City of Albany, Oregon

Natural Hazard Mitigation Plan

Final Report for:
Albany City Council

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December 2005

RESOLUTION NO. 5217

A RESOLUTION APPROVING AND ADOPTING THE CITY OF ALBANY NATURAL HAZARD MITIGATION PLAN.

WHEREAS, in order for the City of Albany to be eligible to apply for federal mitigation grants the City must have a Mitigation Plan in place that has been approved by the Federal Emergency Management Agency; and

WHEREAS, the City of Albany received federal grant funding through Oregon Emergency Management to write a Natural Hazard Mitigation Plan; and

WHEREAS, the City of Albany worked in cooperation with Oregon Emergency Management and Federal Emergency Management Agency to develop the City of Albany Natural Hazard Mitigation Plan.

NOW, THEREFORE, BE IT RESOLVED the Albany City Council approves and adopts the City of Albany Natural Hazard Mitigation Plan dated December 19, 2005.

DATED AND EFFECTIVE THIS 19TH DAY OF DECEMBER 2005.

Mayor

ATTEST:

City Clerk

City of Albany
Natural Hazard Mitigation Plan
Special Thanks & Acknowledgements

This Natural Hazard Mitigation Plan was developed through a regional partnership funded by the Federal Emergency Management Agency's Pre-Disaster Mitigation Competitive Grant Program. The Mid/Southern Willamette Valley Region grant was awarded to support the development of natural hazard mitigation plans for the region. The region's planning process utilized a seven-step planning process, plan framework, and plan development support provided by the Oregon Natural Hazards Workgroup at the University of Oregon.

Regional partners include:
Federal Emergency Management Agency Region 10, Oregon Emergency Management, Oregon Department of Geology and Mineral Industries, Oregon Natural Hazard Workgroup at the University of Oregon's Community Service Center, Benton County, Lane County, Linn County, Marion County, Polk County, Yamhill County, City of Albany, and Mid-Willamette Valley Council of Governments.

Steering Committee

Steve Bryant, City Manager & Emergency Program Manager
Susan Busbice, Assistant City Manager/Budget Officer
Dick Ebbert, Economic Development
Ed Gallagher, Library Director
Ed Hodney, Parks & Recreation Director
Kevin Kreitman, Fire Chief & Emergency Coordinator
Helen Burns Sharp, Community Development Director
David Shaw, Human Resources
Joe Simon, Police Chief
Diane Taniguchi Dennis, Public Works Director
Bob Woods, Information Technology
Marilyn Smith, Public Information Officer
Ric Blasquez, Albany School District
Steve Kalb, Samaritan Health Albany General Hospital
Greg Bronson, Northwest Natural Gas
Debbie Guerra, PacifiCorp

Working Committee

Kevin Kreitman, Fire Chief and Emergency Coordinator
Pete Brandstetter, GIS
Blaine Brassfield, Building Department
Rich Catlin, Community Development
Dick Conolly, Parks & Recreation

Mark Shepard, Public Works, Engineering Group
Mike Wolski, Public Works Operations

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Additional Thanks

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Scott D. Doyle, AICP, Project Coordinator, Oregon Natural Hazards Workgroup
Robert Wheeldon, Linn County Planning
Mike Bamberger, Benton County Emergency Management
Darrel Tedisch, Planning Coordinator for Albany Mitigation Plan

City of Albany
Natural Hazard Mitigation Plan
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Executive Summary

Why Develop this Mitigation Plan?

This natural hazard mitigation plan is intended to assist the City of Albany in reducing its risk from natural hazards by identifying resources, information, and strategies for risk reduction. It will also help to guide and coordinate mitigation activities throughout the city. The City received two thirds of the funds to develop the plan from the Flood Mitigation Assistance (FMA) Program, a Federal Emergency Management Agency (FEMA) grant program. The remainder of the plan was funded through the City of Albany General Fund.

How is the Plan Organized?

The Mitigation Plan contains background on the purpose of the plan, the methodology used to develop the plan, a profile of Albany, chapters on seven natural hazards that have the potential to impact the City, and several appendices. All of the sections are described in detail in Section 1, Introduction. The Plan also includes resources and information to assist city residents, public and private sector organizations, and others to participate in activities which mitigate against the effects of natural hazards. The mitigation plan provides recommendations for activities that will assist the City in reducing risk and preventing loss from future natural hazard events. The action items address multi-hazard issues, as well as activities for the hazards of Flood, Earthquakes, Severe Weather, Wildland/Urban Interface Fire, Volcano, and Landslides. Albany's Natural Hazard Mitigation Plan section contains a five-year plan matrix that incorporates the identified action items.

What is the Plan's Mission?

The mission for the Albany Natural Hazards Mitigation Plan comes from the City of Albany strategic plan and is "*Providing quality public services for a better Albany community*". The Steering Committee wanted to tie the Mitigation Plan to the City's Strategic Plan to place more emphasis on the need to reduce risk, prevent loss, and protect life property and the environment from future natural hazard events. Both plans foster coordinated partnerships and the development of multi-objective strategies for reducing the risks posed by natural hazards.

Who Participated in Developing the Plan?

The City of Albany Natural Hazards Mitigation Plan is the result of a collaborative effort between Albany citizens, public agencies, nonprofit organizations, the private sector, Linn and Benton County Emergency Management and state and regional organizations. Public participation played a key role in the development of goals and action items. A project Steering Committee guided the process of developing the plan. The Steering Committee was comprised of representatives from the following organizations:

- City of Albany
    - City Manager's Office/Finance/Human Resources
    - Emergency Management
    - Fire Department
    - Police Department
    - Community Development
    - Engineering Department

    - Building Division
    - GIS
    - Public Works
    - Parks & Recreation
    - Library
    - Economic Development
    - Information Technology
- Oregon Emergency Management
- Oregon Natural Hazard Workgroup
- FEMA Region X
- Greater Albany School District
- Samaritan Health Albany General Hospital
- Northwest Natural
- PacifiCorp
- The public

What are the Plan Goals?

The plan goals describe the steps the City of Albany, agencies, organizations, and citizens can take toward mitigating risk from natural hazards. The Albany plan goals were adapted from the city's strategic plan goals and incorporated with the input of the City's Steering Committee. The overarching plan vision is to create "*a vital and diversified community that promotes a high quality of life, great neighborhoods, balanced economic growth, and quality public services*" which provides a disaster resistant and resilient community. Capital was defined in the city's "Strategic Plan" as "….a store of useful assets or advantages." The goals and objectives are as follows:

- Goal 1: To maintain and improve the City's physical capital through the active management and sustainability of public infrastructure
    1. Reduce insurance losses and repetitive claims for chronic hazard events while promoting insurance coverage for catastrophic hazards;
    2. Evaluate applicable city guidelines, codes, and permitting processes regarding how the City addresses natural hazard mitigation;
    3. Link watershed planning, natural resource management, and land use planning with natural hazard mitigation activities to protect vital habitat and water quality;
    4. Preserve and rehabilitate natural systems to serve natural hazard mitigation functions; and
    5. Continuously develop and update natural hazard related datasets.

- Goal 2: To strengthen our economic capital by capitalizing on Albany's unique advantages, developing and promoting a strategic economic plan, and leveraging public and private resources to maintain and attract family-wage jobs.
    1. Develop and implement natural hazard education and outreach programs to increase awareness among citizens; local, city, and regional agencies; non-profit organizations; and businesses; and

2. Strengthen communication, coordination, and collaboration among public agencies, citizens, non-profit organizations, and businesses working in natural hazard risk reduction.

- Goal 3: To raise Albany's social capital by enabling civic leadership, community involvement, and development of great neighborhoods
  1. Strengthen emergency operations by increasing communication, collaboration and coordination among public agencies, nonprofit organization, and businesses; and
  2. Coordinate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

- Goal 4: To build political capital to meet the broader long-range public services needs of Albany and the surrounding region
  1. Develop partnerships and promote leadership among local and regional public agencies, citizens, non-profit organizations, and businesses to implement natural hazard mitigation activities;
  2. Ensure consistency between city, county, regional, and state mitigation activities; and
  3. Consistently, seek diverse funding and resource partnerships for future mitigation efforts

- Goal 5: To protect and enhance environmental capital through the strategic management of our natural resources

- Goal 6: To safeguard and enhance the human capital of our organization as an important building block necessary to achieve the other goals

In addition to the goals and objectives identified above, the Strategic Plan has four primary themes as reflections of the mission and vision statements: Great Neighborhoods, Safe City, a Healthy Economy and an Effective Government. The action items developed for this plan were also tied to these four themes as well as the capital elements.

How are the Action Items Organized?

The action items are organized within the matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan. Data collection, research and the public participation process resulted in the development of these action items. The matrix includes the following information for each action item:

- **Objectives:** There are nine objectives listed within the plan. All action items will fit within one of the nine objectives as well as being a part of the multi-hazard, flood, earthquake, or severe weather sections.

- **Lead Organization:** The lead organization is the public agency with regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation. The coordinating organization for all action items listed in this plan shall be the City of Albany.

- **Internal/External Partners:** Internal/external partner organizations are individuals or agencies that are private, government or nonprofit, within the City that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization. External partner organizations can assist the City in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations. The internal and external partner organizations listed in the mitigation plan are potential partners recommended by the Steering Committee, but who were not necessarily contacted during the development of the plan.

- **Timeline**: Action items include both short and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term action items (ST)* are activities which city agencies are capable of implementing with existing resources and authorities within one to two years. *Long-term action items (LT)* may require new or additional resources or authorities, and may take between one and five years to implement.

- **Plan Themes/Goals Addressed:** Each action item will address one or more of the four themes which are a part of the city's strategic plan. Identification of what theme each action fits under will help the city monitor and evaluate progress towards implementation of the plan.

- **Plan Capital Elements Addressed:** Each action item will address one or more of the capital elements addressed in the cities strategic plan. Identification of which capital elements each action item is aligned with will help the city monitor and evaluate how well the mitigation plan is achieving its goals following implementation.

How Will the Plan be Implemented, Monitored, and Evaluated?

Section 5, the plan maintenance section of this document details the formal process that will ensure that the City of Albany's Natural Hazards Mitigation plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the Plan annually and producing a plan revision every five years. This section describes how the city will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the City of Albany intends to incorporate the mitigation strategies outlined in this plan into existing planning mechanisms such as the City's Comprehensive Plan, Capital Improvement plan, Central Albany Revitalization Area (CARA) Plan and building codes.

Plan Adoption

The Albany City Council will be responsible for adopting the Albany Natural Hazards Mitigation Plan. This governing body has the authority to promote sound public policy regarding natural hazards.

Coordinating Body

An Albany Hazard Mitigation Steering Committee will be responsible for coordinating implementation of plan action items and undertaking the formal review process.

Working Committee

Five members of the Steering Committee, selected by the city manager, will become the working committee and meet semi-annually to outline future work and review

department progress. They will develop agendas for the annual meetings and provide progress reports to the city manager on a regular basis.

Convener

The Steering Committee will adopt the Albany Natural Hazard Mitigation Plan and will take responsibility for plan implementation. The Emergency Coordinator will serve as a *convener* to facilitate the Hazard Mitigation Steering Committee meetings, and will assign tasks such as updating and presenting the plan to the members of the committee. Plan implementation and evaluation will be the shared responsibility among all of the Natural Hazard Steering Committee members.

Implementation through Existing Programs

The City of Albany addresses statewide planning goals and legislative requirements through its Comprehensive Plan, Capital Improvement Plan and Building Codes. The Natural Hazard Mitigation Plan provides a series of recommendations that are closely related to the goals and objectives of these existing planning programs. The City of Albany will have the opportunity to implement recommended mitigation action items through existing programs and procedures.

Economic Analysis of Mitigation Projects

The Federal Emergency Management Agency's approaches to identify cost and benefits associated with natural hazard mitigation strategies or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects. Appendix C outlines the cities approach to Benefit/cost Analysis. The city will work on projects which meet the FEMA approved Benefit/cost Analysis.

Formal Review Process

The City of Albany Natural Hazards Mitigation Plan will be evaluated annually to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. The evaluation process includes a firm schedule and timeline, and identifies the local agencies and organizations participating in the Plan evaluation. The convener will be responsible for contacting the Hazard Mitigation Steering Committee members and organizing the annual meeting. Committee members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

Continued Public Involvement

The City of Albany is dedicated to involving the public directly in the continual review and updates of the Hazard Mitigation Plan. Copies of the plan will be catalogued and kept at all the public libraries in the city. The existence and location of these copies will be publicized in the quarterly city newsletter *City Bridges* which reaches every mailing address in the City. The plan also includes the address and phone number of the City department responsible for keeping track of public comments on the plan. In addition,

copies of the plan and any proposed changes will be posted on the City's web site. This site will also contain an email address and phone number for the public.

List of Maps found in the Albany Hazard Mitigation Plan

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Section 1:
Introduction

The City of Albany developed this Natural Hazard Mitigation Plan in an effort to reduce future loss of life and property resulting from natural disasters. Funding to develop the plan was made possible through a region-wide Federal Emergency Management Agency pre-disaster competitive grant. It is impossible to predict exactly when these disasters will occur, or the extent to which they will affect the City. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize the losses that can result from natural disasters.

A natural disaster occurs when a natural hazard impacts people or property and creates adverse conditions within a community. Natural hazards include: floods, earthquakes, coastal erosion, tsunami, volcanic eruption, severe winter storm, windstorms, drought, and wildland/urban interface fire, and each has the potential to harm people or property. This plan focuses on the natural hazards which could affect the City of Albany, Oregon. Albany's topography, the presence of streams and rivers and its proximity to the Cascade Range play a large role in determining which natural hazards affect the City. Albany is subject to and has been affected by flooding, windstorms, severe weather, earthquakes, wildfires, and volcanic eruption. Landslides have not significantly impacted Albany in the past, but this hazard may become more prominent as the City expands, building on lands in North Albany. The historic impacts of these hazards have resulted in economic loss and damaged infrastructure in and around the City.

One of the results of the 1996 flood was an increased awareness of the natural hazards that pose a risk to Albany residents. City departments understood that mitigation of specific identified hazards after the flooding were important to reduce future property loss in and around Albany. After the flooding, the City applied for and received mitigation grant funds to install an alarm system on the Santiam-Albany Canal, and to have a portion of the Calapooia river bank strengthened with riprap.

In 1998, Albany participated with Benton County, which had been selected by FEMA as a Project Impact Community, on several mitigation projects which included community preparedness, school earthquake assessment, public preparedness, and a mitigation project for Quarry Road.

Participation with Benton County reinforced the importance of hazard mitigation and led to the City's involvement in the Region 3 Hazard Mitigation Grant Program.

Throughout the development of this Hazard Mitigation Plan, the City of Albany worked with both Linn and Benton counties to assure all three plans were compatible and dovetailed. The City of Albany used portions of Benton County's Natural Hazard Mitigation Plan throughout its plan. You will find reference to Benton County in many sections of the City of Albany plan. The City participated in meetings held by Linn County during its development of its plan and received copies of the draft material being created. Linn County was not as far along in developing their plan as Benton County or the City of Albany and we where not able to use much of Linn County material in our plan. The City shared all of its material with both Linn and Benton County during development.

Why Develop a Mitigation Plan?

The dramatic increase in costs associated with natural disasters over the past decades has fostered interest in identifying and implementing effective means of reducing vulnerability. This natural hazard mitigation plan is intended to assist the City of Albany in reducing its risk from natural hazards by identifying resources, information, and strategies for risk reduction. It will also help to guide and coordinate mitigation activities throughout the City.

In 2000, Congress passed and President Clinton signed the Disaster Mitigation Act of 2000, commonly known as DMA 2000. Under this Act and rules published in 44 CFR Part 201.6, States, communities, and tribal governments must complete FEMA-approved natural hazard mitigation plans to be eligible for certain federal assistance programs such as the Hazard Mitigation Grant Program (HMGP).

The plan is non-regulatory; it does not set forth any new policy. It does however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the City of Albany; (2) identification and prioritization of future mitigation activities; and (3) assistance in meeting federal planning requirements and qualification for assistance programs. The mitigation plan works in conjunction with other City plans and programs including the Comprehensive Land Use Plan, Emergency Response Plan, Economic Development Strategic Plan, and Capital Improvement Plan as well as Linn and Benton county natural hazard mitigation plans.

The plan provides a set of actions to prepare for and reduce the risks posed by natural hazards through education and outreach programs, the development of partnerships, and implementation of preventative activities such as land use or watershed management programs. The actions described in the plan are intended to be implemented through existing plans and programs within the City.

This plan is not the first effort the City has undertaken in natural hazard mitigation. The City has undergone a seismic survey for two of its fire stations, and developed and routinely conducts public employee preparedness training.

Whom Does the Mitigation Plan Affect?

The plan affects the City of Albany and its urban growth area. The City of Albany is located in both Linn and Benton counties. While this plan does not establish mandates for the City, it does provide a viable framework for planning for natural hazards. The resources and background information in the plan are applicable citywide, and the goals and recommendations can lay groundwork for the development and implementation of local mitigation activities and partnerships. Recognizing that natural hazards do not start or stop at jurisdiction boundaries, mitigation action items identified in the Albany plan overlap, providing mutual benefit to many actions identified in the Linn and Benton county mitigation plans.

Policy Framework for Natural Hazard Planning in Oregon

Planning for natural hazards is an integral element of Oregon's statewide land use planning program, which began in 1973. All Oregon cities and counties have comprehensive plans and implementing ordinances that are required to comply with the statewide planning goals. The continuing challenge faced by local officials and state government is to keep this network of coordinated local plans effective in responding to the changing conditions and needs of Oregon communities.

Oregon's statewide planning program is founded on a set of 19 statewide goals. Goal 7 provides planning guidelines in areas subject to natural disasters and hazards. The goals and implementing regulations are adopted as a set of administrative rules (Oregon Administrative Rules Chapter 660). The coordination and implementation of the statewide goals is achieved through local comprehensive planning.

This is particularly true in the case of planning for natural hazards where communities must balance development pressures with detailed information on the nature and extent of hazards. Oregon's land use program has given its communities and citizens a unique opportunity to ensure that natural hazards are addressed in the development and implementation of local comprehensive plans.

In 1996, FEMA estimated that Oregon saved about $10 million a year in flood losses because of strong land-use planning. Statewide Planning Goal 7, Areas Subject to Natural Hazards, calls for local plans to include inventories, policies, and ordinances to guide development in hazard areas. Goal 7, along with other land use planning goals, has helped to reduce losses from natural hazards.

State Support for Natural Hazard Mitigation

All mitigation is local, and primary responsibility for the development and implementation of risk reduction strategies and policies lies with local jurisdictions. Local jurisdictions, however, are not alone. Partners and resources exist at the state and federal levels. Key state and federal agencies involved in developing risk reduction strategies and resources include: Oregon Emergency Management (OEM), Oregon Building Codes Division (BCD), Oregon Department of Forestry (ODF), Oregon Department of Geology and Mineral Industries (DOGAMI), the Department of Land Conservation and Development (DLCD), and the Federal Emergency Management Agency (FEMA).

Some of the key state agencies:

- **Oregon Emergency Management (OEM)** is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;

- **Building Codes Division (BCD)** and local counterparts are responsible for construction and for some hazards that are building-specific in their occurrence (such as earthquakes); also assessment of buildings after an earthquake;

- **Oregon Department of Forestry (ODF)** is responsible for wildland fire protection on private, state, and Western Oregon BLM forestlands, and administers forest practices regulations, including landslide mitigation, on non-federal lands;

- **Oregon Department of Geology and Mineral Industries (DOGAMI)** is responsible for geologic hazards characterization, public education, the development of partnerships aimed at reducing risk, and exceptions (based on science-based refinement of tsunami inundation zone delineation) to state mandated tsunami zone restrictions; and

- **Department of Land Conservation and Development (DLCD)** is responsible for planning-based hazard management including implementation of Goal 7 (Natural Hazards), with attention given to hazard assessments and hazard mitigation.

In November 2004, the State of Oregon's Natural Hazard Mitigation Plan was approved by FEMA and adopted by the Governor. The state's plan became the model for this plan and information about Albany such as history, demographics and previous events pertaining to the City were used in this plan.

Plan Methodology

The City of Albany Natural Hazard Mitigation Plan was developed using a planning process created by the Oregon Natural Hazard Workgroup at the University of Oregon. The planning process was designed to result in a plan that is DMA 2000 compliant and coordinates this plan with plans for Linn and Benton counties. Following is a summary of the activities included in the planning process.

Plan Development

The City contracted with a mitigation planning coordinator to develop the plan, conduct research that went into the plan, and write sections for the plan. This individual worked closely with the City's Emergency Management Coordinator/Fire Chief to set up the committees, determine participation, develop drafts of plan sections and make sure the planning process was moving forward. Both the mitigation planning coordinator and the Emergency Management Coordinator/Fire Chief worked with the State of Oregon Emergency Management and Oregon Natural Hazard Workgroup by participating in training sessions offered and in telephone conferences, where applicable, that were held throughout the planning process.

Local and Public Involvement

The City established two committees for development of the Natural Hazard Mitigation Plan: the working committee and the Steering Committee. Both are outlined below:

Working Committee

The working committee provided direction and input on development of the draft plan, which included the goals, action items, and material relevant to the plan content. This committee met every two weeks beginning in February to July 2005. It was made up of members of the City organization with responsibilities for the operations of the City and an understanding of the immediate needs of mitigation projects that could improve the City and citizens' ability to deal with a natural hazard. This committee includes a representative from the fire department, parks and recreation, community development, building inspection, engineering group, GIS, and public works. All meetings had agenda; an attendance sheet was used to document committee members' participation and minutes of each meeting were taken. All original attendance sheets, agenda and minutes are on record with the City of Albany in its mitigation files. Below you will find the dates the working committee met and the subject they discussed:

March 7, 2005	Explanation of the committee responsibilities and review of Executive Summary & Sections 1 & 3
March 21, 2005	Reviewed Sections 2 & 5
April 4, 2005	Reviewed Section 4 & 6
April 18, 2005	Reviewed Section 9 – Severe Weather
May 2, 2005	Reviewed Section 9 – Severe Weather
May 16, 2005	Reviewed Section 7 – Floods
May 26, 2005	Reviewed actions items to recommend to Steering Committee

Steering Committee

The Steering Committee was the policy maker. They made the final recommendations and approvals of the plan before it went to the state and FEMA for review and finally to the City Council for adoption. This committee was to adopt the Goals and Action items contained within the plan for each of the natural hazards addressed. They reviewed and approved each section of the plan and provided direction on strategies to be included. The committee began meeting in March of 2005 and had its last meeting in November 2005 (a total of 9 meetings). The committee was made up of the City Manager, Assistant City Manager, department directors, school district representation, hospital representation and utility representatives. Participation was recorded on an attendance sheet for each meeting and minutes of the meetings were taken. An agenda was used to conduct all meetings. Appendix B has the dates and summary of the Steering Committee meetings. All original attendance sheets, agenda and minutes are on record with the City of Albany in its mitigation files

Public Participation

Two forums were used to receive public input. The first was a focus group held by the Oregon Natural Hazards Workgroup for an invited group of local citizens. The meeting provided an opportunity for community members to comment on the hazards of the City, provide ideas on what could be done, and help to set the goals and actions items that needed to be addressed. The second meeting was an open invitation to the community to review a draft of the Natural Hazard Mitigation Plan on the Web site established by ONHW for the City of Albany before it went to the state and FEMA for pre-approval review.

The City determined there were six natural hazards which have or could have a negative impact on the community and its citizens. Those natural hazards were floods, earthquakes, severe weather, wildland/urban interface fires, volcanoes, and landslides. Using the City's 2004 hazard analysis, it was decided three (floods, earthquakes and severe weather) natural hazards had high enough priority to be addressed in the initial development of the Natural Hazard Mitigation Plan and three (wildland/urban interface fires, volcanoes and landslides) would be addressed during the first update. Historical occurrence, probability and vulnerability from the City's hazard analysis were used for each of the natural hazards addressed.

State and Federal Guidelines and Requirements for Mitigation Plan:

The City's working committee reviewed natural hazard mitigation plans from other jurisdictions, current FEMA planning requirements, the FEMA Pre-Disaster Mitigation Program requirements, and the National Flood Insurance Program's Community Rating System. Statewide reference materials consisted of community and county mitigation plans, including:

- Oregon Natural Hazards Workgroup, Plan Framework (ONHW)
- City of Beaverton Natural Hazard Mitigation Plan
- Washington County Natural Hazard Mitigation Plan
- Clackamas County Natural Hazard Mitigation Plan
- City of Portland Natural Hazard Mitigation Plan
- City of Eugene Natural Hazard Mitigation Plan
- City of Medford Natural Hazard Mitigation Plan
- City of Sweet Home Natural Hazard Mitigation Plan
- Linn County Natural Hazard Mitigation Plan

- Benton County Natural Hazard Mitigation Plan
- *Planning for Natural Hazards: Oregon Technical Resource Guide* (DLCD)
- *Natural Hazard Mitigation Plans: An Evaluation Process (OEM)*
- State of Oregon Natural Hazards Mitigation Plan (OEM)
- Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments (OEM)
- Partners for Disaster Resistance & Resilience: Oregon Showcase State Initiative's Community Planning Resources

The City's plan builds upon the resources listed above and is based upon the University of Oregon's Oregon Natural Hazards Workgroup plan framework and collaborative planning process.

How Do I Use the Plan?

Each section of the mitigation plan provides information and available City resources to assist people in understanding hazard-related issues facing Albany's citizens, businesses, and the natural environment. Combined, the sections of the plan work together to create a document that supports the intent of the plan to reduce risk and prevent loss from future natural hazard events.

The structure of the plan also enables people to use a section of interest to them. It allows City government to review and update sections when new data becomes available. The ability to update individual sections of the mitigation plan places less of a financial burden on the City. Decision-makers can allocate funding and staff resources to selected pieces in need of review, thereby avoiding a full update, which can be costly and time-consuming. New data can be easily incorporated, resulting in a natural hazards mitigation plan that remains current and relevant to the City of Albany.

The mitigation plan is organized in three volumes. Volume I contains the following sections: an executive summary, introduction, community profile, risk assessment, mitigation plan mission, goals, objectives and action items, and plan implementation and maintenance. Volume II contains the natural hazard sections and Volume III includes five appendices. Each section of the plan is described below.

Volume I: Mitigation Action Pan

Executive Summary: Five Year Action Plan

The five year action plan provides an overview of the mitigation plan mission, goals, and action items. The action items are included in this section, and address multi-hazard issues, as well as hazard-specific activities that can be implemented to reduce risk and prevent loss from future natural hazard events.

Section 1: Introduction

The introduction describes the background and purpose of developing the mitigation plan for the City of Albany. This section also documents the process used to develop the plan.

Section 2: Community Profile

This section presents the history, geography, demographics, and socio-economics of the City of Albany. It services as a tool to provide a historical perspective of natural hazards in the City. This section includes an analysis of existing and future development trends.

Section 3: Risk Assessment

This section provides information on hazard identification, vulnerability and risk associated with natural hazards in the City of Albany. Hazard specific data and risk assessments can be found in the individual hazard sections in Volume II.

Section 4: Mitigation Plan Mission, Goals, Objectives, and Action Items

This section provides information on the process used to develop goals and action items that cut across the natural hazards addressed in the mitigation plan. It also included the mitigation measures that are not hazard dependent. These are measures to increase a community's hazard resilience regardless of which hazard might strike.

Section 5: Plan Implementation and Maintenance

This section outlines the schedule and methods that will be used to implement, monitor and evaluate the plan.

Volume II: Hazard-Specific Information

Sections 6 – 8 will be addressed in the first 5 year plan adoption cycle. Sections 9 – 11, will be addressed when the plan is updated in the next 5 year cycle.

Section 6: Floods
Section 7: Earthquakes
Section 8: Severe Weather
Section 9: Wildland/Urban Interface Fire
Section 10: Volcano Ash
Section 11: Landslides

Each of the hazard sections listed above include the risk assessment requirements of the Disaster Mitigation Act of 2000, including: hazard identification, previous occurrences, probability of future occurrence, and vulnerability and hazard impacts.

Volume III: Resources

The plan appendices are designed to provide users of the City of Albany Natural Hazards Mitigation Plan with additional information to assist them in understanding the contents of the mitigation plan, and potential resources to assist them with implementation.

Appendix A: Resource Directory

The resource directory includes City, state, and federal programs which may be of technical or financial assistance to the City of Albany during plan implementation.

Appendix B: Steering Committee/Public Participation Process

This appendix includes specific information on the various Steering Committee and public processes used during development of the plan. A summary of the Steering Committee meetings are found here. All of the original agenda, attendance sheets, and minutes from plan development or public meetings are located with the City of Albany in their mitigation file.

Appendix C: Approaches for Economic Analysis

This section describes FEMA's requirements for benefit/cost analysis in natural hazards mitigation, as well as various approaches for conducting economic analysis of proposed mitigation activities.

Appendix D: List of Acronyms and Definitions

This section provides a list of acronyms and definitions for state and federal agencies and organizations that may be referred to within the City of Albany Natural Hazards Mitigation Plan.

Section 2:
Community Profile

Why Plan for Natural Hazards in the City of Albany?

In 2000, Congress passed and President Clinton signed the Disaster Mitigation Act of 2000, commonly known as DMA 2000. Under DMA 2000 and rules published in 44 CFR Part 201.6, communities, states and tribal governments must complete FEMA-approved natural hazard mitigation plans by November 1, 2004 to be eligible for certain federal assistance programs such as the Hazard Mitigation Grant Program (HMGP)[1]

Additionally, while the City of Albany's climate is generally mild and its terrain flat, natural hazards do pose a threat to the city's economy and its citizens' property and health. Natural disasters have caused major problems in Albany's recent history. Windstorms, heavy rain storms and ice storms have posed threats within the last 10 years. Albany's location near a major earthquake subduction zone and faults places it in danger of experiencing significant earthquake damage. Albany is in both Linn and Benton counties which are considered to have high risk in both Cascadia subduction zone and 500 year return interval earthquake events. Linn and Benton Counties are two of only four counties expected to have high losses in both types of earthquakes.[2]

Flooding and ice storms are a primary concern to the city because of Albany's proximity to Corvallis, Salem and Eugene. Both of these natural events can have devastating effects on the local economy and property.

Identifying the risks posed by natural hazards and developing strategies to reduce the impact of a hazard event, can assist in protecting life and property. Local residents and businesses can work together with the city to create a natural hazards mitigation plan that addresses the potential impacts of hazard events.

History of Natural Hazards in Albany

The City of Albany has been or could be greatly affected by a number of natural hazards including: windstorms, winter storms, flooding and earthquakes. Landslides and wildfires are limited within the city limits due to a lack of urban interface area and minimal development on slopes. Volcanic activity is possible, but even in the Mt. St. Helens event in 1980; there was little threat to the city. The following is a brief outline of the history of natural disaster events that have significantly impacted the City of Albany.

The city has had ice and snow storms, the most recent was a Presidential Declaration (DR-1510) for an ice storm in December, 2003 – January, 2004; high winds with the "Columbus Day Storm" in October 1962; and, Presidential Declarations for high wind in 1995 (DR-1107) and 2002 (DR-1405). We have also had several tornadoes in Albany. Three funnels were sighted on May 23, 1990 and another damaged the local mall on March 22, 1994. Because of our location along the Willamette River we have had many floods during our recorded history going back to the 1860's. Our most recent floods occurred in 1964 and 1996 (DR-1099). Minor earthquakes have occurred in Albany. On August 18, 1961 a 4.5 magnitude earthquake caused minor damage; several earthquakes outside Albany have produced tremors felt in the city. In 1993, the Scotts Mills earthquake (also known as the "Spring Break Quake") shook the northern Willamette Valley. It

was a magnitude 5.7 on the Richter scale, and caused extensive damage primarily in the communities of Molalla, Woodburn, Newberg, McMinnville, and Salem. There was no damage created in Albany by this earthquake and depending on where you lived in Albany few people felt it locally.

Geography and the Environment

The City of Albany has an area of 17.5 square miles with an Urban Growth Boundary of 21.7 square miles. Its present population is approximately 45,000 and is situated in both Linn and Benton counties. The city is located in the central Willamette Valley along Interstate 5, 25 miles south of Salem, and 45 miles north of Eugene. Albany is located along the Willamette River.

The elevation of Albany ranges from 210 to 521 feet above sea level and is nestled between the Coast Range and the Cascade mountain range. Albany sits on mostly flat level land with some hills located in the northern part, in Benton County. Bottomland hardwood forests once dominated much of the Willamette River floodplain. Native grasslands and prairie stretched out across the valley floor. Oak savannas and conifer forests covered the hills in North Albany and Knox Butte.

Albany has a short, dry, temperate growing season which is ideal for many specialized crops such as seed production (grasses, flowers, and vegetables), tree fruits, nursery stock, nuts, berries, mint and grains.

Major Rivers

Willamette River

The Willamette River Basin has 13 major tributaries and drains approximately 12,000 square miles, almost one eighth of Oregon's total area. It is the tenth largest river in the continental United States. The river originates at the confluence of the Middle and Coast Forks just upstream from Eugene and flows 187 miles before entering the Columbia River downstream from Portland. At Eugene, the river emerges from the foothills and meanders for many miles over a flat, extensive floodplain up to five miles wide, with numerous secondary changes, sloughs, and oxbow lakes. Upstream from Oregon City, the river flows through a breach in a low range of hills and then drops approximately 50 feet at Willamette Falls.[3]

Calapooia River

The Calapooia River originates in the Cascade Mountains and flows northwest for about 75 miles before joining the Willamette River at Albany. The basin is long and narrow in shape, and encompasses 374 square miles. Elevations in the basin range from about 200 feet above mean sea level at Albany to almost 5,200 feet above mean sea level on Tibits Mountain. The stream gradient is about three feet per mile. The only major tributary to the river is Oak Creek.[4]

At one time, the Calapooia River provided extensive water power to many of the mills that were built in towns and villages along its 70 miles. Mills in Brownsville and Albany were but two examples. Today the river is less used because of the vegetation growing over the river banks and difficulty gaining access due to private property. In and around Albany the river still causes flooding problems because of the back up of the river when the Willamette River rises, and low lying areas found next to the river.

Santiam River

The Santiam River flows into the Willamette River in Marion County approximately seven miles downstream from Albany. At a location approximately 10 miles up stream, where the North and South Santiam converge, the City of Albany and the City of Millersburg have constructed a joint water intake and treatment plant for municipal use. For the City of Albany, this will be a second treatment plant and for the City of Millersburg it will be its first. For both cities this new plant will be the primary treatment plant.

The US Army Corps of Engineers (ACOE) operates and maintains 13 reservoirs in the Willamette Basin. These federal reservoirs in the middle and upper Willamette Basin were built in the late 1930s, principally for flood control. Flooding has always been an issue. Prior to the construction of dams upriver, flooding of the Albany area was quite significant, but the dams have since minimized the threat.

US Army Corps of Engineer Dams located above the City of Albany on the Willamette and McKenzie Rivers:

Hills Creek Dam, Middle Fork of the Willamette River.[5]

It is located 40 miles southeast of Eugene and 26.5 miles upstream from Lookout Point Dam on the Middle Fork if the Willamette River. The dam was constructed between 1956 and 1961. It is an earth-and-gravel embankment 304 feet high and 2,235 feet long. Flood flows from a catastrophic failure of Hills Creek Dam would follow the Middle Fork Willamette River channel, breach Lookout Point and Dexter Dams and continue to the main stem Willamette River and eventually affecting the City of Albany.

Lookout Point Dam, Middle Fork of the Willamette River.[6]

It is located 22 miles upstream of Eugene on the Middle Fork of the Willamette River. The dam was constructed between 1948 and 1954. The dam consists of an earth fill embankment section, a concrete spillway section, and a concrete right abutment. The maximum height of the dam is 295 feet, with a length of 3, 262 feet. A possible cause of failure of this dam would be breaching due to flood flows from failure of Hills Creek Dam, upstream of Lookout Point. Flood flows from a catastrophic failure of Lookout Point Dam would follow the Middle Fork Willamette River channel, breach Dexter Dam and continue to the confluence with the main stem Willamette River eventually affecting the City of Albany.

Dexter Dam, Middle Fork of the Willamette River.[7]

It is located 20 miles upstream of Eugene on the Middle Fork of the Willamette River. The dam was constructed in 1955. The dam consists of an earth fill embankment, and is 117 feet high. Flood flows from a catastrophic failure of Dexter Dam would follow the Middle Fork Willamette River channel, continue to the confluence with the main stem Willamette River and eventually affecting the City of Albany.

Cougar Dam, South McKenzie River.[8]

It is located on the South Fork of the McKenzie River, about 42 airline miles east of Eugene. Construction of the dam occurred between 1956 and 1964. Cougar Dam is a rock fill embankment about 1,500 feet long and a maximum of 452 feet

high. Flood flows from a catastrophic failure of Cougar Dam would follow the South Fork of the McKenzie River into the McKenzie River channel and on into the Willamette River. Flooded area would include a small portion of Albany.

US Army Corps of Engineer Dams located above the City of Albany on the Santiam River:

Green Peter Dam, Middle Santiam River.[9]

Green Peter Dam is located on the Middle Santiam River about eight miles northeast of Foster. Dam construction was completed in 1967. The dam is a concrete gravity structure with a height of 327 feet and a crest length of 1,517 feet. Flood flows from a catastrophic failure of Green Peter Dam would follow the Middle Santiam river channel, breach Foster Dam, and continue to the confluence with the South Santiam River. The flood would then continue down the Oak Creek and Burkhart creek channels. The main flow would go down the South Santiam to the main stem Santiam River and would affect the outskirts of Albany.

Foster Dam, South Santiam River.[10]

It is located at Foster, Oregon 2 miles below the junction of the Middle and South Santiam Rivers, and 8 miles below Green Peter Dam. Construction of the dam was completed in 1967. The dam is a rock fill embankment dam with a concrete spillway. The embankment is 126 feet high and 4,800 feet long. A possible cause of failure of this dam would be breaching due to flood flows from a failure of Green Peter Dam, 8 miles upstream of Foster. Flood flows from a catastrophic failure of Foster Dam would follow the South Santiam River channel about to the town of Jefferson. Flood waters would also branch off from the main flow and follow Oak Creek and Burkhart Creek channels to the outskirts of Albany.

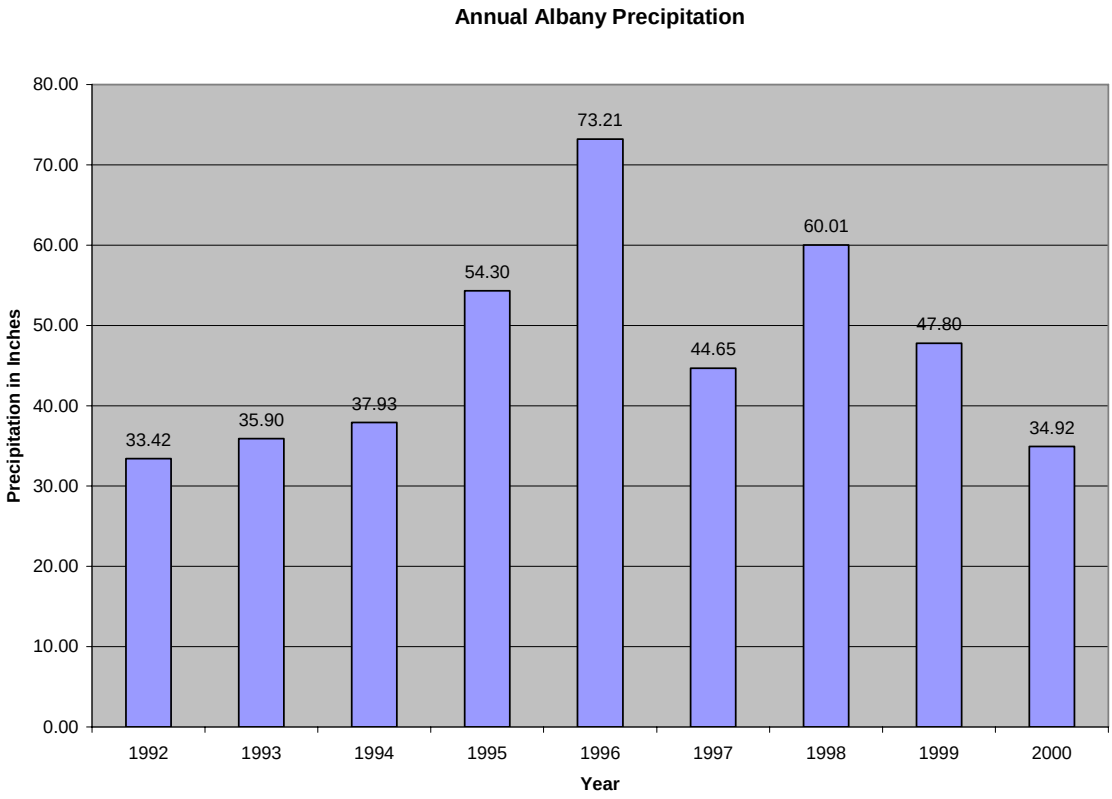
Climate

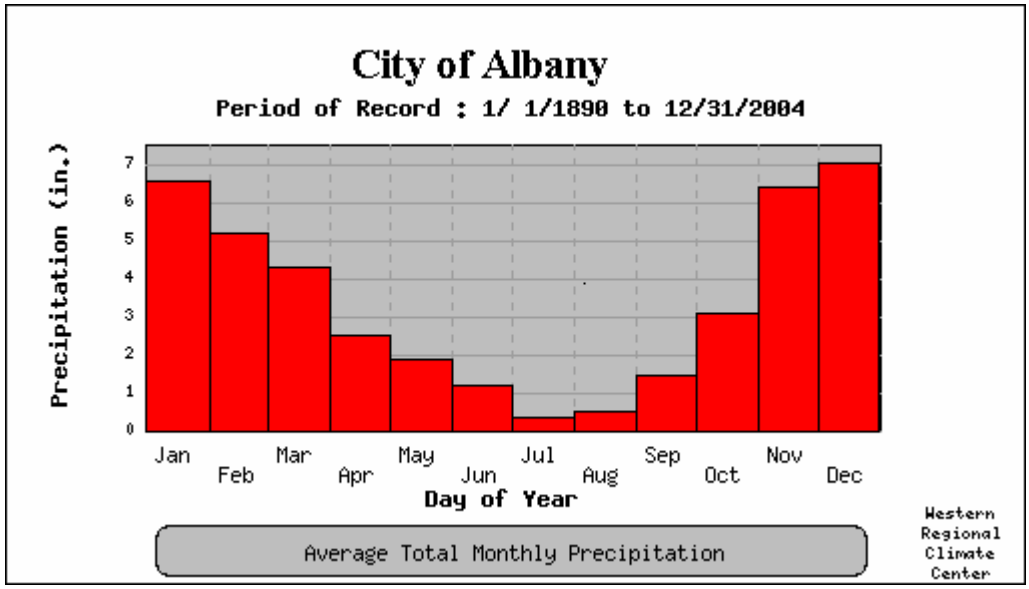
The climate of the Willamette Valley is relatively mild throughout the year, characterized by cool, wet winters and warm, dry summers. Albany is about 80 miles from the Pacific Ocean, which provides a modified marine climate. Extreme summer and winter temperatures are moderated by the airflow moving across the area from the Pacific Ocean. The Cascade Mountains to the east of Albany act as a barrier that prevents colder continental air masses originating in the arctic regions of Canada from reaching Albany.

Occasionally, extreme temperatures can occur when the airflow comes from the east. Temperatures rarely exceed 95° F in the summer months (April – August) and rarely drop below 25° F in the winter months (September – March). The average growing season is about 150 – 180 days in the lower valley.

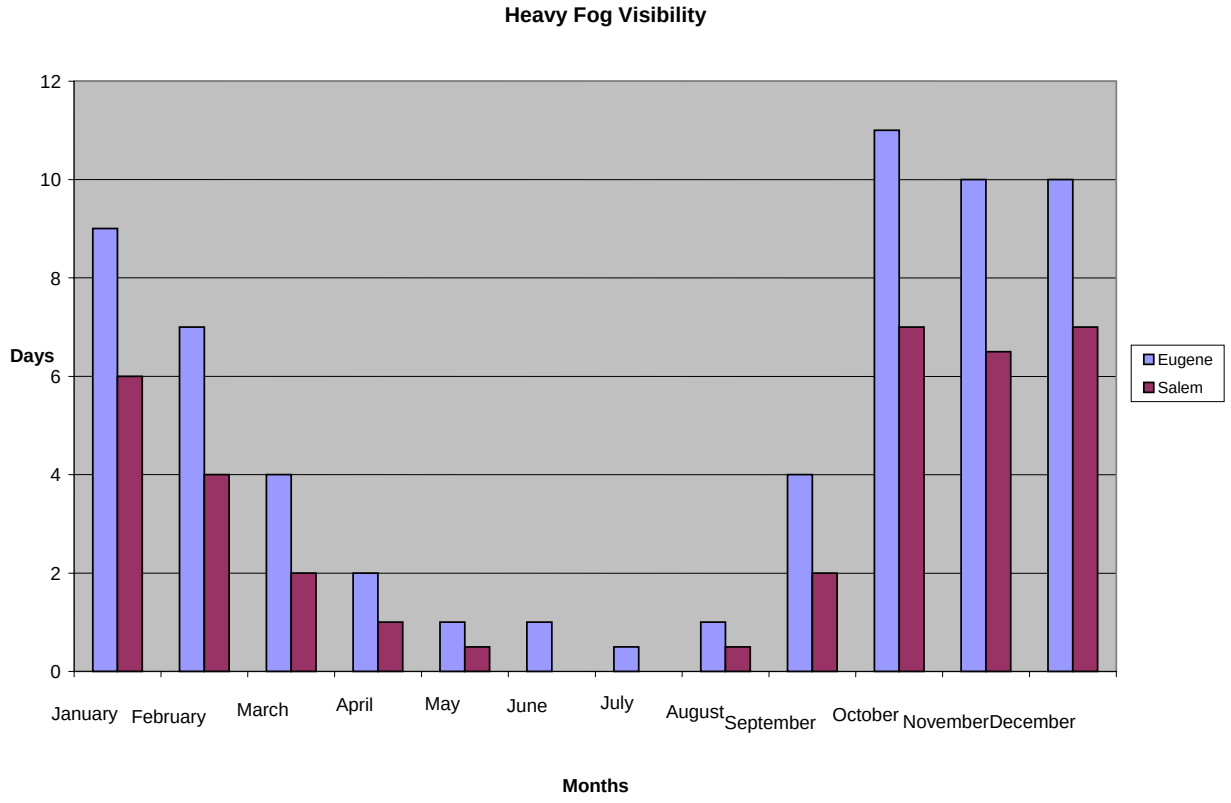
Precipitation ranges from .33 inches in July to 7.05 in February, with an average yearly rainfall of 40.14 inches per year.

Average snowfall since the mid 1960's has been 7.4 inches, occurring between November and March.[11]





Fog can be an extreme hazard in the Albany area. The following chart shows the number of heavy fog visibility, ¼ of mile or less, between Eugene and Salem on average per year. The City of Albany can expect about 60 heavy fog days a year.



Source: Western Regional Climate Center

Minerals and Soils

Albany is centrally located on the broad alluvial plain of the Willamette Valley. The city shares the same temperate climate of the region characterized by warm summers and mild, wet winters. The alluvial soils of the valley overlay thick bedrock of many mixed layers of consolidated volcanic material, basalt, and marine sandstone. Throughout most of the Albany area, the alluvial deposition consists predominantly of deep, silty loam and clay soils overlaying a number of old river terraces of pebbles and cobbles, gravels, sand and clay. These river terraces surface in the northeast portion of the urban growth boundary where the soils are much thinner than elsewhere.

The majority of the soils west of Interstate 5 are loam and silty loam with poor drainage and a high water table. Soils immediately adjacent to Periwinkle and Oak Creeks are clay and silty clay with severe construction limitations because of poor drainage, compressibility, and location in flood-prone areas.[12]

The soils of North Albany are similar silty loams and silty clay loams with areas which are moderately deep, moderately well-drained to somewhat poorly-drained, and areas which are deep, moderately well-drained to somewhat poorly drained, and areas which are deep, moderately well-drained to well-drained.[13]

The soil pattern of the East Albany neighborhood is more complicated, with linear strips of clay loam intermixed with gravelly and stony loam and some silty loam.[14]

The clay-rich soils and generally flat topography found within the Albany Urban Growth Boundary combine with the alternating wet/dry weather cycle to produce poor drainage conditions throughout the area. These soil conditions result in ponding, a seasonal (winter) high water table, and some localized flooding during the winter, which limits construction methods and septic tank use. Disturbance of the natural drainage patterns and the removal of protective vegetative ground cover by urban development and upstream agricultural and forest practices have aggravated these soil conditions and have increased surface runoff.

Generally, soils within the Albany area are of low permeability. The infiltration rate of rainwater is slow and flat surfaces provide no natural gradient for the resulting overland runoff. Ponding occurs when soaked soils can no longer absorb heavy amounts of rainwater or when the rising groundwater table has actually surfaced.

Nearly all of the area soils are subject to severe shrink-swell limitations. These clay soils dry out and crack in summer months and then, with the first winter rains, swell shut and become impermeable, thus increasing surface runoff.

There are 14 drainage basins within the urban growth boundary. Four of these basins are within the North Albany portion of the urban growth boundary while the remaining ten encompass the remainder of the Urban Growth Boundary. The Oak Creek drainage area, containing four basins, extends into the foothills beyond the cities of Lebanon and Sodaville. Periwinkle Creek is one of the largest and most developed drainage areas within the urban growth boundary. This area is divided into four basins. The Truax, Burkhart and Cox Creek basins are currently largely undeveloped, with the majority of the basins outside the urban growth boundary. The Calapooia River Basin is located in the western area of the urban growth boundary.

