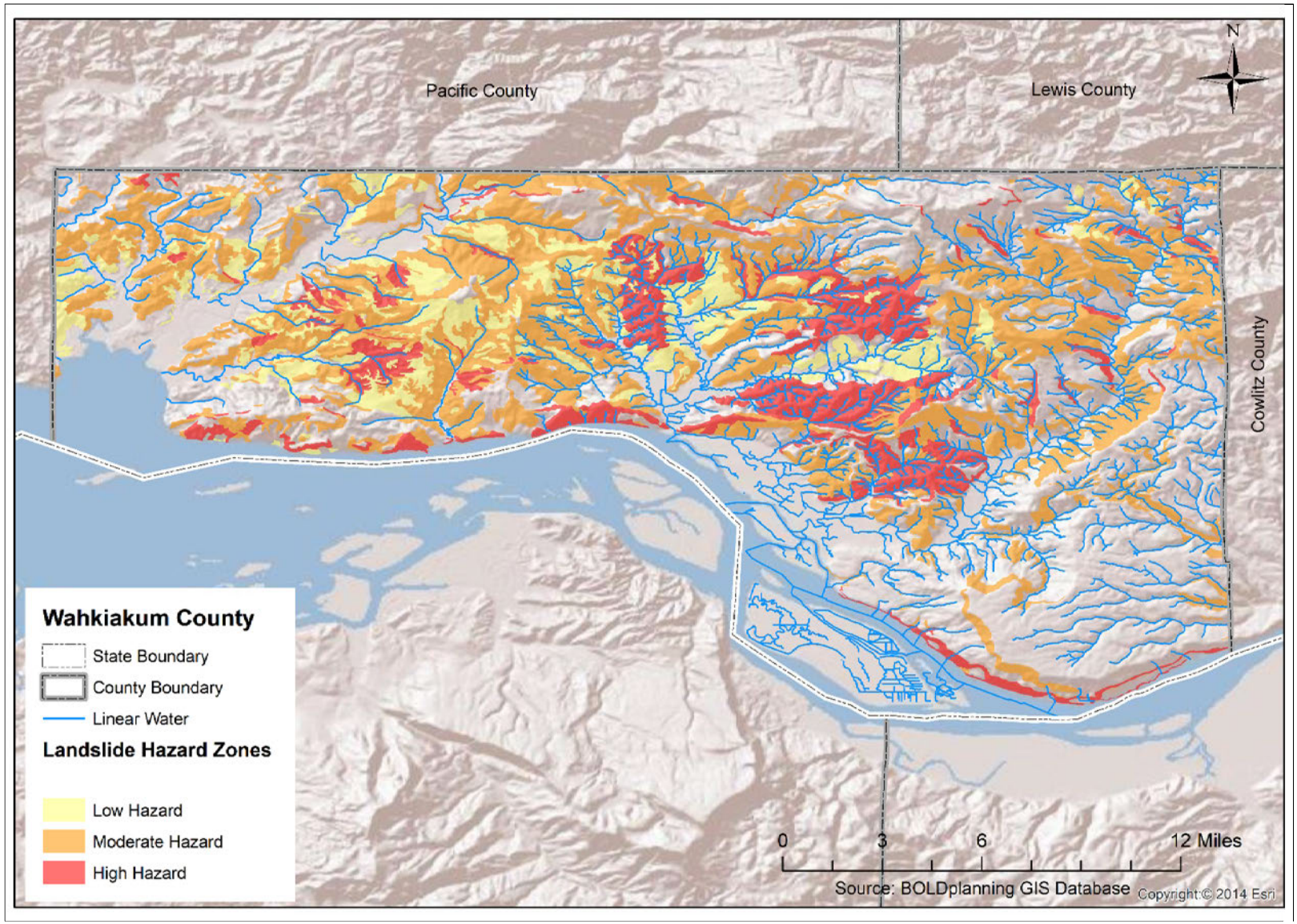
Landslides have the potential to destroy structures and infrastructure or block transportation in mountainous valleys. Although the overall risk is limited, its potential varies throughout Wahkiakum County, with sporadic risk zones identified by the State of Washington's Department of Natural Resources. Additionally, landslides have been reported along highway 4 in the middle portion of the county. Please see the map 6 (below) and map 7 (below) on the following page for the State of Washington's identified risk zones and the location of highway 4 as it runs through the county. Also identified below are the critical facilities, this depicts which facilities are close to the high to medium landslide risk zones.

4.2.3 – Previous Occurrences

Landslides can occur without the presence of another hazard event, but often occur as a secondary hazard. Incidents of heavy rain, melting snow, earthquakes, and land subsidence are their primary cause. Hence, their future occurrences are highly dependent on the likelihood of the mentioned hazards. Wahkiakum County has experienced minor landslides within the county in the past 10 years. Wahkiakum County has received public assistance from federally declared disasters that included landslides as secondary hazards.

4.2.3A – Probability of Future Events

Wahkiakum County and its participating jurisdictions do not have any documented cases of significantly damaging landslides. It has experienced minor landslides bordering on what would be considered a "nuisance hazard." Given the identified hazard areas, there is still a future risk of a significantly damaging and life-threatening landslide, and thus its probability of future occurrence is classified as "rare."



Map 8 – Wahkiakum County Landslide Hazard Zones

4.2.4 – Assessing Vulnerability & Impacts

Photo courtesy of BOLDplanning

Landslide Impacts
Wahkiakum County experienced 4 separate landslides in 2009. None of these landslides involved injuries or fatalities. Based on the past history of landslides we can calculate there is a 2% chance a landslide will happen in the future. However, given the occurrences (although rare) of roadway blocking landslides, Wahkiakum County can be sure that in the future more roadways will be blocked by landslides with the potential to slightly damage or disturb commuter traffic through the county.

Vulnerability of Facilities
Landslides can have minimal or devastating impacts on facilities. The degree of vulnerability depends on the specifics of the landslide itself. Wahkiakum County and its participating jurisdictions do not have any developed areas or structures located next to the identified risk zones.

Vulnerability of Population
Landslides pose a minimal risk to Wahkiakum County and its participating jurisdictions' population. That being said, it is possible for a landslide to impact traveling motorists on its roadways. Depending on the topography and circumstances of the landslide, this could simply immobilize a vehicle, cover it in debris, or cause serious to mortal bodily harm to the vehicles 'inhabitants. Landslides can also impact populations by blocking roads that are the only way in or out of a residential area. This could impact health concerns and access to food and other emergency services.

Wahkiakum County and its participating jurisdictions do not have any recorded deaths or injuries from landslide events.

Vulnerability of Systems
Wahkiakum County and its participating jurisdictions' systems are minimally vulnerable to landslides. A landslide has the potential to temporarily block a major highway or transportation network for weeks at a time. Additionally, if the landslide occurs in tandem with another hazard, such a severe storm event, the blocking of a major route will have compounded effects on response and recovery operations. Emergency personnel may have to use far, out of the way routes, delaying necessary aid to Wahkiakum County and its participating jurisdictions.

Fire Districts
The participating fire districts are not vulnerable to landslides.

Ports
The port district #1 of Cathlamet is vulnerable to landslides due to the fact that the buildings are located on the side of the hill. However, the ports specifically are not vulnerable to landslides.

Public Utility District
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid necessary to delivery of electricity to the planning area. PUD #1's energy grid is at extremely minimal direct risk to landslides. Since landslides are largely isolated in their geographic scope, the only likely scenario is a landslide temporarily damaging or destroying one to a few substations.

Transportation & Wahkiakum Transit
Part of Wahkiakum County's transportation network is vulnerable to landslides. Map 7, depicted in this section, overlays major roadways in the planning area with the identified risk zones. State Highways 4 and 409 runs alongside some of the identified risk zones. It is possible that a series of landslides could occur at both major roadways and, cutting off Washington's access to the south-western portion of the county. Access to Oregon would remain open, but if the landslides are a result of a major earthquake, response and recovery operations could be significantly deterred.

Water Companies and Districts
The participating water companies and districts are not vulnerable to landslides.

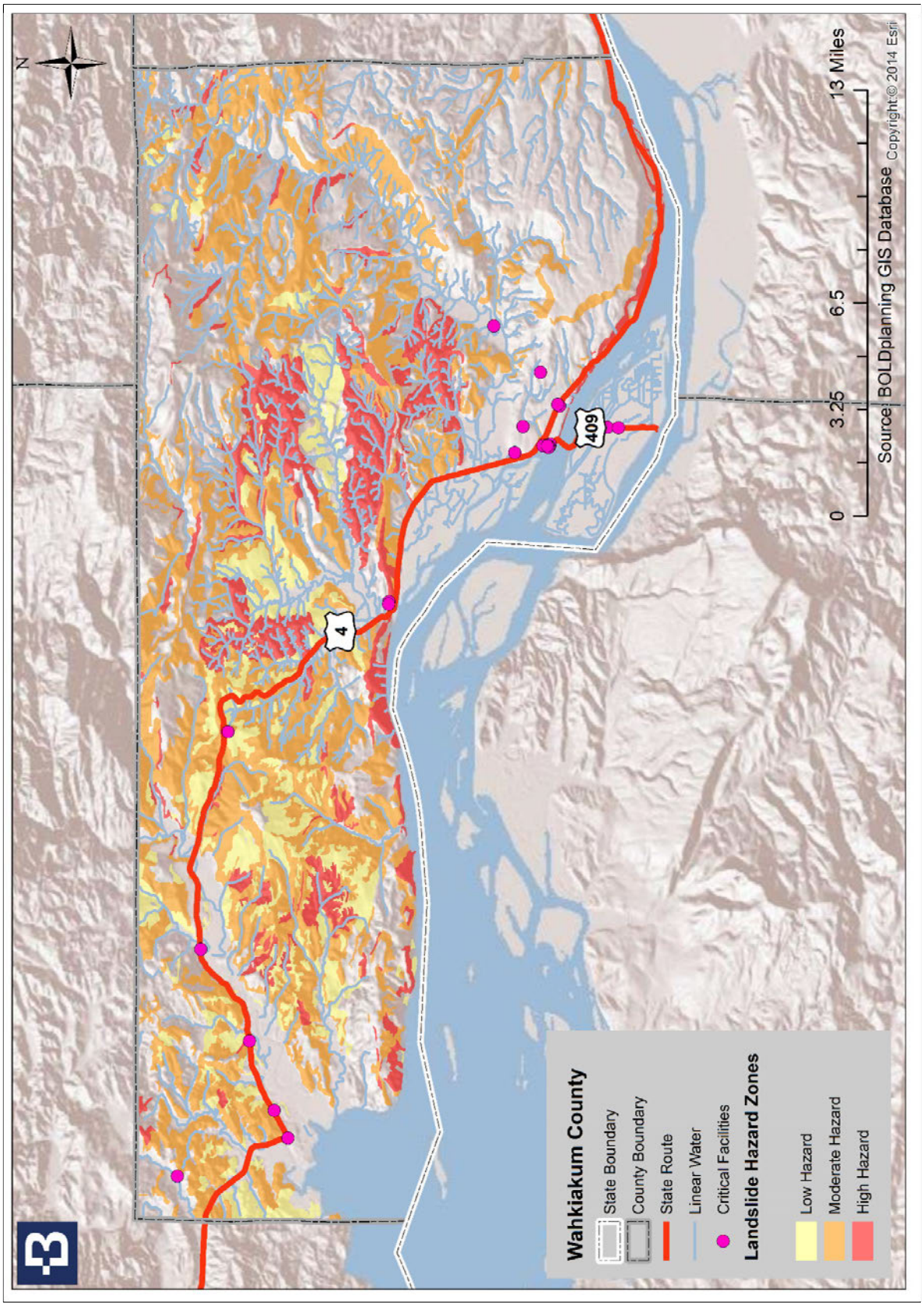
4.2.4A – Infrastructure & Critical Facilities
There are 11 critical facilities located in high risk landslide zones and there are two (2) critical facilities located within medium risk landslide zones. Map 9 below depicts where the critical facilities are in the county in relation to the landslide zones. In Appendix B table listing the names of the facilities located within High to Medium risk landslide zones can be found.

