# City of Albany, Oregon

## Natural Hazard Mitigation Plan

**Final Report for:**
Albany City Council

**Prepared by:**

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**September 2016**

# City of Albany
# Natural Hazard Mitigation Plan
## Special Thanks & Acknowledgements

This Natural Hazard Mitigation Plan was developed by the City of Albany departments and their employees, the public and local businesses who participated in the review of the updated plan, action items, and participated in the Floodplain Management Committee. The City of Albany would like to thank these participants for their time and input:

## Regional Partners

Federal Emergency Management Agency Region 10

Oregon Emergency Management

Oregon Department of Geology and Mineral Industries

## Steering Committee

Wes Hare, City Manager & Emergency Program Manager

Stewart Taylor, Finance Director

Ed Gallagher, Library Director

Ed Hodney, Parks & Recreation Director

Kate Porsche, Economic Development & Urban Renewal Director

John Bradner, Fire Chief & Emergency Management Coordinator

Jeff Blaine, Public Works Engineering & Community Development Director

Chris Bailey, Public Works Operations Director

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Jorge Salinas, Assistant City Manager/ Chief Information officer

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Richard Montague, GIS

## Floodplain Management Planning Committee

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Jessica Pankratz, Town and Country Realty

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## Project Manager

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## Additional Thanks

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## Special Thanks

Joseph Murray, Oregon Emergency Management

TO: Federal Emergency Management Agency

FROM: City of Albany

DATE: December 14, 2015

SUBJECT: Changes to the 2010 City of Albany NHMP for 2015 Plan Update

## PURPOSE

This memo describes the changes made to the 2010 City of Albany Natural Hazard Mitigation Plan (NHMP) during the 2015 plan update process. Major changes are documented by plan section.

## PROJECT BACKGROUND

Beginning May 2015, the City of Albany began the review and update of its 2010 Natural Hazard Mitigation Plan (NHMP). The Disaster Mitigation Act of 2000 requires communities to update their mitigation plans every five years to remain eligible for Pre-Disaster Mitigation (PDM) program funding, Flood Mitigation Assistance (FMA) program funding, and Hazard Grant Mitigation Program (HMGP) funding.

The City of Albany Steering Committee met this year in June, September, October and November to update all content in the City's NHMP. The City held two public meetings for the public learn about the mitigation plan and to review a draft plan and comment. Those meetings occurred in September and November. In addition to the open public meetings, the draft plan was available for public viewing on the City's website. The Steering Committee made several changes to the 2010 NHMP; major changes are documented and summarized in this memo.

## 2016 PLAN UPDATE CHANGES

This memo covers only major changes to the 2010 City of Albany NHMP. Major changes include replacement or deletion of large portions of text, changes to the plan's organization, and new additions. If a section is not addressed in this memo, it can be assumed that no significant changes were made. Format and organization remained the same. The following Table A1 lists the 2010 plan section titles and corresponding 2015 section titles, as updated. This memo uses the 2016 plan update section titles to reference any changes, additions, or deletions within the plan.

**Table A1. 2010 and 2016 Plan Sections**

| 2010 City of Albany NHMP | 2016 City of Albany NHMP |
|---|---|
| Executive Summary | Executive Summary |
| Section 1: Introduction | Section 1: Introduction |
| Section 2: Community Profile | Section 2: Community Profile |
| Section 3: Risk Assessment | Section 3: Risk Assessment |
| Section 4: Mitigation Plan Mission, Goals, Objectives, and Action Items | Section 4: Mitigation Plan Mission, Goals, Objectives, and Action Items |
| Section 5: Plan Implementation and Maintenance | Section 5: Plan Implementation and Maintenance |
| Section 6: Flood | Section 6: Flood |

| 2010 City of Albany NHMP | 2016 City of Albany NHMP |
|---|---|
| Section 7: Earthquake | Section 7: Earthquake |
| Section 8: Severe Weather | Section 8: Severe Weather |
| Section 9: Wildland/Urban Interface Fire | Section 9: Wildfire |
| Section 10: Volcano Ash | Section 10: Volcano |
| Section 11: Landslides | Section 11: Landslide |
| Section 12: Drought | Section 12: Drought |
| *New Appendix* * | Section 13: Climate Change |
| Appendix A: Resources | Appendix A: Resources |
| Appendix B: Public Process and Committees | Appendix B: Public Process and Committees |
| Appendix C: Approaches for Economic Analysis | Appendix C: Approaches for Economic Analysis |
| Appendix D: List of Acronyms | Appendix D: List of Acronyms |
| Appendix E: 2010 Action Items Master List | Appendix E: Master List of 2015 Action Items |
| Appendix F: 2010 Action Items by Hazard | Appendix F: 2015 Action Items by Hazard |
| Appendix G: 2010 Completed Action Items Progress Report | This section deleted; it was a duplication |
| Appendix H: City of Albany Specific HAZUS Run | Appendix G: City of Albany 2015 HAZUS run |
| Appendix I: City of Albany 2009 Hazard Analysis | Appendix H: City of Albany 2015 Hazard Analysis |
| *New Appendix* * | Appendix I: Floodplain Management Planning Committee |
| *New Appendix* * | Appendix J: Flood Information and Insurance Promotion |

* These are new Appendices that have been added to the 2015 updated plan.

A new section has been included in the 2016 plan update by the Steering Committee. They decided at a regular meeting to expand the 2016 hazard list from seven to eight. The new hazard is:

- Climate Change

Two new appendixes have been added to provide information about floodplain management and insurance information. New appendix is:

- Appendix I: Floodplain Management Planning Committee
- Appendix J: Flood Information and Insurance Promotion

## FRONT PAGES

1. The plans cover page has been updated
2. The Special Thanks and Acknowledgements page has been updated to include the 2016 project partners, Steering and Working Committee members, planning participants, and public members who took the time to get involved.
3. The Table of Contents Page has been changed to reflect the new sections and appendices.

## VOLUME I

Volume I provides the overall plan frame work for the 2016 NHMP update. Volume 1 contains the following sections:

- Executive Summary
- Section 1: Introduction
- Section 2: Community Profile
- Section 3: Risk Assessment
- Section 4: Mitigation Plan Mission, Goals, Objectives, and Action Items
- Section 5: Plan Implementation and Maintenance

## EXECUTIVE SUMMARY

The Executive Summary was modified:

1. To reflect which City departments the Steering Committee members represent and the other partners the City worked with during the update;
2. To reflect the new goals the Steering Committee adopted from the City's Strategic Plan
3. To update the map page locations.

### Section 1: Introduction

Section 1 introduces the concept of natural hazards mitigation panning and answers the question of why we develop a mitigation plan. Section 1 summarizes the 2016 plan update process and provides an overview of how the plan is organized. Changes to Section 1 include:

1. Information about the City's participation in mitigation grant programs and the three projects the City has received grant funding for since the 2005 plan approval; the 2006 seismic stabilization grant for the 1912 water treatment plant; the 2008 grant for the collection of HAZUS data for city specific information; and the 2010 grant for the seismic rehabilitation of Fire Station 12.
2. Outlining the Steering Committee, Working Committee and Floodplain Management Planning Committee, which were involvement in the update of the 2010 plan and the action taken to assure a successful evaluation of the Plan. Full documentation of the process can be found in Appendix B.

3. Explaining the public process the Steering Committee chose to ensure that the public was provided an opportunity to comment on the Plan. Full documentation of the process can be found in Appendix B.
4. Modifications in the "How do I use the Plan" Section to show what material the Steering Committee used in determining the hazards to be included in the plan.
5. Adding an outline of the new appendices and a summary of those appendices.

**Section 2: Community Profile**

Major changes to section 2 include:

1. Updating all major river, climate and rain information, including annual and monthly city precipitation charts and heavy fog visibility chart.
2. Adding new information to the population and demographics section, including current population, number of households, average household size, residents over 25, and median family income.
3. Replacing the major City employee table with a table showing the major employees in Linn and Benton Counties, this includes the City of Albany.

**Section 3: Risk Assessment**

Section 3 provides information on the natural hazard risk assessment process. Its general scope is to provide information on what hazards affect the city. The following changes included:

1. Changing the number of natural hazards listed in the plan from seven in 2010 to eight in 2016; Climate Change was added to the list.
2. Table of maps was reviewed and page numbers modified to reflect the appropriate location in the new plan.

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

This section provides the basis for the mission, goals, and mitigation action for the plan. Major changes in Section 4 include:

1. At the June 24, 2015 meeting, the Steering Committee decided to continue to use the City's Strategic Plan mission, themes, and select goals as part of the Mitigation Plan.
2. Appendix G of the 2010 plan, which provided a complete list of all 2005 action items and what has been accomplished over the last five years was deleted because of duplication.
3. At the September 2, 2015 Steering Committee meeting the Committee commented on each of the actions with the following recommendations: to keep in the plan; delete; or modify.

**The following 2010 action items have been deleted/completed from the 2016 plan.**

| Action Item | Action Title | Reason for Deletion/Completion |
|---|---|---|
| MH – Action 1.1 | Create and formalize city of Albany Steering Committee to oversee Plan implementation | This action was completed. The establishment of the Department Heads as the Steering committee for the City of Albany Natural Hazard Mitigation Plan |
| MH – Action 1.2 | Develop agreements with external partners to work together on risk reductions efforts in the city | This action was completed. No formal agreements have been developed, but over the last five years both Pacific Corp and NW Natural have implemented preparedness campaigns to educate the public on being prepared for natural disasters |
| MH – Action 1.3 | Look for funding opportunities to implement the actions identified in the plan and enter into a formal agreement to work together as needed | This action was deleted. Grant funding has been significantly reduced over the last five years. The City of Albany did receive a grant to seismically upgrade Fire Station 12. One city school has been seismically upgraded and Linn Benton Community College recently received a grant to seismically upgrade one of its buildings. It was also decided this was something done automatically when we look at an action item. No need to have a specific action to look for funding. |
| MH – Action 1.5 | Work with Natural Hazard Partners to develop and maintain a data base of current action items | This action was deleted. It was decided by the Steering Committee this action was not necessary. It would take more time and effort to establish and update than it would be worth to the public |
| MH – Action 2.1 | Develop and implement communications strategies for the dissemination of media messages on helping individuals to understand their responsibilities for disaster safety and risk reduction and to be familiar with the cities natural hazard mitigation plan | This action was completed. It was determined by the Steering Committee that a formal strategy was not necessary. Many of the other actions within the Natural Hazard Mitigation Plan were meeting this action in a non formal way |
| MH – Action 2.2 | Develop and implement a public officials informant kit that can be distributed to elected official and community decision makers | This action was dropped. It was determined by the Steering Committee that because the council turnover was so small it was not worth the effort or time to develop a formalized system, but rather to use an informal approach |

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| MH – Action 3.2 | Implement the technology continuity plan for the City in the event of a disaster and exercise it. | This action was completed by the City's Information Technology Department. |
| MH – Action 3.3 | Evaluate and enhance current land use and zoning codes to incorporate mitigation principles | This action was deleted. It was determined by the Steering committee this action was ongoing and a formalized approach was not necessary for the City |
| MH – Action 3.4 | Integrate the Natural Hazard Mitigation Planning principles and action into all the planning documents | This action was deleted. It is something that is taking place naturally so the Steering committee decided there was no need for an Action Item. |
| FL- Action 3.7 | Identify, Prioritize and develop strategies for properties in the floodplain for risk reduction and preventing flood impacts | This action was completed. Floodplain maps have been updated. Another Action item already addresses public education and outreach |
| MH – Action 4.1 | Review existing inventory of City assets and replacement costs to ensure it is current | This action was deleted. It was determined by the Steering Committee that the Finance Department does this on an annual basis for the insurance |
| MH – Action 4.3 | Refine material that will be collected for non-declared natural hazard events to assist in determining vulnerability and risk | This action was deleted. It was determined by the Steering Committee that natural hazard events occur so infrequently that the effort was not worth it |
| FL – Action 4.4 | Develop a storm water management/drainage plan | This action was deleted. Public Works recommends deleting this action item because the scope of the storm water master plan does not include this type of flooding. It focuses more on conveyance of more routine storms that aren't a natural hazard type event. |
| FL – Action 4.5 | Look for opportunity to receive updated flood insurance rate Maps (FIRM) from FEMA | This action was completed. Albany received updated maps from FEMA in 2010, and the City is almost complete with its own updates to the floodplain maps for North Albany. |

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| EQ – Action 4.6 | Refine DOGAMI HAZUS run with local data | This action was completed. In 2010 the City received a grant to evaluate all commercial buildings and 1/3 of the residential buildings pre-1950 and older to provide more accurate information on buildings within the city. We are now looking to add information on water and waste water. A new run will be include in the 2015 update |
| LS – Action 4.8 | Complete an inventory of locations where critical facilities, other buildings and infrastructure are subject to landside | This action was completed. Used the DOGAMI online program to determine locations of landslide areas in the city limits. Determined there were no critical facilities within the areas identified. Public Works and Community development have procedures in place to address building in landslide areas. |
| MH – Action 6.4 | Develop an approach to provide for placement of electrical power lines underground | This action has been deleted. It was determined by the Steering Committee this action was done routinely by the Engineering and Community Development Departments as a part of the plan review process |
| EQ – Action 6.6 | Complete a seismic vulnerability assessment of critical structures within the city, including schools and health care facilities; prioritize the structures for updating | This action was completed. Use the DOGAMI website to complete this assessment. |
| EQ – Action 6.7 | Complete a seismic vulnerability assessment of all City-owned structures and prioritize those structures for updating | This action was completed. Reviewed each city facility to determine if it was a critical facility and then determined its present seismic status. Two facilities, one fire station and one police station were below seismic level, but have been approved to be replaced by the end of 2016. |
| EQ – Action 6.8 | Seek funding to update the prioritized city owned structures identified in Action 6.7 | This action was completed. With the building of a new fire and police station all critical facilities for the City will have been built to the highest seismic level possible. |

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| EQ – Action 6.9 | Review inventory of commercial buildings that may be particularly vulnerable to earthquake damage | This action was completed. A grant in 2010 provided for an intern to conduct an evaluation of 90% of the commercial buildings in Albany. |
| LS – Action 6.15 | Consider landslide mitigation actions for slide areas seriously threatening critical facilities, other buildings or infrastructure | This action was completed. It was determined that processes are in place in Public Works and Community Development to adequately address this situation. |
| SW – Action 7.6 | Partner with Pacific Corp and Consumer power on four outreach projects to provide homeowner information on the importance of tree and limb maintenance and the Right Tree Right Place Program. | This action has been deleted. It was determined that both utilities presently provide preparedness information to their customers that meet the intent of this action independent of the City's participation |
| FL – Action 9.4 | Encourage multi-objective stream and river projects that maximize flood mitigation, fish habitat, and water quality | This action was dropped. The Steering Committee reviewed this action item and determined they wanted to drop it. It had been required by the federal mandate |

**The following 2010 actions items have been deferred, continued or modified.**

| 2010 Action Item | Action Title | Status | 2016 Action Item |
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| MH LT 1.4 | As the City of Albany's Strategic Plan is updated, incorporate and link the Natural Hazard Mitigation Plan Objectives into the Strategic Plan | Action continued. These efforts occur as the Strategic Plan planning process takes place. | MH LT 1.1 |
| MH LT 2.3 | Develop and implement six communications and outreach opportunities to inform the community on the status of the Natural Hazard Mitigation Plan | Action continued. During the last 5 years the City sent out two communications to the public. The Steering Committee wanted to continue this action item to improve the communications between the City and community on Natural Hazard Mitigation Planning. | MH LT 2.1 |
| WF LT 2.4 | Develop and implement a public education strategy for households in identified high-risk areas in the City of Albany and contract rural fire districts | Action continued. No significant work has been done on this action over the last five years because of a lack of resources, primarily personnel. | WF LT 2.2 |
| VO LT 2.5 | Update emergency notification procedures for ash fall events | Action continued. No significant work has been done on this action over the last five years because of a lack of resources; primarily personnel. | VO LT 2.3 |
| MH LT 3.1 | Provide NHMP awareness training to city staff to incorporate Natural Hazard Mitigation Planning aspect into their daily work | Action continued. Training was formally provided to the fire department staff during the last five years. The Steering Committee wants to work on formalizing the training to Public Works Engineering and Community Development. | MH LT 3.1 |
| FL LT 3.5 | Evaluate what can be done to improve the city's current rating in the National Flood Insurance program's Community Rating system | Action modified. The City's rating was improved in 2010 from 7 to 6. The next opportunity to improve the City's rating is in 2016. Changed to Short Term. Review will be in 2016. | FL ST 3.2 |

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| FL LT 3.6 | Look at the need to update applicable city codes to reduce risk and prevent flood impacts | Action modified. In 2010 Community Development updated applicable codes pertaining to floods. | FL LT 3.3 |
| FL LT 3.8 | Continue participation in the National Flood Insurance program | Modified - The City continues to participate in the NFIP. As of 2015, the City was in good standing with the nation program. | FL LT 3.4 |
| EQ LT 3.9 | Explore development of an ordinance/program to address seismically deficient buildings | Action continued. The Building Division has had some discussion about this with Community Development, but because of the remodel cost and the economic conditions has taken no further action. | EQ LT 3.5 |
| | Develop a Flood and Dam Failure Warning and Response Plan | New Action Item. | FL ST 3.6 |
| MH ST 4.2 | Review hazard maps and update vulnerability and risk for hazards which affect the City, partnering with local, state and federal agencies | Action continued. Some work has been completed on this, but a more in-depth review will be made over the next five years. | MH ST 4.1 |
| SW LT 4.7 | Develop pre-storm strategies for coordinated debris removal following wind and winter storms | Action continued. The City has the regional Debris Plan and will be working on adding information to the Linn and Benton Sections with City-specific information. | SW LT 4.2 |
| VO LT 4.9 | Evaluate capability of water and wastewater treatment facilities to deal with ash fall and determine what changes may need to be made | Action continued. No work has been done on this action due in part to a lack of priority and personnel. | VO LT 4.3 |
| VO LT 4.10 | Evaluate ash impact on storm water drainage system and develop mitigation action if necessary | Action Modified. Word "Transportation" was taken out of the sentence. No work has been done on this action due in part to a lack of priority and personnel | VO LT 4.4 |
| VO LT 4.11 | Evaluate the impact of ash fall out on HVAC systems in city facilities | Action continues. No work has been done on this action due in part to a lack of priority and personnel | VO LT 4.5 |

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| EQ LT 5.1 | Develop specific emergency evacuation or shelter-in-place plans for residential areas that near significant hazard material storage facilities and heavy industrial areas | Action continues. There have been some maps that were developed with evacuation circles; Mid-Valley LEPC is facilitating an evacuation plan that will meet this action. | EQ LT 5.1 |
| EQ LT 5.2 | Evaluate city emergency transportation routes with City, County and State partners | Action continues. Emergency routes have been identified, bridge and culvers have been identified, train track locations and intersections have been identified. | EQ LT 5.2 |
| VO LT 5.3 | Update emergency response planning for ash fall event | Action continues. No work has been done on this action due in part to a lack of priority and personnel | VO LT 5.3 |
| MH LT 6.1 | Assist K-12 schools to develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings | Action Modified. Linn Benton Community College has developed an individual Natural Hazard Mitigation Plan and has applied for and received one seismic grant. It has several additional requests for seismic funding waiting to be approved. | MH LT 6.1 |
| EQ LT 6.5 | Develop and implement a non-structural retrofit program for City staff offices and workspaces | Action continues. No work has been done on this action due in part to a lack of priority and personnel. | EQ LT 6.2 |
| EQ LT 6.10 | Evaluate neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1950 homes | Action continued. Over 1/3 of the residential buildings have been evaluated; will continue to look for opportunities to complete the work. | EQ LT 6.3 |
| EQ LT 6.11 | Evaluate City-owned bridges to determine which need to be seismically updated, and seek appropriate funds | Action modified. Action was modified to include City-owned bridges to be evaluated for purpose of funding. The City has no ability to go after funds for State and County bridges. | EQ LT 6.4 |
| EQ LT 6.12 | Conduct a vulnerability analysis of Albany's wastewater collection system to identify elements with the potential for failure, and seek funding alternatives to seismically retrofit them | Action continued. No work has been done on this action due in part to a lack of priority and personnel | EQ LT 6.5 |

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| EQ LT 6.13 | Conduct a vulnerability analysis of Albany water distribution system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit them | Action continued. No work has been done on this action due in part to a lack of priority and personnel. | EQ LT 6.6 |
| EQ ST 6.14 | Evaluate the necessity for seismic valve protection for city of Albany reservoirs and, if determined necessary, seek funding to retrofit them | Action continued. Public works has purchased some valves, installation will take place soon. Additional valves are being evaluated and will occur within the next five years. | EQ ST 6.7 |
| MH ST 7.1 | Provide educational awareness material on how to develop emergency plans and assemble 14 day kits to City employees | Action continued. Much of the material has been collected and some classes actually presented. A formal 2-year plan will be developed to get more employees to participate in family preparedness. | MH ST 7.1 |
| MH ST 7.2 | Provide eight educational and outreach articles to explain how to develop an emergency plan and assemble 14 day kits to residents of Albany | Action continued. Much of this work has been taking place the last three years. There have been a number of articles in the City's quarterly newsletter. A more formal plan needs to be developed. | MH ST 7.2 |
| FL ST 7.3 | Develop an educational and outreach program to provide residents awareness of the flood hazard in their area and the availability of flood insurance | Action continued. Modified – The CRS rating system has changed, and past practices for public outreach and insurance promotion are no longer given the same amount of credit when determining the City's Rating. Following the CRS guidelines to create a program for public information and insurance promotion will garner more points toward the City's CRS rating, which helps to lower flood insurance rates for residents in the City. | FL ST 7.3 |
| EQ ST 7.4 | Develop an education and outreach program to provide residents information about earthquake hazard and the availability of structural and non-structural mitigation | Action continued. Some of this has been done through articles in the City's newsletter. A more formal plan will be developed for the next two years. | EQ ST 7.4 |

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| EQ ST 7.5 | Provide five educational and outreach opportunities to residents on earthquake hazards and the availability of earthquake insurance | Action modified. Changed from a Short Term action to a Long Term action. Some of this has been completed through the city newsletters. A formal plan will be developed. | EQ LT 7.5 |
| MH LT 8.1 | Promote response, mitigation and recovery planning for local businesses to continue operating after a disaster | Action continues. No work has been done on this action due in part to a lack of priority and personnel. | MH LT 8.1 |
| EQ LT 9.1 | Develop a non-structural retrofit program aimed at making child care facilities, schools, City offices and local businesses more resistant to the impact of earthquake | Action continued. No work has been done on this action due in part to a lack of priority and personnel. | EQ LT 9.1 |
| EQ LT 9.2 | Develop public/private partnerships to seek outside funding for retrofitting structures in the downtown and historic districts | Action continued. Two buildings in the downtown area have been assisted in seismic upgrading w hen they remodeled. | EQ LT 9.2 |
| FL LT 9.3 | Implement Santiam-Albany Canal bank improvement projects | Action modified. Words “Future” and “Stability” were dropped and the word “improvement” was added. Significant work has been completed on the Santiam-Albany Canal over the last five years. | FL LT 9.3 |
| WF LT 9.5 | Work with Linn and Benton County to implement community wildland fire protection strategies necessary for the City of Albany and contract rural fire districts to reduce fire risk | Action continues. No work has been done on this action item. | WF LT 9.4 |
| DR LT 9.6 | Support local agency programs that promote measures to reduce water use during drought emergencies | Action continues. No work has been done on this action due in part to a lack of priority and personnel. | DR LT 9.5 |

**The following are new action items added by the Steering Committee.**

| Action Title | Status | Action Item |
|---|---|---|
| Develop a Flood and Dam Failure Warning and Response Plan | New Action Item for Flood Hazard | FL ST 3.6 |
| Continue reviewing DOGAMI hazard maps to identify any changes or amendments to future potential landslide areas within the city of Albany | New Action Item for Landslide Hazard | LS LT 4.6 |

**Section 5: Plan Implementation and Maintenance**

This section details the formal process that will ensure that the City of Albany's Natural Hazard Plan will be implemented and activities documented on a regular basis. The Major changes to Section 5 include:

1. The coordinating body has changed to reflect the current number of department directors.
2. Under implantation through existing programs, all applicable plan and program information has been revised to reflect current information.
3. Continued public involvement section has been updated to reflect the Steering Committee's implementation strategy.

## VOLUME II: HAZARD – SPECIFIC INFORMATION

Volume II contains an introduction to each hazard which includes characteristics of the hazard, occurrences of the hazard within the City, the risk of the hazard to the City, and the vulnerability to the City. It will also lists the program that presently exists in the City to help address the mitigation of the hazard and any county, state, or federal programs that might be available. Finally, it will list the action items that are applicable to the hazard.

For each of the natural hazards you will find a general update of the information found in each of those sections.

**Hazard Chapter 6: Flood**

1. "Precipitation" paragraph has been updated.
2. "Major Rivers" paragraph has been updated.
3. Information on National Geodetic Vertical Datum of 1929 and the more accurate vertical datum of 1988 is discussed.
4. North Albany Floodplain Study of 2010 is discussed.
5. Additional flood events have been added to Table 6.2.
6. High water markers in Figure 6.8 are discussed.
7. "Repetitive flood losses in Albany" has been updated.
8. "Dam failure inundations" has been updated.
9. Climate change has been summarized.
10. "Wastewater Treatment Facilities" paragraph has been updated.
11. State and local programs section has been updated.

**Hazard Chapter 7: Earthquake**

1. Included language about the two grants the City received to seismically upgrade the Vine Street Water Treatment Plant and Fire Station 12.
2. Included information on the City's receipt of a Grant from FEMA to provide city specific information in our HAZUS estimates.
3. Included an updated list of action items for earthquake mitigation.

**Hazard Chapter 8: Severe Weather**
All weather precipitation information updated.

**Hazard Chapter 9: Wildfire**
Information updated

**Hazard Chapter 10: Volcano**
Information updated

**Hazard Chapter 11: Landslide**
Information updated.

**Hazard Chapter 12: Drought**
Information updated.

**Hazard Chapter 13: Climate Change**
New Chapter: all information is new and was taken from Oregon Emergency Management's Natural Hazard Mitigation Plan.

**VOLUME III: RESOURCES**

Appendix B: Public Process and Committees
1. This entire section was changed as the process for public involvement and the Steering and Working Committees were new.

Appendix E: 2016 Action Items Master List
1. This entire list is new and reflects the actions the Steering Committee approved. This list is sequential.

Appendix F: 2010 Action Items by Hazard
1. This appendix has been updated to reflect the action items approved by the Steering Committee and are listed under their respective hazard.

Appendix G: HAZUS run
1. Completed Action Items Progress Report has been deleted from this section.
2. This Appendix is now the City of Albany HAZUS run. Because our previous GIS tech for HAZUS retired, we have a new tech that is being trained to use HAZUS. Our new run will be added in spring of 2016.

Appendix H: 2015 Hazard Analysis
1. City of Albany Specific HAZUS Run deleted from this section.
2. This Appendix is now for the City's 2015 Hazard Analysis.

Appendix I: Floodplain Management Planning Committee
1. City of Albany 2009 Hazard Analysis has been deleted from this section.
2. This is a new Appendix pertaining to the City's Floodplain Management Planning Committee.

Appendix J: Program for Public Information and Insurance

1. This is a new Appendix.

# Local Mitigation Plan Review Tool for Local and State Use

***Please read and follow all instructions:*** The local Mitigation Plan Review Tool's *Section 1: Regulation Checklist* must be filled out completely in all non-shaded fields and accompany all local Mitigation Action Plans submitted to the State. Initial and final drafts must be submitted in both hard and electronic copy.

The State will review the initial submittal against the Checklist. If there are Regulation deficiencies or defects in a plan, the Reviewer will note in the comments section what revisions should be made and recommended approaches and return to the point of contact for revision.

The resubmitted plan must address the deficiencies and defects. Changes to page location must be added to the form when the revisions are submitted. The date of the plan on the cover should be adjusted with any revised plan, up to the final draft date. *Note that Element D applies to Updates only and Element E should be acted upon when a plan receives APA (approvable pending adoption) status.*

In addition, the Multi-jurisdiction Summary Sheet with every participant's point of contact information must accompany the initial submittal.

The State will not forward a plan to FEMA until it has determined that all Elements have been met satisfactorily and in entirety. FEMA will review against the Checklist and, in addition, will fill out *Section 2: Plan Assessment*, which addresses additional recommended (not required) improvements to a plan. When a plan is deemed "approvable" by FEMA, it will receive an APA status and fulfilling Element E must follow. After the plan has been adopted and the appropriate documents have been submitted to the State, forwarded to FEMA and found satisfactory, the plan is deemed FEMA approved through official notice.

| | | |
|---|---|---|
| **Jurisdiction:**<br>**City of Albany** | **Title of Plan:**<br>City of Albany Natural Hazard Mitigation Plan | **Date of Plan:**<br>December 2015 |
| **Local Point of Contact:**<br>**Darrel Tedisch** | **Address:**<br>**P.O. Box 490**<br>**Albany, Oregon 97321** | |
| **Title:**<br>**Emergency Management Specialist** | | |
| **Agency:**<br>**Emergency Management** | | |
| **Phone Number:**<br>**541-917-7725** | **E-Mail:**<br>**darrel.tedisch@cityofalbany.net** | |

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|---|---|---|
| **State Reviewer:** | **Title:** | **Date:** |
| **FEMA Reviewer:** | **Title:** | **Date** |
| **Date Received in FEMA Region (insert 3)** | | |
| **Plan not Approved** | | |
| **Plan Approvable Pending Adoption** | | |
| **Plan Approved** | | |

Element A: The Regulation Checklist must be completed for the "Location in Plan" column for each sub-element. The purpose of the Checklist is to allow the reviewer to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been "Met" or "Not Met".

***Keep in mind*** that the reviewer will be looking for documentation of involvement in the planning process from each participant.

| **REGULATION CHECKLIST**<br><br>**Regulation (44 CFR 201.6 Local Mitigation Plans)** | **Location in Plan (section and/or page number)** | **Met** | **Not Met** |
|---|---|---|---|
| **ELEMENT A. PLANNING PROCESS** | | | |
| **A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))** | Appendix B: Public Process & Committees | ☐ | ☐ |
| **A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))** | Section 1, Page 2: Stand Alone Plan for City of Albany and Urban Growth Area | ☐ | ☐ |
| **A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))** | Appendix B: Public Process & Committees | ☐ | ☐ |
| **A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))** | Section 5: Plan Implementation & Maintenance | ☐ | ☐ |
| **A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))** | Section 5, Page 11: Plan Implementation & Maintenance<br>Appendix J, Page 5: Flood Information & Insurance Promotion<br>Executive Summary, Page 5 | ☐ | ☐ |
| **A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))** | Executive Summary, Page 4<br>Section 5: Plan Implementation & Maintenance | ☐ | ☐ |
| **ELEMENT A: REQUIRED REVISIONS** | | | |

Element B: The Regulation Checklist must be completed for the "Location in Plan" column for each sub-element. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been "Met" or "Not Met".

***Keep in mind*** that the reviewer will be looking for a thorough hazard profile of all hazards that can affect all, or any participant(s). If the hazard is never expected to affect the planning area, it should not be profiled. If the hazard has been either fully mitigated, or will not affect the area because there are no vulnerabilities and subsequent impact, then that should be stated for sub-element B3, and action items will not need to be identified. The reviewer will also assess for consistency between data and narrative.

In order to comply with privacy laws, do not include detailed address information on NFIP properties.

| **REGULATION CHECKLIST**<br><br>**Regulation (44 CFR 201.6 Local Mitigation Plans)** | **Location in Plan (section and/or page number)** | **Met** | **Not Met** |
|---|---|---|---|
| **ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT** | | | |
| **B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))** | Section 6: Flood<br>Section 7: Earthquake<br>Section 8: Severe Weather<br>Section 9: Wildfire<br>Section 10: Volcano<br>Section 11: Landslide<br>Section 12: Drought<br>Appendix H, Hazard Analysis | ☐ | ☐ |
| **B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))** | Appendix H: Hazard Analysis | ☐ | ☐ |
| **B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))** | Each Section 6-13 | ☐ | ☐ |
| **B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))** | Appendix J:<br>Flood Information & Insurance Promotion<br>Section 6, Page 21: Flood | ☐ | ☐ |
| **ELEMENT B: REQUIRED REVISIONS** | | | |

Element C: The Regulation Checklist must be completed for the "Location in Plan" column for each sub-element. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been "Met" or "Not Met".

***Keep in mind*** that the reviewer will be looking for the "who, what, when, and hows" to address how each sub-element C.

| **REGULATION CHECKLIST**<br><br>**Regulation (44 CFR 201.6 Local Mitigation Plans)** | **Location in Plan (section and/or page number)** | **Met** | **Not Met** |
|---|---|---|---|
| **ELEMENT C. MITIGATION STRATEGY** | | | |
| **C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))** | Executive Summary<br>Section 1: Introduction<br>Section 5: Plan Implementation & Maintenance | ☐ | ☐ |
| **C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))** | Section 6: Flood, Page 31 & 32<br>Appendix I: Floodplain Management Planning Committee<br>Appendix J: Flood Information & Insurance Promotion | ☐ | ☐ |
| **C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))** | Section 4: Mitigation plan Mission, Goals, Objectives and Action Items<br>Sections 6 – 13<br>Appendix E: Master List of 2015 Action Items<br>Appendix F: 2015 Action Items by Hazard | ☐ | ☐ |
| **C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))** | Executive Summary<br>Section 3: Risk Assessment<br>Section 6: Flood<br>Appendix E: Master List of 2015 Action Items<br>Appendix F: 2015 Action Items by Hazard | ☐ | ☐ |

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| **C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))** | Appendix C: Approach for Economic Analysis<br>Appendix F: 2015 Action Items by Hazard | ☐ | ☐ |
| **C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))** | Section 5: Plan Implementation & Maintenance | ☐ | ☐ |
| **ELEMENT C: REQUIRED REVISIONS** | | | |

| Element D: The Regulation Checklist must be completed for the "Location in Plan" column for each sub-element. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been "Met" or "Not Met".<br><br>***Keep in mind*** this element applies to Updates to the original plan. Changes in development and priorities should also address recent hazard occurrences and how that affects vulnerabilities and impacts. | | | |
|---|---|---|---|
| **REGULATION CHECKLIST**<br><br>**Regulation (44 CFR 201.6 Local Mitigation Plans)** | **Location in Plan (section and/or page number)** | **Met** | **Not Met** |
| **ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)** | | | |
| **D1. Was the plan revised to reflect changes in development? Requirement §201.6(d)(3))** | Section 1: Introduction<br>Section 4: Mitigation Plan Mission, Goals, Objectives, and Action Items<br>Section 5: Plan Implementation and Maintenance<br>Section 6: Flood, pages 12, 18, 31-32<br>Appendix B: Public Process and Committees | ☐ | ☐ |
| **D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))** | Document Titled "Changes to the 2010 city of Albany NHMP for 2015 Plan Update" Page 5 – 14 discusses the disposition of the 2010 Action Items. Deleted/Completed, Deferred, Continued or modified and new Action Items | ☐ | ☐ |
| **D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))** | Appendix F: 2015 Action Items by hazard. This year a priority column was added. Lead Organization ranked the their action item by High, Medium or Low | ☐ | ☐ |

**ELEMENT D: REQUIRED REVISIONS**

Element E: The Regulation Checklist for Element E does not need to be filled out with the original submittal. It is best to go through the adoption process after the plan has been deemed "approvable pending adoption" (APA) by FEMA after it has gone through review and revision.

***Keep in mind*** that some plans put in place holder pages for resolutions. This practice is optional. Once the first resolution is received and deemed acceptable by FEMA, the plan is approved and the date of the plan's five year expiration is determined. All participants must adopt the plan individually in order to be eligible for hazard mitigation assistance grants (HMGP, PDM, SRL and FMA. RFC does not require a plan)
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| **REGULATION CHECKLIST**<br><br>**Regulation (44 CFR 201.6 Local Mitigation Plans)** | **Location in Plan (section and/or page number)** | **Met** | **Not Met** |
|---|---|---|---|
| **ELEMENT E. PLAN ADOPTION** | | | |
| **E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))** | Governing body will adopt plan via resolution after receiving FEMA's pre-approval | ☐ | ☐ |
| **E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))** | This is a stand-alone plan for the city of Albany no other jurisdiction are involved | ☐ | ☐ |
| **<u>ELEMENT E: REQUIRED REVISIONS</u>** | | | |

Multi-Jurisdiction Summary Sheet contact information

| # | Jurisdiction Name | Jurisdiction Type (city/county/ special district/ non-profit) | Plan POC | Mailing Address | Email | Phone |
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# 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 to reduce risks from natural hazards, and guide the County's mitigation activities. 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.

## 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 that 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, earthquake, severe weather, wildfire, volcanic eruption, landslides and drought. 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 among 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. The City of Albany Steering Committee guided the process of developing and updating the plan. The Steering Committee was comprised of representatives from the following organizations:

- City of Albany Steering Committee
    - City Manager's Office
    - Finance Department
    - Human Resources
    - Emergency Management
    - Fire Department

- Police Department
- Economic Development & Urban Renewal
- Community Development
- Geographic Information Systems
- Public Works
- Parks & Recreation
- Library
- Information Technology

• City of Albany working Committee
- Public Works Engineering
- Public Works Operations
- Planning Department
- Building Department
- Economic Development & Urban Renewal
- Parks & Recreation
- Fire Department
- Emergency Management
- Information Technology

• Other participants
- Oregon Emergency Management
- FEMA Region X
- City of Albany Floodplain Management Team

## What are the Plan goals and objectives?

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. The four themes used in the City's Strategic Plan are used with goals below each theme:

- Theme: Great Neighborhoods
  - Goals
    - Create and sustain a city of diverse neighborhoods where residents feel good about where they live.
    - Provide effective stewardship of Albany's significant natural, cultural, and historic resources.
- Theme: A Safe City
  - Goals
    - Ensure a safe community by protecting people and property.
- Theme: A Healthy Economy
  - Goal
    - Central Albany – Create a readily identifiable downtown core that is unique and vibrant with a mixture of entertainment, housing, specialty shops, offices and other commercial uses.

- Theme: An Effective Government
  - Goal
    - Effectively and efficiently deliver the services that Albany's citizens need, want, and are willing to support.

In addition to the themes and goals identified above, there are nine objectives that the Steering Committee want included in the plan:

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 project in the city.

## How are the Action Items organized?

The Action Items are organized within a matrix, which lists 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 agency with 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/external partner organizations are individuals or agencies that are private, government or nonprofit, 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 that 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 one to five years to implement.

- **Plan Themes:** Each action item will address one or more of the four themes that 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 Strategic Goals:** Each action item will address one or more of the Goals determined to be applicable from the City's Strategic Plan. Identification of which Goal each action item is aligned with will help the City monitor and evaluate how well the Mitigation Plan is achieving its progress 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 Program, 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.

### Convener

The Steering Committee will implement the Albany Natural Hazard Mitigation Plan and will take responsibility for plan implementation. The Emergency Management 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 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 Program 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 approach to identifying cost and benefits associated with natural hazard mitigation strategies or projects falls 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 City's 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 twice a year to determine its effectiveness 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 meetings. 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 the main Public Library in the City as well as copies being available at the Fire Administration office, Community Development front desk and Public Works Engineering front counter at City Hall. The existence and location of a copy of the Plan will be publicized in the City's newsletter which is sent out monthly. In addition, a copy of the Plan will be posted on the City's website. This site will also contain an email address and phone number for the public if they want to contact someone about the Plan.

**List of maps in the Albany Hazard Mitigation Plan**

| Map Name | Map Section Location | Map Page |
|---|---|---|
| Critical Facilities and Emergency Transportation Routes | Section 3: Risk Assessment | 6 |
| City of Albany Floodplains | Section 6: Flood Hazard | 10 |
| 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 | 4 |
| 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 | 9 |

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| Relative Liquefaction Susceptibility Map: NW quadrant of Albany | Section 7: Earthquake Hazard | 10 |
| Relative Liquefaction Susceptibility Map: NE quadrant of Albany | Section 7: Earthquake Hazard | 11 |
| Relative Liquefaction Susceptibility Map: SW quadrant of Albany | Section 7: Earthquake Hazard | 12 |
| Relative Liquefaction Susceptibility Map: SE quadrant of Albany | Section 7: Earthquake Hazard | 13 |
| Liquefaction Potential N Corvallis, N Albany, Adair | Section 7: Earthquake Hazard | 14 |
| Relative Ground-shaking Amplification Susceptibility Map: City of Albany | Section 7: Earthquake Hazard | 15 |
| Relative Ground-shaking Amplification Susceptibility Map: NW quadrant Albany | Section 7: Earthquake Hazard | 16 |
| Relative Ground-shaking Amplification Susceptibility Map: NE quadrant Albany | Section 7: Earthquake Hazard | 17 |
| Relative Ground-shaking Amplification Susceptibility Map: SW quadrant Albany | Section 7: Earthquake Hazard | 18 |
| Relative Ground-shaking Amplification Susceptibility Map: SE quadrant Albany | Section 7: Earthquake Hazard | 19 |
| Oregon Climate Zones | Section 8: Severe Weather | 2 |
| Wind Speed Contours for 2-year Recurrence Interval: Western Oregon | Section 8: Severe Weather | 3 |
| Wind Speed Contours for 50-year Recurrence Interval: Western Oregon | Section 8: Severe Weather | 4 |
| 50-year Ice Thickness from Freezing Rain: Western Oregon | Section 8: Severe Weather | 13 |
| Benton County Wind Hazards | Section 8: Severe Weather | 15 |

# 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. Funding to update the Plan in 2010 came from City Emergency Management funds. 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 storms, windstorms, drought, and wildland/urban interface fire; 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 all play roles 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 and building continues 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 result of the 1996 flood was 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 was 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 rip-rap.

In 1998, Albany participated with Benton County, which had been selected by FEMA as a Project Impact Community, on several mitigation projects including 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 are compatible and dovetail. 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 with Linn County during the development of the Linn County plan and received copies of its draft material. Linn County was not as far along in developing their plan as Benton County or the City of Albany and we were 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.

In 2006, after the Hazard Mitigation Plan was approved by FEMA, Albany applied for and received a grant for more than $920,000 to seismically stabilize its 1912 water treatment plant. Without an approved

plan, the City would not have been able to apply for this grant. In 2008, Albany received a grant from Oregon Emergency Management to survey its commercial and pre-1950 buildings and do a re-run of its 2005 HAZUS results. This will provide Albany with a much more accurate damage estimate of what the community can expect after an earthquake. In 2010, the City received a grant from the State of Oregon to seismically update Fire Station 12.

## 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 community.

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 Program 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, 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 in 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; Fire Station 12 received a grant in 2010 to be seismically upgraded. City staff have also developed and routinely conduct public employee preparedness training.

## Whom does the Mitigation Plan affect?

The Plan affects the incorporated 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 jurisdictional 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 land-use plans and implementing ordinances that are required to comply with 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 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 land-use 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 and other land use planning goals have helped to reduce losses from natural hazards

## Previous Natural Hazard Mitigation Planning Efforts

The Regional All-Hazard Mitigation Master Plan for Benton, Lane, Lincoln, and Linn Counties was developed between 1998 and 2002. The Mitigation Master Plan is designed to help local communities gather the data necessary to compete for future FEMA funding of mitigation projects. The Mitigation Master Plan reviews 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 Mitigation Master Plan addressed planning for flooding, severe winter storms, mud slides and landslides. Phase Two addressed earthquakes, wildland/urban interface fires and dam failures. Phase Three addressed hazardous materials.

Albany's first plan under DMA 2000 was approved by the City Council in December of 2005 and by FEMA in January of 2006. The 2010 Plan was adopted by the City Council January 26, 2011 and formally adopted by FEMA on February 1, 2011. A list of 2010 Action Items and their status can be found in Appendix E.

## 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** is responsible for disaster mitigation, preparedness, response, recovery, and the administration of federal funds after a major disaster declaration;

- **Building Codes Division** 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** is responsible for wildland fire protection on private, State, and Federal Bureau of Land Management forestlands in Western Oregon, and administers forest practices regulations, including landslide mitigation, on non-federal lands;

- **Oregon Department of Geology and Mineral Industries** 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** is responsible for planning-based hazard management including implementation of Goal 7 (Natural Hazards), with attention given to hazard assessments and hazard mitigation.

July 1, 2015 the State of Oregon promulgated the Oregon Natural Hazard Mitigation Plan; the plan was approved by FEMA September 24, 2015 and is effective through September 2020. The State's plan became the model for the City's plan and some information pertaining to Albany such as history, demographics, climate change and previous events pertaining to the City was used in Albany's plan.

## Plan Methodology

The City of Albany 2005 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 with plans for Linn and Benton counties. Following is a summary of the activities included in the planning process.

### Plan Development

For its original plan in 2005, the City contracted with a mitigation planning coordinator to develop the plan, conduct research, and write some of its sections. The coordinator worked closely with the City's Emergency Management Coordinator/Fire Chief to set up 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 and telephone conferences, where applicable, that were held throughout the planning process.

In the 2010 plan update, the City used its Emergency Management Specialist to coordinate and update the planning elements with the steering committee.

The 2016 plan update is being completed in cooperation with Albany Emergency Management and Community Development and the Building Department, Public Works Engineering and Operations, Fire Department, Parks and Recreation, Information Technology, Economic Development and the City Manager's office. No external grant was used to update the plan.

## Local and Public Involvement

The City established a Steering Committee and Working Committee in the update of this plan. Both are outlined below:

**Steering Committee:**

The Steering Committee was the policy maker. Its members made final recommendations and approvals of the Plan before it went to the state of Oregon and FEMA for review and, finally, to the City Council for adoption. The committee reviewed the goals and action items in the Plan for each of the natural hazards addressed. Members reviewed and approved each section of the Plan and provided direction on strategies to be used to involve the public in the Plan's update and over the next five years. The committee met four times: June 24, September 2, October 28, and November 25, 2015. The committee was made up of the City Manager, all City department directors, and the City's Public Information Officer. Each meeting included an attendance sheet, an agenda and minutes of the previous meeting. Appendix B has the dates and summaries of the Steering Committee meetings. All original attendance sheets, agenda and minutes are on record with the City of Albany in its Mitigation Plan files.

**Working Committee:**

The Working Committee reviewed the action items established in the 2010 plan. Members of the Working committee met with the Emergency Management Specialist one-on-one to determine the progress of each action item. Committee members also made recommendations on whether the action should be kept, deleted or revised. Their work was reviewed by the Steering Committee and approved or modified as appropriate. The Working Committee included representatives from the Community Development, Building Department, Economic Development, Public Works/Engineering, Public Works Operations, Parks and Recreations Facilities, Information Technology, Fire Department and Emergency Management. No formal agenda or written minutes were produced from these one-on-one meetings, but results are found in Appendix E. Those who met with the planning facilitator and the dates of those meetings are listed below. Initial meetings were followed by discussions over the phone or by email.

- Gary Stutzman July 27, 2015
- Kate Porsche August 3, 2015
- Jeff Blaine August 24, 2015
- Chris Bailey August 4, 2015
- Gordon Steffensmeier August 24, 2015
- Melissa Anderson August 18, 2015
- Rick Barnett August 5, 2015
- Tom Valentino August 5, 2015
- Shane Wooton August 9, 2015
- Jorge Salinas August 6, 2015
- Russ Pearson August 6, 2015

**Floodplain Management Planning Committee:**

The Floodplain Management Planning Committee was developed by the Community Development Floodplain Manager to: 1) review and update the flood hazard section and its related action items of this plan, and 2) to create a Flood Information and Insurance Promotion Public Outreach Plan (Appendix J). Their work was reviewed by the Steering Committee and approved or modified as appropriate. The committee met six times: June 16, July 13, August 18, September 29, October 13, and November 17, 2015. The Committee was

made up of four City staff members with expertise in floodplain issues and public outreach. The Committee also included four business professionals from outside of the City administration, representing the real estate, lending and insurance industries. The Floodplain Manager served as the project manager for the committee to complete the project. Each meeting included an agenda, attendance and minutes. Appendix I identifies the membership of the Committee and include the dates, attendance and summaries of the Floodplain Management Planning Committee meetings. All original agendas and minutes are on record with the City of Albany, Community Development department's Natural Hazard Mitigation Plan file.

**Public participation**

Public input came through two public forums. The first meeting was held September 14, 2015 in City Council Chambers, facilitated by the Emergency Management Specialist. Two members of the public attended. An agenda, minutes and a signup sheet are included in Appendix B. The meeting provided an opportunity for community members to review the history of the Natural Hazard Mitigation Plan; review the City's hazard analysis as well as those for Linn and Benton Counties; review State Region 3: Mid/Southern Willamette Valley Regional Profile; hear about the City's successes with mitigation; and review the current status of the Plan's action items. The public was asked to make any recommendations on new action items for the seven natural hazards that would be included in the plan.

The second meeting, on November 9, 2015 in City Court Room, was an open invitation to the community to review a draft of the Natural Hazard Mitigation Plan, and a draft of the flood information and insurance promotion public outreach plan (Appendix J), talk about the plan and provide comment to City staff before the Plan went to the state and FEMA for review and approval and then to the Albany City Council for adoption.

## State and Federal Guidelines and Requirements for the Mitigation Plan

The City's facilitator 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:

- Benton County Natural Hazard Mitigation Plan
- State of Oregon Natural Hazard Mitigation Plan (OEM)

The City's plan builds upon the resources listed above and is based on the University of Oregon's Oregon Partnership for Disaster Resilience 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 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 that need 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: an executive summary, introduction, community profile, risk assessment, mission, goals, objectives and action items, and plan implementation and maintenance. Volume II contains the natural hazard sections and Volume III includes eight appendices.

**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 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 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 provides a historical perspective of natural hazards in the community. 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 includes 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**

Section 6: Flood
Section 7: Earthquake
Section 8: Severe Weather
Section 9: Wildfire
Section 10: Volcano
Section 11: Landslide
Section 12: Drought
Section 13: Climate Change

Each of the hazard sections listed above includes 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.

The City determined that seven natural hazards have or could have a negative impact on the community and its citizens. The City has chosen to include Climate Change in this update because of the impact it can have on the majority of the natural hazards within the Plan. The natural hazards we have included are floods, earthquakes, severe weather, wildfires, volcanoes, landslides, and droughts. The City used its 2015 hazard analysis, the State of Oregon's Region 3: Mid/Southern Willamette Valley Regional Profile, and Linn and Benton Counties' most recent hazard analyses to make this determination.

Volume III: Resources

The plan appendices 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: Public Process and Committees**
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 is found here. All of the original agendas, 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**
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.

**Appendix E: Master List of 2016 Action Items**
This is a list of all the Action Items included in the 2015 Natural Hazard Mitigation plan. The actions are listed numerically rather than by disaster so they can be referenced quickly and you can see how many action items there are for each objective.

**Appendix F: 2016 Action Items by Hazard**
This is a list of all Action Items for each of the seven natural hazards that are included in the Natural Hazard Mitigation Plan. The action items are listed under each hazard by objective and then are classified further as a short term or long term action.

**Appendix G: City of Albany Specific HAZUS Run**
This is a HAZUS run of a Cascadia Subduction Earthquake scenarios using city specific information, where applicable, rather than census information. This will not be included in the initial plan submittal but added at a later date.

**Appendix H: City of Albany 2015 Hazard Analysis**
This document was updated in 2015 and provides a good understanding of the types of events that affect the city and its population.

**Appendix I: Floodplain Management Planning Committee**
This committee was developed by the Community Development Floodplain Manager to review the Flood hazard section and to make recommendations on how to maximize the City's efforts in its community rating system program.

**Appendix J: Program for Public Information and Insurance**

This program outlines the efforts by the City to provide information to the public about insurance that is available to the public for natural hazards.

# 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 Federal Emergency Management Agency-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]. The City of Albany's first plan was adopted by the Albany City Council in December 2005 and by FEMA in January 2006. It was last updated in 2010. It is being updated in 2015.

Additionally, while Albany's climate is generally mild and its terrain flat, natural hazards do pose a threat to the city's economy and its residents' 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 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 Oregon counties expected to have high losses in both types of earthquakes.[2]

Flooding and ice storms are a primary concern to the city; both of these natural events can have devastating effects on property and the local economy.

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

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-4169) snow and ice storm on February 6 – 7, 2014, which was a two-day snow event followed by freezing rain. Other such declarations included high winds associated 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 1860s. 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 and 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. The Albany

Democrat-Herald reported broken windows; otherwise, there was no damage created in Albany by this earthquake and, depending on where you lived, few people felt it locally.

## Geography and the Environment

The City of Albany has an area of 17.7 square miles with an Urban Growth Boundary of 21.7 square miles. Its population is approximately 51,270, as calculated by Portland State University (PSU), 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.

The elevation of Albany ranges from 210 to 521 feet above sea level and the community is between the Coast Range and the Cascade mountain range. Albany sits on mostly flat level land with some hills 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 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 Tidbits 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 back-up 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 upstream, where the North and South Santiam converge, the City of Albany and the City of Millersburg have constructed a joint drinking water intake and treatment plant for municipal use. For the City of Albany, this is the second treatment plant, and for the City of Millersburg, its first. For both cities, this plant is the primary treatment plant.

The U.S. 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 reduced the threat.

**U.S. Army Corps of Engineers dams located above the City of Albany on the Willamette and McKenzie Rivers:**

**Hills Creek Dam, Middle Fork of the Willamette River.**[5]
Hills Creek Dam is located 40 miles southeast of Eugene and 26.5 miles upstream from Lookout Point Dam on the Middle Fork of 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, eventually affecting the city of Albany.

**Lookout Point Dam, Middle Fork of the Willamette River.**[6]
Lookout Point Dam is located 22 miles upstream of Eugene on the Middle Fork of the Willamette River. This 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]
Dexter Dam 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; and continue to the confluence with the main stem Willamette River, and eventually affecting the city of Albany.

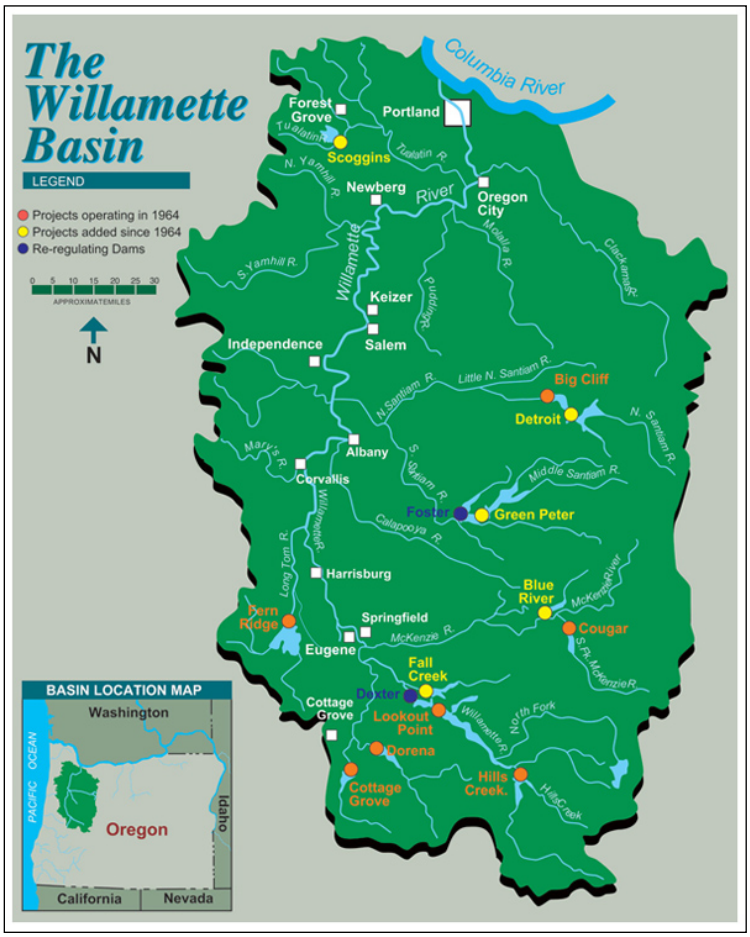
**Cougar Dam, South McKenzie River.**[8]
Located on the South Fork of the McKenzie River, Cougar Dam is about 42 air miles east of Eugene. Construction of the dam occurred between 1956 and 1964. Cougar Dam is a rock-fill embankment about 1,500 feet long and a maximum of 452 feet high. Flood flows from 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 Engineers 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]
This dam is located at Foster, Oregon two miles below the junction of the Middle and South Santiam rivers, and eight 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, eight miles upstream. 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.