Together, the bedrock structure and the alluvial deposits have given the Albany area a generally flat topography. Slopes south and east of the Willamette River are less than three percent. North Albany has more hilly terrain with ridges and valleys resulting from the underlying sandstone pediment. Twenty-five percent of the land in North Albany has slopes of more than 15 percent. Extensive development on these slopes could cause soil slippage and increased erosion. Such problems can be minimized through retention of vegetative cover, particularly trees, and by ensuring that any development follows existing contours as much as possible and replaces lost vegetation around building sites.

Poor drainage caused by relatively flat topography, a high water table, and a clay-rich subsurface has determined soil capability. Drainage channels and land immediately adjacent to them are generally Class III and IV soils. Because of the many drainage ways in the Albany area, there are few large expanses of Class I and II soils except in North Albany.

Ninety-eight percent of the soils within the Albany Urban Growth Boundary are classified by the Soil Conservation Service as I-IV soils, capable of supporting a wide variety of crops and forage for livestock. Most of the soils in Albany are distributed in a complex mottled pattern throughout the area.

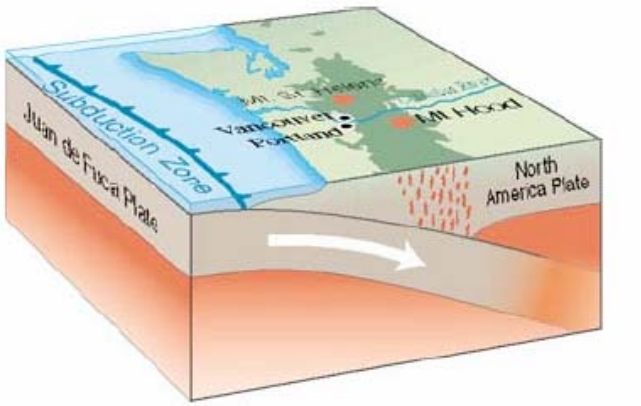
Liquefaction

Liquefaction occurs when ground shaking causes wet granular soils to change from a solid to a liquid state. This result in the loss of soil strength and three potential types of ground failure: lateral spreading, flow failure, and loss of bearing strength. Buildings and their occupants are at risk when the ground can no longer support buildings and structures. Areas of susceptibility to liquefaction include areas with high ground water tables and sandy soils.

DOGAMI has provided a map of the relative liquefaction susceptibility for the City of Albany. This map can be seen in Section 6 Earthquake. A summary of the results indicate that most of Albany has a low to moderate liquefaction susceptibility. These areas are found in the south and east parts of Albany. All of the area which runs along the Willamette River has very high liquefaction susceptibility.

Significant Geologic Features

Most of the Pacific Northwest lies within the Cascadia Subduction Zone, where the Juan de Fuca and North American plates meet. The convergence of these tectonic plates puts most areas of western Oregon and Washington at risk for a catastrophic earthquake with a magnitude of 8.0 or higher. Albany lies in this area of risk. Another potential earthquake risk for Albany is the Corvallis zone Class B #869 fault. The northeast-striking, shallowly northwest-dipping Corvallis fault zone forms the western margin of the southern Willamette Valley in the vicinity of Corvallis. The fault trace is offset by two northwest-striking strike-slip faults that appear to be tear faults in the thrust sheet; however, these faults may extend eastward into the Willamette Valley and thus may not be tear faults. Mill Creek fault, Class A, #871. This fault has the same strike and displacement direction as the Corvallis fault, but there is no evidence that these structures are continuous across the Willamette River. This fault located to the west and north of Albany. As a result of the subduction zone, there are active volcanoes nearby, including Mt. St. Helens in southwest Washington, and Mt. Hood. Major eruptions of these volcanoes may cause ash fall in the Albany area.



Three Sisters, located in the Cascade Range, is one of three potentially active volcanic centers that lie close to rapidly growing communities and resort areas in Central Oregon. Two types of volcanoes exist in the Three Sisters region and each poses distinct hazards to people and property. South Sister, Middle Sister, and Broken Top, major composite volcanoes clustered near the center of the region, have erupted repeatedly over tens of thousands of years and may erupt explosively in the future. In contrast, mafic volcanoes, which range from small cinder cones to large shield volcanoes like North Sister and Belknap Crater, are typically short-lived (weeks to centuries) and erupt less explosively than do composite volcanoes. Hundreds of mafic volcanoes scattered through the Three Sisters region are part of a much longer zone along the High Cascades of Oregon in which birth of new mafic volcanoes is possible.

United States Geological Services scientists have detected a slight swelling, or uplift, of the ground surface over a broad area centered 5 kilometers (3 miles) west of South Sister volcano in the Three Sisters region of the central Oregon Cascade Range. The Three Sisters region is located 22 miles west of Bend, Oregon, and 60 miles east of Eugene, Oregon. The uplift, which occurred between 1996 and 2000, covers an area about nine to 12 miles in diameter and the maximum amount of uplift at its center, is about four inches. It is too broad and low to be noticed from the ground, and several close aerial inspections of the area have revealed no unusual surface features.

In the case of volcanoes wind direction will determine the city's risk. Winds out of the east would have the most severe impact on the city. Prevailing southwest winds would carry ash away from Albany. Historically winds out of the east are most likely to occur in the summer rather than the winter.

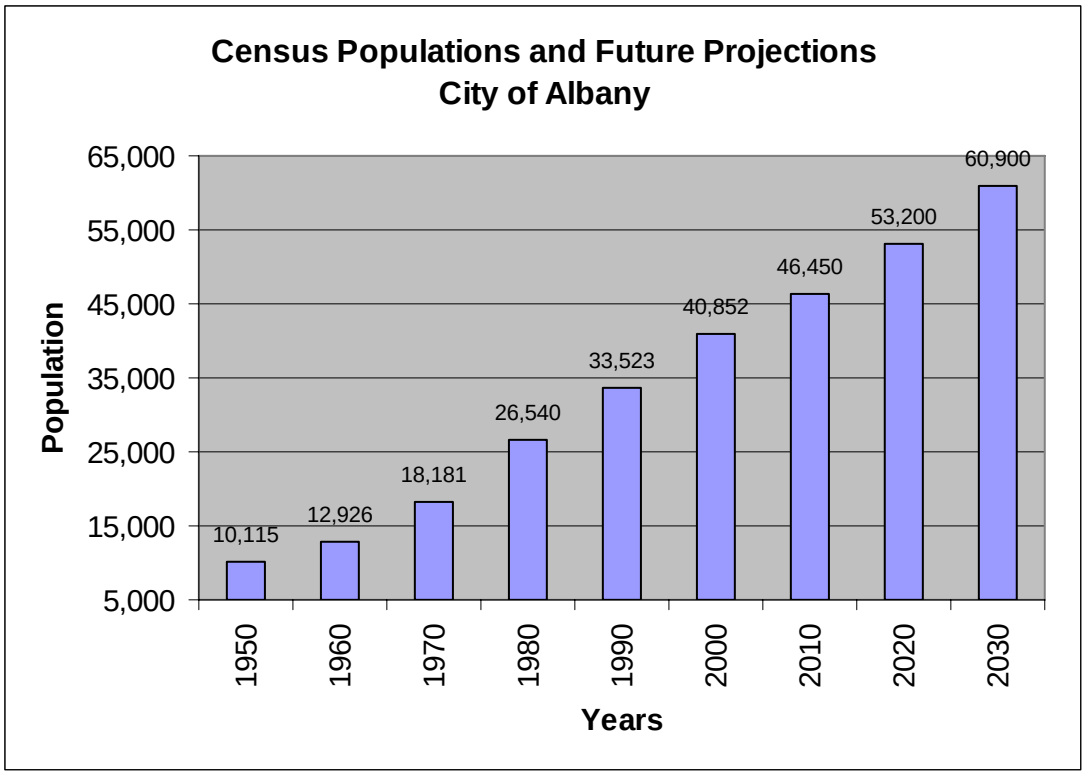
Population and Demographics

The City of Albany lies in both Linn and Benton Counties divided by the Willamette River. In Linn County, Albany is the largest city and in Benton County, it is the second largest city. Approximately 14% of the city's population lives in Benton County.

The present population for Albany is estimated to be 45,000. Since 1960 when Albany's population was 12,926 the average annual growth rate has been 3.00%. In the past 10 years of rapid growth, the population has grown by 10,000 at an average annual growth rate of 2.32%

In 1999, Albany collaborated with Linn and Benton Counties to develop a county coordinated 20 year population forecast, based on long term forecasts by the state economist. Albany estimates an average annual growth rate of 1.5 %. Under this scenario, Albany's population would reach 50,000 in 2016. With recent growth trends, Albany could cross the 50,000 line as early as 2011.

The most recent demographic information was published in the 2000 census. At that time, there were 17,374 total housing units. The average household size was 2.49 persons. Forty eight percent of Albany residents were born outside of Oregon. Thirty six percent of Albany residents commute longer than 20 minutes to work. Eighteen percent of Albany residents 25 years of age or older have graduated from a four year college. The median family income (in 1999 dollars) was $39,409. Twelve percent of Albany resident lived below the poverty level. Seven percent of residents speak another language than English at home.



Source: U.S. Census, City of Albany

Land and Development

Albany's location between the Cascade and Coast mountain ranges, along the Interstate 5 corridor and the state's major metropolitan areas has brought many changes to the community over time.

In the 1800's, commerce flourished in Albany as trade moved up and down the Willamette River. In the early to mid-1900s this pattern continued along the railroads that passed through Albany. With the advent of the interstate highway system, Albany maintained its position, with two I-5 interchanges, as the "Hub of the Willamette Valley".

In 1980, Albany adopted an urban growth boundary to contain urban development. At that time 8.5 square miles of the 21.7 square miles urban growth area had been annexed. Today 17.5 square miles has been annexed.

Periods of rapid growth, such as that experienced between 1960 and 1980 and in the mid-1990s, and the annexation of North Albany in 1991, have brought about the need to rapidly and efficiently provide necessary services. By the year 2020, it is projected that Albany will be home to 53,000 people.

The following table describes how land inside the urban growth boundary is allocated for various uses.

SUMMARY OF LAND USE ALLOCATIONS

TYPE OF LAND USE	NO. OF ACRES	% OF UGB
Residential	7,413	53.3
Commercial	897	6.5
Industrial	1,398	10.0
Public and Semi-Public	956	6.9
Open Space	1,191	8.6
Other (water, rights-of-way)	2,046	14.7
Total	**13,901**	**100.00**

Source: Albany Comprehensive Plan Map, June 2005

Housing and Community Development

The City of Albany has been considered the "Hub of the Willamette Valley" since its beginning in the mid 1800's. We are not far from the Salem, the Capital of Oregon; Eugene, the Pacific Coast; and the Cascade Mountains. We have affordable housing and short commute for many local employers.

According to the 2000 Census, there were a total of 17,374 housing units in the city. A total of 16,108 were occupied. 1,266 housing units were vacant. Data from the Building Division indicates there was an additional 2,095 single family dwelling built from March of 2000 to June of 2005. Owner-occupied housing units were 59.5% of the total and renter-occupied housing units were 40.5 %. There was a 56.6% increase in the number of owner-occupied housing units in Albany and a 15.62% increase in the number of renter-occupied housing units since the 1990 census. The number of mobile homes rose from 821 in the 1990 census to 1,252 in the 2000 census.

Table 2.1 Albany House Age

YEAR STRUCTURE BUILT	Number	Percent
1999 to June 2005*	2,758	14.17
1995 to 1998	1,902	9.77
1990 to 1994	1,214	6.24
1980 to 1989	1,508	7.75
1970 to 1979	4,886	25.10
1960 to 1969	2,400	12.33
1940 to 1959	3,158	16.22
1939 or earlier	1,643	8.44

Source: US Census 2000
* City of Albany Building Division

The majority of homes in Albany were built between 1940 and 1979. The year in which a structure is built is an important indicator of how well a structure will perform during an event. For example, in 1990, the Oregon Building Codes Division revised construction standards for new buildings to make them more resistant to seismic events. Therefore, homes built after 1990 are likely to perform better during an earthquake or related hazard. The table above provides information on the age of Albany housing units.

The median value of an owner-occupied home has gone from $56,825 in the 1990 census to $132,600 in the 2000 census up 133.4%. This compares to a 124.8% increase in Corvallis, 157.6% increase in Lebanon, 117.4% increase in Salem, 141.9% increase in all of Linn County and 132.9% increase in Benton County.

As in many communities affordable homes appear to a major concern. The largest percentages of the houses being built are in the $160,000 to $250,000 range, with some in the $100,000 to $160,000 range. This is a concern when 31.8% of the total households in Albany have a reported income of below $25,000.

Employment and Industry

The City of Albany's per capita income according to the 2000 Census is $18,570. Median earnings are $36,457 for full-time male workers and $24,480 for full-time female workers. The medium household income was $39,409. According to the Census there were 19,312 employed persons within the city. The chart below provides a break down of those employees and where they work.

Table 2.2 Employment Distribution for Employees

Employed civilian population 16 years and over	**19,312**	**100.0**
OCCUPATION		
Management, professional, and related occupations	5,498	28.5
Service occupations	3,255	16.9
Sales and office occupations	4,795	24.8
Farming, fishing, and forestry occupations	257	1.3
Construction, extraction, and maintenance occupations	1,887	9.8
Production, transportation, and material moving occupations	3,620	18.7
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	538	2.8
Construction	1,093	5.7
Manufacturing	3,960	20.5
Wholesale trade	681	3.5
Retail trade	2,289	11.9
Transportation and warehousing, and utilities	867	4.5
Information	446	2.3
Finance, insurance, real estate, and rental and leasing	939	4.9
Professional, scientific, management, administrative, and waste management services	1,227	6.4
Educational, health and social services	3,990	20.7
Arts, entertainment, recreation, accommodation and food services	1,616	8.4
Other services (except public administration)	858	4.4
Public administration	808	4.2
CLASS OF WORKER		
Private wage and salary workers	15,235	78.9
Government workers	2,875	14.9
Self-employed workers	1,157	6.0
Unpaid family workers	45	0.2

Source: US Census 2000

Major employers in the Albany area include: [15]

Company Name	Product or Service	# Employed
Oregon State University	Education	9,011
Hewlett Packard	Computer Printers	4200
Linn Benton C.C.	Education	1,069
Greater Albany Public School District 8J	Education	984
Wah Chang	Rare Metals	973
Linn County Government	Government	747
Target	Distribution Center	614
Georgia Pacific	Towels, Tissue, Napkins	530
City of Albany	Government	401
Weyerhaeuser Co	Kraft Paper	305
Pacific Cast Technologies	Titanium Casting	303
Oregon Freeze Dry	Freeze Dried Products	300
Oberto SmokeCraft	Smoked Meat Products	287
Golden West	Manufactured Homes	260
Palm Harbor Homes	Manufactured Homes	255
Weyerhaeuser Co	Particle & Engineered Wood	225
Allvac Albany(Oremet)	Titanium Products	211
Selmet	Titanium Casting	195
National Frozen Foods	Frozen Vegetables/Fruits	190-360
Weyerhaeuser Co	Engineered Wood Products	114
Panolam Industries	Melamine Laminate	63
Synthetec	Amino Acids, Peptide Blocks	60
Georgia Pacific Resins	Building Products Resins	50

At one time Albany was primarily a wood product town. Today Albany has a diverse employer base that can survive the ups and downs of a changing business climate.

Transportation and Commuting Patterns

The City of Albany is the largest city in Linn County and the second largest city in Benton County. The city has over 311 lane-miles of paved street and 13.7 lane-miles of graveled street. The city is served by Interstate 5, State Highway 20, State Highway 34, and State Highway 99E. In addition there are a number of major county roads which provide links between major cities in the Linn and Benton Counties. The city has local bus service which provides low cost transportation within the city as well as a Linn-Benton Loop Bus which provides transportation to Corvallis and Benton County and the Linn Shuttle which provides service from Sweet Home and Brownsville to Albany. The City of Albany is an Amtrak stop which provides service north to Vancouver, BC, south to San Diego and east to Spokane and, ultimately, Chicago.

The table below is from the 2000 Census and provides commuting information about the citizens of Albany.

COMMUTING TO WORK		
Workers 16 years and over	**19,074**	**100.0**
Car, truck, or van -- drove alone	15,648	82.0
Car, truck, or van -- carpooled	1,931	10.1
Public transportation (including taxicab)	67	0.4
Walked	492	2.6
Other means	263	1.4
Worked at home	673	3.5
Mean travel time to work (minutes)	17.8	(X)

[1] DMA 2000, state and Local Plan Criteria: Mitigation Planning Workshop for Local Governments, http://www.fema.gov/fima/planning.shtm

[2] Earthquake damage in Oregon: Preliminary estimates of future earthquake losses; Special Paper 29, Yumei Wang and J.L.Clark, Oregon Department of Geology and Mineral Industries 1999.

[3] City of Albany Comprehensive plan Background Report; 1980

[4] City of Albany Comprehensive plan Background Report; 1980

[5] US Army Corps of Engineer Guidelines for Flood Emergency Plans November 1981

[6] US Army Corps of Engineer Guidelines for Flood Emergency Plans November 1981

[7] US Army Corps of Engineer Guidelines for Flood Emergency Plans November 1981

[8] US Army Corps of Engineer Guidelines for Flood Emergency Plans November 1981

[9] US Army Corps of Engineer Guidelines for Flood Emergency Plans November 1981

[10] US Army Corps of Engineer Guidelines for Flood Emergency Plans November 1981

[11] Oregon Climate Service 2005

[12] City of Albany Comprehensive plan Background Report; 1980

[13] City of Albany Comprehensive plan Background Report; 1980

[14] City of Albany Comprehensive plan Background Report; 1980

[15] City of Albany, 2004 – 2005 Budget Manual, and Albany-Millersburg Economic Development Corporation

Section 3:
Risk Assessment

This section provides information on the natural hazard risk assessment process. It is general in scope, providing information on what a risk assessment entails as well as listing the related hazard vulnerability maps that are included in this plan. Because of their higher impact on the community it was recommended by the working committee and approved by the Steering Committee that the development of the initial plan includes only the flood, severe weather and earthquake hazards. When the plan is updated in five years, analysis and documentation of the wildland-urban interface fire, volcano ash, and landslide hazards will be completed. Risk assessment information for each of the hazards identified in this plan can be found in the hazard specific sections listed below:

- Section 6: Floods
- Section 7: Earthquakes
- Section 8: Severe Weather
- Section 9: Wildland/Urban Interface Fire
- Section 10: Volcano Ash
- Section 11: Landslides

The risk assessment requirements of the Disaster Mitigation Act of 2000 can be found in the individual hazard sections located in Volume II of the plan.

What is a Risk Assessment?

Conducting a risk assessment can provide information on the location of hazards, the value of existing land and property in hazard locations, and an analysis of risk to life, property, and the environment that may result from natural hazard events. Specifically, the five levels of a risk assessment are as follows:

1. **Hazard Identification** identifies the geographic extent and intensity of the hazard, and the probability of its occurrence. Maps are frequently used to display major hazards that consistently affect a geographic area. The City of Albany identified six major hazards that consistently affect this geographic area. These hazards – floods, earthquakes, severe weather, wildland/urban interface fire, volcanoes, and landslides. The city used its 2004 Hazards Analysis Plan to identify the natural hazards it would address in this plan and to assist in prioritizing the hazards.

2. **Profiling Hazard Events** describes the causes and characteristics of each hazard, how it has affected the City of Albany in the past, and what part of the city's population, infrastructure, and environment has historically been vulnerable to each specific hazard. A profile of each hazard discussed in this plan is provided in each hazard section. For a full description of the history of hazard specific events, please see the appropriate hazard section.

3. **Vulnerability Assessment/Inventory Assets** combines hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard. Critical facilities are of particular concern because these entities provide essential products and services to the general public that are necessary to preserve the welfare and quality of life in the city, and fulfill important public safety, emergency response, and/or

disaster recovery functions. The critical facilities have been identified and are illustrated in the map at the end of this section.

4. **Risk Analysis/Estimating Potential Losses** involves estimating the damage, injuries, and financial losses likely to be sustained in a geographic area over a given period of time. This level of analysis involves using mathematical models. The two measurable components of risk analysis are the magnitude of the harm that may result and the likelihood of the harm occurring. Describing vulnerability in terms of dollar losses provides the community and the state with a common framework in which to measure the effects of hazards on assets. For each hazard where data were available, quantitative estimates for potential losses are included in the hazard assessment.

5. **Assessing Vulnerability/Analyzing Development Trends** provides a general description of land uses and development trends within the community so that mitigation options can be considered in land use planning and future land use decisions. This plan provides a comprehensive description of the character of the City of Albany in Section 2: Community Profile. This description includes the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns. Analyzing these components of the City of Albany can help in identifying potential problem areas and can serve as a guide for incorporating goals and ideas contained in this mitigation plan into other community development plans.

Hazard assessments are subject to the availability of hazard-specific data. Gathering data for a hazard assessment requires a commitment of resources on the part of participating organizations and agencies. Each hazard-specific section of the plan includes a section on hazard identification using data and information from city, county or state agency sources.

At this time, the City of Albany was unable to determine the number and type of buildings, infrastructure, and critical facilities located in hazard areas or estimate the potential losses expected. The Steering Committee crafted an action item and identified necessary resources to address this gap in the future. The vulnerability assessment for the earthquake hazard is addressed in part from FEMA's Hazards U.S. (HAZUS) analysis model which we received from DOGAMI. This analysis was done using general information for the City of Albany. As a part of its ongoing program the city will begin to enter site specific data into the HAZUS program to get more accurate vulnerability assessment of specific locations in the city. Insufficient data exists now to conduct vulnerability assessments and risk analyses for the other hazards addressed in the plan.

Regardless of the data available for hazard assessments, there are numerous strategies the city can take to reduce risk. These strategies are described in the action items detailed in each hazard section of this Plan. Mitigation strategies can further reduce disruption of critical services, reduce the risk to human life, and alleviate damage to personal and public property and infrastructure. Action items throughout the hazard sections provide recommendations to collect further data to map hazard locations and conduct hazard assessments.

Federal Requirements for Risk Assessment

Recent federal regulations for hazard mitigation plans outlined in CFR Part 201 include a requirement for risk assessment. This risk assessment requirement is intended to provide information that will help communities to identify and prioritize mitigation activities that will reduce losses from the identified hazards. There are six hazards profiled in the mitigation plan, including floods, earthquake, severe weather, wildland/urban interface fire, volcanoes, and landslides. The federal criteria for risk assessment and information are outlined in Table 3.2 below.

Table 3.2 Federal Criteria for Risk Assessment

Section 322 Requirement	How is this addressed?
Identifying Hazards	Each hazard section includes an inventory of the best available data sources that identify hazard areas. To the extent GIS data are available, the city developed maps identifying the location of the hazard in the city. The Executive Summary and the Risk Assessment sections of the plan include a list of the hazard maps.
Profiling Hazard Events	Each hazard section includes documentation of the history, and causes and characteristics of the hazard in the city. Floods will be found in Volume II, Section 6, earthquakes in Volume II, Section 7 and severe weather in Volume II, Section 8. Later wildland/urban interface fires will be located in Volume II, Section 9, volcano Ash in Volume II, Section 10 and landslide in Volume II, Section 11.
Assessing Vulnerability: Identifying Assets	Where data is available, the vulnerability assessment for each hazard addressed in the mitigation plan includes an inventory of all publicly owned land within hazardous areas. Each hazard section provides information on vulnerable areas in the city in the community issues section. Each hazard section also identifies potential mitigation strategies.
Assessing Vulnerability: Estimating Potential Losses	The Risk Assessment section of this mitigation plan, found in Volume I, Section 3, identifies key critical facilities and lifelines in the city and includes a map of these facilities. Vulnerability assessments have been completed for the hazards addressed in the plan, and quantitative estimates were made for each hazard where data was available.
Assessing Vulnerability: Analyzing Development Trends	The City of Albany profile section of this plan, found in Volume I, Section 2, provides a description of the development trends in the city, including the geography and environment, population and demographics, land use and development, housing and community development, employment and industry, and transportation and commuting patterns.

Critical Facilities and Infrastructure

Facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection) include: 911 centers, emergency operations centers, police and fire stations, public works facilities, sewer and water facilities, hospitals, bridges and roads, and shelters. Facilities that, if damaged, could cause serious secondary impacts may also be considered "critical." A hazardous material facility is one example of this type of critical facility.

Critical and essential facilities are those facilities that are vital to the continued delivery of key government services or that may significantly impact the public's ability to recover from the emergency. These facilities may include: buildings such as the jail, law enforcement center, public services building, community corrections center, the courthouse, and juvenile services building and other public facilities such as schools. The maps on the following pages illustrate the critical facilities, essential facilities, public infrastructure, and emergency transportation routes within the City of Albany.

Summary

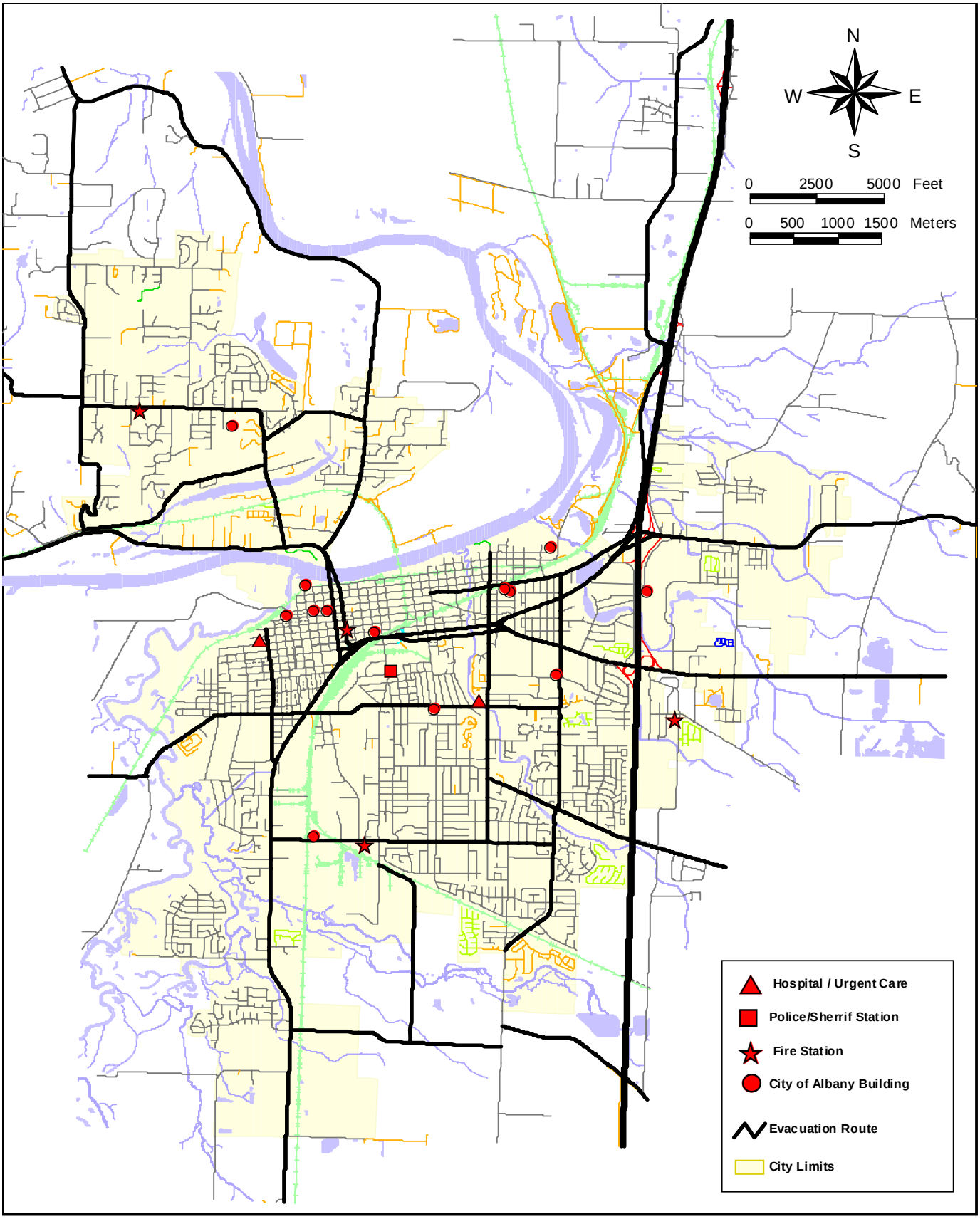
Natural hazard mitigation strategies can reduce the impacts concentrated at large employment and industrial centers, public infrastructure, and critical facilities. Natural hazard mitigation from industries and employers may include developing relationships with emergency management services and their employees before disaster strikes, and establishing mitigation strategies together. Collaboration among the public and private sector to create mitigation plans and actions can reduce the impacts of natural hazards.

At this time, the City of Albany was unable to determine the number and type of buildings, infrastructure, and critical facilities located in hazard areas or estimate the potential losses expected. The Steering Committee crafted an action item and identified necessary resources to address this gap in the future.

The table below lists all of the maps found in Albany's Natural Hazard Mitigation Plan. The table provides the name of the map, the section it's located and the page number.

Map Name	Map Section Location	Map Page
Critical Facilities and Emergency Transportation Routes	Section 3: Risk Assessment	6
North Albany FEMA Floodplain	Section 6: Flood Hazard	10
City of Albany Floodplains	Section 6: Flood Hazard	11
Earthquake Epicenters from 1841 to 2002; Willamette Valley	Section 7: Earthquake Hazard	3
Cascadia Subduction Zone	Section 7: Earthquake Hazard	4
Relative Slope Stability Susceptibility Map: City of Albany	Section 7: Earthquake Hazard	6
Relative Slope Stability Susceptibility Map: NW quadrant of Albany	Section 7: Earthquake Hazard	7
Relative Slope Stability Susceptibility Map: NE quadrant of Albany	Section 7: Earthquake Hazard	8
Relative Liquefaction Susceptibility Map: City of Albany	Section 7: Earthquake Hazard	10
Relative Liquefaction Susceptibility Map: NW quadrant of Albany	Section 7: Earthquake Hazard	11

City of Albany: Critical Facility and Emergency Transportation Route Map.



Section 4:
Mitigation Plan Mission, Goals, Objectives, and Action Items

This section provides information on the process used to develop the mission, goals and action items that guide the mitigation plan. It also describes the framework that focuses the plan on developing successful mitigation strategies. The City of Albany Steering Committee met on April 21, 2005 to craft the vision and mission statement for the plan and to complete a community values and issues identification exercise, (see Appendix B for outcomes of these exercises). During this meeting, the Steering Committee identified the need for the mitigation plan to align with the 2005-2010 City of Albany Strategic Plan, which is described below.

City of Albany Strategic Plan

The Strategic Plan identifies a vision, mission, and the capital necessary to achieve the strategic plan goals. The plan identifies four themes each with its own set of goals, objectives, and strategic actions.

The themes under which natural hazard mitigation would fall in the Strategic Plan are *Great Neighborhoods*, *Safe City*, *Healthy Economy*, *and Effective Government*. The goals within each of these themes are as follows:

Great Neighborhoods:

1. Create and sustain a city of diverse neighborhoods where all residents can find and afford the values, lifestyles, and services they seek.
2. Provide an efficient transportation system with safe streets and alternative modes of transportation.
3. Provide environmental stewardship of our significant natural resources.
4. Create and sustain a diversity of recreational, educational, and cultural opportunities that enrich the lives of our citizens.

Safe City:

1. Ensure a safe community by protecting people and property
2. Provide safe, sufficient, and reliable drinking water; sewage disposal; and drainage systems.

Healthy Economy:

1. Enhance the value and diversity of Albany's economy through building on Albany's status as a regional center of manufacturing, retail services, finance, health care, tourism, and government; creating a readily identifiable downtown core that is unique and vibrant with a mixture of entertainment, housing, specialty shops, offices and other commercial uses; and achieving a healthy balance of housing and jobs.

Effective Government:

1. Effectively deliver the services that Albany's citizens need, want, and are willing to support.

The vision of the City of Albany is: *a vital and diversified community that promotes a high quality of life, great neighborhoods, balanced economic growth, and quality public services.*

The mission of the City of Albany is: *Providing quality public services for a better Albany community.*

Webster's Dictionary defines capital as "...a store of useful assets or advantages." The City of Albany has a finite amount of capital with which to accomplish its Strategic Plan goals. The efficient and well-planned distribution of this capital is critical to its future success. Thus, it is important to understand what these capital elements are and how each is impacted in the decisions we make. The six areas of capital from which Albany draws are physical, economic, social, political, environmental, and human. Albany's goals for effective utilization of these forms of capital are:

1. To maintain and improve the City's *physical capital* through the active management and sustainability of public infrastructure
2. To strengthen our *economic capital* by capitalizing on Albany's unique advantages, developing and promoting a strategic economic plan, and leveraging public and private resources to maintain and attract family-wage jobs.
3. To raise Albany's *social capital* by enabling civic leadership, community involvement, and development of great neighborhoods.
4. To build *political capital* to meet the broader long-range public service needs of Albany and the surrounding region.
5. To protect and enhance *environmental capital* through the strategic management of our natural resources.
6. To safeguard and enhance the *human capital* of our organization as an important building block necessary to achieve the other goals.

Objectives:

The objectives were developed by Oregon Natural Hazard Workgroup (ONHW) from the Steering Committee and public meeting held on April 21, 2005.

1. Establish and maintain methods to ensure plan implementation
2. Provide leadership to promote, communicate, and support disaster safety messages and activities
3. Incorporate mitigation into planning and policy development
4. Support the enhancement of the City vulnerability assessment activities
5. Ensure continuity of City emergency service functions
6. Implement structural and non-structural mitigation of publicly owned facilities and infrastructure
7. Increase citizen awareness and promote risk reduction activities through education and outreach
8. Develop collaborative programs that encourage local businesses to plan for disasters

9. Develop partnerships with external partners to implement hazard specific mitigation projects in the city

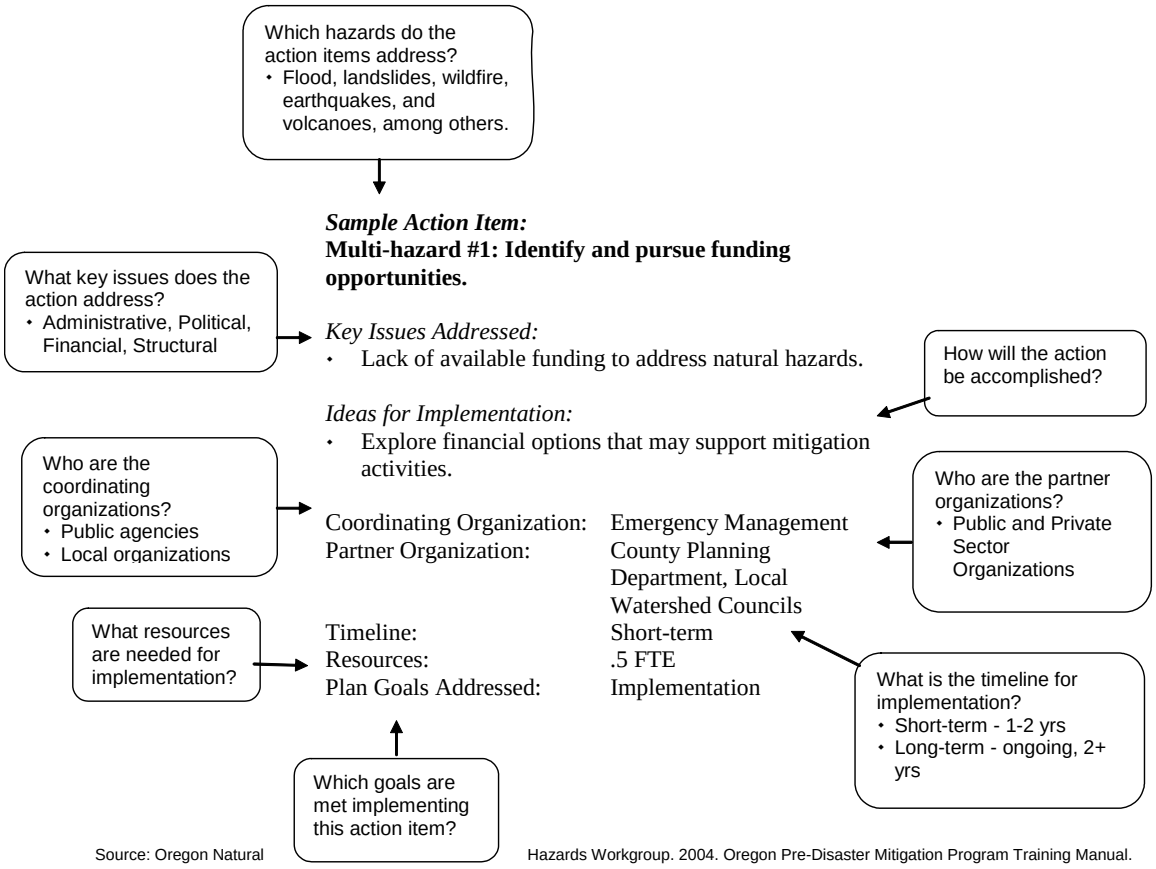
Aligning the Mitigation Plan with the Strategic Plan

The purpose of the City of Albany Natural Hazard Mitigation Plan is to assist in achieving the vision and mission of the Strategic Plan and specifically, aim to advance the "Safe City" theme. The objectives and actions identified in this plan meet the two goals identified in the "Safe City" theme and will be covered by the six Strategic Plan capital categories.

Mitigation Plan Action Items

The mitigation plan identifies short and long-term action items developed through data collection and research. Mitigation plan activities may be considered for funding through state and federal grant programs, including the Federal Emergency Management Agency's Hazard Mitigation Grant Program and Pre-Disaster Mitigation Competitive Grant Program, as funds are made available. Action items address both multi-hazard (MH) and hazard specific issues for the hazards addressed in this plan. To facilitate implementation, each action item includes information on timeline, coordinating and partner organizations, key issues addressed, ideas for implementation, and plan goals addressed. A sample action item is provided in the figure below.

Figure 4.1 Sample Action Item Documentation



Source: Oregon Natural Hazards Workgroup. 2004. Oregon Pre-Disaster Mitigation Program Training Manual.

Lead Organization

The lead organization is the public agency with regulatory responsibility to address natural hazards, or that is willing and able to organize resources, find appropriate funding, or oversee activity implementation, monitoring, and evaluation.

Internal/External Partners

Internal partner organizations are departments within the City that may be able to assist in the implementation of action items by providing relevant resources to the coordinating organization. External partner organizations can assist the coordinating organization in implementing the action items in various functions and may include local, regional, state, or federal agencies, as well as local and regional public and private sector organizations. The internal and external partner organizations listed in the mitigation plan are potential partners recommended by the Steering Committee, but not necessarily contacted during the development of the plan. The lead organization should contact the identified partner organizations to see if they are capable of and interested in participation. This initial contact is also to gain a commitment of time and or resources towards completion of the action items.

Plan Themes and Capital Elements Addressed

The plan themes and capital elements, which are found in the city's Strategic Plan and addressed by each action item, are identified as means for monitoring and evaluating how well the mitigation plan is achieving its goals following implementation.

Timeline

Action items include both short and long-term activities. Each action item includes an estimate of the timeline for implementation. *Short-term action items* (ST) are activities that may be implemented with existing resources and authorities within one to two years. *Long-term action items* (LT) may require new or additional resources and/or authorities, and may take between one and five years to implement.

Key Issue Ideas for Implementation

These parts of the plan will be addressed after the implementation of the plan. Each lead organization will work with its partners to identify key issues and ideas for implementation as a method of assisting in tracking of the progress of each action item.

Multi-Hazard Mitigation Action Items

Multi-hazard action items are those activities that cut across all six hazards in the mitigation plan: floods, earthquake, severe weather, wildland/urban interface fire, volcano ash, and landslides.

There are 14 short-term and 13 long-term multi-hazard action items described below. Each action item is followed by ideas for implementation, which can be used by the Steering Committee and local decision makers in pursuing strategies for implementation

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Multi-Hazard Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #1: Establish and Maintain Methods to ensure plan implementation.														
MH-Short Term	Action 1.1. Create and formalize City of Albany Steering Committee to oversee Plan implementation	City Manager	All Departments	1 – 2 years										
MH-Short Term	Action 1.2. Develop an agreement with external partners to work together on risk reductions efforts in the City.	Emergency Management	All Departments	1 – 2 years										
Objective #2: Provide Leadership to promote, communicate, and support disaster safety messages and activities.														
MH-Short Term	Action 2.1. Develop and implement City protocols and communication strategies for the dissemination of media messages that focus on individual responsibility for disaster safety and risk reduction (e.g. IBHS homeowner guides, press releases for awareness campaigns, etc.)	City Manager/ PIO	Department Heads	1 – 2 years										
MH-Short Term	Action 2.2. Develop and implement a public official's information kit that can be distributed to elected official and community decision makers.	City Manager/ PIO	Department Heads	1 – 2 years										

MH-Short Term	Action 2.3. Develop and implement a communications plan to inform the community on the status of the Natural Hazard Mitigation Plan.	City Manager/ PIO	Steering Committee	1 – 2- years										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
MH-Short Term	Action 4.1. Develop an inventory of City assets including replacement costs	Finance	All Departments	1 – 2 years										
MH-Short Term	Action 4.2. Refine hazard maps to better identify vulnerability and risk for hazards which effect the City	Emergency Management	Public Works/Counties	1 – 2 years										
MH-Short Term	Action 4.3. Develop a program to collect data for non-declared natural hazard events to assist in determining vulnerability and risk	Emergency Management	All Departments	1 – 2 years										
Objective #5: Ensure continuity of City emergency services function.														
MH-Short Term	Action 5.1 Update the Emergency Operations Plan	Emergency Management	All Departments	1 – 2 years										
MH-Short Term	Action 5.3. Identify and evaluate City-owned emergency transportation routes	Emergency Management	Public Works	1 – 2 years										
Objective #6: Implement structure and non-structural mitigation of publicly owned facilities and infrastructure.														
MH-Short Term	Action 6.2. Develop a program to upgrade and retrofit the water treatment facility and lagoons	Public Works		1 – 2 years										

Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
MH-Short Term	Action 7.1. Develop public awareness information kit that can be distributed to residents in the City. The kit should include pertinent information regarding Natural Hazards the City experiences and what residents can do to reduce their own risk. Materials should be produced in English and Spanish	Emergency Management	Community Development, Police Department, PIO, Building Department, Red Cross	1 – 2 years										
MH-Short Term	Action 7.2 Provide educational material and examples of how to assemble 72 hour kits to residents of the City and employees	Emergency Management	PIO, Red Cross, Fire Department, Utilities	1 – 2 years										
MH-Short Term	Action 7.3. Develop and promote an educational awareness program aimed at the elderly, special populations and school aged children	Emergency Management	PIO, Red Cross, Fire Department, Utilities	1 – 2 years										
Objective #1: Establish and Maintain Methods to ensure plan implementation.														
MH-Long Term	Action 1.3. Secure funding with partners to implement the actions identified in the plan and enter into a formal agreement to work together as needed	Emergency Management	All Departments	1 – 5 years										
MH-Long Term	Action 1.4. Establish and maintain all NHMP benchmarks to evaluate performance and modify the plan as necessary	Emergency Management	Steering Committee	1 – 5 years										
MH-Long Term	Action 1.5. As the City of Albany's Strategic Plan is updated, incorporate and link the Natural Hazard Mitigation Plan Objectives into the Strategic Plan	Emergency Management	Steering Committee	1 – 5 years										
MH-Long Term	Action 1.6. Develop and maintain a database of current action items	Emergency Management	Information Technology	Ongoing										

Objective #3: Incorporate mitigation into planning and policy development.														
MH-Long Term	Action 3.1. Provide NHMP awareness training City staff to incorporate Natural Hazard Mitigation Planning aspects into their daily work.	Emergency Management	All Departments	1 – 5 years										
MH-Long Term	Action 3.2. Develop and implement a technology continuity plan for the City in the event of a disaster	Information Technology	All Departments	1 – 5 years										
MH-Long Term	Action 3.3. Evaluate and enhance current land use and zoning codes to incorporate mitigation principles.	Community Development	All Departments	1 – 5 years										
MH-Long Term	Action 3.4. Integrate the NHMP principles and actions into all the planning documents	City Manager	All Departments	1 – 5 years										
Objective #5: Ensure continuity of City emergency services function.														
MH-Long Term	Action 5.2. Consolidate Mitigation plan, EOP, recovery plans and continuity of government plans into a Unified Disaster Plan	Emergency Management	All Departments	1 – 5 years										
Objective #6: Implement structure and non-structural mitigation of publicly owned facilities and infrastructure.														
MH-Long Term	Action 6.1. Assist K-12 schools and Linn Benton Community College develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings	Emergency Management	GAPS Linn Benton Community College	1 – 5 years										
MH-Long Term	Action 6.3 Provide all City of Albany critical facilities with backup power and emergency operations plans to deal with power outages	Public Works	Emergency Management, Pacific Power, Consumer Power, ODOT	1 – 5 Years										

MH-Long Term	Action 6.4. Develop an approach to provide for placement of electrical power lines underground on major street repairs and replacements	Public Works	Pacific Power, Consumer Power	1 – 5 years											
Objective #8: Develop collaborative programs that encourage local businesses to plan for disasters.															
MH-Long Term	Action 8.1. Promote response, mitigation, and recovery planning for local businesses to continue operating after a disaster	Emergency Management	Red Cross, Chamber of Commerce, PIO, Downtown Association, FEMA	1 – 5 years											

Section 5:

Plan Implementation and Maintenance

The plan maintenance section of this document details the formal process that will ensure the City of Albany's Natural Hazards Mitigation Plan remains an active and relevant document. The plan maintenance process includes a schedule for monitoring and evaluating the plan and producing a plan revision every 5 years. This section describes how the City will integrate public participation throughout the plan maintenance process. Finally, this section includes an explanation of how the City of Albany government intends to incorporate the mitigation strategies outlined in the plan into existing planning mechanisms such as the Comprehensive Plan, Capital Improvement Plan (CIP), Central Albany Revitalization Area (CARA) Plan and State Building Codes.

Because the City tied this mitigation plan to the city's strategic plan, both will be reviewed and updated on the same review schedule. While the mission, vision, values, and goals of the strategic plan should remain constant, the objectives, strategies and actions will need periodic review and refinement. Their progress will be tracked through regular reporting which will be incorporated into department, organization, and community publications. The annual budget and Capital Improvement Program will serve as reporting and implementing policy documents, identifying relationships with the strategic plan. Refer to Section 4: Mitigation Plan Mission, Goals, Objectives and Action Items for additional information about the role of the city's strategic plan.

Monitoring and Implementing the Plan

Plan Adoption

The Albany City Council is responsible for adopting and revising the City's Natural Hazards Mitigation Plan. This governing body has the authority to promote sound public policy regarding natural hazards. Once the plan has been adopted, the City Emergency Manager will be responsible for submitting it to the State Hazard Mitigation Officer at Oregon Emergency Management. Oregon Emergency Management will then submit the plan to the Federal Emergency Management Agency (FEMA) for review. This review will address the federal criteria outlined in FEMA Final Rule 44 CFR Part 201. Upon acceptance by FEMA, the City of Albany will gain eligibility for Hazard Mitigation Grant Program funds.

Coordinating Body

The City's Hazard Mitigation Steering Committee is responsible for coordinating implementation of plan action items and undertaking the formal review process. The Hazard Mitigation Steering Committee consists of members from City departments, private industry, non profit organizations and public agencies. As indicated above the plan will be integrated into the strategic plan which will be a part of the CIP and budgeting process and where the actions will be identified and reviewed.

Members of the Steering Committee include:

- Albany City Manager
- Albany Assistant City Manager/Budget Officer
- Albany Fire Chief/Emergency Management Coordinator
- Albany Police Chief
- Albany Public Works Director

Albany Community Development Director
Albany Parks & Recreation Director
Albany Library Director
Albany Economic Development Director
Albany Information Technology Director
Albany Human Resource Director
Albany Public Information Officer
Albany Public School District
Samaritan Health Albany General Hospital
Pacific Corp.
Northwest Natural

Working Committee

Five members of the Steering Committee, selected by the City Manager, will become the working committee and meet semi-annually to outline future work, review department progress and coordinate implementation. They will develop agenda for the annual meetings and provide progress reports to the City Manager on a regular basis.

Convener

The Albany City Council will adopt the City's Natural Hazard Mitigation Plan and the Hazard Mitigation Steering Committee will take responsibility for plan implementation. The Emergency Coordinator will serve as a convener to facilitate the Steering Committee meetings, and will assign tasks such as updating and presenting the plan to the members of the committee. Plan implementation and evaluation will be a shared responsibility among all the Steering Committee members.

Implementation through Existing Programs

The City of Albany Natural Hazard Mitigation Plan is directly tied to the citywide Strategic Plan and as a result of this connection, will be implemented through a number of existing plans, programs, and policies. The City of Albany addresses statewide planning goals and legislative requirements through its Comprehensive Plan, Capital Improvement Plan, Central Albany Revitalization Area (CARA) Plan and State Building Codes. The Natural Hazard Mitigation Plan provides a series of recommendations – many of which are closely related to the goals and objectives of these existing planning programs. The Steering Committee is responsible for determining how each individual action will be implemented through existing programs.

The action items in the mitigation plan may be achieved through activities recommended in the Capital Improvement Plans (CIP). The CIP is updated on an annual basis. Upon annual review of the CIP, the Steering Committee will work with city departments to identify areas where the hazard mitigation action items are consistent with CIP goals and integrate them where appropriate.

Capital Improvements Program

- **Date of last revision:** 2005
- **Plan Owner:** Public Works
- **Plan Description:** The Capital Improvements Plan is a planning document that identifies capital projects in the next five-year horizon for elected officials, citizens and staff. Hazard Mitigation priorities will be considered during the CIP process
- **Plan cycle:** Five-year cycle
- **Relation to hazard mitigation:** Action items may be inserted into the Capital Improvement Plan as approved by the City Council

Within six months of formal adoption of the mitigation plan, the recommendations listed above will be incorporated into the process of existing planning mechanisms at the City level. The meetings of the Steering Committee will provide an opportunity for committee members to report back on the progress made on the integration of mitigation planning elements into City planning documents and procedures.