4.2.4B – Land Use & Development Trends
The Town of Cathlamet have seen a minor decrease in development trends. However, Wahkiakum County as a whole have seen an increase in growth, as detailed in Section 3.1.1 – Land Use & Development Trends. Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of the designated floodplains.

4.2.4C – Unique & Varied Risk
None of the participating jurisdictions are at risk for landslides with the exception of the county at large.

4.2.4D – Repetitive Loss Structures – There are no repetitive loss structures that are applicable to landslides.

Map 9 – Wahkiakum County Landslide Hazard Zones with Critical Facilities



4.2SS – Severe Storms

4.2.1 – Description

Photo courtesy of Lewis & Clark Trail

Severe storms comprise the hazardous and damaging weather effects often found in violent storms. They can occur together or separately; they are common and usually not hazardous, but on occasion they can pose a threat to life and property. This plan defines Severe Storms as a combination of the following severe weather effects as defined by NOAA and the NWS:

Hail: Showery precipitation in the form of irregular pellets or balls of ice more than 5 mm in diameter, falling from a cumulonimbus cloud.

High Winds: Sustained wind speeds of 40 miles per hour or greater lasting for 1 hour or longer, or winds of 58 miles per hour or greater for any duration (often referred to as straight line winds to differentiate from rotating or tornado-associated wind).

Extreme Winds: A classification for winds which exceed 115 miles per hour not associated with tornadoes or hurricanes.

Lightning: A visible electrical discharge produced by a thunderstorm. The discharge may occur within or between clouds, between the cloud and air, between a cloud and the ground, or between the ground and a cloud.

Thunderstorm Winds: The same classification as high or strong winds but accompanying a thunderstorm. They are also referred to as a straight-line wind to differentiate from rotating or tornado-associated wind.

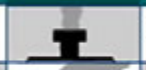
For consistency with the NWS and NOAA, extreme, high and strong winds are shown as separate from thunderstorm winds when raw, collected data is displayed. However, for their impacts and probability, they are combined and referred to simply as “wind” events.

Severe Storms have been so consistent throughout modern history that much of the vulnerability is mitigated. However, this section is not concerned with everyday wind, lightning in the sky, or mild precipitation. This section is concerned with storms when they behave such that they pose a threat to property and life.

4.2.2 – Location & Extent

Severe storms occur throughout the year in Wahkiakum County and its participating jurisdictions. Thunderstorms, high, and strong winds can affect any size area from a county, region, or isolated pockets of a city or a neighborhood. In contrast, lightning will strike a single point. It is not often that multiple strikes will hit and damage persons and property in one severe storm event. Hail will occur in small pockets of an accompanying storm. Wahkiakum County and its participating jurisdictions have a history of damaging winds accompanying storms but have not seen significant hail or lightning impacts.

Beaufort Scale

Beaufort number	Wind Speed (mph)	Seaman's term		Effects on Land
0	Under 1	Calm		Calm; smoke rises vertically.
1	1-3	Light Air		Smoke drift indicates wind direction; vanes do not move.
2	4-7	Light Breeze		Wind felt on face; leaves rustle; vanes begin to move.
3	8-12	Gentle Breeze		Leaves, small twigs in constant motion; light flags extended.
4	13-18	Moderate Breeze		Dust, leaves and loose paper raised up; small branches move.
5	19-24	Fresh Breeze		Small trees begin to sway.
6	25-31	Strong Breeze		Large branches of trees in motion; whistling heard in wires.
7	32-38	Moderate Gale		Whole trees in motion; resistance felt in walking against the wind.
8	39-46	Fresh Gale		Twigs and small branches broken off trees.
9	47-54	Strong Gale		Slight structural damage occurs; slate blown from roofs.
10	55-63	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs.
11	64-72	Storm		Very rarely experienced on land; usually with widespread damage.
12	73 or higher	Hurricane Force		Violence and destruction.

Storms, severe or not, are often predicted within a day or multiple days in advance. The severity of a storm is not as easily predicted, and when it is, the window of notification is up to few hours to under an hour. When a storm is imminent, it is unknown whether or not hail, lightning, or damaging winds will occur until after an incident has been reported.

Strong, high, and thunderstorm winds are classified as winds which occur between 40 and 70 miles per hour (lasting for 1 hour or greater) or of 58 miles per hour (for any duration). The Beaufort Scale (shown on below), displays the ranges of wind speed and correlates them with their typical effects. At a level 7 and 8, citizens should remain indoors, and anywhere above a level 8 will cause damage to structures. Damage to any amount of structures can cause serious disruption to Wahkiakum County and its participating jurisdictions. The scope of damage can range from one residential house up to widespread destruction of homes and reinforced buildings throughout the county.

Typically, severe storms in Wahkiakum County have wind speed between 40 and 50 miles per hour, but often during severe storms, winds are recorded at 45 mph around lower Columbia, 46 in the south coast zone and 69 mph in the southwest interior. There are even historical records of brief gusts reaching up to 109mph

4.2.3 – Previous Occurrences

Wahkiakum County and its participating jurisdictions have recorded 1 fatality and 0 injuries due to strong wind. Since 1996, NOAA has recorded 332 severe storm wind events in Wahkiakum County and its participating jurisdictions. These events have caused $17,727,000 in recorded property damage. There are no recorded incidents of hail or lightning causing property damage, injury, or fatalities in the planning area.

4.2.3A – Probability of Future Events

Wahkiakum County and its participating jurisdictions can each expect a severe storm event with a 1,509.09% chance per year, or 15.09 events per year. The qualitative chance of a severe storm impacting the planning area is “highly likely.”

Table 12: Probability, Severe Storms

Table 12 – Probability, Severe Storms	
Event Year	**Event Count**
1996	4
1997	3
1998	7
1999	11
2000	5
2001	7
2002	7
2003	3
2004	0
2005	5
2006	18
2007	12
2008	7
2009	12
2010	16
2011	23
2012	16
2013	8
2014	22
2015	31
2016	19
2017	17
2018	7
Total Recorded Events =	332
Total Years =	22
Yearly Probability =	**1,509.09%**

**The data are from the NCDC Storm Events Database.*

4.2.4 – Assessing Vulnerability & Impacts

Photo courtesy of BOLDplanning

Wind Impacts

Wahkiakum County and its participating jurisdictions have recorded 323 wind events since 1996 through 2018. The range of magnitude for these events was between 35 miles per hour and 109 miles per hour with an average of 72 miles per hour. Based on the Beaufort Scale on page 58 and future probability in Table 12, Wahkiakum County can expect 15.09 wind events per year, ranging from Beaufort Scale 8 – "Fresh Gale" to Beaufort Scale 12 – "Hurricane Force."

Vulnerability of Facilities

Structural vulnerability to severe storms is the same throughout Wahkiakum County Hail can be costly by damaging rooftops, outdoor equipment, and windows. Lightning can strike anything with the potential to significantly damage electrical infrastructure or ignite a fire. Wind events create flying debris which can damage infrastructure and buildings. Strong enough wind can cause structure damage to older, less well-constructed buildings even toppling or leveling them.

Wind events happen often, especially in conjunction with severe storms. Occasionally there is damage done to county structures by wind as the primary hazard. Among these events costing the county money, the average wind event in Wahkiakum County costs $54,241, while the existing range of a single incident has been from $0 to $10,140,000.

Vulnerability of Population

Wahkiakum County and its participating jurisdictions' vulnerability to severe storms is the same throughout the planning area. In the absence of proper shelter, hail can cause serious injury to an unprotected person. As long as Wahkiakum Counties citizens stay indoors and away from windows, they will be protected against hail injury and death. Similarly, they can avoid being struck by lightning by staying indoors. Although lightning may strike a structure sheltering people, it is extremely unlikely that the strike itself will directly injure or kill a sheltered person. As long as a structure is able to maintain its integrity during high speed winds, it will protect people from wind injury or death. However, old or poorly constructed facilities are not good shelter as previously mentioned flying debris can break windows or cause structural damage. Either of these instances have the potential to seriously injure or kill anyone taking shelter in older, less well-constructed building. The most likely scenario in the planning area is that a tree or other large debris is blown over onto a vehicle, house, or directly on an unsheltered person.

Historically, there have been 0 fatalities and 0 injuries recorded from severe storms in the planning area.

Vulnerability of Systems

Wahkiakum County and its participating jurisdictions' assets and systems' vulnerability to severe storms is the same throughout the planning area.

Hail damage is typically superficial and does not hamper a community's assets, systems, or activities. Lightning strikes can destroy or damage a community asset, but since their strikes are typically isolated and rarely hit anything, it is unlikely to significantly impact a larger system. Wind events can destroy and damage multiple structures and points of infrastructure. They have the potential to significantly impact a community's power and communications grid compounding the effects of other hazards.

Fire Districts
The fire districts' services are an integral part of the planning areas emergency operations before, during, and after an event. The participating fire districts are vulnerable to severe storms. A severe storm is unlikely to damage an entire fire district in a way that would significantly reduce its overall capabilities.

Ports
The ports of Skamokawa and Cathlamet have limited vulnerability to severe storms. High blowing winds are likely to temporarily shut down operations, but without any facility damage, they are unlikely to have any lasting effects. In the event structural damage is incurred, commerce will slow down, but it is unlikely that the port would close for a period of days or weeks. Historically, severe storms have not had a significant impact on these ports.

Public Utility District
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid is necessary to delivery electricity to the planning area. PUD #1's infrastructure is at risk from the high winds that accompany a severe storm. These winds can knock down electrical poles and wires directly or cause trees and other debris to knock them down denying power to Wahkiakum County and its participating jurisdictions' residents.

Transportation & Wahkiakum Transit
The roadways and bus routes of Wahkiakum County are not significantly or directly vulnerable to severe storms. Although high winds accompanying a severe storm will present an immediate danger to traveling motorists, they do not have the power to inhibit the infrastructure's functionality in the long term. They have, however, had an impact in the medium-term.

Water Companies and Districts
The participating water companies and districts are vulnerable to severe storms. High winds have the potential to damage their main facilities, office buildings, pump stations, and contaminate storage ponds with debris.

4.2.4A – Critical Facilities & Infrastructure
All infrastructure and critical facilities are equally at risk. A complete list of infrastructure and critical facilities can be found in Appendix B.

4.2.4B – Land Use & Development Trends
The Town of Cathlamet have seen a minor decrease in development trends. However, Wahkiakum County as a whole have seen an increase in growth, as detailed in Section 3.1.1 – Land Use & Development Trends. Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of the designated floodplains.

4.2.4C – Unique & Varied Risk
Severe storms have the ability to affect a portion of or the entire planning area, but historically they have affected the coastal areas of South coast, southwest interior and lower Columbia.

4.2.4D – Repetitive Loss Structures – There are no repetitive loss structures that are applicable to severe storms.