## Location Map of Dams in the Willamette Basin




Source: US Army Corps of Engineers, retrieved July 11, 2015

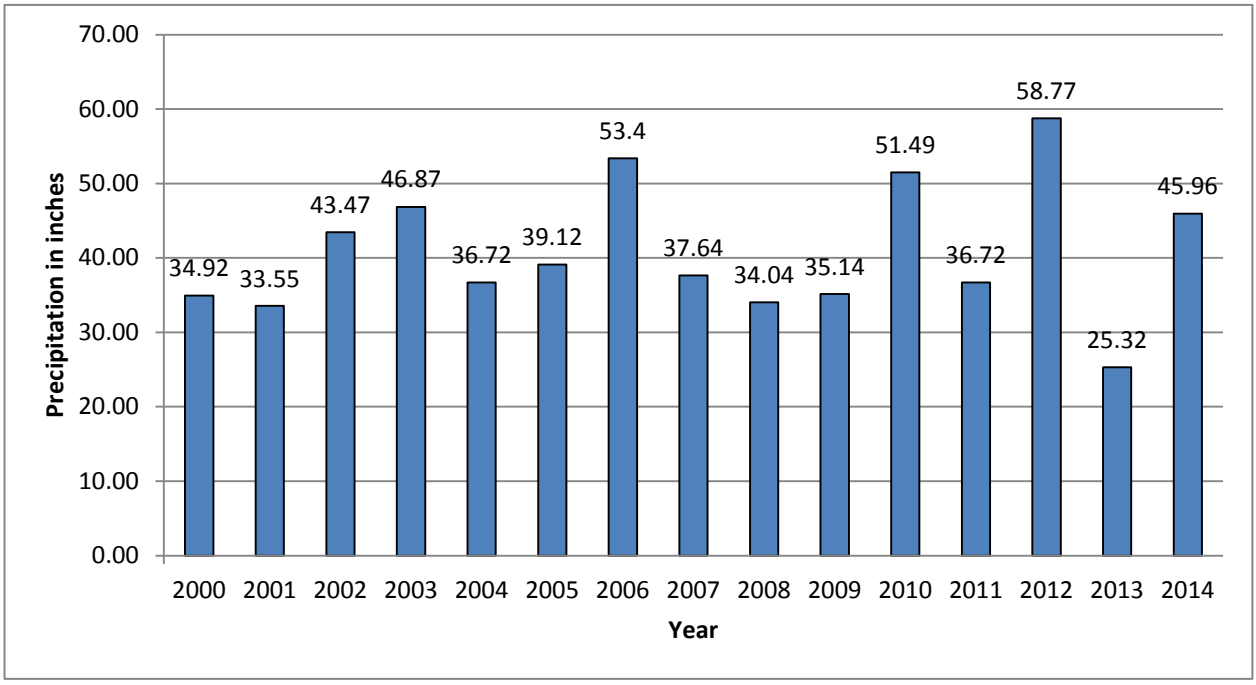
## Climate

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 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 (June – August) and rarely drop below 25° F in the winter months (November – March). Extreme fluctuations of temperature and precipitation are becoming increasingly likely due to effects associated with climate change. The average growing season is about 150 – 180 days in the lower valley.

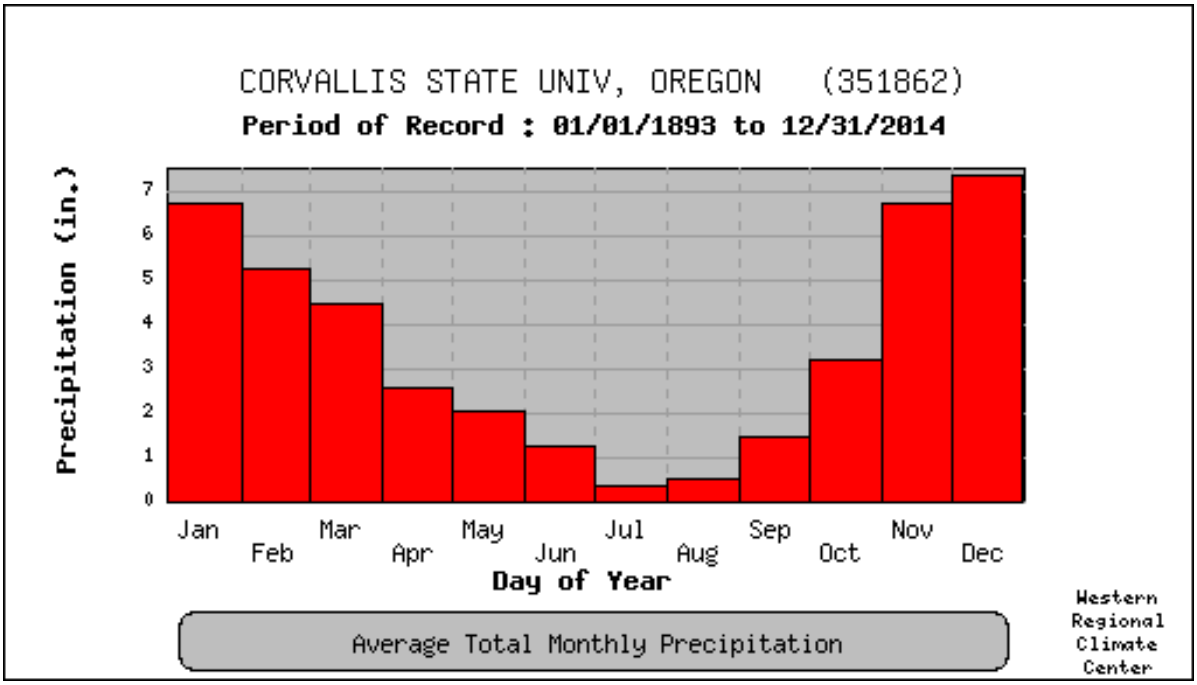
Precipitation ranges from .36 inches in July to 7.05 inches in December, with an average yearly rainfall of 40.91 inches per year.

Average snowfall since the mid 1960s has been 5.9 inches, occurring between November and March.[11]




Source: National Climatic Data Center, Oregon State University - Corvallis, OR
Retrieved June 29, 2015

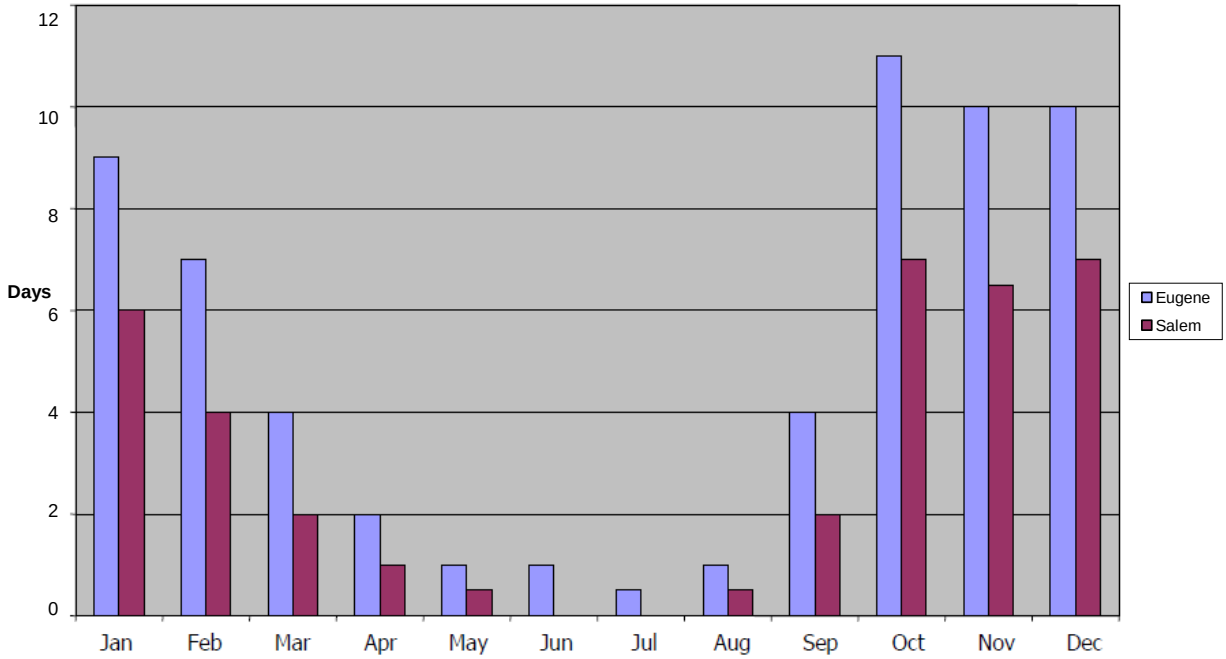
## Average Total Monthly Precipitation in Albany: 1893 - 2014




Source: Western Regional Climate Center
Retrieved July 2, 2015

Fog can be an extreme hazard in the Albany area. The following chart shows the number of days with 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.

## Heavy Fog Visibility



## 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 that are moderately deep, moderately well-drained to somewhat poorly-drained, and areas that are deep, moderately well-drained to somewhat poorly drained, and areas that 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 in North Albany while the remaining ten encompass the remainder. 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.

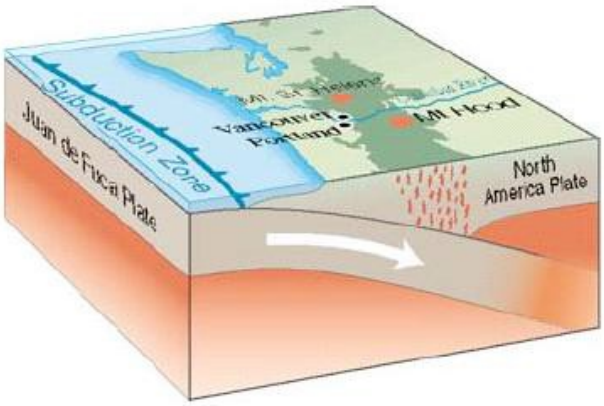
## Liquefaction

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 7 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. 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, 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 is 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.




The Three Sisters 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 where new mafic volcanoes are possible.

United States Geological Services scientists have detected a slight swelling or uplift of the ground surface over a broad area centered five kilometers (three miles) west of South Sister volcano. 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 Albany'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 15% of the City's population lives in Benton County. Since 1960, when Albany's population was 12,926, the average annual growth rate has been 3.00%. In the period from 2000 to 2010, the population has grown by 9,306 at an average annual growth rate of 2.27%.

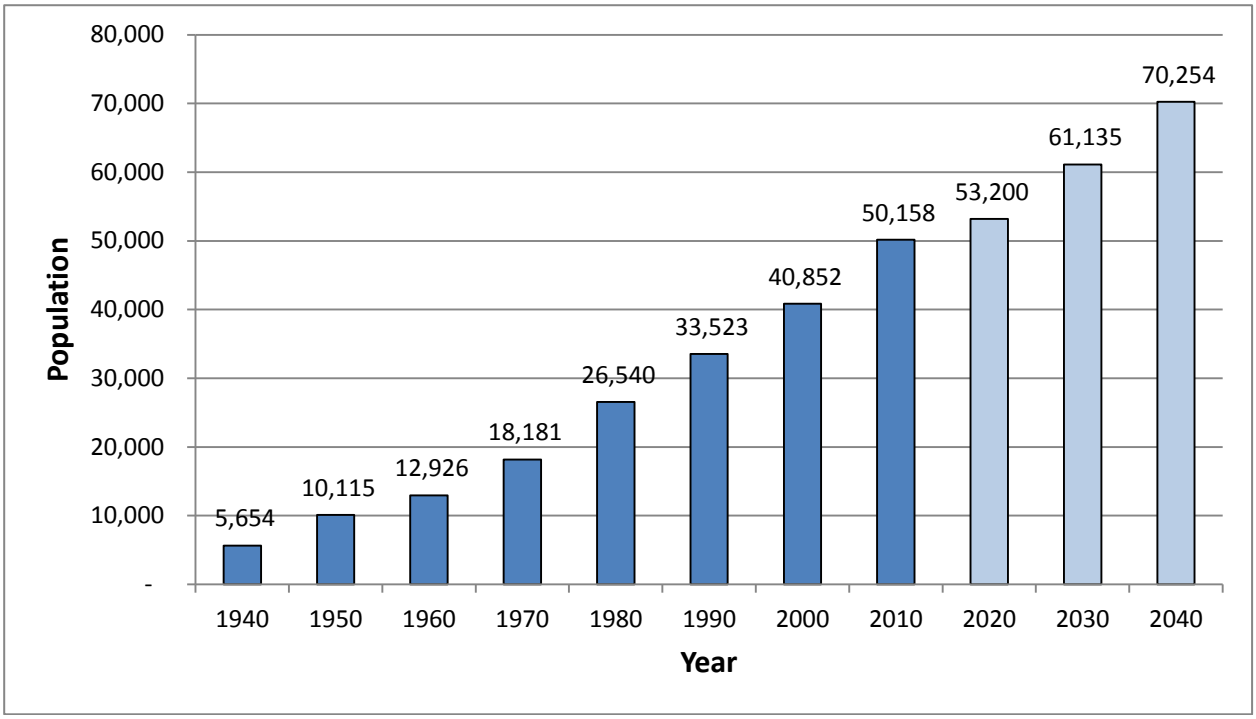
In 1999, Albany collaborated with Linn and Benton counties to develop a county-coordinated 20-year population forecast based on long term forecasts by the State Economist. At the time, Albany estimated an average annual growth rate of 1.5%. Under this scenario, Albany's population was not projected to reach 50,000 until 2016; however, data from the 2010 US Census showed the population already exceeded projections topping out at 50,158.

The population of Albany was estimated to be 51,980, as of July 2014. The population of Albany is projected to rise to 53,200 by 2020, an increase of 1,220 people or a 2.34% increase over the next 6 years or 0.34% per year. Between 2020 and 2030 there is projected to be an increase in population of 7,935 people, a 14.92% increase over 10 years or a 1.49% increase each year. Population increase and its hazardous vulnerability impacts were considered during the updated of this Plan, but because of the small projected population increase over the next 6 years no significant hazardous impact was identified. As the City of Albany grows over time, local decision makers will need to decide how to accommodate expected growth. Two common methods that are considered include revising local zoning regulations to promote increased population density within existing neighborhoods, or expand the urban growth boundary to provide more developable land for the future, or a combination of both methods. As a result, changes in hazard vulnerability can be expected given the presence of more people per square mile over time or greater exposure to hazards over a larger geographic area. Therefore the City's Natural Hazards Mitigation Plan must be evaluated periodically to reflect changes in population or development patterns.

The Oregon House of Representatives and Senate approved legislation in 2013 assigning coordinated population forecasting to the Population Research Center at Portland State University (PSU). This method of population forecasting will replace the county-coordinated 20-year population forecast. The Population Research Center produces the annual population estimates for Oregon and its counties and cities, as well as the estimates by age and sex for the state and its counties. These estimates will be used by State and local governments, various organizations and agencies for revenue sharing, funds allocation, and planning purposes. Estimates for Benton and Linn counties along with their corresponding cities will be completed following the forecast cycle of July 2016 through June 2017.

The most recent demographic information was published in the 2013 American Community Survey. At that time, there were 20,979 total housing units in Albany. The average household size was 2.60 persons. Forty-five percent of Albany residents were born outside of Oregon. Mean travel time to work was 18.4 minutes. About 22.8 percent of Albany residents 25 years of age or older have graduated from a four-year college. The median family income (in 2013 dollars) was $47,612. Nearly 20 percent (19.5%) of Albany residents lived below the poverty level. About 11.2% of residents speak a language other than English at home.

**Population Change and Future Projections for Albany 1940 - 2040**




Sources: U.S. Census Bureau (2010); City of Albany, using the 1999 adopted County-Coordinated Forecast of 1.4%
Retrieved June 29, 2015

## Land and Development

Albany's location between the Cascade and Coast mountain ranges, along the Interstate 5 corridor, and near the state's major metropolitan areas has brought many changes to the community over time. In the 1800s, 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 Interstate 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 was inside the city limits. Today 17.7 square miles is in the city limits.

Periods of rapid growth, such as 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 urban 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 (UGB) is allocated for various uses.

## Summary of Land Use Allocations

| Land Use Category | No. of Acres | Percent of UGB |
|---|---|---|
| Residential | 7,316 | 52.6 |
| Commercial | 594 | 4.2 |
| Industrial | 1,412 | 10.1 |
| Village Center (Mixed-Use) | 351 | 2.5 |
| Public & Semi-Public | 952 | 6.8 |
| Open Space | 1,186 | 8.5 |
| Other (Right-of Ways, Water) | 2,091 | 15.0 |
| **TOTAL** | **13,902** | **100.0** |

Source: Albany Comprehensive Plan Map, 2015

## Housing and Community Development

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

According to 2010 census data and information from the Albany Community Development Department, there were a total of 20,979 housing units in the city. Data from the Census indicates that owner-occupied housing units were 59.4% of the total and renter-occupied housing units were 40.6 %. There has been a slight decline in the percentage of owner-occupied units and an increase in the number of renter-occupied housing units since the 2000 Census. The number of mobile homes dropped from 1,252 in the 2000 census to 1,212 in the 2010 Census.

### Average Age of Homes in Albany

| Year Structure Built | Number | Percent |
|---|---|---|
| 2010 or later* | 584 | 2.9 |
| 2000 to 2009 | 3744 | 19.0 |
| 1980 to 1999 | 4747 | 24.1 |
| 1960 to 1979 | 6445 | 32.7 |
| 1940 to 1959 | 2547 | 12.9 |
| 1939 or earlier | 1640 | 8.3 |

Sources: US Census 2010; *Albany Building Division on July 13, 2015

The majority of homes in Albany were built between 1960 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 in Albany has gone from $132,600 in the 2000 census to $175,100 in the 2010 Census, up 24.2%. The increase was in contrast to the major jump in median value of owner-occupied homes between 1990 and 2000. In 1990, the median value for owner-occupied homes was $56,825; in 2000, it was $132,600, a 133.4% increase.

As in many communities, affordable homes remain 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 26% 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 2010 Census is $21,816. Median earnings are $44,864 for full-time male workers, and $33,155 for full-time female workers. The median household income was $47,612. According to the Census, there were 21,252 employed persons within the city. The chart below provides a breakdown of those employees and where they work.

### Employment Distribution for Employees in Albany

| | Total Estimate | Percent |
|---|---|---|
| **Civilian employed population 16 years and over** | **21,252** | **100.0** |
| **OCCUPATION** | | |
| Management, business, science, and arts | 6,790 | 31.9 |
| Service | 4,402 | 20.7 |
| Sales and office | 5,222 | 24.6 |
| Natural resources, construction, and maintenance | 1,674 | 7.9 |
| Production, transportation, and material moving | 3,164 | 14.9 |
| | | |
| **INDUSTRY** | | |
| Agriculture, forestry, fishing and hunting, and mining | 501 | 2.4 |
| Construction | 1,063 | 5.0 |
| Manufacturing | 2,678 | 12.6 |
| Wholesale trade | 515 | 2.4 |
| Retail trade | 2,899 | 13.6 |
| Transportation and warehousing and utilities | 791 | 3.7 |
| Information | 459 | 2.2 |
| Finance, insurance, real estate, rental and leasing | 939 | 4.4 |
| Professional, scientific, management, administrative, and waste management services | 2,129 | 10.0 |
| Educational, health and social services | 5,273 | 24.8 |
| Arts, entertainment, recreation, accommodation and food services | 2,142 | 10.1 |
| Other services (except public administration) | 943 | 4.4 |
| Public administration | 920 | 4.3 |
| | | |
| **CLASS OF WORKER** | | |
| Private wage and salary | 16,647 | 78.3 |
| Government | 3,380 | 15.9 |
| Self-employed | 1,209 | 5.7 |
| Unpaid family | 16 | 0.1 |

Source: US Census 2010; 2009-2013 American Community Survey

### Major Employers in Linn and Benton Counties:

| Company Name | Product or Service | No. Employed |
|---|---|---|
| Oregon State University | Higher Education | 12,003 |
| Good Samaritan Regional Medical Center | Health Care | 2,700 |
| Hewlett Packard | Computer Technology | 1,700 |
| Samaritan Health Services | Health Care | 1,600 |
| Linn Benton Community College | Higher Education | 1,100 |
| Greater Albany Public Schools | Primary & Secondary Education | 1,080 |
| Wah Chang | Rare Metals | 949 |
| Target | Distribution Warehouse | 632 |
| Linn County | Government | 627 |
| Corvallis Clinic | Health Care | 540 |
| Assurant Solutions | Call Center | 500 |
| Georgia Pacific | Paper Products | 470 |
| Benton County | Government | 420 |
| City of Corvallis | Government | 420 |
| CH2M Hill | Engineering | 400 |
| Oregon Freeze Dry | Freeze Dried Products | 398 |
| City of Albany | Government | 390 |
| National Frozen Foods | Food Processing | 350 |
| ATI Albany Operations | Metals | 293 |
| Selmet | Metal Parts & Fabrication | 275 |
| ATI Pacific Cast | Titanium Products | 260 |
| FiServ | Data Processing Systems | 240 |
| ATS Systems | Automation Systems | 200 |
| Palm Harbor Homes | Manufactured Homes | 131 |
| Golden West | Manufactured Homes | 106 |
| Arauco North America | Particle Board & Engineered Wood | 101 |
| Synthetech-Grace | Pharmaceutical Ingredients | 65 |
| Georgia Pacific Resins | Building Products Resins | 39 |
| Panolam Industries | Melamine Laminate | 31 |

Sources: Benton County Economic Development Office; Albany-Millersburg Economic Development Corporation (August 2014 data); Oregon State University Employment Report, January 2015; Benton County; City of Corvallis

At one time Albany was primarily a wood-products 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. Albany 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 Linn and Benton counties. Albany has local bus service which provides low-cost transportation within the city as well as the 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 passenger rail service north to Vancouver, BC, south to San Diego and east to Spokane and, ultimately, Chicago. The table below is from the 2010 Census and provides commuting information about the citizens of Albany.

### Commuting Characteristics in Albany

| | Total Estimate | Percent |
|---|---|---|
| **Workers 16 years and over** | 20,997 | 100.0 |
| Car, Truck, or Van; Drove Alone | 16567 | 78.9 |
| Car, Truck, or Van; Carpooled | 1953 | 9.3 |
| Public Transportation | 63 | 0.3 |
| Walked | 672 | 3.2 |
| Bicycle | 315 | 1.5 |
| Taxi, Motorcycle, or Other Means | 252 | 1.2 |
| Worked at Home; Telecommuted | 1155 | 5.5 |
| Mean Travel Time to Work | 18.4 Minutes | N/A |

Source: US Census 2010; 2009-2013 American Community Survey

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[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] Our Town 2010 Publication, Mid-Valley Newspapers: Democrat-Herald, Gazette-Times, Lebanon Express

# 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 Steering Committee to include the seven natural hazard risks and Climate Change to the 2016 update. Risk assessment information for each of the hazards identified in this plan can be found in the hazard specific sections listed below:

- Section 6: Flood
- Section 7: Earthquake
- Section 8: Severe Weather
- Section 9: Wildfire
- Section 10: Volcano
- Section 11: Landslide
- Section 12: Drought
- Section 13: Climate Change

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 seven major hazards that consistently affect this geographic area: floods; earthquakes; severe weather; wildfire; volcanic eruption; landslides; and drought. The City reviewed its 2015 Hazards Analysis Plan, the Region 3: Mid/Southern Willamette Valley Regional Profile and Linn and Benton Counties' most recent hazard analysis 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 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 Albany community 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 Albany community 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.

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 seven hazards profiled in the Mitigation Plan including flood, earthquake, severe weather, wildfire, volcano, landslide and drought. 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, 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, volcanoes in Volume II, Section 10, landslides in Volume II, Section 11, and drought in Volume II, Section 12. |
| **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 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; 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.

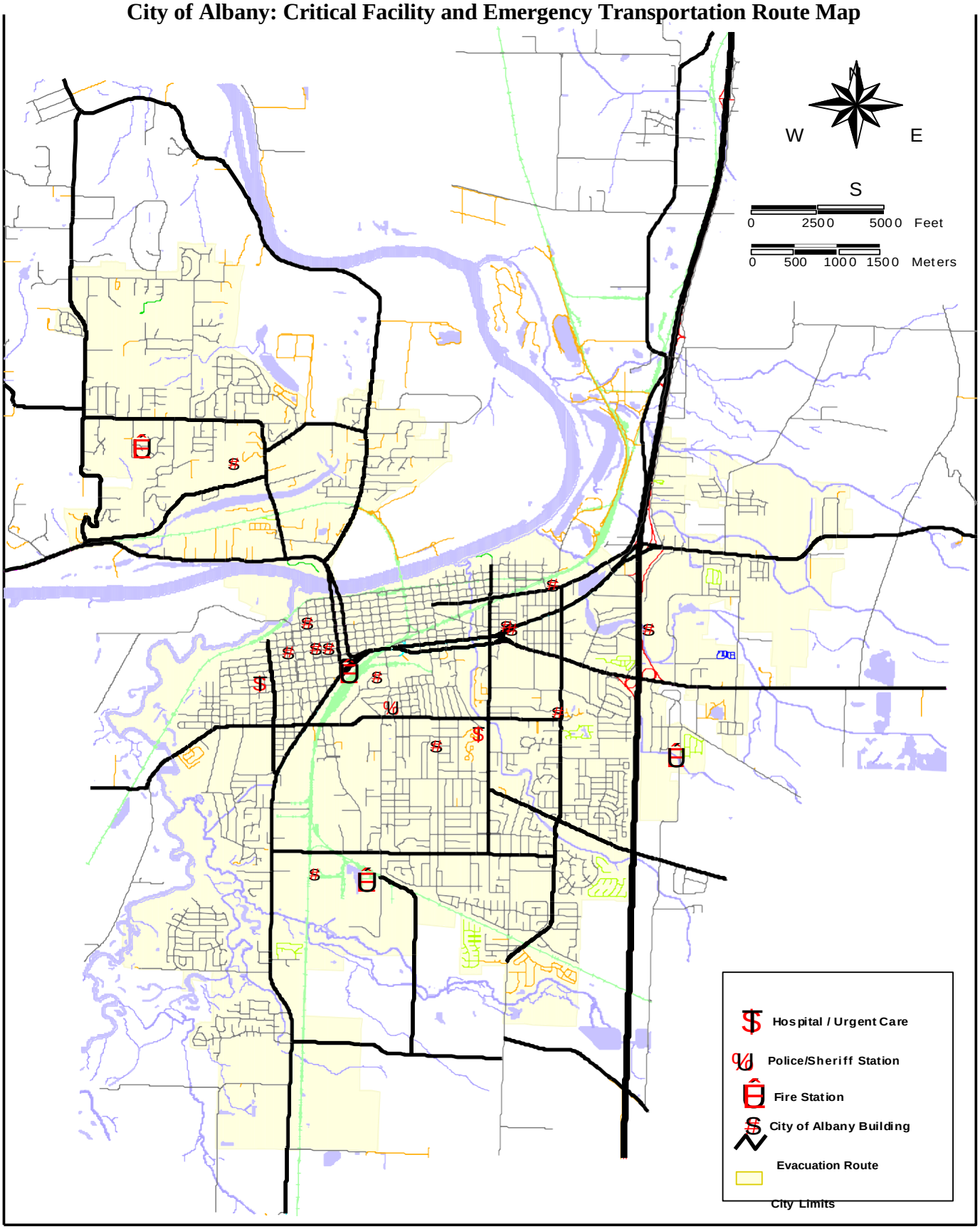
At this time, the City of Albany has been able to determine the number of residents that are within the 100 year flood plain, that no critical facilities are within any landslide area whose location has been identified by DOGAMI, the locations of businesses that are likely to be extensively damaged after an earthquake, and the amount of water infrastructure likely to be damaged after an earthquake.

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 where it is located and the page number.

| Map Name | Map Section Location | Map Page |
|---|---|---|
| Critical Facilities and Emergency Transportation Routes | Section 3: Risk Assessment | 6 |
| City of Albany Floodplains | Section 6: Flood Hazard | 10 |
| 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 | 9 |
| Relative Liquefaction Susceptibility Map: NW quadrant of Albany | Section 7: Earthquake Hazard | 10 |
| Relative Liquefaction Susceptibility Map: NE quadrant of Albany | Section 7: Earthquake Hazard | 11 |

| | | |
|---|---|---|
| Relative Liquefaction Susceptibility Map: SW quadrant of Albany | Section 7: Earthquake Hazard | 12 |
| Relative Liquefaction Susceptibility Map: SE quadrant of Albany | Section 7: Earthquake Hazard | 13 |
| Liquefaction Potential N Corvallis, N Albany, Adair | Section 7: Earthquake Hazard | 14 |
| Relative Ground Shaking Amplification Susceptibility Map: City of Albany | Section 7: Earthquake Hazard | 15 |
| Relative Ground Shaking Amplification Susceptibility Map: NW quadrant Albany | Section 7: Earthquake Hazard | 16 |
| Relative Ground Shaking Amplification Susceptibility Map: NE quadrant Albany | Section 7: Earthquake Hazard | 17 |
| Relative Ground Shaking Amplification Susceptibility Map: SW quadrant Albany | Section 7: Earthquake Hazard | 18 |
| Relative Ground Shaking Amplification Susceptibility Map: SE quadrant Albany | Section 7: Earthquake Hazard | 19 |
| Oregon Climate Zones | Section 8: Severe Weather | 2 |
| Wind Speed Contours for 2-year Recurrence Interval: Western Oregon | Section 8: Severe Weather | 3 |
| Wind Speed Contours for 50-year Recurrence Interval: Western Oregon | Section 8: Severe Weather | 4 |
| 50-year Ice Thickness from Freezing Rain: Western Oregon | Section 8: Severe Weather | 13 |
| Benton County Wind Hazards | Section 8: Severe Weather | 15 |

## 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 July 28, 2010 to approve the vision, mission statement and values for the Plan and to confirm that the City's Strategic Plan, described below, will continue to align with the Natural Hazard Mitigation Plan.

## City of Albany Strategic Plan

The Strategic Plan identifies a vision, mission, and values to achieve the Strategic Plan goals. The Plan also identifies four themes, each with its own set of goals, objectives, and actions. The themes under which natural hazard mitigation would fall in the Strategic Plan are *Great Neighborhoods*, a *Safe City*, a *Healthy Economy*, and an *Effective Government*. The goals within each of these themes are as follows:

**Great Neighborhoods:**

1. Create and sustain a city of diverse neighborhoods where residents feel good about where they live.
2. Provide an efficient transportation system with safe streets and alternative modes of transportation.
3. Provide effective stewardship of Albany's significant natural, cultural and historic resources.
4. Provide diverse 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. Business – Enhance the value and diversity of Albany's economy by attracting, retaining, diversifying and expanding local businesses.
2. Partnerships – Strengthen the area's role as a leading regional economic center through local and regional coordination and collaboration on economic development planning and projects.
3. Prosperity – Maintain and grow the income levels with a focus on living-wages jobs, training, and education opportunities of Albany residents consistent with Oregon and national trends. Work to increase the community's assessed value while working to achieve a healthy balance of housing and jobs.
4. Central Albany – Create a readily identifiable downtown core that is unique and vibrant with a mixture of entertainment, housing, specialty shops, offices and other commercial uses.

**Effective Government:**

1. Effectively and efficiently 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 diverse 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.*
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, to aim to advance the four themes of the Strategic Plan. The objectives and actions identified in this plan meet the goals identified in the four themes of the plan.

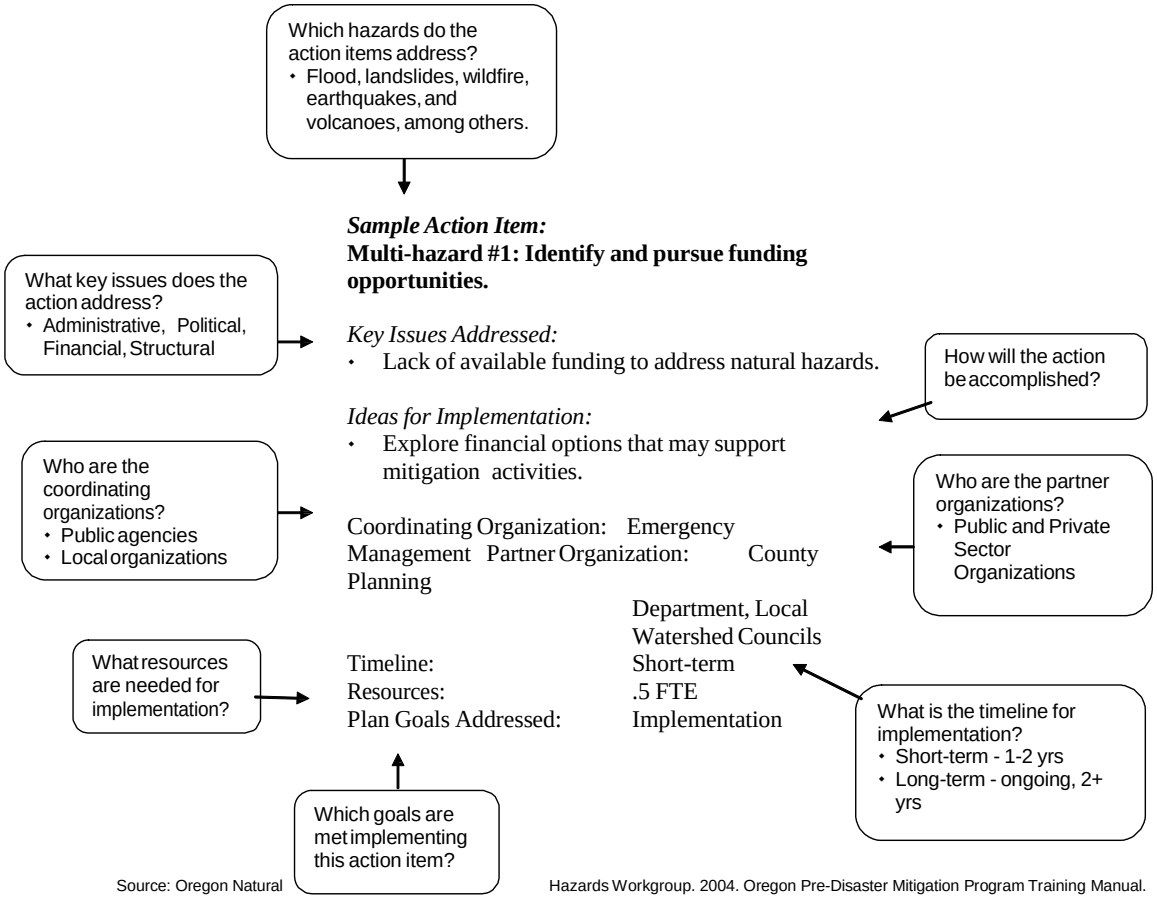
The nine objectives of the Plan are:

1. Establish and maintain methods to ensure plan implementation.
2. Provide leadership to promote, communicates, 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 services functions.
6. Implement structural and non-structural migration 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 project in the city.

## Mitigation Plan Action Items

The Mitigation Plan identifies short- and long-term action items developed through review of the 2010 Mitigation Plan and discussion of the Steering Committee about what they felt needed to be addressed in the next five years. 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 seven natural hazard events. 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 complete list of all action items can be found at Volume III: Resources, Appendix E and Appendix F.

**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 Addressed

The plan themes, 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 two to 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

The following action items have been identified by various stakeholders in the city of Albany. Full Action item worksheets can be found in Appendix F.

Action 1.1. As the city of Albany's Strategic Plan is updated, incorporate and link the Natural Hazard Mitigation Plan Objectives into the Strategic Plan.

Action 2.1. Develop and implement six communications and outreach opportunities to inform the community on the status of the Natural Hazard Mitigation Plan.

Action 3.1. Provide NHMP awareness training to City staff to incorporate Natural Hazard Mitigation Planning aspects into their daily work.

Action 4.1. Review hazard maps and update vulnerability and risk for hazards which affect the city, partnering with local, state and federal agencies.

Action 6.1. Assist K-12 schools to develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings.

Action 7.1. Provide educational awareness material on how to develop emergency plans and assemble 14 d a y kits to city employees.

Action 7.2. Provide eight educational and outreach articles to explain how to develop an emergency plan and assemble 14 day kits to residents of Albany.

Action 8.1. Promote response, mitigation, and recovery planning for local businesses to continue operating after a disaster.

# 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 Program (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 as closely as they can to ensure consistency. While the mission, vision, values, and themes of the Strategic Plan should remain constant, the objectives, and action items 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. The City Emergency Program Manager will be responsible for submitting the draft plan 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 and approval. This review will address the federal criteria outlined in FEMA Final Rule 44 CFR Part 201. Upon receiving the Approval Pending Adoption (APA) letter from FEMA the Albany City Council will adopt the plan and 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. 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 Finance Director
- Albany Fire Chief/Emergency Management Coordinator
- Albany Police Chief
- Albany Public Works Engineering/ Community Development Director

Albany Public Works Operations Director
Albany Economic Development & Urban Renewal Director
Albany Parks & Recreation Director
Albany Library Director
Albany Information Technology Director
Albany Human Resources Director
Albany Public Information Officer

**Convener**
Once the Albany City Council adopts the City's Natural Hazard Mitigation Plan, the Hazard Mitigation Steering Committee will take responsibility for implementation of the plan. The Emergency Management Coordinator will serve as the 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 City's 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 Program (CIP). The CIP is updated annually. Upon 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:** 2015
- **Plan owner:** Public Works
- **Plan description:** The Capital Improvements Program 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:** One-year cycle
- **Relation to hazard mitigation:** Action items may be inserted into the Capital Improvement Plan as approved by the City Council

After formal adoption of the Mitigation Plan, the action items in the Plan will be incorporated into existing plans as is practical. 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, a number of other existing plans, policies and programs 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 have been identified:

***Strategic Plan***

- **Date of last revision:** 2015
- **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:** One-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:** 2013
- **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:** 2012
- **Plan owner:** Emergency Management Coordinator
- **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:** Five-Year cycle.
- **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 that this is accomplished

***Engineering Design Standards***

- **Date of last revision:** January 2015
- **Plan Owner:** Public Works Engineering
- **Plan description:** The purpose of these Engineering Standards documents is to provide a consistent policy for implementing design of public improvements and related facilities.
- **Plan Cycle:** There is no schedule for updates.
- **Relation to hazard mitigation:** Public improvements and related facilities are directly tied to mitigation efforts in a number of the natural hazards that can affect the city. By ensuring there are consistent policies, we improve the efforts to minimize natural hazard damage to property and loss of life.

***North Albany Refinement Plan***

- **Date of last revision:** 2013
- **Plan owner:** City of Albany Community Development Department
- **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 Area Plan***

- **Date of last revision:** 2014
- **Plan owner:** City Manager's Office
- **Plan Description:** The Plan's goal is to revitalize the Central Albany Revitalization Area by implementing the Town Center Plan Developed through the Central Albany Land Use & Transportation study (CALUTS) using a citizen-driven process.
- **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:** 2015
- **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 change the Development Code must be consistent with the goals of the city's Comprehensive Plan

***Building Code***

- **Date of last revision:** Residential, 2014; Commercial, 2014
- **Plan owner:** Building Division
- **Plan Description:** The State Building Code's purpose is to set forth and coordinates City regulations governing the construction of buildings and infrastructure
- **Plan cycle:** Every three years.
- **Relation to hazard mitigation:** Inspections of new construction are intended to ensure compliance with State Building Code, Albany Development Code and Albany Municipal 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, staff 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 Program**

The City of Albany's Capital Improvements Program (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 of Albany adopted the Transportation System Plan in February 2010 and updated 2013. It identifies the transportation improvements needed to accommodate existing and future development in the City of Albany through 2030.

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 Coordination Center (ECC)**

The Emergency Coordination 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 ECC organizational structure staff the ECC. The structure is based on the National Incident Management System (NIMS) Incident Command System (ICS) as outlined in the National Response Framework (NRF).

The ECC staff provides information and recommendations to the ECC 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 ECC include: coordination, operations management, planning, information tracking and dissemination, logistical support, financial management and support, and emergency public information.

**Emergency Operations 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. **Support annexes** - Describe how agencies coordinate and execute common functional processes and administrative requirements necessary to ensure efficient and effective incident management.

4. **Incident 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 it will benefit Albany's efforts to reduce the risks posed by natural hazards. The Natural Hazard Mitigation Steering Committee (NHMSC) 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 | Five-year Review |
|---|---|
| **Steering Committee** | **Steering Committee and City Council** |
| Review current actions and department progress | Review plan update questions |
| Identify new issues, needs and develop agenda for annual meeting | Update plan sections as necessary |
| Prioritize potential projects and report progress to City Manager | Recommend approval of the updated to Albany City Council |
| Update risk assessment data and findings | |
| Discussion of methods of continued public involvement | |
| Documenting successes and failures of lessons learned | |

**Semi-Annual Meetings**
The Steering Committee will meet semi-annually to:

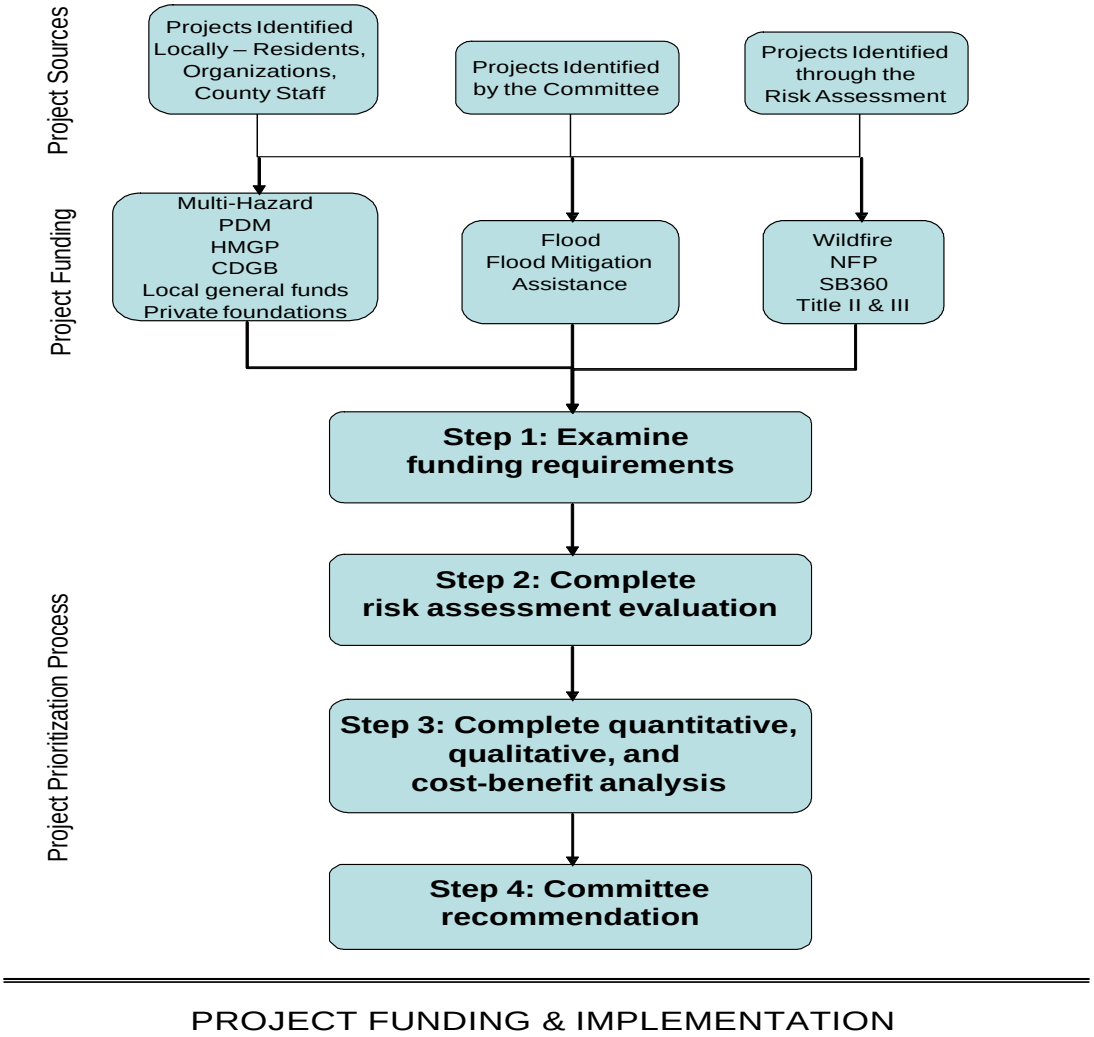
- Review current actions and department progress; Discuss
- methods of continued public involvement;
- Review existing action items to determine appropriateness for funding;
- Document successes and lessons learned base on action that were accomplished during the previous year;
- Review updates on local planning efforts;
- Review updates of the risk assessment data and findings;
- 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, and private foundations. Some of these examples are used in the figure below to illustrate the project prioritization process. The prioritization process utilizes four steps 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 is 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, the community's hazard analysis utilized. This risk assessment identified various hazards that may threaten community facilities in a range of:

- High
- Medium
- Low

The rank ordering of hazards by risk is:

1. Severe Weather
2. Earthquake
3. Floods
4. Volcano
5. Wildfire
6. Landslides
7. Drought

Each of the action items in the Plan addresses risk from all 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 seven 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. The 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 Natural Hazard Mitigation Steering Committee has 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.

## Semi- Annual Meetings

The Steering Committee will meet twice a year 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 each 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 Semi-annual reviews 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 the Main Library, in the Community Development Department and on the City's website. The existence and location of these copies will be publicized in the *City Bridges* e-newsletter twice a year. The Plan also includes the address and phone number of whom to contact within the City's emergency management if the public has questions or comments on the Plan.

The Mitigation Action Items will be among many City documents for which the public will be provided an opportunity to review and provide input. 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 a forum for members of the public to 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 as snow-melt runoff. These large winter storms often cause 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.

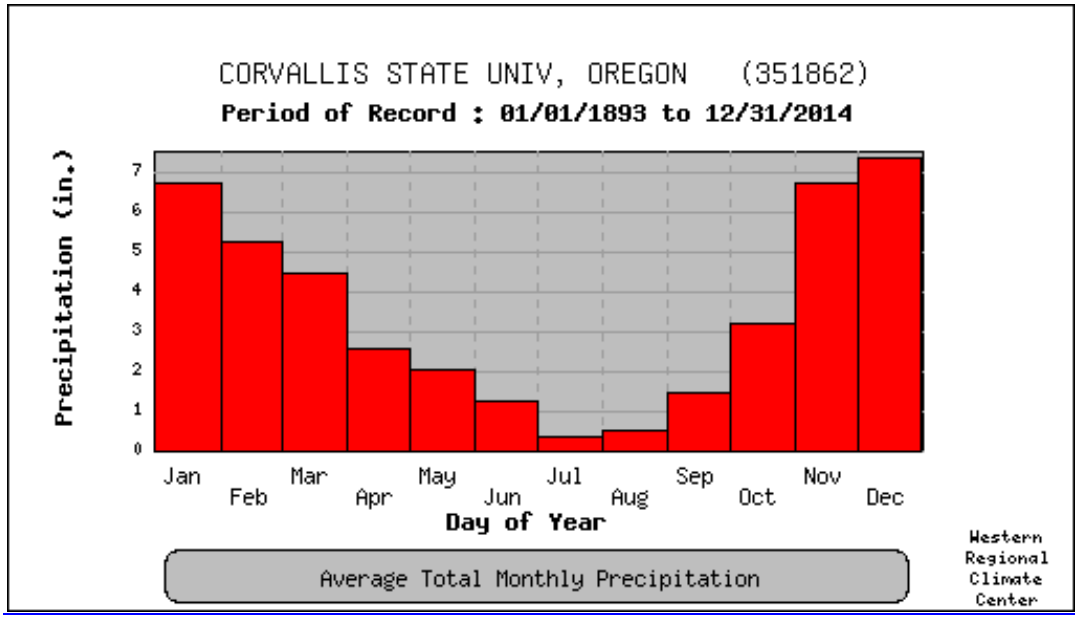
Flood records for the City of Albany indicate there is no regular pattern in which floods occur. Heavy rains that saturate the ground and fill the rivers and creeks coupled with warming weather that melts heavy snow in the mountains and foothills create the major flooding that Albany has seen over the 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 upstream 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 80 miles from the Pacific Ocean, which provides a modified marine climate. Extreme summer and winter temperatures are moderated by the airflow 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 (June – August) and rarely drop below 25° F in the winter months (November – March). The average growing season is about 150 – 180 days in the lower valley. Precipitation ranges from .36 inches in July to 7.05 inches in December, with an average yearly rainfall of 40-91 inches per year. Average snowfall since the mid-1960s has been 5.9 inches, occurring between November and March.[1]

***Figure 6-1: Average Total Monthly Precipitation in Albany: 1893 – 2004***




Source: Western Regional Climate Center, retrieved July 2, 2015

**Geography**

The City of Albany has an area of 17.7 square miles with an urban growth boundary of 21.7 square miles. Its population is approximately 51,270 as calculated by Portland State University (July 2014) 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; the community 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.[2] The soils of North Albany are similar silty loams and silty clay loams with areas that are moderately deep and moderately well-drained to somewhat poorly-drained.[3] The soil pattern of the East Albany neighborhood is more complicate with linear strips of clay loam intermixed with gravelly and stony loam and some silty loam.[4] 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, increasing surface runoff. These shrinking and expanding soils provide poor foundations for large structures and promote caving-in of deep excavations. Building foundations must be designed to resist swell pressures.

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 10 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.

## 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 10th 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.[5]

### 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 Tidbits Mountain. The stream gradient is about three feet per mile. The only major tributary to the river is Oak Creek.[6]

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 back-up 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 upstream, where the North and South Santiam converge, the City of Albany and the City of Millersburg have constructed a drinking water intake and treatment plant for joint municipal use. For the City of Albany, this is the second treatment plant and for the City of Millersburg, its first. For both cities, this plant is 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 reduced the threat.

## US Army Corps of Engineers dams located above the City of Albany on the Willamette and McKenzie Rivers:

### Hills Creek Dam, Middle Fork of the Willamette River[7]

This dam is located 40 miles southeast of Eugene and 26.5 miles upstream from Lookout Point Dam on the Middle Fork of 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, eventually affecting the city of Albany.

### Lookout Point Dam, Middle Fork of the Willamette River[8]

Lookout Point Dam 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[9]

Dexter Dam 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, and continue to the confluence with the main stem Willamette River, and eventually affect the city of Albany.

### Cougar Dam, South McKenzie River[10]

Located on the South Fork of the McKenzie River, Cougar Dam is about 42 air 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 the 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 Engineers dams located above the city of Albany on the Santiam River:

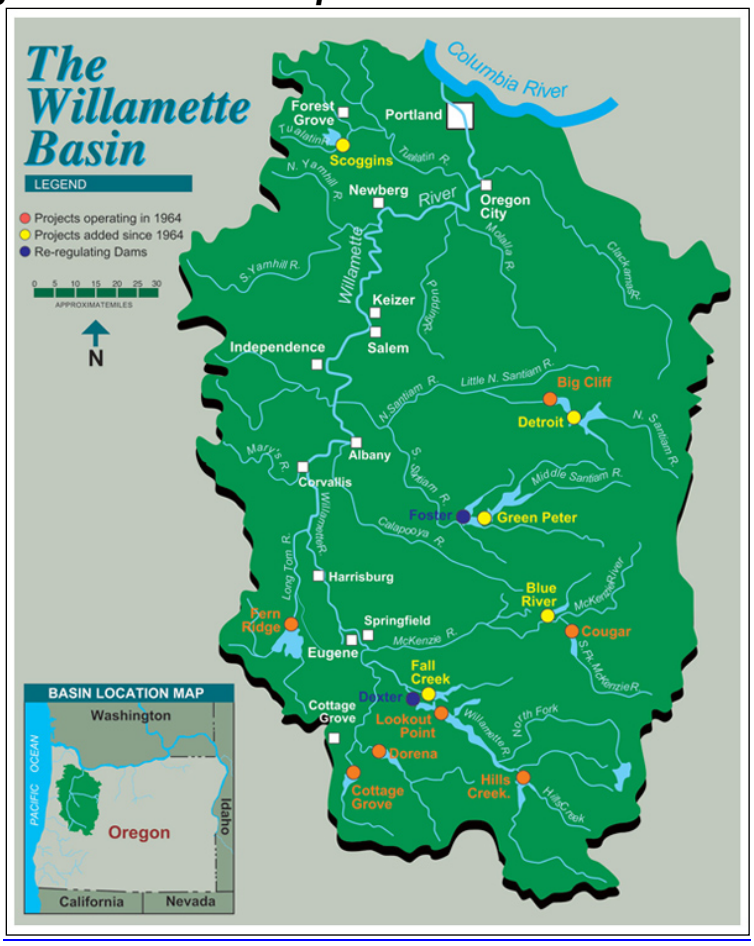
### Green Peter Dam, Middle Santiam River[11]

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[12]

This dam is located at Foster, two miles below the junction of the Middle and South Santiam rivers, and eight 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, eight miles upstream. 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.

***Figure 6-2: Location of Dams in the Willamette Basin***




Source: US Army Corps of Engineers, retrieved July 11, 2015

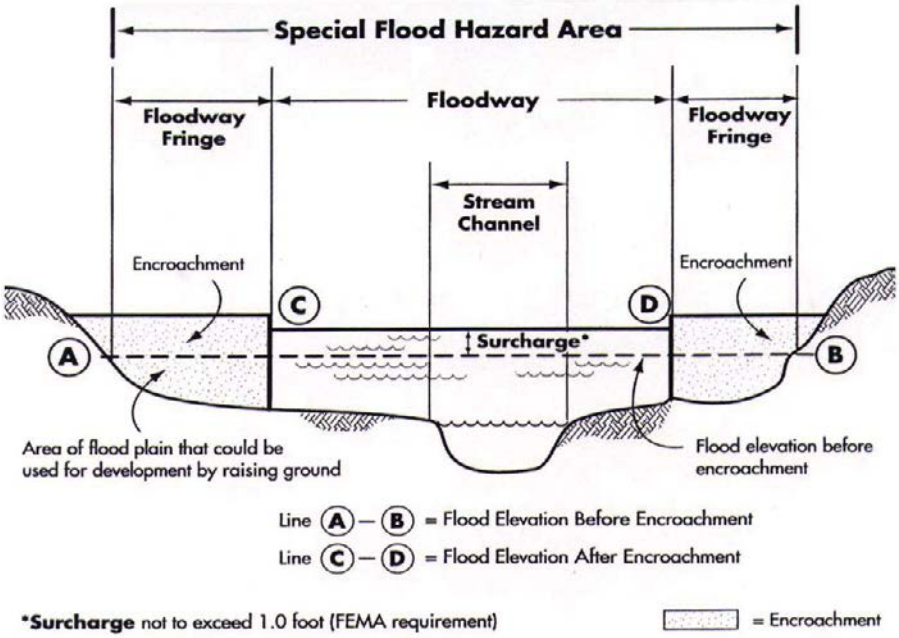
## Floodplain Terminology

### 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 floodway fringe. For regulatory purposes, the floodplain is also referred to as a Special Flood Hazard Area.

***Figure 6-3 Floodplain Schematic***




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

**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 overbank 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 of other structures that would obstruct or divert flood flows onto other properties.

**Floodway Fringe**
The floodway fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. NFIP regulations allow the floodway fringe to be completely filled and used for development. Albany has adopted this approach. However, in some areas of Albany, the floodway 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 North American Vertical Datum of 1988. 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.[13]

## 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 a 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 a "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. Development has relied 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 projects by the Grand Prairie Water Control District. 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 one percent annual chance sheet-flow flooding where average depths are less than one foot, or areas of one percent annual chance stream flooding where the contributing drainage area is less than one square mile.

## Flood Risk Assessment

### Flood Hazard Profile

Section 201.6(c)(2)(*i*) of the Disaster Mitigation Action 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

must include information on previous occurrences of hazard events and on the probability of future hazard events.

### Location and Extent of Flood Hazards

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 standards and what we have come to know as "sound floodplain management."[14] In Albany, the NFIP and related building code regulations went into effect April 3, 1985. 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. Refer to figure 6-4 for a map of the floodplains in the city.

Communities participating in the NFIP may adopt regulations that more stringent than those contained in 44 CFR 60.3, but not less stringent.15 In the City of Albany, all homes and other buildings legally constructed in the floodplain after April 3, 1985 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, the first floor elevated or flood-proofed to at least one foot above the base flood level.