In addition to the Capital Improvement Program, there are a number of other existing plans, policies and programs that have hazard mitigation connections. The Steering Committee will identify how best to implement individual actions into the appropriate existing plan, policy, or program. The following existing plans, programs and policies were identified and documented by the Oregon Natural Hazards Workgroup at the University of Oregon through the regional pre-disaster mitigation partnership.

Strategic Plan

- **Date of last revision:** February, 2005
- **Plan Owner:** Albany City Manager
- **Plan Description:** This plan creates clearly-defined goals, proactive strategies, committed leadership and effective management capabilities to achieve the city's mission statement and vision for the City of Albany
- **Plan cycle:** Five-year cycle
- **Relation to hazard mitigation:** The Natural Hazard Mitigation Plan's purpose statement is to achieve the goals and mission set forth in the city's Strategic Plan as approved by the City Council

Comprehensive Plan

- **Date of last revision:** October 10, 2003
- **Plan Owner:** Community Development Department
- **Plan Description:** The City's Comprehensive Plan provides a framework for making better decisions about the land and its resources. The Plan identifies existing assets, problems, and needs in the community; it projects future conditions; and it sets forth City policy for dealing with these elements. The maps for zoning, parks and the Comprehensive Plan are a part of this document.
- **Plan cycle:** The comprehensive plan changes when the needs and desires of the public change, when development occurs at a different rate than predicted, and when corrections in a plan are needed, the plan needs to be revised.
- **Relation to hazard mitigation:** The Natural Hazard Mitigation Plan mission statement and goals should be cohesive with and align with the mission and goals of the city's Comprehensive Plan.

Emergency Operations Plan

- **Date of last revision:** 2004
- **Plan Owner:** City Manager
- **Plan Description:** Provide for preparation and carry out the plan for the protections of persons and property within the city in the event of an emergency.
- **Plan cycle:** There is no scheduled maintenance/update of the EOP.
- **Relation to hazard mitigation:** The city's Natural Hazard Mitigation Plan mission and goals should accompany the Emergency Operations Plan to help achieve the mission set forth in the City's Strategic Plan. Action items are found in the Natural Hazard Mitigation Plan to see this is accomplished

North Albany Refinement Plan

- **Date of last revision:** October 10, 2003

- **Plan Owner:** City of Albany Planning Commission and Building Inspection
- **Plan Description:** Increase the amount of livable neighborhoods with improved transportation and sustainability of growth
- **Plan cycle:** There currently is no date set for revision.
- **Relation to hazard mitigation:** Action items may be inserted into the Transportation System Plan and Capital Improvement Program with approval of the City Council

Central Albany Revitalization Plan

- **Date of last revision:** 2003
- **Plan Owner:** Economic Development
- **Plan Description:** The plan's goal is to alleviate blighted conditions in the down town area and increase economic vitality. The plan is to revitalize the area using the city's town center and water front district plans
- **Plan cycle:** Reviewed annually
- **Relation to hazard mitigation:** Action items may be inserted into the Transportation System Plan and Capital Improvement Program with approval of the City Council

Development Code

- **Date of last revision:** April, 2005
- **Plan Owner**: Community Development Department
- **Plan Description:** The general purpose of this code is to set forth and coordinate city regulations governing the development and use of land
- **Plan cycle:** It is reviewed as needed by the Planning Commission and the City Council
- **Relation to hazard mitigation:** Action items initiated by the natural hazard mitigation plan that changes the development code must also be consistent with the goals of the city's Comprehensive Plan

Building Code

- **Date of last revision:** January, 2005
- **Plan Owner:** Building Division
- **Plan Description:** The State Building Code's purpose is to set forth and coordinate city regulations governing the construction of buildings and infrastructure
- **Plan cycle:** Every three years. Plan reviewed every January
- **Relation to hazard mitigation:** Inspections of new construction are intended to ensure compliance with Building Code and development code provisions that relate to hazard mitigation

Goals and action items set forth in the Hazard Mitigation Plan are intended to address Statewide Planning Goal 7. Goal 7 assists the community in protecting life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards. Goal 7 requires that local governments base development plans on inventories of known areas of natural disasters and hazards and that the intensity of development be limited by the degree to which the natural hazard occurs within the areas of proposed development.

The Albany Building Division is responsible for administering the building codes in the city. After the adoption of the mitigation plan, they will work with the State Building Code Division to make sure that the city enforces the minimum standard established in the State Building Code. In addition, the Steering Committee will work with other

agencies at the state level to review, develop and ensure building codes that are adequate to mitigate or prevent damage by natural hazards. This is to ensure life-safety criteria are met for new construction.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, county, regional, state, federal agencies, utilities or other organizations.

City Programs

Strategic Plan

The City has chosen to use the vision, mission, capital elements and themes of its Strategic Plan for the Mitigation Plan. This will provide a better tie between the two plans and provide each with additional credibility. Individual objectives and actions will be developed for the Mitigation Plan and then tied back to the Strategic Plan through the Natural Hazard Mitigation Plan matrix.

Capital Improvement Plan

The City of Albany's Capital Improvements Plan (CIP) is a dynamic document that lists and prioritizes needed improvements and expansions of the City's infrastructure system to maintain adequate service levels to existing City residents and businesses, and to accommodate population growth and land development. The CIP reflects the needs and priorities established by the City and the resources available to the City. The CIP can be modified during the fiscal year through the supplemental budget process as needs, priorities, and resources change. The CIP can assist the City of Albany in mitigation against severe weather events by improving infrastructure most prone to damage.

Transportation System Plan

The City's of Albany's adopted Transportation System Plan identifies the transportation improvements needed to accommodate existing and future development in the City of Albany. The plan projects needs and improvements through 2015.

The City of Albany's adopted transportation plan is based on an analysis contained in the Transportation System Plan (TSP), which was developed through a public participation process. The development of the TSP and thereafter the more concise transportation element of the Comprehensive Plan, are closely coordinated and intended to be consistent with other jurisdictions' transportation plans. These include the State of Oregon, and Linn and Benton counties.

Emergency Operations Center (EOC)

The Emergency Operations Center is an established location/facility from which City staff and officials can provide direction, coordination, and support to emergency operations in the event of an incident such as a natural disaster. City personnel who are assigned to and trained for specific positions within the EOC organizational structure staff the EOC. The Structure is based on the National Incident Management System (NIMS) Incident Command System (ICS) as outlined in the National Response Plan (NRP).

The EOC staff provides information and recommendations to the EOC Manager, through the Incident Commander or as directed, to develop a course of action to respond to and contain, control, and recover from an emergency. Some of the primary functions performed at the EOC include: coordination, operations management, planning, information tracking and dissemination, logistical support, financial management and support, and emergency public information.

Emergency Response Plan

The Emergency Response Plan outlines the roles and responsibilities of the departments and personnel for the City of Albany during major emergencies or disasters.

The plan sets forth a strategy and operating guidelines adopted by the city for managing its response and recovery activities during disasters and emergencies.

The Emergency Response Plan consists of various sections and supporting materials. The development and maintenance of this plan is the basis of the City's emergency response and recovery operations.

1. **Basic Plan** – Provides an overview of the City's emergency response organization and policies. It cites the legal authority for emergency operations, summarizes the situations addressed by the plan, explains the general concepts of operations, and assigns general responsibilities for emergency planning and operations.

2. **Functional Annexes** – Explains, by individual city department, the roles that each have in the response to emergencies that might occur. These responsibilities are outlined in appendices which provide for scope, direction, responsibilities and what is to be accomplished.

3. **Hazard Specific Annexes** – These annexes provide additional detailed information and special considerations that are applicable to specific hazards. The annexes are to be used in conjunction with the basic plan and the functional annexes and appendices.

Economic Analysis of Mitigation Projects

For a complete outline of the city's approach to economic analysis refer to Appendix C of this Plan.

FEMA's approaches to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis and cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now, in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards can provide decision-makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

Given federal funding, the Hazard Mitigation Steering Committee chose a FEMA-approved benefit/cost analysis approach to identify and prioritize mitigation action items.

For other projects and funding sources, the Hazard Mitigation Steering Committee uses other approaches to understand the costs and benefits of each action item and develops a prioritized list.

Plan Maintenance

Plan maintenance is a critical component of the Natural Hazard Mitigation Plan. Proper maintenance of the Plan will ensure that this Plan will benefit Albany's efforts to reduce the risks posed by natural hazards. This section was developed by the University of Oregon's Oregon Natural Hazards Workgroup and presents a process to ensure that a regular review and update of the plan occurs. The Hazard Mitigation Advisory Committee (HMAC) and local staff will be responsible for implementing this process in addition to maintaining and updating the plan through a series of meetings outlined in the maintenance schedule below.

Table 5.1: Plan Maintenance Meeting Schedule

Semi-Annual Meeting	Annual Meeting	Five-Year Review
Coordinating Body	**Coordinating Body**	**Coordinating Body and City Council**
Review current actions and department progress	Update risk assessment data and findings	Review plan update questions
Identify new issues, needs and develop agenda for annual meeting	Discussion of methods of continued public involvement	Update plan sections as necessary
Prioritize potential projects and report progress to City Manager	Documenting successes and lessons learned	

Semi-Annual Meetings

The working committee will meet Semi-Annually to:

- Review current actions and department progress
- Identify new issues, needs and develop agenda for annual meeting
- Prioritize potential projects and report progress to City Manager

Annual Meeting

The Committee will meet on a semi-annual basis to:

- Review existing action items to determine appropriateness for funding;
- Identify issues that may not have been identified when the plan was developed; and
- Prioritize potential mitigation projects using the methodology described below.

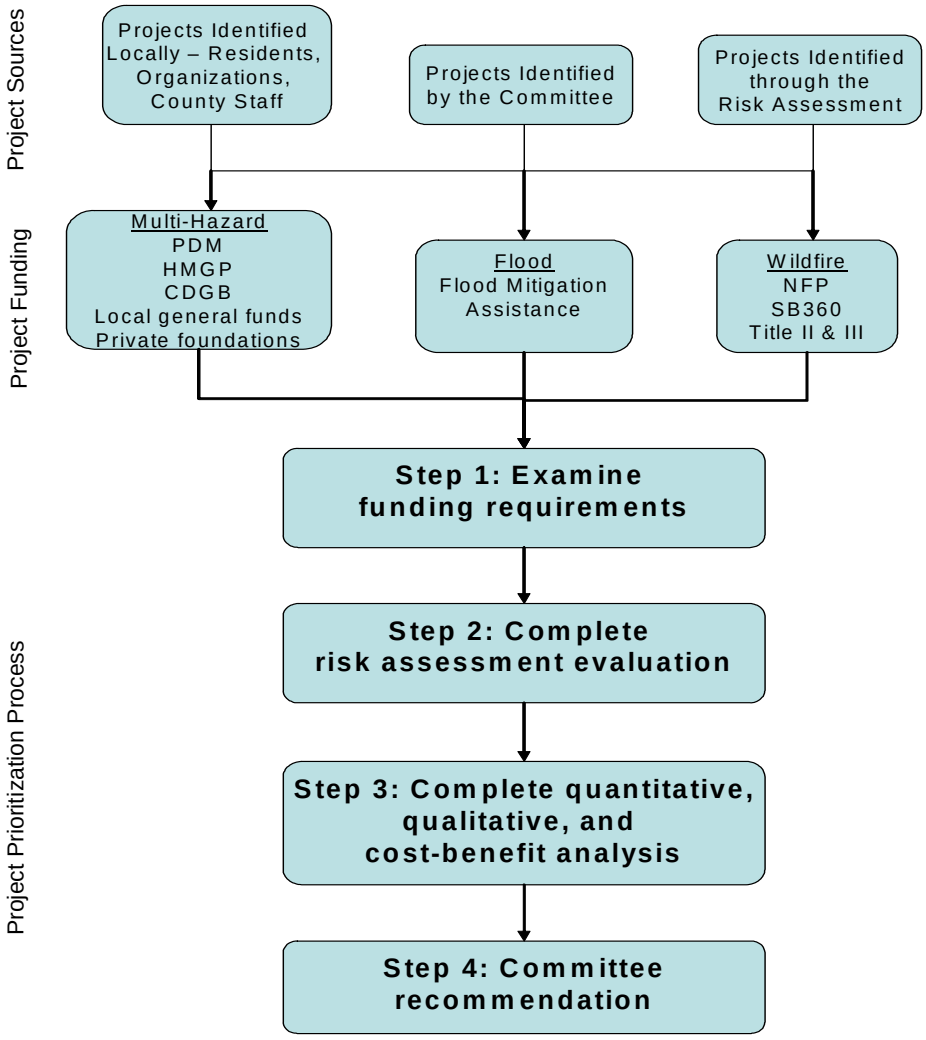
The convener will be responsible for documenting the outcome of the semi-annual meetings. The process the Committee will use to prioritize mitigation projects is detailed in the section below.

Project Prioritization Process

The requirements of Disaster Mitigation Act of 2000 through the Pre-Disaster Mitigation Program state that the Plan must identify a process for prioritizing potential actions. Potential mitigation activities will often come from a variety of sources; therefore project prioritization process needs to be flexible. Projects may be identified by committee members, local government

staff, other planning documents, or the risk assessment. Depending on the potential project's intent and implementation methods, several funding sources may be appropriate. Examples of mitigation funding sources include, but are not limited to: FEMA's Pre-Disaster Mitigation competitive grant program (PDM), Flood Mitigation Assistance (FMA) program, National Fire Plan (NFP), Title II funds, Title III funds, Community Development Block Grants (CDBG), local general funds, private foundations, among other. Some of these examples are used in the figure below to illustrate the project prioritization process. The prioritization process utilizes a four step process to prioritize activities to help ensure that mitigation dollars are used in a cost–effective manner.

Figure 5.1: Project Prioritization Process Overview



Source: ONHW/CPW, 2005

Step 1: Examine Funding Requirements

The committee will examine the selected funding stream's requirements to ensure that the mitigation activity would be eligible through the funding source. The committee may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organization about the project's eligibility.

Step 2: Complete Risk Assessment Evaluation

The second step in prioritizing the plan's action items was to examine which hazards they are associated with and where these hazards rank in terms of community risk. The committee will determine whether or not the plan's risk assessment supports the implementation of the mitigation activity. This determination will be based on the location of the potential activity and the proximity to known hazard areas, historic hazard occurrence, and the probability of future occurrence documented in the Plan. To rank the hazards, community's natural hazard risk assessment was utilized. This risk assessment identified various hazards that may threaten community facilities in a range from:

- No/Low
- Limited
- Moderate
- High
- Severe

The rank ordering of hazards by risk follows:

1. Flood
2. Earthquake
3. Severe Weather
4. Wildfire/Urban Interface Fire
5. Volcano Ash
6. Landslides

Each of the action items in the plan addresses risk from one or more of these hazards.

Step 3: Complete Quantitative, Qualitative Assessment, and Economic Analysis

Depending on the type of project and the funding source, either a quantitative or qualitative assessment of cost effectiveness will be completed to assist in prioritizing potential actions. Conducting benefit/cost analysis for a mitigation activity can assist communities in determining whether a project is worth undertaking now in order to avoid disaster-related damages later. Cost-effectiveness analysis evaluates how best to spend a given amount of money to achieve a specific goal. Determining the economic feasibility of mitigating natural hazards provides decision makers with an understanding of the potential benefits and costs of an activity, as well as a basis upon which to compare alternative projects.

If the activity is seeking federal funding for a structural project, the committee will use a FEMA-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. See *Appendix C: Economic Analysis of Natural Hazard Mitigation Projects* for a description of the FEMA-approved cost-benefit analysis. A project must have a benefit cost ratio of greater than one in order to be eligible for FEMA funding.

For FEMA-funded nonstructural projects or projects funded through entities other than FEMA, a qualitative assessment will be completed to determine the project's cost effectiveness. The committee will use a multivariable assessment technique called STAPLE/E to prioritizing these actions. STAPLE/E stands for Social, Technical, Administrative, Political, Legal, Economic, and Environmental. Assessing projects based upon these 7 variables can help define a project's

qualitative cost effectiveness. The STAPLE/E technique has been tailored for natural hazard action item prioritization by the University of Oregon's Oregon Natural Hazards Workgroup. See *Appendix C: Economic Analysis of Natural Hazard Mitigation Projects* for a description of the STAPLE/E evaluation methodology.

Step 4: Committee Recommendation

Based on the steps above, the committee will recommend whether or not the mitigation activity should be moved forward. If the committee decides to move forward with the action, the coordinating organization designated for the activity will be responsible for taking further action and document success upon project completion. Hazard Mitigation Advisory Committee will convene a meeting to review the issues surrounding grant applications and shared knowledge and or resources. This process will afford greater coordination and less competition for limited funds.

The Hazard Mitigation Advisory Committee and the community's leadership have the option to implement any of the action items at any time, (regardless of the prioritized order). This allows the committee to consider mitigation strategies as new opportunities arise, such as funding for action items that may not be of highest priority. This methodology is used by the Hazard Mitigation Steering Committee to initially prioritize the plan's action items in addition to maintaining the action list during annual review and update.

Annual Meeting

The committee will meet annually to review updates of the risk assessment data and findings, discuss methods of continued public involvement, and document successes and lessons learned based on actions that were accomplished during the past year. The convener will be responsible for documenting the outcomes of the annual meeting.

Five-Year Review of Plan

This plan will be updated every five years in accordance with the update schedule outlined in the Disaster Mitigation Act of 2000. During this plan update, the following questions should be asked to determine what actions are necessary to update the Plan. The convener will be responsible for convening the Committee to address the questions outlined below.

- Are the Plan goals still applicable?
- Do the Plan's priorities align with state priorities?
- Are there new partners that should be brought to the table?
- Are there new local, regional, state, or federal policies influencing natural hazards that should be addressed?
- Has the community successfully implemented any mitigation activities since the Plan was last updated?
- Have new issues or problems related to hazards been identified in the community?
- Do existing actions need to be reprioritized for implementation?
- Are the actions still appropriate given current resources?
- Have there been any changes in development patterns that could influence the effects of hazards?
- Have there been any significant changes in the community's demographics that could influence the effects of hazards?

- Are there new studies or data available that would enhance the risk assessment?
- Has the community been affected by any disasters? Did the Plan accurately address the impacts of this event?

The questions above will help the committee determine what components of the mitigation plan need updating. The Committee will be responsible for updating any deficiencies found in the plan based on the questions above.

Continued Public Involvement

The City of Albany is dedicated to involving the public directly in the review and updates of the Hazard Mitigation Plan. The Hazard Mitigation Steering Committee members are responsible for the annual review and update of the Plan.

The public will have the opportunity to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at all the appropriate agencies in the city. The existence and location of these copies will be publicized in the quarterly city newsletter which reaches all of the homes in the city. The Plan also includes the address and the phone number of the city's Emergency Management Division, which is responsible for keeping track of public comments on the Plan.

In addition, copies of the plan and any proposed changes will be posted on the City and Oregon Natural Hazard Workgroup (ONHW) Web sites. This site will also contain an email address and phone number to which people can direct their comments and concerns.

The Mitigation Action Items will be a part of many city documents in which the public will be provided an opportunity to review and provide input on. These include the budgeting process, Capital Improvement Program review, Strategic Plan review and all of the goals and objectives developed by the individual departments. All public meetings where portions of the Mitigation Plan are discussed will provide the public a forum for which they can express concerns, opinions, or ideas about the plan and parts of it. The City Public Information Officer will be responsible for using city resources to publicize meetings where the public can provide input and to maintain public involvement through the Web page and newspapers.

Section 6:
Flood

Why are Floods a Threat to the City of Albany

The City of Albany is subject to flooding from several different sources which include:

1. The Willamette River, Calapooia River, Oak Creek, Periwinkle Creek, Cox Creek, Burkhart Creek, Truax Creek, and the Santiam-Albany Canal.
2. Local storm water drainage.

Flooding on streams and rivers in Albany generally results from large winter storms from the Pacific. Often the heavy rainfall comes at the same time snow-melt runoff is occurring. These large winter storms often result in simultaneous flooding on all rivers and streams in an affected area. Historically, most major floods in Albany have occurred in the months of December, January and February, although flooding in other months is possible

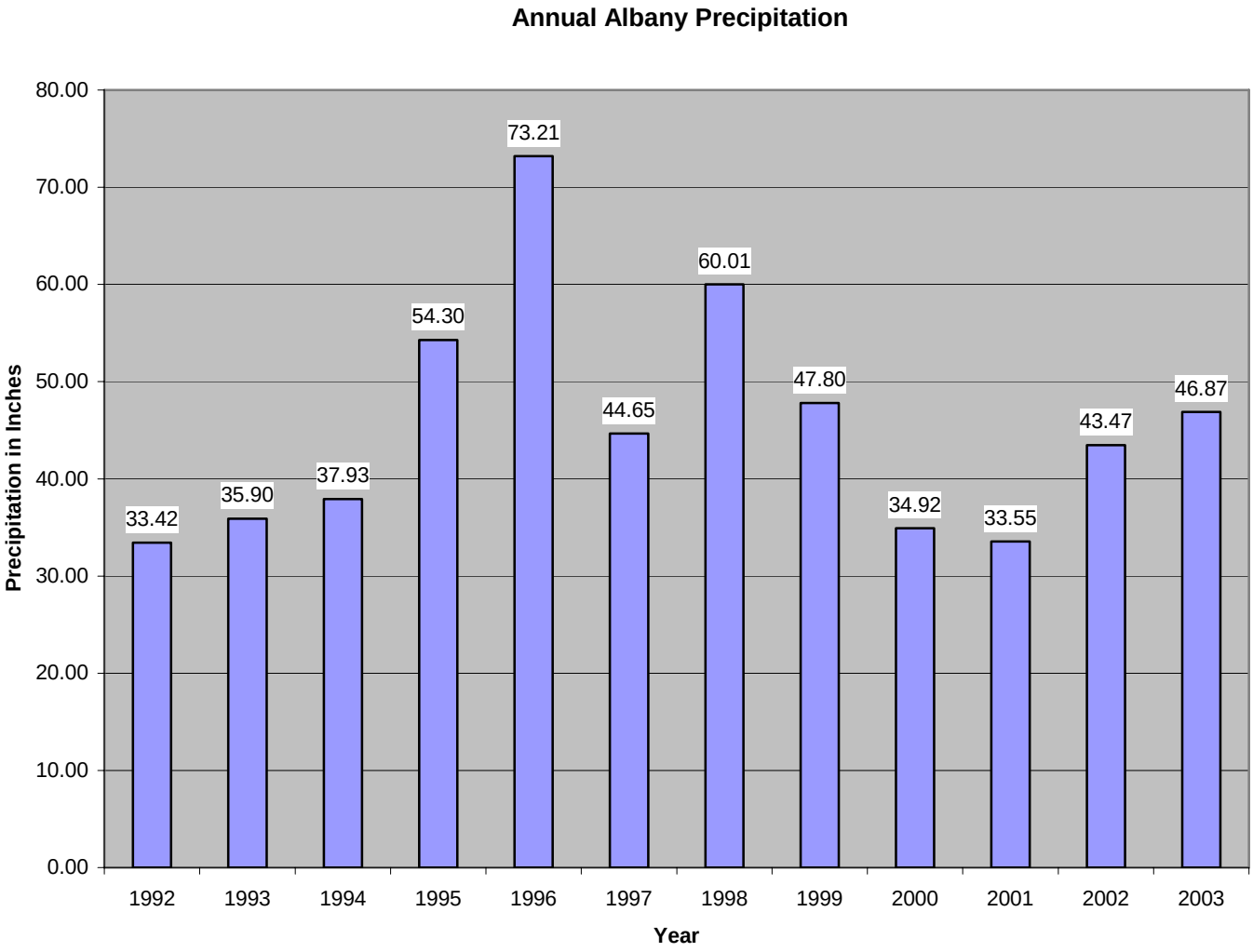
Flood records for the City of Albany indicate there is no regular pattern, such as once every 10 or 20 years, in which floods occur. Heavy rains which saturate the ground and fill the rivers and creeks coupled with warming weather that melts heavy snow in the mountains and foothills create the major flooding that Albany has seen over the last 150 years. The last major flooding took place in 1964 and 1996. Before these floods, major events occurred in 1943 and 1945 and are the only examples of flooding to have occurred within a three year period. These floods took place before the dams were built on the rivers up stream of the city.

Flood Characteristics and Terminology

Precipitation

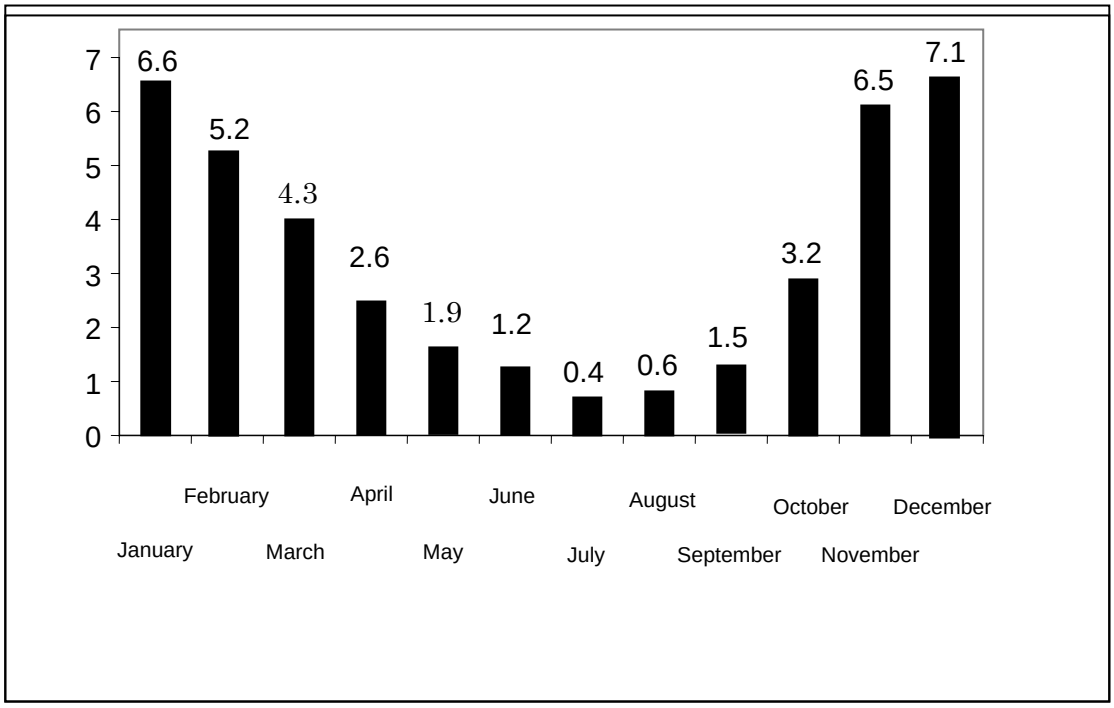
The climate of the Willamette Valley is relatively mild throughout the year, characterized by cool, wet winters and warm, dry summers. Albany is about 70 miles from the Pacific Ocean, which provides a modified marine climate. Extreme summer and winter temperatures are moderated by the airflow moving across the area from the Pacific Ocean. The Cascade Mountains to the east of Albany act as a barrier that prevents the colder continental air masses originating in the arctic areas of Canada from reaching Albany. Occasionally, extreme temperatures can occur when the airflow comes in from the east. Temperatures rarely exceed 95° F in the summer months (April – August) and rarely drop below 25° F in the winter months (September – March). The average growing season is about 150 – 180 days in the lower valley. Precipitation ranges from as low as .33 inches in July to as high as 7.05 inches in February with the average yearly rainfall being about 40.14 inches per year. Snowfall since the mid 1960's has occurred between November and March.

Figure 4.1 Annual Rainfalls for City of Albany, Oregon 1992 - 2003



Source: Western Regional Climate Center

Figure 4.2 Average Monthly Rainfalls for City of Albany, Oregon



Source: Western Regional Climate Center

Geography

The City of Albany has an area of 17.5 square miles with an Urban Growth Boundary of 21.7 square miles. Its present population is approximately 45,000 and is situated in both Linn and Benton counties. The city is located in the central Willamette Valley along Interstate 5, 25 miles south of Salem, and 45 miles north of Eugene. Albany is located on the Willamette River.

The elevation of Albany ranges from 210 to 521 feet above sea level and is nestled between the Coast Range and the Cascade mountain range. Albany sits on mostly flat level land with some hills located in the northern part, in Benton County. Bottomland hardwood forests once dominated much of the Willamette River floodplain. Native grasslands and prairie stretched out across the valley floor. Oak savannas and conifer forests covered the hills in North Albany and on Knox Butte.

Albany has a short, dry, temperate growing season which is ideal for many specialized crops such as seeds (grasses, flowers, and vegetables), tree fruits, nursery stock, nuts, berries, mint and grains.

Soils

The majority of the soils west of Interstate 5 are loam and silty loam with poor drainage and a high water table. Soils immediately adjacent to Periwinkle and Oak creeks are clay and silty clay with severe construction limitations because of poor drainage, compressibility, and location in flood-prone areas.[1]

The soils of North Albany are similar silty loams and silty clay loams with areas which are moderately deep, moderately well-drained to somewhat poorly drained, and areas which are deep, moderately well-drained to somewhat poorly drained, and areas which are deep, moderately well-drained to well-drained.[2]

The soil pattern of the East Albany neighborhood is more complicated with linear strips of clay loam intermixed with gravelly and stony loam and some silty loam.[3]

The clay-rich soils and generally flat topography found within the Albany Urban Growth Boundary combine with the alternating wet/dry weather cycle to produce poor drainage conditions throughout the area. These soil conditions result in ponding, a perched water table, and some localized flooding during the winter, which limits construction methods and septic tank use. Disturbance of the natural drainage patterns and the removal of protective vegetative ground cover by urban development and upstream agricultural and forest practices have aggravated these soil conditions and have increased surface runoff.

Generally, soils within the Albany area are of low permeability. The infiltration rate of rainwater is slow and flat surfaces provide no natural gradient for the resulting overland runoff. Ponding occurs when soaked soils can no longer absorb heavy amounts of rainwater or when the rising groundwater table has actually surfaced.

Nearly all of the area soils are subject to severe shrink-swell limitations. These clay soils dry out and crack in summer months and then with the first winter rains swell shut and become impermeable, thus increasing surface runoff.

There are 14 drainage basins within the urban growth boundary area. Four of these basins are within the North Albany portion of the Urban Growth Boundary while the remaining ten encompass the remainder of the Urban Growth Boundary. The Oak Creek drainage area, containing four basins, extends into the foothills beyond the cities of Lebanon and Sodaville. Periwinkle Creek is one of the largest and most developed drainage areas within the Urban Growth Boundary area. This area is divided into four basins. The Truax, Burkhart and Cox Creek basins are currently largely undeveloped, with the majority of the basins outside the Urban Growth Boundary. The Calapooia River Basin is located in the western portion of the city and Linn County.

Together, the bedrock structure and the alluvial deposits have given the Albany area a generally flat topography. Slopes south and east of the Willamette River are less than three percent. However, North Albany has more hilly terrain with ridges and valleys resulting from the underlying sandstone pediment. Twenty-five percent of the land in North Albany has slopes of more than 15 percent. Extensive development on these slopes could cause soil slippage and increased erosion. Such problems can be minimized through retention of vegetative cover, particularly trees, and by ensuring that any development uses good engineering practices such as following contours as much as possible and replacing lost vegetation around building sites

Albany is centrally located on the broad alluvial plain of the Willamette Valley. The alluvial soils of the valley overlay thick bedrock of many mixed layers of consolidated volcanic

material, basalt, and marine sandstone. Throughout most of the Albany area, the alluvial deposition consists predominantly of deep, silty loam and clay soils overlaying a number of old river terraces of pebbles and cobbles, gravels, sand and clay. These river terraces surface in the northeast portion of the Urban Growth Boundary where the soils are much thinner than elsewhere.

Poor drainage caused by relatively flat topography, a high water table, and a clay-rich subsurface has determined soil capability. Drainage channels and land immediately adjacent to them are generally Class III and IV soils. Because of the many drainage ways in the Albany area, there are few large expanses of Class I and II soils except in North Albany.

Ninety-eight percent of the soils within the Albany Urban Growth Boundary are classified by the Soil Conservation Service as I-IV soils, capable of supporting a wide variety of crops and forage for livestock. Most of the soils in Albany are distributed in a complex mottled pattern throughout the area.

Floodplain Terminology

Base Flood

In Albany, the base flood is a major flood that has a one percent chance of being equaled or exceeded in magnitude in any given year. It is commonly referred to as a 100-year flood. However, it is not a flood occurring once every 100 years.

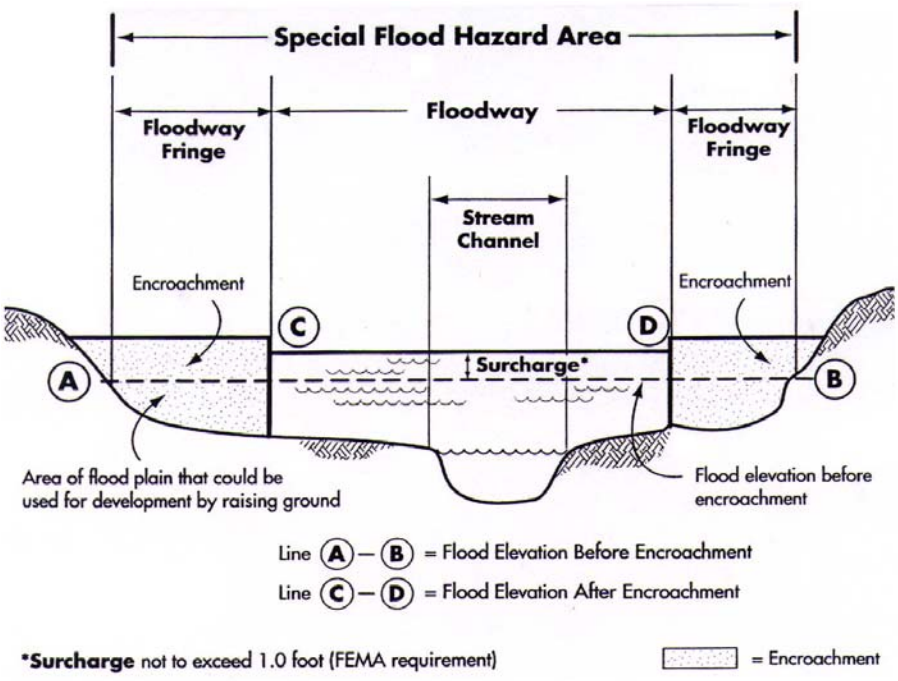
Floodplain

A floodplain is a land area adjacent to a river, stream or lake that is subject to inundation by a minimum of one foot of water during the base flood. This area, if left undisturbed, acts to store excess floodwater. The floodplain is made up of two sections: the floodway and the flood way fringe. For regulatory purposes, the floodplain is also referred to as a Special Flood Hazard Area.

Floodway

The floodway is one of two main sections that make up the floodplain. Floodways are defined for regulatory purposes. Unlike floodplains, floodways do not reflect a recognizable geologic feature. Under the National Flood Insurance Program (NFIP), floodways are defined as the channel of a river or stream, and the over bank areas adjacent to the channel. The floodway carries the bulk of the floodwater downstream and is usually the area where water velocities and forces are the greatest. NFIP regulations require that the floodway be kept open and free from development or other structures that would obstruct or divert flood flows onto other properties.

Figure 6-2. Floodplain Schematic



Source: Floodplain Management in Missouri. (March 1999) Missouri Emergency Management Agency

Flood Way Fringe

The flood way fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. NFIP regulations allow the flood way fringe to be completely filled and used for development. Albany has adopted this approach. However, in some areas of Albany, the flood way fringe has been set aside as open space and is not available for filling or development.

Base Flood Elevation (BFE)

The term "base flood elevation" refers to the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum of 1929.[4] In Albany, base flood elevations are set for the 100-year flood. Some communities choose to use higher frequency flood events as their base flood elevation for certain activities, while using lower frequency events for others. For example, for the purpose of storm water management, a 25-year flood event might serve as the base flood elevation, while the 500-year flood event may serve as base flood elevation for the tie down of mobile homes. The regulations of the NFIP focus on development in the 100-year floodplain.[5]

Types of Flooding in the City of Albany

Two types of flooding primarily affect the City of Albany: *riverine* flooding and *local* flooding.

Riverine Flooding

Rivers and creeks in Albany regularly overflow their banks and inundate low-lying areas. The natural processes of riverine flooding add sediment and nutrients to fertile floodplain areas.

Flooding in large river systems typically results from large-scale weather systems that generate prolonged rainfall over a wide geographic area, causing flooding in hundreds of smaller streams, which then drain into the major rivers.

Riverine flooding along the Willamette River is a significant issue in Albany, particularly North Albany. The bank on the south side of the Willamette River is high enough to prevent over bank flooding in most of downtown Albany during the 100-year flood. However the bank on the north side is low enough to allow more frequent over-bank flooding. The floodplain extends north into North Albany across Thornton Lake to the base of Spring Hill. During high water events, flood water backs into the east end of Thornton Lake, causing an apparent "reverse flow" through the lake from east to west. As flood waters continue to rise, it breaches the west end of Thornton Lake, reversing the flow from west to east. Much of the North Albany floodplain is developed for residential and commercial use. Continued development relies on fill to avoid flood hazards.

Along the Calapooia River, over-bank flooding occurs most every winter. Urbanized areas of Albany are perched on a terrace above the 100-year floodplain. Most flooding occurs on rural farmland to the west of Albany.

Oak Creek has a shallow, wide floodplain, much of which is floodway. Periwinkle Creek, Cox Creek, Burkhart Creek, and Truax Creek were deepened and straightened as flood control projects by the former Soil Conservation Service. The capacity of the creek channels was increased to contain the 100-year flood. Consequently, over-bank flooding along these four creeks is rare.

Local Flooding

Flood damage may occur in areas outside the 100-year floodplain and away from riverine flooding conditions. Local flooding problems are caused by blocked culverts, shallow ditches, or locally intense rainfall. In the terms of the National Flood Insurance Program, these are areas of 1-percent annual chance sheet flow flooding where average depths are less than one foot, or areas of 1-percent annual chance stream flooding where the contributing drainage area is less than one square mile.

What is the Effect of Development on Floods?

When structures or fill are placed in the floodplain, water is displaced. Development raises the base flood elevation by forcing the river to compensate for the flow space obstructed by the inserted structures and/or fill. If left unobstructed, the floodway is designed to compensate for fill in the flood fringe by carrying displaced floodwater. Careful attention must be paid to development that occurs within the floodway to ensure that structures are prepared to withstand base flood events without exacerbating flood levels.

Flood Risk Assessment

Flood Hazard Profile

Section 201.6(c)(2)(*i*) of the Disaster Mitigation Act of 2000 requires that the risk assessment include a description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Location and Extent of Flood Hazards

How are Flood-Prone Areas Identified?

Albany relies on flood insurance rate maps and the Albany Flood Insurance Study to identify flood-prone areas. These were produced for Albany in conjunction with the National Flood Insurance Program (NFIP). The NFIP was established in 1968 as a means of providing low cost flood insurance to the nation's flood-prone communities. The NFIP also reduces flood losses through regulations that focus on building codes and what we have come to know as "sound floodplain management."[6] In Albany, the NFIP and related building code regulations went into effect in 4/3/85. NFIP regulations (44 Code of Federal Regulations (CFR) Chapter 1, Section 60.3) require that all new construction in floodplains must be elevated at or above base flood level. The Oregon Building Code requires new construction to be elevated to one foot above the base flood elevation.

Communities participating in the NFIP may adopt regulations that are more stringent than those contained in 44 CFR 60.3, but not less stringent.[7] In the City of Albany, all homes and other buildings legally constructed in the floodplain after 4/3/85 must be mitigated to NFIP standards with the first floor being elevated at least one foot above base flood level, or in the case of non-residential buildings, flood proofed to at least one foot above the base flood level.

FIRM Maps and Flood Insurance Studies

Floodplain maps are the basis for implementing floodplain regulations and for delineating flood insurance purchase requirements. A flood insurance rate map (FIRM) is the official map produced by the Federal Emergency Management Agency (FEMA), which delineates special flood hazard areas or floodplains where National Flood Insurance Program regulations apply. The maps are also used by insurance agents and mortgage lenders to determine if flood insurance is required and what insurance rates should apply.

The City of Albany uses the FIRM to advise prospective homeowners of flood hazards; to locate zoning boundaries that separate developable land from open space; to make decisions for new development in floodplains; and to administer the terms of the NFIP during the issuance of building permits.

For mapped floodplain areas, the flood hazard data included in the flood insurance study (FIS) allow quantitative calculation of the frequency and severity of flooding for any property within the floodplain. Such calculations are very important for mitigation planning, because they allow the level of flood risk for any structure to be evaluated quantitatively.

Standard hydrologic and hydraulic study methods were used to determine the flood hazard data contained in the FIS. Flood events of a magnitude which are expected to occur once on average every 10-, 50-, 100-, and 500-year period were studied for each of Albany's rivers and creeks.

For example, the following data was computed for the Willamette River at the river gauge under the Ellsworth Street Bridge:

Table 6.3, Flood Hazard Data for the Willamette River at the Ellsworth Street Bridge

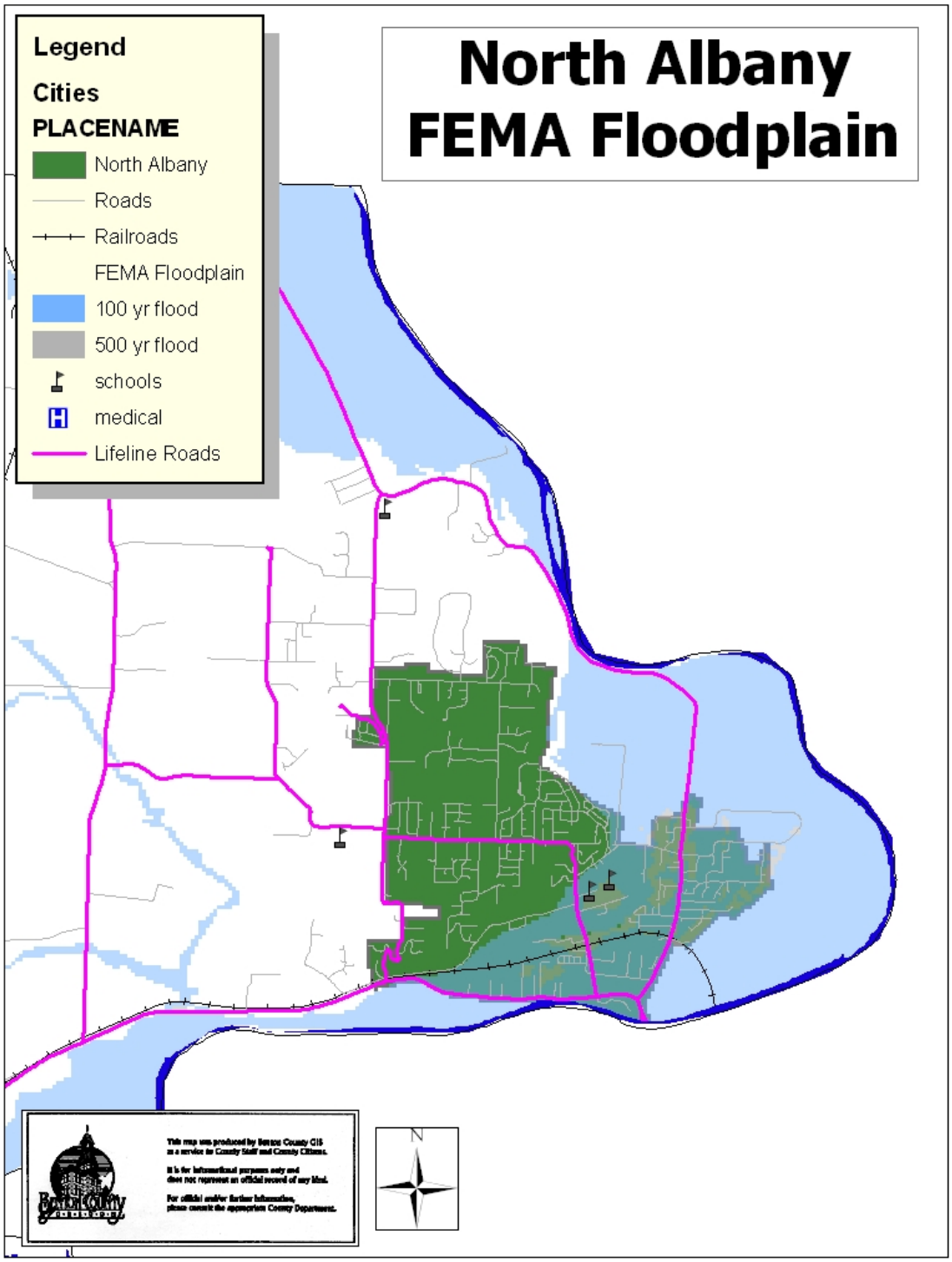
Flood Frequency (years)	Discharge (cfs)	Elevation (feet)
10	**117,000**	**195.9**
50	**172,000**	**200.1**
100	**200,000**	**202.2**
500	**272,000**	**206.0**

Source: Flood Insurance Study, City of Albany, Oregon (1999)

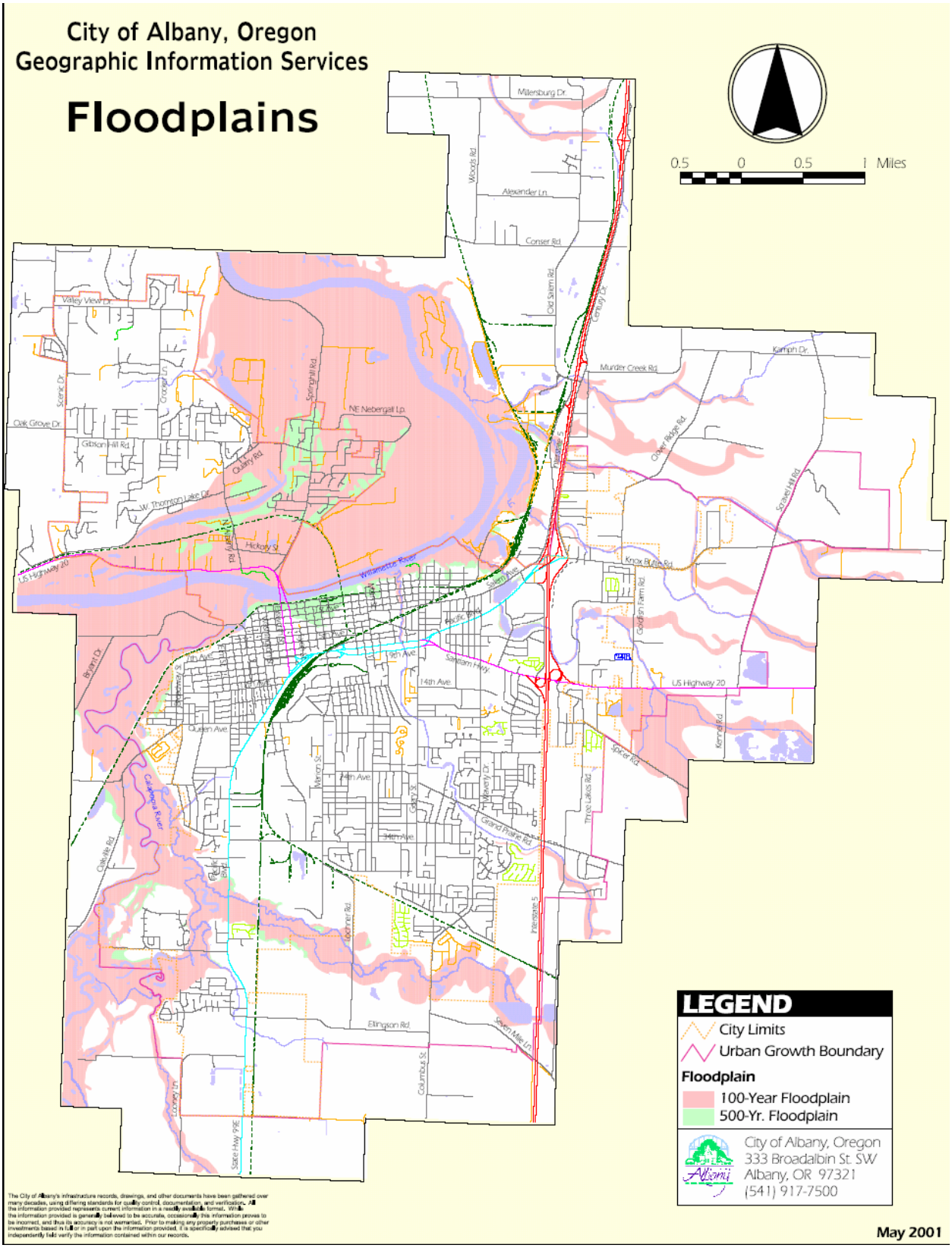
The stream discharge data shown above are from the table on page 11 of the FIS for Albany, for the Willamette River stream gauge at river mile 119.33, just downstream from the confluence of the Calapooia River. Stream discharge means the volume of water flowing down the river and is typically measured in cubic feet of water per second (cfs). The flood elevation data are from the flood profile graph 1P in the FIS. The U.S. Army Corps of Engineers operates eight flood control storage projects upstream from Albany on major tributaries of the Willamette River. These dams control runoff from approximately one-half of the drainage area upstream from Albany. The influence of these dams was taken into account when calculating river discharge figures above.

Quantitative flood hazard data, such as shown above, are very important for mitigation planning purposes because they allow quantitative determination of the frequency and severity (i.e., depth) of flooding for any building or other facility (e.g., road or water treatment plant) for which elevation data exist. For example, a building located on North Albany Road in this vicinity (cf. Table 6.3 above), with a first floor elevation of 196 feet is expected to flood about once very 10 years, on average. Fifty year, 100-year, and 500-year flood events would result in about 4.1 feet, 6.2 feet and 11 feet of water above the first floor, respectively. Thus, such a structure would demonstrably be at significantly high flood risk. However, another structure in the same vicinity with a first floor elevation of 200 feet would still be at flood risk, albeit at a much lower level of risk, with flooding above the first floor about once every 50 years, on average.