4.2WF – Wildfire

4.2.1 – Description

Wildland fires are fires caused by nature or humans that result in the uncontrolled destruction of forests, brush, field crops, grasslands, and property. The wildland fire season in Washington begins in April, picks up in early July, and typically culminates in late September with a moisture event; however, wildland fires have occurred in every month of the year. Drought, snow pack, and local weather conditions can expand the length of the fire season. The early and late shoulders of the fire season usually are associated with human-caused fires. Lightning generally is the cause of most fires in the peak fire period of July, August, and early September.

4.2.2 – Location & Extent

Wildland fires can spread to more than 100,000 acres and may require thousands of firefighters and several months to extinguish. Federal, state, county, city, and private agencies and private timber companies provide fire protection and firefighting services on forestlands in Wahkiakum County. Wildfire's will typical start in dry, heavily wooded areas.

4.2.3 – Previous Occurrences

Wahkiakum County has no previous recorded Wildfire events.

4.2.3A – Probability of Future Events

Due to there being zero past events recorded, there is a 1% chance there will be a wildfire in Wahkiakum County and its participating jurisdictions in the future.

4.2.4 – Assessing Vulnerability & Impact

Wildfire Impacts
Wahkiakum County has no recorded past wildfire events; however, the impact of a wildfire in Wahkiakum county would be severe. Logging is a major export and large employer for Wahkiakum County.

Vulnerability of Facilities
Facilities have a very low vulnerability to wildfires. However, if a wildfire was unable to be contained and spread to the critical facilities, they could potential catch fire. The fire would have to wildly out of control to get to that criticality.

Vulnerability of Population
Wahkiakum County is vulnerable throughout the planning area. Wahkiakum Counties citizens are at risk from logging being shut down due to wildfire. This will affect many residences livelihood. More severely, if populations are physically exposed to wildfires this could cause injuries or fatalities.

Wildfires have the potential to block off major roadways and access to health clinics or emergency responders. Due to Wahkiakum County having 20% of the population 65 or older with disabilities, this increases the vulnerability of the population to wildfires.

Historically, there have been 0 recorded fatalities or injuries relating to wildfires in Wahkiakum County.

Vulnerability of Systems
Wahkiakum Counties vulnerability to wildfire is similar throughout the planning area. Wildfires begin in the heavily wooded areas. However, as previously stated, fires can travel further if they are not able to

be extinguished. This can cause road damage or blockage due to fallen trees or the actual fire. Worst case scenario, the fire reaches the towns and begins to burn standing buildings.

Fire Districts
The fire districts' services are an integral part of the planning area's emergency operations before, during, and after an event. The participating fire districts are only slightly vulnerable to wildfire's. The fire districts will most likely send their resources to assist putting the wildfire out. In the event something outside of a wildfire happen at the same time, fire districts' resources will be stretched thin.

Ports
The ports of Skamokawa and Cathlamet have limited vulnerability to winter storms. A wildfire has the potential to spread to the ports. However, the port would be minimally vulnerable since it is on the water and they have many resources to keep the fire off the ports.

Public Utility District #1
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid necessary to deliver electricity to the planning area. PUD #1 is not considered highly vulnerable.

Transportation & Wahkiakum Transit
The roadways and bus routes of Wahkiakum County are temporarily vulnerable to wildfires. A wildfire can temporarily restrict roadway transportation between the planning area's communities, hindering response and recovery operations. Additionally, closed roadways can leave motorists trapped.

Water Companies and Districts
The participating water companies and districts are not vulnerable to wildfires.

4.2.4A – Critical Facilities & Infrastructure
All infrastructure and critical facilities are at risk, since wildfires have the potential to spread throughout the planning area. However, the risk is minimal. A list of infrastructure and critical facilities can be found in Appendix B.

Table 13: Vulnerable Structures, Wildfire

Table 13 – Vulnerable Structures, Wildfire		
Jurisdiction	**Commercial**	**Government**
Wahkiakum County		
Low WUI	0	12
Medium WUI	0	1
Municipal Total =	0	13
Town of Cathlamet		
Low WUI	0	0
Medium WUI	1	9
Municipal Total =	1	9

*The data is compiled from the 1990-2010 Wildland-Urban Interface (WUI) of the conterminous United States - SILVIS Lab geospatial data

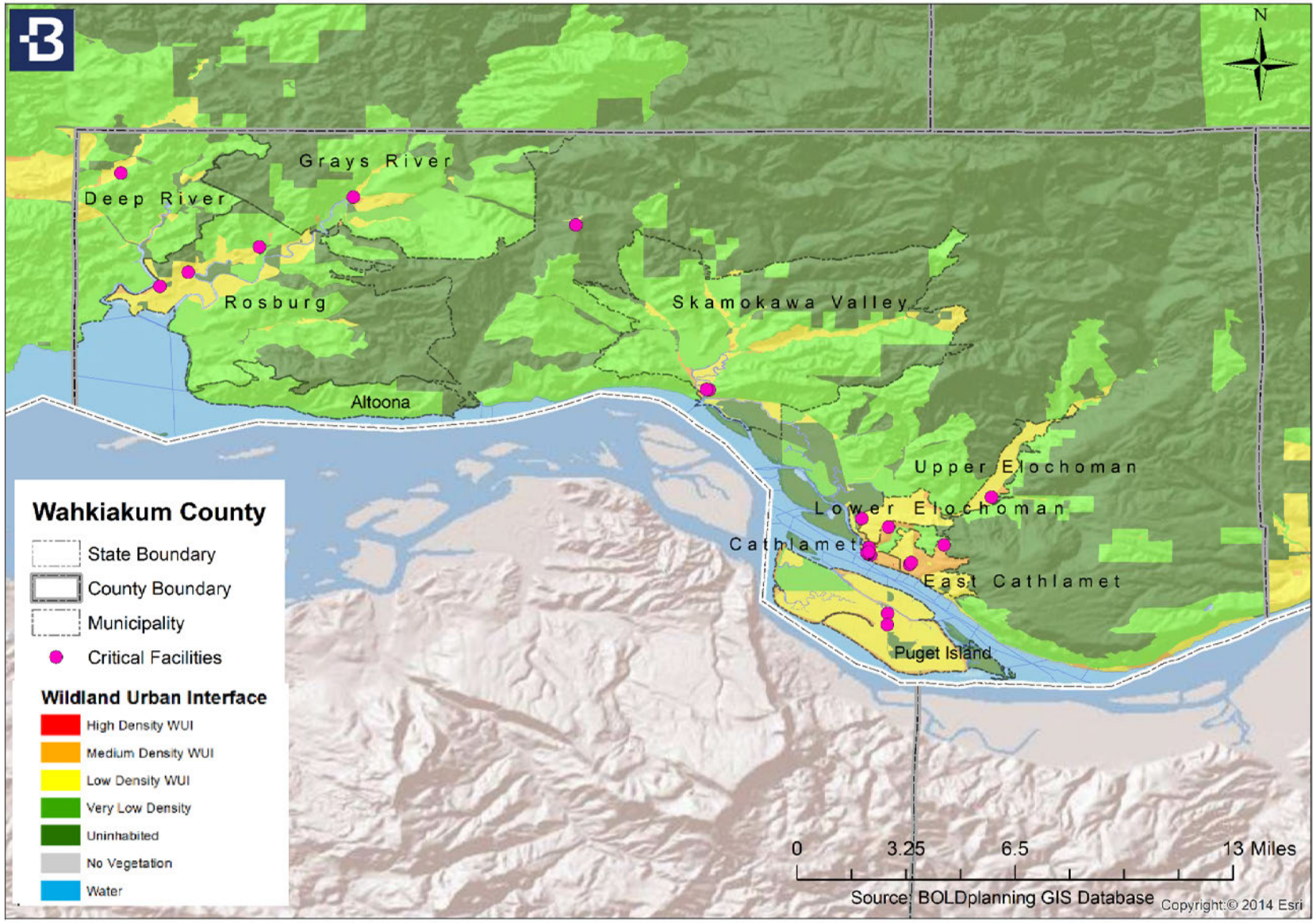
4.2.4B – Land Use & Development Trends

The Town of Cathlamet have seen a minor decrease in development trends. However, Wahkiakum County as a whole have seen an increase in growth, as detailed in Section 3.1.1 – Land Use & Development Trends. Any buildings or infrastructure built in the future will have the same risk as other buildings or infrastructure built within or outside of the designated floodplains.

4.2.4C – Unique & Varied Risk

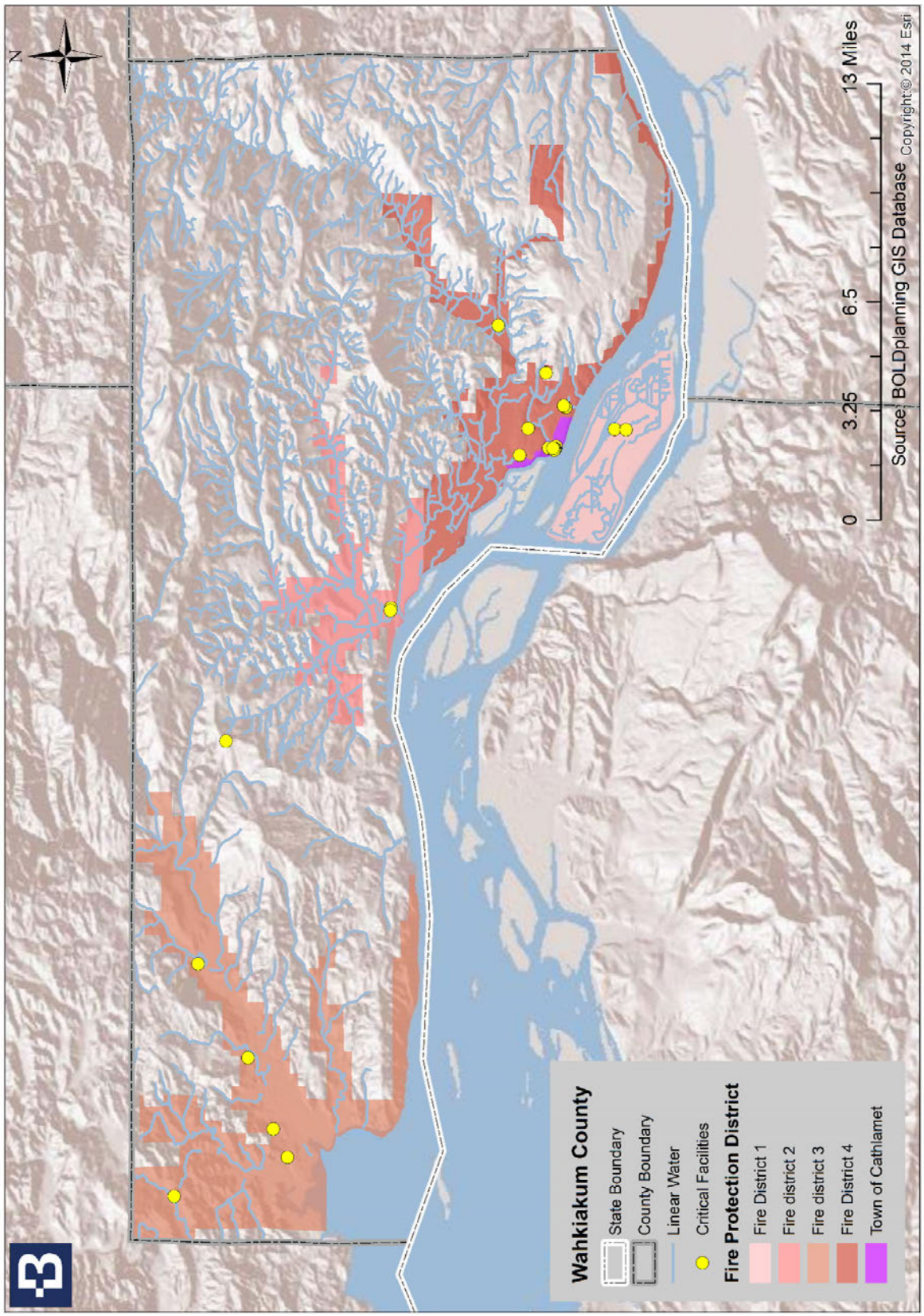
Wildfires have the potential to affect the planning area if the wildfire grows to a level it cannot be contained by local and private fire emergency responders. Historically, there have been no recorded wildfire events, so the risk is low.