### Flood Insurance Rate 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.

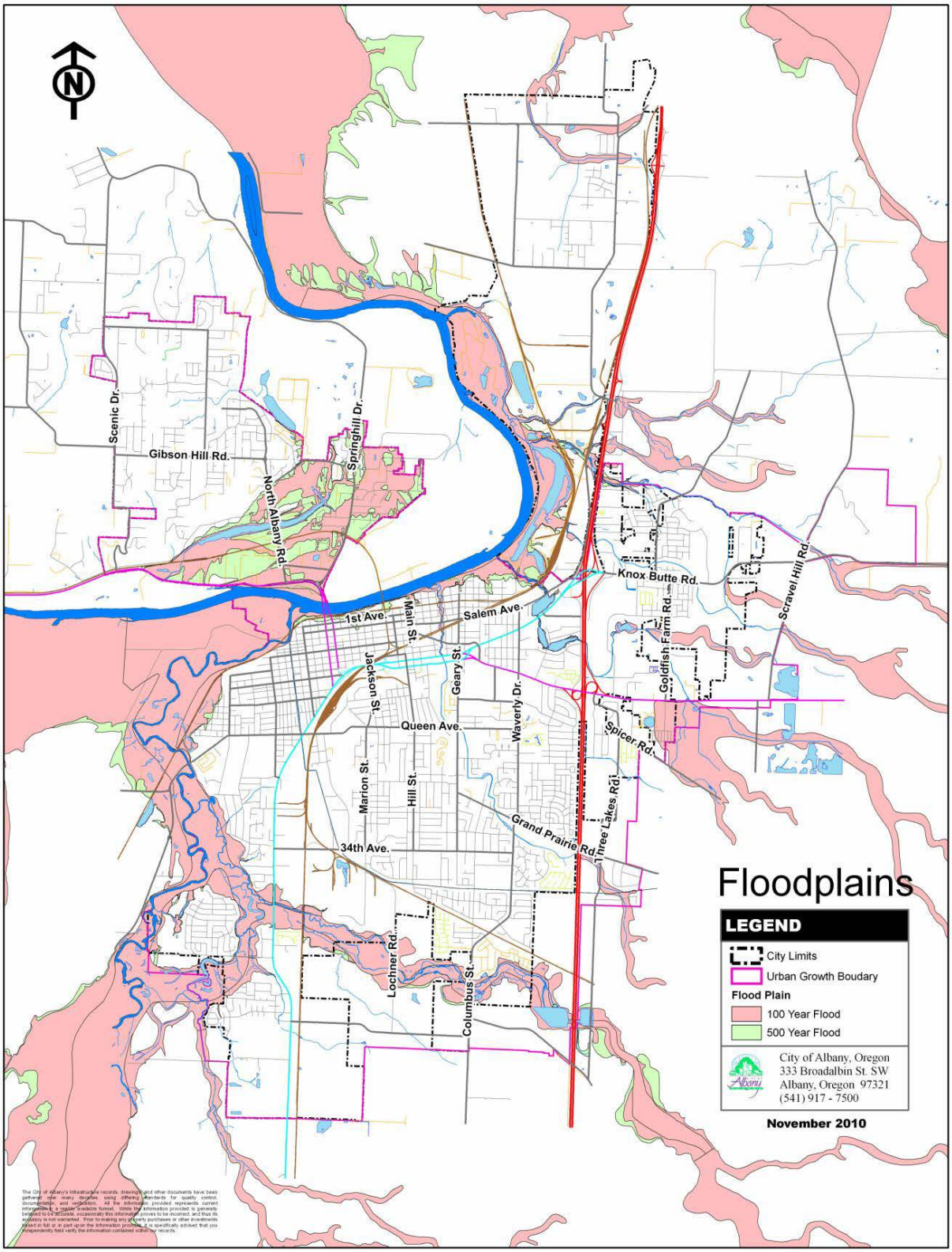
The City of Albany uses FIRM to advise prospective homeowners of flood hazards; to locate zoning boundaries that separate developable land from open space; to make decisions for new development in floodplains; and to administer the terms of the NFIP during the issuance of building permits. The City received new digitized FIRM maps from FEMA in 2010.

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 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 data in Table 6-5 were computed for the Willamette River at the river gauge under the Ellsworth Street Bridge:

## *Figure 6-4: City of Albany Floodplains*



## *Table 6-5:*
### *Flood Hazard Data for the Willamette River at the Ellsworth Street Bridge*

| Flood Frequency (years) | Discharge (cfs) | Elevation (feet) |
|---|---|---|
| **10** | **117,000** | **199.3** |
| **50** | **172,000** | **203.5** |
| **100** | **200,000** | **205.6** |
| **500** | **272,000** | **209.4** |

Source: Flood Insurance Study, City of Albany, Oregon (2010)

The stream discharge data shown above are from the table on page 27 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 62P in the FIS, based on the North American Vertical Datum of 1988. The US 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.

Until recently, the FIRMs have referenced the National Geodetic Vertical Datum of 1929 (NGVD 1929). A newer, more accurate vertical datum, the North American Vertical Datum of 1988 (NAVD 1988), is used for all FIRM updates. The 2010 Albany FIRMs reference the NAVD 1988 datum. NAVD 1988 is used for floodplain management purposes in the City of Albany. US Army Corps of Engineers' elevation data is also based on the NAVD of 1988. The conversion factor from NGVD 1929 to NAVD 1988 for all flooding sources in Albany is +3.38 feet.

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 (Table 6-5 above), with a first-floor elevation of 199 feet is expected to flood about once every 10 years on average. Fifty-year, 100-year, and 500-year flood events would result in about 4.5 feet, 6.6 feet, and 10.4 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 20 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.

### North Albany Floodplain Study

In early 2010, the City began a study to model the floodplain of the Willamette River in North Albany. The study was initiated because the current FEMA floodplain maps for North Albany appeared to be inaccurate. The most significant inaccuracy was an unmapped floodway. In order to adequately review future development proposals and for the development community to know what challenges might exist on an existing parcel prior to investing in development, it was important to have a more accurate assessment of floodplain characteristics throughout North Albany.

The North Albany floodplain study verified that there was a significant unmapped floodway through North Albany. This floodway is essentially an overflow channel from the Willamette River. It is estimated that, during a 100-year flood event, approximately 5,600 cfs of water flows through this floodway at a maximum speed in excess of five feet per second. To put that amount of water in perspective, it is what typically flows in the Willamette River itself in September. At five feet per second, water with very little depth can apply enough force to push a car off the road.

The study also unexpectedly identified significant differences in the amount of flooding throughout the study are. These differences were seen in both the extents and depths of flooding. When compared to FEMA's most recent (2010) FIRMs, the study identified approximately 102 acres of property mapped as being in the floodplain that shouldn't be, and approximately 104 acres of property that should be shown in the floodplain but was not. Differences in depths of flooding ranged from more than four feet less than the 2010 FEMA maps to around two feet more than the 2010 FEMA maps. The City anticipates the new floodplain maps for North Albany to be adopted by FEMA and the City by the end of 2015, and to be in effect by summer of 2016.

## Flood Mapping Methods and Techniques

The use of Geographic Information Systems (GIS) 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 1980s 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 elevate the food 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 provided 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 6-4 above). Thus, floods greater than the 100-year event will flood many areas outside the mapped 100-year floodplain. Second, many flood-prone flood because of local stormwater 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 elevation.

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

A. **Zone AE**: within the 100-year floodplain with base flood elevation (100-year flood) and detailed flood hazard data.
B. **Zone X** (shaded): areas of 500-year flood, areas of 100-year flood with average depths less than one foot or with drainage areas less than one square mile, and areas protected by levees from 100-year flood.
C. **Zone X** (un-shaded): areas outside 500-year floodplain.

## 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 subtropical feel of moisture, often referred to as the Pineapple Connection, will be tapped by the stronger storms. The Pineapple Connection is 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 following Table 6-6 identifies significant flood events in western Oregon since 1861.

## *Table 6-6*
## *Significant Western Oregon Floods*

| *Date* | *Location* | *Characteristics* | *Flood Type* |
|---|---|---|---|
| Dec. 1861 | Willamette Basin and coastal rivers | Proceeded by two weeks of heavy rain. Every town on the Willamette flooded or washed away. | Rain on snow; snow melt |
| Feb. 1890 | Willamette Basin and coastal rivers | Second largest known flood in the Willamette Basin. Almost every large bridge was washed downstream. | Rain on snow |
| Dec. 1937 | Western Oregon | Flooding followed heavy rains. Considerable highway flooding; landslides. | Rain on snow |
| Jan. 1953 | Western Oregon | Widespread flooding in western Oregon accompanied by windstorm. | Rain on snow |
| Dec. 1964-Jan. 1965 | Willamette Basin | Record flooding throughout Willamette Basin. Two intense storms. Near-record early season snow depths. Largest flood in Oregon since dam construction on upper Willamette (1940s-50s) | Rain on snow |
| Jan. 1974 | Western Oregon | Flooding followed heavy wet snow and freezing rain. Nine counties received Disaster Declaration. | Rain on snow |
| Dec. 1978 | Western Oregon | Intense heavy rain, snowmelt, saturated ground. One fatality in Region 3 (Benton County). | Rain on snow |
| Feb. 1986 | Entire State | Severe statewide flooding. Rain and melting snow. Numerous homes flooded and highways closed. | Snowmelt |
| Feb. 1987 | Western Oregon | Willamette River and tributaries: mudslides; damaged highways and homes. | Rain on snow |
| Feb. 1996 | Entire State | Deep snow pack, warm temperatures, record-breaking rains. Flooding, landslides, power outages. (FEMA-1099-DR-OR) | Rain on snow |
| Nov. 1996 | Entire State | Record-breaking precipitation; local flooding/landslides. (FEMA-1149-DR-OR) | Rain on snow |
| Dec. 2005 | Polk, Marion, Linn, Lane and Benton | Heavy rains causing rivers to crest above flood stage in Polk, Marion, Linn, Lane and Benton | Riverine |
| Jan. 2006 | Willamette Valley | Heavy rains caused many rivers to crest above flood stage in the Willamette Valley, causing damage to roads and bridges. | Riverine |
| Dec. 2007 | Yamhill | South Yamhill River flooded near McMinville, causing damage to roads and bridges, 120 homes. | Riverine |
| Dec. 2007 | Polk | Major flooding in Suver and other areas in Polk County; total losses equal $1million for entire county. | Riverine |
| Jan. 2012 | Polk, Marion, Yamhill, Lincoln, Linn, Lane and Benton Counties | Heavy rain and wind; ice (DR-4055); flooding in the Willamette Valley; 130 homes and seven businesses were damaged in the city of Turner; 29 streets were closed in the city of Salem; the state motor pool lost 150 vehicles and thousands of gallons of fuel; Thomas Creek in the city of Scio overtopped, damaging several buildings. | Riverine |

Source: Oregon Natural Hazard Mitigation Plan (2015) and Linn County Natural Hazards Mitigation Plan (2005)

The U.S. Geological Survey gauging station is located on the Willamette River at Albany, Mile 119.3, under the Ellsworth Street Bridge. Bank full stage is at 21.2 feet, which equates to 188.4 feet (NGVD 1929) of elevation above sea level. Flood stage at this location is 25 feet or 192.2 feet (NGVD 1929) 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, 41 feet river stage. Between 1878 and 2012 76 events occurred in Albany at or above bank full stage (21.2 feet). The 13 greatest observed floods during that time were:

***Table 6-7***
***Significant Albany Flood Stages***

| Date | River Stage | Flood Elevation **Feet** (NGVD 1929) |
|---|---|---|
| December, 1861 | 41.0 | 208.2 |
| February 4, 1890 | 39.1 | 206.3 |
| January 14, 1881 | 38.0 | 205.2 |
| January 26, 1903 | 36.5 | 203.7 |
| January 15, 1901 | 36.4 | 203.6 |
| November 24, 1909 | 36.1 | 203.3 |
| February 6, 1907 | 35.8 | 203.2 |
| January 2, 1923 | 35.7 | 202.9 |
| January 8, 1923 | 35.7 | 202.9 |
| December 30, 1945 | 35.0 | 202.2 |
| February 22, 1927 | 34.2 | 201.3 |
| December 24, 1964 | 33.9 | 201.1 |
| February 9, 1996 | 30.0 | 197.2 |

The flood of 1964 is the one most residents remember. It crested at 201 feet elevation (NGVD 1929), which is 34 feet river stage. Had the upstream dams not been in place, the 1964 flood would have been as high as the December 1861 flood, 16 feet above flood stage.

The most recent significant flood occurred in February 1996. At that time, the river crested at 30 feet river stage, or 197.2 feet (NGVD 1929) 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 a significant flooding in or around Albany. The US Army Corps of Engineers indicates that, without flood control on the river, the flood water would

have been five to six feet higher. This would have put the flood waters at 36 feet flood stage, 203 feet elevation (NGVD 1929), or equivalent to the fourth fifth, or sixth greatest flood in Albany's history.

## *Figure 6-8 High Water Mark Signs*

To illustrate the difference in these flood heights and to promote awareness of flood hazards, the City of Albany and the US Army Corps of Engineers installed high-water mark signs at Monteith Riverpark in December of 2014. The timing of the installation was significant as it commemorated 50 years from the date of the 1964 Christmas Eve flood event. The signs are posted at the level flood waters reached Ellsworth Street on December 4, 1861; December 24, 1964; and February 9, 1996. The signs also list the number of upstream dams in place at the time of the latter two floods and how much those dams reduced flood levels (Figures 6-8 and 6-9).

Since the floods of 1861 and 1964, a variety of mitigation efforts have helped to reduce the impact of floods, such as the dams at Foster and Green Peter. For example, without the dams:

In 1996, the Willamette River reached 30 feet at the Ellsworth Street Bridge. River levels would have been five feet higher without the US Army Corps of Engineers' nine dams upstream of the bridge.

In 1964, the water level at the Ellsworth Street Bridge reached 34 feet. The Corps' seven upstream dams reduced the flood's peak by six feet.

In 1861, the water level reached 41 feet at the Ellsworth Street Bridge. No upstream dams were in place at that time.

## *Figure 6-9 Historical Flood Events*

### Probability of Future Flooding Events

The City's hazard analysis scores a flood event as high in the priority group listed as high, medium, and low. Flooding is number 6 of 25 hazards listed. When you look at the list of floods back to 1861, you will find there is no regular schedule, such as once every 10 or 20 years, in which floods have occurred. Heavy rains that 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 the city of Albany has seen over the last 150 years. The time between two major floods, 1964 and 1996, was 32 years. Two major floods occurred in 1943 and 1945 and are the only recent examples of flooding to have occurred within a three-year period. These floods took place before the dams were built on the rivers upstream of the city. Since then, only the 1964, 1996, and 2012 floods have occurred. It is very likely another flood will occur in the future that will equal either the 1964 or 1996 flood. When it will occur is very difficult to predict since many factors need to come together to create a major flood for this area.

## Other Flood Hazards

### 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 floods without exacerbating flood levels.

### Dam Failure Inundation

The Emergency Operations Plan for the City of Albany, Benton, and Linn Counties (Sept. 2012), summarizes the impact and threat of dam failure: *"A dam failure can either be slow in nature or catastrophic, depending on a number of variables, such as the strength of containment structure, the amount and velocity of water released, and the distance of affected structures from the failure. The worst case event for Albany would be a catastrophic failure of the Hills Creek Dam on the Middle Fork of the Willamette River, near Oakridge. Flood flows from such a failure would breach Lookout Point and Dexter Dams and continue down the Willamette River to Willamette Falls at Oregon City. Albany would be impacted by this type of event."*

The City has a mitigation action item pertaining to development of a flood and dam failure warning and response plan.

### Climate Change

The Oregon Natural Hazard Mitigation Plan (2015) summarizes the anticipated impacts of climate change for the State: *"The state information indicates that hazards projected to be impacted by climate change in the Southern Willamette Valley Region include drought, wildfire, flooding and landslides. Climate models project warmer drier summers and a decline in mean summer precipitation for Oregon. Coupled with projected decreases in mountain snowpack due to warmer winter temperatures, all regions within Oregon are expected to be affected by an increased incidence of drought and wildfire. In addition, an increase in extreme precipitation is projected for some areas in this region and can result in a greater risk of flooding in certain basins; including an increased incidence of magnitude and return interval. Landslides in Oregon are strongly correlated with rainfall, so increased rainfall – in particular in extreme events – will likely trigger increased landslides. Flooding and landslides are projected to occur more frequently throughout western Oregon. Generally, western Oregon basins are projected to*

*experience increased flood risk in future decades. Increased flood risk involves both an increased incidence of flooding of a certain magnitude and an increase in the magnitude of floods of a certain interval. Landslides in Oregon are strongly correlated with rainfall, so increased rainfall – particularly in extreme events – will likely trigger increased landslides."*

The executive summary of Oregon's Climate Change Adaptation Framework (Dec. 2010) provides a summary of challenges associated with both flooding and landslides: *"Extreme precipitation events have all the potential to cause localized flooding due partly to inadequate capacity of storm drain systems. Extreme events can damage or cause failure of dam spillways. Increased incidence and magnitude of flood events will increase damage to property and infrastructure, and will increase the vulnerability of areas that already experience repeated flooding. Areas thought to be outside the floodplain may begin to experience flooding. Many of these areas have improvements that are not built to floodplain management standards and are not insured against flood damage; therefore being more vulnerable to flood events. Finally, increased flooding will increase flood-related transportation system disruptions, thereby affecting the distribution of water, food, and essential services"*

## 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 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 less at risk of a 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 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.

### Public Health

The Centers for Disease Control and Prevention warn that floodwaters pose a variety of health risks, including exposure to infectious diseases, chemical hazards, and injuries. Flood waters can become contaminated with bacteria and hazardous chemicals which pose risk of disease through physical contact, ingestion, or open wounds. Floodwaters pose risk of physical injury from floating objects and damaged electrical power lines. Floodwaters, especially when rapidly moving, also pose risk of drowning. Floodwaters can also cause indirect health risks. Animals

can be displaced during flooding and pose a risk to public health. Standing water during and after a flood can increase insect populations, posing an additional risk of insect-borne diseases. If clean-up efforts are delayed after flood events, water-damaged buildings can collect mold, which is a significant health concern to building occupants. Many of these indirect public health concerns can be reduced after flood events by expediting repair of water-damaged buildings and other clean-up efforts.

### 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 landslides 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.

### Homes

Housing losses accounted for the largest share of private property damage during the 1996 flood events.[16] Remembering that the 100-year flood will be five feet above the 1996 flood, it is likely that far more homes will be inundated when the 100-year flood occurs.

## *Table 6-10:*
## *Number of Buildings in the Floodplain by Zoning District*

| **Table 6-10: Number of Buildings in the Floodplain by Zoning District** | |
|---|---|
| **Zoning District** | **Number of Buildings** |
| CB – Central Business | 1 |
| CC – Community Commercial | 17 |
| HD – Historic Downtown | 1 |
| HI – Heavy Industrial | 19 |
| HM – Hackleman Monteith | 5 |
| LI – Light Industrial | 1 |
| MUC – Mixed Use Commercial | 11 |
| OS – Open Space | 33 |
| RC – Regional Commercial | 4 |
| RM – Residential Medium Density | 138 |
| RR – Residential Reserve | 548 |
| RS-10 – Residential Single Family | 62 |
| RS-5 – Residential Single Family | 27 |
| RS-6.5 – Residential Single Family | 125 |
| **TOTAL** | **992** |

## Flood Insurance Claims

The City of Albany joined the National Flood Insurance Program in 1985. As of April 30, 2015, the City had 266 policies in force, with an insurance in-force whole amount of $61,435,500 and a written premium in-force amount of $274,583; of these policies, approximately 67% are for property in North Albany. Total losses in the City have been 14 residential property claims. Eleven of those claims have been paid out for a total payment of $113,663; of this total, $49,112 was paid out from damages due to the 1996 flood event.

## Repetitive Flood Losses

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 $1000 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. In 2015, there are two repetitive loss structures in the community, both of which are residential properties located in North Albany.

## 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 residents 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 operation of the water treatment and wastewater treatment plants continued during the flooding. All public facilities continued to operate with only a few city parks, located in the floodplain, affected.

## Critical Facilities

Of particular importance during flood events are critical facilities located in flood hazard areas. A critical facility is defined as a facility that needs to be operable during a flood, or for which even a slight chance of flooding might pose an unacceptable risk to health and safety. Critical facilities include schools, nursing homes, hospitals, police, fire, and other emergency responders, and installations that produce, use, or store hazardous materials. Based on this definition, there are four critical facilities that are on property in the floodplain; however, only a portion of these properties are within the special flood hazard area and most of the buildings are located outside of the floodplain boundary. These include: 1) Public Works Operations and Wastewater Treatment Plant (310 Waverly Drive NE); 2) Water Treatment Plant (300 Vine Street SW); 3) North Albany Elementary School (815 East Thornton Lake Drive NW); and 4) North Albany Middle School

(1205 North Albany Road NW). During the 1996 flooding event, no City of Albany public building was directly affected by the flooding.

## Life Safety

### Willamette River

The Willamette River has a river gauge that is located at the base of the Ellsworth Street Bridge and can be electronically read on the National Weather Service website. The electronic read provides for five days of actual river depth and flow history and five days of future forecast as reported by the National Weather Service. The gauge also has the action stage, flood stage, moderate flood stage, and major flood stage on the chart so you can see immediately where the river is in reference to potential flooding. This gauge provides the city with up-to-date river levels that it can use to determine the immediate impact to the community. Using the five-day forecast portion of the gauge provides the city the opportunity to plan for future impacts that flooding may have on specific portions of the city depending on river flood stages and city elevations.

### Calapooia River and Local Creeks

Unlike the Willamette River, the Calapooia River, Periwinkle Creek, Oak Creek, Truax Creek, and Cathey Creek do not have gauges on them. Determination of the water levels on these waterways relies directly on observation at specific locations along the course of the river or creeks. Flow heights and rates depend on the amount of rain that falls in one hour or 12 hours. With heavy rains, the creeks can rise very quickly, but when the rain stops, the creek levels will also fall very quickly. Because of the variance of these creeks, it is very difficult for the City to predict to what levels they will rise, the impact they may have on the community and what response action the City should take. In some cases, the City has identified areas where the road is blocked to drivers when the water levels get to the edge of the road. Lochner Road is one such road where signs have been posted warning drivers "When Flooded, Turn Around, Don't Drown." Identification of the water levels is done by direct observation at specific locations, not by predicting future creek levels.

### Notification of the Public

The City has put in place a preparedness team made up of Fire, Police, Public Works, Community Development, Parks & Recreation, Geographic Information Systems, and the Public Information Officer. For river flooding, we have identified two trigger points that will mark the need for this team to get together. The information we use to identify the trigger points is provided by the National Weather Service. The first trigger point is when 3.5 inches of rain may fall within a 48-hour period. The second is when the Willamette River level gets to the action stage, 21.6 feet. The purpose of the team is twofold: first, to coordinate any response that City departments may need to take; and second, to determine the information to release to the public to inform them of what to expect and how to be prepared.

Dissemination of information to the public will be done through FlashNews, the City's website, Twitter, and Facebook. In extreme cases, where immediate notification to the public or to specific segments of the city are necessary, the City works with Linn County and uses the Linn-Benton Alert system which targets telephone landlines and cell phones to provide a message. In very extreme cases, door-to-door notification to evacuate is used.

## Roads

During natural hazard events, or any type of emergency or disaster, dependable road connections are critical for providing emergency services. Emergency vehicles can be delayed because of restricted mobility in flooded areas. 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 natural features; and 2) they can be obstructions in watercourses, inhibiting the flow of water during flood events.

During the 1996 flood, the City of Albany had no major problems with bridges creating obstructions in the watercourses; however, roads affected were located in North Albany along the Willamette River, west Albany along the Calapooia River, south Albany along Oak Creek, and in east Albany where Interstate 5 was shut down due to high water. Several roads outside the city flooded and did have an impact on traffic patterns in the local area, but caused no major traffic problems. Streets that are likely to be closed during major flood events are identified in Table 6-11.

### *Table 6-11: Major Streets Impacted by Flooding*

| Major Streets Impacted by Flooding | | |
|---|---|---|
| **Street Classification** | **Street Name** | **Flooding Source** |
| Principal Arterial | Highway 20 | Willamette River |
| Minor Arterial | Columbus Street | Oak Creek |
| | Lochner Road | Oak Creek |
| | Queen Avenue | Calapooia River |
| | Riverside Drive | Calapooia River |
| | Spring Hill Drive | Willamette River Overflow |
| Collector | Bryant Drive | Calapooia River |
| | Oakville Road | Calapooia River |
| | Quarry Road | Willamette River Overflow |

During the flood of 1996, one overtopping took place on Interstate 5 where water backed up due to insufficient sizing of a drainage pipe under a railroad track. This problem was corrected after the flood with the cooperation of state and local governments and the railroad owners. Over the years, other mitigation projects have improved the threat of flood hazard in North Albany, including raising the height of the bridges over the Willamette River, raising portions of Highway 20 and North Albany Road, and by adding several culverts to Quarry Road. In 2015, North Albany Road was reconstructed between Quarry Road and the Portland & Western Railroad tracks in order to make this critical lifeline route passable to emergency vehicles during a 100-year flood. Meeting this goal required raising the roadway by approximately two feet between Thornton Lakes and West Thornton Lake Drive and replacing the bridge over Thornton Lakes.

## 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. During significant rain events, the City typically experiences localized flooding first followed by river flooding after

the rain event has passed. In 1996, because the Willamette River reached five feet above flood stage, some streets flooded with storm water back-up. This situation was not a major problem in the City's storm water infrastructure.

During heavy rains not necessarily associated with high river levels, sections of the storm system can become inundated and result in localized flooding. In general, these events do not cause damage to the City's storm water system and subside relatively quickly.

### Water Treatment Facility

The City's historic Vine Street 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 flood, the plant was affected by run-offs into the canal that brings water to the plant intake. Because water was coming in from urban settings in Lebanon and local farm fields, the water was extremely dirty, requiring adjustments in purification. At no time was the treatment plant shut down due to direct flooding. The City now has two water sources and treatment facilities that provide redundancy and alternatives during high-water situations. The City's second treatment plant was built in 2005, is co-owned with the City of Millersburg and located near Millersburg. The intake and pump station are at the confluence of the North and South Santiam rivers 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 property is partially located within the 100-year floodplain. In the 1996 flood, 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 was completely updated in 2009 and was designed so that none of the buildings are located within the 100-year floodplain. Additionally, the location of the new plant resulted in the increase in head flow which allows water to flow into the Willamette River even during major flooding events.

During heavy rains not necessarily associated with high river levels, the City's sewer piping system can also be inundated, even though it is separated from the storm water system. This occurs through surface and groundwater inflow and infiltration into holes, cracks, and unknown inlets into an aging sewer piping network. When this occurs, like during the January 2012 event, sewage can back up in the system and spill out of sewer manholes onto the ground, into basements, or out of the sewer overflow pipes into the river. These sanitary sewer overflows don't generally cause major damage; however, they can impact human health and water quality as well as compliance with the City's wastewater discharge permit from the Oregon Department of Environmental Quality.

In 2010, the City constructed Talking Water Gardens, an engineered wetland designed to receive treated effluent from the City's Wastewater Treatment Plant to cool the water prior to its final discharge to the Willamette River. During heavy rains and high river levels, water can back up the discharge line into Talking Water Gardens. It is anticipated that during extreme conditions, the river will overtop the nearest berm, causing damage to the berm and the facility. The City is currently planning to install a valve in this discharge line to prevent water from backing up into the wetland and is identifying operating procedures to help minimize impacts during heavy rain and high river events.

### 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 (2006), notes that natural open space areas "are important for a variety of reasons including flood storage, habitat protection, run-off reduction, etc." The Plan identifies open space resources along Horseshoe Lakes, Thornton Lakes, Truax Creek, Cox Creek, the Calapooia River, Oak Creek, and Burkhart Creek that should be preserved through acquisition. Albany has 271 acres of open space corridor along the Willamette River Greenway, at 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 was updated in 2006 and is scheduled to be updated again in 2016.

In the City of Albany, almost half of the land area in the floodplain is protected from development through open space zoning. Figure 6-12 identifies the land area in the floodplain within each zoning district. To summarize, there is a total of 1,431 acres of land that is located within the 100-year floodplain and 668 acres or 47% of that total is zoned open space. In addition, 229 acres or 16% of the total land area in the floodplain is zoned residential reserve, which limits development through a five-acre minimum lot size requirement. The majority of the remaining land area within the floodplain is zoned for residential single-family uses.

***Table 6-12:***
***Total Land Area in the Floodplain by Zoning District***

**Table 6-10: Number of Buildings in the Floodplain by Zoning District**

| Zoning District | Area (Acres) | Percentage |
|---|---|---|
| CB – Central Business | 1 | 0% |
| CC – Community Commercial | 16 | 1% |
| HD – Historic Downtown | 1 | 0% |
| HI – Heavy Industrial | 13 | 1% |
| HM – Hackleman Monteith | 1 | 0% |
| LI – Light Industrial | 17 | 1% |
| MUC – Mixed Use Commercial | 27 | 2% |
| OP – Office Professional | 0 | 0% |
| OS – Open Space | 668 | 47% |
| RC – Regional Commercial | 21 | 1% |
| RM – Residential Medium Density | 49 | 3% |
| RMA – Residential Med. Density Attached | 0 | 0% |
| RR – Residential Reserve | 229 | 16% |
| RS-10 – Residential Single Family | 68 | 5% |
| RS-5 – Residential Single Family | 35 | 2% |

| | | |
|---|---|---|
| RS-6.5 – Residential Single Family | 284 | 20% |
| WF – Waterfront | 1 | 0% |
| **TOTAL** | **1,431** | **100%** |

### Riparian Areas

Riparian areas are important transitional area that link water and land ecosystems. Vegetation in riparian areas is dependent on stream processes such as flooding and often is composed of plants such as willow and cottonwood trees that require large amounts of water. Healthy vegetation in riparian buffers can reduce streamside erosion. 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 flooding events. Albany relies on Open Space zoning, riparian corridor overlay district, and natural area acquisition 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.[17] 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.[18] Significant wetlands found along rivers, lakes, and streams are protected as part of the riparian corridor and the significant wetland overlay district.

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 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 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 streamside shading and by improving base flows. DEQ is working with the City of Albany to monitor and to reduce inflow and infiltration problems that cause sewage bypasses that discharge untreated sewage to the Willamette River.

## 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.

### Value of Vulnerable Structures

**Residential**: There are approximately 973 parcels in residential use that are located in the regulatory floodplain. The approximate improvement value on those parcels is $155 million. Of those parcels, 659 are pre-FIRM[19] structures (constructed in 1985 or earlier) with approximately $82 million in improvement value; and 314 of those parcels are post-FIRM[20] structures (constructed in 1986 or later) with an approximate improvement value of $73 million. Although there are twice as many parcels with pre-FIRM structures in the floodplain than post-FIRM parcels, the improvement value of post-FIRM structures is almost equal to the pre-FIRM structures. It can be estimated that the potential dollar losses for residential structures from a 100-year flood event would be in the millions of dollars.

Non-Residential: Estimating the potential dollar losses for non-residential structures is less certain than for residential structures. Non-residential properties are often larger than residential properties, and the structures may not be located in the floodplain even though the parcel intersects with the floodplain. In addition, the improvement value of non-residential structures is often much higher than residential structures, particularly for public facilities. Consequently, a parcel may have only a portion of land located in the floodplain, an improvement value of $2 million but none of the structures are actually located in the floodplain. Therefore, the estimated potential dollar losses can be misleading for non-residential structures. With this understanding of the limitations for this analysis, there are more than 80 parcels in non-residential use that are located in the regulatory floodplain. The approximate improvement value on those parcels is just under $171 million.

## Mitigation Plan Goals and Existing Activities

The Mitigation Plan goals and action items are derived from meetings with the Steering Committee and Floodplain Management Planning Committee. 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 find the existing mitigation activities the City has in place and a link to the action items applicable to flooding mitigation approved and adopted by the Floodplain Management Planning Committee and 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.

## 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 and Atmospheric Administration weather radio and are forwarded to the local news media for retransmission using the Emergency Alert System.

## National Resources Conservation Service (NRCS), U.S. 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 than one property.

## Federal Emergency Management Agency (FEMA) Programs

FEMA resulted from the consolidation of five federal agencies that dealt with different types of emergencies. Many states and local jurisdictions have accepted the same 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

Flood Insurance is available to citizens in communities 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 (DCLD) 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

The Community Rating System (CRS) is a voluntary program that recognizes community floodplain management efforts that go beyond the minimum requirements of the NFIP. When a community exceeds the minimum requirements, food insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the CRS goals. The three goals of the CRS program are: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

Property owners in Albany 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 rating of 6 amounts to a 20 percent reduction in flood insurance premiums for Albany residents.

### The U.S. Army Corps of Engineers

The Corps plays a major role in a coordinated and complex system to reduce flood risks and provide water for hydropower generation, fish and wildlife enhancement, navigation, recreation, and other uses. Portland District's primary water management mission is to save lives and reduce property damage by reducing flood risks with measures both structural (such as dams) and non-structural (such as improving the natural function of floodplains).

## State Programs

**Natural Hazard Planning**
Goal 7 of the Statewide Planning Goals administered by the Department of Land Conservation and Development (DLCD) requires local governments to adopt flood protection policies and controls. The DLCD also administers the NFIP in Oregon, and every community with identified flood hazards is a member of this program. Thus, these local governments are required to adopt the NFIP's minimum requirements. The NFIP is comprised of a flood hazard mapping component, an enforcement component, technical assistance, and insurance which provides a financial safety net for owners of improved property. All four components of the NFIP work together to reduce flood losses.

**Oregon Emergency Management Office**
The OEM is involved in many programs that mitigate the effects of flooding including the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, co-sponsoring and participating in training workshops. Also, as part of its warning responsibilities, OEM notifies local public safety agencies and keeps them informed of potential and actual flood conditions so prevention and mitigation actions can be taken.

**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 Protection 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 Oregon Department of State Lands (DSL) to improve land use planning approaches to wetlands conservation. A local wetlands inventory 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 lands 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 stewards, fisheries, and agricultural organizations working with government agencies to protect and restore important wetland Habitats.[21]

## Linn County Programs

**Comprehensive Plan**
The Linn County Comprehensive Plan includes an inventory of areas subject to natural hazards and a set of Plan policies to guide development within known hazard areas. The FEMA FIRMs are adopted as the county's flood hazard inventory. Risk reduction measures in areas subject to natural disasters and hazards are implemented through application of the county's Land Development and Floodplain Management Codes.

**Land Development and Floodplain Management Codes**
The Land Development Code protects public safety and restricts development activities within inventoried natural hazard areas. All development regulated by the Land Development Code must be located outside the mapped 100-year floodplain unless it is demonstrated that the use can be designed and engineered to comply with accepted hazard mitigation requirements. All development within the floodplain must conform to the requirements of the Linn County Floodplain Management Code (LCC Chapter 870). The purpose of the Floodplain Management Code is to promote public safety and welfare and to reduce the potential for loss of life and property damage. This is achieved by requiring construction in a manner that will reduce flood impacts; by managing the alteration of the floodplain, channels, and natural barriers that accommodate or channel flood waters; and other planning and site development measures. The FIRM floodplain information is incorporated into the county's GIS data. Grading permits and removal/fill regulations are also administered through the Floodplain Management Code.

**Public Facilities**
The Linn County Road Department maintains county roadways, bridges, culverts, and roadside drainage systems to reduce flood impacts.

## Benton County Programs

**Comprehensive Plan**
The Benton County Comprehensive Plan, Goal 7 Natural Hazards includes policies that guide regulation of development in flood hazard areas. The FEMA FIRMs are adopted as the county's flood hazard inventory. Risk reduction measures in areas subject to natural disasters and hazards are implemented through application of the Benton County Land Development Code.

**Development Code**
The Benton County Development Code regulates land development in the county. A floodplain development permit is also required for all development conducted in the Special Flood Hazard Area (also referred to as the 100-year floodplain).

**Stormwater Program**
Benton County staff from Community Development, Environmental Health, and Public Works have developed and implemented a National Pollutant Discharge Elimination System (NPDES) program. The program requirements are part of the Clean Water Act that local governments and private organizations must comply with for discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The overall goal of the Benton County Stormwater Program is to reduce the volume of runoff from current development (for example parking lots and subdivisions) and the developing landscape, while reducing the amount of pollutants carried by stormwater runoff to our rivers and streams.

## City of Albany Programs

### National Flood Insurance Program

The City of Albany joined the National Flood Insurance Program (NFIP) in 1985. By participating in the program, the NFIP makes federally backed flood insurance available to homeowners, renters, and business owners within the community. 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 NFIP, 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. In 2015, the City was in good standing with the NFIP; a mitigation action item supports continuation of the city's participation in the NFIP.

### Community Rating System

The City also participated in the Community Rating System (CRS), which is a voluntary program that extends discounts on flood insurance to participating communities. The City joined the CRS program in 1990, with a classification rating of 9. They City's rating improved to a Class 7 by 2005, and to a Class 6 in 2011. The City's current Class 6 rating extends a 20% discount on flood insurance premiums to residents, business owners, and property owners with property in the special flood hazard area. In 2015, the City was in good standing with the CRS program. The Class 6 rating discount amounts to an annual savings of approximately $323 per insurance policy, or $55,150 for the community. The City has a mitigation action item related to researching ways to improve its CRS rating.

### Parks and Recreation

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

### Comprehensive Plan

The Albany Comprehensive Plan, Flood Hazard goal is to protect life and property from natural disasters and hazards. The flood hazard policies in the plan guide regulation of development in flood hazard areas toward that goal. Risk reduction measures in areas subject to flood hazards are implemented through application of the Albany Development Code.

### Development Code

The Albany Development Code (ADC) regulates land development in the City. A floodplain development permit is required for all development conducted in the Special Flood Hazard Area (also referred to as the 100-year floodplain).

The FEMA FIRMs are adopted as the city's flood hazard inventory. The floodplain overlay district standards in the ADC, Article 6 are intended to manage development in the floodplain in a way that promotes public and environmental health and safety and minimizes the economic loss and social disruption caused by impending flood events.

The open space zoning district is another tool to limit development in flood-prone areas. The open space zoning district is intended for the continuation and preservation of existing agricultural uses, park and recreation areas, wildlife habitats, wetlands, natural areas, flood

conveyance, and uses that do not involve the construction of structures other than minor accessory facilities required to conduct the principal use. Approximately half of the land area in the city that is located within the 100-year floodplain is zoned open space.

Annexation agreements, riparian corridor and significant wetland overlay districts also protect new development from flood-prone natural areas.

**Stormwater Management Program**
The City of Albany has developed stormwater management engineering standards that apply to both public and private development and construction within the City. The main objectives of the standards are to design systems that provide safe and controlled management and conveyance of stormwater generated upstream and on-site to approved downstream channels and drainage facilities, considering existing and future development and capacity. The standards also aspire for developed properties to maintain the runoff characteristics of the original undeveloped drainage basin as well as improve overall stormwater quality, with the goal of reducing the overall impacts and volume of stormwater runoff. While volume control is not required, the City's recently adopted post-construction stormwater quality standards promote infiltration, but don't rely on it.

The City is in the process of updating its Stormwater Master Plan which evaluates existing system deficiencies, anticipated future needs, and regulatory requirements. While this plan will likely reference comprehensive land use planning and floodplain analysis, the scope of the Stormwater Master Plan is focused on mitigating routine storms and not large magnitude natural hazard flooding.

**Erosion Prevention and Sediment Control Program**
The City of Albany's Erosion Prevention and Sediment Control (EPSC) program has been established as a part of the City's comprehensive Stormwater Management Plan. This plan addresses federal water quality mandates and helps set local policies and procedures to protect the quality of our waterways. The EPSC program is designed to protect our local waterways and City's stormwater system from pollution generated by ground disturbing activities. An EPSC permit is needed for land-disturbing activities affecting an area of 2,000 square feet or greater.

## Flood Mitigation Action Items

The following action items have been identified by the Floodplain Management Committee, Steering Committee and various stakeholders in the city of Albany. Full Action Item worksheets can be found in Appendix F.

Action 3.2 Evaluate what can be done to improve the City's current rating in the National Flood Insurance Program's Community Rating System.

Action 3.3 Look at the need to update applicable City codes to reduce risk and prevent flood impacts.

Action 3.4 Continue participation in the National Flood Insurance Program.

Action 3.6 Develop a Flood and Dam Failure Warning and Response Plan

Action 7.3 Develop an education and outreach program to provide residents with awareness of the flood hazard in their area and the availability of flood insurance.

Action 9.3 Implement Santiam-Canal bank improvement projects.

[1] Oregon Climate Service
[2] City of Albany Comprehensive Plan Background Report, 1980
[3] Ibid
[4] Ibid
[5] Ibid
[6] Ibid
[7] U.S. Army Corps of Engineer Guidelines for Flood Emergency Plans, Nov. 1981
[8] Ibid
[9] Ibid
[10] Ibid
[11] Ibid
[12] Ibid
[13] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, Department of Land Conservation and Development (July 2000), Ch. 4.
[14] *Floodplain Management: A Local Administrator's Guide to the National Flood Insurance Program*. FEMA, Region X
[15] Ibid
[16] Ibid
[17] *Department of State Lands, Wetlands Functions and Assessment* (May 2001)
[18] Ibid
[19] Pre-FIRM Building is a building for which construction or substantial improvement occurred on or before the effective date of an initial Flood Insurance Rate Map (FIRM). The City of Albany adopted initial FIRMs on April 3, 1985; Benton County adopted initial FIRMs on August 5, 1986; and Linn County adopted initial FIRMs on September 29, 1986.
[20] Post-FIRM Building is a building for which construction or substantial improvement occurred after the effective date of an initial FIRM.
[21] Oregon Wetlands Joint Venture, Website: http://www.dfw.state.or.us/ODFwhtml/Wetlands/about.htm (May 2001)

# 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 (M) 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 residences and businesses, 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 Linn and Benton County. 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 Linn and Benton County. Such earthquakes would mostly be 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 Linn and 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 Linn and Benton County are summarized in Table 7.1 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 7.1**

**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 |

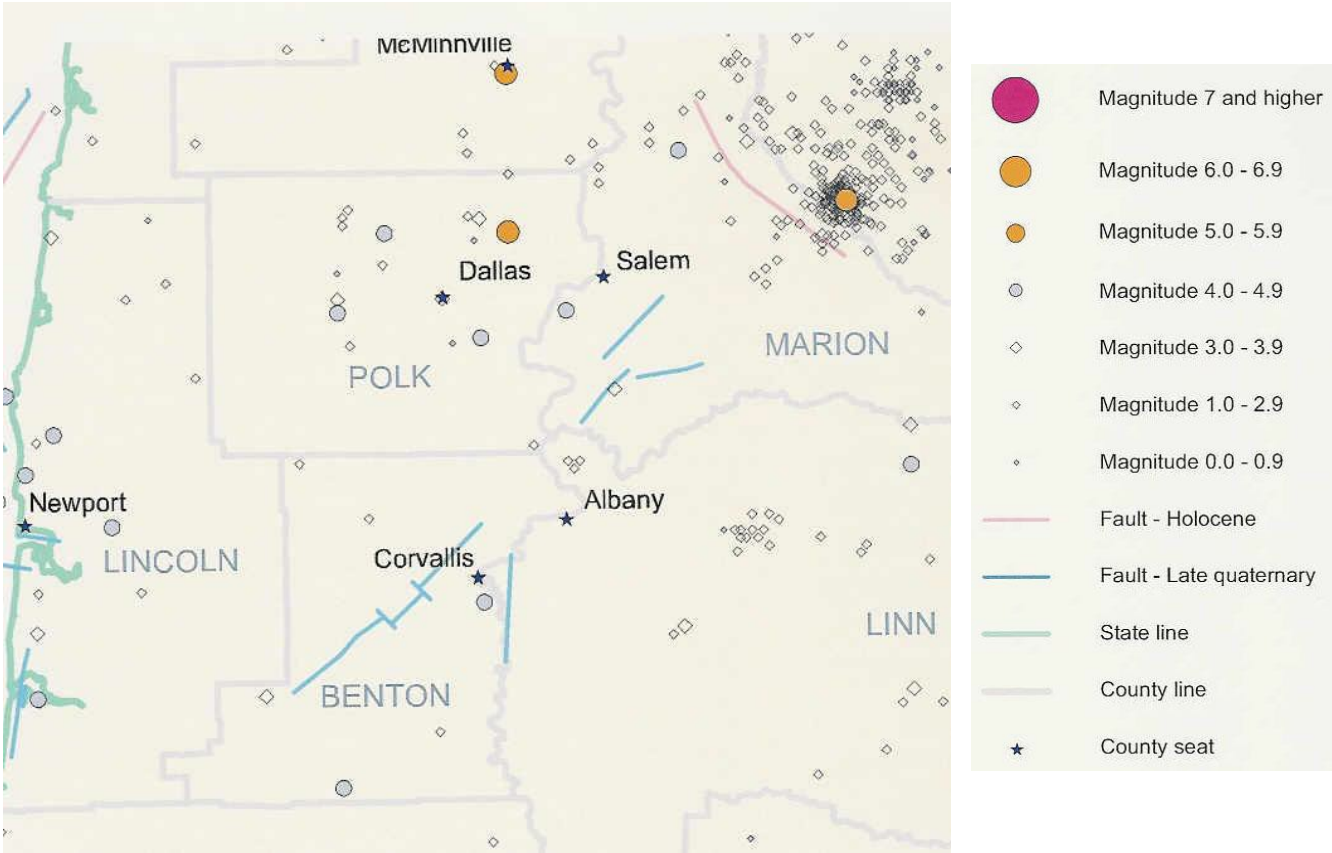
Source: Benton County Hazard Mitigation Plan; Earthquake Section

In addition to these large earthquakes, the Cascadia Subduction Zone also experiences smaller earthquakes such as the M6.8 Nisqually earthquake near Olympia, Washington 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 in Linn and Benton County.

Figure 7.1 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 7-1**

**Earthquake Epicenters from 1841 to 2002**




Source: Benton County Hazard Mitigation Plan; Earthquake Section

**Deep Intraplate 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.

*The December 26, 2005 Sumatra quake is an example of a subduction zone earthquake. This was the fourth largest earthquake in the world since 1900 and is the largest since the 1964 Prince William Sound, Alaska earthquake. In total, more than 283,100 people were killed and 126,900 were displaced by the earthquake and subsequent tsunami in 10 countries in south Asia and east Africa. The earthquake was felt at Banda Aceh, at Meulaboh and at Medan, Sumatra and in parts of Bangladesh, India, Malaysia, Maldives, Myanmar, Singapore, Sri Lanka and Thailand. The tsunami caused more casualties than any other in recorded history and was recorded nearly world-wide on tide gauges in the Indian, Pacific and Atlantic Oceans. Surface water oscillations were observed in India and the United States. Subsidence and landslides were observed in Sumatra.*[5]

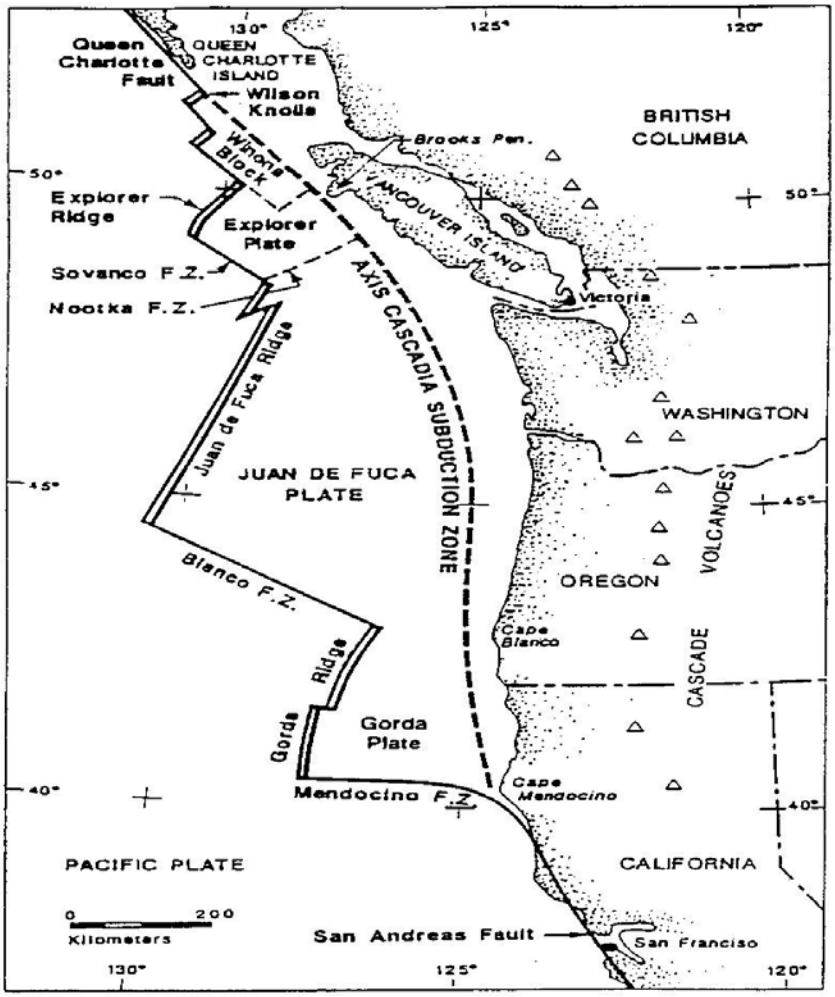



**Figure 10-1. Cascadia Subduction Zone**

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.

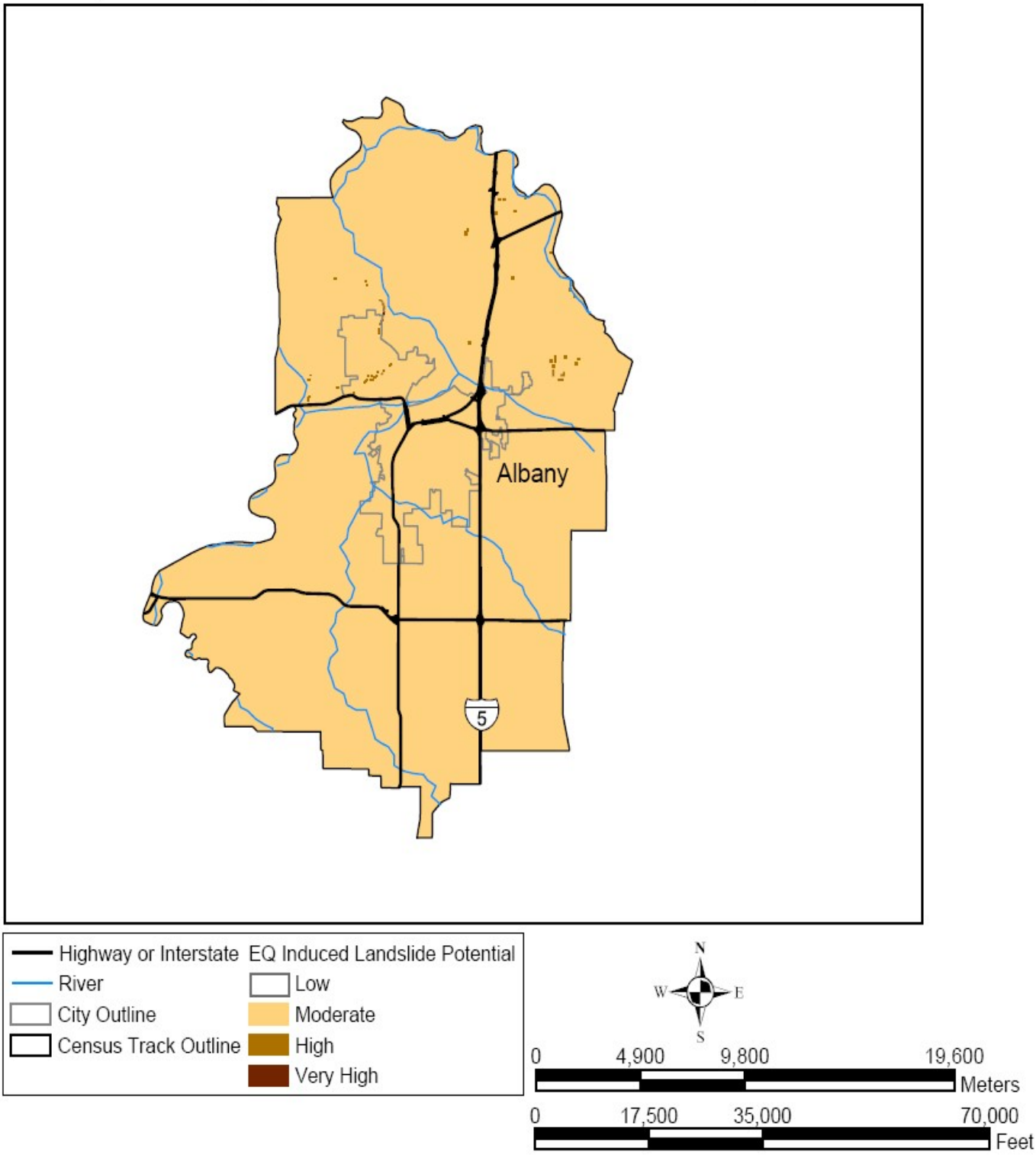
### Surface Fault Ruptures

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.[6]

### Earthquake-induced Landslides

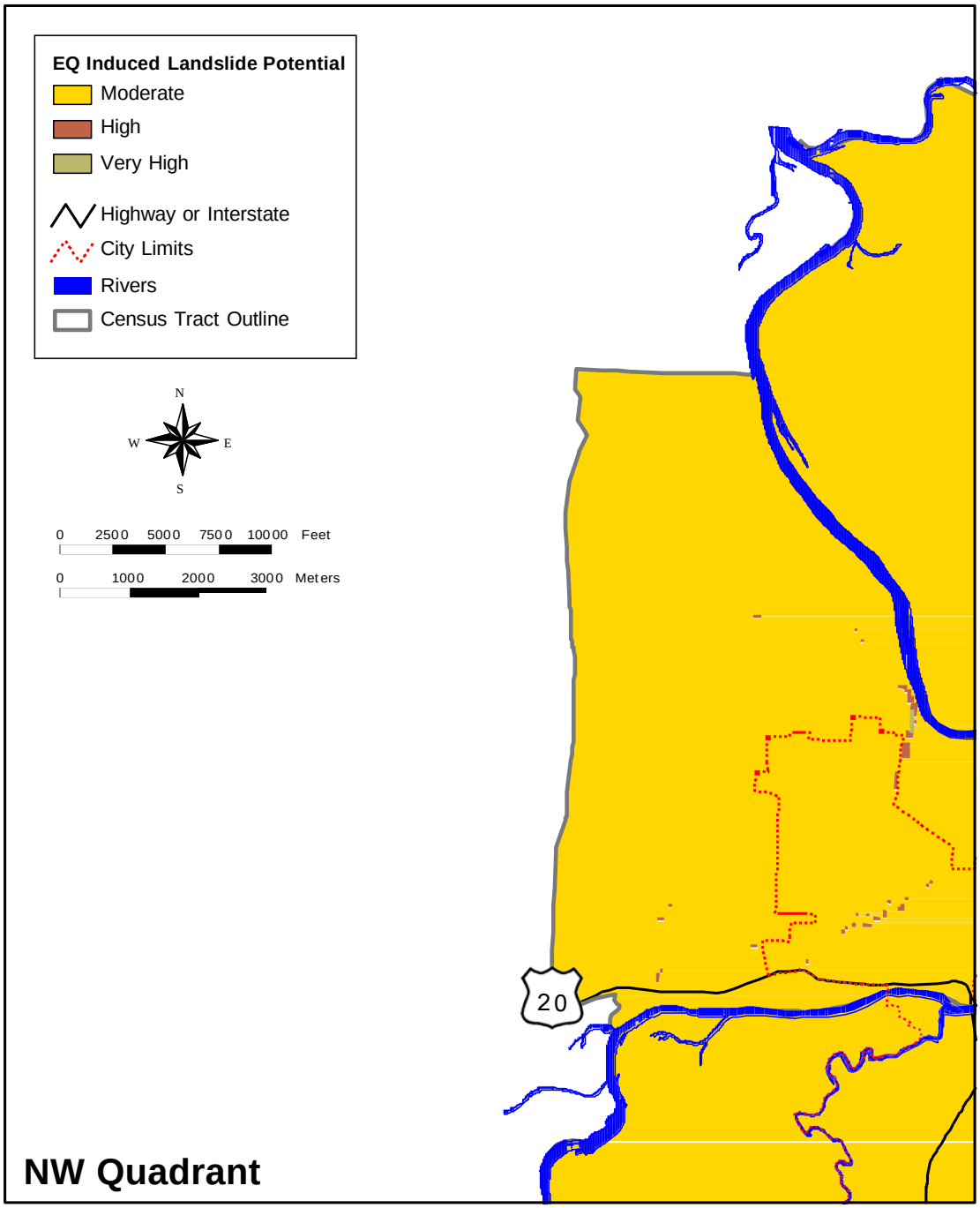
Earthquake-induced landslides are secondary earthquake hazards that occur from ground shaking. They can destroy roads, buildings, utilities, and other critical facilities necessary to respond to and recover from an earthquake. Many communities in Oregon, including the city of Albany, are likely to encounter 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 buildings are constructed on the side of hills and where slides are likely.