Such quantitative flood hazard data also facilitate detailed economic analysis (e.g., benefit-cost analysis) of mitigation projects to reduce the level of flood risk for a particular building or other facility.



Source: Benton County Natural Hazard Mitigation Plan


City of Albany, Oregon
Geographic Information Services
Floodplains
0.5 0 0.5 1 Miles
LEGEND
City Limits
Urban Growth Boundary
Floodplain
100-Year Floodplain
500-Yr. Floodplain
City of Albany, Oregon
333 Broadalbin St. SW
Albany, OR 97321
(541) 917-7500
May 2001

Flood Mapping Methods and Techniques

The use of GIS (Geographic Information Systems) is becoming an important tool for flood hazard mapping. FIRM can be imported directly into GIS, which then allows for GIS analysis of flood hazard areas. Communities find it particularly useful to overlay flood hazard areas on tax assessment parcel maps. However, as the original mapping efforts by FEMA in the 1980's did not contain adequate horizontal controls, any such overlay is subject to significant error. Local communities have found that the only useful mapping information is the water elevation and cross section locations contained in the flood studies. This information can be added to topography maps that more accurately define the areas prone to flood hazard. This allows a community to evaluate the flood hazard risk for a specific parcel during review of a development request.

Coordination between FEMA and local planning jurisdictions is the key to making a strong connection with GIS technology for the purpose of flood hazard mapping.

The level of flood hazard (frequency and severity of flooding) is not determined simply by whether the footprint of a given structure is or is not within the 100-year floodplain. A common error is to assume that structures within the 100-year floodplain are at risk of flooding while structures outside of the 100-year floodplain are not. Some important guidance for interpreting flood hazard is given below.

A. Being in the 100-year floodplain does not mean that floods happen once every 100 years. Rather, a 100-year flood simply means that the probability of a flood to the 100-year level or greater has a 1% chance of happening every year.

B. Occasional flooding happens outside of the mapped 100-year floodplain. First, the 100-year flood is by no means the worst possible flood. For example, for flooding along the Willamette River in North Albany, the 500-year flood is nearly four feet higher than the 100-year flood (cf. data in Table 6.3 above). Thus, floods greater than the 100-year event will flood many areas outside of the mapped 100-year floodplain. Second, many flood prone areas flood because of local storm water drainage conditions. Such flood prone areas have nothing to do with the 100-year floodplain boundaries.

C. The key determinant of flood hazard and flood risk for a structure or other facility is the relationship of the elevation of the structure or facility to the flood elevations for various flood events. Thus, homes with first-floor elevations below or near the 10-year flood elevation have drastically higher levels of flood hazard and risk than other homes in the same neighborhood with first-floor elevations near the 50-year or 100-year flood elevation.

The FEMA FIRMs use a variety of nomenclature to describe different types of flood-prone area and flood plain classifications have changed over time. For reference, definitions of some important flood plain terms commonly used on FIRMs are given below. On Albany FIRMs, the following terms are used:

1. **Zone AE**, within the 100-year floodplain, with base flood elevation (100-year flood) and detailed flood hazard data.

2. **Zone X (shaded)**, areas of 500-year flood, areas of 100-year flood with average depths less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 100-year flood.

3. **Zone X (un-shaded)**, areas outside 500-year flood plain.

Previous Occurrences of Flood Events

The rainy season in western Oregon runs from October through May. Strong storm systems develop in the upper-level flow over the Pacific Ocean during the rainy season, bringing rain to the lower elevations and snow to the higher elevations. Occasionally, a sub-tropical feed of moisture, often referred to as the Pineapple Connection, will be tapped by the stronger storms. The Pineapple Connection is just a term used to describe a continuous stream of upper level moisture originating from the tropics, often near Hawaii. This stream of moisture is warm and as a result the air can hold more moisture. The subtropical moisture will enhance the precipitation process in the storms, producing more precipitation than would normally be expected. Flooding can occur if the storms move across the same area in succession, with heavy snow falling in the higher terrain. There is at least one subtropical connection that brings heavy rain to some part of the Pacific Coast nearly every year. The key to how much precipitation falls during a storm is closely related to how strong and persistent the subtropical connection is.

The U.S Geological Survey Gauging Station is located on the Willamette River at Albany, Mile 119.3. Bank full stage is 21.2, which equates to 188.4 feet of elevation above sea level. Flood stage at this location is 25 feet or 192.2 above sea level. One of the largest floods in Albany's history occurred in December 1861. The flood peaked at approximately 208 feet above sea level which would be 41 feet river stage. Between 1878 and 1970, 73 events occurred in Albany that were at or above bank full stage (21.2 feet). The eleven greatest observed floods during that time were:

Date	River Stage
December, 1861	41.0
February 4, 1890	39.1
January 14, 1881	38.0
January 26, 1903	36.5
January 15, 1901	36.4
November 24, 1909	36.1
February 6, 1907	35.8
January 2, 1943	35.7
January 8, 1923	35.0
December 30, 1945	35.0
February 22, 1927	34.2

The flood of 1964 did not make this list. This flood is the flood most residents remember. It crested at 201 feet elevation, which is 34 feet river stage. Had the upstream dam regulations not been in place, the 1964 flood would have been as high as the December 1861 flood, 16 feet above flood stage.

The last significant flood occurred in February 1996. At that time the river crested at 30 feet river stage or 197.2 feet above sea level. This flood did damage to the low areas in the city, particularly in North Albany where it isolated a community by flooding all the roads into the area. This flood became a Presidential Declared Disaster that impacted most of Oregon. Since that time, there has not been significant flooding in or around Albany. The Army Corps of Engineers indicate that without flood control on the river, the flood water would have been 5 to 6 feet higher. This would have put the flood waters at 36 feet flood stage, 203 feet elevation, or equivalent to the fourth, fifth, or sixth greatest flood in Albany's history.

Repetitive Flood Losses in the City of Albany

Repetitive loss is a term that is usually associated with the National Flood Insurance Program (NFIP). Albany participates in the Community Rating System (CRS) which uses the term for any property on which the NFIP has paid two or more flood claims of at least $1,000 in any 10-year period. Repetitive loss structures are important to the NFIP since structures that flood frequently put a strain on the flood insurance fund. On a local level, the structures are also important because residents' lives are disrupted and may be threatened by the continual flooding. Albany has had eight flood insurance claims since 1980. There is one repetitive loss structure.

Probability of Future Flooding Events

It is very likely another flood will occur equal the 1964 or 1996 floods. When this significant flooding will occur is very difficult to predict, since many factors need to come together to create a major flood for this area.

Flood Hazard Vulnerability: Identifying Assets

Section 201.6(c)(2)(*ii)*(A) of the Disaster Mitigation Act of 2000 requires that the risk assessment include a description of the jurisdiction's vulnerability to the hazard. This description shall include an overall summary for the hazard and its impact on the community. If best available data allows, vulnerability should be described in terms of the type and number of existing and future buildings, infrastructure, and critical facilities located in identified hazard areas.

City of Albany Vulnerability Summary

Since the dams were built upstream of the City of Albany, the community is at little risk to major flood event. The 1964 flood did major damage to areas around the City of Albany. Since then, mitigation activities have been implemented to assure similar flooding does not take place in the future.

The south side of the Willamette River is quite high in relation to the north side. It would take a large flood to do any damage to the core of the city. The north side of the Willamette River is where most of the mitigation activity has taken place. The positive effect of this work could be seen in the 1996 flood where most areas in North Albany were not affected by the flood waters, but more work needs to be done to elevate the roads above the 100 year flood level in that area.

The roads were the major problems during the 1996 flood. Some structures were affected by river flooding.

Drainage flooding in the east and north part of the city did damage to quite a few homes in these areas. Since the 1996 flood, a number of mitigation projects have taken place that will assure these types of flooding do not occur in the future.

Even though the 1964 flood produced the greatest flood loss in the last 50 years in Albany, details of damage from the 1964 event are sketchy and unreliable for mitigation planning purposes. Instead we rely on our experience from the 1996 flood to give us some notion of our vulnerability to flood hazard, realizing that the 1996 event was something less than a 100-year event.

Community Flood Impacts

Property Loss Resulting from Flooding Events

The type of property damage caused by flood events depends on the depth and velocity of the floodwaters. Faster moving floodwaters can wash buildings off their foundations and sweep cars downstream. Pipelines, bridges, and other infrastructure can be damaged when high waters combine with flood debris. Extensive flood damage can be caused by basement flooding and landslide damage related to soil saturation from flood events. Surface water entering into crawlspaces, basements, or daylight basements is common during flood events, not only in or near floodplains, but also on hillsides and other areas that are far removed from floodplains. Most flood damage is caused by water saturating materials susceptible to loss (e.g., wood, insulation, wallboard, fabric, furnishings, floor coverings, and appliances). Most of the losses in the 1996 floods were due to saturation damage.

Private property flood issues

Homes

Housing losses accounted for the largest share of private property damage during the 1996 flood events.[8] In Albany, flood damage claims were filed for two homes. With total damage for both homes estimated to be $11,000. Remembering that the 100-year flood will be five feet above 1996 flood, it is likely that far more homes will be inundated when the 100-year flood occurs. In Albany, more than 600 homes with more than 1,500 residents are situated in the 100-year floodplain.

Business and Industry

Flood events impact businesses by damaging property and by interrupting business. Flood events can cut off customer access to a business as well as close a business for repairs. In Albany, no businesses were inundated by flood waters in 1996, but business interruption was common because flooded roads and highways reduced the work force and stopped the movement of goods and supplies for several days. A quick response to the needs of businesses affected by flood events can help a community maintain economic vitality in the face of flood damage. Responses to business damages can include funding to assist owners in elevating or relocating flood-prone business structures.

Public Infrastructure

Publicly-owned facilities are a key component of daily life for all citizens of Albany. Damage to public water and sewer systems, transportation networks, flood control facilities, emergency

facilities, and offices can hinder the ability of the government to deliver services. Government can take action to reduce risk to public infrastructure from flood events, and to craft public policy that reduces risk to private property from flood events. During the 1996 flood roads were the primary infrastructure affected by the flooding. The roads affected were located in north Albany, along the Willamette River, and in east Albany where Interstate 5 was shut down due to high water. The problem which caused the I-5 closure has been mitigated. The operation of the water treatment and waste water treatment plants continued during the flooding. All public facilities continued to operate with only a few city parks which are located in the flood plain being affected.

Buildings and Roads

Of particular importance during flood events are critical facilities located in flood hazard areas (i.e., facilities that are critical to government response and recovery activities). During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. For the City of Albany, no public building was directly affected by the flooding which occurred in 1996. The only roads within the city affected by the flood were Quarry, Springhill, and Interstate 5. Several roads outside the city flooded and did have an impact on traffic patterns in the local area, but caused no major traffic problems.

Bridges

Bridges are key points of concern during flood events for two primary reasons:

(1) They are often important links in road networks, crossing water courses or other significant natural features; and,

(2) They can be obstructions in watercourses, inhibiting the flow of water during flood events.

During the flood of 1996, in the City of Albany, there were no major problems with bridges creating obstructions in the watercourses. There was one overtopping which took place on Interstate 5 where the water backed up due to insufficient sizing of a drainage pipe under a railroad track. This caused the water to back up in the creek and flooded the interstate. This problem was corrected after the flood with the cooperation of state and local governments and the railroad owners. No critical facilities or high employment centers were impacted by bridge problems in Albany.

Storm Water System

The city's storm water system is considered by the state as separated from the wastewater treatment system. Most storm water will run into local creeks, streams and rivers in and around the city. All water from this system will ultimately end up in the Willamette River. The higher the river, the more difficult it is for storm water run off to make it to the river. In 1996, because the Willamette River reached five feet above flood stage, there were some street flooding problems with storm water back up. This situation was not a major problem in the city.

Water Treatment Facility

The city's historic water treatment plant is located high above the Calapooia River near where it enters the Willamette River. Because of this location, the facility is not prone to flooding. In the 1996 flooding the plant was affected by run offs into the canal, which brings water to the plant intake. Because water was coming in from local farm fields, the water was extremely dirty, which required adjustments in purification. At no time was the treatment plants shut down due to direct flooding. The city now has two water sources and treatment facilities which will

provide redundancy and provide alternatives during high water situations. The city has a second treatment plant, which is co-owned with the city of Millersburg and is located in Millersburg. The intake and pump station is located at the confluence of the North and South Santiam and the treatment facility is located above ground level. One hundred year flood considerations were taken into account when the intake, pump station and treatment facility were designed.

Wastewater Treatment Facility

The City of Albany wastewater treatment plant is partially located within the 100 year flood plain. In the 1996 flooding, the water did not get high enough to shut down the plant. However, a number of pumping stations were inoperable due to flooding in local vaults throughout the city. The treatment plant will be completely updated in the year 2009. The design for this upgrade is taking into consideration its location in relation to the 100 year flood plain. One of the additions which will take place will be the increase in head flow which will allow water to flow into the Willamette Rive even during major flooding events. Also some present sites will be elevated during the upgrade to account for the plants location and operational effectiveness.

Floods and Natural Systems

Maintaining and restoring natural systems helps mitigate the impact of flood events on the built environment. Flooding changes the natural environment and hydrology of an affected area. High water can be beneficial to the natural processes within a floodplain, and can benefit riparian areas.

Parks and Open Space

Albany's Park, Recreation & Open Space Plan (April 2000), notes that natural open space areas "are important for a variety of reasons including flood storage, habitat protection, runoff reduction, etc." The plan identifies open space resources along Horseshoe Lakes, Thornton Lakes, Truax Creek, Cox Creek, Calapooia River, Oak Creek, and Burkhart Creek which should be preserved through acquisition. The City has 271 acres of open space corridor along the Willamette Greenway, Takena Landing Park, and Periwinkle Creek. The plan suggests that "natural open space should be designed and managed … as a means of separation between uses … or to protect and preserve the environment." The plan advises that "improvements should be kept to a minimum, with the natural environment, interpretive, and educational features emphasized." The plan will be updated December 2005 and will rely less on open space acquisition by the city to protect these resources.

Riparian Areas

Riparian areas are important transitional areas, which link water and land ecosystems. Vegetation in riparian areas is dependent on stream processes, such as flooding, and often is composed of plants that require large amounts of water such as willow and cottonwood trees. Healthy vegetation in riparian buffers can reduce streamside erosion.[9] During flood events, high water can cause significant erosion. Well-managed riparian areas can reduce the amount of erosion and help to protect water quality during flood events. Albany relies on Open Space zoning and natural area acquisition as described in the Park, Recreation & Open Space Plan (April 2000) as the primary tools for protecting riparian areas. Restoration of riparian areas is often a condition of annexation.

Wetlands

Many floodplain and stream-associated wetlands absorb and store storm water flows, which reduces flood velocities and stream bank erosion. Preserving these wetlands reduces flood damage and the need for expensive flood control devices such as levees. When the storms are over, many wetlands augment summer stream flows by slowly releasing the stored water back to the stream system.[10] Wetlands are highly effective at removing nitrogen, phosphorous, heavy metals, and other pollutants from water. For this reason, artificial wetlands are often constructed for cleaning storm water runoff and for tertiary treatment (polishing) of wastewater. Wetlands bordering streams and rivers and those that intercept runoff from fields and roads provide this valuable service free of charge.[11] As development occurs in Albany, significant wetlands found along rivers, lakes, and streams are protected as part of the riparian area.

Water Quality

Long-term water quality monitoring is conducted by the Oregon Department of Environmental Quality (DEQ). Albany is located in the Upper Willamette Sub Basin. DEQ indicates that bacteria, mercury, and temperature are significant concerns in this watershed. People can become sick if they ingest water that is contaminated with bacteria when they are swimming, or otherwise in contact with the water. Both urban and rural/agricultural sources are major contributors to the high bacteria levels found in many of the rivers in the Upper Willamette. DEQ has set a goal to reduce bacterial loads 33-84% by addressing direct discharges and runoff of bacterial sources. The Willamette River has fish consumption advisories due to elevated levels of mercury found in some fish species. DEQ is aiming for a 27% reduction in the load of total mercury from point sources and non-point erosion. Waters in the Upper Willamette Sub basin are warmer than necessary to protect salmonid rearing and spawning. Reductions in stream temperature can be achieved by reducing solar radiation loading by planting vegetation to increase stream-side shading and by improving base flows. DEQ is working with the City of Albany to monitor and minimize the mercury content in wastewater discharges and to reduce inflow and infiltration problems that cause sewage bypasses that discharge untreated sewage to the Willamette River.

Vulnerable Assets

No vulnerability study was done for the flood section at this time. An action item for this to be completed is included in the plan to provide for accurate assessment of the future potential flood damage estimates.

Flood Hazard Vulnerability: Estimating Potential Losses

Section 201.6(c)(2)(*ii)*(B) of the Disaster Mitigation Act of 2000 requires that the risk assessment include an estimate of the potential dollar losses to vulnerable structures. This estimate will be completed in the future and added to the plan as an update.

Mitigation Plan Goals and Existing Activities

The mitigation plan goals and action items are derived from meeting with the Steering Committee and a public group. The initial meetings with these groups were facilitated by the Oregon Natural Hazard Workgroup. Follow up meetings were held by the Steering Committee to develop the list of action items the City of Albany will use in this plan. It was the City's decision to use the mission, goals and themes of the City's Strategic Plan to tie in with the Natural Hazard Mitigation Plan. More detail on this tie in can be found in Section 4: Mitigation Plan Mission, Goals, and Action Items. Below you will find the existing mitigation

activities the city has in place and will find a link to the Action Items applicable to flooding mitigation approved and adopted by the Steering Committee.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, county, regional, state, or federal agencies or organizations.

City Programs

The Albany Community Development Department administers the City's floodplain management program. The City's policy is to allow development in the floodplain to the extent permissible under the National Flood Insurance Program, but City staff also works closely with developers to avoid or reduce exposure to flood hazards. Building inspectors, engineers, and planners make sure that new development meets the City's requirements for construction in the floodplain. The City strongly urges developers to fill the project site above the base flood elevation and qualify for a Letter of Map Revision Based on Fill to remove the site from the floodplain. In recognition of these efforts, Albany residents benefit from reduced flood insurance premiums through the City's participation in FEMA's Community Rating System. City planners also use annexation agreements and the Open Space zoning district to protect new development from flood-prone natural areas.

The Albany Parks & Recreation Department acquires land for parks and open space conservation. Flood-prone areas can become desirable park land like Bryant Park, Montieth River Park, Bowman Park, and Takena Landing. The Department also acquires floodplain land to conserve open space natural areas such as Willamette Greenway and Simpson Park.

State Programs

State of Oregon Removal/Fill Law

The Oregon Removal/Fill Law, which is administered by the Oregon Department of State Lands (DSL), requires a permit for activities that would remove or fill 50 cubic yards or more of material in waters of the state (e.g., streams, lakes, wetlands). The Albany Community Development Department is a cooperating partner with DSL by maintaining waterway and wetlands maps for public use, referring affected owners to DSL, and coordinating permit activities.

Oregon's Wetlands Protection Program

Oregon's Wetlands Program was created in 1989 to integrate federal and state rules concerning wetlands protection with the Oregon Land Use Planning Program. The Wetlands Program has a mandate to work closely with local governments and the Department of State Lands (DSL) to improve land use planning approaches to wetlands conservation. A Local Wetlands Inventory (LWI) is one component of that program. DSL also develops technical manuals, conducts wetlands workshops for planners, provides grant funds for wetlands planning, and works directly with local governments on wetlands planning tasks. Albany has compiled a local wetlands inventory for areas where development is likely to occur. Using the Oregon Freshwater Assessment Manual, the City has identified those wetlands that provide the greatest benefit to the community. These significant wetlands are commonly found in flood-prone areas. City planners also use annexation agreements and the Open Space zoning district to protect significant wetlands from new development.

Oregon Wetlands Joint Venture

The Oregon Wetlands Joint Venture is a coalition of private conservation, waterfowl, fisheries, and agriculture organizations working with government agencies to protect and restore important wetland habitats.[12]

Federal Programs

National Weather Service

The Portland Office of the National Weather Service issues severe winter storm watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over NOAA weather radio and are forwarded to the local media for retransmission using the Emergency Alert System.

National Resources Conservation Service (NRCS), US Department of Agriculture

NRCS provides a suite of federal programs designed to assist state and local governments and landowners in mitigating the impacts of flood events. The Watershed Surveys and Planning Program and the Small Watershed Program provide technical and financial assistance to help participants solve natural resource and related economic problems on a watershed basis. The Wetlands Reserve Program and the Flood Risk Reduction Program provide financial incentives to landowners to put aside land that is either a wetland resource, or that experiences frequent flooding. The Emergency Watershed Protection Program (EWP) provides technical and financial assistance to clearing debris from clogged waterways, restoring vegetation, and stabilizing riverbanks. The measures taken under EWP must be environmentally and economically sound and generally benefit more that one property.

Federal Emergency Management Agency (FEMA) Programs

The Federal Emergency Management Agency (FEMA) resulted from the consolidation of five federal agencies that were dealing with different types of emergencies. Since then, many states and local jurisdictions have accepted this approach and changed the names of their organizations to include the words "emergency management." FEMA provides maps of flood hazard areas, various publications related to flood mitigation, funding for flood mitigation projects, and technical assistance.

National Flood Insurance Program (NFIP)

Flood insurance is available to citizens in communities such as that adopt and implement NFIP siting and building standards. The standards are applied to development that occurs within areas subject to inundation during a base flood event. These areas are depicted on federal Flood Insurance Rate Maps. Oregon's Department of Land Conservation and Development is the state's NFIP-coordinating agency. The Community Development Department is the local repository for floodplain information for the City of Albany.

The Community Rating System (CRS)

The Community Rating System (CRS) recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. Property owners within the City receive reduced NFIP flood insurance premiums in return for floodplain management practices that qualify the City for a CRS rating. CRS communities are rated on a scale of 10 to 1 where each number represents a five percent reduction in flood insurance premiums (10 = 0%, 1 = 45%). The City of Albany has been a CRS participant since 1990. Albany's current CRS rating of 8 amounts to a ten percent reduction in flood insurance premiums for Albany residents.

Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in the City of Albany can undertake to reduce risk and prevent loss from flood events. There are four short-term and nine long-term flood hazard action items described below. Each action item is followed by ideas for implementation, which can be used by the Steering Committee and local decision makers in pursuing strategies for implementation.

The Flood Action Item Matrix is a separate file to this document.

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[1] City of Albany Comprehensive plan Background Report; 1980

[2] City of Albany Comprehensive plan Background Report; 1980

[3] City of Albany Comprehensive plan Background Report; 1980

[4] Federal Emergency Management Agency. (June 2003). http://www.fema.gov/fhm/fq_term.shtm#frequt4

[5] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, Department of Land Conservation and Development (July 2000), Ch. 4.

[6] *Floodplain Management: a Local Administrator's Guide to the National Flood Insurance Program.* FEMA, Region 10.

[7] Ibid.

[8] Ibid.

[9] Tualatin River Watershed Council, http://www.trwc.org/ (February 2001).

[10] *Department of State Lands, Wetlands Functions and Assessment*, Website: http://statelands.dsl.state.or.us/fact5.pdf (May 2001)

[11] Ibid.

[12] Oregon Wetlands Joint Venture, Website: http://www.dfw.state.or.us/ODFwhtml/Wetlands/about.htm (May 2001).

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items:**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Flood (FL) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #3: Incorporated mitigation into planning and policy development.														
FL-Short Term	Action 3.8. Enhance data and mapping for floodplain information with in the City to better determine vulnerability and risk	Public Works	All Departments	1 – 2 years										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
FL-Short Term	Action 4.5. Complete an inventory of locations in City of Albany subject to frequent storm water flooding	Public Works	All Departments	1 – 2 years										
FL-Short Term	Action 4.6. Evaluate and develop a City strategy to address repetitive flood loss properties	Emergency Management	Community Development	1 – 2 years										
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
FL-Short Term	Action 7.4. Develop an education and outreach program to make residents aware of the flood hazard in their area and the availability of flood insurance	Community Development	PIO, Emergency Management, FEMA	1 – 2 years										

Objective #3: Incorporated mitigation into planning and policy development.															
FL-Long Term	Action 3.5. Develop strategies to lower the City's current rating in the National Flood Insurance Program's Community Rating System	Community Development	All Departments	1 – 5 years											
FL-Long Term	Action 3.6. Update applicable City codes to improve risk reduction and prevention of flood impacts	Community Development	All Departments	1 – 5 years											
FL-Long Term	Action 3.7. Identify, prioritize and develop strategies for properties in the floodplain for risk reduction and preventing flood impacts	Community Development	All Departments	1 – 5 years											
Objective #4: Support the enhancement of the City vulnerability assessment activities.															
FL-Long Term	Action 4.4. Develop a storm water management/drainage plan	Public Works	All Departments	1 – 5 years											
FL-Long Term	Action 4.7. Request Flood Insurance Rate Maps (FIRM) be updated	Emergency Management	Community Development	1 – 5 years											
Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.															
FL-Long Term	Action 9.3 Partner with the City of Lebanon to complete canal bank failure stability projects	Public Works	City of Lebanon, Linn County	1 – 5 years											
FL-Long Term	Action 9.4 Encourage multi-objective stream and river projects that maximize flood mitigation, fish habitat, and water quality	Public Works		1 – 5 years											

Section 7:
Earthquake

Why are Earthquakes a threat to the City of Albany

Oregon is rated third highest in the nation for potential loss due to earthquakes. This is due at least in part to the fact that, until recently, Oregon was not considered to be an area of high seismicity, and the majority of its buildings and infrastructure were not designed for ground shaking at the magnitude now expected. Recent studies of geological records show that Oregon has a history of seismic events, and that the Cascadia Subduction Zone is capable of producing magnitude 9.0 earthquakes. Projected losses in the Cascadia region could exceed $12 billion; 30,000 buildings could be destroyed and 8,000 lives lost in the event of a magnitude 8.5 Cascadia Subduction Zone earthquake. Identifying locations susceptible to seismic activity generated by local faults or the Cascadia Subduction Zone, adopting strong policies and implementing measures, and using other mitigation techniques are essential to reducing risk from seismic hazards in the City of Albany

Several crustal faults west of Albany in Benton County have been identified. Albany has 7,190 buildings, including residential and business, which were built before 1969, many are wood or non-reinforced masonry construction.

Earthquake Characteristics

Most large earthquakes in the Pacific Northwest are shallow crustal, deep intraplate, or subduction zone earthquakes. These earthquakes can have great impact on Oregon communities.

Crustal Fault Earthquakes

Crustal fault earthquakes are the most common and occur at relatively shallow depths of 6-12 miles below the surface.[1] While most crustal fault earthquakes are smaller than magnitude 4.0 and generally create little or no damage, some can produce earthquakes of magnitude 7.0 and higher and cause extensive damage. Crustal earthquakes within the North American plate are possible on faults mapped as active or potentially active as well as on unmapped (unknown) faults. The only mapped active fault in Benton County is the Corvallis Fault, which runs in a southwest to northeast direction through the center of the county.

Historically observed crustal earthquakes in Oregon from 1841 to 2002 are shown in Figure 10-3 (DOGAMI, Map of Selected Earthquakes for Oregon, 1841 through 2002, Open-File Report 03-02, 2003). During this time period, only six small earthquakes occurred in Benton County as shown on Figure 10.3. Larger earthquakes in nearby counties are also shown.

However, based on the historical seismicity in western Oregon and on analogies to other geologically similar areas, small to moderate earthquakes up to M5 or M5.5 are possible almost any place in western Oregon, including almost any place in Benton County. Such earthquakes would be mostly much smaller than the Scotts Mills earthquake up to about the magnitude of that 1993 earthquake. The possibility of larger crustal earthquakes in the M6+ range cannot be ruled out. However, the probability of such events is likely to be very low.

Because the probability of large crustal earthquakes (M6 or greater) affecting Benton County is low and because any damage in smaller crustal earthquakes is likely to be minor and very localized, crustal earthquakes are not considered significant for hazard mitigation planning purposes. Therefore, our analysis focuses on the larger, much more damaging earthquakes arising from the Cascadia Subduction Zone.

The characteristics of the subduction zone earthquakes affecting Benton County are summarized in Table 8.1 below. The maximum magnitudes are estimated from the length and width of the mapped fault plane or from similar earthquakes elsewhere in the Pacific Northwest (for the intraslab earthquakes). Recurrence intervals are based on current best estimates.

Table 8.1

Seismic Sources Affecting Benton County

Fault	Maximum Magnitude	Probable Recurrence Interval (years)
Cascadia Subduction Zone (interface earthquake**)**	8.5	500 to 800
Cascadia Subduction Zone (intraslab Earthquake)	7.5	500 to 1000

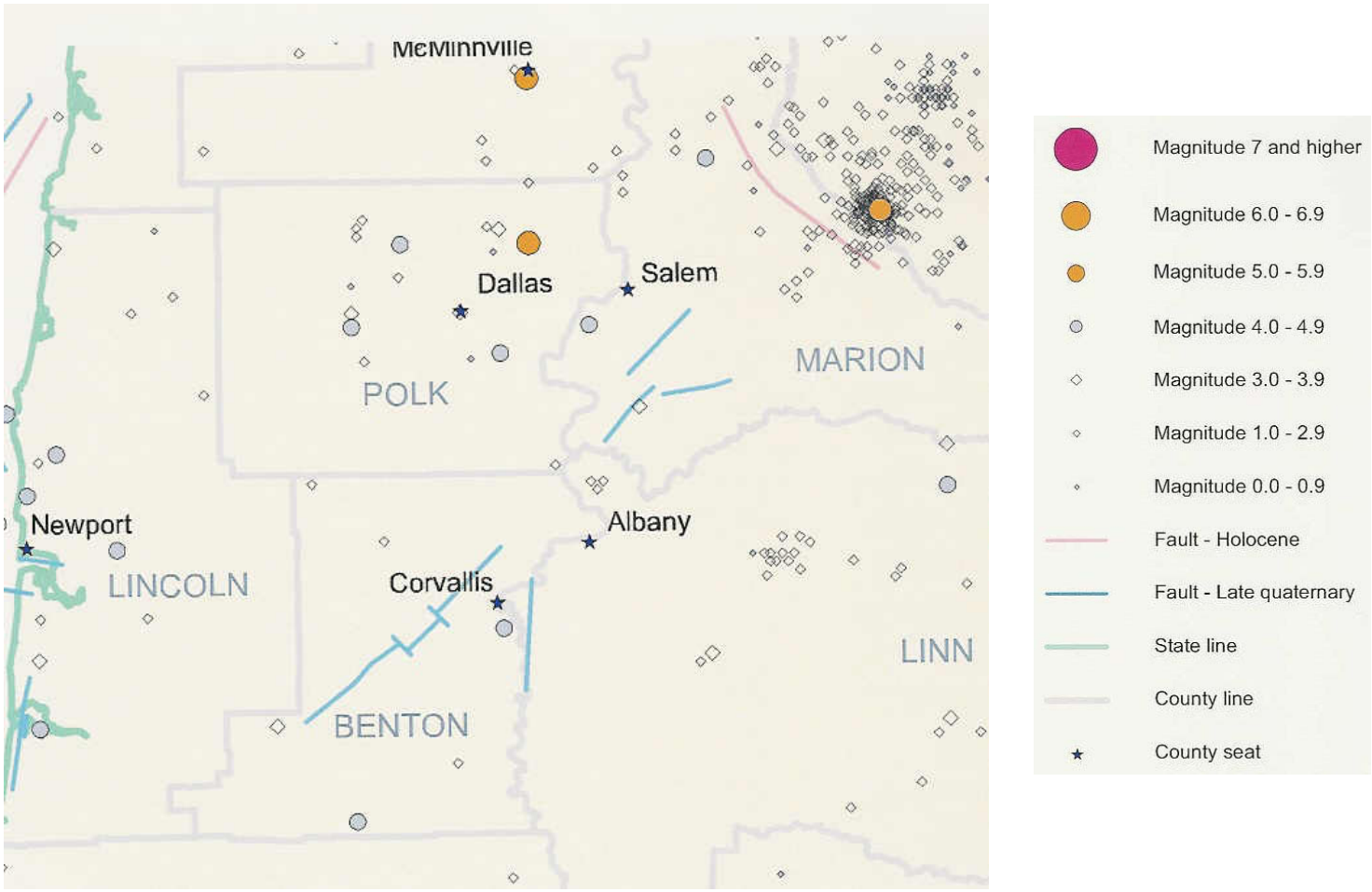
Source: Benton County Hazard Mitigation Plan; Earthquake Section

In addition to these large earthquakes, the Cascadia Subduction Zone also experiences smaller earthquakes such as the M6.8 Nisqually earthquake near Olympia Washington which occurred on February 28, 2001. The Nisqually earthquake was an intraslab earthquake which occurred at a depth of 52 kilometers (about 30 miles). Other relatively recent similar Cascadia Subduction Zone earthquakes include the M7.1 Olympia earthquake in 1949 and the M6.5 Seattle-Tacoma earthquake in 1965. These earthquakes killed 15 people and resulted in over $200 million in damages (1984 dollars, www.dnr.wa.gov). Similar earthquakes are possible in Western Oregon, including Benton County.

Figure 8.1 below shows a generalized geologic map of Benton County and includes the Corvallis Fault and other mapped faults. The mapped faults within or near Benton County are relatively small and not very active. Thus, seismic hazard for Benton County arises predominantly from major earthquakes on the Cascadia Subduction Zone. Smaller, crustal earthquakes in or near Benton County could be locally damaging, but would not be expected to produce widespread or major damage.[2]

Figure 8-1

Earthquake Epicenters from 1841 to 2002



Source: Benton County Hazard Mitigation Plan; Earthquake Section

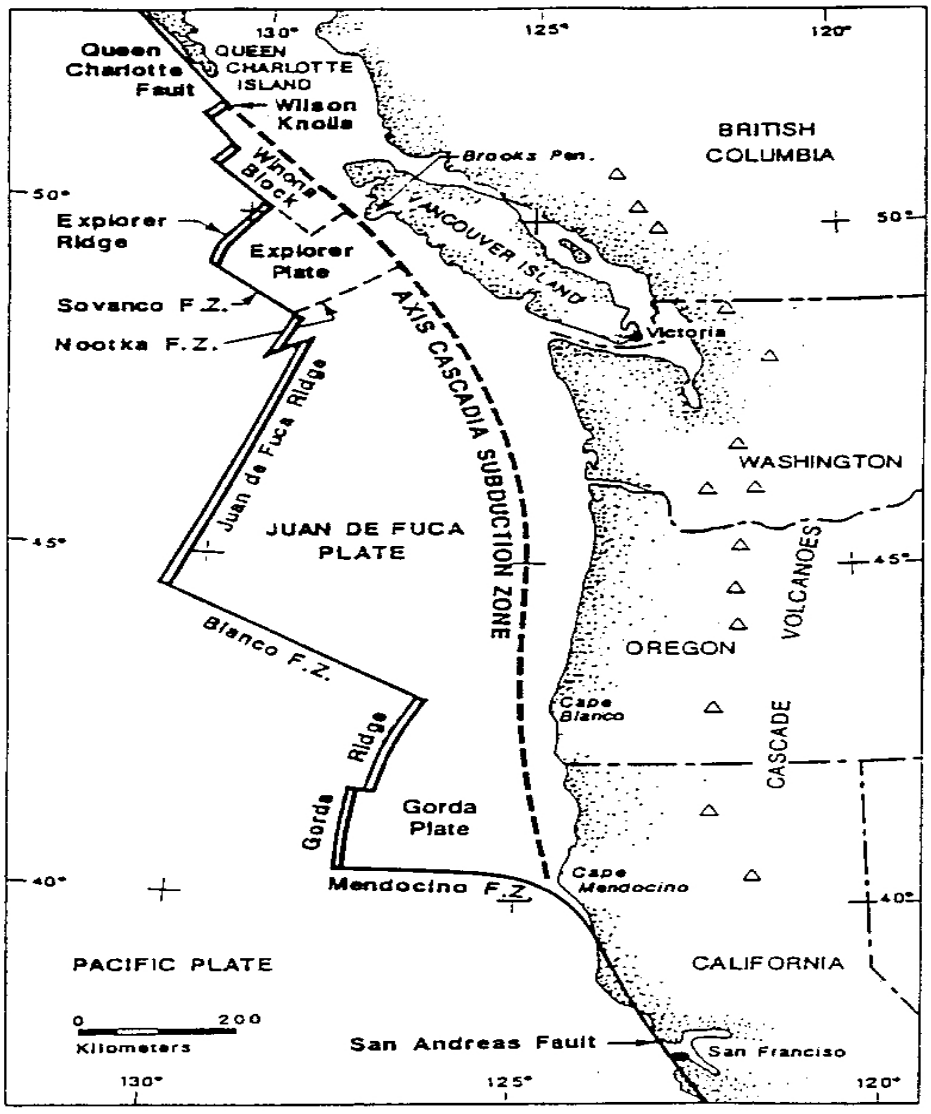
Deep Interplate Earthquakes

Occurring at depths from 25 to 40 miles below the earth's surface in the subducting oceanic crust, deep intraplate earthquakes can reach magnitude 7.5.[3] The February 28, 2001 earthquake in Washington State was a deep intraplate earthquake. It produced a rolling motion that was felt from Vancouver, British Columbia to Coos Bay, Oregon and east to Salt Lake City, Utah. A 1965 magnitude 6.5- intraplate earthquake centered south of the Seattle-Tacoma International Airport caused seven deaths.[4]

Subduction Zone Earthquakes

The Pacific Northwest is located at a convergent plate boundary where the Juan de Fuca and North American tectonic plates meet. The two plates are converging at a rate of about 1-2 inches per year. This boundary is called the Cascadia Subduction Zone and extends from British Columbia to northern California. Subduction zone earthquakes are caused by the abrupt release

of slowly accumulated stress. Subduction zones similar to the Cascadia Subduction Zone have produced earthquakes with magnitudes of 8.0 or larger. Historic subduction zone earthquakes include the 1960 Chile (magnitude 9.5) and the 1964 southern Alaska (magnitude 9.2) earthquakes. Geologic evidence shows that the Cascadia Subduction Zone has generated great earthquakes, most recently about 300 years ago. The largest is generally accepted to have been magnitude 9.0 or greater. The average recurrence interval of these great Cascadia earthquakes is approximately 500 years, with gaps between events as small as 200 years and as large as 1,000 years. Such earthquakes may cause great damage to the coastal area of Oregon as well as inland areas in western Oregon. It is estimated that shaking from a large subduction zone earthquake could last up to five minutes.



Cascadia Subduction Zone

Source: Benton County Hazard Mitigation Plan; Earthquake Section

Earthquake Related Hazards

Ground Shaking

Ground shaking is the motion felt on the earth's surface caused by seismic waves generated by an earthquake. It is the primary cause of earthquake damage. The strength of ground shaking depends on the magnitude of the earthquake, the type of fault, and distance from the epicenter (where the earthquake originates). Buildings on poorly consolidated and thick soils will typically see more damage than buildings on consolidated soils and bedrock.

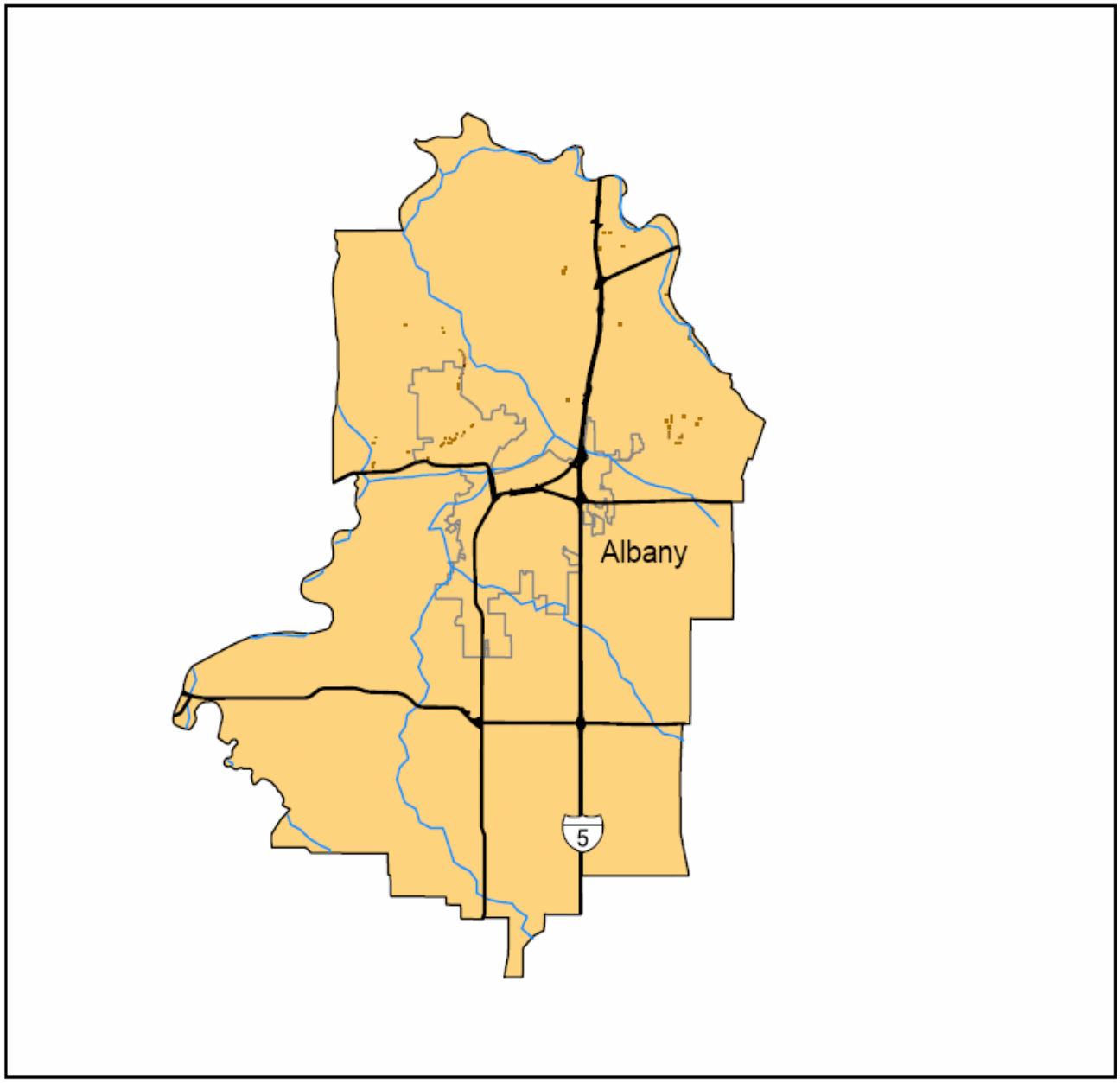
Surface Fault Ruptures

Earthquakes are caused by the sudden movement, or rupture, of a fault. As the rupture zone progresses upward to the earth's surface it can cause surface fault ruptures. The result is often displacement or offset of the ground surface. Generally, the larger the earthquake, the greater the potential for surface fault rupture. It is generally considered impractical to design structures to withstand damage under the stress of surface fault rupture. Additionally, once a structure is located astride a fault, it is impossible to mitigate the surface fault rupture hazard unless the structure is relocated.[5]

Earthquake-Related Landslides

Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy roads, buildings, utilities, and other critical facilities necessary to respond to and recover from an earthquake. Many communities in Oregon, including the City of Albany, are likely to encounter such risks. Albany's risk to landslide is minimal and restricted to the north part of the City in Benton County. It is here where the higher elevations are found, where building is constructed on the side of hills and where slides are likely.