4.2.4D – Repetitive Loss Structures – There are no repetitive loss structures that are applicable to wildfires.



Map 10 – Wahkiakum County Wildland Urban Density

Map 11 – Wahkiakum County Fire Districts with Critical Facilities



4.2D – Drought

4.2.1 – Description

Drought is a prolonged period of reduced precipitation severe enough to reduce soil moisture, water and snow levels below the minimum necessary for sustaining plant, animal, and economic systems. Droughts are a natural part of the climate cycle. Drought can have a widespread impact on the environment and the economy, depending upon its severity, although it typically does not result in loss of life or damage to real property, as do other natural disasters. Unlike most disasters, droughts occur slowly but may last a long time.

4.2.2 – Location & Extent

Droughts can have widespread effect. They can affect whole communities and for extended amounts of time. A whole community can experience a drought, but it is the farmers and land owners who will be most impacted by droughts. This could damage crops, therefore impacting residences and business income. Due to droughts being an extended hazard, this could adversely affect whole communities.

4.2.3 – Previous Occurrences

Wahkiakum County has 2 recorded drought events. Neither drought events had injuries or fatalities. Furthermore, there were zero property and crop damage reported.

4.2.3A – Probability of Future Events

The first drought event was recorded in 2001 and the second one was recorded in 2005. Based on the historical data, the future probability of a drought happening is 8.5% per year. The probability of future occurrences for Wahkiakum County and its participating jurisdictions is occasional.

Table 14: Probability, Drought

Table 14 – Probability, Drought	
Event Year	**Event Count**
2001	1
2005	1
Total Recorded Events =	2
Total Years =	17
Yearly Probability =	**8.5%**

4.2.4 – Assessing Vulnerability & Impact

Drought Impacts
Wahkiakum County has 2 recorded drought events. These events did not yield any property or crop damage

Vulnerability of Facilities
Facilities have low to zero vulnerability to droughts.

Vulnerability of Population
There have been no recorded deaths due to drought. Populations can be indirectly affected, due to droughts potentially killing crops in the planning area. Even though there has not been any recorded crop loss due to drought, this could affect residences livelihood and good sources. Therefore, populations have a low vulnerability to drought.

Vulnerability of Systems
Wahkiakum County's vulnerability to drought is similar throughout the planning area. Systems will not be adversely affected due to a drought.

Fire Districts
The fire districts will not be directly affected by the hazard. However, if the drought were to cause a wildfire, the district will be the first responders to handle the wildfire. Due to this secondary hazard, fire districts are minimally vulnerable to drought.

Ports
The ports of Skamokawa and Cathlamet are not vulnerable to drought.

Public Utility District #1
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid necessary to deliver electricity to the planning area. PUD #1 is not considered highly vulnerable.

Transportation & Wahkiakum Transit
The roadways and bus routes of Wahkiakum County are not directly affected by drought.

Water Companies and Districts
The participating water companies and districts are not vulnerable to wildfires.

4.2.4A – Critical Facilities & Infrastructure
Infrastructures are not directly affected by droughts. A list of infrastructure and critical facilities can be found in Appendix B.

4.2.4B – Land Use & Development Trends
The Town of Cathlamet have seen a minor decrease in development trends. However, Wahkiakum County as a whole have seen an increase in growth, as detailed in Section 3.1.1 – Land Use & Development Trends. Land used for farming can be greatly affected due to drought. However, land that is being used for commercial or residential buildings will not be greatly affected.

4.2.4C – Unique & Varied Risk
Droughts have minimal risk to the planning area. Droughts are specifically harmful to farming lands and can create an environment for wildfires to begin. Other than that secondary hazard, Wahkiakum County has minimal risk to drought.

4.2.4D – Repetitive Loss Structures – There are no repetitive loss structures that are applicable to drought.

4.2V – Volcano

4.2.1 – Description

According to the State of Washington hazard mitigation plan, a volcano is a vent in the earth's crust through which magma, rock fragments, gases, and ash are ejected from the earth's interior. Over time, accumulation of these erupted products on the earth's surface creates a volcanic mountain. Washington State has five major volcanoes in the Cascade Range – from north to south they are Mount Baker, Glacier Peak, Mount Rainier, Mount St. Helens and Mount Adams. These mountains are composite or stratovolcanoes, a term for steep-sided, often symmetrical cones constructed of alternating layers of lava flows, ash, and other volcanic debris. Composite volcanoes tend to erupt explosively and pose considerable danger to nearby life and property. In contrast, the gently sloping shield volcanoes, such as those in Hawaii, typically erupt nonexplosive, producing fluid lavas that can flow great distances from the active vents. Although Hawaiian-type eruptions may destroy property, they rarely cause death or injury. Young lava flow volcanoes similar to Hawaiian volcanoes form much of the southern part of the Cascades south of Mount St. Helens and Mount Adams to the Columbia River.
Volcanoes can lie dormant for centuries between eruptions making the risk posed by volcanic activity not always apparent. When Cascade Range volcanoes do erupt, high-speed avalanches of hot ash and rock called pyroclastic flows, lava flows, and landslides can devastate areas 10 or more miles away, while huge mudflows of volcanic ash and debris called lahars can inundate valleys more than 50 miles downstream. Falling ash from explosive eruptions can disrupt human activities hundreds of miles downwind, and drifting clouds of fine ash can cause severe damage to the engines of jet aircraft hundreds or thousands of miles away. Because people are moving into areas near these volcanoes at a rapid pace, the state’s volcanoes are among the most dangerous in the United States.

Scientists define a volcano as active if it has erupted in recent geologic time or is seismically or geothermally active. Volcanoes commonly repeat past behavior. Typically, volcanoes provide warning signals before they erupt. As magma pushes its way upward, it produces earthquakes, and causes the sides of the volcano to deform. Neither the earthquakes nor the deformation may be apparent to people, but they are detectable with instruments. Heat and gases from the rising magma may cause changes in the temperature, discharge rate and composition of hot springs and vapors on the volcano and are thus also detectable. In contrast, some landslides and debris flows could occur without specific warning.

4.2.2 – Location & Extent

Volcanos can have widespread impact. Lava flows are typically slow moving and short reaching. However, lava flows can create lahars (mudflows), grass or forest fires in its path. Another hazard from a volcanic eruption is pyroclastic flows. Lahars have the potential to travel more than 50 miles downstream. There are high-speed avalanches of hot ash, rock fragments, and gas that move down the side of volcanos. These flows can reach up to 1500 degrees F and move up to 150 miles per hour. Although there are no volcanoes located within the planning area, eruptions can have far reaching impacts. Ash in the air can ground air transportation for month, ash can affect human respiratory systems and kill wildlife.

4.2.3 – Previous Occurrences

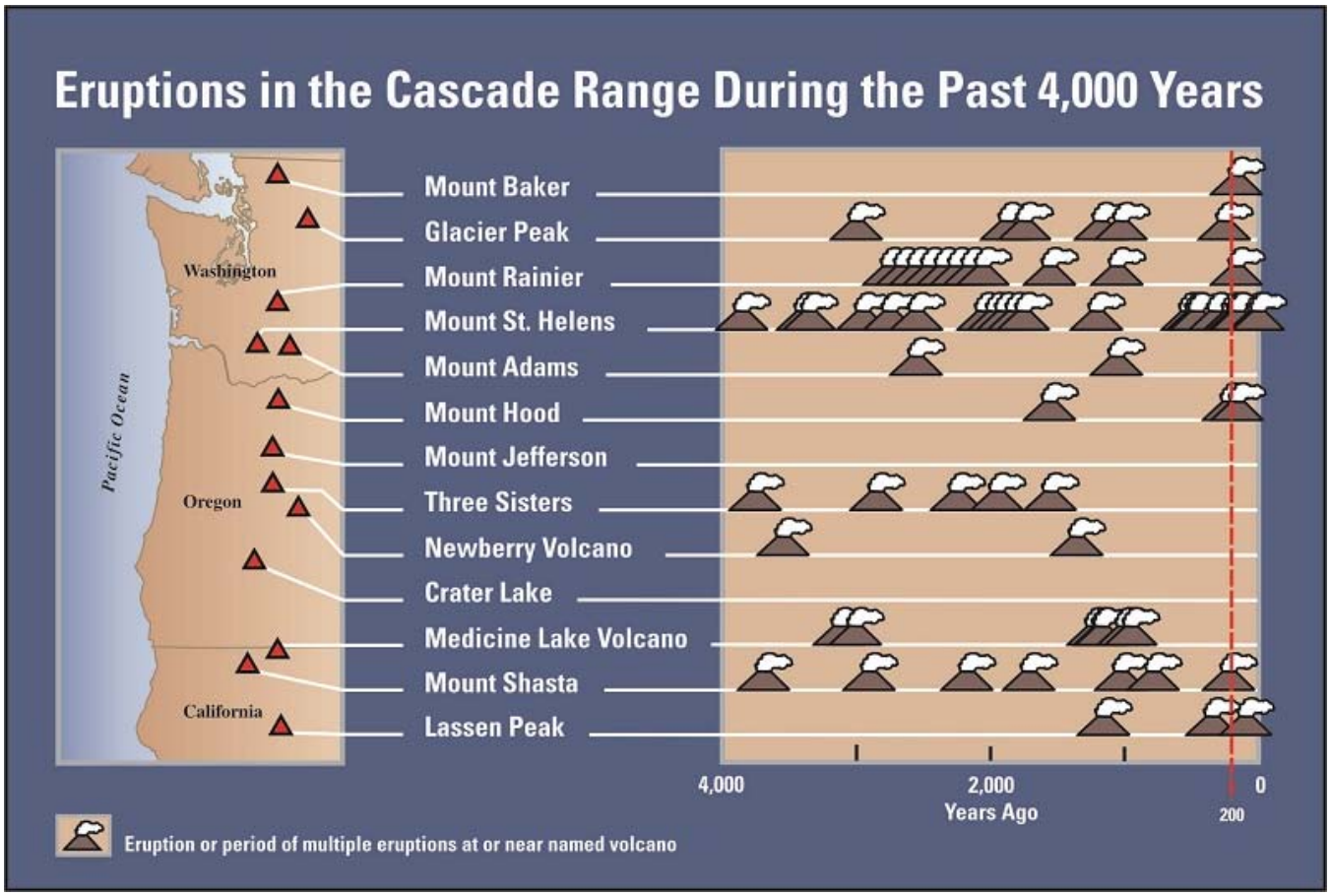
Wahkiakum County has zero volcanos located within the planning area. However, due to the impact of volcanoes located in other Washington counties, the previous occurrence is important. Washington state has reported 11 of volcanos in the past 200 years.