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

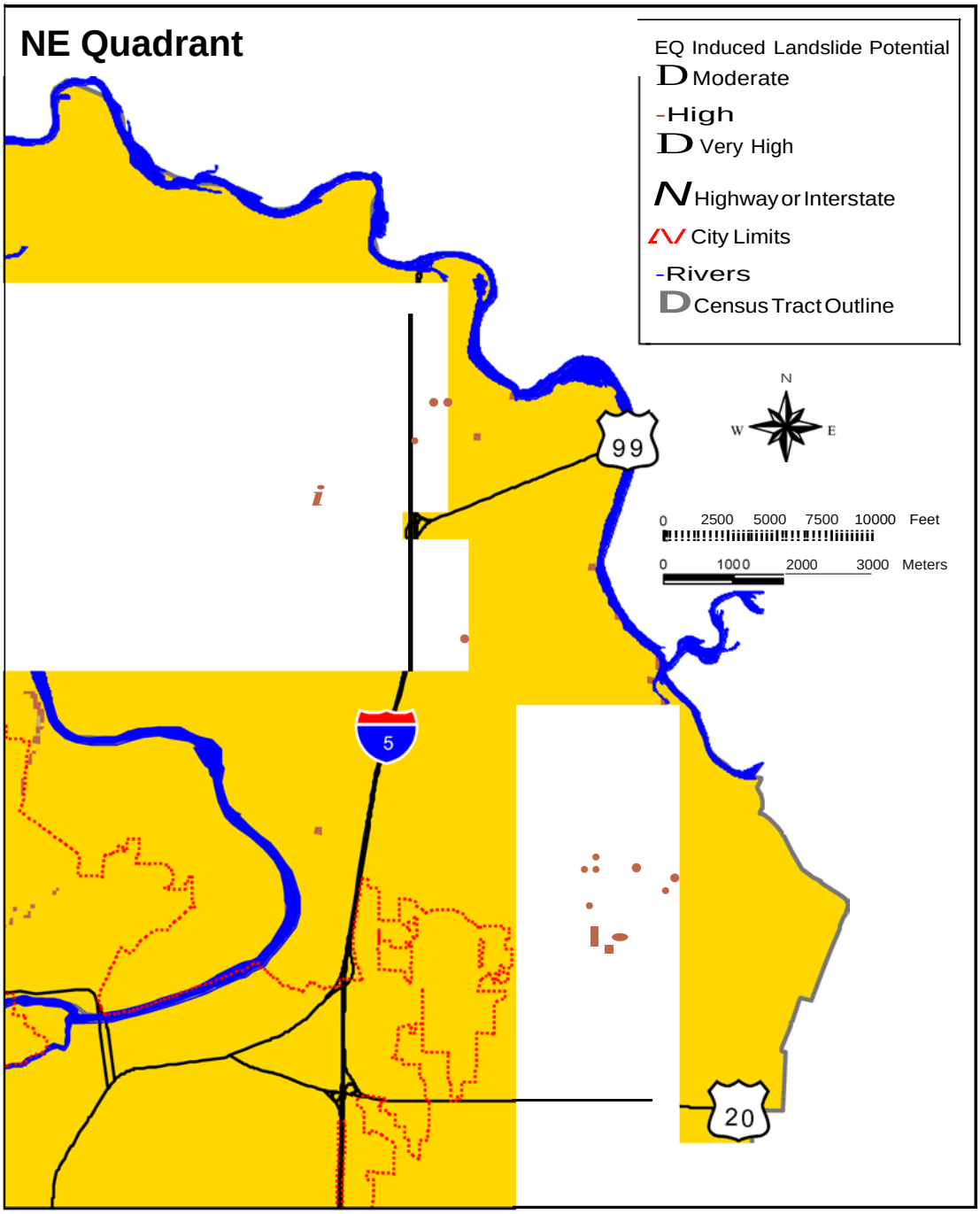



Source: For all City of Albany Relative Slope Stability: DOGAMI

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

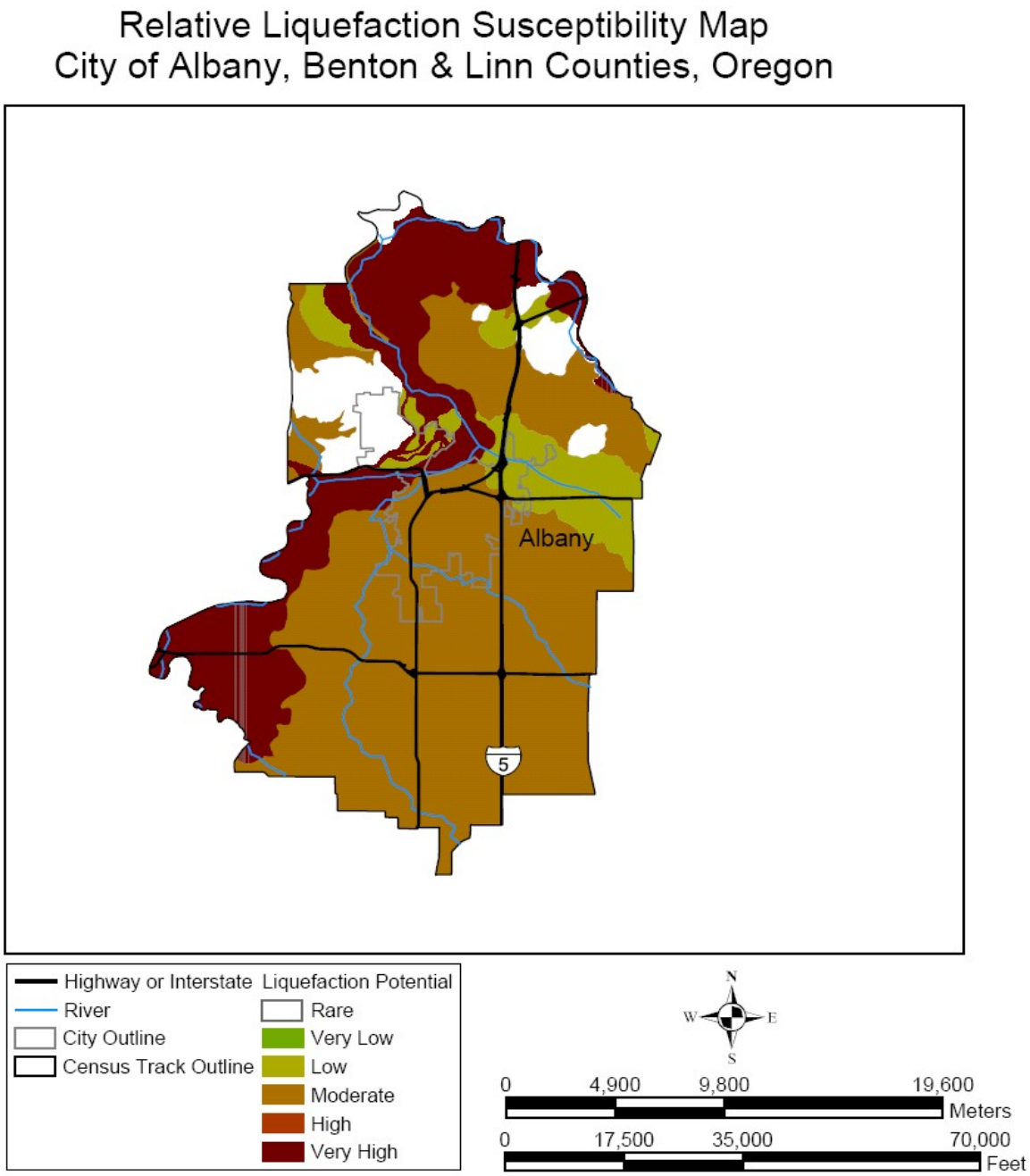


**Relative Slope Stability Susceptibility Map**
**City of Albany, Benton & Linn Counties, Oregon**



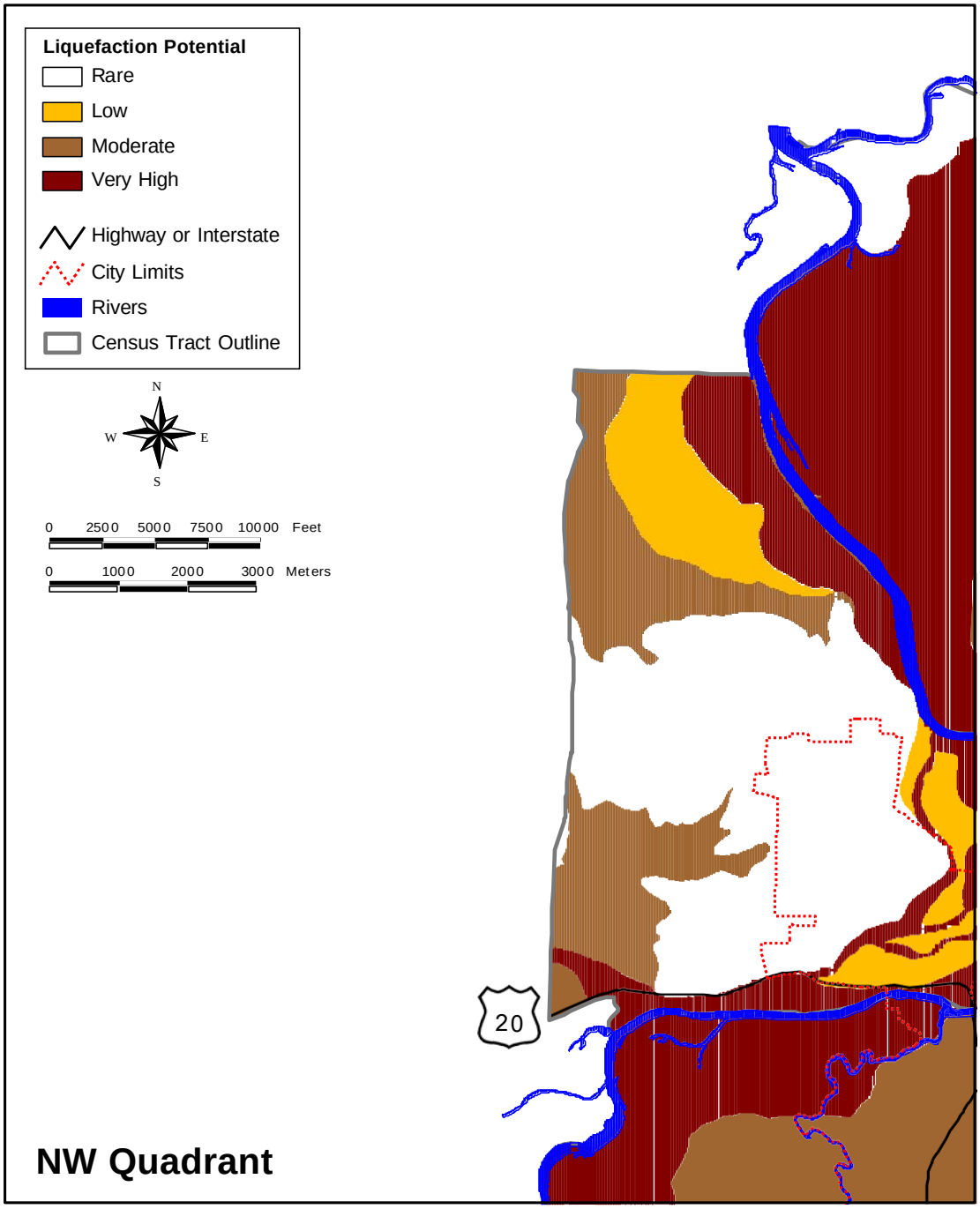
**Liquefaction**

Liquefaction occurs when ground shaking causes wet granular soils to change from a solid to a liquid state. This 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.[7] Areas of susceptibility to liquefaction include areas with high ground water tables and sandy soils.[8]

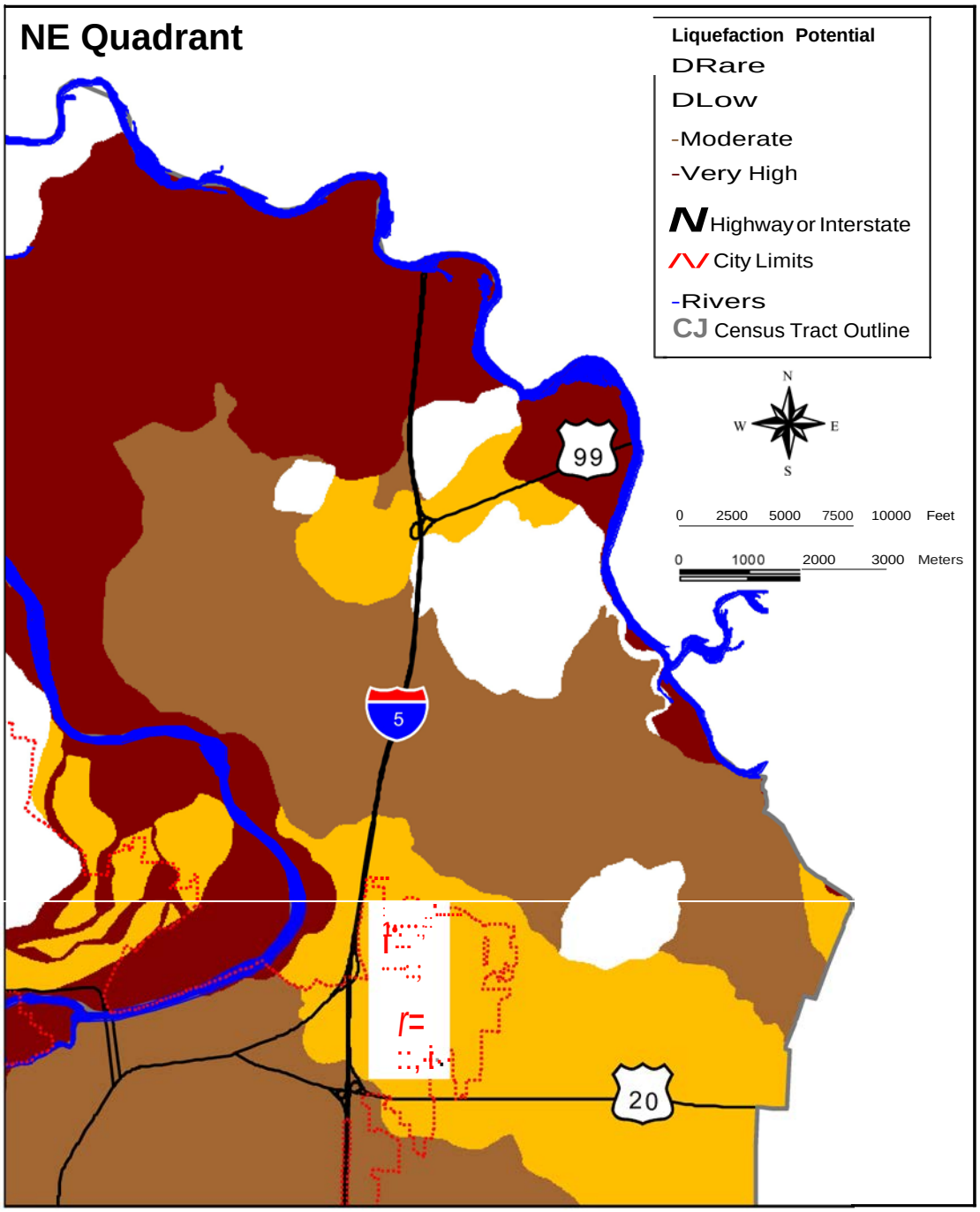



Source: For all Liquefaction for City of Albany: DOGAMI

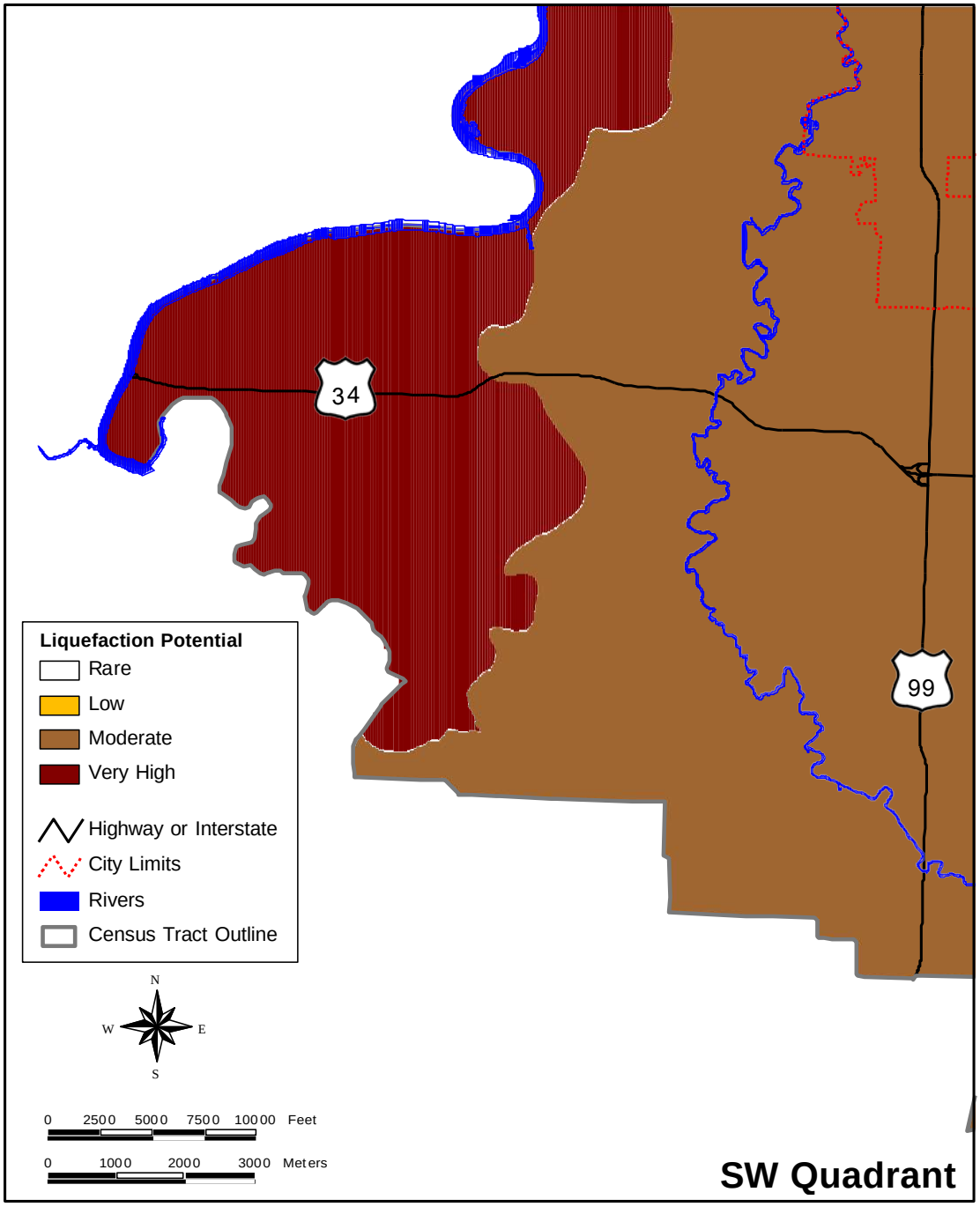
## Relative Liquefaction Susceptibility Map
## City of Albany, Benton & Linn Counties, Oregon



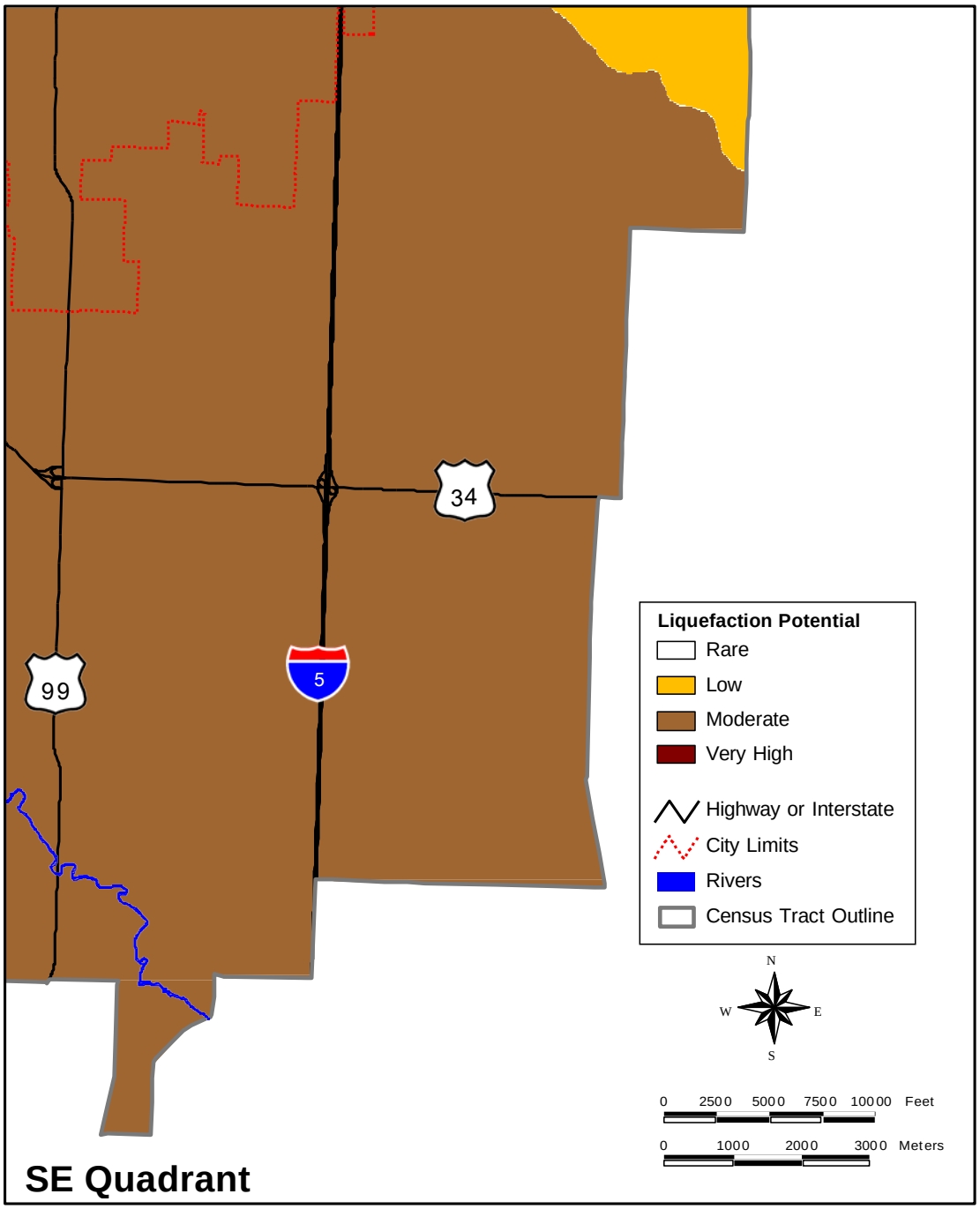
**Relative Liquefaction Susceptibility Map**
**City of Albany, Benton & Linn Counties, Oregon**

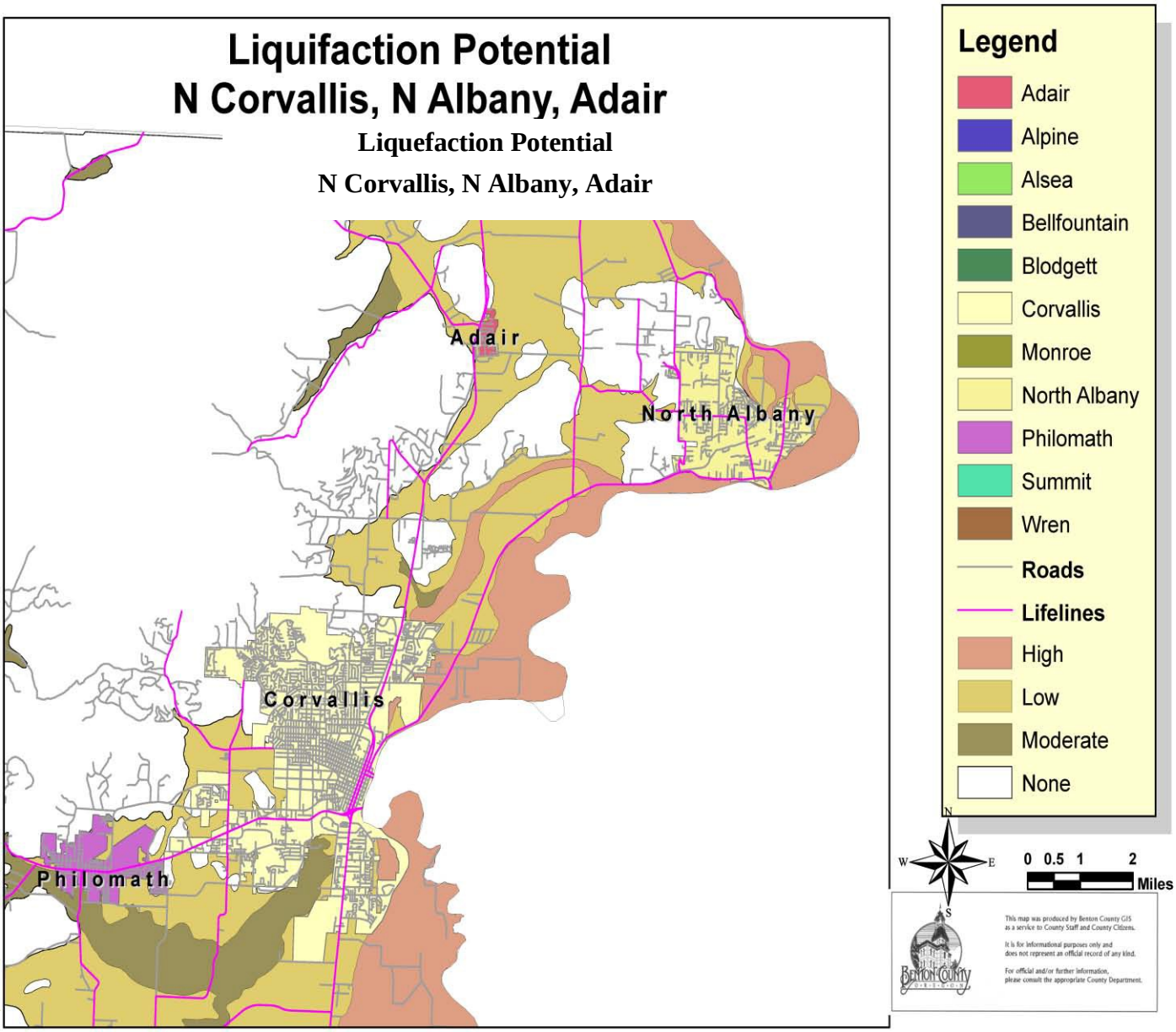


**Relative Liquefaction Susceptibility Map**
**City of Albany, Benton & Linn Counties, Oregon**



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

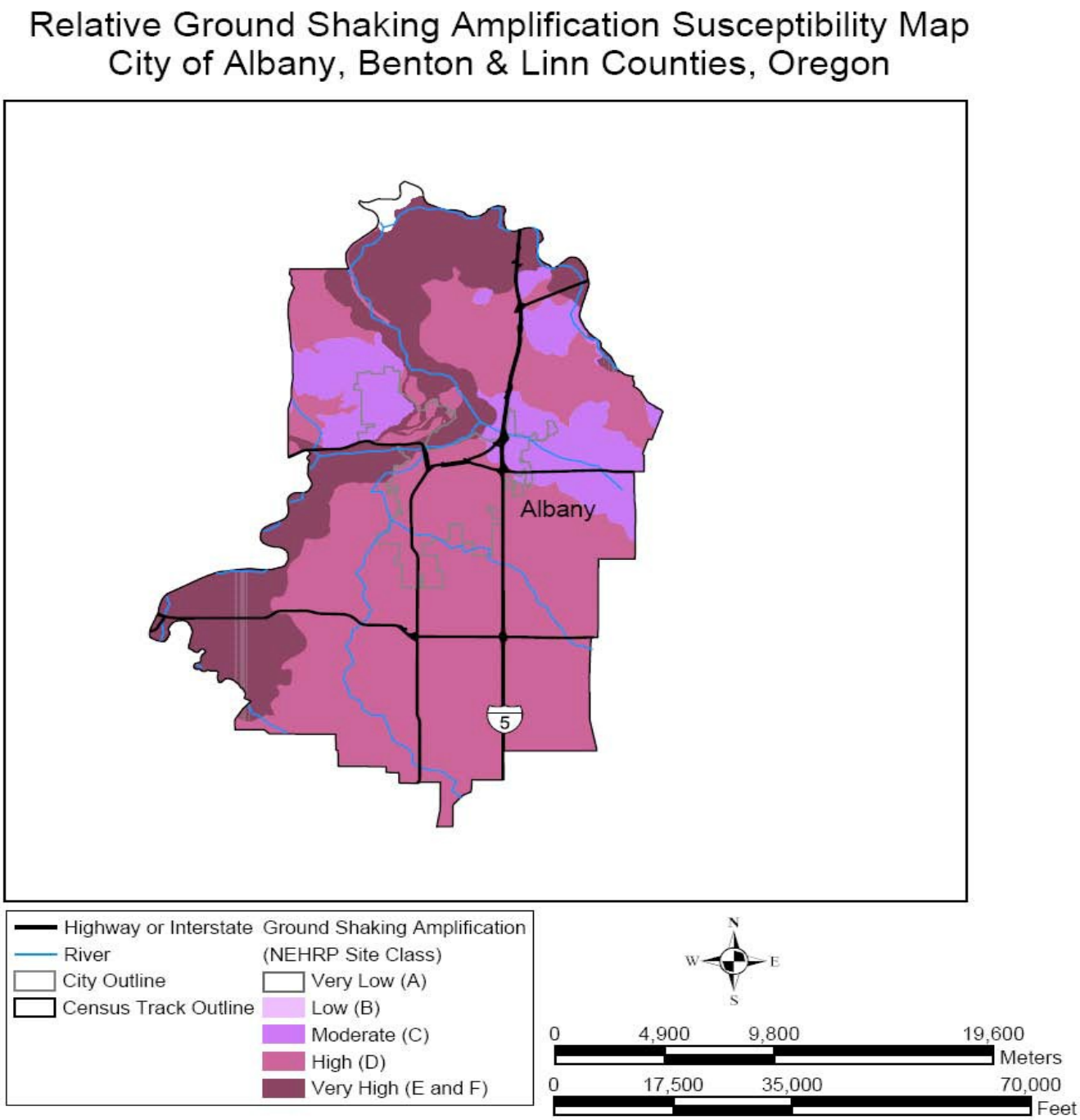





Source: Benton County Natural Hazard Mitigation Plan

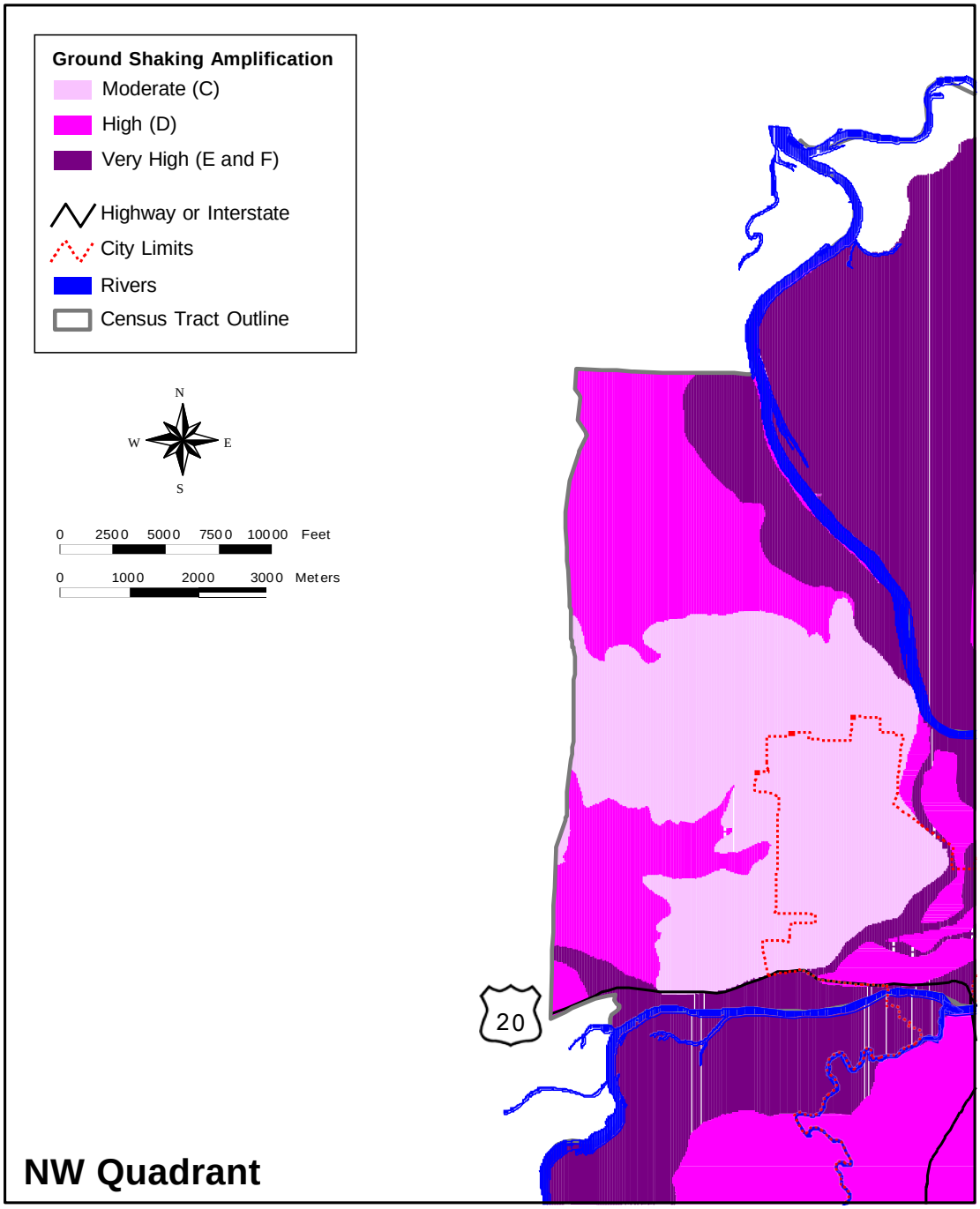
**Amplification**

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.[9] Amplification can also occur in areas with deep, sediment filled basins.

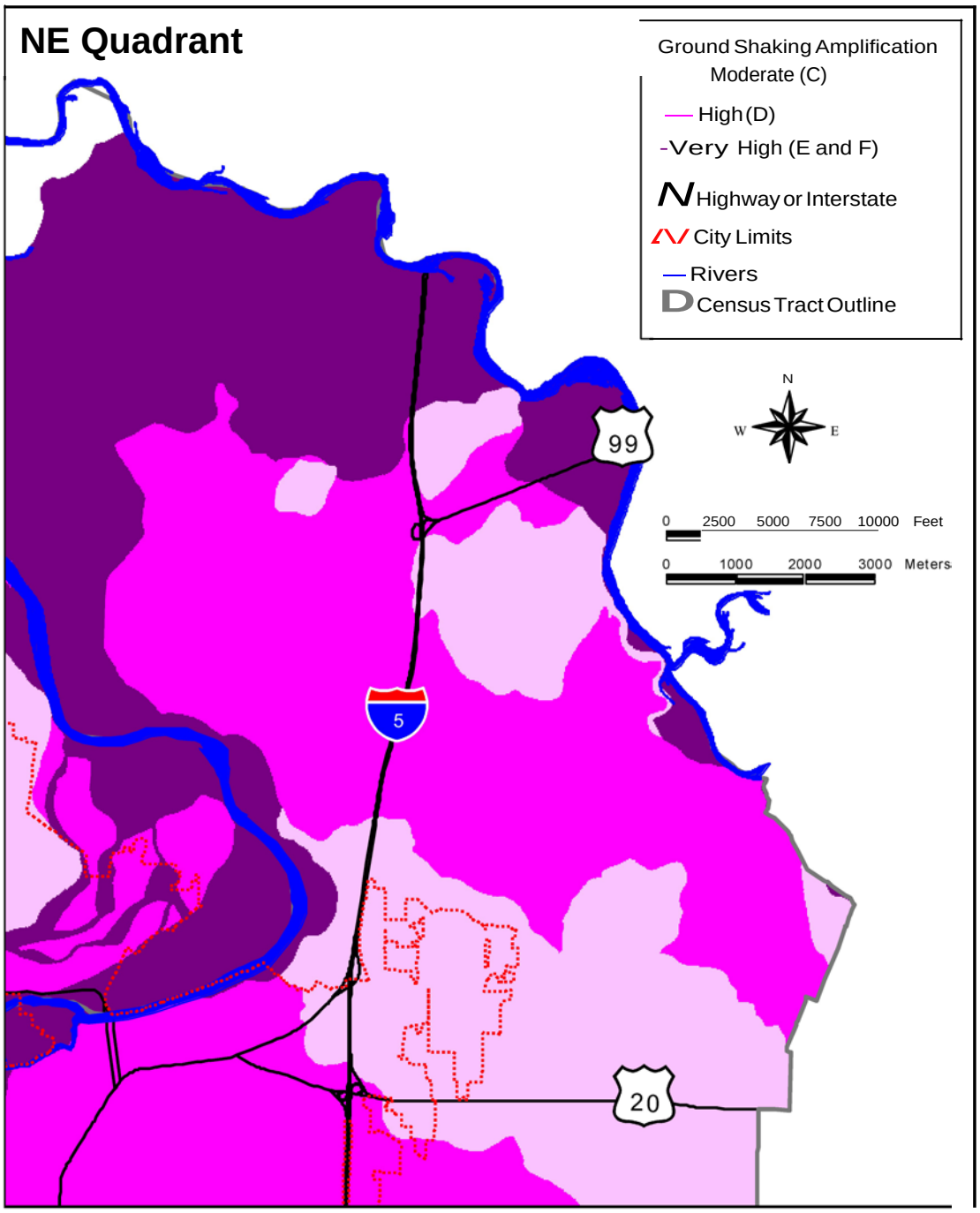



**Source for all City of Albany Amplification: DOGAMI**

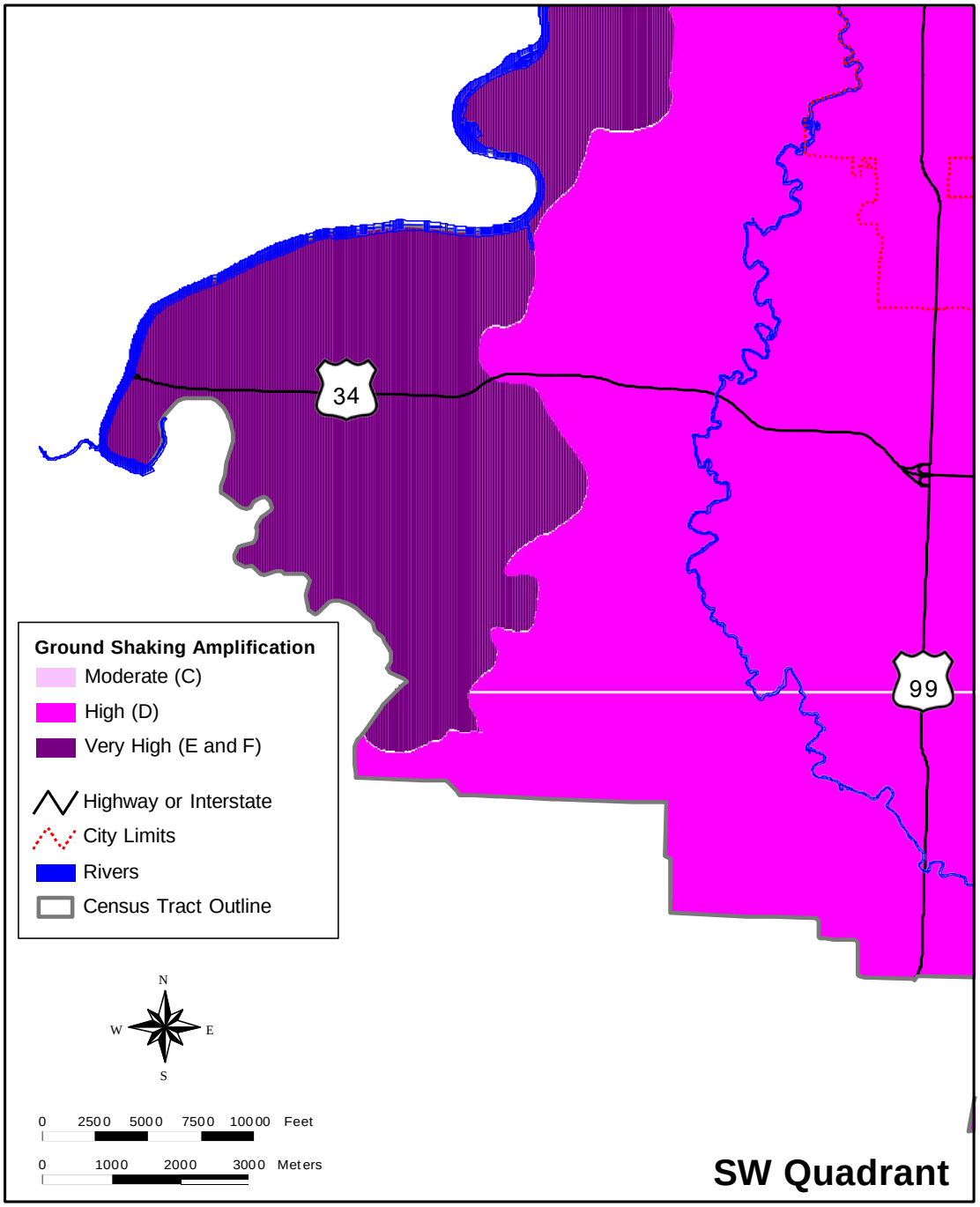
## Relative Ground Shaking Amplification Susceptibility Map
## City of Albany, Benton & Linn Counties, Oregon



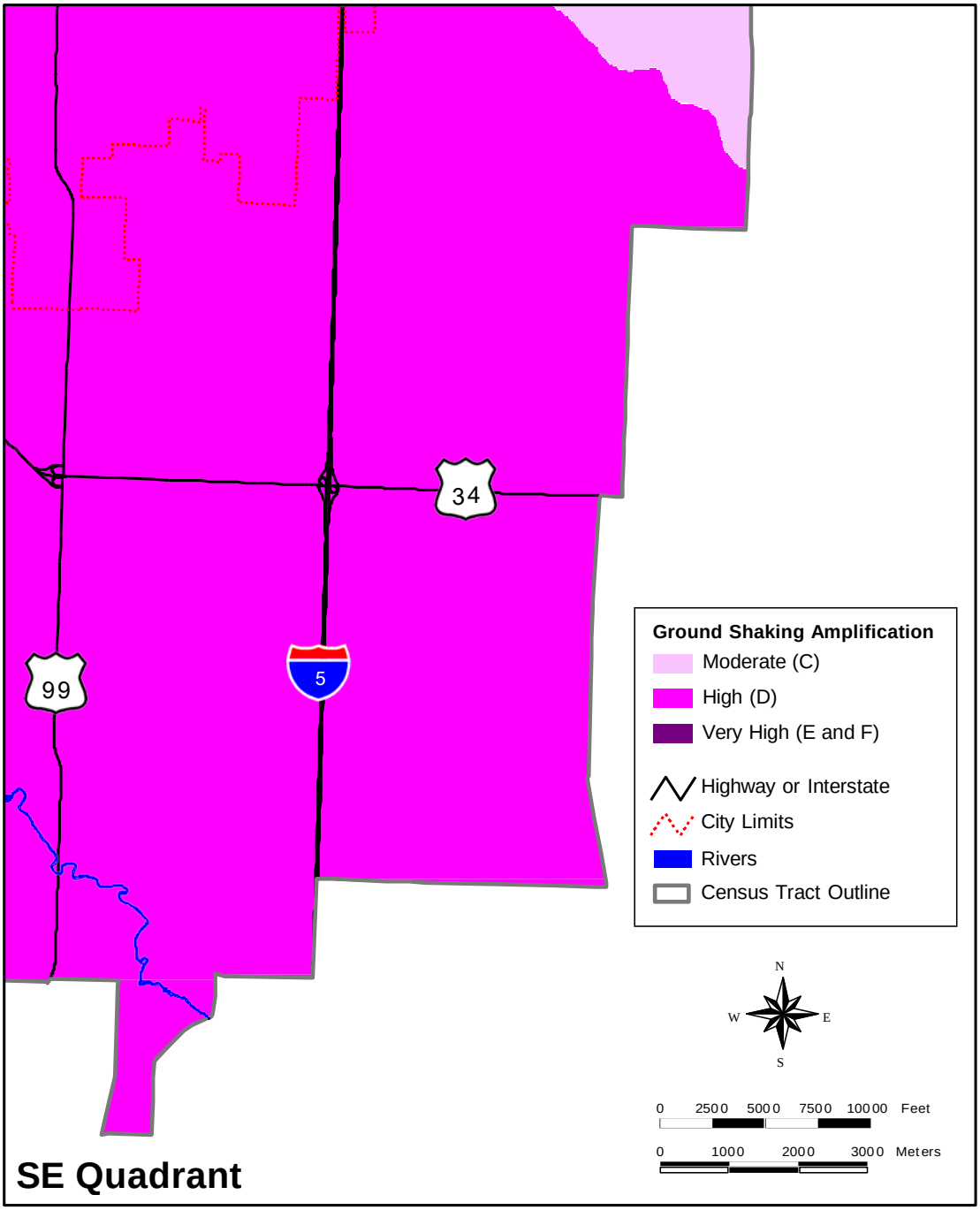
**Relative Ground Shaking Amplification Susceptibility Map**
**City of Albany, Benton & Linn Counties, Oregon**



**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 geographical position of the city of Albany makes it susceptible to earthquakes from four sources: (1) the off-shore Cascadia Fault Zone; (2) deep intraplate events within the subducting Juan de Fuca plate; (3) shallow crustal events within the North America Plate; and (4) earthquakes associated with renewed volcanic activity. All have some tie to the subducting or diving of the dense oceanic Juan de Fuca Plate under the lighter continental North America Plate. Stresses occur because of this movement and there appears to be a link between the subducting plate and the formation of volcanoes some distance inland from the off-shore fault zone.

When crustal faults slip, they can produce earthquakes with magnitudes up to 7.0 and can cause extensive damage which tends to be localized in the vicinity of the area of slippage. Deep intraplate earthquakes occur at depths between 30 and 100 kilometers below the earth's surface. They occur in the subducting oceanic plate and can approach M7.5. Subduction zone earthquakes pose the greatest hazard. They occur at the boundary between the descending oceanic Juan de Fuca Plate and the overriding North American Plate. This area of contact, which starts off the Oregon coast, is known as the Cascadia Subduction Zone (CSZ). The CSZ could produce an earthquake up to 9.0 or greater.

The City of Albany has experienced a few historic earthquakes centered in the region. The area has been shaken historically by crustal and intraplate earthquakes and prehistorically by subduction zone earthquakes centered outside the area. The most devastating future earthquakes will probably originate along shallow crustal faults in the region and along the Cascadia Fault Zone. Deep-seated intraplate events, such as occurred near Olympia, Washington in 1949 and 2001, could generate magnitudes as large as M7.5.

Earthquake-associated hazards include severe ground shaking, liquefaction of fine-grained soils, and land sliding. The severity of these effects depend on several factors, including the distance from the earthquake source, the ability of soil and rock to conduct seismic energy and the degree (angle) and composition of slope materials. Earthquakes produced through volcanic activity could reach magnitudes of M5; however, the Cascade volcanoes are some distance away from populated centers, which tends to lessen the risk.

**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. In 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 were 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 6.1. Most are in the 2.5 to 3.9 range. In 1993, Scotts Mills, had the distinction of having the largest earthquake in Oregon's history with a 5.7 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.[10] 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.

**September 21, 1993, Klamath Falls Earthquakes – Magnitude 5.9**

The most damaging far-inland earthquakes of the century occurred in the California-Oregon border region. These earthquakes occurred along faults which are part of the northernmost Basin and Range geologic province. Significant damage occurred in older unreinforced brick buildings in the Klamath Falls area, approximately 200 miles south of Linn County. Rock falls caused the death of one motorist. This sequence illustrates that inland communities, although not as frequently hit as coastal regions, are also vulnerable to strong earthquakes

**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.[11] This earthquake disappeared quickly from headlines, most likely because residents were still recovering from the Columbus Day Storm.[12] 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 parts 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 could 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 unreinforced masonry ranging from one to five 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, built prior to seismic safety standards, so in a significant earthquake, many will be moved off their foundations. Most of Albany is located on flat land, but many homes in North Albany 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 a little is replaced 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 and seismically updated in 2009. The wastewater treatment plant was substantially upgraded and expanded in 2009; all structures built or remodeled now meet current State of Oregon earthquake standards. Wastewater pipes are located in the same area as water pipes so significant damage to this system is expected also. A new intake, pumping and treatment facility was built in 2005 along the Santiam River north of Albany to serve the cities of Albany and Millersburg. These structures have been built to the State of Oregon's latest earthquake 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. 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 has 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. Albany 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 cost to clean up the damages. The Uniform Building Code classifies commercial buildings within categories A through F with residential buildings recognized as C, D1, and D2. All structures are assigned to a seismic design category based on their seismic use group, I - 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 one-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 earthquake's 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 one 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 earthquakes are located in the downtown business district. This is where the multi-level buildings are located, most with unreinforced 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 buildings 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-1970s 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 1960s.

The City of Albany has approximately 83 bridges within the city limits. The breakdown of ownership is: Benton County, one; 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 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 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 Facilities**
Critical facilities include police stations, fire stations, hospitals, water and wastewater systems, 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. Fire Station 12 has been seismically upgraded. Other City facilities are older buildings which do not meet current codes. Fire station 11 and the police station do not presently meeting current seismic code, but new stations are being built which will meet the new standards.

**Businesses**
Seismic activity can cause great loss to businesses, to 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 those losses. The downtown core business area has the oldest buildings in the city. Most are unreinforced masonry built in the early 1900s. These buildings meet no earthquake standards and are very susceptible to any earthquake that may occur. Even outside the core area, 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 thought an earthquake would 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.[13]

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 earthquakes 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 they do for 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 firefighting 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 is part of a regional debris management plan. One of our action items in the 2015 plan is to write 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. In 2008 the City of Albany received a grant from FEMA to collect specific information on commercial and residential buildings in

the City and to add local utility information for more accurate estimates. In 2016, a new Cascadia HAZUS run will be added to the Plan.

**General description of Albany area used in estimates**

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 it 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 17,000 buildings in the region with a total building replacement value (excluding contents) of $3,155,000,000. 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 between $350,000,000 and $1.9 billion, respectively.

HAZUS estimates there are 17,000 buildings in the region which have an aggregate total replacement value of $3,155,000,000. Wood frame construction makes up 85% of the building inventory. HAZUS identified the following critical facility inventory: one hospital, 26 schools, two fire stations, three police stations, 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 and 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; 131 leaks and 65 breaks in 564 kilometers of waste water pipelines; 140 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. The 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 two communications locations. There will be 266 leaks and 192 breaks in 940 kilometers of potable water pipelines; 210 leaks and 152 breaks in 564 kilometers of waste water pipelines; 225 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**

The model provided by DOGAMI indicates that no fires will occur following a Cascadia earthquake. 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 at 2:00 a.m., 2:00 p.m. and 5:00 p.m. 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 million; 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<br>Income impact | 0<br>(33) | 0<br>-7.14 |
| Second Year | Employment impact<br>Income impact | 0<br>(49) | 0<br>-10.45 |
| Third Year | Employment impact<br>Income impact | 0<br>(55) | 0<br>-11.83 |
| Fourth Year | Employment impact<br>Income impact | 0<br>(55) | 0<br>-11.83 |
| Fifth Year | Employment impact<br>Income impact | 0<br>(55) | 0<br>-11.83 |
| Years 6 to 15 | Employment impact<br>Income impact | 0<br>(55) | 0<br>-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 building damages will total about $6 million. 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 at 2:00 a.m., 2:00 p.m. and 5:00 p.m. 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 millions 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<br>Income impact | 0<br>(37) | 0<br>-8.05 |
| Second Year | Employment impact<br>Income impact | 0<br>(61) | 0<br>-13.21 |
| Third Year | Employment impact<br>Income impact | 0<br>(72) | 0<br>-15.39 |
| Fourth Year | Employment impact<br>Income impact | 0<br>(72) | 0<br>-15.39 |
| Fifth Year | Employment impact<br>Income impact | 0<br>(72) | 0<br>-15.39 |
| Years 6 to 15 | Employment impact<br>Income impact | 0<br>(72) | 0<br>-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.

**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. Provide diverse 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. Build and maintain a healthy economy.
2. Create a readily identifiable downtown core that is unique and vibrant with a mixture of entertainment, housing, specialty shops, offices, and other commercial uses.
3. Achieve 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.
2. Establish City government as a model of sustainability in practice.

## 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 addressed flood and winter storm hazards. It also outlined the interface between mitigation planning and emergency planning.

Phase Two was completed in September 2001 and covered earthquake impacts for Benton, Lane, and Linn counties. Phase Three was completed September 2002 and addressed hazardous materials in Benton, Lane, and Linn counties.[14]

**Capital Improvement Program**

The City of Albany's Capital Improvement Program (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 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). 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) was approved in September of 2012. It 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 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 that 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. **Support Annexes** – These Annexes provide additional information on Donation and Resource Management.
4. **Incident Annexes** – The Incident Annexes provides a check list when responding to a specific emergency. This list can be used by the on scene commander or the ECC director.

**Incident Command System**

The Incident Command System 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 (TSP) 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 identifies needs and improvements through 2030.

The TSP was developed through a public participation process. The development of the TSP and the transportation element of the Comprehensive Plan, are closely coordinated and intended to be consistent with other jurisdictions' transportation plans.

**Urban Forestry Program**
Albany's 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**
The City has completed its 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 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 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[15]

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 2014 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.[16]

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.[17]

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 rights-of-way 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. The 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 following action items have been identified by various stakeholders in the city of Albany. Full Action item worksheets can be found in Appendix F.

Action 3.5 Explore development of an ordinance/program to address seismically deficient buildings.

Action 5.1 Develop specific emergency evacuation or shelter-in-place plans for residential areas that are near significant hazard material storage facilities and heavy industrial areas.

Action 5.2 Evaluate city emergency transportation routes with city, county and state partners.

Action 6.2 Develop and implement a non-structural retrofit program for City staff offices and workspaces.

Action 6.3 Evaluate neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1950 homes.

Action 6.4 Evaluate city-owned bridges to determine which need to be seismically updated and seek appropriate funds.

Action 6.5 Conduct a vulnerability analysis of Albany's wastewater collection system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit.

Action 6.6 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.

Action 6.7 Evaluate the necessity for seismic valve protection for city of Albany reservoirs and if determined necessary seek funding to retrofit.

Action 7.4 Develop an education and outreach program to provide residents information about earthquake hazard and the availability of structural and non-structural mitigation opportunities.

Action 7.5 Provide five educational and outreach opportunities to residents on earthquake hazards and the availability of earthquake insurance.

Action 9.1 Develop a non-structural retrofit program aimed at making child care facilities, schools, city offices and local businesses more resistant to the impact of earthquake.

Action 9.2 Develop public/private partnerships to seek outside funding for retrofitting structures in the downtown and historic districts.

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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 United States Geologic Survey, Earthquake Hazard Program. http://neic.usgs.gov/neis/eq_depot/2004/eq_041226/; March 21, 2005

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

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

8 City of Portland Natural Hazard Mitigation Plan, 2004

9 Ibid.

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

11 Ibid.

12 Ibid.

13 Community Planning Workshop, 2002

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

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

16 Blaine Brassfield, City of Albany building Official.

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

# 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 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 economy in the city of Albany by creating conditions that disrupt essential services such as public utilities, telecommunications, and transportation. Such storms can produce rain, freezing rain, ice, snow, and cold temperatures as well as high winds and tornadoes. Ice storms, freezing rain and high winds can destroy trees and power lines, interrupting utility services and transportation routes.

## Severe Weather Event Characteristics

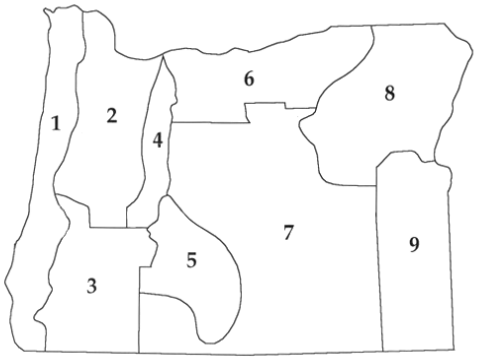
### Weather Patterns

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 southwest off the Pacific Ocean.[2] Albany gets 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 40.91 inches. The National Climatic Data Center has established climate zones in the U.S. 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 8-1. The climate in Zone 2, including 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 summer 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 (June – August) and rarely drop below 25° F in the winter months (November – March). Precipitation ranges from as low as .36 inches in July to as high as 7.05 inches in February. Average snowfall since the mid-1960s has been 5.9 inches, occurring between November and March.[4]

**Figure 8-1**
**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 8-2, and 8-3 and Table 8-1, 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 60 years. Damage was widespread, downing trees and power lines, with winds that gusted as high as 90 mph (144 km/hour). Statistically, one high-wind storm occurs every 10 years.

In all 13 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 40 years, as far fewer people had electricity, and not as many critical facilities existed.

Each of the 13 storms caused significant damage to buildings, trees, and infrastructure. That damage potential has risen over the last 40 years as more buildings have been constructed in Albany.