Relative Slope Stability Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Highway or Interstate
River
City Outline
Census Track Outline

EQ Induced Landslide Potential
Low
Moderate
High
Very High

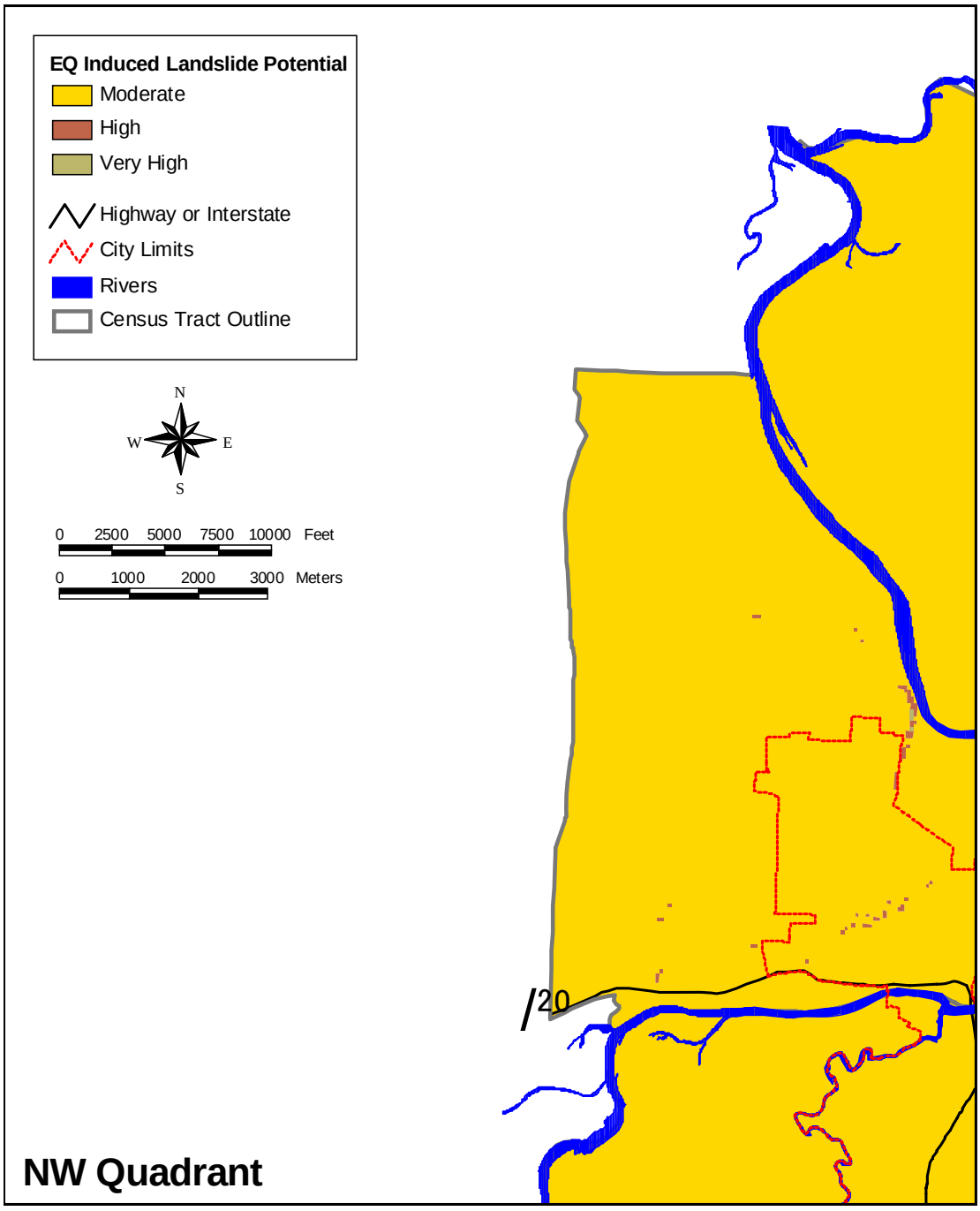
N
W
E
S

0 4,900 9,800 19,600 Meters

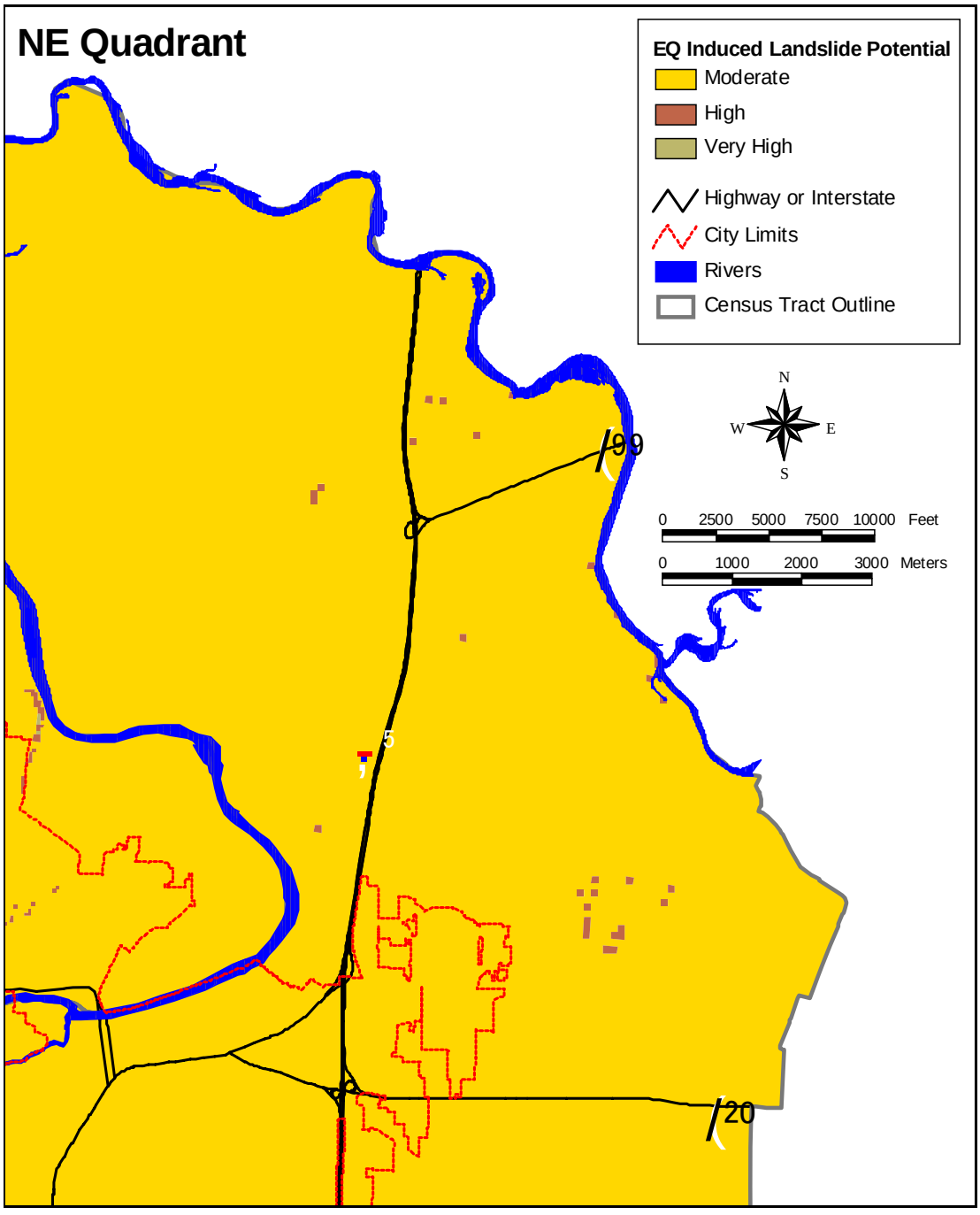
0 17,500 35,000 70,000 Feet

Source: For all City of Albany Relative Slope Stability: DOGAMI

Relative Slope Stability Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



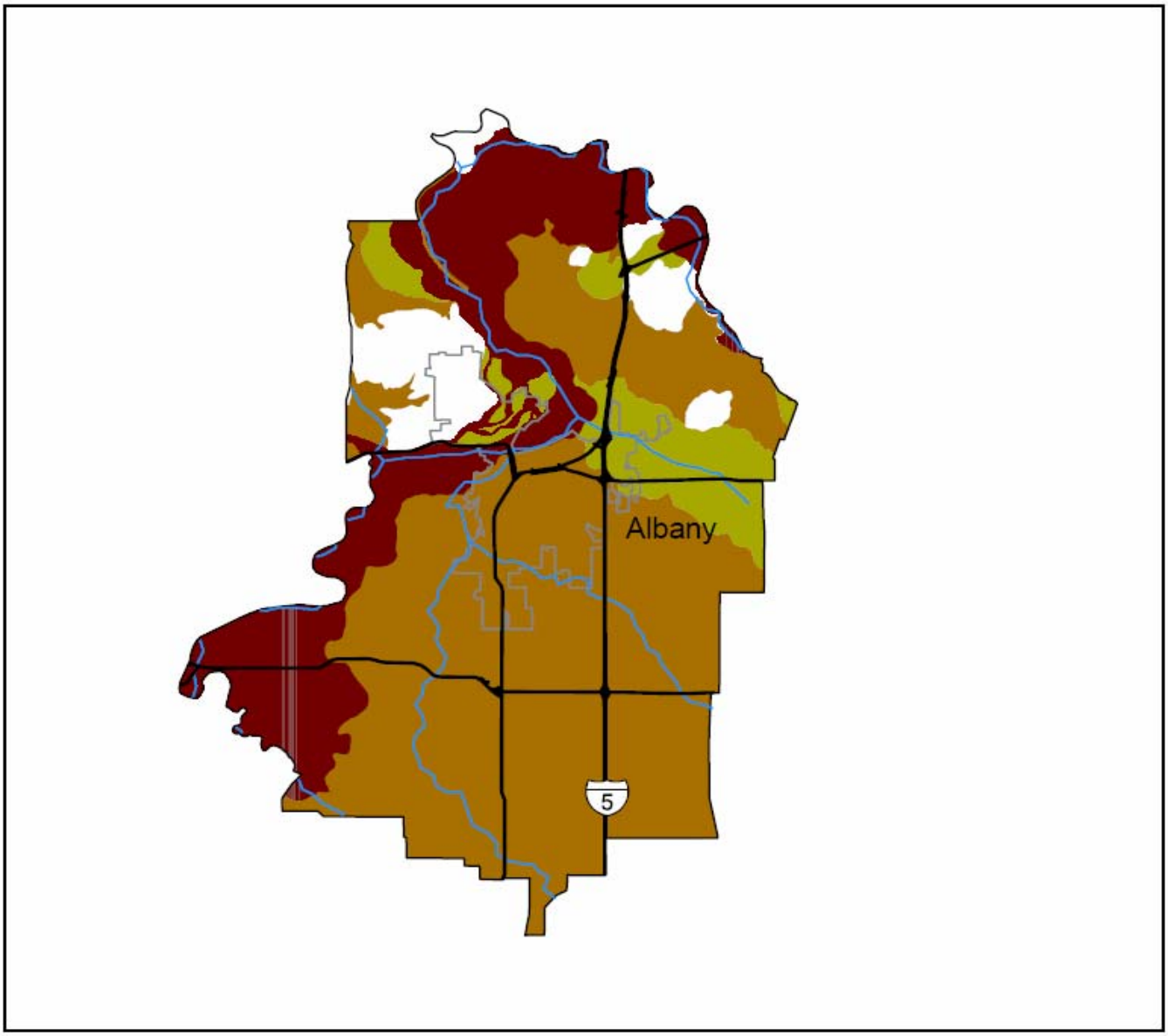
Relative Slope Stability Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Liquefaction

Liquefaction occurs when ground shaking causes wet granular soils to change from a solid to a liquid state. These results in the loss of soil strength and three potential types of ground failure: lateral spreading, flow failure, and loss of bearing strength. Buildings and their occupants are at risk when the ground can no longer support buildings and structures.[6] Areas of susceptibility to liquefaction include areas with high ground water tables and sandy soils.[7]

Relative Liquefaction Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Highway or Interstate
River
City Outline
Census Track Outline

Liquefaction Potential
Rare
Very Low
Low
Moderate
High
Very High

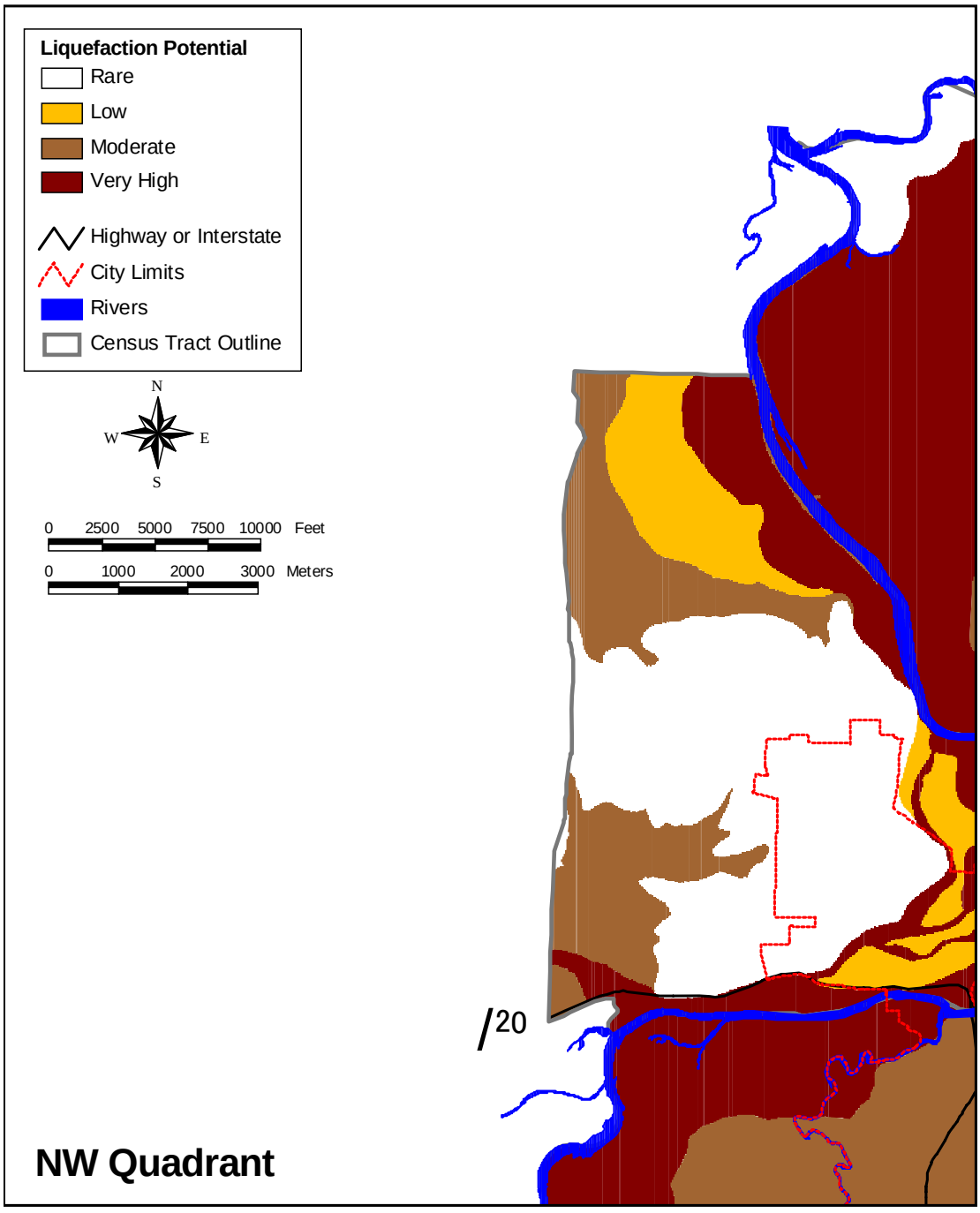
N
W
E
S

0 4,900 9,800 19,600 Meters

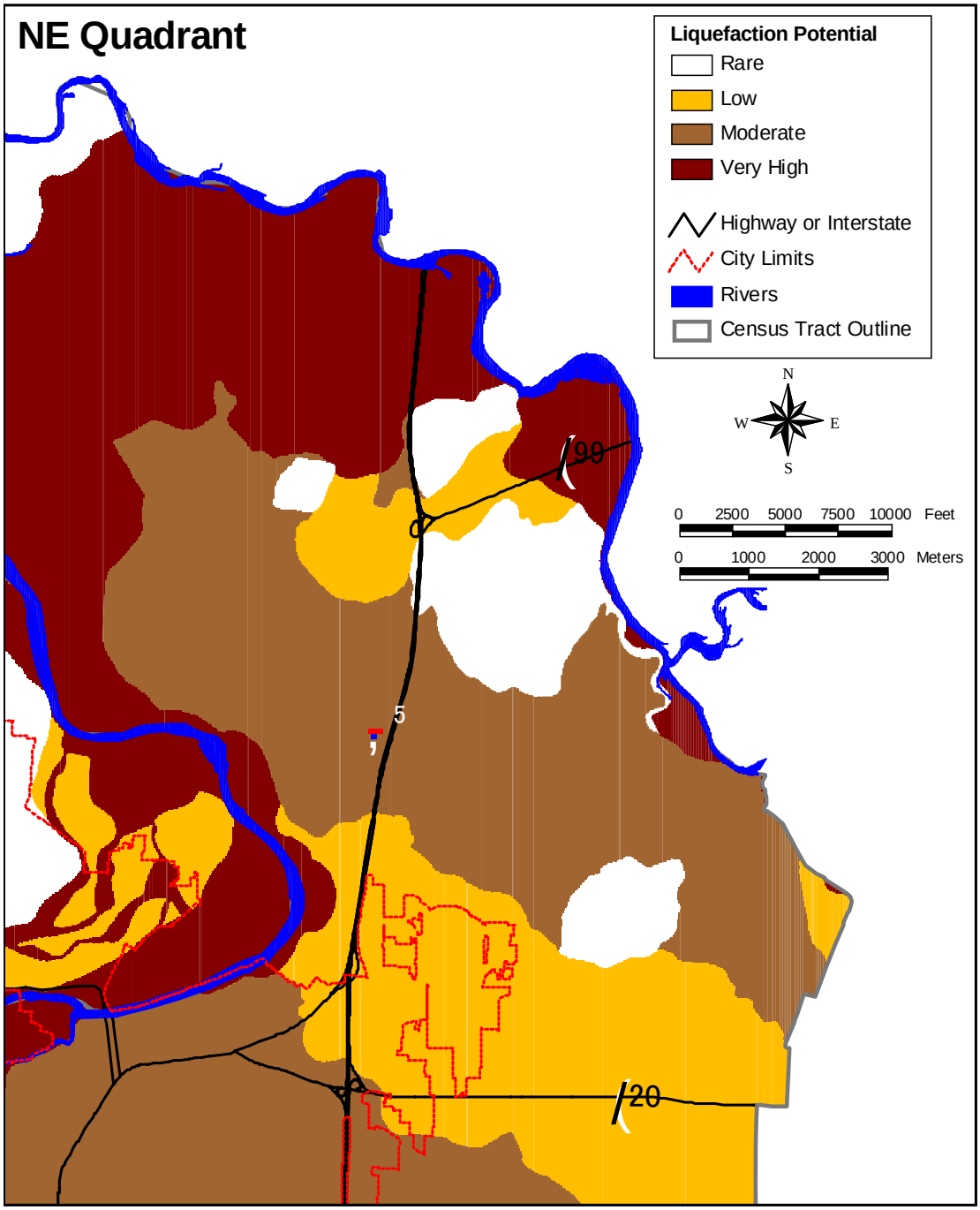
0 17,500 35,000 70,000 Feet

Source: For all Liquefaction for City of Albany: DOGAMI

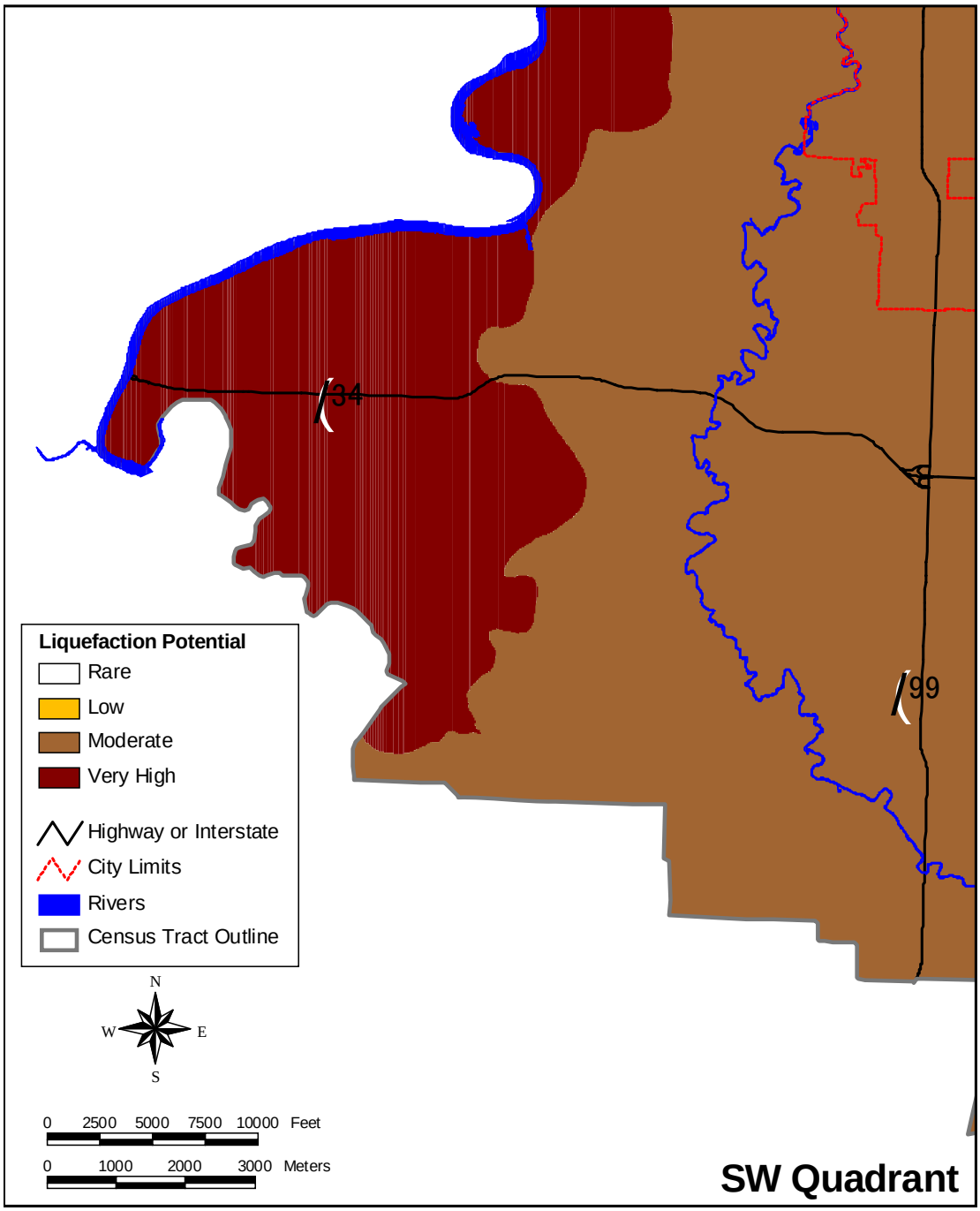
Relative Liquefaction Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



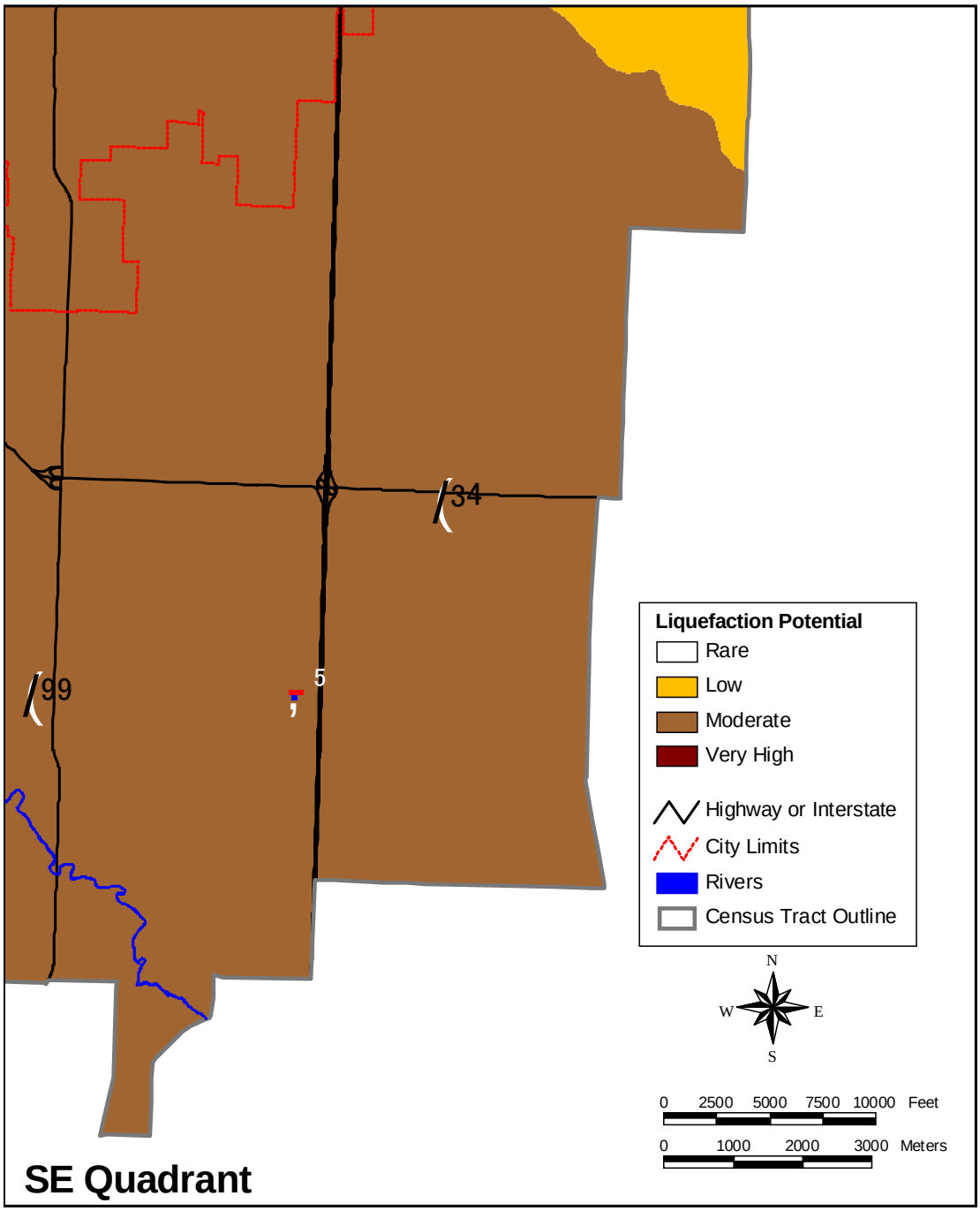
Relative Liquefaction Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon

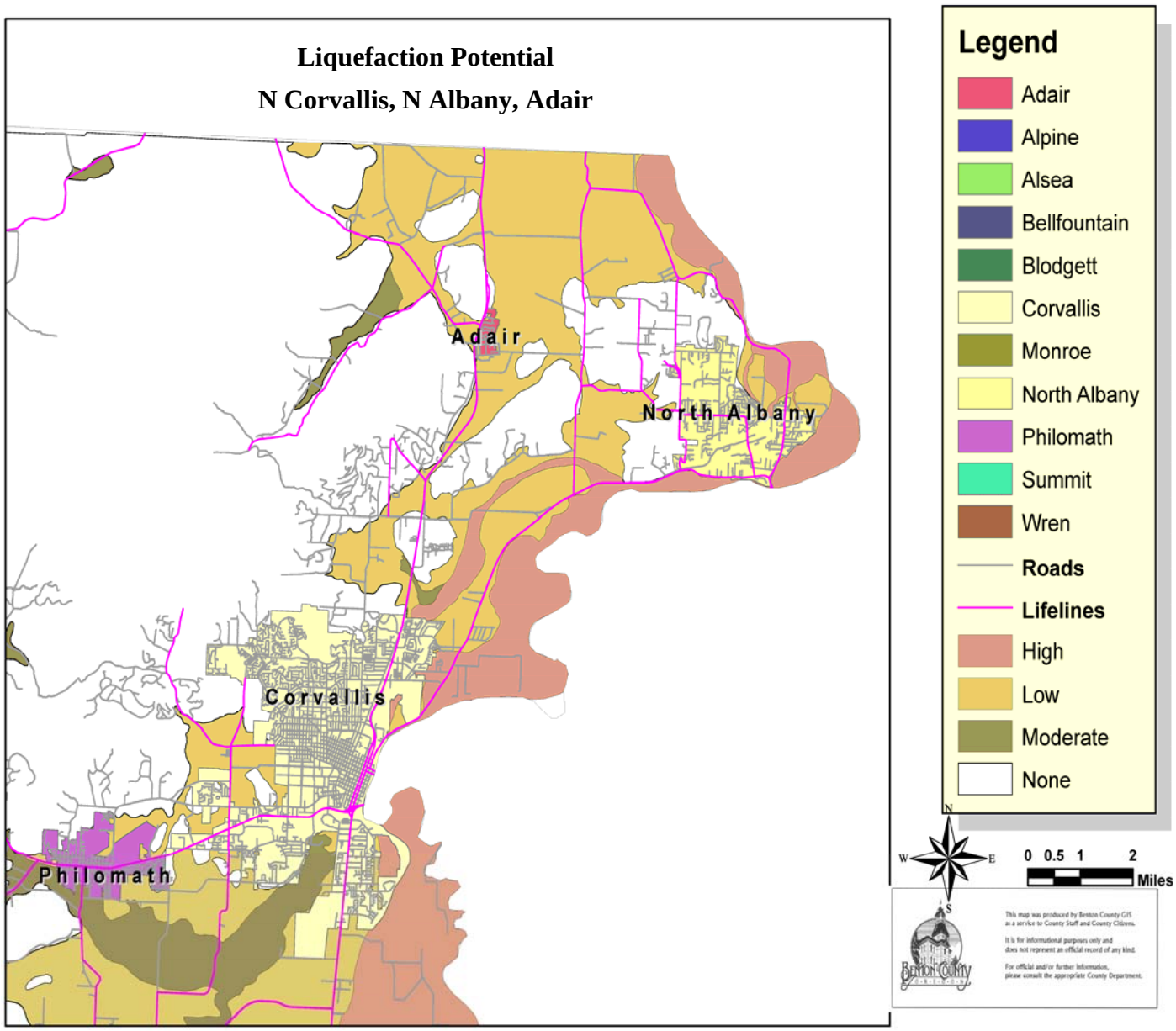


Relative Liquefaction Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Relative Liquefaction Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



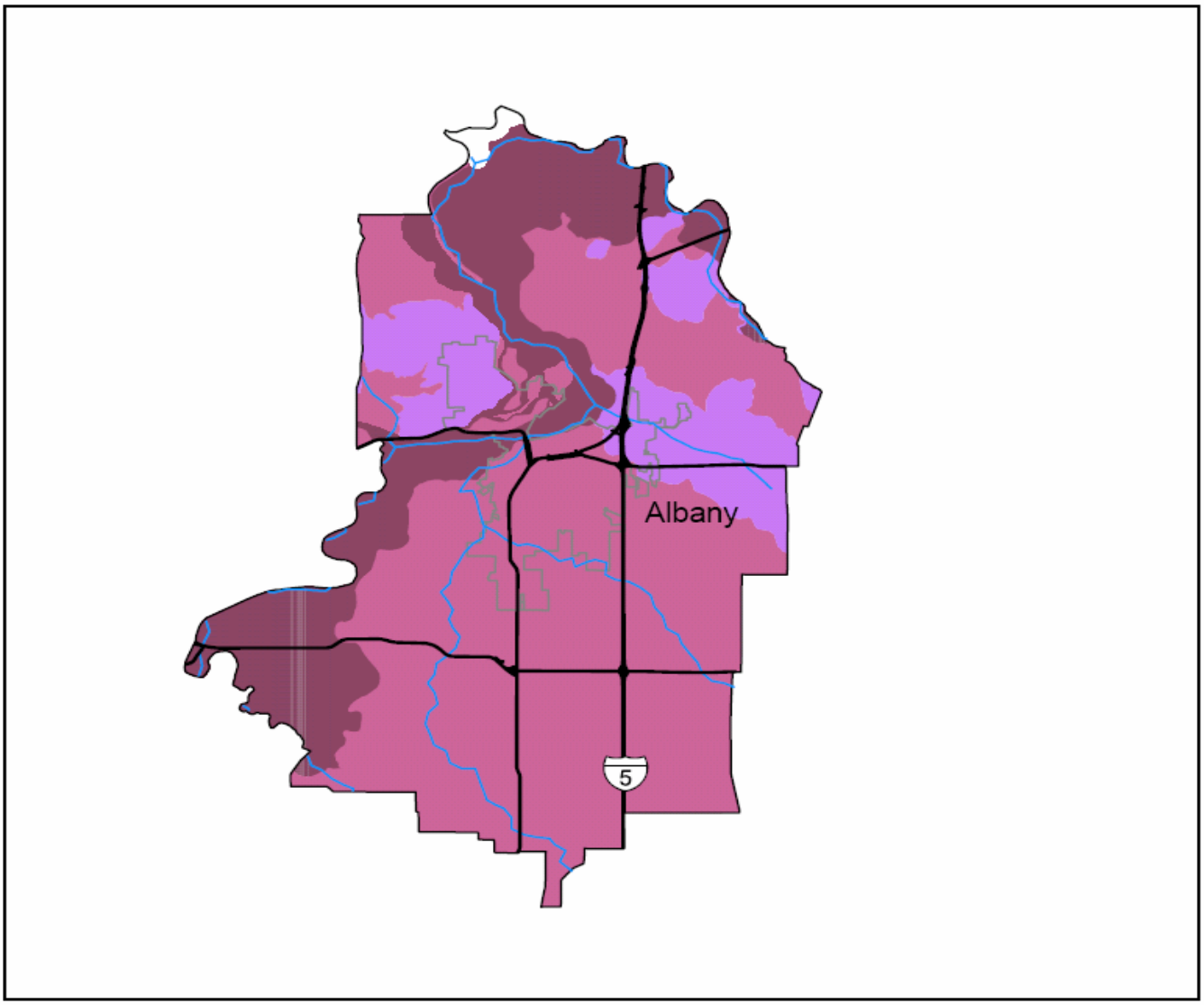


Source: Benton County Natural Hazard Mitigation Plan

Amplification

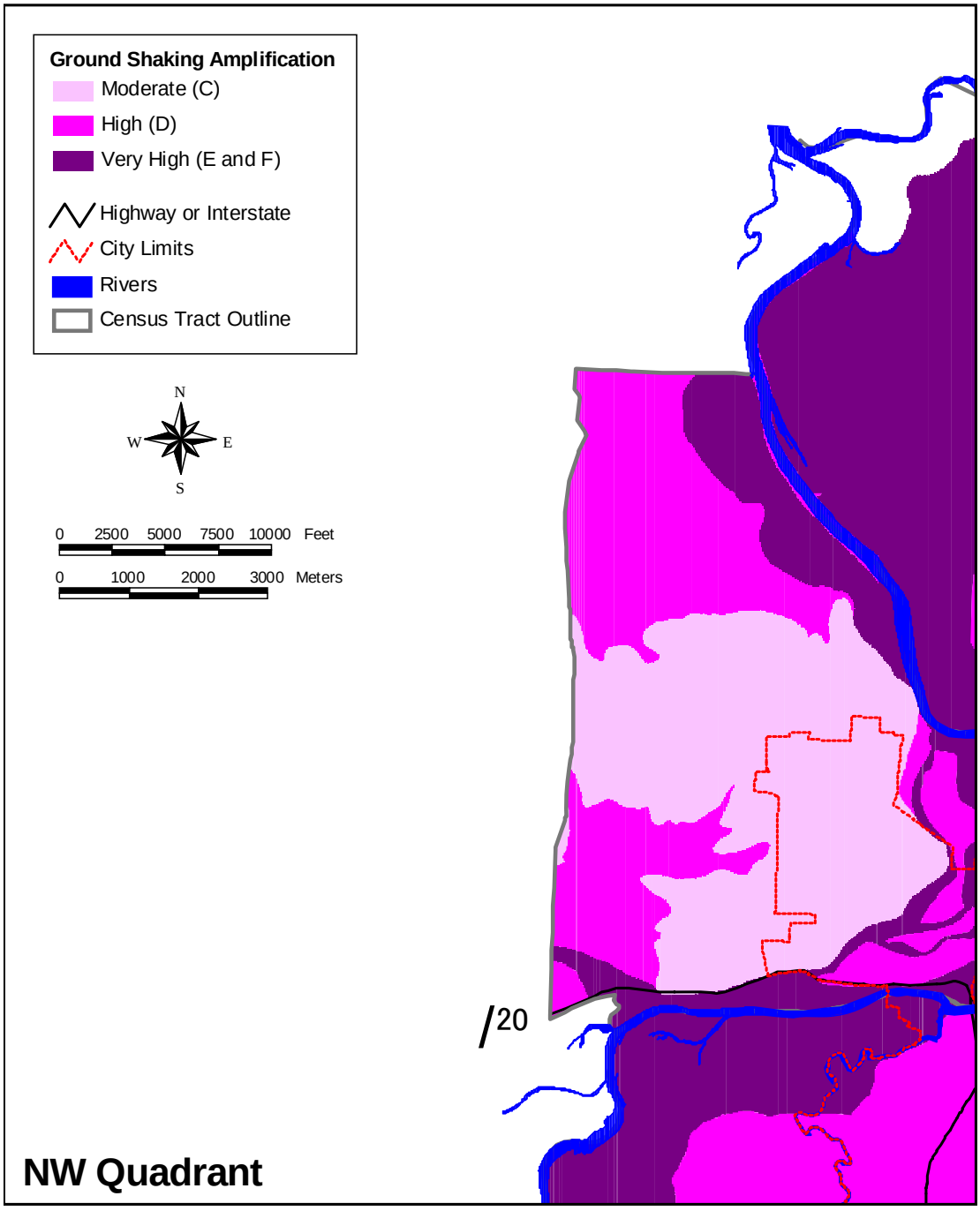
Soils and soft sedimentary rocks near the earth's surface can modify ground shaking caused by earthquakes. One of these modifications is amplification. Amplification increases the magnitude of the seismic waves generated by the earthquake. Amplification depends on the thickness of geologic materials and their physical properties. Buildings and structures built on soft and unconsolidated soils can face greater risk.[8] Amplification can also occur in areas with deep, sediment filled basins.

Relative Ground Shaking Amplification Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon

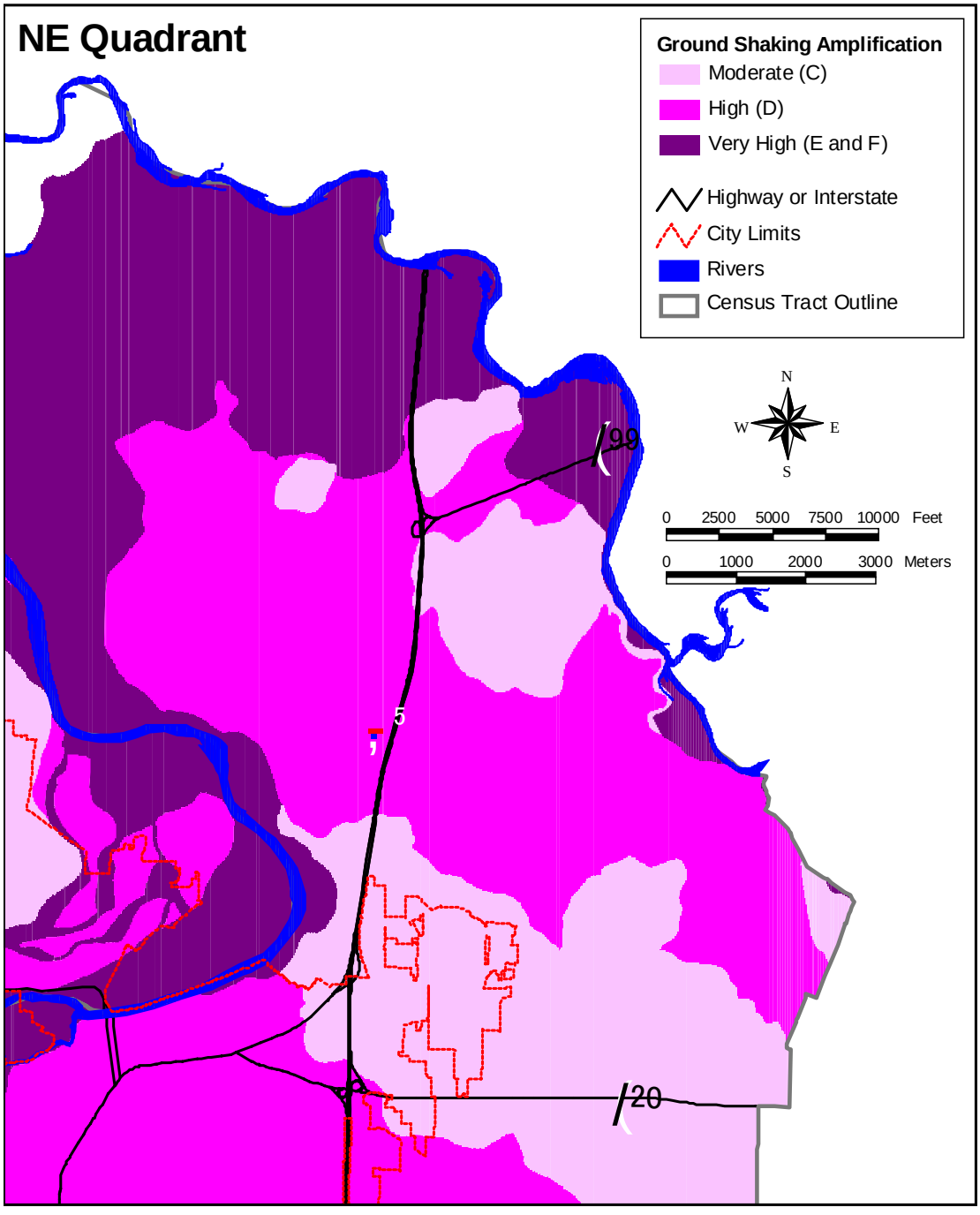


Source: For all City of Albany Amplification: DOGAMI

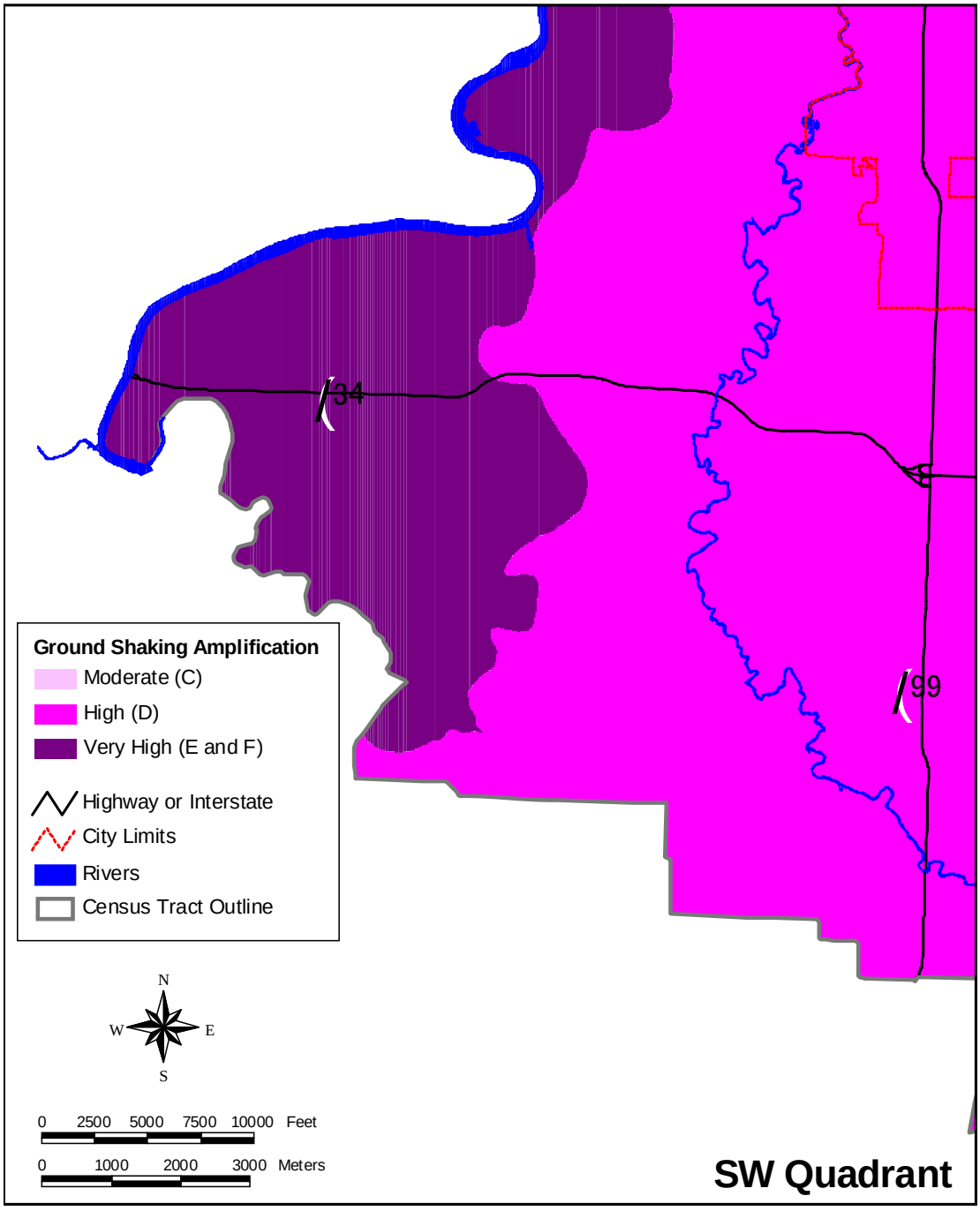
Relative Ground Shaking Amplification Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



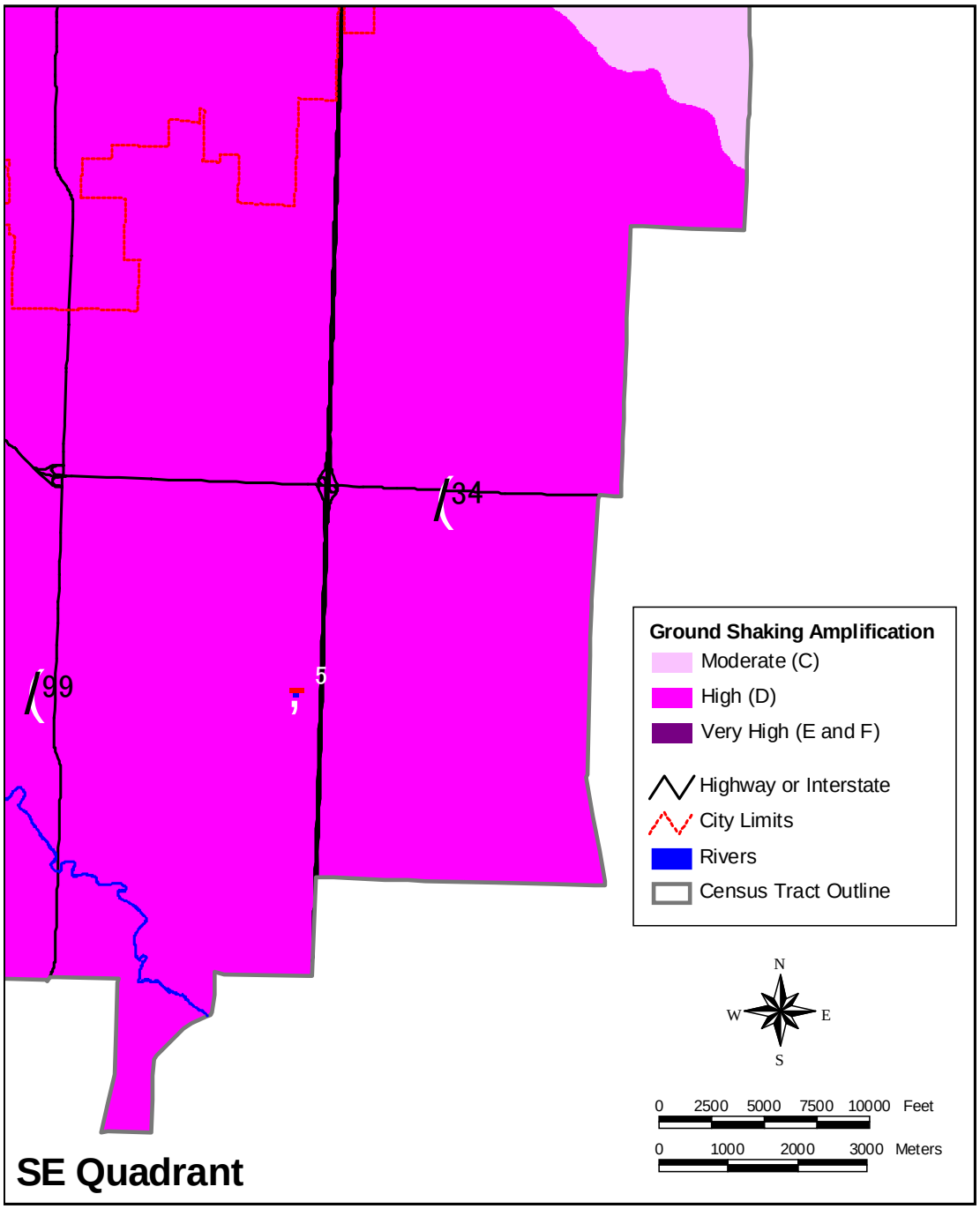
Relative Ground Shaking Amplification Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Relative Ground Shaking Amplification Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Relative Ground Shaking Amplification Susceptibility Map
City of Albany, Benton & Linn Counties, Oregon



Earthquake Risk Assessment

Earthquake Hazard Profile

Section 201.6(c)(2)(*i*) of the Disaster Mitigation Act of 2000 requires that the risk assessment include a description of the location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Location and Extent of Earthquake Hazard

The entire City of Albany is at risk should an earthquake of any size occur. According to the liquefaction map found in the Benton County Mitigation Plan and in this Plan, North Albany, along the Willamette River, has the most potential for damage should a moderate to large earthquake occur. This area has few if any buildings and is mostly open space and farm land.

Previous Occurrences of Earthquakes

The earthquake which took place in 1961 was the only one to do minor damage in Albany out of the many earthquakes that have occurred in Oregon, Washington, California and in the Pacific Ocean. A strong earthquake in Del Norte County, California on November 22, 1873, was felt from Portland to San Francisco. On October 12, 1877, an earthquake apparently centered in the Cascade Mountains was felt in Portland. On February 3, 1892, another earthquake was felt from Astoria to Salem. On April 1896, three shock waves were felt from Portland to Salem. Other dates where quakes occurred and were felt in Oregon were April 19, 1906; October 4, 1913; May 18, 1915; April 14, 1920; February 25, 1921; January 10, 1923; April 8, 1927; July 15, 1936; December 29, 1941; December 15, 1953; November 16, 1957; August 18, 1961 (minor damage to Albany and Lebanon); November 6 1961; and May 26, 1968.

The largest earthquakes in the state of Oregon was reported on August 8, 1910, and September 21, 1993, each a 5.7 magnitude. The 1910 earthquake was the largest historical shock within the state's boundaries, but it occurred too far offshore to cause damage. The damaging 1993 earthquake was the largest historical earthquake beneath the land area of Oregon.

Since 1993 there have been 14 notable earthquakes in Oregon ranging in magnitude from 2.5 to 6.0. Most are in the 2.5 to 3.9 range. In 1993, Scotts Mills, Oregon, had the distinction of having the largest earthquake in Oregon's history with a 5.6 on March 25. It was short lived as a record when on September 20, 1993, Klamath Falls, Oregon, reported magnitudes of 5.9 and 6.0 earthquakes.

February 28, 2001, Nisqually Earthquake- Magnitude 6.8

The most recent large earthquake to be felt in the Northwest was the Nisqually earthquake, on February 28, 2001. This earthquake was centered northeast of Olympia, Washington, and measured a magnitude of 6.8 on the Richter scale. In the Puget Sound area, this quake caused 400 injuries, one quake-related death, and about $2 billion dollars in damage.[9] There was no damage in Albany from this earthquake; depending on where you lived in Albany, few people felt it.

March 25, 1993, Scotts Mills Earthquake- Magnitude 5.7

In 1993, the Scotts Mills earthquake (also known as the "Spring Break Quake") shook the northern Willamette Valley. It was a magnitude 5.7 on the Richter scale, and caused extensive damage primarily in the communities of Molalla, Woodburn, Newberg, McMinnville, and Salem. There was no damage created in Albany by this earthquake and depending on where you lived in Albany few people felt it locally.

November 5, 1962, Vancouver, Washington- Magnitude 5.2

Three and a half weeks after the devastating Columbus Day Storm, an earthquake that measured approximately 5.5 on the Richter scale shook northwest Oregon. It was the largest quake to be generated by a fault under Portland and Vancouver.[10] This earthquake disappeared quickly from headlines, most likely because residents were still recovering from the Columbus Day Storm.[11] This earthquake did not impact Albany.

April 13, 1949, Olympia, Washington- Magnitude 7.1

On April 13, 1949, residents of northwest Oregon felt an earthquake that was centered near Olympia, Washington. In Washington, this quake caused eight deaths and caused extensive damage to buildings and infrastructure. This earthquake did not impact Albany.

Probability of Future Earthquake Events

Though it is likely that another earthquake will occur which will either affect or be felt in the city, when it will occur is impossible to predict. The last earthquake to do damage in Albany was in 1961. Earthquakes have occurred in other part of Oregon which have been felt in Albany, but have done little or no damage. Given what appears as an increase in earthquake activity over the last several years in Oregon and the United States, as well as throughout the world, it is likely an earthquake will occur in the next 20 years.

Earthquake Hazard Vulnerability: Identifying Assets

Section 201.6(c) (2) (*ii)* (A) of the Disaster Mitigation Act of 2000 requires that the risk assessment include a description of the jurisdiction's vulnerability to the hazard. This description shall include an overall summary for the hazard and its impact on the community. If best available data allows, vulnerability should be described in terms of the type and number of existing and future buildings, infrastructure, and critical facilities located in identified hazard areas.

City of Albany Vulnerability Summary

Depending on the strength of the earthquake and the location to Albany, this type of event will likely affect all of the citizens in the community. If the earthquake is of any significant size, the downtown portion of Albany will likely have significant damage. The majority of the buildings in the downtown are un-reinforced masonry ranging from one to seven stories. At this time, most second stories and above are unoccupied, but there is a push to refurbish them into living space. Seismic retrofitting of these may not be possible. An earthquake during the day would create significantly higher deaths and injuries in this area than one that would occur in the evening.

Most homes in the city are single-story; that were built prior to seismic safety standards, so in a significant earthquake, many of the homes will be moved off their foundations. Most of Albany is located on flat land, but many homes in the North Albany area are built in multiple levels on sloped land. Many of these homes are newer and have been built to comply with seismic standards. Still it would be expected that a large number of homes would be damaged not only from the earthquake, but from moving land they are built on.