Mount St. Helens Eruption – 18 May 1980

Mount St. Helens erupted in Skamania County and was the most significant eruption to occur in the contiguous 48 U.S. states since 1915. This eruption killed 57 people and destroyed at least 57 bridges and 185 miles of highway according to komonews.com. Roughly 1,000 miles of state highways and roads had to be closed for months for repairs. Within 15 minutes of the eruption, ash plumes extended 15 miles or 79, 200 feet above the mountain peak. As far as 300 miles from the eruption, experience half an inch of ash on the ground.

4.2.3A – Probability of Future Events

Below is a picture from the Pacific Northwest Seismicity Network depicted historical eruptions from Volcanos in the pacific northwest. Specifically, the volcanos in Washington are Mount Baker, Glacier Peak, Mount Rainer, Mount St. Helens, and Mount Adams. Due to volcanoes being unpredictable, the ability to predict future probability is limited. However, we can look at past occurrences and make an educated prediction on when a future eruption might occur. According to the Pacific Northwest Seismic Network, there is a .5% chance a volcano located in Washington will erupt. Based on geographical area, Wahkiakum is most vulnerable to Mount St. Helens and Mount Adams. Based on the graphic below, there is a 2% chance either of those volcanos will erupt in the next year. There is an occasional probability of a volcanic eruption in the next year for Wahkiakum county and its participating jurisdictions.



4.2.4 – Assessing Vulnerability & Impact

Volcano Impacts

Wahkiakum County has zero recorded volcano eruptions within the planning area. The nearest volcano to Wahkiakum County is 95 miles away. The potential impact is minimal.

Vulnerability of Facilities

Wahkiakum County facilities have a low vulnerability to volcano eruptions. When ash becomes saturated with water is can cause structural collapse due to its weight. However, the nearest volcano to Wahkiakum County is Mt. St. Helen 96 miles away. Therefore, facilities have minor vulnerability to volcanos within the planning area.

Vulnerability of Population

There have been recorded deaths due to volcanic eruptions outside of the planning area. Wahkiakum county has a very low vulnerability due to a volcanic eruption. However, if there is ash in the air for an extended period and depending on wind speed/direction, human respiratory systems can be adversely affected.

Vulnerability of Systems

Wahkiakum County's vulnerability to volcanic eruption is similar throughout the planning area. The vulnerability is low but not absent due to the far-reaching effects of volcanic eruptions.

Fire Districts

The fire districts will not be directly affected by the hazard. However, if one of the volcanos in Washington were to erupt, fire districts may be called up to assist in putting out forest or grass

fires and assist with evacuations. If this were to happen then fire assistance will be limited within the planning area during a volcanic eruption.

Ports
The ports of Skamokawa and Cathlamet are not vulnerable to volcanic eruption.

Public Utility District #1
Public Utility District #1 serves the entire planning area. PUD #1 does not generate any power of its own but provides and maintains the energy grid necessary to deliver electricity to the planning area. PUD #1 is not considered highly vulnerable.

Transportation & Wahkiakum Transit
The roadways and bus routes of Wahkiakum County are indirectly affected by volcanic eruption. If the volcanic eruption is large the ash has the potential to cover air space over the planning area. This will in turn coat the ground with ash and volcanic rock. It has the potential to block road ways and air travel.

Water Companies and Districts
The participating water companies and districts are not vulnerable to volcanos.

4.2.4A – Critical Facilities & Infrastructure
Wahkiakum County critical facilities can be indirectly affected by volcanic eruptions if the ash is water saturated and reaches to the planning area. This can put added weight to structures causing them to collapse. A list of infrastructure and critical facilities can be found in Appendix B.

4.2.4B – Land Use & Development Trends
The Town of Cathlamet have seen a minor decrease in development trends. However, Wahkiakum County as a whole have seen an increase in growth, as detailed in Section 3.1.1 – Land Use & Development Trends. Land used for farming can potentially be affected due to a volcanic eruption. However, land that is being used for commercial or residential buildings will not be greatly affected. Volcanic ash can kill wildlife and crops in affected areas.

4.2.4C – Unique & Varied Risk
Wahkiakum County is minimally at risk for a volcanic eruption. There is a varied future probability of a volcanic eruption and minimal historical data from Wahkiakum county regarding volcanic eruption. However, due to volcanic eruptions potential to be far reaching, Wahkiakum County has some risk to this hazard.

4.2.4D – Repetitive Loss Structures – There are no repetitive loss structures that are applicable to volcanoes.

4.4 – Excluded Hazards

High Winds
Due to high winds being a secondary hazard we included high winds as a subsection under severe storm. This is the reasoning behind the hazard being excluded as its own hazard.

Avalanche
There is no reasonable risk to the planning area. Therefore, the jurisdiction has decided to exclude this hazard that was in the state plan.

Tsunami
Wahkiakum County is not located within the tsunami subduction zone. Therefore, this hazard has not been included as a hazard to the planning area.

4.5 – Land Use and Development Trends
The list below further details how growth and development affect vulnerability and risk. The table below lists these effects for Wahkiakum County and the Town of Cathlamet.

The following table summarizes how recent land use and development trends affect each municipality's vulnerability and risk to each hazard.

Table 15: Land Use & Development Trends, Hazard Summary

Table 15 – Land Use & Development Trends, Hazard Summary							
Jurisdiction	**Earthquake**	**Flash Floods**	**Landslides**	**Floods**	**Volcano**	**Severe Storms**	**Wildfire**
Wahkiakum County	Increase	Increase	Increase	Increase	Increase	Increase	Increase
Town of Cathlamet	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease

4.6 – Risk Summary

The table below outlines each participating jurisdiction's general risk to this plan's profiled hazards. The rankings are based on a composite evaluation of this plan's risk assessment, namely, a hazard's probability of occurring in the future, the vulnerability of a jurisdiction to a hazard, and the intensity of past hazard impacts. The final rankings are based on a joint evaluation between the participating stakeholders of this plan.

Table 16: Hazard Risk Summary

Table 16 – Hazard Risk Summary							
Jurisdictions	**Earthquakes**	**Floods**	**Landslides**	**Severe Storms**	**Drought**	**Volcano**	**Wildfire**
Wahkiakum County	Rare	Rare	Rare	Highly Likely	Occasional	Occasional	Rare
Town of Cathlamet	Rare	Rare	Rare	Highly Likely	Occasional	Occasional	Rare

**These risk ratings are an aggregate assessment of the participating jurisdictions and do not represent specific identified hazard area within a chosen jurisdiction.*

Section 5 – Mitigation Strategy

Planning Process

Local Procedures & Resources

Planning Area

Hazard Risk Assessment

Mitigation Strategy

- Capabilities
- Floodplain Programs
- Goals
- Projects
- Evaluations & Prioritizations
- Planning Integration

5.1 – Mitigation Capabilities

Each type of stakeholder provides a set of capabilities, in some cases broad and in some cases, narrow, by which they can increase the planning area's resiliency.

County and Municipal Governments

The broadest form of mitigation capabilities come from the county and town governments. Their inherent legal authority allows them to institute the greatest regulatory and developmental changes.

School Districts

The participating school districts have broad authority over their campuses and although budgets may be tight, they are more far reaching than some of the smaller organizations. Additionally, the necessity to protect the planning area's children grants them greater influence and political capital to institute change.

Water Districts

The participating water company and water districts do not have far reaching authority or resources that extend beyond their property. However, their services are critical to the planning area. They will primarily use their resources to protect their property and ensure the continuity of their services in the face hazard events.

Fire Districts

The participating fire districts in this plan have personnel resources and capabilities that can be used in the planning and implementation of mitigation activities and projects. When collaborating with other stakeholders and municipal governments, these personnel resources can also provide subject matter expertise. Additionally, their services to the community are necessary and must be protected by mitigation measures.

Public Utility District #1

Like the participating water company and water districts, Public Utility District #1 does not have far reaching authority or resources that extend beyond their property. However, their services are critical to the planning area. They will primarily use their resources to protect their property and ensure the continuity of their services in the face hazard events.

Institutional Capability

Wahkiakum County as a whole community that is capable of implementing the strategies identified herein. In addition, they are capable of promoting the mitigation process and educating the public about the hazards prevalent to their area, as well as mitigation process necessary to mitigate those hazards.

In an emergency, the county and cities' response are an extraordinary extension of responsibility and action, coupled with normal day-to-day activity. Normal governmental duties will be maintained, with emergency operations carried out by those agencies assigned specific emergency functions under the Wahkiakum County Comprehensive Emergency Management Plan.

Storm Ready Communities

The NWS Storm Ready program helps communities with the communication and safety skills needed to save lives and property. Storm Ready communities are better prepared to save lives from the onslaught of severe weather through advanced planning, education, and awareness. This label is granted to communities that meet a measured level of weather preparedness and staffing capabilities. Wahkiakum County, Raymond, and South Bend are Storm Ready communities while Ilwaco and Long Beach are Tsunami Ready communities.

Political Capability

During the process of the development of this plan, opposition to mitigation measures was not evident in Wahkiakum County or in the participating stakeholders. In fact, the county has taken a proactive approach to mitigation through its flood management ordinances and land use planning**.** The primary limiting factor is funding, which is made more difficult by the current situation in the local, state, and national economy.

The county, town, and their partnerships with the participating agencies are well-organized and responsive to community needs. Leadership is informed and remains up-to-date on the hazards that threaten the area. Citizens who did participate in the public meetings and presentations showed an interest in doing things to promote a safer county. Therefore, the county and cities (the governing board, staff, and citizen population) appear willing to promote the economic efficiency and social utility of the mitigation measures contained in this plan, if appropriate funding can be identified.

Technical Capability

The participating stakeholders have the basic technology needed to mitigate and respond to natural disasters. They are equipped with telephone and fax lines and a functional Emergency Operations Center in case of disaster. The county also has an Emergency Manager on staff, this position is overseen by the Sheriff Department. Many key persons are equipped with cellular phones, which can act as a backup to land lines in case service is lost. The County is connected to the Internet, which is a valuable source of information on approaching hazards and mitigation measures. The County sponsors a website (https://www.co.wahkiakum.wa.us/) where there is a link to the Wahkiakum County Emergency Management Agency. The County provides GIS mapping for the County and can provide GIS capabilities.

Fiscal Capability

Wahkiakum County, its cities, and stakeholders in this mitigation plan are not unique in the issues felt by small governments to retain the staff and resources necessary to accomplish the strategies necessary to mitigate the hazards in their area. However, they are aware of potential diverse funding sources available to communities for, assisting in the fiscal needs required to implement local hazard mitigation plans, including both government and private programs. The Board of County Commissioners also has created and maintains a Capital Improvement Plan. All county department heads manage their Community Development Block Grants (CDBGs). While federal and state programs carry out the bulk of disaster relief programs that provide funds for mitigation, local governments can search for alternative funding sources to supplement the local hazard mitigation budget. The participants in the mitigation planning process are aware that before effective mitigation strategies can be applied, stable funding sources and effective incentives must be established on a per project basis to encourage participation by the private and public sectors.

5.1.1 – Authorities

General Authority

Washington State law provides the legal authority for local governments to implement regulatory measures. The basis for much of this authority is the local government power designed to protect public health, safety and welfare. This authority enables local government to enact and enforce ordinances, and to define and abate nuisances. Hazard mitigation is a form of protecting public health, safety, and welfare, and falls under the general regulatory powers of local government. This also extends to building codes and inspections, land use, acquisition, and floodway regulation.