**Figure 8-2**

**Wind Speed Contours for 2-Year Recurrence Interval**

**(km/hour)**

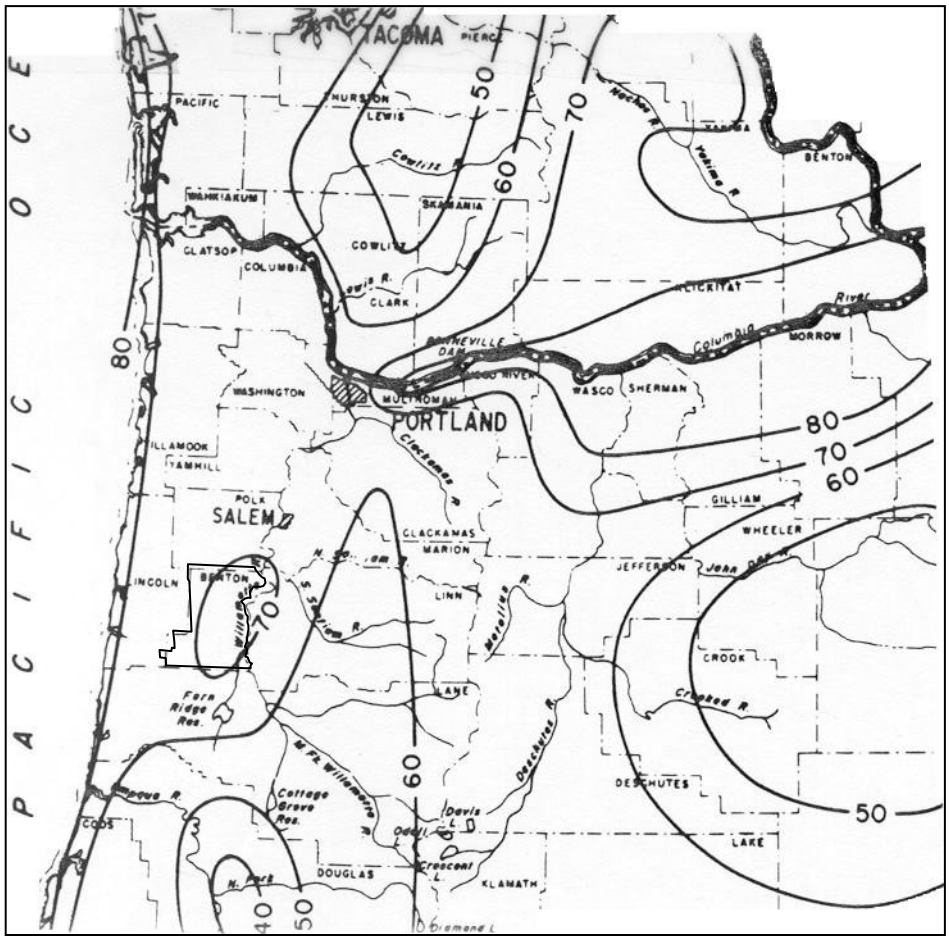
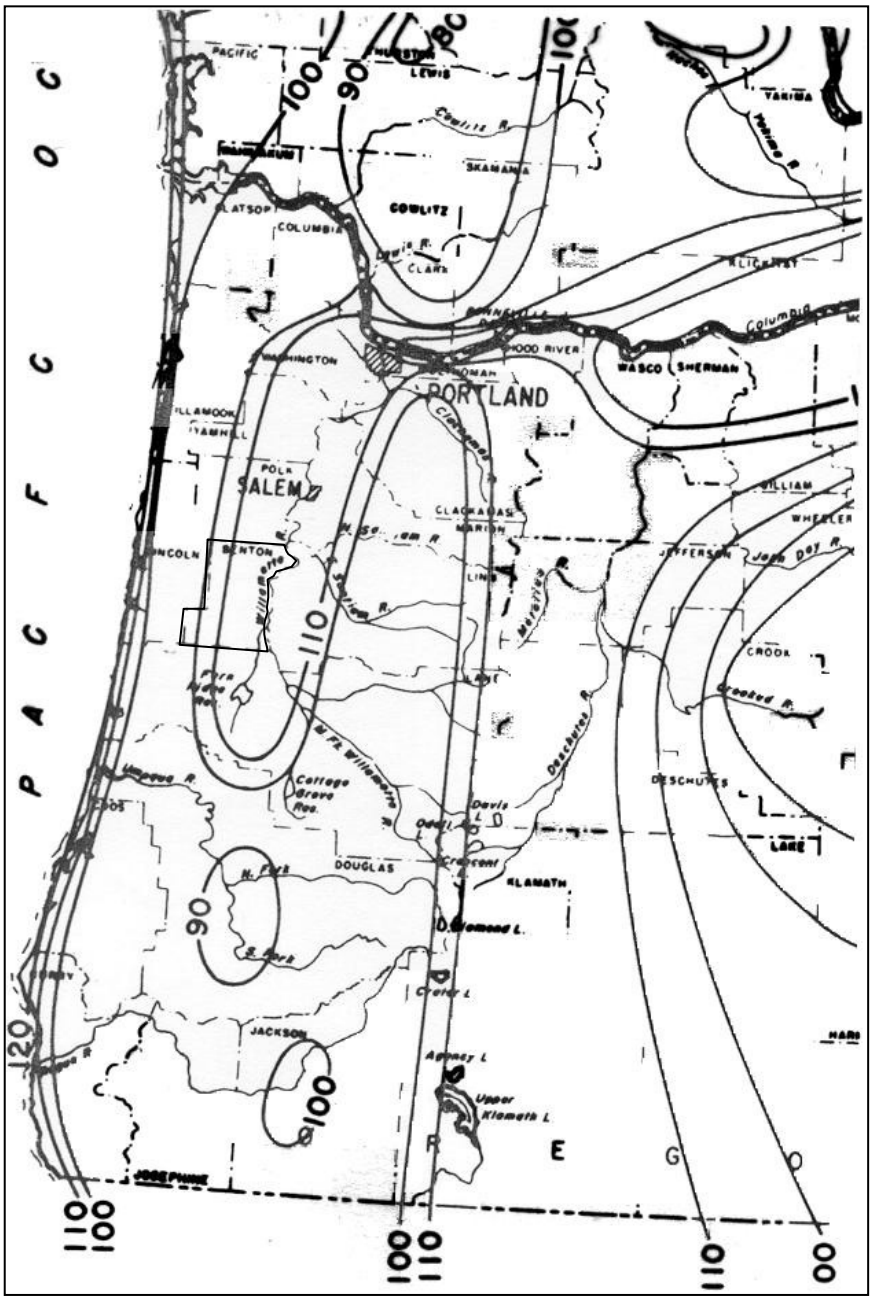


**Figure 8-3**

**Wind Speed Contours for 50-Year Recurrence Interval**

**(km/hr)**




Data from the above maps is summarized below in Table 8-1

**Table 8-1**

**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 - 70 km/hour or about 37 - 43 miles per hour. These 2-year wind speeds are too low to cause widespread substantial 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 - 115 km/hour or about 62 - 71 miles per hour. These wind speeds are high enough to cause widespread 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 tornadoes in Oregon by the National Climatic Data Center includes 105 tornadoes statewide with several occurring in the Albany area.[7]

**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. From 1884 to the present, there have been at least 16 significant snow events in Albany. Six of these have occurred since 1998. The last was on February 7, 2014.[8]

**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.[9] Freezing rain can be the most damaging of ice formations. While accumulated sleet and hail can create hazards for motorists, 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 17.7 square miles where the terrain is relatively flat. Elevations range from 210 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. Two bridges span the Willamette River in downtown Albany and carry 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 that 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 has been difficult to locate. Record searches indicate that, as far back as the 1880s, 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, 1995, 2003-2004, and twice in 2014.[10] Former State Climatologist George Taylor states that, on average, one ice storm occurs every 10 years. Ice storms 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, and traffic accidents that have damaged power lines. Secondary to the power problem is the transportation problem. The area is not set up to deal with routine ice problems like other areas of Oregon or the United States. No immediate de-icing program exists to make the roads usable. This leads to many accidents which creates increased difficulties for emergency responders. Generally, ice storms develop over a 1-4 hour period, and can last for 1-4 days. The February 2014 winter storm was a Presidential Declared Disaster for Benton, Lane, Lincoln and Linn counties in Oregon (FEMA disaster #4169). According to the National Climatic Data Center, 5 to 9 inches of snow fell on the southern Willamette Valley. Snow turned to sleet, then freezing rain, resulting in downed limbs and power lines. The Oregon State Police warned drivers not to travel on Interstate 5 between Salem and Eugene due to icy roadways.

The "Oregon Weather Book" (1999), identified a number of ice storms in Oregon. Some were confined to the area near the Columbia Gorge, but others were much more widespread, affecting the entire Willamette Valley or most of western Oregon. The following described ice storm events are similar to the storm that occurred in February 2014. Information concerning the January 6 – 9, 2004 storm event was provided by the National Climatic Data Center. [11]

**Jan. 5-7, 1942**. Moist, warm air from the south and southwest met cold air coming through the Columbia River Gorge. In some areas there was considerable sleet, followed by freezing rain. Throughout the middle and upper portions of the Willamette Valley the precipitation was mostly freezing rain, which resulted in heavy accumulations of ice on all exposed surfaces. Roads and streets became dangerous for travel, orchard and shade trees were damaged, and telephone, telegraph, and power wires and poles were broken down.

**January 1950**. Severe blizzard conditions on January 13 and a heavy sleet and ice storm on January 18-19 caused several hundred thousand dollars' worth of damage (1950 dollars) and virtually halted traffic for two to three days. The Columbia River Highway was closed between Troutdale and The Dalles, leaving large numbers of motorists stranded, then removed to safety by rail. Damage to orchard crops, timber, and power services was common, costing thousands of dollars.

**Jan. 30-31, 1963**. Substantial snowfall amplified by moderate to severe icing conditions produced hazardous highways. Large numbers of power lines were downed due to large amounts of ice or felled trees. Injuries, one reported death, and statewide school closures were due to the icy streets and highways.

**Nov. 22-23, 1970**. Freezing rain caused severe glazing across western Oregon, especially in Corvallis, Albany, Salem, Independence, and Dallas. Ice accumulations up to a half-inch thick broke thousands of tree limbs and telephone lines. Hazardous traffic conditions, power and phone outage, and felled trees were common.

**Jan. 11-12, 1973**. Rain glazed streets and highways, contributing to numerous car, bus and truck accidents and persons injured in falls. Most hospitals reported full-house conditions. Glaze of one-quarter to half an inch was common in the Willamette Valley, with up to three-quarters of an inch of ice covering all surfaces in the West Hills of Portland.

**Jan. 6-9, 2004**. A strong winter storm packing the powerful punch of a frigid arctic airmass, heavy snow, sleet and freezing rain, along with strong east winds through and near the Columbia River Gorge snarled travel, forced the closure of most schools and businesses, and resulted in widespread power outages and property damage in northwestern Oregon. Snowfall totals in the Willamette Valley ranged from 2 to 8 inches. Accumulations of up to 2 inches of sleet and freezing rain followed the snowfall.

**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. From 1884 to the present, there have been at least 15 significant snow events in Albany. The last was in 2014. The following are the dates, one day amounts and total storm accumulations for previous storms in Albany:

**Table 8-2**
**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 – January 2004 | 3.8” | 2 – 8” |
| February 7 – 9, 2014 | | 5 – 9” |

Source: Data for City of Albany from Western Regional Climate Center Website: www.wrcc.dri.edu; National Climatic Data Center, 2015.

**High Winds**

Since 1880, there have been 13 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 local storms, people have been killed, and in a fourth, there were four injuries. The most significant high wind event was the Columbus Day Storm, October 12, 1962, the storm against which all subsequent storms are measured. In the 1960s, there were three high wind storms; in the 1970s, one; 1980s, one; 1990s, one; 2002, one; and 2012, one. The 1995 (FEMA disaster # 1107) and 2002 (FEMA disaster # 1405) high wind events were Presidential Declared Disasters.

**Table 8-3**
**Significant Windstorms[12,13]**

| DATE | AFFECTED AREA | CHARACTERISTICS |
|---|---|---|
| April 1931 | Western Oregon | Unofficial wind speeds reported at 78 mph. Damage to fruit orchards and timber. |
| Nov. 10-11, 1951 | Statewide | Widespread damage; transmission and utility lines; wind speed 40-60 mph; gusts 75-80 mph. |
| December 1951 | Statewide | Wind speed 60 mph in Willamette Valley. 75 mph gusts. Damage to buildings and utility lines. |
| December 1955 | Statewide | Wind speeds 55-65 mph with 69 mph gusts. Considerable damage to buildings and utility lines. |
| November 1958 | Statewide | Wind speeds at 51 mph with 71 mph gusts. Every major highway blocked by fallen trees. |
| October 1962 | Statewide | Columbus Day Storm; Oregon’s most destructive storm to date. 116 mph winds in Willamette Valley. Estimated 84 houses destroyed with 5,000 severely damaged. Total damage estimated at $170 million. |
| March 1971 | Most of Oregon | Greatest damage in Willamette Valley. Homes and power lines destroyed by falling trees. Destruction of timber in Lane Co. |
| November 1981 | Most of Oregon | Highest winds since Oct. 1962. Wind speed 71 mph in Salem. Marinas, airports and bridges severely damaged. |
| January 1990 | Statewide | Heavy rain with winds exceeding 75 mph. Significant damage. One fatality. |
| December 1995 | Statewide | Followed path of Columbus Day Storm. Wind speeds 62 mph in Willamette Valley. Damage to trees (saturated soil a factor) and homes. (FEMA-1107-DR-OR) |
| November 1997 | Western Oregon | Wind speed 52 mph in Willamette Valley. Trees uprooted. Considerable damage to small airports. |

| | | |
|---|---|---|
| February 7-8, 2002 | Western Oregon | Strongest winds in 40 years in parts of Linn and eastern Lane counties. Wind gusts of 50 – 70 mph caused trees to fall, damaged homes, cars and businesses. Extensive damage to utilities. Estimated damage costs: $6.14 million. (FEMA-1405-DR-OR) |
| December 4, 2012 | Western Oregon | A Pacific cold front brought strong southerly winds to the North and Central Oregon Coast. Weather spotter near Lebanon reported peak wind gust of 62 kts. (71 mph). |

**Tornadoes**

Tornadoes have occurred in Albany and surrounding areas. Since 1925, from Eugene to McMinnville, there have been 26 reported tornadoes. Two tornadoes occurred in Albany during the 1990s, the first on May 23, 1990, and the second on March 22, 1994. The 1990 tornado produced three 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.[13]

**Table 8-4**
**Recorded Tornadoes[14]**

| DATE | COUNTY | RESULT |
|---|---|---|
| January 1887 | Lane | Fences damaged; livestock losses; trees uprooted. |
| 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 uprooted near Eugene. |
| May 1990 | Linn | Three funnel clouds spotted near Albany; no confirmation of touch down. |
| November 1991 | Marion | Barn damaged near Silverton. |
| March 1994 | Linn | Damage to a shopping area in Albany. |
| December 1996 | Lane | Damage to a residential area caused by fallen trees. |
| May 1997 | Marion | Trees uprooted and barn damage near Keizer. |
| June 1997 | Benton | Observed by pilot 15 miles west of Albany. No known damage. |
| September 1997 | Marion | Minor fence and window damage near Turner. |
| October 1998 | Marion | Observed in Silverton. No damage or injuries. |
| December 1999 | Lane | Roof damage and mill slash burner tipped over in Creswell. One unconfirmed injury. |
| December 2006 | Marion | Damage to barn and RV northeast of Salem. |

| | | |
|---|---|---|
| September 2007 | Linn | Six farm buildings damaged near Lebanon; 90 to 100 trees damaged. |
| June 2009 | Linn | Damage to a shed near Peoria. |
| December 2010 | Marion | An EF-2 rated tornado with 5-mile path 150 yards wide caused $1.2 million in damage in Aumsville. Two minor injuries. |
| June 2013 | Yamhill | EF-1 tornado touched down in McMinnville. Tree damage and wind-thrown industrial equipment. |
| April 2015 | Lane | Three vehicles damaged at Lane Community College in Eugene. |

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

- NOAA National Climatic Data Center database - http://www.ncdc.noaa.gov/stormevents/
- National Weather Service - http://www.wrh.noaa.gov/pqr/
- Oregon State University – Oregon Climate Service - http://www.ocs.oregonstate.edu/
- Climate of Oregon Narrative, NWS - http://www.wrcc.dri.edu/narratives/OREGON.htm
- State of Oregon Natural Hazard Mitigation Plan – http://www.oregon.gov/LCD/HAZ/pages/nhmp.aspx

## Probability of Future Winter Storm Events

**Snow Storms**

Winter snow storms are rare in this part of the valley. When they do occur, they are not usually severe. 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 recorded or causing 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: one in 1998 - 1999 and the other in 2003. Before the 1993 snow storm, the valley saw a one to three-year gap between storms with an 18-year gap between 1971 and 1989. Since 2003 however, there have been four noteworthy snow storm events. In January 10 – 12, 2007, up to 4 inches of snow fell in the Willamette Valley, resulting in school closures and perilous driving conditions. Up to 10 inches of snow fell in parts of the Willamette Valley on January 27 – 28, 2008, and Corvallis saw up to 5 inches of snow on February 24 – 25, 2011. The most recent heavy snow event occurred on March 21, 2012. A total of 5 inches of snow was reported in Eugene, Lebanon and Brownsville, and up to 4 inches of snow fell in Albany. This snowstorm resulted in road closures and power outages due to falling trees.

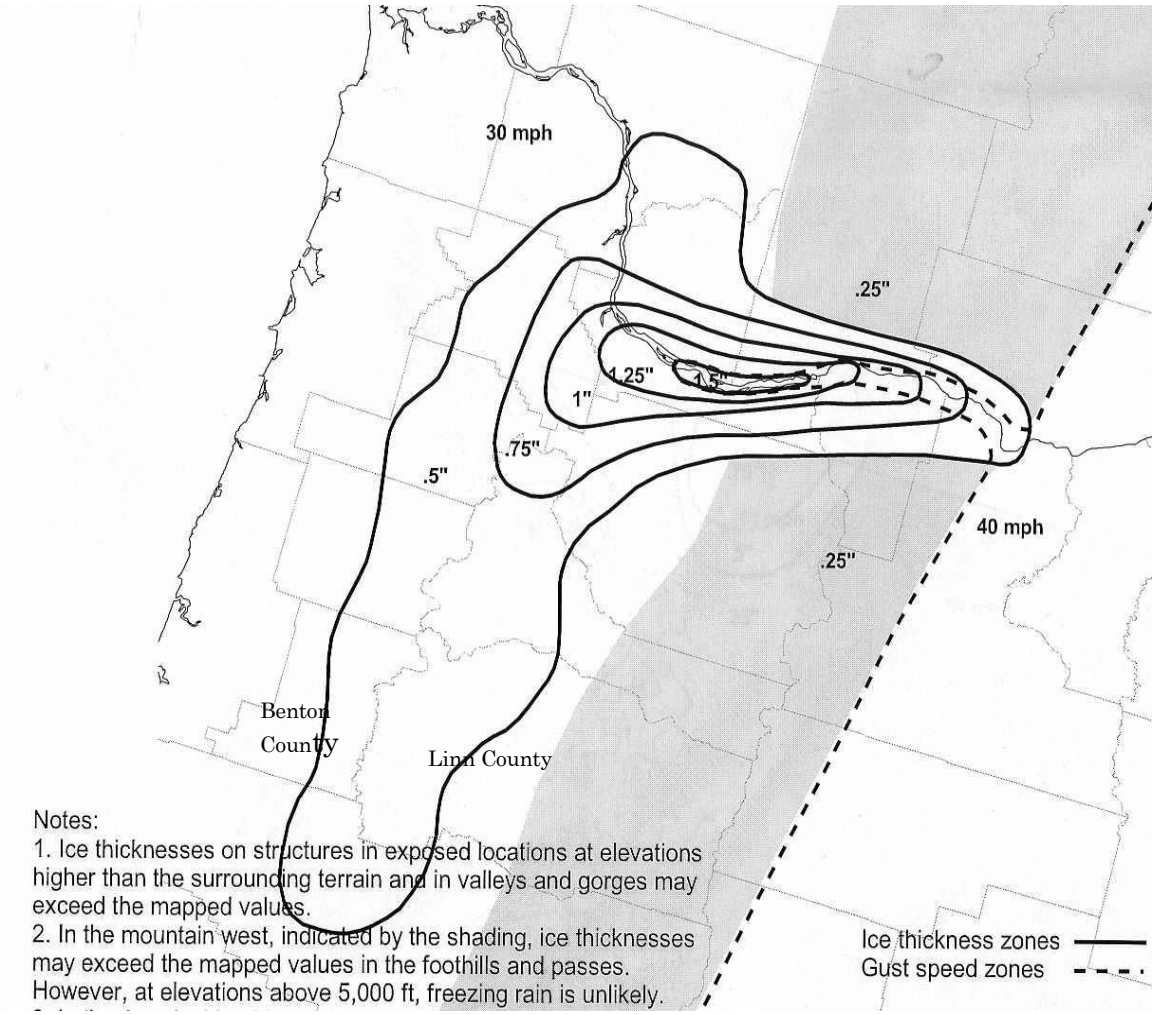
**Ice Storms**

Review of the historical data above indicates an average of one ice storm every 10 years. Given this information, it is most likely we will continue to have future ice storms at this same interval. Though they do not occur on regular intervals but within a certain time period, we can expect at least one to occur between 2015 and 2024.[16]

The National Climatic Data Center (NCDC) database shows four ice storms or freezing rain events for the Southern Willamette Valley between 1993 and 2014; two of which occurred in 2014. The February 8, 2014 storm began with 5 to 9 inches of snow followed by sleet and freezing rain, resulting in power outages and hazardous driving. The second 2014 event happened on November 13 – 14$^{th}$, with reports of sleet and freezing rain in amounts upwards of ½ inch in Corvallis and Dallas.

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 8-4 below) shows about 0.5" of ice for Benton County, with ice thickness decreasing westward from the Willamette Valley. One hundred-year and 400-year ice thicknesses for Benton County are about 0.75" and 1.0," respectively.

**Figure 8-4**
**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.[17]

**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 every 10 years is likely and, since our last significant wind storm was in 2012, we can expect at least one more significant wind storm to occur by 2022.[18]

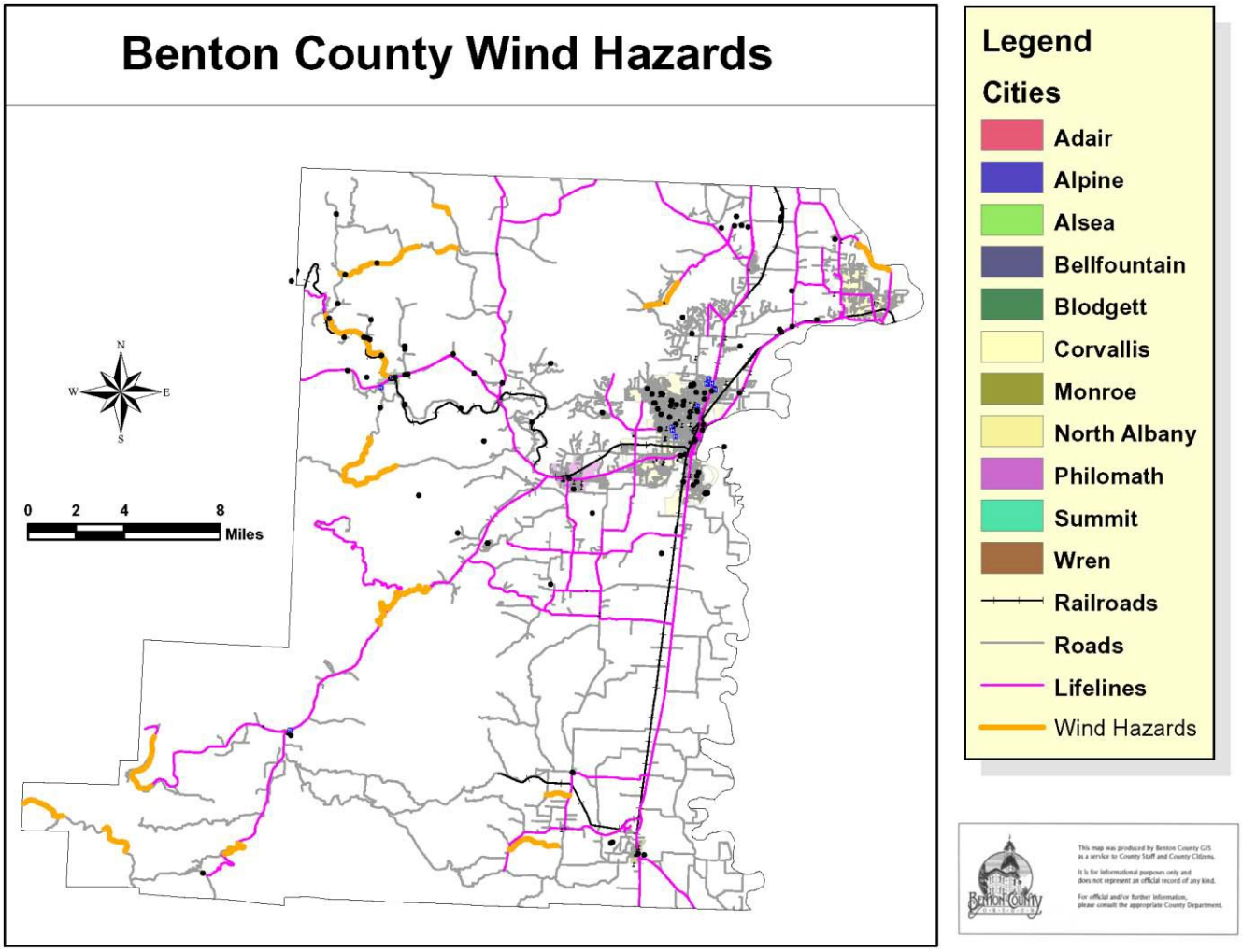
According to the Benton County Natural Hazard Mitigation Plan, the one-year recurrence interval sustains wind speeds range from 37 – 43 mph (59 – 68 km/hour) and can cause significant local wind damage at sites with especially exposed locations. The 50-year recurrence interval wind speeds range from about 62 – 71 mph (99 – 113 km/hour), high enough to cause widespread damage. 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 Albany sits.[19]

**Table 8-5**
**Effects of Wind Speed** [20]

| 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 antennae; 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. |

**Benton County Wind Hazard: Locations with a History of Wind Damage[21]**



**Tornadoes**

Tornadoes in the Albany area are relatively rare. In 1990 three funnel clouds were spotted in the Albany area; and in 1994, a weak tornado damaged a shopping center in the city. In general, tornadoes occur somewhere in the Willamette Valley about once every four years. The potential for tornadoes has increased in the last 15 years. The first documented EF-2 tornado in the southern Willamette Valley struck the community of Aumsville on December 14, 2010, causing $1.2 million in damage and two injuries. It is likely another tornado will occur in the vicinity of the city of Albany within the next 10 years.[22]

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.[23]

## 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 snowfall, power outages from snowfall 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. This will put a strain on emergency services. Also, snowfall means lower temperatures which have a tendency to mean more structure fires created by using unsafe heating methods. In large snowfalls, businesses may suffer because of the inability of workers to get to work because of road conditions. This generally lasts for only a couple of days. Home owners are often not prepared for the cold weather associated with snowfall which means that water pipes often break. Snowfall typically does not have as significant an impact on the total population of the city as freezing rain or extreme cold weather.

**Ice Storms**

Historical records indicate that Albany and the surrounding area are vulnerable to power outages during ice storms. During one 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 2½ days there. 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 occurs, it will affect the entire population. The first effect will be power loss to the residences and businesses. As with ice events, power will be interrupted by downed lines as a result of trees blowing over or branches falling onto 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 Albany strives to increase the tree inventory for beautification and livability. Debris clearing becomes a top priority for the City after high wind storms.[24]

**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 touches down.[25]

**Winter Storm Event Community Impact**

**Life and Property**
Winter storms can have a significant impact on life and property. Many deaths in severe winter storms 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 6) and landslides (see Section 10) 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 Albany, 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 infrequency 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. The Oregon Department of Transportation will serve the state highways that go through Albany, while Albany Public Works will keep emergency transportation routes open on local streets by sanding with City equipment and/or contracting with local vendors.

High winds can cause prolonged and extreme traffic disruptions.

**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 in part on electrical service to keep the system operational; widespread power outages can interrupt that service.

Power loss is also a concern to businesses that 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 broken home water lines. Breaks frequently occur during severe freeze events as well as during extreme cooling periods through October, November, and December. In almost every severe winter storm previously described, broken pipes led to the closures of schools and business throughout Albany. 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 this plan was developed, the City did not have sufficient data to identify the types and numbers 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-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 program was completed in December 1998 and provided a Flood Hazard Mitigation Planning Template for

Local Government, a mitigation planning methodology and addressed 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 2001 and included earthquake impacts for Benton, Lane, and Linn counties. Phase Three of the program was completed in September 2002 and dealt with hazardous materials in Benton, Lane, and Linn counties.[26]

**Capital Improvement Program**

The City of Albany's Capital Improvement Program (CIP) is a dynamic document that lists and prioritizes needed improvements and expansions of the City's infrastructure to maintain adequate service to current 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 severe weather events by improving infrastructure most prone to damage.

**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). 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 have been 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. **Resources** – The addenda include the Emergency Resource Guide, emergency call list, mutual aid agreements and memoranda of understanding, 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 includes the Incident Command System, for 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 (TSP) is a supporting document of 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 identifies needs and improvements through 2030. The TSP was developed through a public participation process. The development of the TSP and the transportation element of the Comprehensive Plan are closely coordinated and intended to be consistent with other jurisdictions' transportation plans.

**Urban Forestry Program**
Albany's 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 trees on public rights-of-way. The permitting system provides an opportunity to specify failure-resistant species 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**
The City has completed its 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. To further this goal, "The City of Albany is currently working on long-range tree preservation planning. This will help drive development away from hazard-prone areas, and attempt to increase the City's ability to mitigate for disasters."

**PacifiCorp Right Tree, Right Place**
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 of them. Dangerous buildings include 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 following action items have been identified by various stakeholders in the city of Albany. Full action item worksheets can be found in Appendix F.

Action 4.2 Develop pre-storm strategies for coordinated debris removal following wind and winter storms.

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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] Oregon Climate Service

[5] Ibid.

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

[7] National Climatic Data Center, 2015.

[8] Ibid.

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

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

[11] National Climatic Data Center, 2015.

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

[13] National Climatic Data Center, 2015.

[14] City of Albany Hazard Analysis 2004, Tornadoes

[15] National Climatic Data Center, 2015.

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

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

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

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

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

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

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

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

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

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

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

# Section 9: Wildfire

## Why is wildfire a threat to the City of Albany?

Wildfire is defined as an uncontrolled burning of wildland (forest, brush or grassland). Although fire is a natural part of forest and grassland ecosystems, a wildfire can pose a significant risk to life and property in wildland/urban interface areas. The urban interface is the area at the urban-rural fringe where homes and other structures are built into a forested or natural landscape. If left unchecked, fires in these areas can threaten lives and property.

Albany's climate is characterized by warm dry summers. During the summer fire season, the danger of fire in the city increases as the trees, brush and grassland dries, increasing the potential for a conflagration. The forest lands in eastern Linn County are subject to annual small to moderate fires caused by human and other natural causes such as lightening.[1]

Much of the Willamette Valley in western Linn County is dominated by grass seed fields. In 1948, Oregon's grass seed farmers began burning their fields to control disease and dispose of straw. In 1988, grass smoke from a controlled burn in a field adjacent to Interstate 5 between Albany and Highway 34 intruded across the interstate, causing a 24-car pile-up. Thirty-eight people were injured and seven people died. Since then, legislation has been adopted restricting but not eliminating the burning of fields. Grass farmers have developed alternatives to burning and currently burn fewer acres than allowed by law. [2] In June of 2009, the Oregon Legislature passed Senate Bill 528[3], further reducing the acres growers are allowed to burn.

Burning of any kind is a potential threat to safety. Forest slash burns, grass field burns, and residential back yard burning in the wildland/urban interface all have the potential to ignite wildfire, threatening health, life and property.

## Causes and Characteristics of Wildfire Hazards

The characteristics of fire are important to understand when trying to mitigate its negative effects on humans and structures. In order for fire to exist, the three components of the fire triangle must be present: fuel, heat, and oxygen.[4]

Most naturally-caused fires are initiated by lightning strikes. Human-caused fires, both accidental and deliberate, are produced in many ways, including campfires, chimneys, torches, matches, fireworks, cigarettes, vehicles, military ordnance, and smoldering slash piles.[5] Whether natural or human-caused, the ignition is started because the fire triangle exists. Fire occurring in natural ecosystems begins as a point of ignition, burns outward into circles and, if escalated, spreads in the direction toward which the wind is blowing.[6] Additionally, when burning occurs on uneven terrain, the fire spreads upslope to eventually form broad ellipses.[7]

Effects of fire on ecosystem resources can represent damages, benefits, or some combination of both, depending largely on the characteristics of the fire site, the severity of the fire, the time period of valuation, and the values placed on the resources affected by the fire.[8] The ecosystems of most forests depend upon fire to maintain various functions. The use of fire for beneficial purposes is considered for

reducing fuel loads, disposing of slash, preparing seedbeds, thinning overstocked stands, increasing forage plant production, improving wildlife habitats, changing hydrologic processes, and improving aesthetic environments.[9] However, despite its beneficial values to ecosystems, fire has been suppressed for years because of its perceived effects on timber harvest and threat to human life. In addition, new development continues to push its way into what is termed as the "wildland/urban interface."

## The Interface

There are three categories of interface:[10]

- Classic wildland/urban interface exists where well-defined urban and suburban development presses up against open expanses of wildland areas;
- Mixed wildland/urban interface is characterized by isolated homes, subdivisions, and small communities situated predominantly in wildland settings; and
- Occluded wildland/urban interface exists where islands of wildland vegetation occur inside a largely urbanized area.

Unlike most other natural hazards, the wildland/urban interface is not designated by geography alone. Certain conditions must be present for significant interface fires to occur. The most common are hot, dry, and windy weather; the inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm committed resources; and a large fuel load (dense vegetation).[11]

Once a fire has started, several conditions influence its behavior, including fuel, topography, weather, drought, and development. These combined conditions are key elements for increased wildfire risk. The severity of the wildfire is ultimately affected by the severity of these conditions. For example, if a steep slope is combined with extremely low humidity, high winds, and highly flammable vegetation, a high–intensity wildfire may develop.

Since the 1970s, Oregon's growing population has expanded further and further into traditional resource lands such as forestland. The "interface" between urban and suburban areas and the resource lands created by this expansion has produced a significant increase in threats to life and property from fires, and has pushed existing fire protection systems beyond original or current design or capability.[12] Property owners in the interface are often unaware of the problems and threats they face. Therefore, many owners have done very little to manage or offset fire hazards or risks on their own property. Human activities also increase the incidence of fire ignition and potential damage.

The Oregon State Natural Hazards Mitigation Plan (OR-SNHMP) Region 3 Hazards Assessment identifies the following as wildland/urban interface communities in Linn County[13]:

- Albany
- Brownsville
- Clear Lake Resort
- Harrisburg
- Lebanon
- Marion Forks
- Mill City
- New Idanha
- Scio
- Sweet Home East
- Sweet Home West

There are many other rural residential areas in Linn County that may be subject to wildfire hazards because of their location in forested areas or on steep dry slopes. Examples of such rural residential exception areas include: Bartel's Canyon Estates, Cascadia, Middle Ridge, Mountain Home Drive, Mt. Tom/Wildwood Estates, Northernwood Drive, Powell Hills, Rodger's Mountain, Washburn Heights, the Upper Calapooia, and others.

## Fuel[14]

Fuel is the material that feeds a fire, and is a key factor in wildfire behavior. Fuel is classified by volume and by type. *Volume* is described in terms of "fuel loading," or the amount of available vegetative fuel. The *type* of fuel refers to the species of trees, shrubs, and grass that are present. Oregon, as a western state with prevalent conifer, brush, and rangeland fuel types, is subject to more frequent wildfires than other regions of the nation.

An important element in understanding the danger of wildfire is the availability of diverse fuels in the landscape, such as natural vegetation, manmade structures, and combustible materials. A house surrounded by brushy growth rather than cleared space allows for greater continuity of fuel and increases the fire's ability to spread. After decades of fire suppression, "dog-hair" thickets have accumulated. These enable high intensity fires to flare and spread rapidly.

Structures that are made of combustible material such as shake roofs and wood siding are especially susceptible to fire. Untrimmed bushes near these structures often serve as "ladder fuels," enabling a slow-moving ground fire to climb onto rooftops and into the crowns of trees. A crown fire is significantly more difficult to suppress than a ground fire and is much more threatening to structures in the interface.

Wildfire at the upper end of the wildfire intensity spectrum is likely to spread into the tops of the tallest trees in violent and discontinuous surges.[15] Fire that occurs at this severe end of the spectrum responds to its own convective winds, spreading rapidly as sparks from exploding trees ignite other fires many meters away.[16] Because of the many different possible fuels found in the interface landscape, firefighters have a difficult time predicting how fires will react or spread.

## Topography[17]

Topography influences the movement of air, thereby directing a fire's course. For example, if the percentage of uphill slope doubles, the rate of spread in wildfire will likely double. Gulches and canyons can funnel air and act as chimneys, which intensify fire behavior and cause the fire to spread faster. Solar heating of dry, south-facing slopes produces upslope drafts that can complicate fire behavior.

Unfortunately, hillsides with hazardous topographic characteristics are often desirable as residential areas. This underscores the need for wildfire hazard mitigation and increased education and outreach to homeowners living in interface areas.

The City of Albany's geography is characterized by mostly flat land with some hills in the North Albany in Benton County.

## Weather[18]

Weather patterns combined with certain geographic locations can create a favorable climate for wildfire. Areas where annual precipitation is less than 30 inches are extremely fire susceptible.[19] High-risk areas in Oregon share a hot, dry season in late summer and early fall when high temperatures and low humidity

favor fire activity. Predominant wind directions may guide a fire's path. In addition, many high intensity fires produce their own wind, which aids in the spread of fire.

Recent concerns about the effects of climate change, particularly drought, are contributing to concerns about wildfire vulnerability. The term *drought* is applied to a period in which an unusual scarcity of rain causes a serious hydrological imbalance.

Drought contributes to the frequency and intensity of fires. Unusually dry winters, or significantly less rainfall than normal, can lead to drier conditions and leave reservoirs and water tables lower. Drought leads to problems with irrigation and may contribute to additional fires, or additional difficulties in fighting fires. However, most fuel types, other than grasses, require two or three years of drought before the fuel becomes dangerously dry.

All areas of Linn County receive an average of more than 40 inches of rainfall per year. However, the county usually receives very little rainfall during the warm summer months, commonly going long periods with no measurable precipitation. During the summer fire season, the danger of fire in the forests and grasslands increases as the trees, brush and grassland dries and increases the potential for conflagration. The county is highly susceptible to lightning-induced fires during late summer Cascade thunderstorms.

## Development

Growth and development in forested areas is increasing the number of structures in the interface. Wildfire affects development, and development can influence wildfire. While wildfires have always been part of the ecosystem in Oregon, homes in the interface often lead to human ignition of fire. The increase in human development and activity in the interface combined with the high fuels content from years of fire suppression can create a lethal combination.

Homeowners often prefer lots that are private and have scenic views nestled in vegetation. A private setting may be far from public roads, or hidden behind a narrow, curving driveway. These conditions, however, make evacuation and firefighting difficult. The scenic views found along mountain ridges can also mean areas of dangerous topography. Natural vegetation contributes to scenic beauty, but it may also provide a ready trail of fuel leading a fire directly to the combustible fuels of the home itself. [20]

## Wildfire Hazard Assessment

The wildfire hazard assessment provides information on the location of wildfire hazards, the land and property characteristics within the hazard area, and an assessment of risks to life and property that may result from a wildfire. The three elements of hazard assessment are: hazard identification; vulnerability assessment; and risk analysis.

Section 201.6(c)(2)(*i*) of the Disaster Mitigation Act of 2000 (DMA-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 the probability of future hazard events.

## Hazard Identification

The first phase of wildfire-hazard assessment is hazard identification. Hazard identification identifies: the geographic extent of areas subject to wildfire; the expected intensity of a wildfire event at different locations; and the probability of occurrence of wildfire events.

Wildfire hazard areas are commonly identified in areas of wildland/urban interface. The level of wildfire hazard is determined by the ease of fire ignition, from natural or human causes, and the difficulty of fire suppression. Wildfire hazard can be magnified by several fire suppression and control factors, such as the fuel load, weather, topography, and property characteristics. Hazard identification rating systems are based on weighted factors of fuels, weather, and topography.[21]

To determine the base hazard factor of specific wildfire hazard sites and interface regions, several factors must be considered. Categories used to assess the base hazard factor include[22]:

- Topographic location, characteristics and fuels;
- Site/building construction and design;
- Site/region fuel profile (landscaping);
- Defensible space;
- Accessibility;
- Fire protection response; and
- Water availability.

The use of Geographic Information System (GIS) tools and improved data can assist in fire hazard assessment, allowing further integration of fuels, weather, topography, and development data for fire behavior prediction, watershed evaluation, developing mitigation strategies, and hazard mapping.

## Wildfire in Oregon

Oregon has a very lengthy history of fire in the undeveloped wildland and in the developing wildland/urban interface. There have been many fires in Oregon, named and unnamed.[23]

***Table 9-1*** lists some of the major fires that occurred in Oregon from 1848 to 2002.

**Table 9-1**
**Historic Oregon Wildfires (1848-2002)**

| Year | Fire | Number of acres burned |
|---|---|---|
| 1848 | Nestucca | 290,000 |
| 1849 | Siletz | 800,000 |
| 1853 | Yaquina | 482,000 |
| 1865 | Silverton | 988,000 |
| 1868 | Coos Bay | 296,000 |
| 1933 | Tillamook | 240,000 |
| 1936 | Bandon | 143,000 |

| | | |
|---|---|---|
| 1939 | Saddle Mountain | 190,000 |
| 1945 | Wilson River/Salmonberry | 180,000 |
| 1951 | North Fork/Elkhorn | 33,000 |
| 1966 | Oxbow | 44,000 |
| 1987 | Silver | 970,000 |
| 1992 | Lone Pine | 31,000 |
| 1996 | Skelton | 17,000 |
| 2002 | Biscuit | 500,000 |

Source: "Atlas of Oregon," William G. Loy, et al, University of Oregon Books, 1976. Oregon Department of Forestry, "Tillamook Burn to Tillamook State Forest," revised 1993. Department of Forestry, http://www.odf.state.or.us/DIVISIONS/protection/fire_protection/stats/histfire.asp?id=3070105
Oregon Emergency Management, State Hazard Risk Assessment, 2003.

In 1990, Bend's Awbrey Hall Fire destroyed 21 homes, causing approximately $9 million in damage and costing over $2 million to suppress. In 1996, Bend's Skeleton Fire burned over 17,000 acres and damaged or destroyed 30 homes and structures. In that same year, 218,000 acres were burned, 600 homes were threatened, and 44 homes were lost statewide.[24] In 2002, the Biscuit Fire became one of Oregon's most destructive fires in recent history, impacting nearly 500,000 acres, destroying four homes, nine outbuildings, a lookout, and numerous recreational structures. The costs of fighting this fire totaled $153 million and included over 7,000 firefighters and support personnel.[25]

The number of wildfires in Oregon varies from year to year. In 2004, Oregon had 918 wildfires that burned 5,940 acres. Over the past 10 years, Oregon has averaged 1,098 wildfires a year burning an average of 24,236 acres. The cost of fire suppression varies accordingly, averaging $8.69 million annually over the past 16 years. Lightning accounts for approximately 30 percent of forest fires in Oregon, the remaining 70 percent are human-caused.[26] Oregon wildfire data from the Oregon Department of Forestry (ODF) is summarized in ***Table 9-2***.

**Table 9-2**
**Oregon Seasonal Fire Occurrence**
**State and Association Districts**

| Item | Summary |
|---|---:|
| Number of Fires – All Causes (2009 season) | 1,089 |
| 10-year Average – All Causes (1999-2008) | 1,116 |
| Number of Lightning Caused Fires Only (2008 season) | 292 |
| 10-year Average (1999-2008) | 319 |
| Number of Human Caused Fires Only (2008 season) | 695 |
| 10-year Average (1994-2003) | 797 |
| Acres Burned (2009 final) | 7,033.94 |

| | |
|---|---|
| 10-year Average (1994-2003) | 26,782.03 |
| Average State Fire Suppression Costs* (1985-2000) | $8.69 million |
| Year 2000* | $5.75 million |
| Low year (1997)* | $1.21 million |
| High year (1987)* | $32.08 million |

Source: Oregon Department of Forestry March 22, 2010
Retrieved March 22, 2010 from: http://egov.oregon.gov/ODF/FIRE/GenCause.pdf

Oregon Department of Forestry November 26, 2004
Retrieved February 18, 2005 from: www.odf.state.or.us/DIVISIONS/protection/Fire_protection/stats
*Figures apply to the 15.8 million acres of state, private and federal forest lands protected by the Oregon Department of Forestry

In recent years, the cost of fire suppression has risen dramatically. A large number of homes have been threatened or burned, more fire fighters have been placed at risk, and fire protection in wildland areas has been reduced. These factors prompted the passage of Oregon Senate Bill (SB) 360 (Forestland/Urban Interface Protection Act, 1997).[27] SB 360:

(1) Establishes legislative policy for fire protection;
(2) Defines urban/wildland interface areas for regulatory purposes;
(3) Establishes standards for locating homes in the urban/wildland interface; and
(4) Provides a means for establishing an integrated fire protection system.

## Wildfire in Linn County

The eastern two-thirds of the county are forested. The forest lands are owned by the U. S. Forest Service, Bureau of Land Management, Oregon Department of Forestry and private owners. The Western one-third of the county is primarily grassland or moderate to steep Cascade foothills. During the summer fire season, the danger of fire in the forests and grasslands increases as the trees, brush and grassland dries and increases wildfire potential.[28]

In 1988, a controlled burn in a field adjacent to Interstate 5 between Albany and Highway 34 caused a multi-vehicle accident when the smoke drifted across the highway. The forest land in eastern Linn County are subject to annual small to moderate fires caused by human intervention and natural causes, such as lightning.[29]

In 2006, the Santiam Unit of the Oregon Department of Forestry recorded 16 fires, which burned 9.73 acres. The main cause of these fires was debris burning. In the same time period, the Sweet Home Unit, 51 fires burned 1,181 acres. Lightning was the greatest cause of fire within the Sweet Home Unit. The largest fire was the Middle Fork Fire, which burned 1,070 acres September of 2006.

## Linn and Benton County Community Wildfire Protection Plan (CWPP)

In November 2007, the Linn County Community Wildfire Protection Plan was adopted by the Linn County Board of Commissioners and in June 2009, the Benton County Community Wildfire Protection Plan was adopted by the Benton County Board of Commissioners. Several Linn and Benton county and state agencies collaborated to develop the plans. These agencies included the Oregon Department of Forestry; U.S. Bureau of Land Management, Salem Office; Linn and Benton County Planning and

Building Departments; Linn and Benton County Fire Defense Board; Willamette National Forest and Bureau of Land Management, Eugene Office; and other Linn and Benton county emergency services agencies. In addition, the CWPP draws upon the input and feedback provided by members of the public and other stakeholders who participated in a public workshop. The Linn and Benton County Community Wildfire Protection Plans build upon the section of the Natural Hazard Mitigation Plan.

## Probability of Future Wildfire[30]

The natural ignition of forest fires is largely a function of weather and fuel. Human-caused fires add another dimension to the probability of wildfire. Dry and diseased forests can be mapped accurately and some statement can be made about the probability of lightning strikes. Each forest is different and consequently has different probability / recurrence estimates.

This document defines wildfire as an uncontrolled burning of forest, brush, or grassland. Wildfire has always been a part of these ecosystems with sometimes devastating effects. Wildfire results from natural causes (e.g., lightning strikes), mechanical failure (Oxbow Fire), or human causes (unattended campfire, debris burning, or arson). The severe fire season of 1987 resulted in a record-setting mobilization of fire-fighting resources. Most wildfires can be linked to human carelessness.

The intensity and behavior of wildfire depends on a number of factors including fuel, topography, weather, and density of development. There are a number of often-discussed strategies to reduce the negative impacts of these phenomena. They include land-use regulations, management techniques, site standards, building codes, and the recently-passed Oregon Forestland-Urban Interface Fire Protection Act (1997). All of these have a bearing on a community's ability to prevent, withstand, and recover from a wildfire event.

The City of Albany's 2009 Hazard Analysis indicated a medium probability of a wildfire occurring in the city. This probability is limited to the northwest section of town. There have been no wildfires in the city of Albany in its history, which goes back to 1864.

## Vulnerability Assessment

Vulnerability assessment is the second phase in wildfire hazard assessment. Vulnerability assessment inventories property development and populations that are located within wildfire hazard areas. Locating and understanding the population, property and facilities that are exposed to wildfires will assist in reducing risks and preventing losses from future wildfire events.

Section 201.6(c)(2)(ii)(A) of the DMA-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 appropriate data is available, the vulnerability assessment should describe the type and number of existing and future buildings, infrastructure, and critical facilities located in identified hazard areas.

An understanding of risk begins with the knowledge that wildfire is a natural part of forest and grassland ecosystems. Past forest practices included the suppression of all forest and grassland fires. This practice, coupled with areas of dry brush or trees weakened or killed through insect infestation, has fostered a dangerous situation. Present state and national forest practices include the reduction of understory vegetation through thinning and prescribed (controlled) burning. [31]

The City of Albany's 2009 Hazard Analysis indicated a low vulnerability to the population if a wildfire were to occur in the city. This is because of the limited locations the city has for wildfire to occur.

## Risk Analysis

Risk analysis builds on the hazard identification and vulnerability assessment to estimate the damage, injuries and economic losses that may be sustained within a hazard area over a given period of time. The risk analysis uses mathematical models based on the magnitude of the harm that may result and the likelihood of the harm occurring.

As indicated above the probability of a wildfire is medium and vulnerability is low. When you look at the history of wildfire in Albany, you see that it is also low. Most wildfires have been grass fires rather than timber fires and have not affected many homes. These rankings are based on an analysis of risk conducted by county emergency program managers with the assistance of a team of local public safety officials.[32] The city of Albany has only one Wildland threat and it is located in North Albany which is an area in located solely in Benton County. The boundaries for this area are the Willamette River on the South, North and East sides, and Independence highway on the West Side.

The **probability** scores address the likelihood of a future major emergency or disaster within a specific period of time, as follows:

High = One incident likely within a 10- to 35-year period.
Moderate = One incident likely within a 35- to 75-year period.
Low = One incident likely within a 75- to 100-year period.

The **vulnerability** scores address the percentage of population or region assets likely to be affected by a major emergency or disaster, as follows:

High = More than 10% affected
Moderate = 1-10% affected
Low = Less than 1% affected

A detailed community inventory of factors that affect vulnerability is important in assessing risk and is currently beyond the scope and capabilities of this assessment. Development of wildfire hazard maps have been completed as part of the Linn and Benton County Community Wildfire Protection Plans, which assists county fire districts and fire departments in developing fire mitigation plans to address the areas most vulnerable to wildfires in the city.

Key factors in assessing wildfire risk include ignition sources, building materials and design, community design, structural density, slope, vegetative fuel, fire occurrence and weather, including occurrences of drought. At the time of publication of this plan, data was insufficient to conduct a risk analysis. The National Wildland/Urban Fire Protection Program has developed the Wildland/Urban Fire Hazard Assessment Methodology tool for communities to assess their risk to wildfire. Information on wildfire hazard assessment is available at http://www.Firewise.org.[33]

When assessing the risks from natural hazards, established mitigation practices already provide benefits in reduced disaster losses. It is important to understand the benefits of past mitigation practices when assessing their risks, being mindful of opportunities to further reduce losses. Possible mitigation practices include[34]:

- Identify and map current hazardous forest conditions such as fuel, topography, etc.;
- Identify forest/urban interface communities (list of interface communities, Federal Register, 08/17/01. V. 66, N. 160);
- Identify and map Forest Protection Districts;
- Identify and map water sources;
- Implement effective addressing system in rural forested areas;
- Clearly mark evacuation routes;
- Identify and locate seasonal forest users. Initiate information program through schools, summer camps, forest camping grounds, lodges, etc.;
- Identify and map bridges that can and cannot support the weight of emergency vehicles. This is a basic requirement for fire suppression;
- Form committees to implement Oregon Senate Bill 360. This is required in Oregon Senate Bill 360; and
- Enforce existing county road standards in interface areas to reflect fire suppression needs. Roads must be wide enough for fire suppression vehicles to turn around. Road grades cannot be too steep for large, heavy vehicles.

## Community Wildfire Issues

### Growth and Development in the Interface

The forested hills where homes and structures are built are considered to be interface areas, as are residential developments surrounded by grasslands. The development of homes and other structures encroaching onto the forest wildland and other natural areas is expanding the wildland/urban interface. The interface areas are characterized by a diverse mixture of varying housing structures, development patterns, ornamental and natural vegetation and natural fuels.

The vegetation in these interface areas consists of an assortment of grasses, shrubs, and deciduous and coniferous trees. Steep slopes may also be a consideration in determining wildfire-prone areas. In the event of a wildfire, vegetation, structures and other flammables can merge into unwieldy and unpredictable events. Factors germane to the fighting of such fires include access, firebreaks, proximity of water sources, distance from fire stations, and available firefighting personnel and equipment. Reviewing past wildland/urban interface fires shows that many structures are destroyed or damaged by wildfire for one or more of the following reasons:[35]

- Combustible roofing material;
- Wood construction;
- Structures with no defensible space;
- Fire department with poor access to structures;
- Subdivisions located in heavy natural fuel areas;
- Structures located on steep slopes covered with flammable vegetation;
- Limited water supply; and
- Winds over 30 miles per hour

### Road Access

Road access is a major issue for all emergency service providers. Of particular concern to firefighters are developments with narrow roadways and few routes of egress; routes with very limited accessibility; and houses without adequate turn-around space. Developments that do not allow rear access to homes can be a significant problem for firefighters and emergency services in defending the structure and ensuring the safety of its inhabitants.

**City of Albany Streets**

12.060 General Provisions. No development may occur unless it has frontage on or approved access to a public street currently open to traffic. A currently non-open public right-of-way may be opened by improving it to City standards.

Streets shall be connected to reduce travel distance, provide multiple travel routes, and promote the use of alternative modes. Street patterns have a greater long-range effect on land use patterns, than do parcel patterns or building location.

Streets (including alleys) within and adjacent to a development shall be improved in accordance with the standards in this Article. In addition, any new street or additional street width planned as a portion of an approved street plan shall be dedicated and improved in accordance with this Article.

12.100 Access to Public Streets. With the exceptions noted in Section 1.070, the location and improvement of an access point onto a public street shall be included in the review of a development proposal. In addition, the following specific requirements shall apply to all access points, curb cuts, and driveways:

(1) Approaches and driveways to City streets and alleys must be paved and constructed in accordance with the Standard Construction Specifications. Driveways serving more than one property shall be paved the full length of the shared portion. [Ord. 5720, 08/12/2009]

(2) Driveways for single- and two-family dwellings must have a minimum width of 10 feet and a maximum width of 24 feet (not to exceed the width of the driveway curb cut) and minimum separation of 5 feet.

Up to four multiple-family units that front on a public street may have separate driveways. The driveways shall meet the same standards as for single- and two-family dwellings.

Driveways for all other uses must have widths of 12-16 feet for one-lane (one-way) driveways, 24-32 feet for two-lane driveways, and 36 feet for three-lane driveways. Three-lane driveways must have designated lanes and turning movements. Industrial driveways shall have a width of 24-48 feet. There must be a minimum separation of 22 feet between all driveways except for single- and two-family dwellings. The width of a driveway will be determined by measuring at the curb line and will exclude the transitions which must conform to standards fixed by the City Engineer.

(3) All driveways must be located as far as practical from a street intersection, and in no instance shall the distance from an intersection be less than the following, as measured from the nearest curb return radius:

- Arterial Street 40 feet
- Collector Street 20 feet
- Local Street 10 feet

When different classes of streets intersect, the distance required is between an access point and the intersection of the street type that requires the greater distance.

(4) The location, width, and number of accesses to a public street may be limited for developments that are subject to site plan review. All development that proposes access to an arterial street is subject to site plan review and the design requirements of 12.230.

(5) Access points to a public street shall be the minimum necessary to provide reasonable access while not inhibiting the safe circulation and carrying capacity of the street. [Ord. 5720. 8/12/2009]

(6) Properties with frontage on more than one street may be restricted to access on the street(s) of a lower classification through site plan, land division, or other review procedures.
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(7) A common access point at a property line is encouraged and may be required in order to reduce the number of access points to streets. Construction of common access points must be preceded by recording of joint access and maintenance easements.

(8) With the exception of single-family residential development, approach grades must not exceed 10 percent slope within 20 feet of a public street. Driveways for single-family residential development shall comply with applicable fire and building codes.

(9) Access to designated state highways is subject to the provisions of this Article in addition to requirements of the State Highway Division and State Department of Transportation. When regulations of the City and State conflict, the more restrictive requirements will apply.

(10) For developments on property larger than five acres in contiguous ownership fronting on an arterial street or limited access highway, a frontage road may be required in order to provide a single access determined by the review body to be the most appropriate location for safety and convenience.

(11) When access is allowed on an arterial street, efforts shall be made to locate it adjacent to the interior property line where it could be shared by the adjacent property. [Ord. 5338, 1/28/1998; Ord. 5445, 4/12/2000]

12.110 Street Location, Width and Grade. The location, width, and grade of all streets must conform to any approved transportation master plan or recorded subdivision plat. When location of a street is not shown in an approved street plan, the arrangement of streets in a development shall either provide for the continuation or appropriate projection of existing principal streets in the surrounding areas or conform to a plan for the neighborhood approved or adopted by the City to meet a particular situation where topographical or other conditions made continuance of or conformance to existing streets impractical or where no plan has been previously adopted.