Infrastructure damage to the water and sewer system would have a large impact on the citizens of Albany after an earthquake. The city's water piping system is old and being replaced a little each year. It would be expected that depending on the type of ground movement created from an earthquake, significant damage to underground pipes would occur as well as damage to the old treatment plant, established in 1912, which has not been seismically updated. The city is preparing to update the wastewater treatment plant with a completion date of 2009. When this is done all structures which will be built or remodeled will meet current state of Oregon earthquake standards. The water waste treatment plant which was built during the 1950's has not been upgraded. Since the pipes for this system are located in the same area as the water pipes you would expect significant damage to this system also. A new intake, pumping and treatment facility has been built in the City of Millersburg and along the Santiam River. These structures have been built to the state of Oregon's latest earthquake building standards.

The City has several bridges that are not seismically upgraded including the Lyon street bridge and the Ellsworth street bridge over the Willamette River. These bridges connect Linn and Benton counties. After a significant earthquake these bridges will be out of service. In addition to these, many smaller bridges cross streams or canals and culverts underneath City streets. Depending on the size and type of earthquake event, these bridges and culverts will create significant transportation problems within the City. Safe emergency traffic routes will need to be created to assure that emergency vehicles can get from each section of town to the other safely.

Critical facilities will be impacted during an earthquake. At this time, two fire stations and City Hall have been built at the latest earthquake standard. The two remaining fire stations have been evaluated but not upgraded and the police station was built prior to the increased standards and has not been upgraded. Albany's hospital, which is four stories, was built prior to seismic standards and has not been upgraded. It can be expected that if a significant earthquake occurs major damage will take place at this facility.

The type and magnitude of an earthquake will have different effects on the city. The city is not prepared to withstand a major event. The effect on the citizens and infrastructure will be catastrophic.

Earthquake Community Impacts

Earthquake damage occurs because structures cannot withstand severe shaking. Buildings, airports, schools, and lifelines including water, sewer, storm water and gas lines, transportation systems, electricity, and communication networks suffer damage in earthquakes and can cause death or injury to humans.

The welfare of homes, businesses, and public infrastructure is very important. Addressing the integrity of buildings, critical facilities, and infrastructure, and understanding the potential costs to government, businesses, and individuals as a result of an earthquake are challenges that the City of Albany must address.

Buildings

The built environment is susceptible to damage from earthquakes. Buildings that collapse can trap and bury people, putting lives at risk and creating great costs to clean up the damages. The Uniform Building Code classifies Commercial buildings within categories A through F with the residential buildings recognized as C, D1, and D2. All structures are assigned to a seismic design category based on their seismic use group, I through III, and the mapped spectral response acceleration coefficients: Ss and S1. In other words, would the failure of the building result in no real hazard as in Group I, a substantial public hazard as in Group II, or is it an essential facility as in use Group III. The response acceleration coefficients are short periods and 1 second periods of ground movement shown as point values based on a percentage of gravity. The earthquake loads are based on energy dissipation in the structure designed to resist the earthquakes motion and accelerations. Seismic designs with a short period of 0.4g's or less do not need seismic design as in Categories A, B, and C. The maximum considered earthquake ground motions for the Albany area are approximately 0.933g for the short period and 0.4g for 1-second. Albany is in Seismic Design Category D which is comparable to the Seismic Zone 3.

In most Oregon communities, the majority of buildings were built before 1993 when seismic building codes were less strict. Upgrading existing buildings to present seismic levels can be very expensive. State code only requires seismic upgrades when there is significant structural alteration to the building or where there is a change in use which puts building occupants and the community at a greater risk. Therefore, approximately 7,000 buildings are at risk. The lack of funding for such activity is serious. For the City of Albany, the majority of older structures at risk to earthquake are located in the downtown business district. This is where the multi-level buildings are located most with non-reinforced masonry. The east end of the city also has a large number of businesses built prior to the seismic code change and though they are at risk, nearly all are one story buildings. The difference is that these building will have more people in them at any one time than the more dangerous downtown buildings, which do not have the volume of occupants.

Infrastructure and Communication

An earthquake can greatly damage bridges and roads, hampering the movement of people and goods. Damaged infrastructure strongly affects the economy of the community – it disconnects people from work, school, food, and leisure, and separates businesses from their employees, customers, and suppliers.

Bridge Damage

Even modern bridges can sustain damage during earthquakes, leaving them unsafe for use. Some bridges have failed completely due to strong ground motion. Bridges are a vital transportation link – with even minor damages making some areas inaccessible. Because bridges vary in size, materials, siting, and design, any given earthquake will affect them differently. Bridges built before the mid-1970's have a significantly higher risk of suffering structural damage during a moderate to large earthquake compared with those built after 1980 when design improvements were made. Much of the interstate highway system was built in the mid to late 1960's.

The City of Albany has approximately 83 bridges within the city limits. The breakdown of ownership is: Benton County one bridge; Linn County, 15; City of Albany, 26; State of Oregon, 24; railroad, 17. The state bridges will have the highest priority for transportation. Two of the state-owned bridges cross the Willamette River as a part of Highway 20 between Albany and

Corvallis. The loss of these bridges will have a significant impact on travel between North Albany and Benton County and the remainder of the city in Linn County. The next closest opportunity of getting to Benton County is found on Highway 34 about 10 miles south of Albany. Three additional bridges are located there, but they will be in the same condition as the ones in Albany. The remainder of the State owned bridges is along the I-5 corridor and any damage to these bridges will also have significant impacts on the City.

All bridges within the city have been identified in the City of Albany's emergency route maps so critical decisions can be made about potential traffic routes for both emergency and citizen movement.

Damage to Lifelines

Lifelines are the connections between communities and outside services. They include water and gas lines, transportation systems, electricity, and communication networks. Ground shaking and amplification can cause pipes to break, power lines to fall, roads and railways to crack or move, and radio and telephone communication to cease. Disruption to transportation makes it especially difficult to bring in supplies or services. All lifelines need to be usable after an earthquake to allow for rescue, recovery, and rebuilding efforts and to relay important information to the public.

Disruption of Critical Services

Critical facilities include police stations, fire stations, hospitals, shelters, and other facilities that provide important services to the community. These facilities and their services need to be functional after an earthquake event. Many critical facilities are housed in older buildings that are not up to current seismic codes. For the City of Albany, City Hall and the two newest fire stations are built to present earthquake standards. Other City facilities are older buildings which do not meet present day codes. Seismic evaluations of all City buildings need to be done and are a part of the Action Items Identified in this Plan.

Businesses

Seismic activity can cause great loss to businesses - both large-scale corporations and small retail shops. When a company is forced to stop production for just a day, the economic loss can be tremendous, especially when its market is at a national or global level. Seismic activity can create economic loss that presents a burden to small shop owners who may have difficulty recovering from their losses. The downtown core business area has the oldest buildings in the City. Most are un-reinforced masonry built in the early 1900's. These buildings meet no earthquake standards and are very susceptible to any earthquake which may occur. Even outside the core area in other locations, most commercial and industrial buildings were built 20 – 30 years ago under a different, less stringent, earthquake code. Even if the building housing a business is undamaged by an earthquake, the loss of bridges can disrupt employee access to work and the flow of raw materials and finished products that keep the company in business.

Individual Preparedness

A 1999 DOGAMI survey shows that about 39% of respondents think an earthquake will occur in Oregon within the next 10 years. Only 28% of Oregon residents say they are prepared for an earthquake, and 22% have earthquake insurance. In addition, only 24% correctly identified what to do during an earthquake.[12]

Because the potential for earthquake occurrences and earthquake- related property damage is relatively high, increasing individual preparedness is a significant need. Strapping down heavy furniture, water heaters, and expensive personal property as well as being insured for

earthquake, are just a few steps individuals can take to prepare. Because few individuals have experienced an earthquake and they occur infrequently, people do not prepare for an earthquake as seriously as other hazards.

Death and Injury

Death and injury can occur both inside and outside of buildings due to falling equipment, furniture, debris, and structural materials. Downed power lines and broken water and gas lines can also endanger human life. Deaths can be prevented with proper building design and individual preparedness.

Fire

Downed power lines or broken gas mains can trigger fires. When fire stations suffer structural or lifeline damage, quick response to suppress fires is less likely. Therefore, it is necessary for fire stations and critical facilities to be well protected from natural disasters. It is also necessary that the water system be well protected so that water for fire fighting will be available if needed. In the San Francisco earthquake of 1906, 85% of the damage was caused by post-earthquake structural fires that could not be effectively fought because of earthquake damage to the water system.

Debris

Following damage to structures, much time is spent cleaning up brick, glass, wood, steel or concrete building elements, office and home contents, and other materials. Developing strong debris management strategies can assist in post-disaster recovery. The city has developed a debris management Annex as a part of the Emergency Operations Plan. This Annex will be used after an event to assure Debris Management is handled in an effective manner.

Earthquake Hazard Vulnerability: Estimating Potential Losses

Two draft HAZUS-MH: Earthquake Event Reports were provided to the City of Albany at the April 21, 2005 meeting with ONHW and DOGAMI. One was for an Albany Crustal Event, Crustal Mill Creek M6.7 and the other was for an Albany Cascadia event, Cascadia M8.5.

General description of Albany area used in estimates

General description of the region for both reports was as follows: The earthquake loss estimates provided in these reports was based on a region that includes two counties, Linn and Benton in the state of Oregon. The geographical size of the region is 158.25 square miles and contains 10 census tracts. There are over 20,000 households in the region and a total population of 50,972 people (2000 Census Bureau data). There are an estimated 17 thousand buildings in the region with a total building replacement value (excluding contents) of $3,155,000. Approximately 99% of the buildings (and 82% of the building value) are associated with residential housing. The replacement value of the transportation and utility lifeline systems is estimated to be 1.948 and $350,000,000, respectively.

HAZUS estimates there are 17 thousand buildings in the region which have an aggregate total replacement value of $3,155,000. Wood frame construction makes up 85% of the building inventory. HAZUS identified the following critical facility inventory: one hospital, 26 schools, 2 fire stations, 3 police station, no emergency operations facilities and 40 hazardous material sites. HAZUS identified seven transportation systems that include highways, railways, light

rail, bus, ports, ferry and airports. There are six utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The total value of the lifeline inventory is over $2,298,000. This inventory includes over 131 kilometers of highways, 52 bridges, and 1,880 kilometers of pipes.

Estimates of losses to structures, transportation, utilities and citizens:

Cascadia M8.5 Event

Building damage: HAZUS estimates that about 6,022 buildings will be at least moderately damaged. This is over 34% of the total number of the buildings in the region. An estimated 1,628 buildings will be completely destroyed. Building damage by occupancy and type are found in the draft report.

Essential facility damage: Before the earthquake, the region had 71 hospital beds available for use. On the day of the earthquake, the model estimates that only 63 hospital beds (90%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 90% of the beds will be back in service. By 30 days, 90% will be operational. On day 1 all of the fire stations, police stations and 25 of the 26 schools are likely to be functional.

Transportation and utility lifeline damage: Estimates for transportation systems indicate four of the 52 bridges will be at least moderately damaged. One of the two potable water locations will be moderately damaged. There will be 166 leaks and 83 breaks in 940 kilometers of potable water pipelines; One hundred thirty one leaks and 65 breaks in 564 kilometers of waste water pipelines. One hundred forty leaks and 70 breaks in 376 kilometers of natural gas pipelines. Of the 20,002 households, 5,155 will be without potable water at day 1.

Crustal Mill Creek M6.7 Event

Building Damage: HAZUS estimates that about 11,742 buildings will be at least moderately damaged. This is over 67% of the total number of the buildings in the region. There are an estimated 2,525 buildings that will be completely destroyed. Building damage by occupancy and type are found in the draft report.

Essential facility damage: Before the earthquake, the region had 71 hospital beds available for use. On the day of the earthquake, the model estimates that only three hospital beds (4%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 20% of the beds will be back in service. By 30 days, 62% will be operational. None of the two fire stations, three police stations and only three of the 26 schools will be functional on day 1.

Transportation and Utility Lifeline Damage: Estimates for transportation systems indicate 11 of the 52 bridges will be at least moderately damaged. One of one railway facility will be moderately damaged. One bus facility will be moderately damaged and seven of nine airport facilities will be moderately damaged. Both of the potable water and wastewater locations will be moderately damaged. One electrical power location will be moderately damaged as will 2 communications locations. There will be 266 leaks and 192 breaks in 940 kilometers of potable water pipelines; Two hundred ten leaks and 152 breaks in 564 kilometers of waste water pipelines; Two hundred twenty five leaks and 162 breaks in 376 kilometers of natural gas pipelines. Of the 20,002 households, 13,645 will be without potable water at day 1 and 10,780

at day 3. For electrical power, 14,034 will be without service at day 1; 9,312 at day 3; 4,465 at day 7; 1,125 at day 30; and 18 at day 90.

Cascadia M8.5 Event

For fires following a Cascadia earthquake, the model provided by DOGAMI indicates that no fires will occur. No debris will be generated. Shelter requirements indicated by the model estimates 2,166 households to be displaced, of these, 558 people will seek temporary shelter. HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four severity levels.

Level 1: Injuries will require medical attention but hospitalization is not needed.

Level 2: Injuries will require hospitalization but are not considered life-threatening.

Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.

Level 4: Victims are killed by the earthquake.

Casualty estimates are provided by three times of day, 2:00 AM, 2:00 PM and 5:00 PM. For the purpose of this section the summary is not provided by category. For the full report please see the DOGAMI event summary report.

		Level 1	Level 2	Level 3	Level 4
2 AM	Total	409	105	11	21
2 PM	Total	760	235	39	74
5 PM	Total	613	188	38	56

The total economic loss estimates for the earthquake is $1,000,460, which included building and lifeline related losses based on the region's available inventory. The building losses are broken into two categories: direct building losses and business interruption losses. The total building-related losses were $890.63 millions; 12 % of the estimated losses were related to the business interruption of the region. The largest loss was sustained by the residential occupancies which made up over 52% of the total loss.

For the transportation and utility lifelines system, HAZUS computes the direct repair cost for each component only. HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake.

	Inventory value	**Economic loss**
Highway	$1,509,300,000	$48,000,000
Railways	$101,300,000	$1,000,000
Bus	$1,200,000	$300,000
Airport	$336,000,000	$9,800,000
Total	$1,948,000,000	$59,000,000

Utility system economic losses:

	Inventory value	Economic loss
Potable water	$94,060,000	$12,830,000
Waste water	$161,800,000	$19,930,000
Natural gas	$7,500,000	$1,960,000
Electrical power	$124,300,000	$15,970,000
Communications	$230,000	$20,000
Total	$387,910,000	$50,700,000

Indirect economic impact with outside aid (employment as # of people and income in millions of $)

	Loss	Total	%
First year	Employment impact	0	0
	Income impact	(33)	-7.14
Second year	Employment impact	0	0
	Income impact	(49)	-10.45
Third year	Employment impact	0	0
	Income impact	(55)	-11.83
Fourth year	Employment impact	0	0
	Income impact	(55)	-11.83
Fifth year	Employment impact	0	0
	Income impact	(55)	-11.83
Years 6 to 15	Employment impact	0	0
	Income impact	(55)	-11.83

Crustal Mill Creek M6.7 Event

For fires following a Crustal earthquake the model provided by DOGAMI indicates that seven fires that will burn about 0.07 sq miles (0.04% of the regional area). About 109 people will be displaced by fire and about $6 millions building value will be damaged. No debris will be generated. The model estimates 3,569 households to be displaced; of these, 894 people will seek temporary shelter. HAZUS estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four severity levels.

Level 1: Injuries will require medical attention but hospitalization is not needed.

Level 2: Injuries will require hospitalization but are not considered life-threatening.

Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.

Level 4: Victims are killed by the earthquake.

Casualty estimates are provided by three times of day; 2:00 AM, 2:00 PM and 5:00 PM. For the purpose of this section, the summary is not provided by category. For the full report, please see the DOGAMI event summary report.

		Level 1	Level 2	Level 3	Level 4
2 AM	Total	626	151	14	24
2 PM	Total	827	248	40	75
5 PM	Total	719	214	49	60

The total economic loss estimates for the earthquake is $1,626,160, which included building and lifeline related losses based on the region's available inventory. The building losses are broken into two categories: direct building losses and business interruption losses. The total building-related losses were $1,333,690; 10 % of the estimated losses were related to the business interruption of the region. The largest loss was sustained by the residential occupancies which made up over 68% of the total loss.

For the transportation and utility lifelines system, HAZUS computes the direct repair cost for each component only. HAZUS estimates the long-term economic impacts to the region for 15 years after the earthquake.

	Inventory value	**Economic loss**
Highway	$1,509,300,000	$122,800,000
Railway	$101,300,000	$1,210,000
Bus	$1,2000,000	$600,000
Airport	$336,000,000	$25,900,000
Total	$1,948,300,000	$152,100,000

Utility system economic losses in million of dollars:

	Inventory value	Economic loss
Potable water	$94,060,000	$30,870,000
Waste water	$161,800,000	$50,610,000
Natural gas	$7,500,000	$4,140,000
Electrical power	$124,300,000	$54,750,000
Communications	$230,000	$70,000
Total	$387,910,000	$140,440,000

Indirect economic impact with outside aid (employment as # of people and income in millions of $)

	Loss	Total	%
First year	Employment impact	0	0
	Income impact	(37)	-8.05
Second year	Employment impact	0	0
	Income impact	(61)	-13.21
Third year	Employment impact	0	0
	Income impact	(72)	-15.39
Fourth year	Employment impact	0	0
	Income impact	(72)	-15.39
Fifth year	Employment impact	0	0
	Income impact	(72)	-15.39
Years 6 to 15	Employment impact	0	0
	Income impact	(72)	-15.39

Mitigation Plan Goals and Existing Activities

The mitigation plan goals were derived from the City's Strategic Plan and the action items were developed and approved by the Steering Committee with input from the public. The plan goals are further outlined in the executive summary portion of the Plan. A list of action items for earthquake is found at the end of this section.

Goal 1: To maintain and improve the City's physical capital through the active management and sustainability of public infrastructure

Goal 2: To strengthen our economic capital by capitalizing on Albany's unique advantages, developing and promoting a strategic economic plan, and leveraging public and private resources to maintain and attract family-wage jobs.

Goal 3: To raise Albany's social capital by enabling civic leadership, community involvement, and development of great neighborhoods

Goal 4: To build political capital to meet the broader long-range public services needs of Albany and the surrounding region

Goal 5: To protect and enhance environmental capital through the strategic management of our natural resources

Goal 6: To safeguard and enhance the human capital of our organization as an important building block necessary to achieve the other goals

Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, state, or federal agencies and organizations.

Local Programs

Regional All Hazard Mitigation Plan for Benton, Lane, Lincoln and Linn Counties

Beginning in 1996, the City of Albany participated with Benton, Lane, Lincoln, and Linn counties in the development of a three-phase hazard mitigation program. The plan reviewed the principles of mitigation planning and presents a seven-step process for conducting a detailed, quantitative evaluation of prospective mitigation projects. Phase one of the programs was completed in December of 1998 and provided a flood hazard mitigation planning template for local government, a mitigation planning methodology and spoke to flood and winter storm hazards. It also outlined the interface between mitigation planning and emergency planning.

Phase Two of the planning was completed in September of 2001 and spoke to earthquake impacts for Benton, Lane, and Linn counties. Phase Three of the program was completed September of 2002 and addressed hazardous materials in Benton, Lane, and Linn counties.[13]

Capital Improvement Plan

The City of Albany's Capital Improvements Plan (CIP) is a dynamic document that lists and prioritizes needed improvements and expansions of the City's infrastructure system to maintain adequate service to existing City residents and businesses, and to accommodate population growth and land development. The CIP reflects the needs and priorities established by the City and the resources available to the City. The CIP can be modified during the fiscal year, through the supplemental budget process, as needs, priorities, and resources change. The CIP can assist the City of Albany in mitigating against severe weather events by improving infrastructure most prone to damage.

Emergency Operation Center (EOC)

The Emergency Operations Center is an established location/facility from which City staff and officials can provide direction, coordination, and support to emergency operations in the event of

an incident such as a natural disaster. City personnel who are assigned to and trained for specific positions within the EOC organizational structure staff the EOC. The structure is based on the National Interagency Incident Management (NIIMS) Incident Command System (ICS). The EOC staff provides information and recommendations to the Mayor, through the Incident Commander or as directed, to develop a course of action to respond to and contain, control, and recover from an emergency. Some of the primary functions performed at the EOC include: coordination, operations management, planning, information tracking and dissemination, logistical support, financial management and support, and emergency public information.

Emergency Operations Plan (EOP)

The Emergency Operations Plan (EOP) describes the roles and responsibilities of the departments and personnel for the City of Albany during major emergencies or disasters.

The Plan sets forth a strategy and operating guidelines using National Incident Management System (NIMS) Incident Command System (ICS) which was adopted by the City for managing its response and recovery activities during disasters and emergencies.

The EOP consists of various sections and supporting materials. The development and maintenance of this plan is the basis of the City's emergency response and recovery operations.

1. **Basic Plan** - Provides an overview of the City's emergency response organization and policies. It cites the legal authority for emergency operations, summarizes the situations addressed by the plan, explains the general concept of operations, and assigns general responsibilities for emergency planning and operations.

2. **Functional Annexes** - Each annex focuses on one of the critical emergency functions that are typically common for all hazards, which the City will perform in response to an emergency. The type and scope of an incident will dictate which functional annexes will be needed.

3. **Hazard Specific Appendices** - The appendices provide additional detailed information and special considerations that are applicable to specific hazards. The appendices are to be used in conjunction with the Basic Plan and the Functional Annexes.

4. **Addendum** – The addendum includes the Emergency Resource Guide, Emergency Call List, Mutual Aid and Memorandum of Understanding (MOU) Agreements, and Radio Frequency Communication Guide.

Incident Command System

The Incident Command System (ICS) is a management system that may be used for any type of hazard event, and has three main components. The City of Albany has adopted the use of the National Incident Management System (NIMS), which included the Incident Command System for its method of responding to and recovering from any disaster or emergency. The NIMS components are:

1. Command and management
2. Preparedness
3. Resource management
4. Communications and information management
5. Support technologies
6. Ongoing management and maintenance

Transportation System Plan

The City of Albany's adopted transportation System plan is the transportation element of the City's Comprehensive Plan. It identifies the transportation improvements needed to accommodate existing and future development in the Albany area. The plan projects needs and improvements through 2015. An update is underway with a forecast year of 2030. At this time all improvements within the Transportation Plan are development driven.

Albany's adopted transportation plan is based on an analysis contained in the Transportation System Plan (TSP), which was developed through a public participation process. The development of the TSP and thereafter the more concise transportation element, along with the Comprehensive Plan are closely coordinated and intended to be consistent with other jurisdictions' transportation plans.

Urban Forestry Program

Albany's Public Works Urban Forestry Program has a number of ongoing educational efforts designed to mitigate damage from downed trees during storms. The program also has authority to identify and eliminate known hazards. The following is a brief summary of related activities. Albany Municipal Code gives the City Forester authority to require permits for planting of trees on public rights of way. The permitting system provides an opportunity to specify failure resistant species of trees and to set standards that reduce losses from tree failure. The City Forester has the authority to remove trees that threaten public safety and to require property owners to perform street tree maintenance to correct hazardous situations.

The Urban Forestry Program also provides a free inspection service for public street trees. Property owners who request this service are visited by the City Forester who is trained to pre-identify many tree related hazards and advise property owners.

Tree Inventory Map

Currently the City is working on a comprehensive public tree inventory to help identify hazard trees. A map of hazardous trees in Albany will provide information useful for targeting measures that can be used to mitigate against the effects of falling trees. Further to this goal, "The City of Albany Public Works Department is currently working on long range tree preservation planning. This will help drive development away from hazard prone areas, and attempt to increase City's ability to mitigate for disasters."

PacifiCorp

Pacific Power's Right Tree-Right Place program educates homeowners, landscapers, and tree propagators on tree species that will not be subject to ongoing stress by constant pruning. Pacific Power distributes posters and our *Small Trees for Small Places* booklet that list low-growing trees that fit within the utility right-of-way and are compatible with small urban planting strips. The poster includes information on how to select the correct tree, the energy-saving benefits of trees, and proper planting and pruning techniques. Pacific Power offers tree owners certificates to help defray the cost of a new tree that replaces one that is inappropriate. Pacific Power's foresters work with local government and the public to assess and identify situations in which trees or power lines put life and property at risk or endanger electric service reliability.

International Building Code

The State of Oregon and the City of Albany have adopted the International Building Code which includes new earthquake standards.

Dangerous Building Code

Albany Municipal Code, Title 18 – Building & Construction, 18-16 Dangerous Buildings defines "dangerous buildings" and requires abatement of them. Dangerous buildings are those with structures that are overstressed because of snow or wind loading or because they require extensive maintenance.

State Resources

State Building Codes[14]

The Oregon State Building Codes Division adopts statewide standards for building construction that are administered by the State, cities, and counties throughout Oregon. The codes apply to new construction and to the alteration of, or addition to, existing structures. The One and Two Family Dwelling Code and the Structural Specialty Code (both included in the State Building Code) prescribe seismic design requirements for new construction based on the seismology of the region. These codes are state of Oregon amended additions of national model codes from the International Code Council. These codes are based on maps that identify the various seismic zones for Oregon.

The Structural Specialty Code is based on the 2003 International Building Code published by the International Code Council and amended by the State of Oregon. The International Building Code contains specific regulations for development within seismic zones.[15]

Within these standards are six levels of design and engineering specifications that are applied to areas according to the expected degree of ground motion and site conditions that a given area could experience during an earthquake (ORS 455.447). The Structural Code requires a site-specific seismic hazard report for projects including essential facilities such as hospitals, fire and police stations, emergency response facilities, and special occupancy structures such as large schools and prisons.

The seismic hazard report required by the Structural Specialty Code for essential facilities and special occupancy structures must take into consideration factors such as the seismic zone, soil characteristics including amplification and liquefaction potential, any known faults, and potential landslides. The findings of the seismic hazard report must be considered in the design of the building. The Dwelling Code simply incorporates prescriptive requirements for foundation reinforcement and framing connections based on the applicable seismic zone for the area. The cost of these requirements is rarely more than a small percentage of the overall cost for a new building.[16]

The requirements for existing buildings vary depending on the type and size of the alteration and whether there is a change in the use of the building to house a more hazardous use. Oregon State Building Codes recognize the difficulty of meeting new construction standards in existing buildings and allow some exception to the general seismic standards. Upgrading existing buildings to resist earthquake forces is more expensive than meeting code requirements for new construction.

State code only requires seismic upgrades when there is significant structural alteration to the building or where there is a change in use that puts building occupants and the community at a greater risk. The local building official is responsible for enforcing these codes. Although there is no statewide building code for substandard structures, local communities have the option of adopting one to mitigate hazards in existing buildings. The State has adopted regulations to abate buildings damaged by an earthquake in Oregon Administrative Rules (OAR) 918- 470. Oregon Revised Statutes (ORS) 455.020 and 455.390-400 also allow municipalities to create

local programs to require seismic retrofitting of existing buildings within their communities. The building codes do not regulate public utilities and facilities constructed in public right-of-ways such as bridges that are regulated by the Department of Transportation.

Senate Bill 13: Seismic Event Preparation

Signed by Governor John Kitzhaber on June 14, 2001, Senate Bill 13 requires each state and local agency and persons employing 250 or more full-time employees to develop seismic preparation procedures and inform their employees about the procedures. Further, the Bill requires agencies to conduct drills in accordance with Office of Emergency Management guidelines. These drills must include "familiarization with routes and methods of exiting the building and methods of duck, cover, and hold during an earthquake."

Senate Bill 14: Seismic Surveys for School Buildings

The Governor signed Senate Bill 14 on July 19, 2001. It requires the State Board of Higher Education to provide for seismic safety surveys of buildings that have a capacity of 250 or more persons and are routinely used for student activities by public institutions or departments under the control of the board. A seismic safety survey is not required for any building that has previously undergone a seismic safety survey or that has been constructed to the state building code standards in effect for the seismic zone classification. If a building is found to pose an undue risk to life and safety during a seismic event, a plan shall be developed for seismic rehabilitation or other seismic risk reducing activities. (Plans are subject to available funding.) All seismic rehabilitation or other actions to reduce seismic risk must be completed before January 1, 2032.

DOGAMI and the Oregon University System joined to design a pilot program to begin the process to fulfill ORS 455.400 (2001). Through university maintenance funds and FEMA Pre-Disaster Mitigation grants, they have initiated seismic safety surveys of university buildings and selected several particularly vulnerable buildings for seismic safety upgrades.

Senate Bill 15: Seismic Surveys for Hospital Buildings

Governor John Kitzhaber signed Senate Bill 15 on July 19, 2001. It requires the Health Division to provide for seismic safety surveys of hospital buildings that contain an acute inpatient care facility. Seismic surveys shall also be conducted on fire stations, police stations, sheriffs' offices, and similar facilities subject to available funding. The surveys should be completed by January 1, 2007. A seismic survey is not required for any building that has undergone a survey or that has been constructed to the state building code standards in effect for the seismic zone classification at the site. If a building is evaluated and found to pose an undue risk to life and safety during a seismic event, the acute inpatient care facility, fire department, fire district or law enforcement agency using the building shall develop a plan for seismic rehabilitation of the building or for other actions to reduce the risk. (Again, plans are subject to available funding.) All seismic rehabilitations or other actions to reduce the risk must be completed before January 1, 2022.

Earthquake Awareness Month

April is Earthquake Awareness Month. During the month, the State Office of Emergency Management encourages individuals to strap down computers, heavy furniture, and bookshelves. In addition, the Oregon Natural Hazards Workgroup distributed a flyer with educational information about how to prepare for an earthquake.

Earthquake Education

Earthquake education in schools is ongoing in Oregon. Public schools are required to conduct periodic earthquake drills and educate students on how to respond when an earthquake event occurs (ORS 455.447 and 336.071).

Federal Resources

National Earthquake Hazards Reduction Program (NEHRP)

NEHRP's mission includes improved understanding, characterization, and prediction of hazards and vulnerabilities; improved model building codes and land use practices; risk reduction through post-earthquake investigations and education; development and improvement of design and construction techniques; improved mitigation capacity; and accelerated application of research results. FEMA is designated as the lead agency of the program and assigns several planning, coordinating, and reporting responsibilities.

National Earthquake Loss Reduction Program (NEP)

NEP was formed as a result of the report "Strategy for National Earthquake Loss Reduction" prepared by the Office of Science and Technology Policy (OSTP) in April 1996. The NEP "aims to focus scarce research and development dollars on the most effective means for saving lives and property and limiting the social disruptions from earthquakes, coordinate federal earthquake mitigation research and development and emergency planning in a number of agencies beyond those in NEHRP to avoid duplication and ensure focus on priority goals, and cooperate with the private sector and with state and local jurisdictions to apply effective mitigation strategies and measures." The NEP does not replace NEHRP but encompasses a wider range of earthquake hazard reduction activities than those supported by the NEHRP agencies and provides a framework within which these activities can be more effectively coordinated.

The National Earthquake Technical Assistance Program (NETAP)

The NETAP is a technical assistance program created to provide ad hoc, short-term architectural and engineering support to state/local communities as they are related to earthquake mitigation. The program was designed to enhance the state/local communities' ability to become more resistant to seismic hazards. This assistance cannot be used for actions that are covered under the States/Territories Performance Partnership Agreement (PPA). This program assists in carrying out the statutory authorities of the National Earthquake Hazards Reduction Act of 1977, as amended.

Technical assistance under the NETAP is available for use by the state/local communities within the 45 eligible and or participating seismic states and U.S. territories. This assistance is provided at no cost to the requesting local community/state government.

Examples of NETAP projects are seismic retrofit/evaluation training, evaluation of seismic hazards critical/essential facilities, post earthquake evaluations of buildings, and development of retrofit guidance for homeowners.

National Seismic Hazard Mapping Project

National maps of the earthquake shaking-hazard in the United States have been produced since 1948. Scientists revise these maps as new earthquake studies improve their understanding of this hazard. After thorough review, professional organizations of engineers in turn update the seismic-risk maps and seismic design provisions contained in building codes. More than 20,000 cities, counties, and local government agencies use building codes such as the International

Building Code to help establish the construction requirements necessary to preserve public health and safety in earthquakes.

The 1996 U.S. Geological Survey shaking-hazard maps for the United States are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from quake sources.

Earthquake Event Mitigation Action Items

The earthquake mitigation action items provide direction on specific activities that organizations and residents in City of Albany can undertake to reduce risk and prevent loss from earthquake. There are five short-term and 13 long-term earthquake action items described in the Earthquake Action Item Matrix. Each action item can be used by the Steering Committee and local decision makers in pursuing strategies for implementation.

The Earthquake Action Item Matrix is a separate file to this document.

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1 Wong, Ivan G and Bott Jacqueline D.J. (November 1995). A look back at Oregon's earthquake history, 1841- 1994. Oregon Geology 57 (6). 125.

2 Benton County Natural Hazard Mitigation Plan: Section 10 Earthquake

3 Ibid.

4 Hill, Richard. "Geo Watch Warning Quake Shook Portland 40 Years Ago." The Oregonian, October 30, 2002

5 California Department of Conservation, California Geological Survey, 2002; Guidelines for Evaluating the Hazard of Surface Fault Rupture, Note 49.

6 Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000), Ch. 8, pp.7

7 City of Portland Natural Hazard Mitigation Plan, 2004

8 Ibid.

9 Richard. "Geo Watch Warning Quake Shook Portland 40 Years Ago." The Oregonian, October 30, 2002

10 Ibid.

11 Ibid.

12 Community Planning Workshop, 2002

13 Regional all Hazard Mitigation Master Plan for Benton, Lane, Lincoln and Linn Counties: Phases I, II, and III. Kenneth A. Goettel; Goettel & Associates Inc.

14 Planning for Natural Hazards: The Oregon Technical Resource Guide, Department of Land Conservation and Development (July 2000), Ch. 8, pp.13

15 Blaine Brassfield, City of Albany building Official.

16 United States Geological Survey, Geologic Division, Earthquake Information: reducing hazards, http://quake.wr.usgs.gov, October 19, 1999

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items:**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Earthquake (EQ) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
EQ-Short Term	Action 4.8. Re-run DOGAMI HAZUS with local refined data	Emergency Management	Public Works	1 – 2 years										
Objective #5: Ensure continuity of City emergency services function.														
EQ-Short Term	Action 5.4. Develop specific emergency evacuation or shelter-in-place plans for residential areas that are near significant hazard material storage facilities and heavy industrial areas.	Emergency Management	Public Works	1 – 2 years										
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
EQ-Short Term	Action 7.5. Develop an education and outreach program to make residents aware of the earthquake hazard and the availability of earthquake insurance	Community Development		1 – 2 years										
EQ-Short Term	Action 7.6. Develop awareness program which encourages and assists property owners to implement structural and non-structural mitigation for the earthquake hazard	Emergency Management	Community Development, PIO, FEMA, Red Cross	1 – 2 years										

Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.															
EQ-Short Term	Action 9.1. Develop a non-structural retrofit program aimed at making child care facilities and schools more resistant to the impact of earthquakes	Emergency Management	PIO, GAPS, State of Oregon	1 – 2 years											
Objective #3: Incorporate mitigation into planning and policy development.															
EQ-Long Term	Action 3.9. Explore development of an ordinance to address seismically-deficient buildings.	Community Development	Emergency Management	1 – 5 years											
Objective #6: Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure.															
EQ-Long Term	Action 6.5. Develop and implement a non-structural retrofit program for City staff offices and workspaces	Emergency Management	All Departments Safety Committee Red Cross	1 -5 years											
EQ-Long Term	Action 6.6. Seek funding to provide a pilot project that provides funding or incentives for non-structural seismic mitigation in private households and for housing that is vulnerable to the effects of natural hazards	Emergency Management	Public Works, Insurance Companies, Utilities	1 – 5 years											
EQ-Long Term	Action 6.7. Complete a seismic vulnerability assessment of all city-owned structures and prioritize the structures for updating	Emergency Management	Building Department	1 – 5 years											
EQ-Long Term	Action 6.8. Seek funding to update the prioritized city owned structures identified in Action 6.7	Emergency Management	Building Department, Public Works	1 – 5 years											
EQ-Long Term	Action 6.9. Complete inventory of commercial buildings that may be particularly vulnerable to earthquake damage	Emergency Management	Building Department	1 – 5 years											
EQ-Long Term	Action 6.10. Identify neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1940 homes and homes with cripple wall	Emergency Management	Building Department, GIS	1 – 5 years											
EQ-Long Term	Action 6.11. Seek funding to complete seismic retrofitting of the City of Albany structures, bridges, and infrastructure which have been identified and prioritized	Finance Department	Emergency Management, Public Works, State of Oregon, FEMA	1 – 5 years											

EQ-Long Term	Action 6.12. Conduct a vulnerability analysis of Albany's sewer system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit	Public Works	Emergency Management, Building Department	1 – 5 Years											
EQ-Long Term	Action 6.13. Conduct a vulnerability analysis of Albany's water distribution system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit	Public Works	Emergency Management, Building Department	1 – 5 Years											
EQ-Long Term	Action 6.14. Evaluate the necessity for seismic valve protection for City of Albany reservoirs and if determined necessary seek funding to retrofit	Public Works	Emergency Management, Building Department	1 – 5 Years											
Objective #8: Develop collaborative programs that encourage local businesses to plan for disasters.															
EQ-Long Term	Action 8.2. Provide examples and educational material to support implementation of non-structural mitigation programs in local businesses	Emergency Management	PIO, Economic Development, Chamber of Commerce, Downtown Association, Red Cross	1 – 5 years											
Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.															
EQ-Long Term	Action 9.2 Develop public/private partnerships to seek outside funding for retrofitting structures in the downtown and historic districts	CARA	SHIPO, Emergency Management, Economic Development, Downtown Association, Chamber of Commerce	1 – 5 years											

Section 8
Severe Weather

This section is concerned with severe weather events and focuses on ice and snow storms and high winds. Flooding is not included in this section, as it has been covered separately in Section 6.

Why are Severe Weather Events a Threat to the City of Albany?

Severe weather events pose a significant threat to life, property, and the local economy in the City of Albany by creating conditions that disrupt essential services such as public utilities, telecommunications, and transportation routes. Such storms can produce rain, freezing rain, ice, snow, and cold temperatures as well as high winds and tornados. Ice storms, freezing rain and high wind can destroy trees and power lines, interrupting utility services and transportation routes.

Severe Weather Event Characteristics

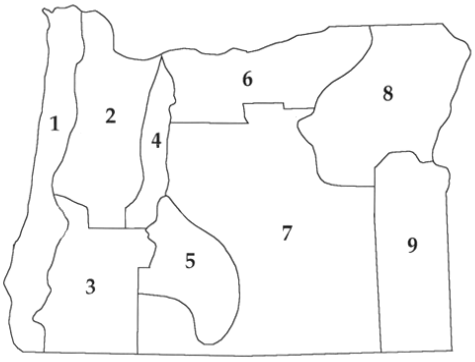
Weather patterns

Severe storms affecting the City of Albany with snow and ice typically originate in the Gulf of Alaska or in the central Pacific Ocean. These storms are most common from October through March.[1] A majority of the destructive surface winds in Oregon and, specifically, Albany, are from the south and south west off the Pacific Ocean.[2] We do get some winds from the east, but these normally occur during the summer and most often do not carry the same destructive force as those from the Pacific Ocean.

Albany's average rainfall is 40.14 inches a year. The National Climatic Data Center has established climate zones in the US for areas that have similar temperature and precipitation characteristics. Oregon's latitude, topography, and proximity to the Pacific Ocean give the state diversified climates. Albany is in Zone 2 as seen in Figure 9-1. The climate in Zone 2, including the City of Albany and surrounding areas, is generally mild throughout the year, characterized by cool, wet winters and warm, dry summers.[3]

Albany is about 70 miles from the Pacific Ocean, which provides a modified marine climate. Extreme summers and winter temperatures are moderated by the airflow moving across the area from the Pacific Ocean. Temperatures rarely exceed 95° F in the summer months (April – August) and rarely drop below 25° F in the winter months (September – March). Precipitation ranges from as low as .33 inches in July to as high as 7.05 inches in February. An average of one day per year has measurable snow with accumulations rarely measuring more than one inch.[4]

Figure 9.1
Oregon Climate Zones



Zone 1: Coastal Area
Zone 2: Willamette Valley
Zone 3: Southwestern Interior
Zone: 4 Northern Cascades
Zone 5: High Plateau
Zone 6: North Central Area
Zone 7: South Central Area
Zone 8: Northeast Area
Zone 9: Southeast Area

Source: Taylor, George H. and Hannan, Chris, *The Oregon Weather Book*, OSU Press (1999)

Winds

A windstorm is generally a short duration event involving straight-line winds and/or gusts in excess of 50 mph (80 km/hour). Albany is relatively flat with some higher elevations in the northern portion of the city. There is no natural buffer around the city to cause a wind storm to be deflected or to turn the wind. A wind storm will generally affect all parts of the city equally when it occurs.

The most destructive winds are those that blow from the south parallel to the major mountain ranges.[5] Windstorms affect areas of Albany with significant tree stands as well as areas with exposed property, major infrastructure, and above ground utility lines. Figures 9-1 and 9-2, as well as table 9-1 below, provide an overview of the potential wind hazard that exists for the City of Albany. As can be seen from this data, the lower wind speeds typical in the valleys are still high enough to knock down trees, bring down power lines, and cause other property damage.

As is true for many Oregon communities, the Columbus Day Storm of 1962 was the most severe storm to occur in Albany in the last forty years. Damage was widespread, downing trees, and power poles, with winds that gusted as high as 90 mph (144 km/hour). Statistically, one high-wind storm occurs every 10 years.

In all of the 12 high wind storms, power was lost to a large segment of the community. Depending on the duration and wind speed of the event, it was four hours to several days before power to communities and neighborhoods was restored. In the earlier part of the last century, the impact of a power outage was not as important as it has been in the last 30 years, as far fewer people had electricity, and not as many critical facilities existed.

Each of the 12 storms caused significant damage to buildings, trees, and infrastructure. That damage potential has risen over the last 30 years as more buildings have been constructed in Albany.

Figure 9.2

Wind Speed Contours for 2-Year Recurrence Interval

(km/hour)

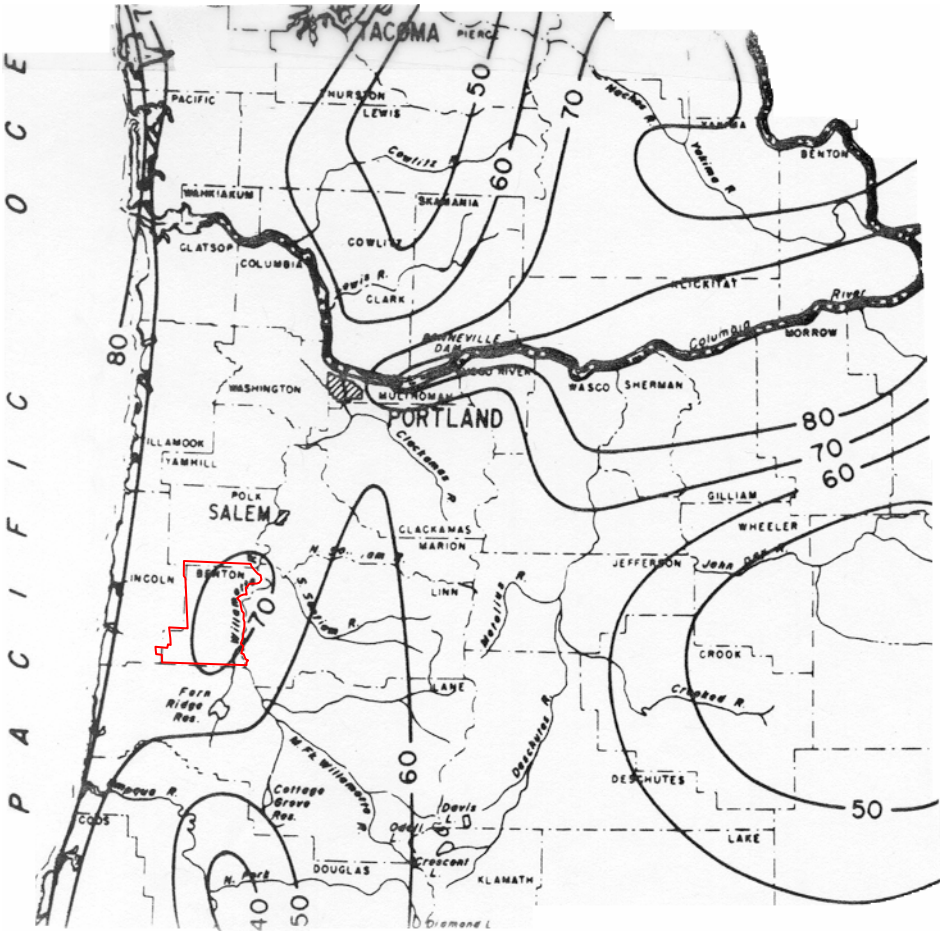
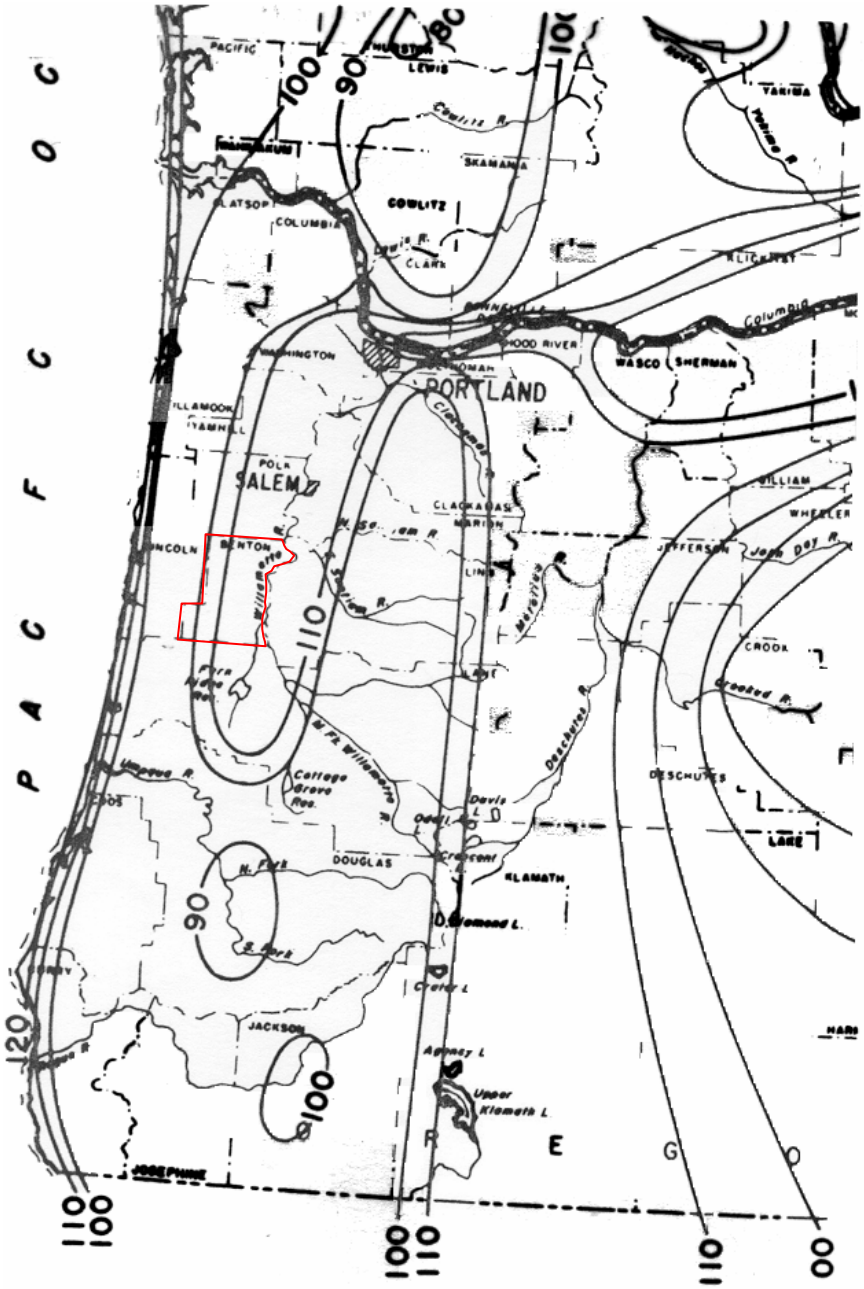


Figure 9.3

Wind Speed Contours for 50-Year Recurrence Interval

(km/hr)



Data from the above maps are summarized below in Table 9.1

Table 9.1

Wind Speed Data for Benton County

Return Period	Sustained Wind Speeds (km/hr)	Sustained Wind speeds (miles/hr)*
2-Year	60 to 70	37 to 43
50-year	100 to 115	62 to 71

* Conversion from map contours in kilometers per hour is 0.6214 miles per kilometer

For Benton County and the City of Albany, the 2-year recurrence interval sustained wind speeds range from about 60 to 70 km/hour or about 37 to 43 miles per hour. These 2-year wind speeds are too low to cause widespread substantial wind damage. However, there may be significant local wind damage at sites where local wind speeds are higher or where there are exposed locations, such at the boundary between clear cut and forested areas.

For Benton County and the City of Albany, the 50-year recurrence interval wind speeds range from about 100 to 115 km/hour or about 62 to 71 miles per hour. These wind speeds are high enough to cause widespread wind damage. Damage may be severe at particularly exposed sites. Thus, for most regions of Benton County, winter storms with significant direct wind damage are not likely every year or every few years, but perhaps once every decade or so, on average, with major wind storm events happening at intervals averaging a few decades.

The maps shown above have limited spatial resolution for Benton County and the City of Albany, but suggest that the potential for damaging winds may be somewhat higher in eastern Benton County along the Willamette River than elsewhere.[6]

Tornadoes

Tornadoes occasionally occur in Oregon. However, Oregon is not among the 39 states with reported tornado deaths since 1950. A compilation of historical tornados in Oregon by the National Weather Service (http://nimbo.wrh.noaa.gov/Portland/tornado.html) includes 64 tornadoes statewide, with several occurring in the Albany area**.**

Snow

Snow events are not common in Albany and the Willamette Valley. They need two ingredients: cold air and moisture. Rarely do the two ingredients occur at the same time over western Oregon, except in the higher elevations of the Coast Range and especially in the Cascades. But snowstorms do occur over eastern Oregon regularly during December through February. Cold arctic air sinks south along the Columbia River Basin, filling the valleys with cold air. Storms moving across the area drop precipitation, and if conditions are right, snow will occur. Since 1884 to the present, there have been at least 14 significant snow events in Albany. The last was in 2003.