Building Codes and Inspections

Building codes and inspections provide local governments with the means to maintain County structures that are resilient to natural hazards. Wahkiakum County has adopted the Uniform Construction and Fire Codes in 2000. These codes prescribe minimum standards for building construction, which ensures that new buildings and structures are built to standards that are seismically sound, fire resistant and developed within flood-proofing measures. These codes also require appropriate hazard code updating and compliance when certain thresholds are met for remodel and renovation of existing buildings. These codes also authorize local governments to carry out building inspections to ensure local structures adhere to the minimum state building standards.

Wahkiakum County officials have the primary role of enforcement of the Uniform Building Code structural regulations. Fire Departments also take part in the inspection process for fire and general public safety inspections. They enforce the appropriate codes both at the plan approval stage and the site inspection stage. Wahkiakum County is committed to the high standards of building provided through the respective codes and requires that the same codes and the same enforcement procedures apply during routine permitting procedures as well as following a disaster.

Land Use Planning

Through land use regulatory powers granted by the state, local governments can control the location, density, type and timing of land use and development in the community. Provisions of the land use plans are implemented through regulatory tools that include subdivision ordinances since 1969 and a comprehensive land use plan. The county has planners located with the public works department that are knowledgeable on land use and land development. The Wahkiakum County Mitigation Plan will support appropriate land use planning.

Floodplain Ordinances

Floodplain management is the operation of a community program of measures for reducing flood damage. These measures take a variety of forms; and generally, include zoning, subdivision, or building requirements, and special-purpose floodplain ordinances. The housing and community development department overseas flood plain management. Included in this group is the county Floodplain Manager.

5.2 – National Flood Insurance Program & Community Rating System Participation

Wahkiakum County participate in the NFIP. School districts are not municipal entities and thus do not classify as possible participants of the NFIP program.

The Wahkiakum County Planning Department oversees all NFIP related activities within the county. They employ a NFIP Coordinator/floodplain administrator to ensure base flood elevation certificates are completed for new construction in the planning area. This helps ensure any development in a floodplain is accompanied by a Flood Hazard Development Certificate. In order to acquire a development certificate, a licensed surveyor must assess the land and the applicant must undergo an application and review process. The NFIP Coordinator/floodplain administrator also works to further develop protective measures that exceed NFIP compliance.

5.3 – Mitigation Goals & Objectives

Goals for Wahkiakum County and its participating jurisdictions were established based upon results from the local and state risk assessments, Wahkiakum County Mitigation Planning Committee meetings, and input from non-planning team local jurisdiction and state officials. These goals represent Wahkiakum County and its participating jurisdictions' long-term vision for the continued reduction of hazard risks and the enhancement of mitigation capabilities.

Goal 1 – Reduce the impact of natural hazards on citizens, public infrastructure, and property.

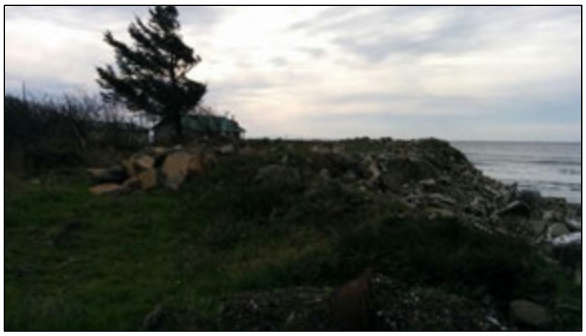
Goal 2 – Strengthen the resilience of the local economy.

Goal 3 – Increase the level of coordination and dialogue among community members and interests of state and federal agencies to promote natural hazard mitigation.

Goal 4 – Enhance public awareness about activities that reduce the impact of natural hazards.

Goal 5 – Protect and enhance productive lands and the rural character of Wahkiakum County

5.4 – Mitigation Projects



The Wahkiakum County MPC identified a comprehensive range of 16 possible and unique mitigation projects. The selected set carefully takes an all-hazards approach to mitigation while simultaneously addressing each of the individual eight profiled hazards.

The projects and actions were selected based upon their potential to reduce the risk to life and property with an emphasis on new and existing infrastructure, ease of implementation, community and agency support, consistency with local jurisdictions' plans and capabilities, available funding, vulnerability, and total risk. For further information on evaluation criteria, please see Section 5.5. The full list of mitigation projects, their descriptions, and prioritization per jurisdiction and stakeholder can be found in Appendix C.

For the status of mitigation projects since the development of Wahkiakum County's previous hazard mitigation plan, please see Section 5.4.2.

The table on the following page summarizes the hazards addressed by each mitigation project and activity, and the corresponding participating jurisdictions suggested to undertake the project or activity.

NOTE: Some projects and actions mitigate risk and vulnerability to multiple hazards. Some of these projects and actions list participating jurisdictions that are only at risk from one or a few of the mitigated hazards.

5.4.2 – Mitigation Activities and Projects Updates

The following details the mitigation projects and actions suggested in their previous FEMA approved hazard mitigation plan. In the event an activity was not implemented, the cause or reason is included in the status column. Some previously listed mitigation activities are no longer considered mitigation and are tagged with "Not Mitigation."

Table 17 – Mitigation Project Updates

Project	Status	Justification
Develop education and outreach	Included, Ongoing	This was a well-received project when the county completed it in the past.
Hold a symposium	Included, Proposed	This is still a valid project for the County.
Develop a program for special needs populations	Included, Proposed	This is still a valid project for the County.
Assessment of critical facilities vulnerabilities	Included, Proposed	This is still a valid project for the County.
Federal, state and local collaboration	Included, Proposed	This is still a valid project for the County.
Identify critical facilities in hazard prone areas	Included, Proposed	This is still a valid project for the County.
Community based fuel reduction	Included, Proposed	This is still a valid project for the County.
Wildfire program development	Included, Proposed	This is still a valid project for the County.
Program to promote partnerships	Included, Proposed	This is still a valid project for the County.
Streambank protection	Included, Proposed	This is still a valid project for the County.
Riparian planting program	Included, Proposed	This is still a valid project for the County.
Participate in CRS	Included, Proposed	This is still a valid project for the County.
Reinstall stream gauges	Included, Proposed	This is still a valid project for the County.
Retro-fit sewer lines	Included, Proposed	This is still a valid project for the County.
Identify high risk landslide zones	Included, Ongoing	This is still a valid project for the County.
Rehabilitate Twin Bridges	Included, Proposed	This is still a valid project for the County.
Strengthen the connection between land use planning policies and the county's natural hazard risk assessment to assure that development will be disaster-resistant.	Not Included	This project has been completed.
Elevate the Fire District #3 Fire Station.	Not Included	This project has been completed.
Assist Diking District #5 with Flood Protection Infrastructure.	Not Included	This project has been completed.
Reduce or eliminate the vulnerability of the Wahkiakum County Fairground facilities to flood damage.	Not Included	This project has been completed.

5.5 – Evaluations

Wahkiakum County and its participating jurisdictions' mitigation priorities have not changed since the development of its last plan. Their primary hazards risks, and thus priorities, remain flooding, severe storms, and tsunamis with the addition of coastal erosion.

A composite evaluation matrix was used to prioritize Wahkiakum County and its participating jurisdictions' mitigation projects and activities. The evaluation was conducted for each mitigation project and activity for each jurisdiction. The composite evaluation matrix is comprised of the three factors detailed below.

The first factor is the STAPLE+E evaluation which is best for measuring feasibility and ease of implementation. The tables in Section 5.5.1 provide the STAPLE+E evaluation criteria and the evaluation itself.

The second factor is the effectiveness of the mitigation project. How well does it mitigate the impact of a particular hazard? This is determined by its ability to protect citizens, property, and systems. For instance, installing wires to pin down trees and other objects will reduce their ability to become uprooted or take flight during hazards of high wind, but are not as effective at reducing impacts from tornadoes or strong winds as are properly constructed and reinforced buildings. This factor is rated as: Low = 0.5, Medium = 1, and High = 1.5.

The third factor is a hazard risk-based evaluation. It draws on the hazard risk summary found in Section 4.4 of this plan. Each risk rating is assigned a value based on the assessment (None = 0, Low = 5, Medium = 10, and High = 15). A summary of these results is displayed in Section 5.5.2 while the full, per jurisdiction per hazard tables are located in Appendix G.

$$(HRT) = (HR_1 + HR_2 + HR_n)$$

The total evaluation score is based on the hazard risk total multiplied by the effectiveness factor and added to the STAPLE+E score.

> ***Hazard Risk Total (HRT):*** The sum of values (low through high) of each hazard the project is designed to mitigate.
> ***Mitigation Project Effectiveness (MPE):*** A multiplier based on the project's effectiveness to mitigate against a chosen hazard.
> ***STAPLE+E Evaluation:*** A raw score comprised of positive and negative feasibility.

$$(Priority) = (STAPLE+E) + (MPE * HRT)$$

Upon completing the evaluations, a composite score is calculated and prioritized based on the total score (Low = 0 – 25, Medium = 26 – 50, High = > 50).

5.5.1 – STAPLE+E

Table 18 – STAPLE+E Criteria	
Evaluation Category	**Sources of Information**
Social	Mitigation actions are acceptable to the community if they do not adversely affect a particular segment of the population, do not cause relocation of lower income people, and are compatible with the communities social and cultural values.
Technical	Mitigation actions are technically most effective if they provide long term reduction of losses and have minimal secondary adverse impacts.
Administrative	Mitigation actions are easier to implement if the jurisdiction has the necessary staffing and funding.
Political	Mitigation actions can truly be successful if all stakeholders have been offered an opportunity to participate in the planning process, and if there is public support for the action.
Legal	It is critical that the jurisdiction or implementing agency have the legal authority to implement and enforce a mitigation action.
Economic	Budget constraints can significantly deter the implementation of mitigation actions. Hence, it is important to evaluate whether an action is cost-effective (as determined by a cost benefit review) and possible to fund.
Environmental	Sustainable mitigation actions that do not have an adverse effect on the environment, that comply with Federal, State, and local environmental regulations, and that are consistent with the community's environmental goals, have mitigation benefits while being environmentally sound.