In addition, new streets may be required to be located where the City Engineer determines that additional access is needed to relieve or avoid access deficiencies on adjacent or nearby properties. In determining the location of new streets in a development or street plan, consideration shall be given to maximizing available solar access for adjoining development sites.

Street grades must be approved by the City Engineer, who will consider drainage and traffic safety.

12.120 Rights-of-Way and Roadway Widths. Unless otherwise indicated on an approved street plan or in Section 12.130, the street right-of-way and roadway widths shall not be less than the

minimum shown in the following table. Where a range is indicated, the width shall be determined by the City Engineer.

Minimum Rights-of-Way Minimum Roadway

Type of Street Width

- Arterial 70-120 feet 40-70 feet
- Collector 60-80 feet 36-48 feet
- Local* 42-56 feet 22-32 feet
- Radius for turnaround at end of cul-de-sac 43 feet 36 feet
- Alley 14-20 feet 12-20 feet
- When street rights-of-way are less than 60 feet wide, a parallel public utility easement 7-feet-wide shall be dedicated on both sides of the right-of-way unless waived by the City Engineer.

[Ord. 5445, 4/12/2000]

12.122(6) Residential Street Design for Constrained Sites. Natural features may constrain the standard local street design. Examples of such natural features include floodplains, steep slopes, drainage ways, wetlands, riparian corridors, and tree groves. Through the subdivision or planned development review process, the City will consider a narrower street section that does not compromise the goals for street design in a great neighborhood. For example, the sidewalks may be placed curbside and parking may be removed from the street in order to narrow the street paving and preserve natural areas.

**Linn County Code**

To ensure adequate ingress and egress for emergency vehicles, the Linn County Land Development Code at LCC 935.200 includes a number of roadway improvement standards. The Code requires that all access roadways and drives be constructed of an all-weather surface capable of supporting 50,000 pounds gross vehicle weight (GVW). Some rural fire protection districts may require a surface capable of supporting 80,000 pounds GVW. The roadway must be at least 12 feet in width and must be constructed of six-inches of crushed rock or gravel or six inches of quarry-run rock topped with four inches of one-inch-minus crushed gravel.

All roads and access drives must maintain an unobstructed vertical clearance of 13 feet, six inches and a horizontal clearance of 20 feet along their entire length. Roadways below 20 feet in width must have at least one vehicle turnout for emergency vehicles every 500 feet and provide a turnaround at the end of the access road. Additional access safety requirements are contained in *LCC 935.200*.

**Minimum Fuel Break Standards**

To reduce fire risks associated with development in forested areas, the Linn County Land Development Code requires all dwellings in the Farm/Forest (F/F) and Forest Conservation and Management (FCM) zones to maintain a 30-foot wide primary fuel break around structures and a 100-foot wide secondary fuel break around the primary fuel break. The specific standards are described at *LCC 934.590(8).*

**Fire Safety Construction Standards**

In addition to the State Uniform Building Code (UBC) requirements for residential development, the Linn County Land Development Code contains additional fire safety construction requirements for dwellings in the F/F and FCM zones at LCC 934.590.

**Water Supply**
Water supply is a critical factor in the ability to fight wildland fires. Developments lacking an adequate water supply and hydrant taps create extra challenges for firefighting personnel. Another water supply issue is that of small-diameter pipe water systems, which are inadequate to provide sustained fire-fighting flows.

The majority of rural development in wildfire-prone areas is not connected to any sort of public water system and must rely on emergency services response, water trucks, and on-site water sources in the event of a fire or wildfire. The Land Development Code requires that a dwelling shall be located within a fire protection district or shall be provided structural fire protection by contract. If this is not practical, then alternative means for protecting the structure from fire hazards may be provided such as an on-site water storage system, pond, stream or lake subject to standards in LCC 934.590(B)(6).

**Rural Services**
People moving from more urban areas to secluded rural developments may not realize they are living outside of a fire protection district, or that the services provided are not the same as in an urban area. The diversity and amount of equipment and the number of personnel can be substantially limited in rural areas, and the response time may be increased. Fire protection may rely more on the landowner's personal initiative to take measures to reduce fire risk and protect their own property. Therefore, public education and awareness may play a greater role in rural or interface areas.[36]

Development in rural areas in Linn County influences the wildland/urban interface. Although structural losses from wildfires in Linn County have historically been relatively low, continued development, and, along with it, an increase in fuel loads, expands the public need for natural hazards mitigation planning in the county.

**Vulnerable Assets – Estimating Potential Losses**
Section 201.6(c)(2)(*ii*)(B) of the Disaster Mitigation Act of 2000 (DMA-2000) requires that the risk assessment include an estimate of the potential dollar losses to vulnerable structures. There is insufficient development and vulnerability data available to estimate potential dollar losses to vulnerable structures and facilities at this time. The collection and analysis of appropriate data would serve as an important mitigation item to be completed in the future. Needed data includes the location and ranking of hazard areas; the types and numbers of buildings, infrastructure and critical facilities; and the location, construction, materials, and replacement value of buildings, infrastructure and critical facilities in hazard areas.

## Wildfire Mitigation Programs

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

**Local Programs**
All development within the City of Albany must comply with the fire protection construction standards in the Uniform Building Code (UBC) and the City of Albany Development Code, as well as additional standards set forth by the applicable rural fire protection districts.

**Linn County Forestland Development Handbook**
Linn County has developed a guide for development in the Farm/Forest (F/F) and the Forest Conservation and Management (FCM) zones. The *Linn County Forestland Development Handbook* was published in June 2003, funded by Title III. The forestland development handbook is a free publication given to property owners when they request information or a development permit in the F/F or FCM zones. The handbook describes the forestland structural siting standards contained in the Development Code including property line setbacks, building material requirements, road and access design standards, firebreaks and water supply standards.

**State Programs**

***Oregon Revised Statute 215.730***
*ORS 215.730*, Additional Criteria for Forestland Dwellings, provides criteria for approving dwellings located on lands zoned for forest and mixed agriculture/forest use. Under its provisions, county governments must require, as a condition of approval, that single-family dwellings on lands zoned as forestland meet the following requirements:

1. Dwelling has a fire retardant roof;
2. Dwelling will not be sited on a slope of greater than 40 percent;
3. Evidence is provided that the domestic water supply is from a source authorized by the Water Resources Department and not from a Class II stream as designated by the State Board of Forestry;
4. Dwelling is located upon a parcel within a fire protection district or is provided with residential fire protection by contract;
5. If dwelling is not within a fire protection district, the applicant provides evidence that the applicant has asked to be included in the nearest such district;
6. If dwelling has a chimney or chimneys, each chimney has a spark arrester; and
7. Dwelling owner provides and maintains a primary fuel-free break and secondary break areas on land surrounding the dwelling that is owned or controlled by the owner.

If a governing body determines that meeting the fourth requirement is impractical, local officials can approve an alternative means for protecting the dwelling from fire hazards.

***Oregon Revised Statute 477.015-061***
Provisions in *ORS 477.015-061*, Urban Interface Fire Protection, were established through efforts of the Oregon Department of Forestry, the Office of the State Fire Marshal, fire service agencies from across the state, and the Commissioners of Deschutes, Jefferson, and Jackson Counties. It is innovative legislation designed to address the expanding interface wildfire problem within Oregon Department of Forestry Fire Protection Districts. Full implementation of the statute will occur on or after January 1, 2002. The statute does the following:

1. Directs the State Forester to establish a system of classifying forestland-urban interface areas;
2. Defines forestland-urban interface areas;
3. Provides education to property owners about fire hazards in forestland-urban interface areas. Allows for a forestland- urban interface county committee to establish classification standards;
4. Requires maps identifying classified areas to be made public;
5. Requires public hearings and mailings to affected property owners on proposed classifications;
6. Allows property owners appeal rights;

7. Directs the Board of Forestry to promulgate rules that set minimum acceptable standards to minimize and mitigate fire hazards within forestland-urban interface areas; and
8. Creates a certification system for property owners meeting acceptable standards. Establishes a $100,000 liability limit for cost of suppressing fires, if certification requirements are not met.

**Senate Bill 360**

Senate Bill 360, passed in 1997, is state legislation put in place to address the growing wildland/urban interface problem. The bill has three purposes:

1. To provide an interface fire protection system in Oregon to minimize cost and risk and maximize effectiveness and efficiency;
2. To promote and encourage property owners' efforts to minimize and mitigate fire hazards and risks; and
3. To promote and encourage involvement of all levels of government and the private sector in interface solutions.[37]

The bill has a five-year implementation plan that includes public education and outreach, and the development of rules, standards, and guidelines that address landowner and agency responsibilities. The success of Senate Bill 360 depends upon cooperation among local and regional fire departments, fire prevention cooperatives, and the Oregon Department of Forestry, which means that interagency collaboration, is vital for successful implementation of the bill. This cooperation is important in all aspects of wildland firefighting. Resources and funding are often limited, and no single agency has enough resources to tackle a tough fire season alone. The introductory language of Senate Bill 360 states: "The fire protection needs of the interface must be satisfied if we are to meet the basic policy of the protection of human life, natural resources, and personal property. This protection must be provided in an efficient and effective manner, and in a cooperative partnership approach between property owners, local citizens, government leaders, and fire protection agencies."

**Oregon Department of Forestry**

The Oregon Department of Forestry (ODF) is involved with local fire chiefs and local fire departments to provide training. Local firefighters can get a range of experience from exposure to wildland firefighting. Local firefighters can also obtain their red card (wildland fire training documentation), and attend extensive workshops combining elements of structural and wildland firefighting, defending homes, and operations experience. [38] ODF has been involved with emergency managers to provide support during non-fire events and for years, ODF has worked with industrial partners (big timber companies) to share equipment in the case of extremely large fires. [39]

**Federal Programs**

The proposed role of the federal land managing agencies, such as the U.S. Forest Service and the Bureau of Land Management, in the wildland/urban interface is diverse. Their roles include: reducing fuel hazards on the lands they administer; cooperating in prevention and education programs; providing technical and financial assistance; and developing agreements, partnerships, and relationships with property owners, local protection agencies, states, and other stakeholders in wildland/urban interface areas. These relationships focus on activities before a fire occurs, which render structures and communities safer and better able to survive a fire.[40]

**Federal Emergency Management Agency Programs**
The Federal Emergency Management Agency (FEMA) is directly responsible for providing fire suppression assistance grants and, in certain cases, major disaster assistance and hazard mitigation grants in response to fires. The role of FEMA in the wildland/urban interface is to encourage comprehensive disaster preparedness plans and programs, increase the capability of state and local governments, and provide for a greater understanding of FEMA's programs at the federal, state, and local levels.[41]

**Fire Suppression Assistance Grants**
Fire Suppression Assistance Grants may be provided to a state only if the state has an approved hazard mitigation plan for the suppression of a forest or grassland fire that threatens to become a major disaster on public or private lands. These grants are provided to protect life and improved property, encourage the development and implementation of viable multi-hazard mitigation measures, and provide training to clarify FEMA's programs.

The grant may include funds for equipment, supplies, and personnel. A Fire Suppression Assistance Grant is the form of assistance most often provided by FEMA to a state for a fire. The grants are cost-shared with states. Once the federal grant money is provided to the state, it is passed along to local jurisdictions. This money would ultimately be passed along to Linn County to be applied to projects. FEMA's U.S. Fire Administration (USFA) provides public education materials addressing wildland/urban interface issues, and the USFA's National Fire Academy provides training programs.[42]

**Hazard Mitigation Grant Program**
Following a major disaster declaration, the FEMA Hazard Mitigation Grant Program provides funding for long-term hazard mitigation projects and activities to reduce the possibility of damages from all future fire hazards and to reduce the costs to the nation for responding to and recovering from the disaster.

**National Wildland/Urban Interface Fire Protection Program**
Federal agencies can use the National Wildland/Urban Interface Fire Protection Program to focus on wildland/urban interface fire protection issues and actions. The Western Governors' Association can act as a catalyst to involve state agencies, as well as local and private stakeholders, with the objective of developing an implementation plan to achieve a uniform, integrated national approach to hazard and risk assessment and fire prevention and protection in the wildland/urban interface. The program helps states develop viable and comprehensive wildland fire mitigation plans and performance-based partnerships.

**U.S. Forest Service**
The U.S. Forest Service (USFS) implements a fuel-loading program to assess fuels and reduce hazardous buildup on federal forestlands.

**Firewise**
Firewise is a program developed within the National Wildland/ Urban Interface Fire Protection Program and is the primary federal program addressing interface fire. It is administered through the National Wildfire Coordinating Group whose extensive list of participants includes a wide range of federal agencies. The program is intended to empower local planners and decision makers. Through conferences and information dissemination, Firewise increases support for interface wildfire mitigation by educating professionals and the general public about hazard evaluation and policy implementation techniques.

Firewise offers online wildfire protection information and checklists, as well as listings of other publications, videos, and conferences. The interactive home page allows users to ask fire protection experts questions, and to register for new information as it becomes available.

For more information on the Firewise program, contact:

The Wildland/Urban Interface Fire Program
C/o The National Fire Protection Association
1 Batterymarch Park, Quincy, MA 02269
http://www.firewise.org

**FireFree Program**
FireFree is a unique private/public program for interface wildfire mitigation involving partnerships among an insurance company and local government agencies. It is an example of an effective non-regulatory approach to hazard mitigation. Originating in Bend, the program was developed in response to that city's Skeleton Fire of 1996, which burned over 17,000 acres and damaged or destroyed 30 homes and other structures.[43] Bend sought to create a new kind of public education initiative that emphasized local involvement. SAFECO Insurance Corporation was a willing collaborator in this effort. Bend's pilot program included:

- A short video production featuring local citizens as actors, made available at local video stores, libraries, and fire stations;
- Two city-wide yard debris removal events;
- A 30-minute program on a model FireFree home, aired on a local cable television station; and;
- Distribution of brochures featuring a property owner's evaluation checklist and a listing of fire-resistant indigenous plants.

The success of the program helped to secure $300,000 in FEMA "Project Impact" matching funds. By fostering local community involvement, FireFree also has the potential for building support for sound interface wildfire policy. For information on FireFree, contact:

SAFECO Plaza T-8,
Seattle, WA 98185
(206) 545-6188

## Hazard Mitigation Action Items

The following action items have been identified by various stakeholders in the city of Albany. Full Action item worksheets can be found in Appendix F.

Action 2.2 Develop and implement a public education strategy for those household within identified high risk areas in the city of Albany and contract rural fire district.

Action 9.4 Work with Linn and Benton County to implement community wildland fire protection strategies necessary for the city of Albany and contract rural fire districts to reduce fire risk.

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[1] Hazard Analysis 2004, Linn County Emergency Management Agency, March 31, 2004, pg. 9

[2] A Tale of Two Grass Industries, North Idaho Communities On-Line, Retrieved February 26, 2005 from: www.nicon.org/sos/oregon-willamette.html

Introductory language in Senate Bill 528, (July 2001), ODF website, (July 2001), ODF website http://www.oregon.gov/ODA/NRD/docs/pdf/528enrolled.pdf.

[3] Smoke Management Program, Oregon Department of Agriculture. Retrieved April 13, 2010 from: http://www.oregon.gov/ODA/NRD/smokefrontpage.shtml

[4] DeBano, Leonard; Neary, Daniel; Ffolliott, Peter, *Fire's Effects on Ecosystems*, 1998, pg. 21

[5] Ibid 22

[6] Ibid 22

[7] Ibid 49

[8] Ibid. pg. 304

[9] Ibid

[10] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, (July 2000), Department of Land Conservation and Development, Ch. 7.

[11] Robert Olson Associates, *Metro Regional Hazard Mitigation Policy and Planning Guide*, (June 1999), Metro.

[12] Introductory language in Senate Bill 360, (July 2001), ODF website, http://www.odf.state.or.us/fireprot/sb360.html.

[13] OR-SNHMP (Region 3) Mid/Southern Willamette Valley Hazards Assessment, Nov. 2003, pp R3-15

[14] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, (July 2000), Department of Land Conservation and Development, Ch. 7.

[15] DeBano, Leonard; Neary, Daniel; Ffolliott, Peter, *Fire's Effects on Ecosystems*, 1998, pg. 59.

[16] Ibid

[17] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, (July 2000), Department of Land Conservation and Development, Ch. 7.

[18] Ibid.

[19] Ibid.

[20] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, (July 2000), Department of Land Conservation and Development, Ch. 7.

[21] Douglas County Natural Hazard Mitigation Plan – Section 8: Wildfire (2003), pp. 86

[22] National Interagency Fire Center, Wildland Fire Statistics. Retrieved February 18, 2005 from: http://www.nifc.gov/fire_info/ytd_state_2007.htm

[23] OR-SNHMP, Region 3, Mid/Southern Willamette Valley Hazards Assessment, Jan. 2009, pp R3-12

[24] *Planning for Natural Hazards: The Oregon Technical Resource Guide*, (July 2000), Department of Land Conservation and Development, Ch. 7.

[25] Biscuit Fire Recovery Facts (February 2005), Burn Area Emergency Rehabilitation Team website, http://www.biscuitfire.com/index.htm

[26] Oregon Department of Forestry, January 4, 2010; Retrieved March 22, 2010 from: www.odf.state.or.us/DIVISIONS/protection/Fire_protection/stats

[27] OR-SNHMP, Region 3, Mid/Southern Willamette Valley Hazards Assessment, Jan. 2009, pp R3-18

[28] Hazard Analysis 2004, Linn County Emergency Management Agency, March 31, 2004, pg. 9

[29] Ibid.

[30] OR-SNHMP, Region 3, Mid/Southern Willamette Valley Hazards Assessment, Jan. 2009, pp R3-19, R3-20

[31] Ibid. pg R3-20

[32] Ibid. pg R3-21

[33] Douglas County Natural Hazard Mitigation Plan – Section 8: Wildfire (2003), pp. 88

[34] OR-SNHMP, Region 3, Mid/Southern Willamette Valley Hazards Assessment, Jan. 2009, pp R3-20

[35] Colorado State Forest Service, (July 2001), http://205.169.13.227/depts/emmgmt/wildfireproblem.htm

[36] Douglas County Natural Hazard Mitigation Plan – Section 8: Wildfire (2003), pp. 89

[37] Oregon Department of Forestry, (1999) Oregon Forests Report.

[38] Personal Interview. Jim Wolf, Oregon Department of Forestry, February 28, 2001.

[39] Ibid.

[40] Federal Wildland Fire Policy, (July 2001), http://www.fs.fed.us/land/wdfire7c.htm.

[41] Ibid.

[42] Ibid.

[43] http://www.firewise.org/communities/ffoverview.pdf/ (Accessed 6/26/03)

# Section 10:
# Volcano

## Causes and Characteristics of the Hazard

The Cascade Range of the Pacific Northwest has more than a dozen active volcanoes. These familiar snow-clad peaks are part of a 1,000-mile-long chain of mountains that extend from southern British Columbia to northern California. Cascades volcanoes tend to erupt explosively and eruptions have occurred at an average rate of one or two per century for the last 4,000 years. Future eruptions are certain. Seven Cascades volcanoes have erupted since the first U.S. Independence Day. Four of those eruptions would have caused considerable property damage and loss of life had they occurred today without warning. The most recent events were Mt. St. Helens in Washington (1980 and 1986) and Lassen Peak in California (1914-1917). The existence, position and recurrent activity of Cascades volcanoes are generally thought to be related to the convergence of shifting crustal plates. As the population increases in the Pacific Northwest, areas near volcanoes are being developed and recreational usage is expanding. As a result, more and more people and property are at risk from volcanic activity.

To identify the areas that are likely to be affected by future events, pre-historic rock deposits are mapped and studied to learn about the types and frequency of past eruptions at each volcano. This information helps scientists to better anticipate future activity at a volcano and provides a basis for preparing for the effects of future eruptions through emergency planning.

## History of the Hazard in City of Albany

In the past 200 years, seven of the Cascade volcanoes in the United States have erupted, including: Mt. Baker, Glacier Peak, Mt. Rainier, Mount St. Helens, Mt. Hood, Mt. Shasta, and Mt. Lassen.

Over the past 4,000 years (a geologically short period of time), there have been three eruptions in Mt. Hood, four eruptions in the Three Sisters area, and two eruptions in the Newberry volcano area (see Figure V.1 below). Minor eruptions have occurred near Mt. Jefferson, at Blue Lake Crater, in the Sand Mountain Field (Santiam Pass), near Mt. Washington, and near Belknap Crater. During this time period, the most active volcano in the Cascades has been Mount St. Helens with about 14 major eruptions and many smaller eruptions.

**Figure V.1**
**Active Volcanoes in Oregon**

Many other volcanoes are deemed active or potentially active. The Smithsonian Institution's Global Volcanism Project lists 20 active volcanoes in Oregon and seven in Washington. These volcanoes are listed below in Tables V.1, and V.2.

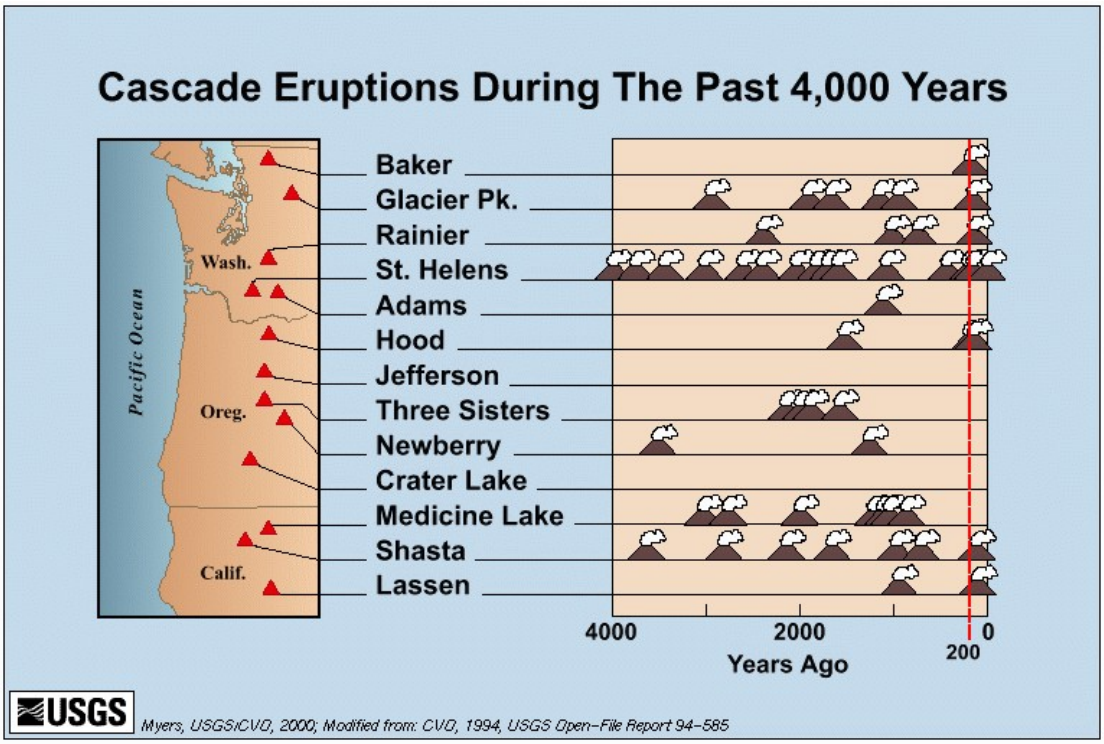



**Table V.1**

**Active Volcanoes in Washington**

| Volcano | Type | Last Eruption |
|---|---|---|
| Mt. Baker | Stratovolcano | 1880 |
| Glacier Peak | Stratovolcano | 1700 +/- 100 |
| Mt. Rainier | Stratovolcano | 1825 (?) |
| Mt. Adams | Stratovolcano | 950 AD (?) |
| Mount St. Helens | Stratovolcano | 1991 (eruptions started in 1980) |
| West Crater | Volcanic field | 5760 BC (?) |
| Indian Heaven | Shield volcanoes | 6250 BC +/- 100 |

**Table V.2**

**Active Volcanoes in Oregon**

| Volcano | Type | Last Eruption |
|---|---|---|
| Mt. Hood | Stratovolcano | 1866 |
| Mt. Jefferson | Stratovolcano | 950<br>Main volcano inactive for > 10,000 years |
| Blue Lake Crater | Crater | 1490 BC |
| Sand Mountain Field | Cinder cones | 1040 BC? |
| Mt. Washington | Shield volcano | 620<br>Main volcano inactive |
| Belknap Field | Shield volcano | 460? |
| North Sister Field | Complex volcano | 350 |
| South Sister | Complex volcano | 50 BC? |
| Mt. Bachelor | Stratovolcano | 5800 BC |
| Davis Lake | Volcanic field | 2790 BC? |
| Newberry Volcano | Shield volcano | 620<br>Crater formation 300,000 to 500,000 years ago |
| Devils Garden | Volcanic field | Unknown |
| Squaw Ridge Lava Field | Volcanic field | Unknown |
| Four Craters Lava Field | Volcanic field | Unknown |
| Cinnamon Butte | Cinder cones | Unknown |
| Crater Lake | Caldera | 2290 BC<br>Crater formation about 7,700 years ago |
| Diamond Craters | Volcanic field | Unknown |
| Saddle Butte | Volcanic field | Unknown |
| Jordan Craters | Volcanic field | 1250 BC |
| Jackies Butte | Volcanic field | Unknown |

On a longer geological time scale, volcanic activity in the Cascades has been very widespread. A report by the Oregon Department of Geology and Mineral Industries on prehistoric and historic volcanic eruptions in Oregon (see website below) notes that over 3,000 large and small volcanoes in the Cascades have erupted in the past five million years. Between 1843 and 1860, there were a series of 21 eruptions in the Cascades; scientists have speculated that the Northwest may be entering another period of volcanic activity.

A great deal of general background information on Oregon and Washington volcanoes and volcanoes in general is available on several websites, including:

- Smithsonian Institution, Global Volcanism Program: http://www.volcano.si.edu/
- United States Geological Survey (USGS) Volcano Hazards Program: http://volcanoes.usgs.gov/
- Department of Geology and Mineral Industries (DOGAMI) Landslide Hazards in Oregon: http://www.oregongeology.org/sub/Landslide/Landslidehome.htm

## Risk Assessment

## How are hazard areas identified?

Several of the active volcanoes in Oregon and Washington are located relatively near Linn and Benton counties, including Mount St. Helens and Mt. Hood. Approximate distances from Albany to three relatively nearby volcanoes are shown below in Table V.3. Among these relatively nearby volcanoes, Mount St. Helens is the most active.

**Table V.3**
**Distances from Albany**

| Volcano | Distance (miles) |
|---|---|
| Mount St. Helens | 102 |
| Mt. Hood | 82 |
| Three Sisters | 70 |

In May 2001, the USGS announced that it had detected a slight swelling or uplift of the west side of South Sister. This bulge, which occurred between 1996 and 2000, covers an area about nine to 12 miles in diameter with a maximum bulge in the center of about four inches. The cause of this uplift is most likely intrusion of a small amount of magma (molten rock) deep under the surface, probably at a depth of about four miles. This observation confirms that South Sister is still an active volcano, but the potential implications need to be interpreted cautiously. For comparison, a bulge was also observed on the north side of Mount St. Helens in the months prior to the May 18, 1980 eruption. However, the Mount St. Helens bulge was 450 feet high and growing at a rate of five feet per day prior to the eruption. Thus, the 4-inch South Sister bulge is certainly not an indication of imminent eruption.

The USGS analysis of volcano hazards in the Three Sisters region, Oregon was published in 1999 (Open-File Report 99-437). Its main conclusions are:

- The Three Sisters area includes two large composite volcanoes (Middle and South Sister). Large composite volcanoes in the Cascades (e.g., Mt. Hood, Mt. Jefferson, Newberry Volcano, and Crater Lake) are often active for hundreds of thousands of years and are subject to sometimes explosive eruptions (e.g., Mount St. Helens in 1980).
- Hazards from eruptions of composite volcanoes include all of the hazards listed below in "Community Hazard Issues." Between the major composite volcanoes, the crest of the Cascades is built up of hundreds of "mafic" volcanoes. Mafic volcanoes typically erupt for a few weeks to a few centuries, although some can be nearly as large as the composite volcanoes. Prominent mafic volcanoes in the Three Sisters area include North Sister, Mount Bachelor, Belknap Crater, Black Butte, and Mount Washington. Mafic volcanoes often form broad fields of volcanic vents such as in the Sand Mountain Field near the Santiam Pass, north of the Three Sisters.

- Mafic volcanoes typically erupt less explosively than do composite volcanoes, so that impacts of eruptions are less widespread. Most mafic eruptions in the Three Sisters areas have produced tephra deposits and lava flows that typically traveled three to nine miles from the vents and rarely nine to 12 miles from the vents. Tephra deposits rarely exceed four inches in thickness at distances six miles from the vent.
- Belknap Crater, about 1,500 years old, is one of the youngest mafic volcanoes in the Cascades. The Sand Mountain Field, a cluster of cones and lava flows west of Santiam Pass, was formed during three eruptive periods about 2,000 and 4,000 years ago.

The USGS study of volcano hazards in the Three Sisters region includes three hazard zones: proximal hazards; distal hazards; and a regional lava flow hazard zone.

**The proximal hazard zone** is limited to the immediate area around the Three Sisters and is an oval area about eight miles east-west by 10 miles north-south. The proximal hazard area is the area subject to the most intense volcanic hazards including lava flows, tephra flows, pyroclastic flows, landslides and debris flows and lahars. This area is predominantly wilderness with very low population.

**The distal hazard zones** are river valleys extending away from the proximal hazard zone that are subject to landslides, debris flows and lahars. The distal hazard zone has three levels for areas subjected to lahars and other flows of varying sizes. Areas subjected to lahars include Squaw Creek into Sisters, Tumalo Creek into Bend, the valley between Sparks Lake and Crane Prairie Reservoir, and the McKenzie River and tributaries west of the Three Sisters.

**The regional lava flow hazard** zone includes a band about 30 to 40 miles wide covering the entire crest of the Cascades. Locations throughout this zone, which includes Sisters, Bend, and the Santiam Pass, are subject to lava flows from mafic volcanism which could occur anywhere in this entire zone.

None of these Three Sisters volcanic hazard zones impact the city of Albany directly. Thus, the extent of volcanic hazards for the city of Albany appears largely limited to the possibility of minor ash falls from eruptions at Three Sisters, and other locations in the Cascades (e.g., Mount St. Helens). In all but the most extreme events, ash falls in the city of Albany are likely to be minor with an inch or less of ash likely. Volcanic events in the Three Sisters area or in the Santiam Pass area (Sand Mountain volcanic field) could close eastbound Highway 20 and thus affect transportation to/from Albany to a very limited extent.

## Probability of Future Occurrence

The following maps show probabilistic data on ash fall in western Oregon, taking into account all of the active volcanoes (USGS Open File Report 9-437, Plate 1, 1999). Interpolating between the map contours of Figure V.2, the annual probability of one centimeter (about 0.4 inch) or more of volcanic ash is about 1/5000 in Albany. In other words, the return period for such ash falls is about 5,000 years for various locations within Albany.

Interpolating between the map contours of Figure V.3, the annual probability of 10 centimeters (about four inches) or more of volcanic ash is less than 1/10,000. In other words, the return period for such ash falls is greater than 10,000 years for various locations within Albany.

**Figure V.2**
**Annual Probability of 1 Centimeter (about 0.4 inch or More of Volcanic Ash**

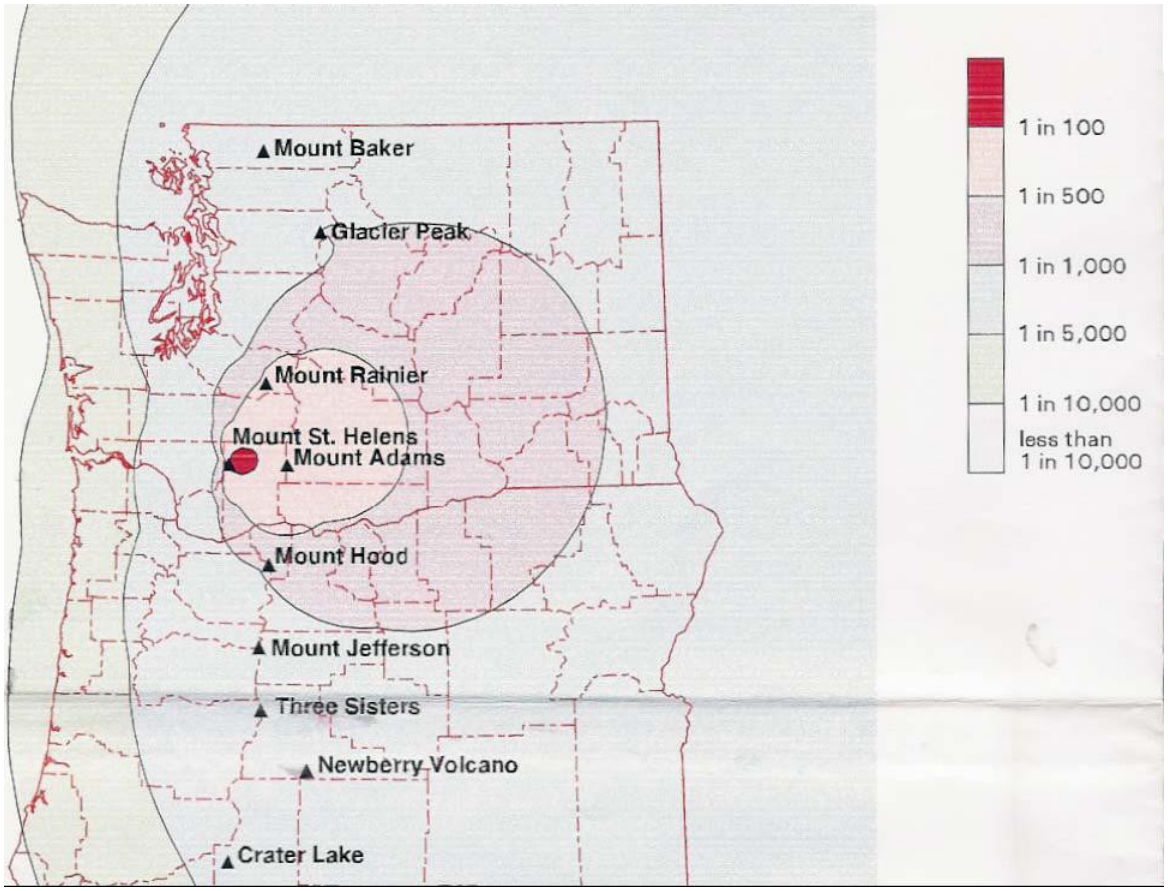
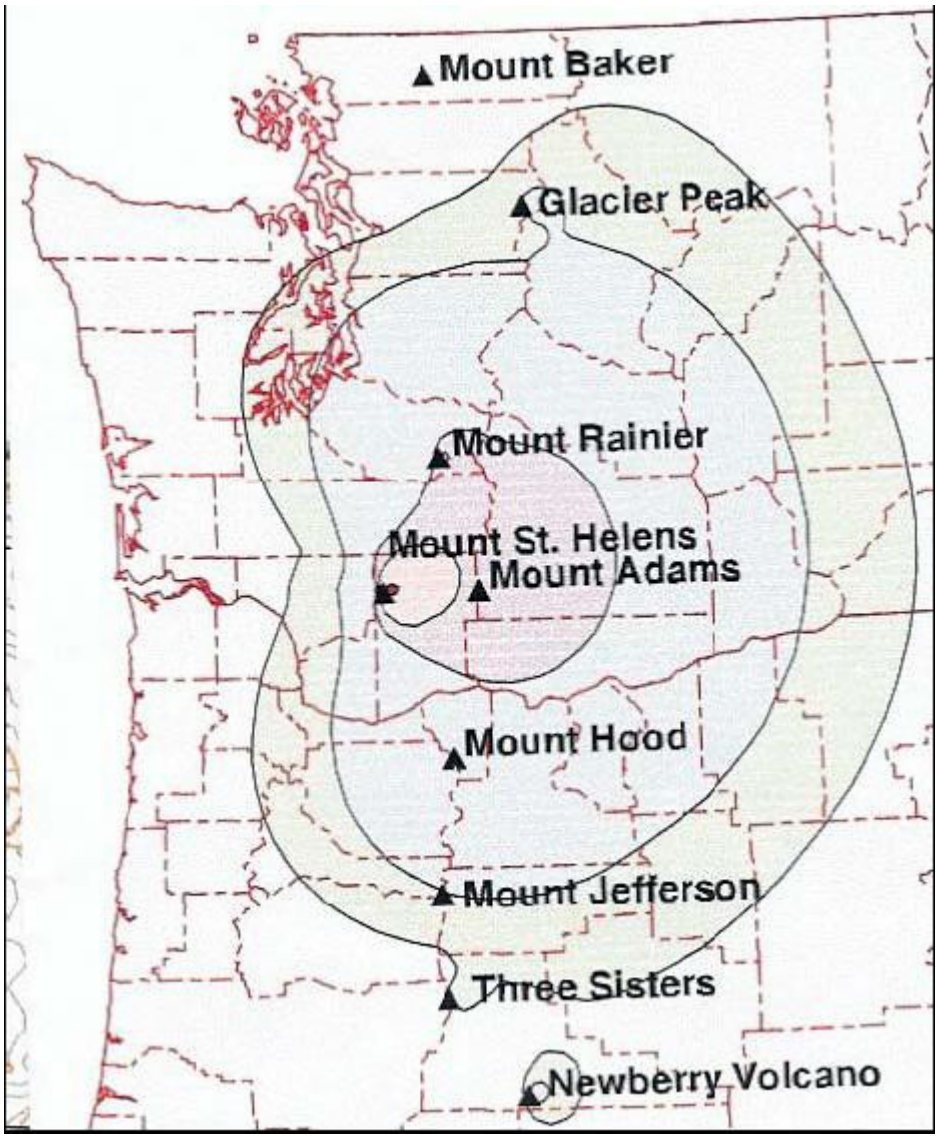


**Figure V.3**

**Annual Probability of 10 Centimeters (about 4 inches) or More of Volcanic Ash**

**(same scale as Figure V.2 above)**




The low probabilities of significant ash falls (i.e., long return periods) arise because ash falling in Albany requires volcanic eruptions producing ash and wind directions that deposit ash westward from the volcanoes.

The City of Albany estimates that one volcanic event is likely to occur within a 100-year period. This equates to a "low" probability estimate, as reflected in Albany's 2015 Hazard Analysis.

## Vulnerability Assessment

To a very low extent, volcanic activity at Three Sisters could affect Albany in several ways:

1) Depending on the volume of volcanic ash ejected by an eruption and on prevailing wind directions at the time of eruption, various thicknesses of ash falls may affect Albany. Possible impacts of ash falls include:
    a. Clean-up and debris removal;
    b. Possible respiratory problems for at-risk populations such as the elderly, young children or others with respiratory problems;
    c. Possible impacts on public water supplies drawn from surface waters, including degradation of water quality (high turbidity) and possible increased maintenance requirements at water treatment plants; and
    d. Possible electric power outages from ash-induced short circuits in distribution lines, transmission lines, and substations.
2) Debris flows, landslides, and lahars into the river valleys near the Three Sisters may affect the McKenzie River and the Willamette River downstream and thus also affect public water supplies downstream.

The probable impacts of potential volcanic eruptions on Albany are summarized below in Table V.4.

**Table V.4 Probable**

**Impacts of Potential Volcanic Eruptions on Albany**

| Inventory | Probable Impacts |
|---|---|
| Portion of city of Albany Affected | Entire city and surrounding region may be affected by ash falls |
| Buildings | Negligible impact other than minor cleanup required |
| Streets within Albany | Negligible impact other than minor cleanup required |
| Roads to/from Albany | Negligible impact other than minor cleanup required |
| Electric power | Temporary power outages possible from short circuits caused by ash falls |
| Other utilities | Negligible impact other than minor cleanup required for most utilities. Potential to impact water treatment plants which may require additional maintenance to deal with high turbidity in water |
| Casualties | Some potential for health impacts, especially for people with respiratory problems |

The City of Albany estimates that all of the population or property is likely to be affected by volcanic hazards, primarily ash fallout, but the impact would be minor. This equates to a" low" vulnerability estimate, as reflected within Albany's 2015 Hazard Analysis.

## Risk Analysis

Estimates of potential losses (i.e., potential dollar losses to specific vulnerable structures, transportation systems, utilities, economic assets, etc. in Albany) are not available at this time.

## Community Hazard Issues

## What is susceptible to damage during a hazard event?

In Oregon, awareness of the potential for volcanic eruptions was greatly increased by the May 18, 1980 eruption of nearby Mount St. Helens in Washington that killed 57 people. In this eruption, lateral blast effects covered 230 square miles and reached 17 miles northwest of the crater, pyroclastic flows covered six square miles and reached five miles north of the crater, and landslides covered 23 square miles. Ash accumulations were about 10 inches at 10 miles downwind, one inch at 60 miles downwind, and ½ inch at 300 miles downwind. Lahars (mudflows) affected the North and South Forks of the Toutle River, the Green River, and ultimately the Columbia River as far as 70 miles from the volcano. Damage and reconstruction costs exceeded $1 billion.

Volcanic eruptions often involve several distinct types of hazards to people and property, as well evidenced by the Mount St. Helens eruption. Major volcanic hazards include: eruption columns and clouds, volcanic gases, lava flows and domes, pyroclastic flows, volcanic landslides, and lahars. Some of these hazards (e.g., lava flows) only affect areas very near the volcano. Other hazards may affect areas 10 to 20 miles away from the volcano, while ash falls may affect areas many miles downwind of the eruption site.

**Eruption Columns and Clouds**

An explosive eruption blasts solid and molten rock fragments called tephra and volcanic gases into the air with tremendous force. The largest rock fragments, called bombs, usually fall back to the ground within two miles of the vent. Small fragments (less than 0.1 inch across) of volcanic glass, mineral and rock (ash) rise high into the air forming a huge, billowing eruption column. Eruption columns creating an eruption cloud can grow rapidly and reach more than 12 miles above a volcano in less than 30 minutes. Volcanic ash clouds can pose serious hazards to aviation. Several commercial jets have nearly crashed because of engine failure from inadvertently flying into ash clouds.

Large eruption clouds can extend hundreds of miles downwind resulting in ash fall over enormous areas. Ash from the May 18, 1980 Mt. St. Helens eruption fell over an area of 22,000 square miles in the western U.S. Heavy ash fall, particularly when mixed with rain, can collapse buildings and even a minor ash fall can damage crops, electronics and machinery.

**Volcanic Gases**

Volcanoes emit gases during eruptions. Even when a volcano is not erupting, cracks in the ground allow gases to reach the surface through small openings called fumaroles. More than 90 percent of all gas emitted by volcanoes is water vapor (steam), most of which is heated ground water. Other common volcanic gases are carbon dioxide, sulfur dioxide, hydrogen sulfide, hydrogen and fluorine. In higher concentrations, these gases can cause corrosion, contaminate domestic water supplies and harm or even kill vegetation, livestock, and people.

**Lava flows and domes**
Molten rock (magma) that pours or oozes onto the earth's surface is called lava and forms lava flows. The higher a lava's silica content, the less easily it flows. Low-silica basalt lava can form fast-moving (10 to 30 miles per hour) streams or it can spread out into broad thin sheets up to several miles wide.

**Pyroclastic flows**
High-speed avalanches of hot ash, rock fragments and gas can move down the sides of a volcano during explosive eruptions or when the steep side of a growing lava dome collapses and breaks apart. Pyroclastic flows can be as hot as 1,500 degrees Fahrenheit and move at speeds of 100 to 150 miles per hour. Such flows tend to follow valleys and are capable of knocking down and burning everything in their paths. Lower-density pyroclastic flows called pyroclastic surges can easily overflow ridges hundreds of feet high. The climactic eruption of Mount St. Helens generated a series of explosions that formed a huge pyroclastic surge which destroyed an area of 230 square miles and leveled trees six feet in diameter as far as 15 miles from the volcano.

**Volcano landslides**
A volcanic landslide or debris avalanche is a rapid downhill movement of rocky material, snow and/or ice. Volcano landslides range in size from small movements of loose debris on the surface of a volcano to massive collapses of the entire summit or sides of a volcano. Landslides on volcano slopes are triggered when eruptions, heavy rainfall or large earthquakes cause these materials to break free and move downhill.

**Lahars**
Lahars are mudflows or debris flows composed mostly of volcanic materials on the flanks of a volcano. These flows of mud, rock and water can rush down valley and stream channels at speeds of 20 to 40 miles per hour and can travel more than 50 miles. Some lahars contain so much rock debris (60 to 90% by weight) that they look like fast-moving rivers of wet concrete. Historically, lahars have been one of the deadliest volcano hazards. Close to their source, these flows are powerful enough to rip up and carry trees, houses and huge boulders miles downstream. Farther downstream, they can entomb in mud everything in their path. Lahars can occur during an eruption and when a volcano is quiet. The water that creates lahars can come from melting snow and ice (especially water from a glacier melted by a pyroclastic flow or surge), intense rainfall, or the breakout of a summit crater lake. Large lahars are potential hazards to many communities downstream from glacier-clad volcanoes.

## Existing Hazard Mitigation Activities

Mitigation of volcanic hazards is predominantly in the areas of monitoring volcanic activity, warnings and evacuation, and emergency response. That is, there are few, if any, practical physical measures to mitigate the direct impacts of volcanic activity.

The USGS actively monitors volcanic activity in the Cascades via networks of seismic sensors which can detect earthquakes related to magma movements as well as very accurate ground surface measurements, such as that which has detected the very small bulge on South Sister. The USGS also has a volcanic warning system with several levels of alert as a potential eruption becomes more likely and more imminent.

For the Cascades, the USGS volcano warning system (www.usgs.gov) has three levels. Level One (Volcanic Unrest) indicates that anomalous conditions could be indicative of an eventual volcanic eruption. Level Two (Volcanic Advisory) indicates that processes are underway that have a significant likelihood of culminating in hazardous volcanic activity. Evidence would not indicate, however, that a life- or property-threatening event is imminent. Level Three (Volcano Alert) means that precursory events have escalated to the point where a volcanic event with attendant volcanologic or hydrologic hazards is underway and will likely be threatening to life and property.

For most of Albany, which is located well outside of any of the likely direct hazard zones for any Cascades volcanic events, mitigation for volcanic activity is likely a low priority. In the event of a minor ash fall, public warnings directing people, especially those with respiratory problems, to remain indoors, and minor cleanup are most likely the only necessary responses for most volcanic effects impacting Albany.

## Hazard Mitigation Action Items

The following action items have been identified by various stakeholders in the city of Albany. Full Action item worksheets can be found in Appendix F.

Action 2.3 Update emergency notification procedures for ash fall events

Action 4.3 Evaluate capability of water and wastewater treatment facilities ability to deal with ash fall and determine what changes may need to be made.

Action 4.4 Evaluate ash impact on storm water drainage system and develop mitigation action if necessary.

Action 4.5 Evaluate the impact of ash fall out on HVAC systems in City facilities.

Action 5.3 Update emergency response planning for ash fall events.

# Section 11:
# Landslide

## Why are landslides a threat to the City of Albany?

Landslides are a serious geologic hazard in many states, including Oregon. Nationally, landslides cause 25 to 50 deaths each year.[1] The best estimates of the direct and indirect costs of landslide damage in the United States range between $1 and $2 billion annually.[2] Although not all landslides result in private property damage, many impact transportation corridors, fuel and energy conduits, and communication facilities.[3]

Landslides and debris flows have helped shape the landscape in some of the city of Albany. Development, road building, and logging can cause or contribute to the severity of landslides. Landslides become hazardous when buildings and infrastructure are placed within their path. In general, slopes that are over 25 percent or have a history of landslides might signal a problem. However, landslides can also occur in areas of generally low relief in the form of cut-and-fill failures, river bluff failures, lateral-spreading landslides, and mining slope failures.

***Table 7-1*** describes some of the major landslides that have occurred in Oregon over the last 75 years. The list is not all-inclusive, but focuses on slides that caused loss of life or significant damage. Although most of the listed events were outside of Albany, all serve as indicators of the type of landslide events likely to occur in the region.

**Table 7-1**
**Major Landslides in Oregon**

| | |
|---|---|
| February 1926 | A landslide closed Roosevelt Highway between Coos Bay and Coquille, causing at least $25,000 in damage. |
| November 1928 | A landslide killed two workmen working on a railroad tunnel near Baker. |
| August 1957 | A rockslide killed two quarry workers near Westfir. |
| February 1961 | A large section of Ecola State Park, including the parking lot, slid into the Pacific Ocean near Cannon Beach. |
| March 1972 | Three motorists were injured in a mud and rockslide on Interstate 5 near Portland. |
| January 1974 | Nine employees working in a telephone company building were killed when the building was pushed by a mudslide into Canyon Creek near Canyonville. |
| October 1984 | Two children were killed in a rockslide along Interstate 84 near Cascade Locks. The cost of stabilizing the slide area eventually reached $4 million. |
| September 1990 | Four highway workers were injured in a landslide near Troutdale. |
| February 1996 | Heavy rains and rapidly melting snow contributed to hundreds of landslides across the state, many occurring on clear cuts that damaged logging roads. |
| November 1996 | Heavy rain triggered mudslides in Lane and Douglas counties that resulted in eight fatalities. |
| February 1999 | Two timber workers were killed in a mud and rockslide south of Florence. |
| January 2000 | A landslide north of Florence closed Highway 101 for three months, resulting in major social and economic disruption to nearby communities. |

Source: Department of Land Conservation and Development, Natural Hazards Program website, http://www.lcd.state.or.us

There are several categories of landslides, based on configuration (slide mechanism), slide materials, and rate of movement. Some slides are ancient, deep-seated, and slow-moving. Others move rapidly as a mass of rock, mud, and large woody debris. All can be hazardous when in the vicinity of buildings and infrastructure. Oregon counties with the highest percentage of reported landslides are: Lane (24%), Douglas (11%), Linn (10%), Tillamook (9%), Lincoln (8%), and Multnomah (7%).[4]

Landslides and debris flows usually accompany the major storm systems that impact western Oregon. Particularly noteworthy landslides accompanied storms in 1964, 1982, 1986, and 1996. Two major landslide-producing winter storms occurred in Oregon during 1996. Intense rainfall triggered over 9,500 landslides and debris flows, some of which resulted directly or indirectly in eight fatalities. Highways were closed and a number of homes were lost. The fatalities and losses resulting from the 1996 landslides led to the passage of Oregon Senate Bill 12, which authorized the mapping of areas subject to rapidly-moving landslides and the development of model landslide ordinances.[5]

## Steep Slope Failure

Types of landslides on steep slopes (slopes greater than 50 percent) include rock falls, rockslides, and shallow earthflow or mudflow. Unlike deep failures, such as those involved in mass movement topography, failures on steep slopes do not penetrate to great depths. Slope maps may be used to define general areas especially prone to these forms of landslide.

In the City of Albany, failures on steep slopes might be most common north of Thornton Lake Drive NW and along Spring Hill Drive.

Human-induced causes of steep slope failures include: undercutting steep slopes; placing excessive fill; indiscriminant blasting; improper handling of runoff in construction areas; removal of vegetation; and the diversion of streams against steep canyon walls that have poorly engineered, valley-bottom roads.

## Causes and Characteristics of Landslide Hazards

This section provides information about landslide types and causes. Much of the information was gathered from the Department of Land Conservation and Development (DLCD) Natural Hazards Program website; the United States Geologic Survey (USGS) Landslide Hazard Fact Sheet 2004-3072; Oregon Department of Geology and Mineral Industries (DOGAMI) Bulletin 84; the Oregon Natural Hazards Mitigation Plan (OR-SNHMP) Region 3 Hazards Assessment; and the Regional All-Hazard Mitigation Plan for Benton, Lane and Linn Counties (RAHMP).

## What is a landslide?

The term "landslide" is used to describe the down slope movement (sliding or falling) of slope-forming materials composed of rock, soil, artificial fill, or a combination of these. The materials may move by falling, toppling, sliding, spreading, or flowing. The term is also applied to the mass of soil or rock material that results from one of these events.[6]

The various types of landslides can be differentiated by the kinds of materials involved and the mode of movement. Although landslides are primarily associated with mountainous regions, they can also occur in areas of generally low relief.[7]

Landslides are natural processes, but can be triggered or accelerated by: changes in groundwater levels, usually from intense rainfall or rapid snow melt; undercutting of a slope or cliff by erosion or excavation;

shocks or vibrations from earthquakes or construction; vegetation removal; or the placing of fill on steep slopes.[8]

## Landslide Types

Some of the processes that are referred to as landslides are shown in ***Figure 7-1*** and include:

- **Debris Flow**: Rapidly-moving landslides that can travel long distances, often within confined channels, and often involving significant amounts of water and mud. Debris flows (mudslides, mudflows, debris avalanches) are common and generally occur during intense rainfall on previously saturated ground. They usually begin on steep hillsides as slumps or slides that liquefy, accelerate to speeds as great as 35 mph, and flow down slopes and channels onto gently sloping ground.[9]

  The consistency of debris flows ranges from watery mud to thick, rocky, mud-like wet cement, dense enough to carry boulders, trees, and automobiles. Debris flows from different sources can combine in canyons and channels, where their destructive power is greatly increased.[10] Generally speaking, five conditions must be present for a debris flow to occur:

  1. Steep slopes;
  2. Loose rock and soil materials;
  3. Clay minerals;
  4. Saturated soils; and
  5. Rainfall or snowmelt generated runoff of high intensity and duration.

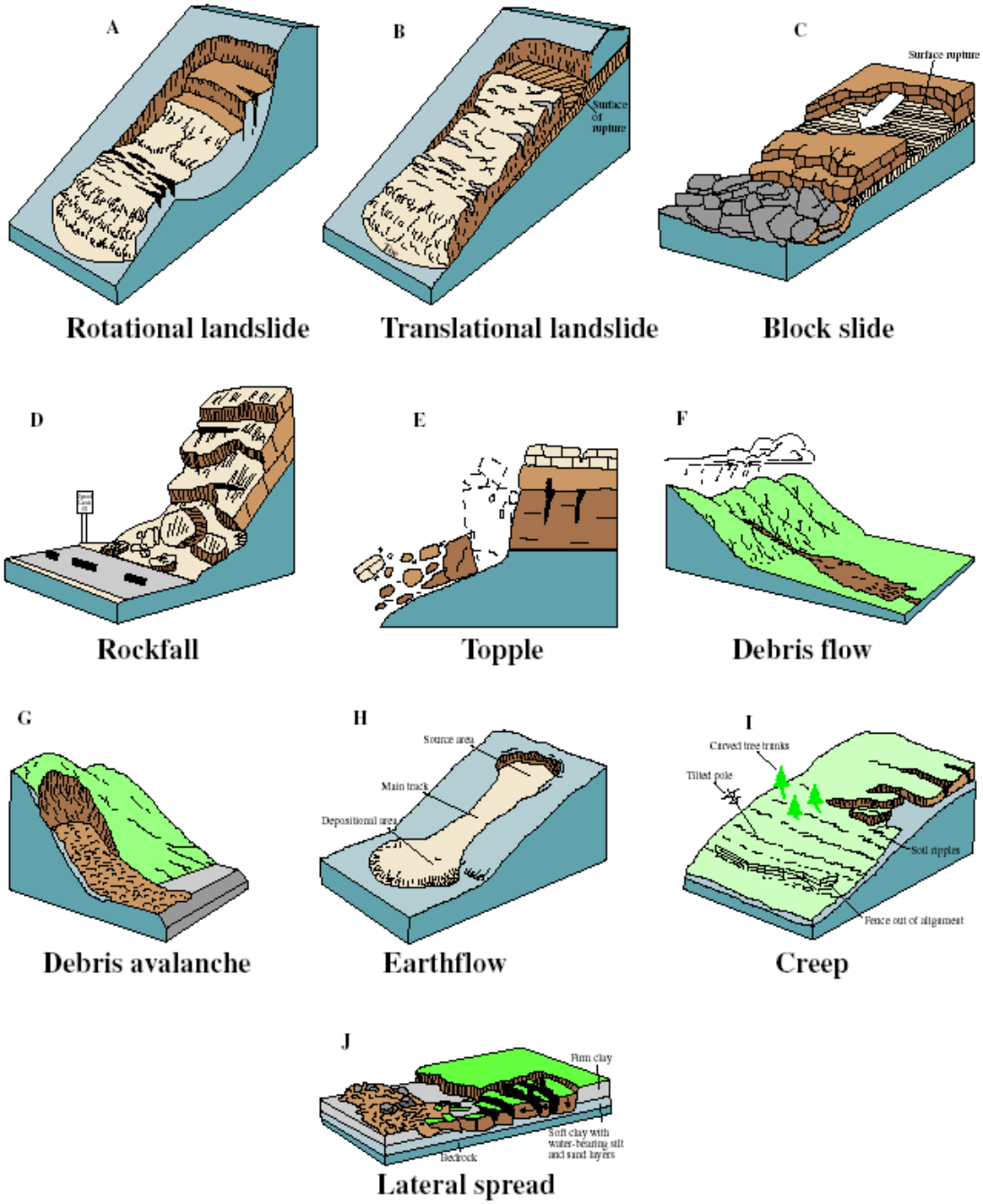
  Debris flow areas are associated with steep gullies. A **debris avalanche** is a type of very rapid to extremely rapid debris flow. A debris avalanche is generally long and narrow and often leaves a V-shaped scar tapering uphill at the head. A **mudflow** is an earth flow consisting of material that is wet enough to flow rapidly and contains at least 50 percent sand, silt and clay-sized particles.[11]

- **Rockfalls**: The abrupt movement of masses of geologic materials that become detached from steep slopes or cliffs. Separation occurs along fractures, joints, and bedding surfaces, and movement occurs by free-fall, bouncing, and rolling. Falls are strongly influenced by gravity, mechanical weathering, and the presence of interstitial water. Depending on the type of materials involved, the result is a rock fall, soil fall, debris fall, boulder fall, and so on. All types of falls are promoted by undercutting, differential weathering, excavation, or stream erosion. Rock falls are common along Oregon highways where roads are cut through bedrock.[12]

- **Rockslides**: The rapid down-slope movement of rock material along a plane of separation within the bedrock, which could be a fault surface, a fracture surface, or the depositional surfaces found in some sedimentary rocks. These slides can occur on relatively gentle slopes and cause serious damage.[13]

***Figure 7-1*** illustrates the major types of landslides described in this section.

**Figure 7-1**
**Landslide Types**



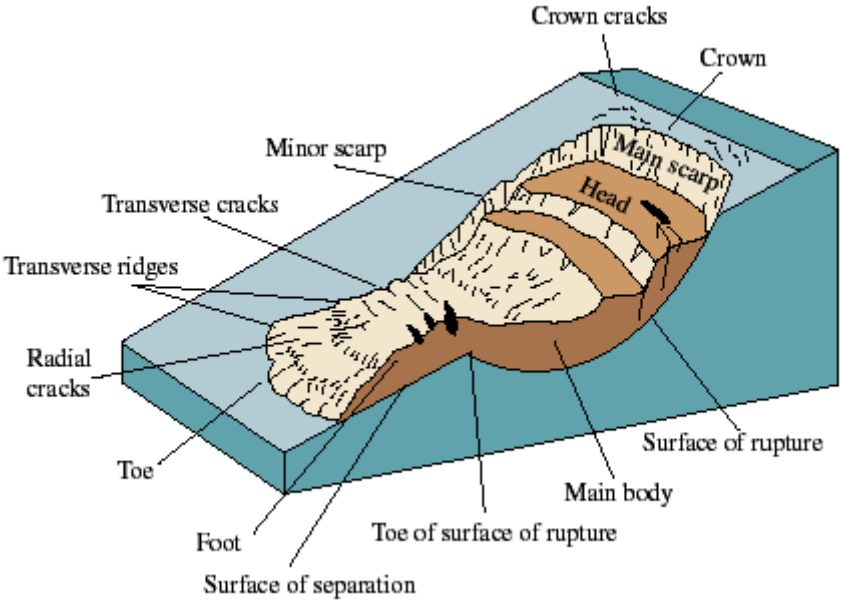

Source: USGS Landslide Hazard Fact Sheet 2004-3072

- **Rotational slides**: Slides in which the surface of the rupture is curved concavely upward and the slide movement is rotational about an axis that is parallel across the slope. The scarp formed at the head of the slope may be almost vertical. The toe usually bulges upward, but sometimes flows outward. **Slumps** are examples of small rotational slides.