Ice

Like snow storms, ice storms are comprised of cold temperatures and moisture, but subtle changes can result in varying types of ice formation including freezing rain, sleet, and hail.[7] Freezing rain can be the most damaging of ice formations. While sleet and hail can create hazards for motorists when they accumulate, freezing rain can cause the most dangerous conditions within a community. Much of the damage from ice storms occurs when the ice thaws: although some tree limbs fall from the weight of the ice, many broken tree limbs are held in place by the frozen ice structure. Residential water lines that have frozen in the storm will begin to leak as the ice melts. As a result, storm emergency periods often extend beyond the freeze to include the thaw.

Severe Weather Risk Assessment

Location and Extent of Severe Weather Events

When severe weather, which includes ice, snow and high winds, occurs it impacts the entire City. Unlike a county or region where areas are miles apart, the city is 16 square miles where the terrain is relatively flat. Elevations range from 210 feet above sea level to 521 feet above sea level. Because of the similarity in topography, any ice or snow storm affects the entire City. In the northern part of the City, in Benton County, the elevation does increase and this will generally create hazardous driving conditions when ice and snow occur. There are two bridges spanning the Willamette River in downtown Albany, which carries traffic to the northern part of the City; the bridges are also part of a state highway taking traffic to Corvallis. When ice storms or snow occur, these bridges become impassable and create serious traffic problems. Because of the mild weather which generally occurs in Albany, the City does not have the equipment to handle ice or snow storms as effectively as regions where these events occur more often.

Previous Occurrences of Winter Storm Events

Ice

Historical data on ice storms which have occurred in the past has been difficult to locate. However record searches indicate that as far back as the 1880's, ice storms did occur in Albany with one actually freezing the Willamette River so individuals could walk from one bank to the other. Ice storms have also occurred in Albany and the surrounding area in 1942, 1950, 1963, 1970, 1973, 1993, and 1995 and finally in 2003-2004.[8] Climatologist George Taylor of Oregon State University states that, on average, one ice storm occurs every 10 years. Ice storms generally have created widespread power outages due to iced power lines that have broken, trees that have fallen over power lines, branches that have fallen onto power lines, or traffic accidents that have damaged power poles. Secondary to the power problem is the transportation route problem. The area is not set up to deal with routine ice problems like other areas of Oregon or the United States. Therefore, when they occur, there is no immediate de-icing program to get the roads usable. This leads to many accidents on the roadway which creates increased difficulties for emergency responders. Generally ice storms develop over a one – four hour period, and can last for one – four days. The 2003 -2004 ice storm was a Presidential Declared Disaster for Oregon (FEMA disaster #1510).

Snow

Snow events are not common in Albany and the Willamette Valley. They need two ingredients; cold air and moisture. Rarely do the two ingredients occur at the same time over western Oregon, except in the higher elevations of the Coast Range and especially in the Cascades. Snowstorms do occur over eastern Oregon regularly during December through February. Cold arctic air sinks south along the Columbia River basin, filling the valleys with cold air. Storms moving across the area drop precipitation, and if conditions are right, snow will occur. Since 1884 to the present, there have been at least 14 significant snow events in Albany. The last was in 2003.

The following are the dates, one day amounts and total storm accumulations for previous storms in Albany:

TABLE 9-2
Significant Past Winter Snow Storms

City of Albany		
Dates	**1 Day Amount**	**Storm Total**
December 16 – 18, 1884	16”	19”
December 20- - 23, 1892	9”	15”
January 5 – 10, 1909	3.5”	11.5”
January 11 – 15, 1916		5 – 8”
December 9 – 11, 1919	10”	25.5”
January 31 – February 4, 1937	16”	30”
January 9 – 18, 1950		54.7”
January 25 – 31, 1969		24 - 30”
December 29 - 1971	1.3”	15”
February 1 – 8, 1989		6 -8”
February 14 – 16, 1990		6 - 8”
February - 1993	6”	10 - 12
Winter 1998 - 1999		2 – 5”
December - 2003		3.8”

Data for City of Albany from Western Regional Climate Center Website: www.wrcc.dri.edu

High Winds

Since 1880, there have been 12 significant windstorms that have taken place in the Albany area. The wind speeds for these events ranged from as low as 40 mph to as high as 127 mph, gust speed. In at least three storms that have occurred locally, people have been killed, and in a fourth, there were 4 injuries. The most significant high wind event was the “Columbus Day Storm” of October 12, 1962. It is the storm that all present day storms are measured against. In the 1960’s, there were three high wind storms, in the 1970’s one, 1980’s one, 1990’s one and

2002 one. The 1995 (FEMA disaster # 1107) and 2002 (FEMA disaster # 1405) high wind events were Presidential Declared Disasters.

Tornadoes

Tornadoes have occurred in the city and the surrounding areas. Since 1925, from Eugene to McMinnville, there have been 9 reported tornados. Two tornadoes occurred in Albany during the 1990's, the first on May 23, 1990, and the second on March 22, 1994. The 1990 tornado produced 3 funnel clouds, but there was no confirmation that any of the three touched down. The 1994 tornado touched down near an Albany shopping area and blew out store windows and damaged some merchandise in the stores.[9]

TABLE 9-3
RECORDED TORNADOES[10]

DATE	COUNTY	RESULT
January, 1887	Lane	Fences damaged; livestock losses; trees up-rooted.
November, 1925	Polk	Buildings, barns, and fruit trees damaged.
February, 1926	Polk	House and trees damaged.
September, 1938	Linn	Observed in Brownsville. No damage.
December, 1951	Lane	Barn destroyed.
January, 1953	Benton	Observed. No damage.
March, 1960	Marion	Several farms damaged near Aumsville. Trees uprooted.
May, 1971	Yamhill	House and barn damaged near McMinnville.
August, 1975	Lane	Metal building destroyed near Eugene.
August, 1978	Yamhill	Minor damage near Amity.
April, 1984	Yamhill	Barn roof destroyed.
May, 1984	Lane	Barn and shelter damaged near Junction City.
November, 1989	Lane	Telephone poles and trees up-rooted near Eugene.
November, 1991	Marion	Barn damaged near Silverton.

Histories of severe weather storms for the City of Albany are found at the following websites.

- NOAA National Climatic Data Center database - http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms
- National Weather Service - http://www.nws.noaa.gov/organization.php
- Oregon State University – Oregon Climate Service - http://www.ocs.oregonstate.edu/index.html
- Climate of Oregon Narrative, NWS - http://www.wrcc.dri.edu/narratives/OREGON.htm

- State of Oregon Natural Hazard Mitigation Plan - http://csc.uoregon.edu/pdr_website/projects/state/snhmp_web/index.htm

Probability of Future Winter Storm Events

Snow Storms

Winter snow storms are rare in this part of the valley. As is indicated in the chart above, when they do occur they are occurring with less and less severity. The interval for snow storms over the last 30 years has been one every six years. During this time there have been small storms but generally not a significant amount of snow fall to be recorded or to cause problems to people and property. Snow fall as recorded by month indicates that, on average, 2.2 inches will fall in January, 1.3" in February, 0.2" in March, 0.2" in November and 1.6" in December. There was a four year span between the last two snow storms with one being in 1998 - 1999 and the other in 2003. If you look past the 1993 snow storm you will see there had been a 1 – 3 year gap between storms with an 18-year gap between 1971 and 1989.[11]

Ice Storms

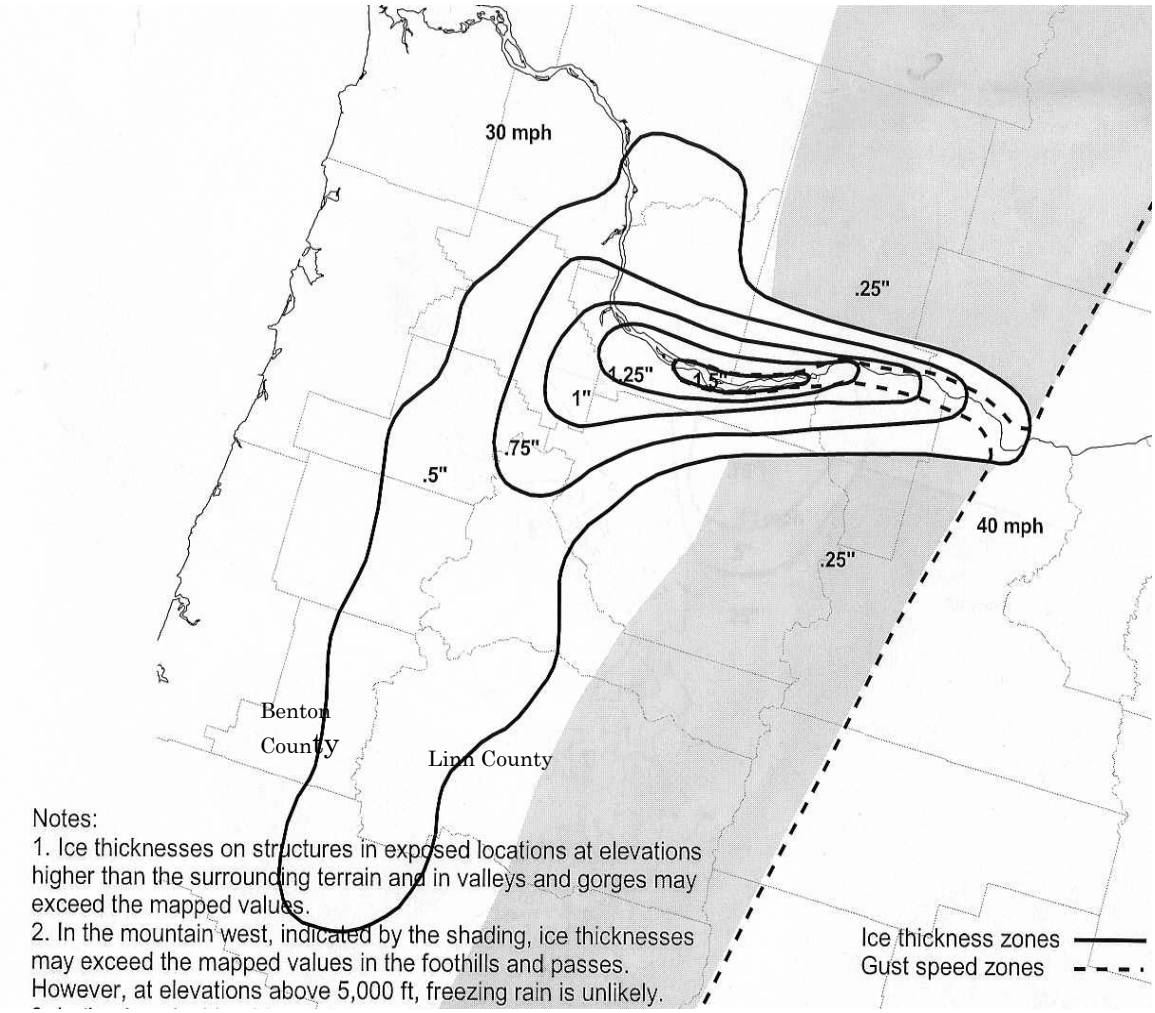
Review of the historical data above indicated an average of one ice storm has occurred every 10 years. Given this information, it is most likely we will continue to have additional future ice storms at this same interval. Though they do not occur on regular intervals, but rather within a certain time period, we can expect at least one to occur between 2004 and 2013.[12]

The National Climatic Data Center (NCDC) database shows two ice storm or freezing rain events for Benton County between 1993 and 2004. Both of these were relatively minor events with increased traffic accidents due to ice on the roads, but few other damages. Website addresses for NCDC and the state and county storm event database are: www.ncdc.noaa.gov and http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms, respectively.

Probabilistic ice storm data showing ice thicknesses with return periods from 50 years to 400 years are given in a recent draft report for FEMA and the National Institute of Building Sciences, "Extreme Ice Thicknesses from Freezing Rain", (Kathleen F. Jones, US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, May 28, 2004). The 50-year return period ice thickness map (Figure 7.8 below) shows about 0.5" of ice for Benton County, with ice thickness decreasing westward from the Willamette River Valley. One hundred year and 400-year ice thicknesses for Benton County are about 0.75" and 1.0", respectively.

Figure 9.4

50-Year Ice Thickness from Freezing Rain



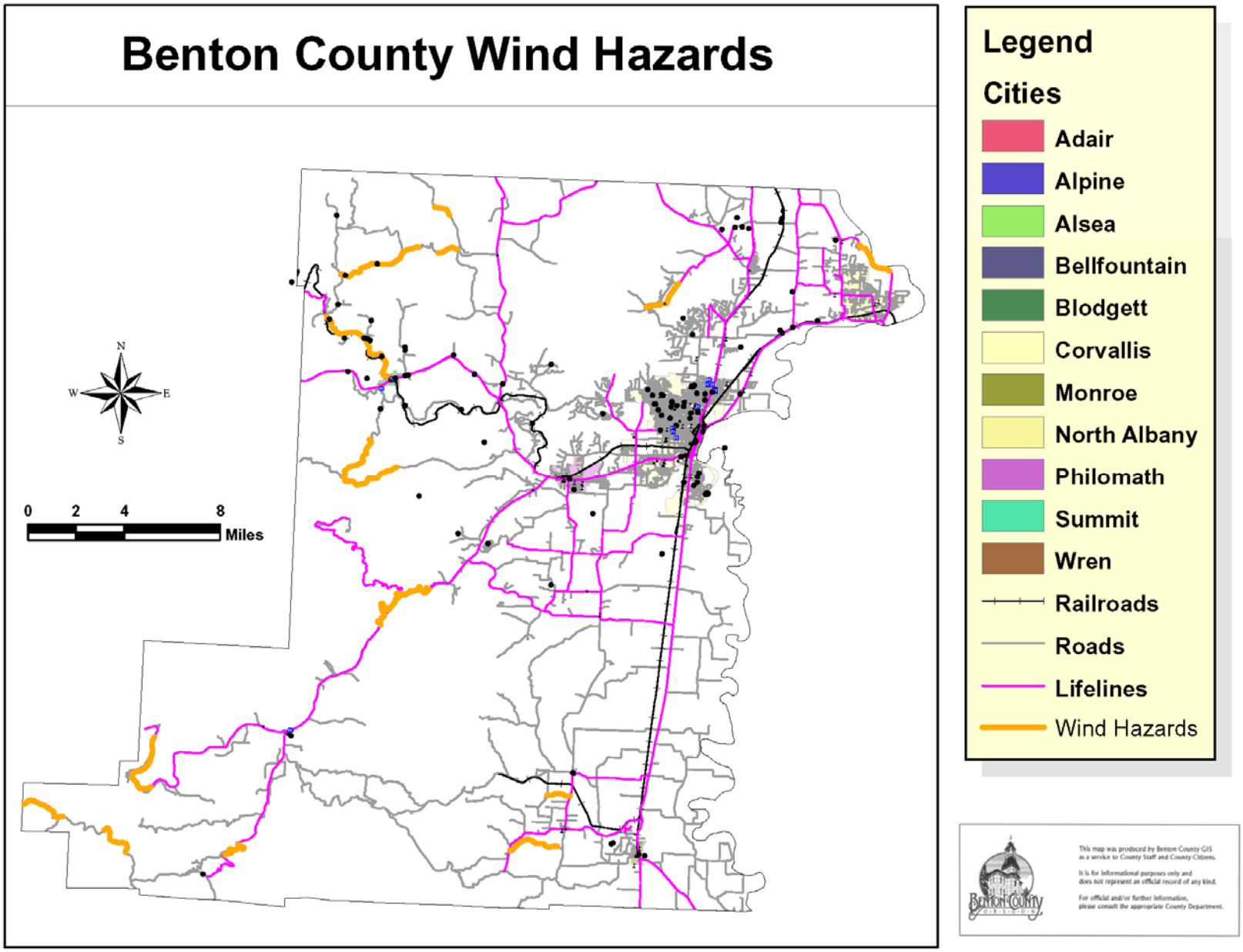
For Benton County and the City of Albany, ice thicknesses in 50-year or more severe events are high enough (0.5" or greater) to cause substantial damage, especially to trees and utility lines.[13]

High Winds

In review of the historical occurrences another high-wind storm will occur in the future. As with other winter storms, it is impossible to predict when, but it appears that one each 10 years is likely and, since our last significant wind storm was in 2002, we can expect at least one more significant wind storm to occur by 2012.[14]

According to the Benton County Natural Hazard Mitigation Plan, the one year recurrence interval sustained wind speeds range from 37 – 43 mph (59 – 68 km/hour) and can cause significant local wind damages at sites with especially exposed locations. The 50 –year recurrence interval wind speeds range from about 62 – 71 mph (99 – 113 km/hour). These wind speeds are high enough to cause widespread damage. Thus, for most regions of Benton County, direct wind damage is likely perhaps once every decade, on average with major wind storm events happening at intervals averaging a few decades. The potential for damaging winds may be somewhat higher in eastern Benton County along the Willamette River, where the City of Albany sits.[15]

Benton County Wind Hazard: Locations with a History of Wind Damage[16]



Tornadoes

Tornadoes in the Albany area are rare. Nine reported tornadoes from Eugene to McMinnville since 1925 is not significant. What is significant is that since 1990 three funnel clouds have been spotted in the Albany area, with a four year interval between the occurrences. This would indicate the potential for tornadoes having increased in the last 15 years. The last was over 11 years ago. With this in mind, it is likely another tornado will occur in the vicinity of the City of Albany within the next 10 years.[17]

Climate and weather conditions in Oregon and specifically in Benton County make the occurrence of major tornadoes unlikely. The most practical mitigation actions for tornadoes are public warnings and taking shelter to minimize the potential for deaths and injuries.[18]

Severe Weather Event Hazard Vulnerability: Identifying Assets

Section 201.6(c)(2)(*ii)*(A) of the Disaster Mitigation Act of 2000 requires that the risk assessment include a description of the jurisdiction's vulnerability to the hazard. This description shall include an overall summary for the hazard and its impact on the community. If best available data allows, vulnerability should be described in terms of the type and number of existing and future buildings, infrastructure, and critical facilities located in identified hazard areas.

City of Albany Vulnerability Summary

Snow Storms

When winter snow storms occur they will affect the entire community's population. Unless freezing rain has accompanied the snow fall, power outages from snow fall alone are rare. The City has no snow clearing equipment which means non-state roads will not be plowed as soon as state roads. This can lead to multiple accidents as drivers with little winter driving experience will tend to drive too fast and brake too quickly, causing accidents. This will put a strain on emergency services. Also snow fall means lower temperatures which have a tendency to mean more structure fires created by using unsafe heating methods. In large snow falls businesses may suffer because of the inability of workers to get to work because of the road condition. This generally lasts for only a couple of days. Home owners are often not prepared for the cold weather associated with snow fall which means that water pipes often break. Snow fall typically does not have as significant an impact on the total population of the City as freezing rain or extreme cold weather.

Ice Storms

Past historical records indicates our entire City and surrounding population are vulnerable to power outages during ice storms. During the last such storm, 18,000 customers were initially without power. After one day, the outage was isolated to a small geographic area which included North Albany. Power was out as long as 2 ½ days in this area. In addition to power concerns, the entire population is affected by road conditions and is susceptible to a higher rate of traffic accidents. Requests for emergency services generally increase by 100% during ice storms, putting a strain on emergency personnel.

High Winds

When a wind storm does occur it will affect the entire population. The first effect will be power loss to the residences and businesses. Like the ice events, power will be interrupted by downed lines as a result of trees blowing over or branches falling on lines. Power companies have been proactive by implementing mitigation programs that cut back tree branches at least 10 feet from power lines. For wind events, this will help tree limbs falling on to the lines. Debris in the road causes driving hazards for the public and emergency service personnel. Rural areas are more at risk because of the number of trees, but the problem exists within the City as the city strives to increase the tree inventory to achieve beautification and livability. Debris clearing becomes a top priority for the city after high wind storms.[19]

Tornadoes

Tornadoes have a very narrow field of effect so if one does set down in Albany it will affect a very small percentage of the population. Given local history, the number of people directly affected by a tornado would range from one to 25 depending on where the tornado touched down.[20]

Winter Storm Event Community Impact

Life and Property

Winter storms can have a significant impact on life and property. Many severe winter storm deaths occur as a result of traffic accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to the cold. Debris carried along by extreme winds can contribute directly to loss of life and indirectly through the failure of protective structures (i.e., buildings) and infrastructure.

Property can also be damaged by flooding (see Section 7) and landslides (see Section 12) that result from heavy snowmelt. Ice, wind, and snow can affect the stability of trees, power lines, telephone lines, and television and radio antennae. Falling trees and limbs affected by these events and saturated soils can become hazards for houses, cars, utilities, and other property. These conditions can be major hindrances to emergency response and disaster recovery.

Infrastructure

Traffic

The importance of transportation is never more noticeable than where travel is difficult or dangerous. Both property damage and loss of life are risks to those who must drive. Traffic delays or blockages can seriously hinder emergency service providers.

Economic concerns rise during storms that cause dangerous road conditions since many people choose to stay home or are asked to leave work early to get home safely. This means businesses will suffer economically from not opening or if they are open no customer is able to get to them. For the City these situations have typically occurred every 5 to 10 years, depending on the type of event, i.e. snow or ice storm. Because of the infrequence of these events Albany can provide the minimum of recovery response to the roads, but generally will need to wait until the event has run its course. For state highways which go through the City, Oregon Department of Transportation will handle while Public Works keeps emergency transportation routes open on local streets by sanding with the equipment they have, and/or contracting with local vendors.

High winds can cause prolonged and extreme traffic disruptions. The importance of transportation is never more noticeable than in situations where travel is difficult or dangerous. Both property damage and loss of life are risks to those who must drive. Additionally, traffic delays or blockages can seriously hinder the ability of emergency service providers.

Table 9-4 Effects of Wind Speed

WIND SPEED (MPH)	WIND EFFECTS
25-31	Large branches will be in motion.
32-38	Whole trees in motion; inconvenience felt walking against the wind.
39-54	Twigs and small branches may break off of trees; wind generally impedes progress when walking; high profile vehicles such as trucks and motor homes may be difficult to control.
55-74	Potential damage to TV antennas; may push over shallow rooted trees especially if the soil is saturated.
75-95	Potential for minimal structural damage, particularly to unanchored mobile homes; power lines, signs, and tree branches may be blown down.
96-110	Moderate structural damage to walls, roofs and windows; large signs and tree branches blown down; moving vehicles pushed off roads.
111-130	Extensive structural damage to walls, roofs, and windows; trees blown down; mobile homes may be destroyed.
131-155	Extreme damage to structures and roofs; trees uprooted or snapped.
Greater than 155	Catastrophic damage; structures destroyed.

Utilities

Historically, falling trees have been the major cause of power outages resulting in interruption of services and damaged property. The issue of weather related power outages should be addressed as many Albany residents rely on electricity for heat. Even homes using natural gas typically require electricity for the system to operate and run circulation fans and thermostats. Natural gas distribution systems also rely to some degree on electrical service to keep the system operational, widespread power outages can interrupt that service.

Power loss is also a concern to businesses which may have to close during outages.

Many overhead wires are at risk from snow and ice accumulations that are beyond the design specifications. High winds can create flying debris and downed utility lines. For example, tree

limbs breaking in winds of only 45 mph can be thrown more than 75 feet. As such, overhead power lines can be damaged even in relatively minor windstorm events.

Increasing population and new infrastructure in Albany mean that more lives and property are exposed to risk; this situation creates a higher probability that damage will occur from severe weather events.

Water Lines

The most frequent water system problem related to cold weather is a break in home water lines. Breaks frequently occur during severe freeze events as well as during extreme cooling periods through the months of October, November, and December. In almost every severe winter storm previously described, broken pipes led to the closures of schools and business throughout the City. Pipe breakage also occurs in many older homes that are not properly insulated or of construction types with inadequate protection of water pipes under the house.

During freezes, the broken waterlines not only result in lost water service to customers but also cause extensive property damage from spilled water. Severe weather can also affect the water system in other ways. Power interruptions at distribution pump stations can have dramatic negative consequences to the water system. Another common problem during severe freeze events is the failure of commercial and residential water lines. Inadequately insulated potable water and fire sprinkler pipes can rupture and cause extensive damage to property.

Severe Weather Event Hazard Vulnerability: Estimating Potential Losses

Vulnerable Assets

At the time the plan was developed the City did not have sufficient data to identify the types and number of buildings, infrastructure, and critical facilities vulnerable to winter storms.

Existing Mitigation Activities

Existing mitigation activities include current mitigation programs and activities that are being implemented by city, state, or federal agencies and organizations.

City Programs

Regional All Hazard Mitigation Plan for Benton, Lane, Lincoln and Linn Counties

Beginning in 1996, the City of Albany participated with Benton, Lane, Lincoln, and Linn counties in the development of a three-phased hazard mitigation program. The plan reviewed the principles of mitigation planning and presents a seven-step process for conducting a detailed, quantitative evaluation of prospective mitigation projects. Phase One of the program was completed in December of 1998 and provided a Flood Hazard Mitigation Planning Template for Local Government, a mitigation planning methodology and spoke to flood and winter storm hazards. It also outlined the connectivity between mitigation planning and emergency planning.

Phase Two of the planning was completed in September of 2001 and spoke to earthquake impacts for Benton, Lane, and Linn counties. Phase Three of the program was completed in September of 2002 and addressed hazardous materials in Benton, Lane, and Linn counties.[21]

Capital Improvement Plan

The City of Albany's Capital Improvements Plan (CIP) is a dynamic document that lists and prioritizes needed improvements and expansions of the City's infrastructure system to maintain adequate service to existing City residents and businesses, and to accommodate population growth and land development. The CIP reflects the needs and priorities established by the City and the resources available to the City. The CIP can be modified during the fiscal year through the supplemental budget process, as needs, priorities, and resources change. The CIP can assist the City of Albany in mitigating against severe weather events by improving infrastructure most prone to damage.

Emergency Operation Center (EOC)

The Emergency Operations Center is an established location/facility from which City staff and officials can provide direction, coordination, and support to emergency operations in the event of an incident such as a natural disaster. City personnel who are assigned to and trained for specific positions within the EOC organizational structure staff the EOC. The structure is based on the National Interagency Incident Management (NIIMS) Incident Command System (ICS). The EOC staff provides information and recommendations to the Mayor, through the Incident Commander or as directed, to develop a course of action to respond to and contain, control, and recover from an emergency. Some of the primary functions performed at the EOC include: coordination, operations management, planning, information tracking and dissemination, logistical support, financial management and support, and emergency public information.

Emergency Operations Plan (EOP)

The Emergency Operations Plan (EOP) describes the roles and responsibilities of the departments and personnel for the City of Albany during major emergencies or disasters.

The Plan sets forth a strategy and operating guidelines using NIMS ICS which was adopted by the City for managing its response and recovery activities during disasters and emergencies.

The EOP consists of various sections and supporting materials. The development and maintenance of this plan is the basis of the City's emergency response and recovery operations.

1. **Basic Plan** - Provides an overview of the City's emergency response organization and policies. It cites the legal authority for emergency operations, summarizes the situations addressed by the plan, explains the general concept of operations, and assigns general responsibilities for emergency planning and operations.

2. **Functional Annexes** - Each annex focuses on one of the critical emergency functions that are typically common for all hazards, which the City will perform in response to an emergency. The type and scope of an incident will dictate which functional annexes will be needed.

3. **Hazard Specific Appendices** - The appendices provide additional detailed information and special considerations that are applicable to specific hazards. The appendices are to be used in conjunction with the basic plan and the functional annexes.

4. **Addenda** – The addenda includes the Emergency Resource Guide, Emergency Call List, Mutual Aid and MOU agreements, and Radio Frequency Communication Guide.

Incident Command System

The Incident Command System (ICS) is a management system that may be used for any type of hazard event, and has three main components. The City of Albany has adopted the use of the National Incident Management System (NIMS), which included the Incident Command System for its method of responding to and recovering from any disaster or emergency. The NIMS components are:

1. Command and management
2. Preparedness
3. Resource management
4. Communications and information management
5. Support technologies
6. Ongoing management and maintenance

Transportation System Plan

The City of Albany's adopted Transportation System Plan is the transportation element of the City's Comprehensive Plan. It identifies the transportation improvements needed to accommodate existing and future development in the Albany area. The plan projects needs and improvements through 2015. An update is underway with a forecast year of 2030. At this time all improvements within the Transportation Plan are development driven.

Albany's adopted transportation plan is based on an analysis contained in the Transportation System Plan (TSP), which was developed through a public participation process. The development of the TSP and thereafter the more concise transportation element, along with Chapter Six of the Comprehensive Plan, (a summary of the analysis, goals and policies, and improvements) are closely coordinated and intended to be consistent with other jurisdictions' transportation plans.

Urban Forestry Program

Albany's Public Works Urban Forestry Program has a number of ongoing educational efforts designed to mitigate damage from downed trees during storms. The Program also has authority to identify and eliminate known hazards. The following is a brief summary of related activities. Albany municipal code gives the City Forester authority to require permits for planting of trees on public rights of way. The permitting system provides an opportunity to specify failure resistant species of trees and to set standards that reduce losses from tree failure. The City Forester has the authority to remove trees that threaten public safety and to require property owners to perform street tree maintenance to correct hazardous situations.

The Urban Forestry Program also provides a free inspection service for public street trees. Property owners who request this service are visited by an Urban Forestry Inspector who is trained to pre-identify many tree related hazards and advise property owners.

Tree Inventory Map

Currently the City is working on a comprehensive public tree inventory to help identify hazard trees. A map of hazardous trees in Albany will provide information useful for targeting measures that can be used to mitigate against the effects of falling trees. Further to this goal, "The City of Albany Public Works Department is currently working on long range tree preservation planning.

This will help drive development away from hazard prone areas, and attempt to increase City's ability to mitigate for disasters."

PacifiCorp

Pacific Power's Right Tree-Right Place program educates homeowners, landscapers, and tree propagators on tree species that will not be subject to ongoing stress by constant pruning. Pacific Power distributes posters and a *Small Trees for Small Places* booklet that list low-growing trees that fit within the utility right-of-way and are compatible with small urban planting strips. The poster includes information on how to select the correct tree, the energy-saving benefits of trees, and proper planting and pruning techniques. Pacific Power offers tree owners certificates to help defray the cost of a new tree that replaces one that is inappropriate. Pacific Power's foresters work with local government and the public to assess and identify situations in which trees or power lines put life and property at risk or endanger electric service reliability.

International Building Code

The City of Albany and the State of Oregon have adopted the International Building Code which includes specifications for new development to withstand snow and wind loads.

Dangerous Building Code

Albany Municipal Code, Title 18 – Building & Construction, 18-16 Dangerous Buildings defines "dangerous buildings" and requires abatement for them. Dangerous buildings are those with structures that are overstressed because of snow or wind loading or because they require maintenance.

Federal Programs

National Weather Service

The Portland Office of the National Weather Service issues severe winter storm watches and warnings when appropriate to alert government agencies and the public of possible or impending weather events. The watches and warnings are broadcast over National Oceanic & Atmospheric Administration (NOAA) weather radio and are forwarded to the local media for retransmission using the Emergency Alert System.

Severe Weather (SW) Event Mitigation Action Items

The severe weather event mitigation action items provide direction on specific activities that organizations and residents of the City of Albany can undertake to reduce risk and prevent loss from severe weather events. There are two short-term and two long-term severe weather hazard action items described in the Severe Weather Action Item Matrix. Each action item can be used by the Steering Committee and local decision makers in pursuing strategies for implementation.

The Severe Weather Action Item Matrix is a separate file to this document.

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[1] Interagency Hazard Mitigation Team, *State Hazard Mitigation Plan* (2000) Office of Emergency Management

[2] National Weather Service Web-Page, http://www.wrh.noaa.gov/pqr/pdxclimate/index/php (Accessed 20 October 2004)

[3] Western Regional Climate Center

[4] Western Regional Climate Center

[5] Ibid.

[6] Benton County Natural Hazard Mitigation Plan, Winter Storms chapter 7

[7] Taylor, George H. and Hannon, Chris, *The Oregon Weather Book*, (1999) Oregon State University Press

[8] City of Albany Hazard Analysis 2004, Winter Ice Storms

[9] City of Albany Hazard Analysis 2004 Tornados

[10] Linn County Natural Hazard Mitigation Plan, Section 9, Severe Weather Events

[11] City of Albany Hazard Analysis 2004, Winter Snow Storms

[12] City of Albany Hazard Analysis 2004, Winter Ice Storms

[13] Benton County Natural Hazard Mitigation Plan, Winter Storms Chapter 7

[14] City of Albany Hazard Analysis 2004, High Wind Storm, Probability section

[15] Benton County Natural Hazard Mitigation Plan, Winter Storms Chapter 7

[16] Benton County Natural Hazard Mitigation Plan, Winter Storms Chapter 7

[17] City of Albany Hazard Analysis 2004, Tornados, Probability section

[18] Benton County Natural Hazard Mitigation Plan, Winter Storms Chapter 7

[19] City of Albany Hazard Analysis 2004, High Wind Storm, Vulnerability section

[20] City of Albany Hazard Analysis 2004, Tornados, Vulnerability section

[21] Regional all Hazard Mitigation Master Plan for Benton, Lane, Lincoln and Linn Counties: Phases I, II, and III. Kenneth A. Goettel; Goettel & Associates Inc.

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items:**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Severe Weather (SW) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
SW-Short Term	Action 4.9. Develop pre-storm strategies for coordinated debris removal following wind and winter storm	Emergency Management	Public Works	1 – 2 years										
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
SW-Short Term	Action 7.7. Partner with utility providers to make homeowners aware of the importance of tree and limb maintenance and the Right Tree, Right Place program	Public Works	Utilities, Emergency Management, PIO	1 – 2 years										
Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.														
SW-Short Term	Action 9.5 Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during wind and winter storms	Public Works	Pacific Power, Consumer, Power	1 – 2 years										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
SW-Long Term	Action 4.10. Develop and implement landscaping and tree standards to keep trees from threatening lives, property, and public infrastructure	Public Works	Community Development	1 – 5 years										

Appendix A:
Resource Directory

City

Albany Emergency Management (AOEM)

AOEM coordinates citywide emergency management programs including citizens, businesses, employees, and partners of the City. To be effective, the City partners collaborate across the region to ensure that activities of mitigation, preparedness, response, and recovery are intertwined with citizen protection, economic stability, and in-depth coverage of our assets.

Contact: Emergency Coordinator
Address: 333 Broadalbin SW, Albany, OR 97321
Phone: 541-917-7700
Fax: 541-917-7716

Albany Fire & Rescue

Albany Fire & Rescue is the responding agency in charge of plan development for the coordination of an earthquake event. With 4 stations and many regional partners in the fire service, the fire department lends a trained force that has familiarized itself with the buildings' plans, the street network, and the neighborhood of their fire management areas. With this knowledge they know where vulnerable people live and can work with the community to save lives and property expediently.

Contact: Chief Kevin Kreitman
Address: 333 Broadalbin SW, Albany, OR 97321
Phone: 541-917-7700

Community Development, Building Division

Building Division issues building permits, performs land use reviews, and promotes compliance with the zoning codes and the state adopted construction codes.

Contact: Building Division Manager
Address: 333 Broadalbin SW, Albany, OR 97321
Phone: 541-917-7553

County

Benton County Emergency Management

The Emergency Services unit of the Benton County Sheriff's Office coordinates emergency preparedness and response efforts throughout the county. Emergency Services also provides preparedness training for natural and manmade disasters and coordinates search and rescue efforts in the county (a significant portion of the county is located in the coastal mountain range).

Contact: Mike Bamberger, Program Manager
Address: 553 NW Monroe Street, Corvallis, OR 97330
Phone: (541) 766-6864
Website: http://www.co.benton.or.us/sheriff/ems

Linn County Emergency Management

The Emergency Services unit of the Linn County Sheriff's Office coordinates emergency preparedness and response efforts throughout the county. Emergency Services also provides preparedness training for natural and manmade disasters and coordinates search and rescue efforts in the county (a significant portion of the county is located in the Cascadia mountain range).

Contact: Jim Howell, Emergency Coordinator
Address: 1115 Jackson St. S.E, Albany, Oregon 97321
Phone: (541) 967-3911

State

Department of Land Conservation and Development (DLCD)

DLCD administers the State's Land Use Planning Program. The program is based on 19 statewide Planning Goals, including Goal 7, related to flood and other natural hazards. DLCD serves as the federally designated agency to coordinate floodplain management in Oregon. They also conduct various landslide related mitigation activities. In order to help local governments address natural hazards effectively, DLCD provides technical assistance and conducts workshops, reviews local land use plan amendments, and works interactively with other agencies.

Contact: Natural Hazards Program Manager, DLCD
Address: 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
Phone: (503) 373-0050
Fax: (503) 378-6033
Website: http://www.lcd.state.or.us
Oregon Floodplain Coordinator: (503) 373-0050 ext. 255

Office of Emergency Management (OEM)

OEM administers FEMA's Hazard Mitigation Grant Program to provide post-disaster monies for acquisition, elevation, relocation, and demolition of structures located in the floodplain. OEM also administers FEMA's Flood Mitigation Assistance Program. This program provides assistance for NFIP-insured structures only. OEM also helps local jurisdictions to develop hazard mitigation plans. OEM is heavily involved in flood damage assessment and works mainly with disaster recovery and hazard mitigation programs. OEM provides training for local governments through workshops on recovery and mitigation. OEM also helps implement and manage federal disaster recovery programs.

Contact: Oregon Emergency Management
Physical Location: 3225 State Street**,** Salem, OR
Mailing Address: P.O. Box 14370, Salem OR 97309-5062
Phone: (503) 378-2911
Fax: (503) 373-7833
Website: http://www.osp.state.or.us/oem

Oregon Department of Fish and Wildlife (ODFW)

ODFW's mission is to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. ODFW regulates stream activity and engages in stream enhancement activities.

Contact: ODFW
Address: 2501 SW First Avenue, PO Box 59, Portland, OR 97207
Phone: (503) 872-5268
Website: http://www.dfw.state.or.us

Oregon Department of State Lands (DSL)

DSL is a regulatory agency responsible for administration of Oregon's Removal-Fill Law. This law is intended to protect, conserve, and make the best use of the state's water resources. It generally requires a permit from DSL to remove, fill, or alter more than 50 cubic yards of material within the bed or banks of state waters. Exceptions are in state scenic waterways and areas that are designated essential salmon habitat; in these areas, a permit is required for all in-stream activity regardless of volume. DSL and the US Army Corps of Engineers may issue these permits jointly.

Contact: Department of State Lands
Address: 775 Summer Street NE, Suite 100, Salem, OR 97301-1279
Phone: (503) 378-3805
Fax: (503) 378-4844

Website: http://statelands.dsl.state.or.us

Oregon Water Resources Department (WRD)

The Oregon Water Resources Department's mission is to serve the public by practicing and promoting wise long-term water management. The WRD provides services through 19 water master offices throughout the State. In addition, five regional offices provide services based on geographic regions. The Department's main administration is performed from the central office in Salem.

Contact: WRD
Address: 158 12th ST. NE, Salem, OR 97301-4172
Phone: (503) 378-8455
Website: http://www.wrd.state.or.us

Oregon Department of Consumer and Business Services

The Building Codes Division of Oregon's Department of Consumer and Business Services is responsible for administering statewide building codes. Its responsibilities include adoption of statewide construction standards that help create buildings able to resist flood, wildfire, wind, foundation stability, and seismic hazards.

Contact: Building Codes Division
Address: 1535 Edgewater St. NW, P.O. Box 14470, Salem, OR 97309
Phone: (503) 373-4133
Fax: (503) 378-2322
Website: http://www.cbs.state.or.us

Oregon Climate Service

The Oregon Climate Service collects, manages, and maintains Oregon weather and climate data. OCS provides weather and climate information to those within and outside the State of Oregon and educates the citizens of Oregon on current and emerging climate issues. OCS also performs independent research related to weather and climate issues.

Contact: Oregon Climate Service
Address: Oregon Climate Service, Oregon State University
Strand Ag Hall Room 316, Corvallis, OR 97331-2209
Phone: (541) 737-5705
Website: http://www.ocs.orst.edu

Oregon Department of Geology and Mineral Industries (DOGAMI)

The mission of the Department of Geology and Mineral Industries is to serve a broad public by providing a cost-effective source of geologic information for Oregonians and to use that information to reduce the future loss of life and property due to potentially devastating earthquakes, tsunamis, landslides, floods, and other geologic hazards. The Department has mapped earthquake hazards in most of western Oregon.

Contacts: Deputy State Geologist, Geohazards and Coastal Hazards Team Leaders
Address: 800 NE Oregon St., Suite 965, Portland, Oregon 97232
Phone: (503) 731-4100
Fax: (503) 731-4066
Website: www.oregongeology.com

Oregon Department of Consumer & Business Services-Building Codes Division

The Building Codes Division (BCD) sets statewide standards for design, construction, and alteration of buildings that include resistance to seismic forces. BCD is active on several earthquake committees and funds construction-related continuing education programs. BCD registers persons qualified to inspect buildings as safe or unsafe to occupy following an earthquake and works with OEM to assign inspection teams where they are needed.

Contact: Building Codes Division
Address: 1535 Edgewater St. NW, P.O. Box 14470, Salem, Oregon 97309
Phone: (503) 378-4133
Fax: (503) 378-2322
Website: http://www.cbs.state.or.us

The Nature of the Northwest Information Center

The Nature of the Northwest Information Center is operated jointly by the Oregon Department of Geology and Mineral Industries and the USDA Forest Service. It offers selections of maps and publications from state, federal, and private agencies. DOGAMI's earthquake hazard maps can be ordered from this site.

Address: Suite 177, 800 NE Oregon Street # 5, Portland, Oregon 97232
Phone: (503) 872-2750
Fax: (503) 731-4066
Website: http://www.naturenw.org/geo-earthquakes.htm

Federal

Federal Emergency Management Agency (FEMA)

FEMA provides maps of flood hazard areas, various publications related to flood mitigation, funding for flood mitigation projects, and technical assistance. FEMA also operates the National Flood Insurance Program. FEMA's mission is "to reduce loss of life and property and protect the nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery." FEMA Region X serves the northwestern states of Alaska, Idaho, Oregon, and Washington.

Contact: FEMA, Federal Regional Center, Region 10
Address: 228th St. SW, Bothell, WA 98021-9796
Phone: (425) 487-4678
Website: http://www.fema.gov
To obtain FEMA publications:
Phone: (800) 480-2520
To obtain FEMA maps:
Contact: Map Service Center
Address: P.O. Box 1038, Jessup, Maryland 20794-1038
Phone: (800) 358-9616
Fax: (800) 358-9620

United States Geological Survey (USGS)

The USGS website provides current stream flow conditions at USGS gauging stations in Oregon and throughout the Pacific Northwest. The Oregon USGS office is responsible for water-resources investigations for Oregon and part of southern Washington. Their office cooperates with more than 40 local, state, and federal agencies in Oregon. Cooperative activities include water-resources data collection and interpretive water-availability and water-quality studies.

Contact: USGS Oregon District Office
Address: 10615 S.E. Cherry Blossom Dr., Portland, OR 97216
Phone: (503) 251-3200
Fax: (503) 251-3470
Website: http://oregon.usgs.gov

Army Corps of Engineers

The Corps of Engineers administers a permit program to ensure that the nation's waterways are used in the public interest. Any person, firm, or agency planning to work in waters of the United States must first obtain a permit from the Army Corps of Engineers. In Oregon, joint permits may be issued with the Division of State Lands. The Corps is responsible for the protection and development of the nation's water resources including navigation, flood control, energy production through hydropower management, water supply storage, and recreation.

Contact: US Army Corps of Engineers-Portland District, Floodplain Information Branch
Address: P.O. Box 2946, Portland, OR 97208-2946
Phone: (503) 808-4874
Fax: (503) 808-4875
Website: http://www.nwp.usace.army.mil/

National Resources Conservation Service (NRCS), US Department of Agriculture (USDA)

NRCS provides a suite of federal programs designed to assist state and local governments and landowners in mitigating the impacts of flood events. The Watershed Surveys and Planning Program and the Small Watershed Program provide technical and financial assistance to help participants solve natural resource and related economic problems related to watershed. The Wetlands Reserve Program and the Flood Risk Reduction Program provide financial incentives to landowners to put aside land that is either a wetland

resource or experiences frequent flooding. The Emergency Watershed Protection Program (EWP) provides technical and financial assistance for clearing debris from clogged waterways, restoring vegetation, and stabilizing riverbanks. The measures taken under the EWP must be environmentally and economically sound and generally benefit more that one property.

Contact: USDA-NRCS
Address: 1080 SW Baseline, Bldg B, Suite B-2, Hillsboro 97123-3823
Phone: (503) 648-3174
Fax: (503) 640-1332
Tangent Field Office Phone: 541-967-5925
Website: http://www.swcd.net

Building Seismic Safety Council (BSSC)
The Building Seismic Safety Council (BSSC) established by the National Institute of Building Sciences (NIBS), deals with complex regulatory, technical, social, and economic issues and develops and promotes building earthquake risk mitigation regulatory provisions for the nation.

Address: 1090 Vermont Avenue, NW, Suite 700, Washington, DC 20005
Phone: (202) 289-7800
Fax: (202) 289-1092
Website: http://www.bssconline.org

Western States Seismic Policy Council (WSSPC)
The WSSPC is a regional organization that includes representatives of the earthquake programs of 12 states (Alaska, Arizona, California, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming), three U.S. territories (American Samoa, Commonwealth of the Northern Mariana Islands and Guam), one Canadian Province (British Columbia), and one Canadian territory (Yukon). The organization has primarily sought to improve public understanding of seismic risk, to improve earthquake preparedness, and to provide a cooperative forum to enhance transfer of mitigation technologies at the local, state, interstate, and national levels. The mission of the Council is to provide a forum to advance earthquake hazard reduction programs throughout the western region and to develop, recommend, and present seismic policies and programs through information exchange, research and education.

Contact: WSSPC, Executive Director
Address: 121 Second Street, 4th Floor, San Francisco, CA 94105
Phone: (415) 974-6435
Fax: (415) 974-1747
Website: http://www.wsspc.org

Cascadia Region Earthquake Workgroup (CREW)
CREW provides information on regional earthquake hazards, facts, and mitigation strategies for the home and business office. CREW is a coalition of private and public representatives working together to improve the ability of Cascadia Region communities to reduce the effects of earthquake events. Members are from Oregon, Washington, California, and British Columbia. The workgroup seeks to promote efforts to reduce the loss of life and property. They conduct education efforts to motivate key decision makers to reduce risks associated with earthquakes. They also foster productive linkages between scientists that critical infrastructure provides businesses and governmental agencies in order to improve the viability of communities after an earthquake.

Contact: CREW, Executive Director
Address: 1330A S. 2nd Street, #105, Mount Vernon, WA 97273
Phone: (360) 336-5494
Fax: (360) 336-2837
Website: http://www.crew.org

The National Flood Insurance Program

The National Flood Insurance Program (NFIP) Website is a subsection of the Federal Emergency Management Agency (FEMA) site (http://www.fema.gov). The NFIP information is intended for both the general public and the many organizations and agencies participating in the program. It includes information about the NFIP and other flood disaster assistance available from the Federal Government. It also provides access to the newly revised NFIP booklet: *Answers to Questions about the National Flood Insurance Program.*

Contact: The National Flood Insurance Program
Phone: (888) FLOOD29 or (800) 427-5593
Website: http://www.fema.gov/nfip

USGS Water Resources

This web page offers current US water news; extensive current (including real-time) and historical water data, numerous fact sheets and other publications, various technical resources, descriptions of ongoing water survey programs, local water information, and connections to other sources of water information.

Contact: USGS Water Resources
Phone: (503) 251-3200
Website: http://water.usgs.gov or http://water.usgs.gov/public/realtime.html

Office of Hydrology, National Weather Service

The National Weather Service's Office of Hydrology (OH) and its Hydrological Information Center offer information on floods and other aquatic disasters. This site offers current and historical data including an archive of past flood summaries, information on current hydrologic conditions, water supply outlooks, an Automated Local Flood Warning Systems Handbook, Natural Disaster Survey Reports, and other scientific publications on hydrology and flooding.

Contact: Office of Hydrology, National Weather Service
Website: http://www.nws.noaa.gov/oh or http://www.nws.noaa.gov/oh/hic/

FEMA's List of Flood Related Websites

This site contains a long list of flood related Internet sites from "American Heritage Rivers" to "The Weather Channel" and is a good starting point for flood information on the Internet.

Contact: Federal Emergency Management Agency.
Phone: (800) 480-2520
Website: http://www.fema.gov/nfip/related.htm

National Oceanic and Atmospheric Administration (NOAA)

NOAA's historical role has been to predict environmental changes, protect life and property, provide decision makers with reliable scientific information, and foster global environmental stewardship.

Contact: National Oceanic and Atmospheric Administration
Address: 14th Street & Constitution Avenue, NW, Room 6013, Washington, DC 20230
Phone: (202) 482-6090
Fax: (202) 482-3154
Website: http://www.noaa.gov

National Weather Service, Portland Bureau

The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, and adjacent waters for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and

infrastructure that can be used by other governmental agencies, the private sector, the public, and the global community.

Contact: National Weather Service
Address: 5241 NE 122nd Ave, Portland, Oregon 97230
Phone: (503) 326-2340
Website: http://nimbo.wrh.noaa.gov/Portland

Additional

American Red Cross

The American Red Cross is a volunteer-led humanitarian organization that provides relief to victims of disasters and helps people prevent, prepare for, and respond to emergencies. The Oregon Pacific Chapter serves the residents of Benton, Coos, Curry, Douglas, Lane, Lincoln and Linn counties. The Oregon Pacific Chapter provides a variety of community services which are consistent with the Red Cross mission and meet the specific needs of this area including disaster planning, preparedness, and education.