Table 19 – STAPLE+E Rankings

X = N/A - Even Impact	+ = Positive Influence										- = Negative Influence												
STAPLE+E Criteria	Social		Technical			Administrative			Political			Legal		Economic				Environmental						Total Impact
Considerations	Community Acceptance	Effect on Segment of Population	Technical Feasibility	Long-term Solution	Secondary Impacts	Staffing	Funding Allocated	Maintenance/Operations	Political Support	Local Champion	Public Support	State Authority	Existing Local Authority	Potential Legal Challenge	Benefit of Action	Cost of Action	Contribute to Economic Goals	Outside Funding Required	Effect on Land/Water	Effect on Endangered Species	Effect on HAZMAT/Waste Sites	Consistent with Community Goals	Consistent with Federal Laws	
Develop education and outreach	+	+	X	X	X	+	+	X	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	19
Hold a symposium	+	+	+	-	+	+	-	X	+	+	+	+	+	+	+	+	+	+	X	X	X	+	+	17
Develop a program for special needs populations	+	+	+	-	+	+	-	X	+	+	+	+	+	+	+	+	+	+	X	X	X	+	+	17
Assessment of critical facilities vulnerabilities	+	+	-	+	+	+	-	X	+	+	+	+	+	+	+	+	+	+	X	X	X	+	+	17
Federal, state and local collaboration	+	+	X	-	-	X	+	X	+	+	+	+	+	+	+	+	+	X	X	X	X	+	+	14
Identify critical facilities in hazard prone areas	+	+	-	+	+	+	-	X	+	+	+	+	+	+	+	+	+	+	X	X	X	+	+	17
Community based fuel reduction	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
Wildfire program development	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
Program to promote partnerships	+	+	X	-	-	X	+	X	+	+	+	+	+	+	+	+	+	X	X	X	X	+	+	14
Streambank protection	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
Riparian planting program	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
Participate in CRS	+	+	X	-	-	X	+	X	+	+	+	+	+	+	+	+	+	X	X	X	X	+	+	14
Reinstall stream gauges	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
Retro-fit sewer lines	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
Identify high risk landslide zones	+	+	X	-	-	X	+	X	+	+	+	+	+	+	+	+	+	X	X	X	X	+	+	14
Rehabilitate Twin Bridges	+	+	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20

5.6 – Planning Integration

Mitigation doesn't end at plan approval. Plan approval is only the beginning. The successful implantation of any number mitigation activities and projects requires the coordination and collaboration of a number of local agencies, departments, and organizations. Each group has varying decision-making processes and authorities governing their actions. This plan, once approved, must be integrated into their decision-making processes as a tool for improving their respective resiliencies.

This plan is not only useful for implementing mitigation activities and projects but is also critical in making development plans and capital improvement projects. The risk assessment in this plan can prevent unmanaged and dangerous development into identified hazard areas or other portions of the planning area that decrease a community's overall resiliency.

Democratic Governments and Boards

These organizations rely on agenda proposals, deliberation and discussion, and voting to solidify their decision-making. This type of decision-making makes up the majority of Wahkiakum County's participating jurisdictions and stakeholders.

This plan should be integrated into agenda proposal's designs and cross-referenced during deliberation and discussion of the proposed activity. By using this plan's risk assessment, development and capital improvement projects can be appropriately implemented taking into consideration a community's resiliency.

Appendix A – Public Participation

PUBLIC NOTICE

PUBLIC MEETINGS TO DISCUSS THE WAHKIAKUM COUNTY HAZARD MITIGATION PLAN

NOTICE IS HEREBY GIVEN that you are invited to attend, give input and ask questions regarding the Wahkiakum County Hazards Mitigation Plan update. This plan identifies hazards and vulnerability that may affect or impact Wahkiakum County.

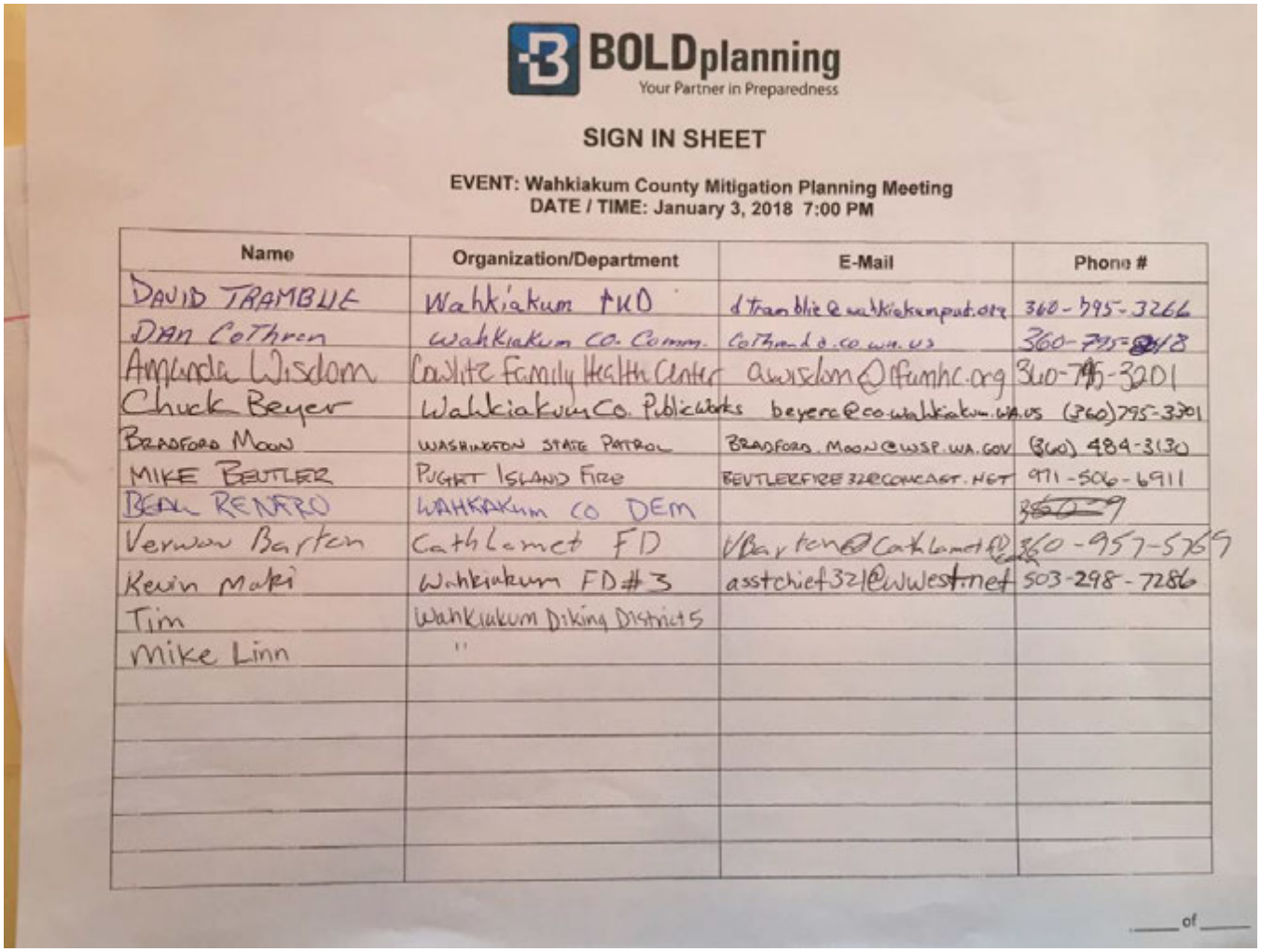
March 6th at 2pm - Johnson Park Community Center 30 Rosburg School Rd, Rosburg

March 6th at 6:30pm – River Street Meeting Room, 35 River Street, Cathlamet

The Public is encouraged to attend these meetings.

DATED this 1st day of February 2018

Coordinator, Beau Renfro



BOLDplanning
Your Partner in Preparedness

SIGN IN SHEET

EVENT: Wahkiakum County Mitigation Planning Meeting
DATE / TIME: January 3, 2018 7:00 PM

Name	Organization/Department	E-Mail	Phone #
DAVID TRAMBLE	Wahkiakum PUD	dtramblie@wahkiakumpud.org	360-795-3266
DAN COTHREN	WAHKIAKUM CO. COMM.	COTHRAND@CO.WA.US	360-795-[illegible]18
Amanda Wisdom	Cowlitz Family Health Center	awisdom@cfamhc.org	360-795-3201
Chuck Beyer	Wahkiakum Co. Public Works	beyerc@co.wahkiakum.wa.us	(360)795-3301
BRADFORD MOON	WASHINGTON STATE PATROL	BRADFORD.MOON@WSP.WA.GOV	(360) 484-3130
MIKE BEUTLER	PUGET ISLAND FIRE	BEUTLERFIRE32@COMCAST.NET	971-506-6911
BERL RENFRO	WAHKIAKUM CO DEM		[illegible]
Vernon Barton	Cathlamet FD	VBarton@Cathlamet[illegible]	360-957-5769
Kevin Maki	Wahkiakum FD#3	asstchief32@wwest.net	503-298-7286
Tim	Wahkiakum Diking Districts		
Mike Linn	"		

____ of ____

AFFIDAVIT OF PUBLICATION

STATE OF WASHINGTON)
) SS.
COUNTY OF WAHKIAKUM)

Rick Nelson

being first duly sworn on oath deposes and says he is

the Publisher of The Wahkiakum County Eagle, a weekly newspaper. That said newspaper is a legal newspaper and has been approved as a legal newspaper by order of the Superior Court in the county in which it is published and it is now and has been for more than six months prior to the date of publications hereinafter referred to, published in the English language, continuously as a weekly newspaper in Cathlamet, Wahkiakum County, Washington, and it is now and during all of the said time was printed in an office maintained at the aforesaid place of publication of said newspaper. That the annexed is a true copy of

Notice of Meetings
Hazard Mitigation Plan

as it was published in regular issues (and not in supplement form) of said newspaper once a week for a period

of 2 consecutive weeks, commencing on the

8 day of February, 20 18 and ending on the

8 day of February, 20 18 both dates inclusive and that such newspaper was regularly distributed to its subscribers during all of said period. That the full amount of the fee charged for the foregoing publication

is the sum of $ 53.60 which amount has been paid in full.

Rick Nelson

Subscribed and sworn to before me this 8th day of

February, 20 18

Katie S. Thomas

Notary Public in and for the State of Washington, residing at Cathlamet, Washington.
SEAL

KATIE S. THOMAS
NOTARY PUBLIC
STATE OF WASHINGTON
My Commission Expires: MARCH 23, 2021

No. 18-20

PUBLIC NOTICE

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DATED this 1st day of February 2018

Coordinator, Beau Renfro
Wahkiakum Co. Department of Emergency Management

Publish February 8, 2018

Appendix B – Facilities & Infrastructure

Critical Facilities, Wahkiakum County	
Name	**Type**
Wahkiakum County	
Wahkiakum West Telephone Company	Government
Fire Dist. No. 3 Salmon Creek Fire Station	Government
Fire Dist. No. 2 Fire Station	Government
County Road Shop No. 2	Government
Fire Dist. No. 4 Elochoman Valley Fire Station	Government
County Road Shop No. 1	Government
KM Repeater Facility	Government
Puget Island Fire Station	Government
CenturyTel Telephone Facility	Government
Fire Dist. No. 3 Raistakka Fire Station	Government
County Road Shop No. 3	Government
Fire Dist. No. 3 Fire Station	Government
Kents Bridge Rd. Reservoir	Government
Town of Cathlamet	**Type**
Greenwood Reservoir	Government
Cathlamet town Hall	Community
Cathlamet Fire Station No. 1	Government
CenturyTel Telephone Facility	Government
Emergency Operations Center	Government
Wahkiakum PUD No. 1	Government
Wahkiakum County Courthouse	Government
WSDOT Cathlamet Maintenance Shop	Government
Fire Dist. No. 4 Boege Rd. Fire Station	Government
Critical Facilities, Wildfire	**Risk Zone**
Cathlamet town Hall	Medium
Cathlamet Fire Station No. 1	Medium
CenturyTel Telephone Facility	Medium
CenturyTel Telephone Facility	Low – Very Low
County Road Shop No. 1	Low – Very Low
County Road Shop No. 2	Low – Very Low
County Road Shop No. 3	Low – Very Low
Emergency Operations Center	Medium
Fire Dist. No. 2 Fire Station	Low – Very Low
Fire Dist. No. 3 Fire Station	Low – Very Low
Fire Dist. No. 3 Raistakka Fire Station	Low – Very Low
Fire Dist. No. 3 Salmon Creek Fire Station	Low – Very Low
Fire Dist. No. 4 Boege Rd. Fire Station	Medium
Fire Dist. No. 4 Elochoman Valley Fire Station	Low – Very Low
Greenwood Reservoir	Medium
Kents Bridge Rd. Reservoir	Medium
KM Repeater Facility	Low – Very Low
Puget Island Fire Station	Low – Very Low
Wahkiakum County Courthouse	Medium
Wahkiakum PUD No. 1	Medium
Wahkiakum West Telephone Company	Low – Very Low
WSDOT Cathlamet Maintenance Shop	Medium
Critical Facilities, Landslide	**Risk Zone**
Cathlamet town Hall	High
Cathlamet Fire Station No. 1	High
CenturyTel Telephone Facility	High