  The head of a rotational slide can sometimes be located in the fill side of a road. The axis of the road would generally follow the contour of the hill. Many older hillside roads were built without proper design of the "fill" side of the road. The head of the slide would damage the fill side of the road; and the foot of the slide would damage any buildings located below the road surface, commonly for a distance of 20 to 80 feet below the road surface.[14]

  ***Figure 7-2*** shows a graphic illustration of a rotational landslide, with the commonly accepted terminology describing its features.

**Figure 7-2**
**Rotational Landslide Features**




Source: USGS Landslide Hazard Fact Sheet 2004-3072

- **Translational Slides**: Slides in which the mass moves out or down and out along a more or less planar surface and has little rotational or backward tilting. The mass commonly slides out on the original ground surface. Such a slide may progress over great areas if the conditions are right. The movement of translational slides is commonly controlled by surfaces of weakness such as faults, bedding planes, and variations in shear strength between layers of bedded deposits, or by contact between firm bedrock and overlying loose soils.[15]

## Landslide Causes

Factors contributing to landslides and other mass movement include climate, rock type, slope, and natural or human caused changes to any of these factors. Albany's moist, moderate climate promotes deep weathering which breaks down the rock, increases pore pressures, and decreases shear strength.[16]

Landslides are typically triggered by periods of heavy rainfall or rapid snowmelt. Earthquakes, volcanic activity, and erosion may also trigger landslides. Human activities, including excavation, locating development near steep slopes, and removing vegetation can increase susceptibility to landslide events. Grading for roads and construction can decrease the stability of a hill slope by adding weight to the top of the slope, removing support at the base of the slope, and increasing water content. Landslides on steep slopes are more dangerous because movements can be rapid.[17]

Certain geologic formations are more susceptible to landslides than others. Rocks which weather to clay-rich soils are the least stable and the most prone to failure.

The primary causes of landslides are listed in ***Table 7-2***.

**Table 7-2**
**Landslide Causes**

| Geological causes | Morphological causes | Human causes |
|---|---|---|
| Weak or sensitive materials | Tectonic or volcanic uplift | Excavation of slope or its toe |
| Weathered materials | Glacial rebound | Loading of slope or its crest |
| Sheared, jointed, or fissured materials | Fluvial, wave, or glacial erosion of slope toe or lateral margins | Drawdown (of reservoirs) |
| Discontinuous orientation of materials (unconformity, schistosity, layering, faults) | Subterranean erosion (solution, piping) | Deforestation |
| Contrast in permeability and/or stiffness of materials | Deposition loading on slope or its crest | Irrigation; altering ground water table |
| | Vegetation removal (fire, drought) | |
| | Thawing | |
| | Freeze-and-thaw weathering | |
| | Shrink-and-swell weathering | |

Source: USGS Landslide Hazard Fact Sheet 2004-3072

## Natural Causes

Natural processes can cause landslides or re-activate historical landslide sites. The undercutting of shoreline material along bodies of water by currents and waves causes many small slides each year. Seismic tremors can trigger landslides on slopes historically known to have landslide movement. Earthquakes can also cause lateral spreading on gentle slopes above steep streams and riverbanks. Heavy precipitation and rainfall can cause landslides by erosion, soil saturation or the combination of both.

Landslides are particularly common along stream banks, reservoir shorelines, and large lakes. Steep, concave-shaped slopes with larger drainage areas appear to be more susceptible to landslides than other landforms of over one cubic mile of material. All soil types can be affected by natural landslide triggering conditions.[18]

## Human Causes

Human impacts can affect the potential for landslide failures in Albany. Proper planning can protect people, property and infrastructure. Three major human causes of landslides in Albany are: (1) excavation and grading; (2) drainage and groundwater alterations; and (3) changes in vegetation.

**Excavation and Grading**
Slope excavation is common in the development of home sites or roads on sloping terrain. Grading these slopes can result in some slopes that are steeper than the pre-existing natural slopes. Since slope steepness is a major factor in landslides, these steeper slopes can be at increased risk for landslides. The added weight of fill placed on slopes can also result in an increased landslide hazard. Small landslides can be fairly common along roads, in either the road cut or the road fill.[19]

**Drainage and Groundwater Alterations**
Water flowing through or above ground is often a trigger for landslides. Any activity that increases the amount of water flowing into landslide-prone slopes can increase landslide hazards. A high groundwater table results in increased pore pressure and decreased shear strength of the soil, thus increasing the chance of slide movement. Broken or leaking water or sewer lines can be especially problematic, as can water retention facilities that direct water onto slopes. However, even lawn irrigation and minor alterations to small streams in landslide prone locations can result in damaging landslides. Ineffective storm water management and excess runoff can also cause erosion and increase the risk of landslide hazards.

Development that results in an increase in impervious surface impairs the ability of the land to absorb water and may redirect water to other areas. Channels, streams, ponding, and erosion on slopes all indicate potential slope problems. Road and driveway drains, gutters, downspouts, and other constructed drainage facilities can concentrate and accelerate flow. Ground saturation and concentrated velocity flow are major causes of slope problems and may trigger landslides.[20]

**Changes in Vegetation**
Removing vegetation from very steep slopes can increase landslide hazards. The *Storm Impacts Study* conducted by the Oregon Department of Forestry found that landslide hazards in three out of four steeply sloped areas were highest for a period of roughly 10 years after timber harvesting. Areas that have experienced wildfire and land clearing for development may have long periods of increased landslide hazard. In addition, woody debris in stream channels (both natural and man-made from logging) may cause the impacts from debris flows to be more severe.[21]

## Major Landslide Hazards[22]

The three most damaging landslide causes around the world are: (1) water; (2) seismic activity; and (3) volcanic activity.

**Landslides and Water**
Slope saturation by water is a primary cause of landslides in the city of Albany. This effect can occur in the form of intense rainfall, snowmelt, changes in groundwater levels, and water-level changes along coastlines, earth dams, and the banks of lakes, reservoirs, canals, and rivers.

Landsliding and flooding are closely allied because both are related to precipitation, runoff, and the saturation of ground by water. In addition, debris flows and mudflows usually occur in small, steep stream channels and often are mistaken for floods; in fact, these two events often occur simultaneously.

Landslides can cause flooding by forming landslide dams that block valleys and stream channels, allowing large amounts of water to back up. This causes backwater flooding and, if the dam fails, subsequent downstream flooding. Also, solid landslide debris can "bulk" or add volume and density to an otherwise normal stream flow or cause channel blockages and diversions creating flood conditions or localized erosion. Landslides can also cause overtopping of reservoirs and/or reduced capacity of reservoirs to store water.

**Landslides and Seismic Activity**
Many mountainous areas that are vulnerable to landslides have also experienced at least moderate rates of earthquake occurrence. The occurrence of earthquakes in steep landslide-prone areas greatly increases the likelihood that landslides will occur, due to ground shaking alone or shaking-caused dilation of soil materials, which allows rapid infiltration of water.

The 1964 Great Alaska Earthquake caused widespread land sliding and other ground failure, which caused most of the monetary loss due to the earthquake. Other areas of the United States, such as California and the Puget Sound region in Washington, have experienced slides, lateral spreading, and other types of ground failure due to moderate to large earthquakes. Widespread rock falls also are caused by loosening of rocks as a result of ground shaking. Worldwide, landslides caused by earthquakes kill people and damage structures at higher rates than in the United States.

**Landslides and Volcanic Activity**
Landslides due to volcanic activity are some of the most devastating. Volcanic lava may melt snow at a rapid rate, causing a deluge of rock, soil, ash, and water that accelerates rapidly on the steep slopes of volcanoes, devastating anything in its path. These volcanic debris flows, (also known as lahars), reach great distances once they leave the flanks of the volcano and can damage structures in flat areas surrounding the volcanoes. The 1980 eruption of Mount St. Helens in Washington triggered a massive landslide on the north flank of the volcano, the largest landslide in recorded time.

## Landslide Hazard Assessment

The landslide hazard assessment provides information on the location of landslide hazards, the land and property characteristics within the hazard area, and an assessment of risks to life and property that may result from a landslide event. The three elements of hazard assessment are: (1) hazard identification; (2) vulnerability assessment; and (3) risk analysis.

Section 201.6(c)(2)(*i*) of the *Disaster Mitigation Act of 2000* (DMA-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.

## Hazard Identification

The first essential step of landslide hazard assessment is hazard identification. Hazard identification identifies: (1) the geographic extent of areas that are known to be subject to landslides; (2) the characteristics of potential landslides at different locations; and (3) the probability of occurrence of landslide events.

## Landslide Hazard Areas

Locations at risk from landslides or debris flows include areas with one or more of the following conditions[23]:

- On or close to steep hills;
- Steep road-cuts or excavations;
- Existing landslides or places of known historic landslides;
- Steep areas where surface runoff is channeled, such as below culverts, V-shaped valleys, canyon bottoms, and steep stream channels; and
- Fan-shaped areas of sediment and boulder accumulation at the outlets of canyons.

The city of Albany has only two areas where landslide potential has been identified by DOGAMI. One is located in North Albany which is solely located in Benton County. The first location is on West Thornton Lake Drive NW between the West end of NW Thornton Lake Place and NW Kouns Drive. Four separate locations are identified. There have been no significant landslides in the city in its recorded history, which goes back to 1864. The second location is on the Calapooia River on the North East bank north of the 53rd Street developments. No buildings are located in the immediate area.

**Preliminary Debris Flow Hazard Maps**

In response to the catastrophic landslides that occurred in Oregon in 1996, the State of Oregon adopted Senate Bill 12 in 1999 to address rapidly moving landslides (debris flows). Among other requirements, Senate Bill 12 directs DOGAMI to identify areas potentially prone to debris flows on further-review-area maps.

The Oregon Department of Forestry (ODF) has developed preliminary debris flow maps for western Oregon. While the debris flow maps are generally good for steep slope areas where landslides typically initiate, they are less accurate for identifying the down-slope impacts of these landslides, and may not capture many areas that are of public safety concern. They are not intended to be used as the final further-review areas as defined by Senate Bill 12, but they are available to local governments to provide an initial indication of debris flow hazards. These maps can be used to show areas where further on-the-ground investigation is needed, but should not be used to determine the actual hazard at any specific location. The preliminary debris flow hazard maps can help analyze vulnerability and risk and identify landslide mitigation action items.[24]

**Further Review Area Maps**

DOGAMI is refining the ODF debris-flow maps to identify further-review areas as required by Senate Bill 12. DOGAMI has performed preliminary field investigations throughout western Oregon to improve the delineation of the down-slope run-out areas – the most critical areas in terms of public safety. Findings from those field investigations are being used to develop and

evaluate improved methods for GIS modeling of debris flow hazards. Several models have been identified and are currently being tested.[25]

DOGAMI is also inventorying and consolidating slope failure information from the three major storms of February 1996, November 1996, and December 1996/January 1997. The final inventory identified 9,582 known landslide locations. For each documented landslide, up to 15 descriptive items are reported. From this study, DOGAMI found that counties with the highest percentage of total landslides reported are Lane (24 %), Douglas (11 %), Linn (10 %), Clackamas (9 %), Tillamook (9 %), Lincoln (8 %), and Multnomah (7 %)."[26]

## Vulnerability Assessment

Vulnerability assessment is the second phase in landslide hazard assessment. Vulnerability assessment inventories development and populations that are located within identified landslide hazard areas.

Section 201.6(c)(2)(*ii*)(A) of the DMA-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 appropriate data is available, the vulnerability assessment should describe the type and number of existing and future buildings, infrastructure, and critical facilities located in identified hazard areas.

Landslides can impact important transportation routes, impeding commerce and blocking residents from reaching essential services, businesses and places of employment. Locating and understanding the population, property, and facilities that are exposed to landslide and debris flow hazards will assist in reducing risks and preventing losses from future landslides.

Information on landslide-prone and debris flow-prone locations in the city can be used to assess the value of property and the population at risk from future landslides. The amount of property within landslide-prone areas and the value of those properties can be calculated to estimate potential losses. Calculating a community's vulnerability to landslides is difficult because site-specific vulnerability data is difficult and costly to obtain.

A property-specific assessment of the number of lives or amount of property exposed to landslide hazards has not yet been conducted for the City of Albany. However, Phase I of the *Regional All Hazard Mitigation Master Plan (RAHMP) for Benton, Lane and Linn Counties* estimated vulnerability and losses due to winter storm-induced landslides using the small-scale landslide data available in 1998.[27] Unfortunately, the results of this study are not useful on a site-specific scale. An updated vulnerability analysis for landslides in the City of Albany will be developed using the debris flow hazard maps being prepared by ODF and DOGAMI.

## Probability

Most of the Cascade Range in eastern Linn County is classified as having "moderate" landslide incidence and susceptibility. **Susceptibility** is defined as the probability of landslides. **Incidence** is defined as the observed rate of landslides. Parts of the Cascades east side of the Willamette Valley are considered to have high landslide incidence and susceptibility. Within the Willamette Valley, including the City of Albany, the landslide susceptibility and incidence is low. For the City of Albany, our highest opportunity for landslide is in North Albany in Benton County. This is not to say that no landslides can occur elsewhere in the community but that the incidence rate is less than 1.5 percent.[28]

The Oregon Department of Forestry estimates widespread landslide activity will occur about every 20 years. The City of Albany has not had a widespread landslide since it was incorporated in 1864. The probability of a rapidly moving landslide occurring depends on a number of factors. These include steepness of slope, slope materials, local geology, vegetative cover, human activity, and water. There is a strong correlation between intensive winter rainstorms and the occurrence of rapidly moving landslides (debris flows). Consequently, the ODF tracks storms during the rainy season, monitors rain gauges and snow melt, and issues warnings as conditions warrant.[29]

## Vulnerability

The probability that Albany will experience landslides is very low given the fact we have not had a widespread landslide in over 150 years and Albany only has two locations where landslides might occur. Albany's overall probability score is low and its overall vulnerability score is low for landslides.

The probability score addresses the likelihood of a future major emergency or disaster within a specific period of time, as follows:

High = One incident likely within a 10- to 35-year period.
Moderate = One incident likely within a 35- to 75-year period.
Low = One incident likely within a 75- to 100-year period.

The vulnerability score addresses the percentage of population or assets likely to be affected by a major emergency or disaster, as follows:

High = More than 10% affected
Moderate = 1-10% affected
Low = Less than 1% affected

## Risk Analysis

Risk analysis builds on the hazard identification and vulnerability assessment to estimate the damage, injuries and economic losses that may be sustained within a hazard area over a given period of time. The risk analysis uses mathematical models based on the magnitude of the harm that may result and the likelihood of the harm occurring.

Section 201.6(c)(2)(*ii*)(B) of the Disaster Mitigation Act of 2000 (DMA-2000) requires that the risk assessment include an estimate of the potential dollar losses to vulnerable structures. A landslide risk analysis for City of Albany would include at least two components: the life and value of property and critical facilities that may incur losses from a landslide event; and the number and type of landslide events expected to occur over time. A risk analysis would predict the severity of damage from a range of events and the probability of those events occurring at specific locations.

Factors included in assessing landslide risk include population and property distribution in the hazard area, the frequency of landslide or debris flow occurrences, slope steepness, soil characteristics, and precipitation intensity. This type of analysis could generate estimates of the damage to the area due to a specific landslide or debris flow event. At the time of publication of this plan, data was insufficient to conduct a risk analysis.[30]

Minor amounts of landslide-induced ground movement are not normally life-threatening. For example, settlements of 0.5 inches may occur due to landslide, and such settlements will generally cause some

damage in buildings, but such damage is not likely to cause severe injury. Given that a site experiences some permanent ground movement, the extent of building damage depends on where the structure is located within the zone of permanent ground deformation. For example, if the structure straddles the area where the ground moves to where the ground does not move, the structure will experience major damage. On the other hand, if the structure is located within a large land mass that moves, more or less, as a unified mass, the structure may experience very little or no damage, other than loss of buried utilities.

For roads, it is assumed that minor landslides are repaired by coning off the affected section and repaving with asphalt. For major movements of 60 inches, it is assumed that the fill-side lane of a two-lane road will be rebuilt at about 70 percent of the cost of a new two-lane road. For ground movements over 100 inches, it is assumed that the road will be rebuilt.

The DOGAMI SLIDO, Statewide Landslide Information Layer for Oregon, website identifies three locations within the city of Albany that has the potential for landslides. One is on Thornton Lake Drive between the west entrance to Thornton Lake Place and Scenic Drive; the second immediately east of the end of Bloom Lane and the third is along the Calapooia River, west of 39th avenue SW.

## Community Landslide Issues

## What is susceptible to damage from a landslide event?

Landslides can affect utility services, transportation systems, and critical lifelines. In addition to the immediate damages and loss of service that communities may suffer, the disruption of infrastructure, roads, and critical facilities may also have a long-term effect on the economy. Utilities including potable water, wastewater, telecommunications, natural gas, and electricity are all essential to the community. Loss of electricity has the most widespread impact on the whole community and can even affect other utilities. For example, landslide movements as small as an inch or two increases the potential for natural gas pipelines to break.[31]

**Roads and Bridges**

Roads are subject to closure during landslide events and constitute the largest losses incurred from landslide hazards in Albany. The City of Albany Public Works Department, Linn and Benton County road departments and the Oregon Department of Transportation are responsible for responding to slides that inhibit the flow of traffic and/or damage a road or bridge.

Since many of Albany residents depend on roads for commuting to work, delays and detours generated by a landslide will likely have an economic impact on residents and businesses. Bridges are a critical part of road connections that may suffer extensive damage in landslide events. A transportation analysis will be conducted to determine which of the City of Albany's roads and bridges should be classified as critical to the transportation network.

It is not cost effective to mitigate for all slides, since some historical slides are likely to become active again even after mitigation measures have been implemented. The Public Works Department can alleviate problem areas by grading slides, and by installing new drainage systems on the slopes to divert water from the landslides. This type of response activity is often the most cost-effective in the short term.

**Lifelines and Critical Facilities**

It is important to identify facilities determined to be critical to life and safety, such as hospitals, emergency services, and public utilities that are subject to direct impacts from landslides. Critical facilities may also be indirectly impacted by landslides. Lifelines and critical facilities must remain accessible during a natural hazard event. The impact of closed transportation arteries is increased if the closed road or bridge is the access to a hospital or other emergency facility or if populations are cut off from emergency services or utilities. Inspection and repair of critical transportation facilities and routes is essential and should be a high priority. Loss of power and/or phone service is also potential consequences of landslide events. In hillside areas, soil erosion can be accelerated by heavy rains, resulting in loss of soil support beneath high-voltage transmission towers.

## Landslide Loss Potential

Landslides are a significant hazard to life and property. In some cases, it is cost-effective to mitigate existing infrastructure against landslides. More often, the most cost-effective approach to landslides is zoning regulations, where landslide hazard areas are identified prior to construction, and planned facilities are relocated or the landslide is mitigated prior to construction. If the cost to mitigate a landslide is high, and the risk of landslide loss is suitably small, in some cases it may be worthwhile to accept the risk and consequences from unmitigated landslides. Landslides should also be considered in the development of emergency response plans.[32]

## How to Reduce the Effects of Landslides[33]

Vulnerability to landslide hazards is a function of location, type of human activity, use, and frequency of landslide events. The effects of landslides on people and structures can be lessened by total avoidance of landslide hazard areas or by restricting, prohibiting, or imposing conditions on hazard-zone activity. Local governments can reduce landslide effects through land-use policies and regulations. Individuals can reduce their exposure to hazards by educating themselves on the past hazard history of a site and by making inquiries to planning and engineering departments of local governments. They can also obtain the professional services of an engineering geologist, a geotechnical engineer, or a civil engineer, who can properly evaluate the hazard potential of a site.

The hazard from landslides can be reduced by avoiding construction on steep slopes and existing landslides, or by stabilizing the slopes. Stability increases when ground water is prevented from rising in the landslide mass by:

(1) Covering the landslide with an impermeable membrane;
(2) Directing surface water away from the landslide;
(3) Draining ground water away from the landslide; and
(4) Minimizing surface irrigation.

Slope stability is also increased when a retaining structure and/or the weight of a soil/rock berm are placed at the toe of the landslide, or when mass is removed from the top of the slope.

## Landslide Mitigation Programs

## City of Albany Codes

As part of the City's commitment to environmental stewardship and responsibility, the City of Albany has implemented an Erosion Prevention and Sediment Control (EPSC) program. This program will assist the City in meeting requirements set forth by the Oregon Department of Environmental Quality and the federal Environmental Protection Agency for compliance with standards established by the federal Clean Water Act.

This EPSC program will be authorized and established through these revisions to Title 12 of the Albany municipal Code. The EPSC program has been developed to support the objectives of Title 12, which are to "provide for the health, safety, and general welfare of the citizens of the City of Albany and to protect and enhance the water quality and natural functions of watercourses and water bodies through the regulation of stormwater discharges; to set forth uniform requirements for direct and indirect contributors to the stormwater system; and to enable the City of Albany to comply with applicable state and federal laws."

## State Programs and Activities

**Statewide Planning Goal 7**[34]
Statewide Planning Goal 7 is one of 14 original statewide planning goals adopted by the Land Conservation and Development Commission in 1974. Goal 7 seeks to protect life and property from natural disasters and hazards such as floods, landslides, and earthquakes. To help accomplish this protection, the goal requires that local plans be based on an inventory of known areas subject to natural hazards and disasters and advises that "developments subject to damage or that could result in loss of life shall not be planned nor located in known areas of natural disasters and hazards without appropriate safeguards."

**Senate Bill 12**[35]
In response to the catastrophic landslide events that occurred in Oregon in 1996, the state of Oregon adopted Senate Bill 12 in 1999 to address rapidly moving landslides (debris flows). Among other requirements, Senate Bill 12 requires local governments to:

*Regulate through mitigation measures and site development standards the siting of dwellings and other structures designed for human occupancy in further review areas where there is evidence of substantial risk for rapidly moving landslides.*

In brief, Senate Bill 12 (Source: DLCD Natural Hazards Program website):

- Directs the Oregon Department of Geology and Mineral Industries to identify areas potentially prone to debris flows on "further review area" maps;
- Directs the Oregon Department of Land Conservation and Development to assist local governments in implementing the bill;
- Requires the Oregon Board of Forestry to adopt regulations that reduce the risks associated with rapidly moving landslides;
- Requires the Oregon Department of Forestry and DOGAMI to provide technical assistance to local governments;
- Requires the Oregon Department of Transportation to provide warnings to motorists during periods determined to be of the highest risk of rapidly moving landslides along

areas of state highways with a history of being most vulnerable to rapidly moving landslides; and

- Directs the Office of Emergency Management of the Department of State Police to coordinate state resources for rapid and effective response to landslide-related emergencies.

**Department of Geology and Mineral Industries**
DOGAMI has created an Oregon HazVu: Statewide Geohazards Viewer which the City uses to identify landslide areas within the city. At this time there are no official maps that have been provided specifically to the City showing our landslide areas of concern.

**Department of Land Conservation and Development**
The DLCD awarded a grant to Douglas County for the development of a model program to help in the mitigation of rapidly moving landslide hazards. Douglas County agreed to produce four main products: (1) a model landslide hazards ordinance; (2) model documents to support implementation of Senate Bill 12; (3) a model Transfer of Development Rights program; and (4) procedures to integrate DOGAMI's further-review-area maps into local tax parcel maps.

**Oregon Department of Forestry**
Senate Bill 1211 and Senate Bill 12, passed in 1997 and 1999 respectively, contain provisions to be addressed by the ODF. These provisions include the interim prohibition of forest operations in certain areas and the development of certain forest practices requirements. The interim prohibitions authorized by Senate Bill 1211 will eventually be replaced by the forest practice rules to be adopted by the Oregon Board of Forestry as required by Senate Bill 12. (Source: DLCD Natural Hazards Program)

**Interim Prohibitions**[36]
Senate Bill 1211, a precursor to Senate Bill 12, authorized ODF to prohibit forest operations on steep, landslide-prone sites above homes and busy roads in the interest of public safety. Specifically, the State Forester is authorized to prohibit operations if all of the following conditions exist:

- The operation location includes high-risk sites;
- Homes and other buildings where people are likely to be present during periods of intense rainfall or where county or state highways are in such close proximity to the potential path of a landslide or debris torrent that there is significant risk to human life; and
- The farthest expected extent of a potential landslide or debris torrent that might originate in the operation area, based on physical features of the landslide or debris torrent path, will reach the residences, buildings or highways.

**Forest Practices Requirements**
Senate Bill 12 required ODF to adopt and enforce forest practice rules to reduce the risk of serious bodily injury or death from rapidly-moving landslides (Oregon Revised Statutes 527.630). ORS 527.710(11) sets forth the criteria the Board of Forestry should consider in adopting such rules, including the exposure of the public to these safety risks and appropriate practices to reduce the occurrence, timing, or effects of rapidly-moving landslides.

**Landslide Warnings**
DOGAMI is developing a slope-failure database to study the relationship between rainfall events and debris flows. Records from the four major storms that hit western Oregon during 1996 and 1997 confirm that the occurrence of many landslides and debris flows can be related to rainfall intensity and duration. The relationships between rainfall intensity and debris flows are useful in helping to determine areas where debris-flow warning systems are appropriate. A debris-flow hazard warning system has been developed and a current alert message can be found at ODF.[37]

Oregon's landslide/debris flow warning system primarily involves three state and one federal agency: ODF, DOGAMI, ODOT, and the National Oceanic and Atmospheric Administration (NOAA). The warning system is triggered by rainfall and monitored in areas that have been determined to be hazardous.

As the lead agency, ODF is responsible for forecasting and measuring rainfall from storms that may trigger debris flows. Advisories and warnings are issued as appropriate. Information is broadcast over NOAA weather radio and on the Law Enforcement Data System. DOGAMI provides additional information on debris flows to the media. ODOT provides information concerning the location of landslides/debris flows and alternate transportation routes.[38]

**House Bill 3375**
House Bill 3375 (2003) directs local governments to adopt new land use regulations for siting dwellings and other structures once DOGAMI issues final maps of rapidly-moving landslide hazard areas. The bill clarifies that local governments may deny a request for a building permit if a geotechnical report discloses information about landslide hazards. This bill repeals the mitigation threshold requirements and transferable development rights program in landslide areas in Senate Bill 12.

## Oregon State Building Code Standards

The Oregon Building Codes Division adopts statewide standards for building construction that are administered by state and local municipalities throughout Oregon. The One- and Two-Family Dwelling Code and the Structural Specialty Code contain provisions for lot grading and site preparation for the construction of building foundations.

Both codes contain requirements for cut, fill, and sloping of a building lot in relationship to the location of the foundation. There are also building setback requirements from the top and bottom of slopes. The codes specify foundation design requirements to accommodate the type of soils, the soil bearing pressure, and the compaction and lateral loads from soil and ground water on sloped lots. The Building Official has the authority to require a soils analysis for any project where it appears the site conditions do not meet the requirements of the code, or that special design considerations must be taken. ORS 455.447 and the Structural Code require a seismic site hazard report for projects that include essential facilities such as hospitals, fire and police stations, emergency response facilities, and special occupancy structures, such as large schools and prisons.[39]

## Hazard Mitigation Action Items:

The following action items have been identified by various stakeholders in the city of Albany. Full Action item worksheets can be found in Appendix F:

Action 4.6 Continue reviewing DOGAMI hazard maps to identify any changes or amendments to future potential landslide areas within the city of Albany

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

[2] Robert Olson Associates, *Metro Regional Hazard Mitigation Policy and Planning Guide* (June 1999) Metro.

[3] Ibid.

[4] Oregon State Natural Hazard Mitigation Plan (OR-SNHMP) (Region 3) Mid/Southern Willamette Valley Hazards Assessment, Nov. 2003, pp R3-22

[5] Ibid.

[6] Department of Land Conservation and Development (DLCD) Natural Hazards Program Website, http://www.lcd.state.or.us

[7] Regional All Hazard Mitigation Plan for Benton, Lane, Lincoln and Linn Counties (RAHMP) July 27, 1998, pg. 25

[8] DLCD Natural Hazards Program Website, http://www.lcd.state.or.us

[9] Ibid.

[10] Ibid.

[11] RAHMP, July 27, 1998, pg. 26

[12] Ibid. pg. 25

[13] Ibid.

[14] Ibid.

[15] Ibid.

[16] DOGAMI Bulletin 84 (1974), pg. 62

[17] Douglas County Natural Hazard Mitigation Plan (NHMP), 2003, pp. 105

[18] Douglas County NHMP (2003), pp. 105

[19] Ibid. pg. 106

[20] Ibid. pg. 106

[21] Ibid. pg. 105

[22] USGS Landslide Hazard Fact Sheet 2004-3072 (July 2004)

[23] Douglas County NHMP (2003), pp. 105

[24]DLCD Natural Hazards Program Website, http://www.lcd.state.or.us

[25] Ibid.

[26] Ibid.

[27] RAHMP July 27, 1998, pg. 32

[28] RAHMP July 27, 1998, pp 29-30

[29] OR-SNHMP Region 3 Hazard Assessment, pp R3-23

[30] Douglas County NHMP (2003), pp 107

[31] Regional All Hazard Mitigation Master Plan for Clackamas County (February 1998) Goettel & Associates.

[32] Source: RAHMP, July 27, 1998, Page 25

[33] USGS Landslide Hazard Fact Sheet 2004-3072 (July 2004)

[34] Source: DLCD Natural Hazards Program Website, http://www.lcd.state.or.us

[35] Ibid.

[36] Ibid.

[37] Ibid.

[38] OR-SNHMP Region 3 Hazard Assessment, pp R3-23

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

# Section 12:
# Drought

## Causes and Characteristics of the Hazard

Drought is a normal, recurrent feature of climate. It occurs almost everywhere, although its features vary from region to region. Defining drought is therefore difficult; it depends on differences in regions, needs, and disciplinary perspectives.[1] Based on the many definitions that have appeared in the literature, drought can be categorized and defined in the following ways:[2]

**Meteorological or climatological droughts** usually are defined in terms of the departure from a normal precipitation pattern, and the duration of the event. Drought is a slow-onset phenomenon that usually takes at least three months to develop and may last for several seasons or years.

**Agricultural droughts** link the various characteristics of meteorological drought to agricultural impacts. The focus is on precipitation shortages and soil-water deficits. Agricultural drought is largely the result of a deficit of soil moisture. A plant's demand for water is dependent of the specific plant, its stage of growth, and the physical and biological properties of the soil.

**Hydrological droughts** refer to deficiencies in surface water and sub-surface water supplies. It is measured as stream flow, and as lake, reservoir, and ground water levels. Hydrological measurements are not the earliest indicators of drought. When precipitation is reduced or deficient over an extended period of time, the shortage will be reflected in declining surface and subsurface water levels.

**Socioeconomic droughts** occur when a physical water shortage begins to affect people, individually and collectively. Most socioeconomic definitions of drought associate it with supply, demand, and economic good. One could argue that a physical water shortage with no socioeconomic impacts is a policy success.

## History of the Hazard in City of Albany

Oregon records dating back to the late 1880s clearly associate drought with a departure from expected rainfall. Concern for mountain snowpack, which feeds the streams and rivers, came later. Droughts were particularly noteworthy during the following years:

| Date | Description |
|---|---|
| 1904-1905 | A statewide drought period of about 18 months |
| 1917-1931 | A very dry period throughout Oregon, punctuated by brief wet spells in 1920-21 and 1927 |
| 1939-1941 | A three-year intense drought in Oregon |
| 1976-1981 | Intense drought in western Oregon; 1976-77 single driest year of century |
| 1985-1997 | Generally a dry period, capped by statewide droughts in 1992 and 1994 |
| 2000-2001 | Klamath drought intensifies; low snow pack in mountains worsens conditions<br>Draw-down at Detroit Lake, Oregon, all but curtails lake recreation |

Source: State of Oregon Enhanced Natural Hazards Mitigation Plan, 2009

Additionally, the Drought Impact Reporter[i] identified the following reported drought impacts for the city of Albany:[3]

- **Oct. 4, 1986**: Due to losses incurred from sustained drought conditions, farmers and producers in several Oregon counties are eligible to apply for low-interest loans. The loans are a form of drought disaster assistance provided by the U.S. Department of Agriculture. (Kadera, Jim. "Drought Aid Begins, Feed Plan Expanded." The Oregonian. Oct. 4, 1988.)
- **Oct. 22, 1987**: Sustained drought conditions contributed to job losses in the Pacific Northwest timber industry. As the continued drought and related increased fire danger led to forest closures, thousands of loggers and truck drivers were forced out of work. According to an official with the Washington Forest Protective Association, drought-related state restrictions affected about 7,000 forest products employees.
- **Jan. 1, 1990 – Dec. 31, 1990**: According to an official with the U.S. Department of Agriculture, in 1990, $4,464,000 was provided to Oregon farmers impacted by drought conditions to purchase emergency feed supplies. (Oregon Emergency Management Drought Council. Meeting minutes. October 17, 1991. pg. 2)
- **Jan. 1, 2009 – Sept. 17, 1991**: According to an official with the U.S. Department of Agriculture, to date in 1991, $313,000 was provided to Oregon farmers impacted by drought conditions to purchase emergency feed supplies. (Oregon Emergency Management Drought Council. Meeting minutes. October 17, 1991. pg. 2)
- **Dec. 14, 1999**: Non-farm businesses and agricultural cooperatives became eligible to receive low-interest disaster loans in 15 counties in Oregon due to this year's drought. These businesses can receive loans for up to $1.5 million to help with financial obligations. (12/14/99, Drought News Headline)
- **April 10, 2001**: Due to lack of hydropower from drought, along with increased demand, Bonneville Power Administration asked approximately 12 factories in the Pacific Northwest, mostly aluminum plants, to shut down for up to two years in an attempt to conserve power and limit the rise of energy prices. This would cut the power demand on the company 5% to 10%, approximately 2,100 megawatts. They also asked residential users in the area to limit their power use.
- **April 22, 2005**: Due to water rationing, farmers in both Oregon and Washington cut back significantly on planting certain crops, including wheat and hay.
- **July 23, 2007**: Farmers in Oregon were allowed to cut hay and graze their livestock on land in the U.S. Department of Agriculture's Conservation Reserve Program. This allowed farmers access to use land within 210 miles of counties that had been declared to be drought disaster areas, instead of being able to use CRP lands only within the affected counties.
- **August 19, 2015**: For the first time ever, Linn county Commissioners have approved a drought declaration for the county. Snow packs have been at record lows for the year and the last rainfall in the mid-valley was in June.

[i] The National Drought Mitigation Center developed the Drought Impact Reporter in response to the need for a national drought impact database for the United States. Drought impacts are inherently hard to quantify, therefore there has not been a comprehensive and consistent methodology for quantifying drought impacts and economic losses in the United States. The Drought Impact Reporter is intended to be the initial step in creating a comprehensive database. The principal goal of the Drought Impact Reporter is to collect, quantify, and map reported drought impacts for the United States and provide access to the reports through interactive search tools.

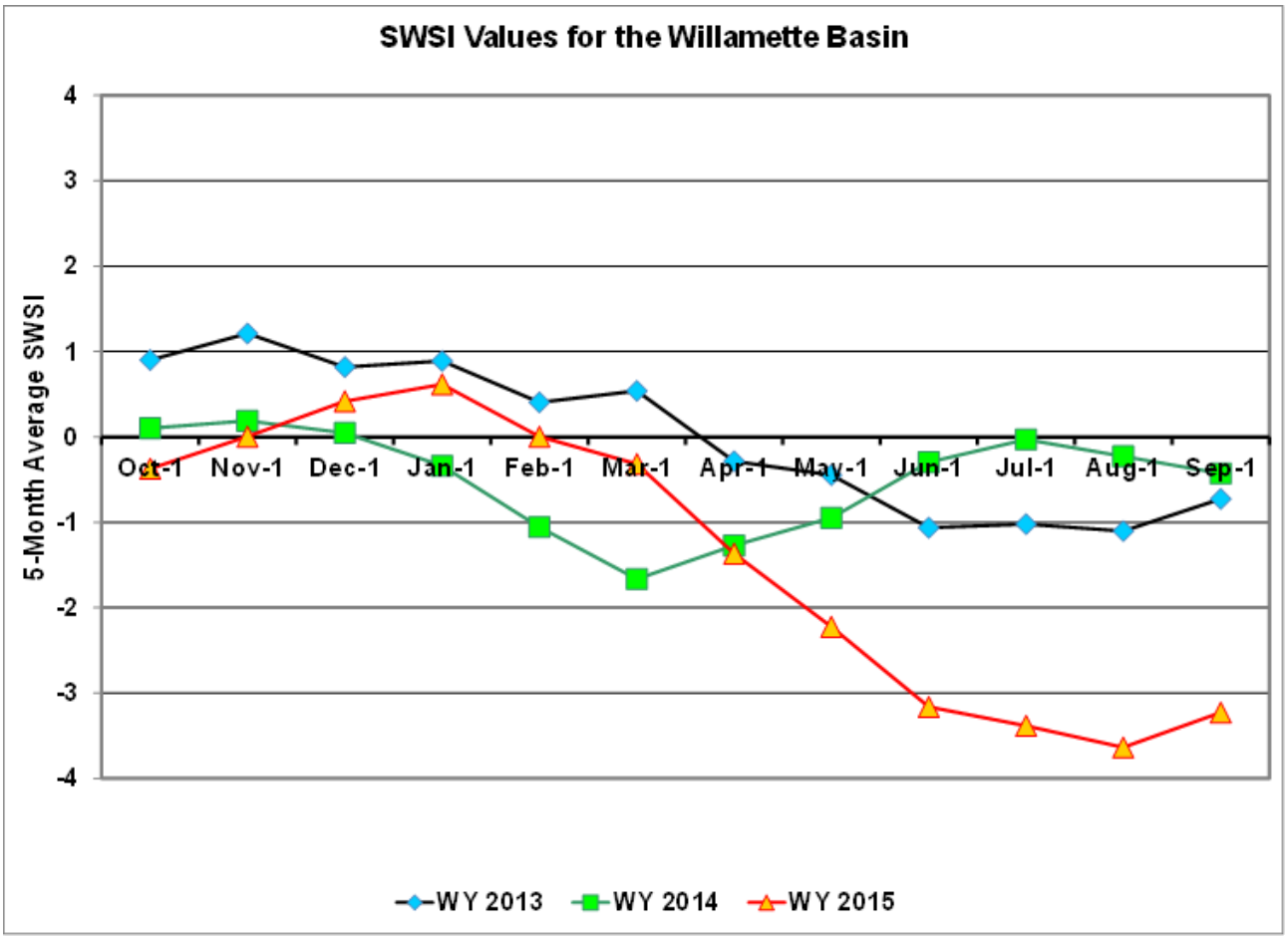
## Risk Assessment

## How are hazard areas identified?

Drought is typically measured in terms of water availability within a defined geographical area. It is common to express drought with a numerical index that ranks severity. Most federal agencies use the Palmer Method which incorporates precipitation, runoff, evaporation and soil moisture. However, the Palmer Method does not incorporate snowpack as a variable. It is not believed to provide a very accurate indication of drought conditions in Oregon and the Pacific Northwest.[4]

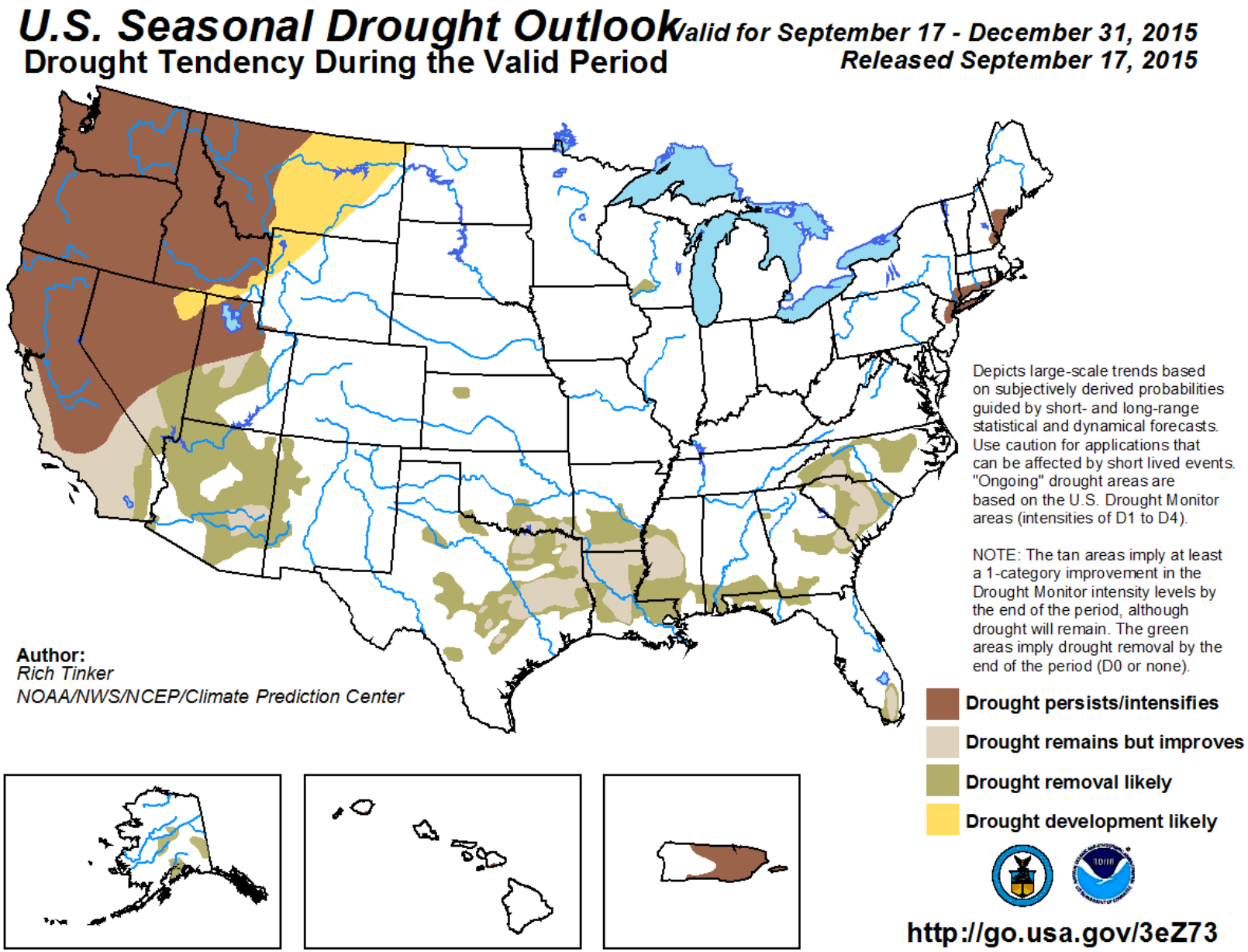
The Oregon Drought Severity Index is the most commonly used drought measurement in the state because it incorporates both local conditions and mountain snow pack. It is considered to be a better indicator of drought severity because it incorporates both local conditions and mountain snowpack. The Oregon Drought Severity Index categorizes droughts as mild, moderate, severe, and extreme. The index is available from the Oregon Drought Council.[5]

The Surface Water Supply Index (SWSI) is an index of current water conditions throughout the state, designed for areas that rely on snow melt as the primary source of surface water. This index utilizes parameters derived from snow pack, mountain precipitation, streamflow, reservoir storage, and soil moisture conditions. The following graph shows the Willamette Basin's 3-year SWSI. Note that the lowest SWSI value, -4.1, indicates extreme drought conditions. The highest SWSI value, +4.1, indicates extreme wet conditions. The mid-point is 0.0. This indicates a normal water supply.[6] SWSI values for 2010 are currently below normal.


SWSI Values for the Willamette Basin
5-Month Average SWSI
4
3
2
1
0
-1
-2
-3
-4
Oct-1
Nov-1
Dec-1
Jan-1
Feb-1
Mar-1
Apr-1
May-1
Jun-1
Jul-1
Aug-1
Sep-1
WY 2013
WY 2014
WY 2015

The National Weather Service's Climate Prediction Center produces operational predictions of climate variability, real-time monitoring of climate and the required data bases, and assessments of the origins of major climate anomalies. ***Figure DR.1*** below depicts the United States' seasonal drought outlook for September 17, 2015 through December 31, 2015.[7] In Southern Oregon, drought is likely to persist or intensify. Linn and Benton County's appears to be following normal trends.

*Figure DR.1 U.S. Seasonal Drought*



City of Albany residents receive water from two sources on the Santiam River. One location is near the City of Lebanon, and the other near the City of Jefferson.

## Probability of future occurrence

Drought is a normal, recurrent feature of climate, although many erroneously consider it a rare and random event. It is a temporary condition and differs from aridity because the latter is restricted to low rainfall regions and is a permanent feature of climate. It is rare for drought not to occur somewhere in North America each year. Despite impressive achievements in the science of climatology, estimating drought probability and frequency continues to be difficult. This is because of the absence of long historic databases, and the many variables that contribute to weather behavior and climate change. Nevertheless, progress is being made, particularly in the area of cyclic climatic variations.[8]

The City of Albany estimates that one drought event is likely to occur within a 100-year period. It occurs so infrequently that drought is not a part of the City's hazard analysis, although for the first time ever, as of August 2015, the County issued a drought declaration for all of Linn County.[9]

## Vulnerability assessment

The City of Albany estimates that less than 1% of the City's population or property is likely to be affected by drought conditions. This equates to a "low" vulnerability estimate.

At this time, no full vulnerability assessment for the City of Albany drought hazard is available (i.e., inventories of existing structures in hazard areas, and potential impacts of future land development). The drought mitigation actions listed below were identified in response to this need. A general description of the community's vulnerabilities is listed in the "Community Hazard Issues" section below.

## Risk analysis

The impacts of drought are greater than the impacts of any other natural hazard. They are estimated to be $6-8 billion annually in the United States and occur primarily in agriculture, transportation, recreation and tourism, forestry, and energy sectors. Social and environmental impacts are also significant, although it is difficult to put a precise cost on these impacts.[10]

Estimates of potential losses (i.e., potential dollar losses to specific vulnerable structures, transportation systems, utilities, economic assets, etc. in Linn and Benton Counties) are not available at this time.

## Community Hazard Issues

## What is susceptible to damage during a drought hazard event?

The following information addresses the impact of a severe or prolonged drought on Linn and Benton County's population, infrastructure, facilities, economy, and environment:

> **Population:** Drought can affect all segments of the City's population, particularly those employed in water-dependent activities (e.g., agriculture, hydroelectric generation, recreation, etc.). Also, domestic water users may be subject to stringent conservation measures (e.g., rationing) and could be faced with significant increases in electricity rates.

**Infrastructure:** In general, infrastructure such as highways, bridges, energy conveyance systems, etc., are unaffected by drought, which can, but seldom does, produce structural damage.[ii] An exception would include areas of severe soil shrinkage. In these uncommon situations, soil shrinkage would affect the foundation upon which the infrastructure was built. In addition, water-borne transportation systems (e.g., ferries, barges, etc.) could be impacted by periods of low water.

**Critical/essential facilities:** Facilities affected by drought conditions include communications facilities, hospitals, and correctional facilities that are subject to power failures. Storage systems for potable water, sewage treatment facilities, water storage for firefighting and hydroelectric generating plants also are vulnerable. Low water also means reduced hydroelectric production especially as the habitat benefits of water compete with other beneficial uses.

**State-owned or -operated facilities:** There are a variety of state-owned or -operated facilities that could be affected by a prolonged drought. The most obvious include schools, universities, office buildings, and health-care facilities. Power outages always are a concern. Maintenance activities (e.g., grounds, parks, etc.) may be curtailed during periods of drought.

**Economy:** Drought has an impact on a variety of economic sectors. These include water-dependent activities and economic activities requiring significant amounts of hydroelectric power. The agricultural sector is especially vulnerable as are some recreation-based economies (e.g., boating, fishing, etc).

**Environment:** Oregon has several fish species listed as threatened or endangered pursuant to the Endangered Species Act (ESA) of 1973. Some of these species have habitat requirements that often conflict with the needs or desires of the human environment. For example, in times of scarcity, the amount of water necessary to maintain certain fish species may conflict with the needs of the local agricultural community.

## Hazard Mitigation Action Items

The following action items have been identified by various stakeholders in the city of Albany. Full Action item worksheets can be found in Appendix F.

Action 9.5 Support local agency programs that promote measure to reduce water use during drought emergencies.

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[1] National Drought Mitigation Center, *What is Drought?* University of Nebraska, Lincoln. http://drought.unl.edu/index.htm.

[2] State of Oregon Enhanced Natural Hazards Mitigation Plan, Part 3: Hazard Chapters, *Drought*. 2009.

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[ii] Some clay soils (e.g., those containing bentonite) have significant shrink-swell properties. Prolonged drought can shrink these soils resulting in structural damage. Although these soils occur in Oregon, their geographical extent is limited.

[3] National Drought Mitigation Center, *Drought Impact Reporter*. http://droughtreporter.unl.edu/map.jsp.

[4] State of Oregon Enhanced Natural Hazards Mitigation Plan, Part 3: Hazard Chapters, *Drought*. 2009.

[5] State of Oregon Enhanced Natural Hazards Mitigation Plan, Part 3: Hazard Chapters, *Drought*. 2009.

[6] United States Department of Agriculture, Natural Resources Conservation Service. *Surface Water Supply Index; Current SWSI.* http://www.or.nrcs.usda.gov/snow/watersupply/swsi.html (accessed May 4, 2010).

[7] National Weather Service Climate Prediction Center. *U.S. Seasonal Drought Outlook*. http://www.cpc.noaa.gov/products/expert_assessment/seasonal_drought.html (accessed May 3, 2010).

[8] State of Oregon Enhanced Natural Hazards Mitigation Plan, Part 3: Hazard Chapters, *Drought*. 2009.

[9] Lathrop, Steve. "Commissioners approve drought declaration for Linn County." Albany Democrat-Herald. http://democratherald.com/commissioners-approve-drought-declaration-for-linn-county/article_8c81242a-62ad-5a0c-88b2-b42c2c926f72.html (accessed August 19, 2015).

[10] National Drought Mitigation Center, *Planning for Drought*. University of Nebraska, Lincoln. http://drought.unl.edu/index.htm.

# Section 13:
# Climate Change

## Introduction to Climate Change

This section presents an overview of climate change in Oregon. Climate is an important element in certain natural hazards, even though in itself, climate is not a distinct natural hazard.

In broad terms, climate in the Pacific Northwest is characterized by variability, and that variability is largely dominated by the interaction between the atmosphere and ocean in the tropical Pacific Ocean that is responsible for El Niño and La Niña. Human activities are changing the climate, particularly temperature, beyond natural variability. Climate change is already affecting Oregon communities and resources, and needs to be recognized in various planning efforts as an important stressor that significantly influences the incidence – and in some cases the location – of natural hazards and hazard events. Climate change is anticipated to affect the frequency and/or magnitude of some kinds of natural hazards in Oregon. A brief review of some of the observed changes in Oregon or the Pacific Northwest will give some idea of the influence of climate on natural hazards. First, temperatures increased across the Pacific Northwest by 1.3°F in the period 1895-2011 (the observed record). In that same timeframe, Cascade Mountain snowpacks have declined, and higher temperatures are causing earlier spring snowmelt and spring peak streamflows. On the coast, increasing deep-water wave heights in recent decades are likely to have increased the frequency of coastal flooding and erosion. In Oregon's forested areas, large areas have been impacted by disturbances that include wildfire in recent years, and climate change is probably one major factor. Closer to home for some Oregonians, a three-fold increase in heat-related illness has been documented in Oregon with each 10°F rise in daily maximum temperature. (Dalton et al., 2013; Dello & Mote, 2010).

### Oregon Responses to Climate Change

The human influence on the climate is clear (IPCC, 2013). Global greenhouse gas emissions will determine the amount of warming both globally and here in Oregon. On that basis, Oregon and other states and local communities have undertaken measures to reduce greenhouse gas emissions as a way to slow the warming trend. Similarly, states and local communities are beginning to implement measures to adapt to future climate conditions that cannot be avoided. The global climate has considerable inertia, so the changes that can be anticipated today are largely a result of conditions that occurred up to several decades, almost a century ago. Inertia in the global climate system cannot be immediately influenced, so states and communities are beginning to do "climate adaptation planning" in local and regional scales. In many cases, planning for climate change – or adaptation planning – quickly comes down to improved planning for natural hazards, since many of the anticipated effects of climate change will be experienced in the form of natural hazard events. That said, planning to adapt to climate change and planning to mitigate natural hazards are not entirely the same thing, although there is considerable overlap.

In 2010, the State of Oregon produced the Oregon Climate Adaptation Framework. This framework identifies 11 climate-related risks for which the State must plan. Five of those 11 climate risks – drought, coastal erosion, fire, flood, and landslides – are directly identified in the Oregon NHMP. In addition, three other hazards in the Oregon NHMP – wind storms, winter storms, and dust storms – have an underlying climate component.

Oregon and the Pacific Northwest have been rich in climate impacts research over the last 18 years. In 2007 the Oregon Legislature created the Oregon Climate Change Research Institute (OCCRI) under HB 354. Much of the material in this section is drawn from two reports from OCCRI: the 2010 Oregon Climate Assessment Report (Dello & Mote, 2010) and the 2013 Northwest Climate Assessment Report (Dalton et al., 2013), both found at http://occri.net/reports. This section is not meant to be a comprehensive assessment of climate change and impacts in Oregon or an all-encompassing overview of each hazard. Rather, it presents future projections of temperature and precipitation, and describes some of the effects of such future conditions based on the frequency and magnitude of natural hazards in Oregon.