Contact: Mid-Valley District
Address3388 SW Pacific Blvd, Albany, OR 97321
Phone: (541) 926-1543
Fax: (541) 967-6887
Website: http://www.oregonpacific.redcross.org

Institute for Business & Home Safety (IBHS)

IBHS was created by the insurance industry to reduce damage and losses caused by natural disasters. The IBHS website provides educational resources and on-line publications for insurers, businesses, and homeowners who are interested in taking the initiative to minimize future damages and losses.

Contact: Institute for Business and Home Safety
Address: 1408 North Westshore Boulevard - Suite 208 - Tampa, FL 33607
Phone: (813) 286-3400
Fax: (813) 286-9960
Website: http://www.ibhs.org/ibhs2

The Floodplain Management Association

The Floodplain Management website was established by the Floodplain Management Association (FMA) to serve the entire floodplain management community. It includes full-text articles, a calendar of upcoming events, a list of positions available, an index of publications available free or at nominal cost, a list of associations, a list of firms and consultants in floodplain management, an index of newsletters dealing with flood issues (with hypertext links if available), a section on the basics of floodplain management, a list of frequently asked questions (FAQs) about the Website, and, of course, an extensive catalog of Web links.

Contact: Floodplain Managers Association
Website: http://www.floodplain.org

Northwest Regional Floodplain Managers Association (NORFMA)

This site is a resource for floodplains, fisheries, and river engineering information for the Northwest. This site provides technical information, articles, and Internet links in the field of floodplain and fisheries management.

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Contact: Northwest Regional Floodplain Managers Association
Website: http://www.norfma.org/

The Association of State Floodplain Managers

The Association of State Floodplain Managers is an organization of professionals involved in floodplain management, flood hazard mitigation, the National Flood Insurance Program, and flood preparedness, warning, and recovery. ASFPM fosters communication among those responsible for flood hazard activities, provides technical advice to governments and other entities about proposed actions or policies that will affect flood hazards, and encourages flood hazard research, education, and training. The ASFPM

Web site includes information on how to become a member, the organization's constitution and bylaws, directories of officers and committees, a publications list, information on upcoming conferences, a history of the association, and other useful information and Internet links.

Contact: The Association of State Floodplain Managers
Address: 2809 Fish Hatchery Road, Madison, WI 53713
Phone: (608) 274-0123
Website: http://www.floods.org

Appendix B:
Steering Committee – Public Participation Process

Memo

To: City of Albany Natural Hazard Mitigation Plan Steering Committee

From: Oregon Natural Hazards Workgroup at the University of Oregon

Date: May 13, 2005

Re: **Goal Setting Minutes & Outcomes**

The purpose of this memo is to provide you with the notes and outcomes from the goal setting work session that took place on April 21st. This memo can be inserted into the plan's appendix as documentation of the goal setting process. The following draft products are included with this memo:

- Draft Goal & Action Item Chapter
- Draft Action Item Matrix
- Electronic Action Item Form

Background

The components of an effective natural hazard mitigation action plan include: vision statement, mission statement, goals, objectives and action items. The **vision statement** describes the preferred or desired future for the community with regard to natural hazards. The **mission statement** is a philosophical or value statement that answers the question "Why develop a plan?" In short, the mission states the purpose and defines the primary function of the plan. The mission is an action-oriented statement of the plan's reason to exist. It should be broad enough that it need not change unless the community environment changes.

Goals are designed to drive actions and they are intended to represent the general end toward which the community's effort is directed. Goals identify how the community intends to work toward mitigating risk from natural hazards. They should not specify how the community is to achieve the level of performance. The goals are guiding principles for the specific recommendations that are outlined in the action items.

Objectives are the directions, methods, processes, or steps used to accomplish or achieve goals. Objectives link goals and actions.

Action items are detailed recommendations for activities that community departments, citizens and others could engage in to reduce risk. Action items describe how the vision, mission, goals and objectives will be achieved. They link to specific issues, identify resources and levels of responsibility.

DRAFT City of Albany Natural Hazard Mitigation Plan Action Plan

Work session participants reviewed sample mission statements from existing plans around the state and answered the following questions to develop the City's mission statement.

1. Who does the plan serve?
2. What does the plan do?
3. What can the plan accomplish?

The review of existing statements and discussion resulted in the Steering Committee identifying the need for the mitigation plan to align with the 2005-2010 City of Albany Strategic Plan. Following the meeting,

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ONHW crafted a draft chapter describing the relationship between the mitigation plan and the Strategic Plan and also developed a matrix organizing the draft objectives and action items.

The draft chapter describes the purpose of the City of Albany Natural Hazard Mitigation Plan as: *to assist in achieving the vision and mission of the Strategic Plan and specifically, aims to advance the Safe City theme. The objectives and actions identified in this plan meet the two goals identified in the Safe City theme and will be cut by the six Strategic Plan capital categories.*

The mitigation plan will essentially use the vision, mission, and Safe City theme goals identified in the Strategic Plan. The mitigation plan will have separate set of objectives and actions dealing with natural hazards that are directly tied to the Safe City theme goals.

In addition to the discussion on the purpose of the plan, participants completed two exercises to help identify potential action items. Participants were first asked to identify community values by answering the question of what makes Albany unique. Participants then brainstormed issues by hazard. Following the Steering Committee an additional meeting was held to gather similar input from the public. Participants were recruited to attend this meeting through existing City Boards and Commissions. The Steering Committee and Public's responses are documented below.

Community Values – Steering Committee

The Steering Committee identified the following important community values by answering the following question: "What makes Albany, Albany?"

Environmental Assets

- Willamette River, Tributaries and Creeks
- Diversity in Topography(Steep Slopes , Liquefaction, Floodplain Areas, Open Space)
- Urban Forest
- Park System/Open Space
- Hazardous Materials
- Recreation Areas
- Wildlife (i.e. Ducks)
- City is Split by a River
- Trail System

Economic Assets

- Rare Metals
- Food Processing
- High Tech. (HP)
- Government (City and County)
- Hospitals/Medical Community
- Tourism
- Small Business-Retail
- Agriculture

Economic Assets (con't.)

- Heritage Mall/Downtown
- Timber
- Transportation - Railroads
- Dept. of Energy Research Facility
- Manufacturing/Airport
- Incubators
- Schools – Community College, public schools
- Small Business Development
- Construction

Infrastructure & Critical Facilities

- Willamette River Bridges
- Rail Lines
- Utility Lines
- Underground Main Gas Transmission
- Sewer
- Water (Pump Treatment Plants)
- Communications
- Power (transmission lines/plant)

Built Environment

- Development in N.E./S.W./East
- Industrial Development on I-5 Corridor
- Revitalization Areas
- Mixed Use Development
- Concentrated Retail (Heritage Mall)
- Gov't/County buildings
- Airport
- Rail Road Station/Yards

Human Populations

- Elderly
- Growing Hispanic Population
- Greater Percentage of Seniors

Human Populations (con't)

- Low Income Residents
- Mennonite Care Home
- Commuters

Historic & Cultural Resources

- Inventory of over 700 Historical Buildings
- Indian Archeological Sites
- Downtown Area
- Libraries
- Two Museums
- Water Treatment Plant and Canal
- Community Theater

Community Values – Public Meeting

The public identified the following important community values by answering the following question: "What makes Albany, Albany?"

Environmental Assets

- Proximity & access to rivers & beaches
- Recreation Areas
- Parks & Open Space
- Planning
- Lush Environment (i.e. soils)
- Moderate Temp/Climate

Economic Assets

- Timber
- Food Processing
- Gas Seed Industries
- Transportation
- Retail/Merchandizing
- Banking
- Metals Industry
- LBCC/Target Distribution Ctr.
- Hewlett Packard
- OSU
- Heritage Mall
- Millersburg
- Vacant Industrial Areas
- Rail Road

Infrastructure & Critical Facilities

- Fire (specifically Station 12)
- Bridges
- Southbound I-5 Access
- Electrical Hub
- Hospitals
- Churches
- Schools
- Water
- Gas
- Hazmat
- Communication
- Natural Gas
- Wastewater Treatment

Built Environment

- Historical Districts
- River Front
- North Albany
- 53rd St.-Large Residential Area
- Metal/Timber Industries
- Food Processing
- Rail yards

Built Environment (con't)

- Developed Residential Areas

Human Populations

- Developmentally Disabled
- Mennonite Care Home
- Growing Hispanic Population
- Mental Health/Foster Homes
- Commuters from out of town

Historic & Cultural Resources

- Courthouse
- Downtown Library
- Old City Hall
- Downtown
- Park (esp. Performing Park)
- Mennonite Theatre
- Fairgrounds
- ACT Theatre

Hazard Issue Identification – Steering Committee

Steering Committee members were asked to identify specific hazard-related issues within the City.

Flooding

- North Albany Shut Off
- Canal Flooding
- 13th Ave. Repetitive Flooding
- Storm Management Plan Update
- N.E. Portion of Town
- Oak Creek Basin (Lochner Rd.)
- Sewer Pump Stations Low Grade
- Sewage Treatment Plant
- Response
- FEMA Flood Remapping
- Flood Insurance Outreach
- Community Ratings System (Flood)

Earthquake

- Historic Areas are Un-reinforced
- Water Treatment, Fire, Police
- Education
- Hospital

Earthquake (con't.)

- Schools
- Wastewater Plants
- Hazardous Material Facilities
- High Pressure Natural Gas
- North Albany Cut Off
- Inventory of Generators
- Older Tilt-up Buildings
- Hazardous Chemicals

Wind/Winter Storms

- Large, Flat Roofs
- Urban Forest
- Utility Lines Through Forest
- Loss of Water and Sewage
- Trees Falling Across Roads
- Lack of Emergency Generators(i.e. Loss of Building Function)

Hazard Issue Identification – Public Meeting

Public participants were asked to identify specific hazard-related issues within the City.

Flooding
- Increasing Awareness
- Bill Stuffers/Mailings
- Alert System
- Flooding (con't)
- Lack of Central Coordination
- Spanish –Speaking Diversion
- Power Lines/Trees Down
- Tree Inventory(Large #of Trees)
- Limited Roads In/Out of Area

Earthquake
- Buildings/Infrastructure
- Historic Districts
- Education-Preparedness
- Neighborhood Groups
- City Newsletter
- River Rhythms
- Saturday Market
- Chamber of Commerce

Earthquake (con't)
- Homes Built before 1970's
- Fair/Expo Center
- Bridges
- Department of Energy(next to high school

Wind/Winter Storms
- Closed Roads
- Drainage Areas
- Loss of Natural Function of Areas
- Water Purification
- South Albany Flooding
- Elderly/Foster Care Cut Off
- Sewer Water Flows into River
- Water Contamination
- North Albany Cut Off
- Bryant Park
- Hwy. 34/I-5/12 Closures
- Springfield Road

Next Steps

The draft action plan matrix (formatted for legal sized paper) which outlines the objectives and associated actions is included with this memo. The action plan matrix organizes the draft actions by objective as well as by hazard. The objectives in the matrix were pulled from the Linn County mitigation planning effort and help to group similar actions together. Using the objectives from the County's plan allows for Albany's activities to be aligned and connected to activities going on county-wide. Draft actions have been identified for the flood, earthquake, and wind and winter storm hazards. Several multi-hazard actions have also been identified. Several of the actions in the matrix were specifically identified by the Steering Committee during the session while others have been provided as points of discussion for the steering committee. Those actions identified by the Steering Committee are highlighted in yellow in the matrix and are: Action 1.3, 3.2, 3.4, 3.6, 4.1, 4.2, 5.3, 5.5, 6.2, 6.5, 6.6, 7.1, 7.7, and 9.2.

The following are potential next steps the Steering Committee and/or Working Group should take:

1. Review the draft chapter describing the relationship between the mitigation plan and the City's Strategic Plan.

2. Either accept or modify the chapter and descriptions of the plan's relationships to the Strategic Plan.
3. Review the action item matrix.
4. Schedule a work session to go through each action to: 1) affirm or deny the action, 2) if affirmed, identify a coordinating organization, partner organizations, timeline, key issues addressed and ideas for implementation using the attached action item form. Several actions identified during the last Steering Committee, already have identified the coordinating organization and are included in the matrix.
5. Identify any additional actions by completing the action item form and adding the action to the matrix

If you have any questions, please feel free to contact Krista Mitchell at the Oregon Natural Hazards Workgroup at 541-346-3588 or kristam@uoregon.edu

May 20, 2005 revision to original document sent May 13, 2005.

List below are the participants for each of the meeting which took place on April 21, 2005.

City of Albany Steering Committee	Organization Representing
• Ed Hodney	Parks & Recreation
• Dick Ebbert	Economic Development
• Diane Taniguchi-Dennis	Public Works
• Stephen Kalb	Albany General Hospital
• Bob Woods	Information Technology
• Jeff Volkman	FEMA Region X
• Andre LeDuc	ONHW University of Oregon
• Vanessa Bekkache	ONHW University of Oregon
• Marilyn Smith	Public Information Officer
• Joe Simon	Albany Police Department
• Kevin Kreitman	Albany Fire Department/Emergency Coordinator
• Blain Brassfield	Community Development/Building Department
• Ed Gallager	Library
• Natalie Metzger	ONHW University of Oregon
• Krista Mitchell	ONHW University of Oregon

Public Meeting	Organization Representing
• Jason Desler	Traffic Safety Council
• Marian Anderson	Senior Center representative
• Alf Anderson	Private Citizen
• Jeff Howard	Public Safety Committee
• Bill Coburn	Public Safety Committee
• Mark Spence	Public Safety Committee
• Steve Cox	Public Safety Committee
• Jay Neil	Tree Commission

- Anne Peltier — Planning Commission/Linn County Health
- Jim Lawrence — Albany Bicycle and Pedestrian Advisory Commission
- Wayne Rackham — Albany Planning Commission/Georgia Pacific
- Jeff Volkman — FEMA Region X
- Gordon Kirbey — Businesses Downtown
- Kevin Kreitman — Albany Fire Department/Emergency Coordinator
- Andre LeDuc — ONHW University of Oregon
- Krista Mitchell — ONHW University of Oregon
- Vanessa Bekkache — ONHW University of Oregon
- Natalie Metzger — ONHW University of Oregon

Steering Committee Meetings:

March 31, 2005 Explanation of the committee responsibilities

This was the first meeting for the steering committee. The membership and purpose of the committee was explained. The role of the committee members was discussed as was an explanation of the final product. It was also explained the committees function was ongoing and would be responsible to see the plan, once approved by FEMA, was implemented and carried out as outlined.

April 21, 2005 Goal setting workshop, ONHW

This meeting was facilitated by Oregon Natural Hazard Workgroup. The purpose was to set the Mission, Goals and Objectives for the Plan. It was at this meeting the Steering Committee decided to use the Strategic Plan for the basis of this plan. More detail on this meeting is found above.

May 31, 2005 Review Executive Summary & Sections 1,2,3,5

The committee reviewed draft material, which was recommended to them from the Working Committee, for the Executive Summary, Section 1 – Introduction, Section 2 – Community Profile, Section 3 - Risk Assessment and Section 5 – Plan Implementation and Maintenance.

June 14, 2005 Establish action Items

The committee met and reviewed ½ (approximately 30) of the Action Items recommended to them from the Working Committee. For each of the action items they reviewed the language, established the lead organization, internal/external partners, short term or long term timeline, what Strategic theme they fell under and what Strategic Capital Element they were tied to. This was done for action items applicable to the Multi-hazard, Flood, Earthquake and Severe Weather sections.

June 29, 2005 Establish action Items

The committee met and reviewed the second half (approximately 30) of the Action Items recommended to them from the Working Committee. For each of the action items they reviewed the language, established the lead organization, internal/external partners, short term or long term timeline, what Strategic theme they fell under and what Strategic Capital Element

they were tied to. This was done for action items applicable to the Multi-hazard, Flood, Earthquake and Severe Weather sections.

July 13, 2005 Review sections 4, 6 & 9

The committee met and reviewed Section 4 – Mitigation Plan Mission, Goals, and Action Items, Section 6 – Multi-Hazard Action Items and Section 9 Severe Weather Hazard.

July 27, 2005 Review sections 7, 8 & Appendix A

The committee met to review Section 7 – Floods Hazard, Section 8 – Earthquake Hazard, and Appendix A – The Resource Directory. They also discussed implementation Strategies.

August 10, 2005 Final review of Executive Summary, Section 1 Introduction, Section 2 Community Profile, Section 3 Risk Assessment, Section 4 Mitigation Plan Mission, Goals, Objectives, and Action Items. Discussed Section 5: Plan Implementation. Approved sending the complete plan to the State Emergency Management and FEMA for pre-approval review.

Appendix C:
Approaches for Economic Analysis

This appendix outlines approaches for conducting economic analysis of proposed hazard mitigation strategies, measures, or projects. Evaluating the cost effectiveness of hazard mitigation can be a complex and difficult task which is influenced by a number of variables. First, natural disasters affect all segments of the communities they strike, including individuals, families, businesses, and public services such as fire, police, utilities, and schools. Second, while some of the direct and indirect costs of disaster damages are measurable, some of the costs are not easily measured and difficult to quantify in dollars. Third, many of the impacts of such events produce "ripple-effects" throughout a community, thus increasing the variables to be considered.

While not easily accomplished, there is value, from a public policy perspective, in assessing the economic value of impacts avoided by implementing hazard mitigation measures, and obtaining an objective benefit/cost comparison. Otherwise, the decision to pursue or not pursue various hazard mitigation options would not be based on an objective understanding of the net benefit associated with those actions.

The approaches used to identify the costs and benefits associated with natural hazard mitigation strategies, measures, or projects fall into two general categories: benefit/cost analysis (b/ca) and cost-effectiveness analysis. The distinction between the two methods is the way in which the relative costs and benefits are measured. In the first method, benefit/cost analysis, all costs and benefits are evaluated in terms of dollars, and a net benefit/cost ratio is computed to determine whether a project should be implemented (i.e.: if net benefits exceed net costs, the project is worth pursuing). By contrast, the second method, cost-effectiveness analysis, evaluates how best to spend a given amount of money to achieve a specific goal; this type of analysis does not necessarily measure costs and benefits in terms of dollars.

Determining the economic feasibility of mitigating natural hazards can also be organized according to the perspective of those with an economic interest in the outcome. Hence, economic analysis approaches are covered for both public and private sectors as follows.

Public Investment Decisions

Developing and evaluating a policy mandating mitigation of natural hazards is a difficult process. After determining that a sufficient risk exists and that effective hazard mitigation alternatives are possible, knowing whether hazard mitigation is economically feasible is useful in selecting a strategy. If a public decision is being made, economic feasibility takes on a definition that differs from economic feasibility decisions made in the private sector. Economic feasibility in the private sector is defined as an owner’s benefits (monetary profits, satisfaction, etc.) exceeding the owner’s costs. The benefits and costs that are included in the decision are entirely up to the private decision-maker, but the calculation can usually be made directly by the decision maker using prices and costs provided by the marketplace.

The economic question in the public sector is complicated because it involves estimating all of the economic benefits and costs regardless of to whom they shall accrue, possibly to a large number of persons and economic entities. Economic benefits and costs are defined as

true changes in economic efficiency. In addition, some of the benefits are not evaluated through normal "markets" but still affect the public in profound ways.

Economists have developed methods to evaluate the economic feasibility of public decisions that involves a diverse set of beneficiaries and non-market benefits. One such procedure was published by FEMA, whose models were developed in conjunction with industry economists, engineers, and public officials, and are generally accepted regarding making public decisions on mitigating natural hazards.

The selection of hazard mitigation projects to be funded in the public sector can be made using three sets of criteria; maximum present value, benefit/cost ratio, and internal rate of return.

The Maximum Present Value Criterion

The maximum present value criterion states that the optimal investment strategy is to select the set of projects that maximize present value of future revenues subject to the available budget. In benefit/cost analysis, those projects with the greatest benefits minus costs calculates this value. All projects or public investment alternatives must be evaluated simultaneously in this procedure. Where projects have different, discrete sizes, and different values for present value, there is no simple decision rule to determine, in isolation, whether a particular proposed project should be included in the optimal public investment strategy. All proposed projects must be considered together, in terms of present value, and the package of projects that maximizes social wealth subject to the funds constraint in the initial time period must be selected simultaneously.

Benefit/Cost Ratio

Selecting projects for public investment using the benefit/cost ratio criteria is similar to the maximum present value criteria if unlimited funds are available. The set of projects for which benefits exceed costs would be the same as the projects selected by maximizing present value criterion. However if a budget constraint exists on investment funds in the initial time period, the benefit/cost ratio criterion is satisfactory under certain conditions but not others: select discrete-sized projects, one by one, starting with that project for which the benefit/cost ratio is highest, and working down, until the investment funds constraint in the initial time period is exhausted.

This strategy is quite effective when the candidate projects are of approximately similar size and when the total investment funds far exceed the investment cost of any project.
Such a decision strategy will be inadequate however, when candidate projects are of vastly different discrete sizes and when the size of some candidate projects is quite large relative to the total investment budget. In that case, it is best to revert to a procedure that maximizes the present value of the set of discrete-sized projects, given a constraint on the availability of investment funds in the initial time period.

Internal Rate of Return

The internal rate of return for a project or set of projects is that rate of discount that yields a present value of zero. With unlimited capital, all projects that have an internal rate of return equal to or greater than the social rate of discount should be funded. This criterion yields the same results as the maximum present value criterion if capital is unlimited. If the supply of capital is limited, optimal project selection is attained by selecting those projects with the

highest internal rate of return and that the internal rate of return is greater or equal to the social discount rate.

Private Investment Decisions

An individual must make consumption and production decisions regarding the current time period and future time periods. Economists have developed criteria for individuals to make optimal consumption and production decisions over time. Consumers maximize their current utility by making purchasing and saving decisions given observed prices and interest rates. Producers maximize current profits by making production and investment decisions given observed prices and interest rates.

Investing by the private sector in a hazard mitigation measure may occur on the basis of one of two incentives: it may be mandated by a regulation or standard, or it may be economically justified on its own merits. These very different investment decisions are covered in the following subsections.

Conforming to a Hazard Mitigation Standard

A building or land owner, whether a private entity or a public agency, required conforming to a mandated standard may consider the following options:

- Request cost sharing from public agencies;
- Dispose of the building or land either by sale or demolition;
- Change the designated use of the building or land and change the hazard mitigation compliance requirement; or
- Evaluate the feasible alternatives to meet the standard and initiate the most cost effective hazard mitigation alternative.

The sale of a building or land triggers another set of concerns. For example, real estate disclosure laws can be developed which require sellers of real property to disclose known defects and deficiencies in the property, including earthquake weaknesses and hazards to prospective purchasers. Correcting deficiencies can be expensive and time consuming, but their existence can prevent the sale of the building. Conditions of a sale regarding the deficiencies and the price of the building can be negotiated between a buyer and seller.

Economic Feasibility of Mitigating Natural Hazards

A building or land owner may decide to reduce the risk of natural hazards through mitigation based only on economic criteria. This decision is usually based on the results of an investment or capital budgeting analysis. Capital budgeting analysis is a seven-step process:

- Identify All Relevant Investment Alternatives. Typical investment alternatives for building owners can include the reduction of natural hazards risk, income enhancing equipment, or expansion of the facility. All of these investments can improve the income derived from the use of building.
- Select the economic criteria. Alternative criteria include the simple rate of return, the payback period, the expected net present value, and internal rate of return. The internal rate of return is preferred because the results are directly comparable and alternative projects can be ranked directly.
- Estimate the capital requirements. The capital requirements include the initial cost of the investment and the repair and maintenance of the investment over its productive life.
- Estimate the cash flow. Projecting cash flow that results from the investment is difficult. Expected future returns from the mitigation depend on the correct specification of the risk

and the effectiveness of the investment which is not well known. Expected future costs depend on the physical durability and potential economic obsolescence of the investment. This is difficult to project. These considerations will also provide guidance in selecting an appropriate salvage value. Future tax structures and rates must be projected. Financing alternatives must be researched, and they may include retained earnings, bond and stock issues, and commercial loans.

- Determine the correct interest rate. Determination of the interest rate can just be the risk-free cost of capital, but it may include the decision maker's time preference and also a risk premium. The inclusion of inflation should also be considered.

- Define the planning horizon. The planning horizon is usually defined by the decision maker's projected interest in the building. This determination has a substantial effect on the results of the analysis.

- Analyze and rank the investment alternatives. Time dependent parameters such as risk, project effectiveness, economic returns, and costs should be defined over the time horizon and not on an annual basis. Once the investments are ranked on the basis of economic criteria, the decision-maker can bring other parameters into the selection process.

Economic Returns of Hazard Mitigation

The estimation of economic returns which accrue to the building or land owner as a result of natural hazards mitigation is difficult. Owners deciding the economic feasibility of hazard mitigation should consider reductions in physical damages and financial losses. A partial list is as follows:

- Building damages avoided
- Contents damage avoided
- Inventory damages avoided
- Rental income losses avoided
- Relocation and disruption expenses avoided
- Proprietors income losses avoided

These parameters can be estimated using observed prices, costs, and engineering data. The difficult part is to correctly determine the effectiveness of the hazard mitigation and the resulting reduction in damages and losses. The damages and losses should only include those that will be borne by the owner.

The salvage value of the investment can be important in determining economic feasibility. Salvage value becomes more important as the time horizon of the owner declines.

The Cost of Hazard Mitigation

Hazard mitigation projects have initial investment cost and recurring costs over the period of the investment. The project may also deteriorate or be subject to destruction over the relevant time horizon. Expected loss of the investment is approximated by multiplying the annual probability of destroying the effectiveness of the investment times the value of the investment. Estimating deterioration can be captured by normal depreciation schedules.

The Total Economic Impacts of Natural Disasters

In addition, the building or land owner should also assess changes in a broader set of parameters that can change as a result of a large natural disaster. These are usually termed "indirect" effects, but they can have a very direct effect on the economic life of the owner's building or land. They can be positive or negative, and include changes in the following:

- Commodity and resource prices
- Availability of resource supplies
- Commodity and resource demand changes
- Building and land values
- Capital availability and interest rates
- Availability of labor
- Economic structure
- Infrastructure
- Regional exports and imports
- Local, state, and national regulations and policies
- Insurance availability and rates

This set of parameters is more difficult to estimate and requires models that are structured to estimate total economic impacts. Total economic impacts are the sum of direct and indirect economic impacts. Total economic impact models are usually not combined with economic feasibility models. Many models exist to estimate total economic impacts of changes in an economy.

Two Specific Economic Analysis Models

VSP Associates, Inc. has produced a number of economic analysis models for FEMA, some of which are noted under references on page AC-7.

Publicly-Owned Buildings

It may seem appropriate for public agencies to use traditional benefit/cost analysis to make decisions regarding rehabilitation but that is usually not the case. An agency rightfully includes only those benefits and costs that the agency is responsible for and excludes those parameters that are the responsibility of other agencies or the private sector. Only when the agency is directed to perform a true benefit/cost calculation does it make sense for the agency to perform such an analysis. With this in mind, FEMA contracted to derive a benefit/cost model for publicly-owned buildings based on the earlier benefit/cost model for privately-owned buildings. The resulting model for publicly-owned buildings is very similar to the private building model, with the addition of the value of lost public services avoided.

Data on the cost of service, payroll, and a post-earthquake continuity premium are used to estimate the value of lost public services. This model was the result of a two-year effort advised by a panel of economics, engineers, and geologists. The model was also extensively tested. Analyses were performed on eight buildings owned by various federal agencies located throughout the United States.

Privately-Owned Buildings

A benefit/cost model was developed in 1992 to aid local and state planners in determining the economic feasibility of seismic rehabilitation programs. The development was funded by FEMA's National Earthquake Hazards Reduction Program. The model estimates the expected net present value of benefits of seismic rehabilitation derived from the following parameters:

- Building damages prevented
- Rental income losses avoided
- Relocation expenses avoided
- Personal and proprietors' income losses avoided
- Business inventory damages prevented
- Personal property losses prevented
- Value of casualties avoided

Procedures were developed to analyze a single building or a building inventory. The model was the result of an extensive two year research and development effort: a multidisciplinary advisory panel of economists, engineers, and other experts played an important review and guidance role throughout the project.

The model was also extensively tested. Nine seismic rehabilitation projects located in different cities throughout the country were analyzed using the single building model. A 67 building inventory located in the Pioneer Square area of Seattle was also analyzed.

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Appendix D:
List of Acronyms and Definitions

Acronyms

Oregon

AGC	Associated General Contractors
AOC	Association of Oregon Counties
BCD	Building Codes Division (Department of Consumer and Business Services)
BPA	Bonneville Power Administration
CPW	Community Planning Workshop (University of Oregon)
DAS	Department of Administrative Services
DCBS	Department of Consumer and Business Services
DEQ	Department of Environmental Quality
DLCD	Department of Land Conservation and Development
DOGAMI	Department of Geology and Mineral Industries
DSL	Division of State Lands
ESD	Education Service District
GIHMT	Governor's Interagency Hazard Mitigation Team
GNRO	Governor's Natural Resources Office (State of Oregon)
LCDC	Land Conservation and Development Commission (State of Oregon)
LOC	League of Oregon Cities
OCS	Oregon Climate Service
ODA	Oregon Department of Agriculture
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODOT	Oregon Department of Transportation
OEM	Office of Emergency Management
OEMA	Oregon Emergency Management Association
OERS	Oregon Emergency Response System
OHIRA	Oregon Hazard Identification and Risk Assessment
ONHW	Oregon Natural Hazards Workshop (University of Oregon)
ORS	Oregon Revised Statues
OSFM	Office of State Fire Marshal
OSP	Oregon State Police
OSSPAC	Oregon Seismic Safety Policy Advisory Commission
OSU	Oregon State University
OUS	Oregon University System
OWEB	Oregon Watershed Enhancement Board
PSU	Portland State University
PUC	Public Utility Commission
SEAO	Structural Engineers Association of Oregon
SHMO	State Hazard Mitigation Officer
WRD	Water Resources Department

Federal

AASHTO	American Association of State Highway and Transportation Officials
ATC	Applied Technology Council
b/ca	benefit/cost analysis
BFE	Base Flood Elevation
BLM	Bureau of Land Management
BSSC	Building Seismic Safety Council
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CRS	Community Rating System
CVO	Cascade Volcano Observatory (USGS)
EDA	Economic Development Administration
EPA	Environmental Protection Agency
ER	Emergency Relief
EWP	Emergency Watershed Protection (NRCS Program)
FAS	Federal Aid System
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FMA	Flood Mitigation Assistance (FEMA Program)
FTE	Full Time Equivalent
GIS	Geographic Information System
GNS	Institute of Geological and Nuclear Sciences (International)
GSA	General Services Administration
HAZUS	Hazards U.S.
HMGP	Hazard Mitigation Grant Program
HMST	Hazard Mitigation Survey Team
HUD	Housing and Urban Development (United State, Department of)
IBHS	Institute of Business and Home Safety
ICC	Increased Cost of Compliance
IHMT	Interagency Hazard Mitigation Team
NCDC	National Climate Data Center
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHMP	Natural Hazard Mitigation Plan (also known as “409 plan”)
NIBS	National Institute of Building Sciences
NIFC	National Interagency Fire Center
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	Natural Resources Conservation Services
NWS	National Weather Service
SBA	Small Business Administration
TDR	Transfer of Development Rights
UGB	Urban Growth Boundary
URM	Unreinforced Masonry
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFA	United States Fire Administration
USGS	United States Geological Survey
WSSPC	Western States Seismic Policy Council

Definitions

"100-year" flood means a flooding condition which has a one percent chance of occurring each year. The 100-year flood level is used as the base planning level for floodplain management in the National Flood Insurance Program. See "base flood elevation" and "National Flood Insurance Program" below.

"409 plan" means the state natural hazards mitigation plan that was called for by Section 409 of the Stafford Act. This requirement has been superseded by Section 322 of the Stafford Act as created by the Disaster Mitigation Act of 2000.

Base flood elevation, for National Flood Insurance Program purposes, most often means the flood having a one percent chance of being equaled or exceeded in any given year. It is also referred to as the "100-year" flood. The base flood elevation is the elevation (normally in feet above mean sea level) that the base flood is expected to reach. For certain critical and essential facilities the base flood elevation is determined from the 500-year flood.

Disaster Mitigation Act of 2000 (DMA2K) amended the Stafford Act, making both sweeping and minor changes and additions to it, including: establishing a national program for pre-disaster mitigation; streamlining the administration of disaster relief; changing FEMA's post-disaster programs for individuals and families, including creating the Individuals and Households Program; establishing minimum standards for public and private structures; requiring local and state natural hazards mitigation plans that meet a FEMA standard (Section 322); revising - in part - FEMA funding for the repair, restoration, and replacement of damaged facilities (Section 406); revising FEMA's participation in the costs of WUI fire suppression through an expanded and renamed Fire Management Assistance Grant Program (Section 420); removing the requirement for post-disaster IHMT or HMST meetings and reports (see Part IV, Appendices 1 and 10 of this plan); and other amendments.

Disaster Resistant Community is a concept whereby individuals, businesses, private nonprofit organizations, and government work in partnership by preparing in advance and taking actions to reduce the impact of natural hazards that will likely occur. In Oregon the key initiative towards disaster resistant community is *Partners for Disaster Resistance and Resilience*.
http://csc.uoregon.edu/PDR_website/

Floodplain is a land area adjacent to a river, stream, lake, estuary or other water body that is subject to flooding. These areas, if left undisturbed, act to store excess flood water.

Floodplain Administrator means the person designated by the governing body in a flood-prone community who is responsible for making floodplain determinations for construction sites, issuing building permits for floodplain construction, ensuring compliance, and other floodplain management activities.

Floodway is the channel of a river and the portion of the floodplain that carries most of the flood flow. Floodways are usually the area where water velocities and forces are the greatest and most destructive. The National Flood Insurance Program (NFIP) definition of floodway is "the channel of a river or other watercourse and adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot." NFIP regulations, adopted in local ordinances, require that floodway be kept open so that flood flows are not obstructed or diverted onto other properties.

Goal 7 of the statewide land use planning program calls for local comprehensive plans to include inventories, policies, and implementing measures to guide development in hazard areas thereby reducing losses from flooding, landslides, earthquakes, tsunamis, coastal erosion, and wildfires.

State Interagency Hazard Mitigation Team means that team of state agency officials who, in 1997, former Governor Kitzhaber directed the Office of Emergency Management to make a permanent body and establish regular meeting dates in order to understand losses arising from natural hazards and coordinate recommended strategies to mitigate loss of life, property, and natural resources.

Hazard is any situation that has the potential of causing damage to people, property, or the environment.

Hazard mitigation means "any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards." (44 CFR 201.2)

Hazard Mitigation Grant Program means "the program authorized under Section 404 of the Stafford Act... and implemented at 44 CFR Part 206, Subpart N, which authorizes funding for certain mitigation measures identified through the evaluation of natural hazards conducted under Section 322 of the Stafford Act." (44 CFR 201.2)

High risk sites are specific landslide locations determined by the State Forester within high risk areas. A high risk site may include but is not limited to: slopes greater than 65 percent; steep headwalls; highly dissected land formations; areas exhibiting frequent high intensity rainfall periods; faulting, slumps; slides; or debris avalanches. (OAR 629-600-100[28])

Major disaster means any natural catastrophe including any hurricane, tornado, storm, high water, wind driven water, tidal wave, tsunami, earthquake, volcanic eruption, landslide, mudslide, snowstorm or drought, or, regardless of cause, any fire, flood, or explosion in any part of the United States, which in the determination of the President causes damage of sufficient severity and magnitude to warrant major disaster assistance... to supplement the efforts and available resources of states, local governments, and disaster relief organizations in alleviating the damage, loss, hardship, or suffering caused thereby. (44 CFR 206.2)

National Flood Insurance Program means the program run by the federal government to improve floodplain management, to reduce flood-related disaster costs, and to provide low cost flood insurance for residents of flood-prone communities.

Natural Hazards Mitigation Plan means a plan resulting from a risk assessment of the nature and extent of vulnerability to the effects of natural hazards present in a geographic area and actions needed to minimize future vulnerability to those hazards, especially a plan developed and adopted which meets the requirements of 44 CFR Part 201.

Public Assistance is that part of the disaster assistance program in which the federal government supplements the efforts and available resources of state and local governments to restore certain public facilities or services. Public Assistance includes emergency assistance, debris removal, community disaster loans, and the permanent repair, restoration, or replacement of public and designated private nonprofit facilities damaged or destroyed by a major disaster and is further described under Section 406 of the Stafford Act.

Stafford Act means the Robert T. Stafford Disaster Relief and Emergency Assistance Act (PL 93-288, as amended by PL 100-707 and by PL 106-390, the Disaster Mitigation Act of 2000).

State Hazard Mitigation Officer is the official representative of state government who is the primary point of contact with FEMA, other federal agencies, and local governments in mitigation planning and

implementation of mitigation programs and activities required under the Stafford Act. In Oregon, this person is on the staff of the Office of Emergency Management.

Vulnerability is the susceptibility of life, property, or the environment to damage if a hazard manifests to potential.

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Multi-Hazard (MH) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #1: Establish and Maintain Methods to ensure plan implementation.														
MH-Short Term	Action 1.1. Create and formalize City of Albany Steering Committee to oversee Plan implementation	City Manager	All Departments	1 – 2 years										
MH-Short Term	Action 1.2. Develop an agreement with external partners to work together on risk reductions efforts in the City.	Emergency Management	All Departments	1 – 2 years										
Objective #2: Provide Leadership to promote, communicate, and support disaster safety messages and activities.														
MH-Short Term	Action 2.1. Develop and implement City protocols and communication strategies for the dissemination of media messages that focus on individual responsibility for disaster safety and risk reduction (e.g. IBHS homeowner guides, press releases for awareness campaigns, etc.)	City Manager/ PIO	Department Heads	1 – 2 years										
MH-Short Term	Action 2.2. Develop and implement a public official's information kit that can be distributed to elected official and community decision makers.	City Manager/ PIO	Department Heads	1 – 2 years										
MH-Short Term	Action 2.3. Develop and implement a communications plan to inform the community on the status of the Natural Hazard Mitigation Plan.	City Manager/ PIO	Steering Committee	1 – 2- years										

Objective #4: Support the enhancement of the City vulnerability assessment activities.															
MH-Short Term	Action 4.1. Develop an inventory of City assets including replacement costs	Finance	All Departments	1 – 2 years											
MH-Short Term	Action 4.2. Refine hazard maps to better identify vulnerability and risk for hazards which effect the City	Emergency Management	Public Works/Counties	1 – 2 years											
MH-Short Term	Action 4.3. Develop a program to collect data for non-declared natural hazard events to assist in determining vulnerability and risk	Emergency Management	All Departments	1 – 2 years											
Objective #5: Ensure continuity of City emergency services function.															
MH-Short Term	Action 5.1 Update the Emergency Operations Plan	Emergency Management	All Departments	1 – 2 years											
MH-Short Term	Action 5.3. Identify and evaluate City-owned emergency transportation routes	Emergency Management	Public Works	1 – 2 years											
Objective #6: Implement structure and non-structural mitigation of publicly owned facilities and infrastructure.															
MH-Short Term	Action 6.2. Develop a program to upgrade and retrofit the water treatment facility and lagoons	Public Works		1 – 2 years											
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.															
MH-Short Term	Action 7.1. Develop public awareness information kit that can be distributed to residents in the City. The kit should include pertinent information regarding Natural Hazards the City experiences and what residents can do to reduce their own risk. Materials should be produced in English and Spanish	Emergency Management	Community Development, Police Department, PIO, Building Department, Red Cross	1 – 2 years											

MH-Short Term	Action 7.2 Provide educational material and examples of how to assemble 72 hour kits to residents of the City and employees	Emergency Management	PIO, Red Cross, Fire Department, Utilities	1 – 2 years										
MH-Short Term	Action 7.3. Develop and promote an educational awareness program aimed at the elderly, special populations and school aged children	Emergency Management	PIO, Red Cross, Fire Department, Utilities	1 – 2 years										
Objective #1: Establish and Maintain Methods to ensure plan implementation.														
MH-Long Term	Action 1.3. Secure funding with partners to implement the actions identified in the plan and enter into a formal agreement to work together as needed	Emergency Management	All Departments	1 – 5 years										
MH-Long Term	Action 1.4. Establish and maintain all NHMP benchmarks to evaluate performance and modify the plan as necessary	Emergency Management	Steering Committee	1 – 5 years										
MH-Long Term	Action 1.5. As the City of Albany's Strategic Plan is updated, incorporate and link the Natural Hazard Mitigation Plan Objectives into the Strategic Plan	Emergency Management	Steering Committee	1 – 5 years										
MH-Long Term	Action 1.6. Develop and maintain a database of current action items	Emergency Management	Information Technology	Ongoing										
Objective #3: Incorporate mitigation into planning and policy development.														
MH-Long Term	Action 3.1. Provide NHMP awareness training City staff to incorporate Natural Hazard Mitigation Planning aspects into their daily work.	Emergency Management	All Departments	1 – 5 years										
MH-Long Term	Action 3.2. Develop and implement a technology continuity plan for the City in the event of a disaster	Information Technology	All Departments	1 – 5 years										
MH-Long Term	Action 3.3. Evaluate and enhance current land use and zoning codes to incorporate mitigation principles.	Community Development	All Departments	1 – 5 years										
MH-Long Term	Action 3.4. Integrate the NHMP principles and actions into all the planning documents	City Manager	All Departments	1 – 5 years										

Objective #5: Ensure continuity of City emergency services function.														
MH-Long Term	Action 5.2. Consolidate Mitigation plan, EOP, recovery plans and continuity of government plans into a Unified Disaster Plan	Emergency Management	All Departments	1 – 5 years										
Objective #6: Implement structure and non-structural mitigation of publicly owned facilities and infrastructure.														
MH-Long Term	Action 6.1. Assist K-12 schools and Linn Benton Community College to develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings	Emergency Management	GAPS Linn Benton Community College	1 – 5 years										
MH-Long Term	Action 6.3 Provide all City of Albany critical facilities with backup power and emergency operations plans to deal with power outages	Public Works	Emergency Management, Pacific Power, Consumer Power, ODOT	1 – 5 Years										
MH-Long Term	Action 6.4. Develop an approach to provide for placement of electrical power lines underground on major street repairs and replacements	Public Works	Pacific Power, Consumer Power	1 – 5 years										
Objective #8: Develop collaborative programs that encourage local businesses to plan for disasters.														
MH-Long Term	Action 8.1. Promote response, mitigation, and recovery planning for local businesses to continue operating after a disaster	Emergency Management	Red Cross, Chamber of Commerce, PIO, Downtown Association, FEMA	1 – 5 years										

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items:**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Flood (FL) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #3: Incorporate mitigation into planning and policy development.														
FL-Short Term	Action 3.8. Enhance data and mapping for floodplain information with in the City to better determine vulnerability and risk	Public Works	All Departments	1 – 2 years										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
FL-Short Term	Action 4.5. Complete an inventory of locations in City of Albany subject to frequent storm water flooding	Public Works	All Departments	1 – 2 years										
FL-Short Term	Action 4.6. Evaluate and develop a City strategy to address repetitive flood loss properties	Emergency Management	Community Development	1 – 2 years										
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
FL-Short Term	Action 7.4. Develop an education and outreach program to make residents aware of the flood hazard in their area and the availability of flood insurance	Community Development	PIO, Emergency Management, FEMA	1 – 2 years										

Objective #3: Incorporate mitigation into planning and policy development.															
FL-Long Term	Action 3.5. Develop strategies to lower the City's current rating in the National Flood Insurance Program's Community Rating System	Community Development	All Departments	1 – 5 years											
FL-Long Term	Action 3.6. Update applicable City codes to improve risk reduction and prevention of flood impacts	Community Development	All Departments	1 – 5 years											
FL-Long Term	Action 3.7. Identify, prioritize and develop strategies for properties in the floodplain for risk reduction and preventing flood impacts.	Community Development	All Departments	1 – 5 years											
Objective #4: Support the enhancement of the City vulnerability assessment activities.															
FL-Long Term	Action 4.4. Develop a storm water management/drainage plan	Public Works	All Departments	1 – 5 years											
FL-Long Term	Action 4.7. Request Flood Insurance Rate Maps (FIRM) be updated	Emergency Management	Community Development	1 – 5 years											
Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.															
FL-Long Term	Action 9.3 Partner with the City of Lebanon to complete canal bank failure stability projects	Public Works	City of Lebanon, Linn County	1 – 5 years											
FL-Long Term	Action 9.4 Encourage multi-objective stream and river projects that maximize flood mitigation, fish habitat, and water quality	Public Works		1 – 5 years											

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items:**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Earthquake (EQ) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
EQ-Short Term	Action 4.8. Re-run DOGAMI HAZUS with local refined data	Emergency Management	Public Works	1 – 2 years										
Objective #5: Ensure continuity of City emergency services function.														
EQ-Short Term	Action 5.4. Develop specific emergency evacuation or shelter-in-place plans for residential areas that are near significant hazard material storage facilities and heavy industrial areas.	Emergency Management	Public Works	1 – 2 years										
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
EQ-Short Term	Action 7.5. Develop an education and outreach program to make residents aware of the earthquake hazard and the availability of earthquake insurance	Community Development		1 – 2 years										
EQ-Short Term	Action 7.6. Develop awareness program which encourages and assists property owners to implement structural and non-structural mitigation for the earthquake hazard	Emergency Management	Community Development, PIO, FEMA, Red Cross	1 – 2 years										

Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.															
EQ-Short Term	Action 9.1. Develop a non-structural retrofit program aimed at making child care facilities and schools more resistant to the impact of earthquakes	Emergency Management	PIO, GAPS, State of Oregon	1 – 2 years											
Objective #3: Incorporate mitigation into planning and policy development.															
EQ-Long Term	Action 3.9. Explore development of an ordinance to address seismically-deficient buildings.	Community Development	Emergency Management	1 – 5 years											
Objective #6: Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure.															
EQ-Long Term	Action 6.5. Develop and implement a non-structural retrofit program for City staff offices and workspaces	Emergency Management	All Departments Safety Committee Red Cross	1 -5 years											
EQ-Long Term	Action 6.6. Seek funding to provide a pilot project that provides funding or incentives for non-structural seismic mitigation in private households and for housing that is vulnerable to the effects of natural hazards	Emergency Management	Public Works, Insurance Companies, Utilities	1 – 5 years											
EQ-Long Term	Action 6.7. Complete a seismic vulnerability assessment of all City-owned structures and prioritize the structures for updating	Emergency Management	Building Department	1 – 5 years											
EQ-Long Term	Action 6.8. Seek funding to update the prioritized City owned structures identified in Action 6.7	Emergency Management	Building Department, Public Works	1 – 5 years											
EQ-Long Term	Action 6.9. Complete inventory of commercial buildings that may be particularly vulnerable to earthquake damage	Emergency Management	Building Department	1 – 5 years											
EQ-Long Term	Action 6.10. Identify neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1940 homes and homes with cripple wall	Emergency Management	Building Department, GIS	1 – 5 years											
EQ-Long Term	Action 6.11. Seek funding to complete seismic retrofitting of the City of Albany structures, bridges, and infrastructure which have been identified and prioritized	Finance Department	Emergency Management, Public Works, State of Oregon, FEMA	1 – 5 years											

EQ-Long Term	Action 6.12. Conduct a vulnerability analysis of Albany's sewer system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit	Public Works	Emergency Management, Building Department	1 – 5 Years										
EQ-Long Term	Action 6.13. Conduct a vulnerability analysis of Albany's water distribution system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit	Public Works	Emergency Management, Building Department	1 – 5 Years										
EQ-Long Term	Action 6.14. Evaluate the necessity for seismic valve protection for City of Albany reservoirs and if determined necessary seek funding to retrofit	Public Works	Emergency Management, Building Department	1 – 5 Years										
Objective #8: Develop collaborative programs that encourage local businesses to plan for disasters.														
EQ-Long Term	Action 8.2. Provide examples and educational material to support implementation of non-structural mitigation programs in local businesses	Emergency Management	PIO, Economic Development, Chamber of Commerce, Downtown Association, Red Cross	1 – 5 years										
Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.														
EQ-Long Term	Action 9.2 Develop public/private partnerships to seek outside funding for retrofitting structures in the downtown and historic districts	CARA	SHIPO, Emergency Management, Economic Development, Downtown Association, Chamber of Commerce	1 – 5 years										

City of Albany: Natural Hazard Mitigation Plan Matrix					Alignment with City of Albany Strategic Plan Goals/Themes				Alignment with City of Albany Strategic Plan Capital Elements					
Objectives	**Action Items:**				Great Neighborhoods	Safe City	Healthy Economy	Effective Government	**Physical Capital**	**Economic Capital**	**Social Capital**	**Political Capital**	**Environment Capital**	**Human Capital**
Severe Weather (SW) Action Items		**Lead Organization**	**Internal/External Partners**	**Timeline**										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
SW-Short Term	Action 4.9. Develop pre-storm strategies for coordinated debris removal following wind and winter storm	Emergency Management	Public Works	1 – 2 years										
Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.														
SW-Short Term	Action 7.7. Partner with utility providers to make homeowners aware of the importance of tree and limb maintenance and the Right Tree, Right Place program	Public Works	Utilities, Emergency Management, PIO	1 – 2 years										
Objective #9: Develop partnerships with external partners to implement hazard specific mitigation projects in the City.														
SW-Short Term	Action 9.5 Develop and implement programs to keep trees from threatening lives, property, and public infrastructure during wind and winter storms	Public Works	Pacific Power, Consumer, Power	1 – 2 years										
Objective #4: Support the enhancement of the City vulnerability assessment activities.														
SW-Long Term	Action 4.10. Develop and implement landscaping and tree standards to keep trees from threatening lives, property, and public infrastructure	Public Works	Community Development	1 – 5 years										