CenturyTel Telephone Facility	Not In Impact Zone
County Road Shop No. 1	Not In Impact Zone
County Road Shop No. 2	High
County Road Shop No. 3	High
Emergency Operations Center	High
Fire Dist. No. 2 Fire Station	High
Fire Dist. No. 3 Fire Station	High
Fire Dist. No. 3 Raistakka Fire Station	High
Fire Dist. No. 3 Salmon Creek Fire Station	Not In Impact Zone
Fire Dist. No. 4 Boege Rd. Fire Station	Not In Impact Zone
Fire Dist. No. 4 Elochoman Valley Fire Station	Not In Impact Zone
Greenwood Reservoir	Not In Impact Zone
Kents Bridge Rd. Reservoir	Not In Impact Zone
KM Repeater Facility	Low
Puget Island Fire Station	Not In Impact Zone
Wahkiakum County Courthouse	High
Wahkiakum PUD No. 1	Low
Wahkiakum West Telephone Company	Not In Impact Zone
WSDOT Cathlamet Maintenance Shop	High
Critical Facilities, Liquefaction	Risk Zone
Cathlamet town Hall	Not Impacted
Cathlamet Fire Station No. 1	Not Impacted
CenturyTel Telephone Facility	Moderate- High
CenturyTel Telephone Facility	Moderate- High
County Road Shop No. 1	Moderate- High
County Road Shop No. 2	Moderate- High
County Road Shop No. 3	Moderate- High
Emergency Operations Center	Moderate- High
Fire Dist. No. 2 Fire Station	Moderate- High
Fire Dist. No. 3 Fire Station	Moderate- High
Fire Dist. No. 3 Raistakka Fire Station	Moderate- High
Fire Dist. No. 3 Salmon Creek Fire Station	Moderate- High
Fire Dist. No. 4 Boege Rd. Fire Station	Low
Fire Dist. No. 4 Elochoman Valley Fire Station	Moderate- High
Greenwood Reservoir	Low
Kents Bridge Rd. Reservoir	Low
KM Repeater Facility	Low
Puget Island Fire Station	Moderate- High
Wahkiakum County Courthouse	Moderate- High
Wahkiakum PUD No. 1	Moderate- High
Wahkiakum West Telephone Company	Moderate- High
WSDOT Cathlamet Maintenance Shop	Not Impacted

Appendix C – Mitigation Projects

#1 – Develop education and outreach			
Description	Develop education and outreach aimed at making residents of the county and Cathlamet aware of mitigation and preparedness actions.		
Hazard/s Addressed	All Hazards		
Status	Ongoing	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$10,000 +/-
Lead Department/s	Wahkiakum Emergency Management	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		

#2 – Hold a symposium			
Description	Hold a symposium regarding the development of business continuity and recovery plans and the identification of non-strucutural mitigation activities.		
Hazard/s Addressed	All Hazards		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$200,000 +/-
Lead Department/s	Chamber of commerce, Wahkiakum Emergency Management	**Effectiveness**	Medium
Jurisdictional Priority			
Wahkiakum County	Medium		

#3 – Develop a program for special populations			
Description	Develop a program to aid elderly and special needs residents to implement non-structural mitigation at their residences.		
Hazard/s Addressed	All Hazards		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP. PDM, Local Funding	**Cost Estimate**	$2,000 +/-
Lead Department/s	Wahkiakum Emergency Management/Town of Cathlamet	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		

#4 – Assessment of critical facilities vulnerabilities			
Description	Estimate replacement costs for each critical facility. Where practical, develop specific measures to mitigate hazards that pose risks to each hazard.		
	All Hazards		
	Proposed		Existing
	HMGP, PDM, Local Funding		$5,000 +/-
Lead Department/s	Wahkiakum Emergency Management/Town of Cathlamet		High
Jurisdictional Priority			
Wahkiakum County	High		

#5 – Federal, state and local collaboration			
Description	Collaborate with federal, state, and local agencies to more efficiently and effectively implement mitigation programs and actions.		
Hazard/s Addressed	All Hazards		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$0.00
Lead Department/s	Wahkiakum County Steering Committee	**Effectiveness**	Medium
Jurisdictional Priority			
Wahkiakum County	High		

#6 – Identify critical facilities in hazard prone areas			
Description	Identify the types and numbers of buildings, infrastructure, and critical facilities in hazard areas. This involves mapping identified hazard areas and then identifying the status of non-critical buildings within the identified hazard areas.		
Hazard/s Addressed	All Hazards		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$2,000 +/-
Lead Department/s	Emergency Manager/County Assessor	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	High		

#7 – Community based fuel reduction

Description	Demonstrating fuel reduction projects to communities in the WUI can assist in showing residents how easy and aesthetically pleasing fuels reduction projects can be. Community residents may be more likely to share responsibility for mitigating the fire risk on their own properties and implement fuel reduction measures after viewing a demonstration. Such actions can assist the County in reducing its overall WUI fire risk.		
Hazard/s Addressed	Fire		
Status	Proposed	**Infrastructure Emphasis**	New
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$5,000 +/-
Lead Department/s	Fire Districts 1, 2, 3, 4, Town of Cathlamet, and Wahkiakum Emergency Manager	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		

#8 – Wildfire program development

Description	Develop a program that connects residents to existing resources for wildfire risk reduction.		
Hazard/s Addressed	Fire		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$200.00 +/-
Lead Department/s	Wahkiakum Emergency Management	**Effectiveness**	Medium
Jurisdictional Priority			
Wahkiakum County	Low		

#9 – Program to promote partnerships

Description	Wind and winter storms have the potential to down trees and cause injuries, and damage to property and infrastructure. Developing and implementing programs to reduce the potential for wind and winter storms to cause damage by downing trees can assist the County in mitigating its overall risk to wind and winter storms.		
Hazard/s Addressed	Winter Storm		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding Sources	**Cost Estimate**	$0.00 +/-
Lead Department/s	Public Works	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Low		

#10 – Streambank protection

Description	Implement innovative streambank protection structures incorporating designs that slow down erosion-causing velocities. Increasing sediment load in rivers leads to increased erosion. Certain types of structure (large woody debris, J-Hooks, and others) can slow down stream velocities and trap sediment, thereby reducing downstream erosion.		
Hazard/s Addressed	Landslides		
Status	Proposed	**Infrastructure Emphasis**	New
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$10,000 - $100,000 +/-
Lead Department/s	CREST	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		

#11 – Riparian planting program

Description	In conjunction with local groups and the County, develop a riparian planting program that identifies areas to enhance riparian areas to reduce flow velocities, store sediment, and protect streambanks from erosion.		
Hazard/s Addressed	Landslides		
Status	Proposed	**Infrastructure Emphasis**	New
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$5,000 +/-
Lead Department/s	CREST	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		

#12 – Participate in CRS			
Description	The County currently does not participate in the National Flood Insurance Program's Community Rating System (CRS). Participating in the CRS can help the County to better identify ways to reduce its flood risk and save money by earning reduced insurance premiums.		
Hazard/s Addressed	Flood		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$0.00
Lead Department/s	Land use and building division	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Low		
#13 – Reinstall stream gauges			
Description	Re-install stream gauges in all major watersheds of Wahkiakum County.		
Hazard/s Addressed	Flood		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$10,000 - $100,000 +/-
Lead Department/s	CREST	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		
#14 – Retro-fit sewer lines			
Description	The Skamokawa Sewer System is vulnerable to damage from several natural disasters. Earthquake, flooding, landslides and even wind damage from trees falling and damaging the system.		
Hazard/s Addressed	Earthquake, Flood, Landslide, Severe Storm		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$10,000 - $100,000 +/-
Lead Department/s	Skamokawa water and sewer district	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	High		

#15 – Identify high risk landslide zones			
Description	Work with Cowlitz County, Pacific County and the Washington State Department of Transportation to identify higher-risk slide locations and mitigate the risk of landslide-induced closures on Highway 4.		
Hazard/s Addressed	Landslide		
Status	Ongoing	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$10,000 - $100,000 +/-
Lead Department/s	Department of Emergency Management	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Low		

#16– Rehabilitate Twin Bridges			
Description	The substructure and deck of this historic bridge needs rehabilitation to provide service. The bridge is currently inadequate for use by fire fighting vehicles. The lack of a bridge in this location means loss of an important access opportunity in the event of wildfire. An alternate route could prove a life saver and could help to save millions of dollars in timber and wildlife habitat.		
Hazard/s Addressed	Flood		
Status	Proposed	**Infrastructure Emphasis**	Existing
Funding Source/s	HMGP, PDM, Local Funding	**Cost Estimate**	$10,000 - $100,000 +/-
Lead Department/s	Wahkiakum County Public Works	**Effectiveness**	High
Jurisdictional Priority			
Wahkiakum County	Medium		

Appendix D – Mitigation Project Prioritization Tables

Table 20 – Project Prioritization											
Mitigation Activity or Project	STAPLE+E	Effectiveness Multiplier	Hazard Risk Value							Total	Priority
			Earthquakes	Floods	Wildfire	Landslides	Drought	Severe Storms	Volcano		
Develop education and outreach	19	0.5	5	5	5	5	10	15	10	46.5	Medium
Hold a symposium	17	0.5	5	5	5	5	10	15	10	44.5	Medium
Develop a program for special needs populations	17	0.5	5	5	5	5	10	15	10	44.5	Medium
Assessment of critical facilities vulnerabilities	17	1	5	5	5	5	10	15	10	72	High
Federal, state and local collaboration	14	1	5	5	5	5	10	15	10	69	High
Identify critical facilities in hazard prone areas	17	1.5	5	5	5	5	10	15	10	99.5	High
Community based fuel reduction	20	1.5	X	X	5	X	X	X	X	27.5	Medium
Wildfire program development	20	0.5	X	X	5	X	X	X	X	22.5	Low
Program to promote partnerships	14	0.5	X	X	X	X	X	15	X	21.5	Low
Streambank protection	20	1.5	X	X	X	5	X	X	X	27.5	Medium
Riparian planting program	20	1.5	X	X	X	5	X	X	X	27.5	Medium
Participate in CRS	14	1	X	5	X	X	X	X	X	19	Low
Reinstall stream gauges	20	1.5	X	5	X	X	X	X	X	27.5	Medium
Retro-fit sewer lines	20	1.5	5	5	X	5	X	15	X	65	High
Identify high risk landslide zones	14	1	X	X	X	5	X	X	X	19	Low
Rehabilitate Twin Bridges	20	1.5	X	5	X	X	X	X	X	27.5	Medium

Appendix E - Adoption Letters

Pending FEMA Approval

Appendix F - FEMA Approval Letter

Pending FEMA Approval