## Past and Future Climate in Oregon (Mote et al., 2013)

### *Historical (1895 – Present)*

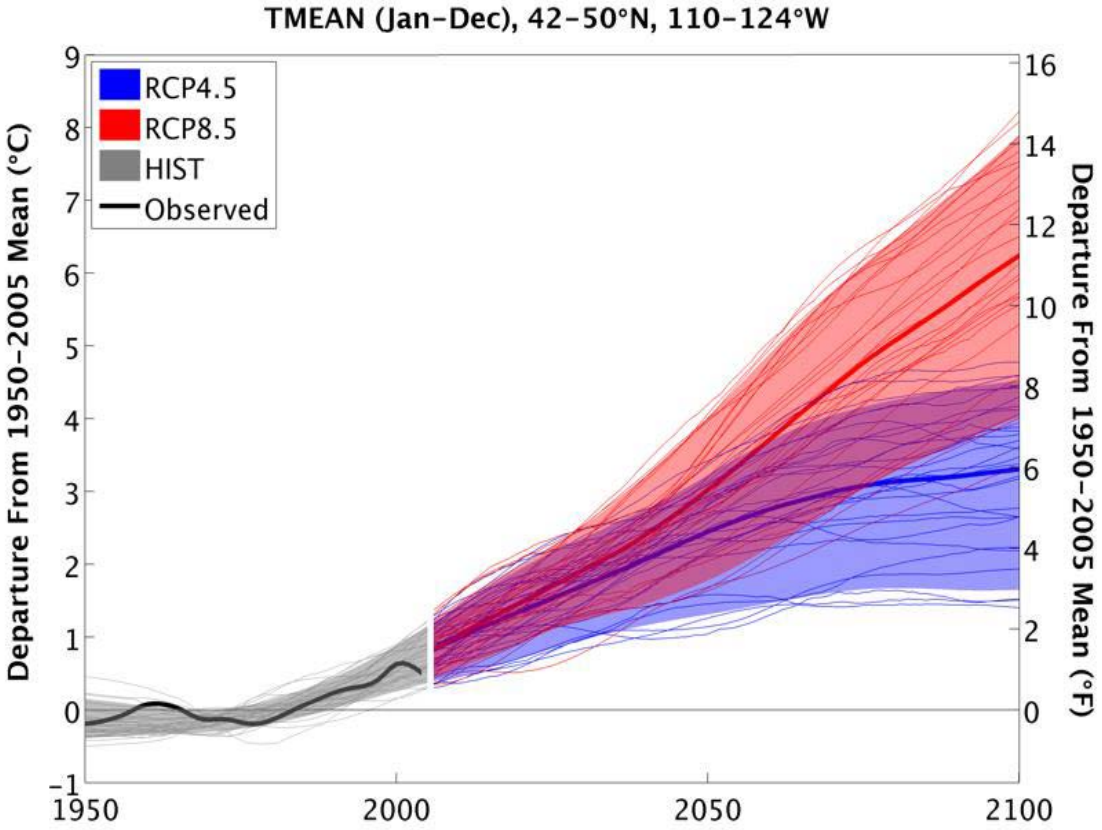
The impacts of climate change in Oregon are largely driven by temperature and precipitation. Temperatures in the Pacific Northwest increased 1.3°F over the historical period (1895-2011 observed period). Over the last 30 years, temperatures in Oregon have generally been above the 20$^{th}$ century average (Figure 2.3). The average annual temperatures in all but two years since 1998 have been above the average annual temperatures for the 20$^{th}$ century. Within the same historical time period, annual precipitation amounts fall within the normal range of natural annual variability.

### *Future Climate*

Climate modeling is mostly performed at global to regional scales because of the computational power required. The temperature and precipitation projections relied on for this summary use data from the grid cells covering the Pacific Northwest in Global Climate Models. Since the Pacific Northwest region is relatively homogenous in its climate, Global Climate Model projections for the Pacific Northwest are relevant for planning in Oregon.

A number of research centers around the world run computerized Global Climate Models (GCMs), which provide scientists and decision makers with simulations of future global climate for comparison purposes. One such project, the Coupled Model Intercomparison Project (CMIP), involves many of these modeling centers worldwide. CMIP offers many simulations for scientists to use to assess the range of future climate projections for the globe. The latest CMIP experiment is the 5$^{th}$ phase of the project and is thus referred to as the CMIP5. CMIP5 simulations of the 21$^{st}$ century climate are driven by what are called “representative concentration pathways” (RCPs). RCPs represent the total amount of extra energy (in watts per square meter) entering the climate system throughout the 21$^{st}$ century and beyond.

**Figure 2-3**. Observed and Simulated Regional Mean Annual Temperature for Selected Global Climate Models for RCP 4.5 and 8.5 Scenarios




Note: Black line shows observed (1950-2011) regional mean annual temperature; blue and red lines simulate regional mean annual temperature (1950-2100) for global climate model representative concentration pathway (RCP) 4.5 and 8.5 scenarios.

Source: Dalton et al. (2013)

This summary and the Pacific Northwest section of the National Climate Assessment use scenario RCP4.5, which represents a significant reduction in global greenhouse gases, and RCP 8.5, which represents increasing greenhouse gases over time. Figure 2-3 shows observed mean global temperatures from 1950-2011, and simulated mean temperatures under the two different RCPs from 2011 to 2100. Note that the projected temperature trends under different RCPs generally track closely until about 2030 or so, and they dramatically diverge after 2050.

## Seasonality

Some of the most relevant climate data for planning purposes, and the most crucial to some of the hazards addressed in this Plan, are seasonal projections of temperature, seasonal projections of precipitation, and change in extreme precipitation events (Table 2-3, Table 2-4, and Table 2-5, respectively).

Table 2-3 and Table 2-4 summarize a lot of information drawn from analyses of CMIP5 data. Table 2-3 contains the maximum, mean, and minimum projected changes in Pacific Northwest

temperatures from historical (1950-1999) to mid-21st century (2041-2070), using both RCP 4.5 and RCP 8.5 scenarios. Projected changes are shown annually and for each season.

Every climate model shows an increase in temperature for the Pacific Northwest, with the magnitude of increase depending on rate of magnitude of global greenhouse gas emissions. *There is no plausible scenario in which the Pacific Northwest cools in the next century*. New models project an increase by mid-century (2041-2070) in annual temperatures in the PNW of 2.0°F to 8.5°F over the recent past (1970-1999). The lower projection is possible only if greenhouse gas emissions are significantly reduced (Figure 2-3, RCP 4.5 scenario). Both scenarios show a similar amount of warming through about 2040, meaning that temperatures beyond 2040 depend on global greenhouse emissions occurring now (Mote et al., 2013).

Of particular note in Table 2-3 is that both scenarios (for RCP 4.5 and RCP 8.5) show increased average temperatures for the year *and for every season*. All models are in agreement that each season will be warmer in the future, and that the largest amount of warming will occur in the summer. Increased average winter temperatures will result in less snowpack in Oregon. Increased summer temperatures have the potential to increase the potential for wildfires and increase health-threats from poor air quality conditions and the potential for heat waves.

**Table 2-3**. Projected Change in Average Temperatures (Maximum, Mean, and Minimum), from last Half of 20th to Mid-21st Centuries

| Time Period | Annual | | Winter (Jan, Feb, Mar) | | Spring (Apr, May, Jun) | | Summer (Jul, Aug, Sep) | | Fall (Oct, Nov, Dec) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Representative concentration pathway scenario | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 |
| Maximum change | 3.7°F | 4.7°F | 4.0°F | 5.1°F | 4.1°F | 4.6°F | 4.1°F | 5.2°F | 3.2°F | 4.6°F |
| Mean change | 2.4°F | 3.2°F | 2.5°F | 3.2°F | 2.4°F | 3.0°F | 2.6°F | 3.6°F | 2.2°F | 3.1°F |
| Minimum change | 1.1°F | 1.7°F | 0.9°F | 1.3°F | 0.5°F | 1.0°F | 1.3°F | 1.9°F | 0.8°F | 1.6°F |

Note: Maximum, mean, and minimum values represent the maximum model projection, the multi-model mean, and the minimum model projection.

Source: Dalton et al. (2013)

Table 2-4 contains a summary of projected change, in percent, in average precipitation for the Pacific Northwest (maximum, mean, and minimum) from historical (1950-1999) to mid-21st century (2041-2070), under both RCP 4.5 and RCP 8.5 scenarios. Projected changes are shown annually and for each season.

Note in the "Annual" column in Table 2.4 that precipitation amounts are projected to remain within the range of current variability. However, Table 2-4 also shows that there is some indication from climate models that summers will be drier in the future.

**Table 2-4**. Projected Change in Average Precipitation (Maximum, Mean, Minimum) for Two Scenarios, from Last Half of 20th to Mid-21st Centuries

| Time Period | Annual | | Winter (Jan, Feb, Mar) | | Spring (Apr, May, Jun) | | Summer (Jul, Aug, Sep) | | Fall (Oct, Nov, Dec) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Representative concentration pathway scenario | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 | RCP 4.5 | RCP 8.5 |
| Maximum change | 10.1% | 13.4% | 16.3% | 19.8% | 18.8% | 26.6% | 18% | 12.4% | 13.1% | 12.3% |
| Mean change | 2.8% | 3.2% | 5.4% | 7.2% | 4.3% | 6.5% | -5.6% | -7.5% | 3.2% | 1.5% |
| Minimum change | -4.3% | -4.7% | -5.6% | -10.6% | -6.8% | -10.6% | -33.6% | -27.8% | -8.5% | -11% |

Note: Maximum, mean, and minimum values represent the maximum model projection, the multi-model mean, and the minimum model projection.

Source: Dalton et al. (2013)

## Extreme Precipitation

Natural hazards are often an expression of extreme conditions – wind storms, rain storms, floods, droughts, and so on. Extreme precipitation is perhaps the most common and widespread natural hazard in Oregon. Many people may associate extreme rainfall events almost exclusively with western Oregon, but in fact extreme precipitation events occur across the entire state.

Projected future changes in extreme precipitation are less ambiguous (Table 2-5) than changes in total seasonal precipitation. The North American Regional Climate Change Assessment Program (NARCCAP) results indicate increases throughout the Northwest in the number of days above every threshold. Table 2-5 shows the projected *percent change* in the number of days when rainfall will exceed thresholds of one, two, three, and four inches. These projections (which are based on different models from those summarized in Table 2-3 and Table 2-4) show there will likely be an increase in extreme events of several different magnitudes. Note that the higher magnitude events show the largest overall increase. Note that although the frequency of extreme events rises in percentage with the magnitude of the extreme, the standard deviation rises faster. In other words, only modest events (>2.5 cm, or 1 inch) increase by much more than one standard deviation (Mote et al., 2013).

**Table 2-5**. Change in the Number of Days with Extreme Precipitation (from mid-Century [2041-2070] Minus Historical [1971-2000]) Over Four Thresholds

| | NARCCAP Mean Change % | NARCCAP Standard Deviation % |
|---|---|---|
| Change in the number of days with precipitation over one inch | +13% | 7% |
| Change in the number of days with precipitation over *two inches* | +15% | 14% |
| Change in the number of days with precipitation over *three inches* | +22% | 22% |
| Change in the number of days with precipitation over *four inches* | +29% | 40% |

Note: NARCCAP (North American Regional Climate Change Assessment Program) is a multi-institution regional modeling effort with a coordinated approach similar to CMIP NARCCAP (http://www.narccap.ucar.edu/)

Source: Dalton et al. (2013)

## Effect of Oregon's Future Climate Conditions on Natural Hazards

In 2010, Oregon achieved a significant milestone in the release of two reports for two important initiatives that developed in parallel; both reports addressed climate change across the state. In November 2010, OCCRI released the Oregon Climate Assessment Report (Appendix 9.1.17; Dello & Mote, 2010), the first ever comprehensive scientific assessment of climate change in Oregon. At the same time, the State released the Oregon Climate Change Adaptation Framework (Appendix 9.1.19), representing the efforts of over a dozen state agencies and institutes, including OCCRI, to begin to establish a rigorous framework for addressing the effects of climate change across the state. More recently, the 2010 Oregon Climate Assessment Report was updated by the 2013 Northwest Climate Assessment Report (Appendix 9.1.18), also produced by OCCRI. The Framework, however, has not been updated since its release in 2010.

Development of Oregon's Climate Change Adaptation Framework was significant in that the State began to address the need to plan for the effects of future climate conditions. Furthermore, Oregon's Framework is the first state-level adaptation strategy based on *climate risks* as opposed to *affected sectors*. Oregon's Framework lays out 11 climate risks that are of concern to the State. The risks provide a consistent basis for agencies and communities to review plans and decisions to identify measures to reduce those risks. Many of the risks in the Oregon Framework are natural hazards.

Following is a summary of the principal effects of changing climate conditions on the natural hazards addressed in the Oregon NHMP. Hazards are discussed together where the climate changes and drivers are essentially the same. How each hazard (or group of hazards) affects each of the eight Oregon NHMP Natural Hazard Regions is then summarized.

## Relationship between Adaptation Framework *Risks* and *Hazards* in the Oregon NHMP

**Table 2-6. Relationship Between Adaptation Framework *Risks* and *Hazards* in the Oregon NHMP**

| | Oregon NHMP Hazards | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Adaptation Framework climate *risks*** | **Coastal Erosion** | **Droughts** | **Dust Storms** | **Wildfire** | **Floods/ CMZ** | **Landslides** | **Wind-storms** | **Winter Storms** | **Heat Wave*** |
| Increased temperatures | x | X | x | X | | | | | X |
| Changes in hydrology | | X | x | | X | X | | | |
| Increased wildfires | | x | x | X | x | x | | | |
| Increase in ocean temperatures and changes in ocean chemistry | X | | | | x | | | X | |
| Increased drought | | X | | X | | | | | |
| Increased coastal erosion | X | | | | | x | | | |
| Changes in habitat | | | | | | | | | |
| Increase in invasive species and pests | | x | | X | | | | | |
| Loss of wetland ecosystems and services | | X | X | | X | | | | |
| Increased frequency of extreme precipitation events and flooding | | | | | X | X | | x | |
| Increased landslides | | | | | | X | | | |

*Heat waves are not identified as a natural hazard in the current natural hazards mitigation plan.

**What is contained in** Table 2-6: The leftmost column contains the climate risks in the Oregon Climate Change Adaptation Framework. Column headings show natural hazards identified in the Oregon Natural Hazards Mitigation Plan (NHMP).

**How to read this table**: Cells with an x or X show which *climate risks* will affect the frequency, intensity, magnitude, or duration of which *natural hazards*. A big *X* shows a primary relationship between the risk and the hazard. A small *x* shows a secondary relationship. The green cells in the body of the table show where an Adaptation Framework risk and a natural hazard in the Oregon NHMP are essentially the same thing.

Note that the first two risks – increased temperatures and changes in hydrology – are *the primary climate drivers* for natural hazards. The other climate risks represent known environmental or ecosystem responses to one or both of the primary drivers. Note also that a clear link has not been established between climate change and the frequency or intensity of wind storms.

## Coastal Erosion and Coastal Flooding

Regions affected: 1

Oregon's ocean shoreline is constantly subject to the dynamic and powerful forces of the Pacific Ocean, and it changes at timescales that vary from days to decades. Variable and changing ocean conditions continuously reshape the ocean shoreline, particularly where the shore is composed primarily of sand. Sand levels on Oregon's beaches generally experience an annual cycle of erosion through winters and rebuilding in summer months. Over any extended time period, sandy beaches and shores will build out and retreat several times, due in part to the effects of winds,

storms, tides, currents, and waves. These cycles can occur over decades. In the annual cycle, beach profiles do not always recover to the heights and extent of previous years. In recent years, sand levels have remained fairly low at many locations on the Oregon coast.

The shape of Oregon's ocean shoreline is a function in part of ocean water levels and wave heights. Ocean water levels are also a primary factor in the frequency of flooding around the fringes of Oregon's estuaries. In other words, erosion of the ocean shore is directly affected by sea levels and wave heights. Flooding on the estuarine fringe is affected by ocean water levels – including tides and storm surges – in addition to freshwater inflow from the estuarine watershed. Other factors influence coastal erosion, but sea levels and wave heights are the primary climate-related drivers that influence rates of coastal erosion.

Recent studies make it clear that global ocean water levels are rising. Global sea levels are projected to rise 8-23 cm by 2030 and 18-48 cm by 2050 (NRC, 2013). In Oregon (as elsewhere) the rates of *relative* sea level rise are not the same as rates of change in global sea levels, because of a number of factors related to ocean conditions and vertical movement of the land. Oregon's western edge is rising, so the rates of sea level rise in Oregon are not as high as rates seen in other west coast locations. But even after factoring in local conditions, sea levels along Oregon's coast are rising. For more information on coastal erosion and sea level rise, see the Coastal Hazards section.

Recent research also indicates that significant wave heights off Oregon are increasing. Increasing significant wave heights may be a factor in the observed increase of coastal flooding events in Oregon. During El Niño events, sea levels can rise up to about 1.5 feet (0.5 meters) higher over extended periods (seasons).

Rising sea levels and increasing wave heights are both expected to increase coastal erosion and coastal flooding.

One of the climate risks discussed in the Oregon Climate Adaptation Framework is "increased coastal erosion and risk of inundation from increasing wave heights and storm surges." The executive summary of the Adaptation Framework provides a summary of various challenges associated with increased coastal erosion:

> *Increased wave heights, storm surges, and sea levels can lead to loss of natural buffering functions of beaches, tidal wetlands, and dunes. Accelerating shoreline erosion has been documented, and is resulting in increased applications for shore protective structures. Shoreline alterations typically reduce the ability of beaches, tidal wetlands, and dunes to adjust to new conditions.*
>
> *Increasing sea levels, wave heights, and storm surges will increase coastal erosion and likely increase damage to private property and infrastructure situated on coastal shorelands. Coastal erosion and the common response to reduce shoreland erosion can lead to long-term loss of natural buffering functions of beaches and dunes. Applications for shoreline alteration permits to protect property and infrastructure are increasing, but in the long term they reduce the ability of shore systems to adjust to new conditions.*

## Droughts, Wildfires, and Dust Storms

Regions affected: 1-8

All eight regions in the Oregon NHMP are potentially affected by increasingly common droughts and wildfires. Moreover, areas that have historically been both hotter and drier than the statewide average – southwest Oregon counties and central and eastern Oregon – are at somewhat higher risk of increased drought and wildfire than the state overall.

There is no current research available on the direct effects of future climate conditions on the incidence of dust storms. However, because drought conditions have the effect of reducing wetlands and drying soils, droughts can increase the amount of soil particulate matter available to be entrained in high winds, in particular where agriculture practices include tilling. This correlation between drought conditions and dust storms means that an increase in future droughts could increase the incidence of dust storms, even though the drought is unrelated to the storm.

Droughts, fires, and dust storms are addressed as separate hazards in this Plan. However, the underlying climate mechanism is similar for each. These hazards all occur in conjunction with warmer and drier conditions.

Virtually all climate models project warmer, drier summers for Oregon, with mean projected seasonal increases in summer temperatures of 2.6 to 3.6°C by mid-century, and a decline in mean summer precipitation amounts of 5.6 to 7.5% by mid-century. These summer conditions will be coupled with projected decreases in mountain snowpack due to warmer winter temperatures. Models project a mean increase in winter temperatures of 2.5 to 3.2°C by mid-century. This combination of factors exacerbates the likelihood of drought, which in turn often leads to an increase in the incidence and likelihood of wildfires and dust storms.

Two climate risks that are somewhat prominent in the Framework are "Increase in wildfire frequency and intensity" and "Increased incidence of drought." Dust storms were not addressed in the Framework as a climate risk; at the time the Framework was developed, research literature on the climatic conditions behind dust storms was scarce or nonexistent.

The executive summary of Oregon's Climate Change Adaptation Framework provides a summary of challenges associated with increased incidence of both wildfires and drought, as follows:

### *Wildfires*

Increased temperatures, the potential for reduced precipitation in summer months, and accumulation of fuels in forests due to insect and disease damage present high risk for catastrophic fires, particularly in forests east of the crest of the Cascade Range. An increase in frequency and intensity of wildfires will damage larger areas, and likely cause greater ecosystem and habitat damage. Larger and more frequent wildfires will increase human health risks due to exposure to smoke.

Increased risk of wildfire will result in increased potential for economic damage at the urban-wildland interface. Wildland fires destroy property, infrastructure, commercial timber, recreational opportunities, and ecosystem services. Some buildings and infrastructure subject to

increased fire risk may not be adequately insured against losses due to fire. Increased fire danger will increase the cost to prevent, prepare for, and respond to wildfires.

### *Droughts*

Longer and drier growing seasons and droughts will result in increased demand on ground water resources and increased consumption of water for irrigation, which will have potential consequences for natural systems. Droughts affect wetlands, stream systems, and aquatic habitats. Droughts will result in drier forests and increase likelihood of wildfire.

Droughts will cause significant economic damage to the agriculture industry through reduced yields and quality of some crops. Droughts can increase irrigation-related water consumption, and thus increase irrigation costs. Drought conditions can also have a significant effect on the supply of drinking water.

## Winter Storms, Floods, and Landslides

Regions affected: 1-4

Flooding and landslides are projected to occur more frequently throughout western Oregon, in Oregon NHMP Regions 1 through 4. While winter storms affect all areas of the state, there is no current research available indicating any change in the incidence of winter storms due to changing climate conditions.

The increase in extreme precipitation that is projected to occur at all thresholds from 1 to 4 inches per day (Table 2-5) is expected to result in a greater risk of flooding in certain basins. Changes in flood risk are strongly associated with the dominant form of precipitation in a basin, with mixed rain-snow basins in Washington and Oregon already seeing increases in flood risk. Generally, western Oregon basins are projected to experience increased flood risk in future decades. Increased flood risk involves both an increased incidence of flooding of a certain magnitude and an increase in the magnitude of floods of a certain return interval. In other areas of the state, flood risk may decrease in some basins and increase in others.

Landslides in Oregon are strongly correlated with rainfall, so increased rainfall – particularly in extreme events – will likely trigger increased landslides.

The executive summary of Oregon's Climate Change Adaptation Framework provides a summary of challenges associated with both flooding and landslides:

### *Floods*

Extreme precipitation events have the potential to cause localized flooding due partly to inadequate capacity of storm drain systems. Extreme events can damage or cause failure of dam spillways. Increased incidence and magnitude of flood events will increase damage to property and infrastructure and will increase the vulnerability of areas that already experience repeated flooding. Areas thought to be outside the floodplain may begin to experience flooding. Many of these areas have improvements that are not built to floodplain management standards and are not insured against flood damage; therefore being more vulnerable to flood events. Finally, increased flooding will increase flood-related transportation system disruptions, thereby affecting the distribution of water, food, and essential services.

### *Landslides*

Increased landslides will cause increased damage to property and infrastructure and will disrupt transportation and the distribution of water, food, and essential services. Widespread damaging landslides that accompany intense rainstorms (such as "Pineapple Express" winter storms) and related floods occur during most winters. Particularly high consequence events occur about every decade; recent examples include those in February 1996, November 2006, and December 2007.

## Windstorms

Regions affected: Unknown

There is little research on changing wind in the Pacific Northwest as a result of climate change.

# Appendix A:
# Resource Directory

## City

**Albany Emergency Management (AEM)**
AEM 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 Management 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:** Fire Chief
**Address:** 333 Broadalbin SW, Albany, OR 97321
**Phone:** 541-917-7700

**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 Official
**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:** Emergency 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:** Emergency Services Coordinator
**Address:** 1115 Jackson St. S.E, Albany, Oregon 97321
**Phone:** 541-812-2272

## 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 & Floodplain Specialist
**Address:** 635 Capitol St. NE, Suite 200, Salem, OR 97301-2540
**Phone:** 503-373-0050
**Fax:** 503-378-5518
**Website:** http://www.oregon.gov/lcd
**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.oregon.gov/omd/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:** 4034 Fairview Drive SE, Salem, OR 97302
**Phone:** 503-947-6000
**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 U.S. 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:** 503-986-5200
**Fax:** 503-378-4844
**Website:** http://www.oregon.gov/dsl

**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**: 725 Summer Street NE, Suite A, Salem, OR 97301
**Phone:** 503-986-0900
**Website:** http://www.oregon.gov/owrd

**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 instability, 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 (OCS) 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
326 Strand Ag Hall, Corvallis, OR 97331
**Phone**: 541-737-8927
**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**: DOGAMI
**Address**: 800 NE Oregon St., Suite 965, Portland, Oregon 97232
**Phone**: 971-673-1555
**Fax**: 971-673-1562
**Website**: www.oregongeology.org

**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

# 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
**Phone:** 202-646-2500
**Website:** http://www.fema.gov
**To obtain FEMA publications:**
**Phone:** 800-480-2520
**To obtain FEMA maps:**
**Contact:** Map Service Center
**Phone:** 1-877-336-2627

**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:** 2130 SW 5th Ave., Portland, OR 97201
**Phone:** 503-251-3200
**Fax:** 503-251-3470
**Website:** http://www.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:** U.S. Army Corps of Engineers-Portland District
**Address:** 333 SW First Avenue, Tenth Floor, Portland, OR 97204
**Phone:** 503-808-4510
**Website:** http://www.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 than one property.

**Contact**: Tangent Service Center
**Address**: 31978 N. Lake Creek Dr., Tangent, OR 97389
**Phone**: 503-648-3174
**Fax**: 503-640-1332
**Tangent Field Office Phone**: 541-967-5925
**Website**: www.nrcs.usda.gov

**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.nibs.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
**Address**: 801 K Street, Suite 1236, Sacramento, CA 95814
**Phone**: 916-444-6816
**Fax**: 916-444-8077
**Website**: http://www.wsspc.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:** National Flood Insurance Program Region X
**Phone:** 360-658-8188
**Website:** http://www.fema.gov/national-flood-insurance-program

**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://www.usgs.gov

**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

**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**: 1401 Constitution Avenue, NW, Room 5128, Washington, DC 20230
**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**: 503-261-9246
**Website**: http://www.wrh.noaa.gov

## 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**: Oregon Pacific Chapter
**Address:** 862 Bethel Dr., Eugene, OR
**Phone**: 541-344-5244
**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**: 4775 East Fowler Ave - Tampa, FL 33617
**Phone**: 813-286-3400
**Fax**: 813-286-9960
**Website**: http://www.disastersafety.org

**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 Management 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/

**Association of State Floodplain Managers**
The Association of State Floodplain Managers (ASFPM) 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:** Association of State Floodplain Managers
**Address:** 575 D'Onofrio Drive, Suite 200, Madison, WI 53719
**Phone:** 608-828-3000
**Website:** http://www.floods.org

# Appendix B:
# Public Process and Committees

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 its 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 can 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, levels of responsibility.

## City of Albany Natural Hazard Mitigation Plan Action Plan

The Steering Committee reviewed the goals of the 2010 plan at a meeting June 24, 2015. They recognized significant changes to the City's Strategic Plan since 2010 but felt it was very important to continue to use it as the basis for the mission, vision, values and goals for the mitigation plan. At the June 24th meeting, the Committee approved using of the 2015 – 2019 Strategic Plan mission, vision, values and themes in the Natural Hazard Mitigation Plan.

Within the four themes of the Strategic Plan, the committee chose six goals to align its action items:

- Create and sustain a city of diverse neighborhoods where residents feel good about where they live.
- Provide effective stewardship of Albany's significant natural, cultural, and historic resources
- Ensure a safe community by protecting people and property.
- Provide safe, sufficient systems, sufficient, and reliable drinking water, sewage disposal and drainage systems.
- Create a readily identifiable downtown core that is unique and vibrant with a mixture of entertainment housing, specialty shops, offices, and other commercial uses.
- Effectively and efficiently deliver the services that Albany's citizens need, want, and are willing to support.

## City of Albany Natural Hazard Mitigation Steering Committee

| City of Albany Steering Committee | Organization Representing |
|---|---|
| • Wes Hare | City Manager |
| • Ed Hodney | Parks & Recreation |
| • Jeff Blaine | Public Works Engineering and Community Development |
| • Chris Bailey | Public Works Operations |
| • David Shaw | Human Resources |
| • Mario Lattanzio | Albany Police Department |
| • John Bradner | Albany Fire Department |
| • Marilyn Smith | Management Assistant/Public Information Officer |
| • Ed Gallagher | Library |
| • Stewart Taylor | Finance |
| • Jorge Salinas | Assistant City Manager/Chief information officer |
| • Kate Porsche | Economic Development & Urban Renewal |

## Steering Committee Meetings

**June 24, 2015**

This was the first meeting for the Steering Committee, intended to explain the purpose of the Natural Hazard Mitigation Plan, the purpose of the plan review and the Committee's role in the process. The Committee reviewed the proposed schedule, Steering and Working Committee duties and responsibilities and expected involvement. They discussed how the public would be involved in the review process and approved scheduling two public meetings, one in September and the second in November. The first meeting will be to get input from the public on hazard mitigation and the second will be to review the draft plan and get feedback on any changes they feel needs to be addressed. The Steering Committee heard that Melissa Anderson, Floodplain Coordinator for the City, had put together a Floodplain Management Planning Committee made up of an equal number of City and non-City members. The purpose of the Committee is to look at the Flood section in the Natural Hazard Mitigation Plan and to make recommendations on changes to that section and any new action items. Its other purpose is to make recommendations on how to meet the new Community Rating regulations so the City can receive the maximum points for flood preparedness and public outreach. The Committee reviewed the natural hazards that would be included in the plan; this year there will be the seven found in the 2010 plan as well as a section on Climate Change. The Committee was informed that the City Hazard Analysis had been updated and was available on the fire department website. The number of hazards had been increased to 25 for 2015. The Committee approved the Vision, Theme, Goals and Objectives for the 2015 Plan update. The next meeting will be in August of 2015. A copy of the minutes of the meeting is found at the end of this Appendix.

**September 2, 2015**

Second meeting of the Steering Committee began with a review of the June 24 meeting.
The Committee reviewed the action of the Working Committee; those members had met and reviewed their 2010 actions. Results can be seen in the minutes found at the end of this Appendix. The Committee then reviewed the actions that would be deleted, had been completed, or had been modified and carried forward. A list of actions to be deleted had been identified previously at Steering Committee meetings over the last four years. The Committee reviewed the recommend action items that would be include in Appendix F of the Plan. This was a draft list, with additional actions being included as we go through the process. The Committee was informed that Section 1, 2, 5 and 10 had been updated and were available to review. A copy of the minutes of the meeting is found at the end of this Appendix.

**October 28, 2015**

At the third meeting of the Steering Committee they reviewed the minutes of the September meeting. The Committee next discussed the September 14, 2015 public meeting. An outline of the public meeting and its minutes is found below. The Committee was informed that 17 portions of the plan had been completed and were available for review, 10 items are remaining, four of the items are large portions which include the cross walk, the outline of changes made to the plan this year, and the earthquake and severe weather sections. Appendix F was once again reviewed with the updates that had been made since the September meeting. Actions within each section were also reviewed; the seven hazards had at least one action item for them. At the November meeting Melissa Anderson will attend to share information about the Floodplain Management Planning Committee. A copy of the minutes of the meeting is found at the end of this appendix.

**November 25, 2015**

The Committee reviewed what they had accomplished at the July 28 meeting. They reviewed action items for the 2010 plan and discussed how to prioritize them. The Committee decided to move all actions, whether short term or long term, under the same objective within a natural hazard. They decided their priority would be to work on the short-term action items first since these usually mean the City has the resources to accomplish them. They would then work on the long-term action items, considering that these would require additional resources, grant funding is competitive, and it could take several years to acquire it. The Committee made changes to several action items, then determined, after approval of the new plan as a part of the implementation, they would meet in June and December of each year to review plan progress. The Committee discussed the importance of continuing public participation and identified several action items that will provide information to the public on the progress of the plan implementation. The Committee approved a draft of the updated plan in preparation for the public meeting and an update for City Council on September 15.

A copy of the minutes of the meeting is found at the end of this appendix.

## Working Committee Meetings

The Working Committee did not meet in a traditional way, but one on one with the Facilitator. Individuals from each of the lead organizations were identified and approved by their respective department head to participate. Those individuals included:

- Jeff Blaine – Public Works Engineering
- Chris Bailey – Public Works Operations
- Gary Stutzman – Building Division
- Shane Wooton- Fire Department
- Jorge Salinas – Information Technology
- Rick Barnett – Parks & Recreation
- Melissa Anderson – Community Development Floodplain Management
- Kate Porsche – Economic Development & Urban Renewal
- Darrel Tedisch – Emergency Management

Working Committee members were provided with lists of the 2010 plan's action items for each of their departments and were asked to outline accomplishments in the last five years, modifications, deletions, and action items to add, and then submit results to the facilitator. The Facilitator later met with each individual to go over the results.

## Floodplain Management Planning Committee Meetings

The Floodplain Management Planning Committee was developed by the Community Development Floodplain Manager to: 1) review and update the flood hazard section and its related action items of this plan; and 2) to create a Flood Information and Insurance Promotion Public Outreach Plan (Appendix J). Their work was reviewed by the Steering Committee and approved or modified as appropriate. The Committee met six times: June 16, July 13, August 18, September 29, October 13, and November 17, 2015. The Committee was made up of four City staff members with expertise in floodplain issues and public outreach. The Committee also included four business professionals from outside of the City administration, representing the real estate, lending, and insurance industries. The Floodplain Manager served as the Project Manager for the Committee to complete the project. Each meeting included an agenda, attendance, and minutes. Appendix I identifies the membership of the Committee and includes the dates, attendance and summaries of the Floodplain Management Planning Committee meetings. All original agenda and minutes are on record with the City of Albany, Community Development department's Natural Hazard Mitigation Plan file.

## Public Meetings

During both public meetings no questions, comments or recommendations were made from the attending public members pertaining to the draft natural hazard mitigation plan. All discussion centered on response capability of the city and talk about previous major events that have occurred in Albany. The facilitator asked several times, at both meetings, if there were any comments the individuals might want to make about the draft natural hazard mitigation plan or if there were any questions about the draft plan. No comments or questions were offered.

**September 14, 2015**

The first public meeting took place at 6:00 p.m. in the Council Chambers of City Hall. Two members of the public participated. It began with introductions and a review of the purpose of the meeting. The Facilitator gave a brief history of mitigation planning from the Federal to the local level, followed by a review of the 2010 plan goals, objectives and action items. The public reviewed hazard analyses for Linn and Benton Counties and the 2015 City of Albany analysis and discussed the natural hazards found in the these three analyses as well as the State Region 3: Mid/Southern Willamette Valley regional profile. The public reviewed the current status of action items in the 2010 plan and provided input on future action items for the 2015 plan. The meeting adjourned at 7:20 p.m. Announcements of this public meeting appeared in the *Albany Democrat-Herald* on September 9, 2015. The announcement was also made on the City's webpage, Facebook page, and the City's Twitter page. A copy of the minutes of the meeting is found at the end of this appendix.

**November 9, 2015**

This public meeting was held to review a draft of the 2015 Natural Hazard Mitigation Plan and was held in the Court Room at City Hall. It began at 6 p.m. and went until 7:30 p.m. Three individuals from the public attended. An agenda was passed out.

The purpose of the meeting was explained and the following documents were reviewed and discussed.

- City of Albany 2015 Hazard Analysis
- 2010 Natural Hazard Mitigation Plan
- Draft of the 2015 Natural Hazard Mitigation Plan
- Master List of 2015 Action Items
- Multiple Flood Maps
- Draft of the Flood Information and Insurance Promotion Public Outreach Plan
- A list of key sections was reviewed

A general summary of the meeting included a review of the City's hazard analysis, the 2015 hazard plan, a review of the changes to the 2015 plan, a review of the action items included in the 2015 plan for each of the natural hazards, and a discussion of flood events in Albany. A discussion took place about earthquake events in Albany, general preparedness for an earthquake, and what the City was doing with HAZUS. After one hour and 30 minutes the public was asked if they had any additional questions or comments, or if they had any recommended changes to the plan. A few questions about the City's response to earthquakes were asked, including the City's preparedness to move people across the river if the bridges were not usable. No suggestions on new action items were provided.

A news release was issued by the city to media outlets on October 21, 2015. An announcement for the meeting appeared in the local newspaper on Wednesday, November 11, 2015 requesting input into the plan. The meeting announcement and a short discussion of Natural Hazard Mitigation was aired on the local radio station prior to the meeting. An invitation for the public to attend the November 9th Natural Hazard Mitigation Draft Plan meeting was posted on the City's website.

A copy of the minutes of the meeting is found at the end of this Appendix.

# City of Albany
# Natural Hazard Mitigation Planning Steering Committee
# Minutes
# June 24, 2015

All appropriate material was sent to the Steering Committee members prior to the meeting to provide them an opportunity to review and comment in preparation for the meeting.

- **Introductions – Signup sheet**
    - See the Attendance Log sheet for meeting attendees
- **Purpose of the Plan Review**
    - The purpose of the City of Albany Natural Hazard Mitigation Plan review was discussed. It was shared that FEMA requires the plan to be updated every five years. Our plan was approved by FEMA on February 1, 2011 and needs to be updated and reapproved by February 1, 2016.
- **Review of the Work Plan**
    - Schedule
        - It was explained that the key deadlines for the review process were found below and had to do with review of the draft plan by OEM, approval by FEMA, and adoption by the City Council. A complete schedule for the review process was available to the Steering Committee upon request. It is attached to this document.
            - Final Draft completed and to OEM — December 4, 2015
            - Pre-Approval by FEMA — January 8, 2016
            - Approved by City Council — January 13, 2016
            - Approved by FEMA — February 1, 2016
    - Internal Partners – Melissa Anderson and David Martineau, Kate Hennessy
        - At this time we are not partnering with the University of Oregon or the Department of Land Conservation and Development in the form of a grant. However Community Development staff and Fire Department staff have been assigned to assist with the update this year.
    - Steering Committee
        - As outlined in the 2010 NHMP the Steering committee will oversee the update of the plan. The committee will make recommendations for changes, review and approve recommendations from the Working Committee and public and approve the final draft.
    - Working Committee
        - The Working Committee members have been identified and approved by the Steering Committee. Specific action items have been assigned to each Working Committee member and meeting dates will be established. The purpose of the Working Committee will be to review present action items and determine their status, and to recommend new action items to be considered by the Steering Committee. The Steering Committee members will meet individually with Darrel Tedisch.
    - Flood Plain Group – National Flood Insurance Program & Community Rating System - Melissa Anderson

- The Steering Committee was informed that this review cycle Melissa Anderson, Floodplain manager and Project Planner for the city, was convening a Floodplain group to review the flood section of the NHMP and to also make recommendations pertaining to the City's participation in the National Flood Insurance Program and the Community Rating system. The City is presently rated at a 6 and would like to move to a 5 after its next review which is in 2016. The group has met once and will be meeting several times during over the next 6 months. Agenda and minutes will be attached to these Steering Committee minutes.

- Public Involvement
  - As required by the FEMA, we will get the public involved in the review of and commenting on the NHMP. We are scheduling two meetings with the public in the months listed below. The first meeting is a review of the NHMP and explanation of what its purpose is. The second meeting is an opportunity to review and comment on the draft plan.
    - September 2015
    - October 2015
- Council update – September 2015
  - The council is updated on the progress of the update at least once prior to asking them to approve the pre-approved plan. This year we are looking at sharing the information with the Council at one of their working meetings in September.
- Community Stake holders
  - This review cycle Darrel Tedisch will be participating in the Benton and Linn Counties' update process for their NHMP. Because LBCC also has a plan, we will be asking them to participate in the City's update by reviewing different elements of the plan.
    - Linn & Benton Counties
    - LBCC
- Hazards
  - The Steering Committee was informed we would be updating the seven natural hazards that were included in our 2010 plan. In addition we would add a section on climate change, even though it was not required this year, in order to have it included when it does become a requirement. The state NHMP does mention climate change.
      - Seven: Flood, Severe Weather, Earthquake, Wildfire, Landslide, Drought, Volcano
      - New for this year: Climate Change
- Hazard Analysis update
  - The committee was informed the City's Hazard Analysis was updated at the beginning of 2015 ahead of the update of the NHMP. A copy is available on the intranet as well as the Fire Department's web page. An electronic copy will be made available to the committee members as required.

- Action Items
  - Beginning with the 2005 plan development, the City of Albany has used its Strategic Plan Vision, Theme, and Goals. The Steering Committee reaffirmed it wanted to continue to do that as it made it much simpler to tie this plan to other City plans. By consensus vote the Committee indicated it wished to use the Vision, Theme and Goals for the 2015 updated to the City's Natural Hazard Mitigation Plan.
    - Vision, Theme, Goals, Objectives:
      - Vision: "*A vital and diversified community that promotes a high quality of life, great neighborhoods, balanced economic growth, and quality public services*"
      - Theme and Goals:
        - Great Neighborhoods
          - Create and sustain a city of diverse neighborhoods where residents feel good about where they live.
          - Provide effective stewardship of Albany's significant natural, cultural, and historic resources.
        - A Safe City
          - Ensure a safe community by protecting people and property.
          - Provide safe, sufficient, and reliable drinking water, sewage disposal, and drainage systems.
        - A Healthy Economy
          - Create a readily identifiable downtown core that is unique and vibrant with a mixture of entertainment, housing, specialty shops, offices, and other commercial uses. .
        - An Effective Government
          - Effectively and efficiently deliver the services that Albany's citizens need, want, and are willing to support.

    - Objectives:
      - The steering committee reviewed and approved of the nine objectives it used in the 2010 NHMP. They felt these objectives were still appropriate for the plan and would work for the 2015 update.
        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 project in the city.

- Next Meetings:
  - The next three meetings take place within the following months of this year:
    - August 2015
    - October 2015
    - November 2015

# Steering Committee Meeting Minutes September 2, 2015 10 AM

All appropriate material was sent to the Steering Committee members prior to the meeting to provide them an opportunity to review and comment in preparation for the meeting.

- **Introductions – Signup Sheet**
  - Signup sheet was passed around and members signed in.

1. Review of June 24, 2015 meeting
   - The Committee reviewed the previous meeting minutes focusing on the update schedule, Internal Partners, Working Committee members, the Flood Plain Group, Public Involvement, Council report, Hazards to be included in the update, Hazard Analysis, and a review of the Vision, Theme, Goals, and Objectives.
2. Review working Committee Meetings
   - All meetings completed
     - Darrel met with twelve individuals and reviewed a total of 27 action items:
       - 19 were carried forward
       - 1 completed
       - 6 deleted
       - 1 new
     - In addition Darrel reviewed 20 actions with the following results:
       - 15 were carried forward
       - 4 completed
       - 1 deleted
   - The Committee approved those that were carried forward, completed, deleted, or added as new.
3. Review
   - The Committee reviewed the list of actions that will be deleted from the 2010 plan, those that will be continued forward and all new action items. One for flooding was recommended which was approved by the committee.
     - Deleted/Completed Action Items: Pages 5 - 8
     - Deferred, continued or modified Action Items: Pages 9 – 14
     - New Action Items: Page 15

4. 2015 Recommended Action Items Appendix F review

    - The Steering Committee reviewed document Appendix F. This document lists the all the natural hazards and then identifies the Action Items as short-term or long-term under each applicable Objective. Under natural hazard Earthquake Objective 6, Action item 6.4 the Committee decided to reword the Action to insert the words "City-owned Bridges" since they cannot seek funds for State and County bridges. The Action will read "Evaluate City-owned Bridges in the city to determine which need to be seismically updated and seek appropriate funds".
    - The Committee reviewed the natural hazard Severe Weather. No action items had been identified. It decided to include one action item for Severe Weather: "Develop pre-storm strategies for the coordination of debris removal following wind and winter storms".
    - At this time there are no action items for the Landslide natural hazard; one will be added prior to the update being completed.
    - After some discussion the Committee decided to add an additional column to Appendix F. Right after the Timeline column a priority column will be added. High, Medium and Low will be used to assign a priority to each action item. This will provide the Staff and the departments working on the action item knowledge of which priority the Steering Committee gave it.

5. Discussion: Natural Hazard with no Action Items

    - The committee discussed that there were no actions for the Severe Weather and Landslide natural hazards. Earlier they agreed to add one action item to Severe Weather. No action was identified for Landslide.
        - Severe Weather: page 8
        - Landslide: page 11

6. Report to City Council
    - Include in September 21 Work Session (in conjunction with the Earthquake report)
        - It was decided to update the City Council the Natural Hazard Mitigation update at the September 21st work session on Earthquake preparedness.

7. Discussion: Update to Section

- The Steering Committee was notified that the four sections identified below were being updated, and that if they were interested in reviewing these documents to let Darrel know and he would be send them to each individual wanting to review them.
    - Section 1: Introduction
    - Section 2: Community Profile
    - Section 5: Plan Implementation & Maintenance
    - Section 10: Volcano

- Discuss: Public Meeting
    - The Committee was informed there would be two opportunities for the public to provide input on the draft Natural Hazard Mitigation Plan. Those dates are listed below along with an outline of the agenda for each meeting.
        - 1st September 14, 2015
            - Mitigation – what it is
            - Progress to date
            - Discussion
            - Ideas

        - 2nd November 9, 2015
            - Review draft of the plan

- Next Meeting: October 2015 Report from Melissa Anderson, Flood Plain Group
    - The third Committee meeting would be scheduled sometime in October 2015. Information pertaining to Melissa Anderson, Flood Plain Group, would be shared at that time.

# Natural Hazard Mitigation Planning
# Steering Committee Meeting
# Minutes
# Wednesday, October 28, 2015

Attending: David Shaw, Human Resources; Stewart Taylor, Finance; Ed Hodney, Parks & Recreation; Jorge Salinas, IT; Ed Gallagher, Library; John Bradner, Fire Department; Eric Carter, Police; Jeff Blaine, Public Works/Community Development; Marilyn Smith, PIO; Kate Porsche, Economic Development & Urban Renewal; and Darrel Tedisch, Emergency Management.

1. Review of September meeting accomplishment included:
    a. The Working Committee 27 actions and another 20 actions submitted by Darrel Tedisch;
    b. A list of the actions to be deleted from 2010;
    c. Appendix F and the recommended actions for each natural hazard;
    d. The fact that one action each had been added to the Landslide and Severe Weather hazards;
    e. Sections that had been completed by the September meeting;
    f. What was going to be discussed at the first public meeting;
    g. The need to move Melissa Anderson to the November Meeting.

2. Public Meeting
    a. Discuss September 14, 2015 Public meeting
        i. The first public meeting took place on September 14, 2015 beginning at 6 p.m. Two individuals from the community showed up. One representing the public at large and one from the Albany Democrat Herald. Because the audience was small we did not stick to the agenda, but rather provided some general information to the group and then responded to questions. Meeting ended at 7:20 pm.
    b. Second Public Meeting
        i. Will take place on Monday, November 9, 2015 and will focus on reviewing a draft of the plan and asking for input from the community on any actions they may want to include in the plan. Focus will be on Action Items for each of the hazards

3. Review progress on the sections and appendixes
    a. The Committee reviewed the number of sections that had been completed to date and the number remaining to be completed. In many cases there were small items that needed to be done in a section such as identifying map pages in order to complete that section. There were four major items that needed to be worked on over the next month, they were: write up of all the changes that had been done in

the 2015 update; the crosswalk; and review of the Earthquake and Severe Weather sections.

i. 17 items completed
ii. 10 remaining

4. Review and set priorities for Appendix F Action Items

   a. The committee review Appendix F which showed all of the natural hazards, the Multi-Hazard, and the action items for each. At the September meeting it was suggested to prioritize the action items so a new column was added to Appendix F. After much discussion it was decided for each lead agency rank their Action items as “high” or “medium”. The action items for each hazard will be sent to the lead agency for them to determine priority. Steering committee will get the results prior to the November meeting.

      i. Multi-Hazard
      ii. Flood
      iii. Earthquake
      iv. Severe Weather
      v. Landslides
      vi. Wildfire
      vii. Drought
      viii. Volcanic

5. November Agenda
    a. Melissa Anderson – Floodplain Management Planning Committee

6. Process for Council approval of the plan
    a. It was decided that management will inform the Council to expect the Natural Hazard Mitigation Plan to come to them in early January 2016 for approval, after it has been pre-approved by FEMA.

7. Next Meeting
    - November 2015

# Natural Hazard Mitigation Steering Committee Meeting
# Minutes
# November 25, 2015
# 10 AM

All appropriate material was sent to the Steering Committee members prior to the meeting to provide them an opportunity to review and comment in preparation for the meeting.

- **Introductions – Signup Sheet**
  - Attendance Log for this meeting is attached.
- **Review of July 28th meeting accomplishments**
  - The Facilitator reviewed with the committee the accomplishment of the July 28th, highlighting:
    - June 24th Public meeting and the information that was shared and received.
    - Changing of the 2nd public meeting from August 31st to September 30 to allow for the draft plan to be adopted by the Committee.
  - Reviewed the changes to the plan goals and why those changes were necessary, and that the Committee reaffirmed their commitment to using the City Strategic Plan goals.
  - Talked about the 2005 Mitigation Action item accomplishment, reviewing and changing the format to more clearly show what had been accomplished.
  - Discussed the addition of four new natural hazards to the 2010 plan and the review of Action Items for those hazards.
  - Reviewed the fact that the Committee made a commitment to continue participating in the National Flood Insurance Program (NFIP).
  - Reviewed the fact that sections were sent out for Committee members' review.
  - Minutes of the July 28th meeting were approved by the Committee.
- **Action Item Review and Prioritization Process.**
  - The Committee reviewed the draft material found in Section 5 Plan Implementation and Maintenance, pages 7 – 10. After reviewing the prioritization material they reviewed the draft list of action items under each natural hazard. The Committee then decided to move the short-term and long-term action items under the same objective within each natural hazard to minimize confusion and have all objective action items together. They then decided to leave action items listed as they appear in the draft list, understanding that the short-term actions were actions that could be accomplished with resources presently available to the City, and the long-term actions were actions that needed additional resources to accomplish. Their first priority was to accomplish the short-term action items and then work on the long-term actions as resources became available. With the understanding that monetary resources were very limited, they decided to leave the long-term action items in the order they were drafted and then review at each Steering Committee meeting which resources were available and where they needed to be used.
  - The Committee reviewed the list of draft action items provided them. In addition to moving the short-term and long-term action items under a single objective they made some recommendations on changes to the wording to a number of action items in order to

make them more meaningful. With the recommended changes approved, the draft action items will be carried forward for review by the public at their September 30 meeting and the City Council for their review.

- **Method and schedule for monitoring, evaluating, and updating the plan, including the responsible departments.**
  - The Committee reviewed Section 5 Plan implementation and Maintenance pages 1 -2, 7 and 10 -11. They approved the language found on those pages and agreed to meet twice a year; June and December. The Committee also approved the five-year review of plan language on page 10 of Section 5.

- **Incorporation of the mitigation strategy into existing plans and programs.**
  - The Committee reviewed language found in Section 5 Plan Implementation and Maintenance pages 2 – 6. After some discussion it is recommended that the City Engineering design standards be added to the list of City existing programs. This was the only change to this section.

- **Continued public involvement.**
  - The Committee reviewed language in Section 5 Plan Implementation and Maintenance page 11 pertaining to public involvement. They reviewed action items 2.1 and 2.3 which both address the need for additional public involvement after the approval of the Plan. It addresses specific methods in which information will be shared with the public on the Plan and its status. The Committee reaffirmed these two specific action items again and commented on the importance of continued public involvement in the Hazard Mitigation process.

- **Approve the draft plan for review by the City Council and the public.**
  - After some discussion the Committee approved a draft of the Plan for the purpose of having it available for the September 30th public meeting and to have available for City Council review. A representative of the Committee will be providing an update to the City Council on September 20th at one of their work sessions. Council members will be able to review the draft document on the Fire Department website. Information in the City's newsletter "City Bridges" has gone out to the public announcing the September 30th meeting; in addition, notice will be posted on the City's website, newspaper articles will be developed, and notices will be sent to the media announcing the public meeting. The Committee approved of these notifications.

# City of Albany Natural Hazard Mitigation Planning
# Public Meeting
# September 14, 2015
# 6 PM – 7:20 PM
# Minutes

- **Introductions/Sign in**
  - The meeting began at 6 PM and was held in the Willamette Room of the Albany City Council Chamber. Those in attendance signed the attendance log and then we went around the room and did introductions. The following were in attendance: Gabe Wigtil, Citizen of Albany, Neil Zawicki, Citizen of Albany and Writer for the Democrat Herald, Darrel Tedisch, City of Albany Facilitator.

- **Purpose of the meeting**
  - The Facilitator of the meeting, Darrel Tedisch, explained that the purpose of the meetings was to receive input from the public pertaining to the City's Natural Hazard Mitigation plan. We are particularly interested in receiving any comments on the Action Items for each of the natural hazards that will be included in the updated plan.

- **History of Present Natural Hazard Mitigation Plan**
    - 2005 and 2010 planning process
      - Goals
      - Objectives
      - Action Items
  - The Facilitator explained that an approved Natural Hazard Mitigation Plan is required by FEMA if local governments wish to receive any Mitigation grants to support programs in their community. The City Council approved the original plan in December of 2005 and FEMA approved the Plan in January of 2006. Every five years the plan is required to be updated and reapproved by the council and FEMA. There was discussion about the City using its strategic plan goals as the goals for the Natural Hazard Mitigation plan. This had not been done before. The group reviewed the Goals and Objectives for the plan and also reviewed Action Items.

- **Review of the Hazard Analysis**
    - City of Albany
  - The Facilitator explained that a Natural Hazard Mitigation Plan begins with an understanding of what the hazards are in the community. The group then reviewed the City of Albany's Hazard Analysis and discussed what hazards were included and the process we went through to determine the priority of each. We also talked about who is involved in the scoring process, which in the City's case are City employees down to the supervisor level, and the public.

- **Hazards to be included in the Plan**
    - State Region 3: Mid/Southern Willamette Valley Regional Profile
    - City Hazards
  - The facilitator shared and discussed the Region 3: Mid/Southern Willamette Valley Regional Profile, what it was and what hazards were included in the document. This

document and had been made available on the Fire Department website and is still there for the public to review. It includes seven natural hazards: Earthquake; Floods; Severe Weather; Landslides; Wildfires; Drought; and Volcanic Eruption. Climate Change has been added this year as the eighth natural hazard. It may become a requirement for the 2020 plan update.

- **Successes**
  - 96 flood grant funds for canal stabilization
  - Duo power feed at the waste water treatment plant
    - Power outage May 19th no power loss
  - Grant to harden the Vine street water treatment plant
  - Downtown Seismic stabilization with CARA
    - Penny building
    - Boda Furniture building
  - Re-Run HAZUS Program
  - Fire Station 12 Seismic upgrade
  - Central School seismic upgrade
  - Linn-Benton Community College seismic upgrade
- **Status of current Action Item**
  - The facilitator shared three documents with those in attendance: a list of actions that have been deleted/completed, carried forward and new actions items; Appendix E, which is a chronological list of all the actions that will be carried forward into the 2015 plan; and Appendix F, which lists all the action items under the Natural Hazard they pertain to. The purpose was to show how the Action items tied to an objective, established a lead organization, showed who were the Internal/External Partners, defined a timeline and aligned with the City's strategic plan goals/themes and strategic plan Capital Elements.
- **Input from Public on any additional Action Items**
  - At the meeting there were no additional action items suggested.
- **Comments from the Public**
  - No comments from the public were made other than that the presentation was informative and they appreciated the opportunity to learn more about the City.
- The meeting ended at 7:20 p.m. with the Facilitator asking for the email addresses of the participants for additional communication, and requesting that if they had any further comments, to please contact him.

**City of Albany**
**Public Meeting**
**November 9, 2015**
**6:00 P.M.**
**City Hall Court Room**
**Minutes**

- Introduction/Sign in
  - Three individuals from the community attended the meeting; all were citizens interested in emergency management. The meeting began at 6:05 p.m. and ended at 7:30 PM.

- Purpose of the Meeting
  - The purpose of the meeting was explained by the Facilitator, Darrel Tedisch. Primarily it was to explain the Natural Hazard Mitigation Plan, the elements of the plan, and the changes we are looking to make.

- History of Albany Natural Hazard Mitigation Planning
  - The Facilitator talked about the history of Natural Hazard Mitigation, the requirement for a mitigation plan beginning in 2000 and the history of Albany's plan development beginning with the first plan in 2005. We discussed changes the City had made when updating the plan in 2010 and 2015 and the importance of having a plan approved by FEMA in order to receive a mitigation grant.

- Review of Hazard Analysis
  - We talked about the Hazard Analysis the City does every five years, the history behind the Hazard Analysis, who is required to have one, and how we update the Hazard Analysis before beginning to update the Mitigation plan. We also talked about how the Hazard Analysis provides for emergencies other than naturally-occurring emergencies, and how the document is updated each time an event occurs in the City. The Hazard Analysis was reviewed individually by those in attendance.

- Hazards included in Hazard Mitigation Plan
  - A list of key sections of the Mitigation Plan was provided to the attendees and the Facilitator went over each one explaining why they were important and what each part does for the plan. The list of "key sections" included: Letter of Change; Table of Content; Community Profile; Mission, Goals, Objectives & Action Items; Section 6, Flood; Section 7, Earthquake; Section 8, Severe Weather; Section 9, Wildfire; Section 10, Volcano; Section 11, Landslide; Section 12, Drought; Section 13, Climate Change; Appendix E, Master List of Actions; Appendix F, Action Items by Hazard; and Appendix H, Hazard Analysis.

- Action items for each Hazard
  - The Facilitator explained that for each Natural Hazard Action items were identified to assist in mitigating the impact of that specific Hazard on the public. In some cases there is only one action item, in others there may be many. Each is different. The Master List of Action Items was passed around so those in attendance could look over the all of the action items to get an idea of how they were written.

- Comments from the Public
  - There were a number of comments from the public pertaining to past flooding, earthquakes, ice and snow events, and their impacts on the community and citizens of Albany. There were also a number of emergency response questions the attendees had pertaining to earthquakes, flooding, and snow events.
  - There were no recommendations on deleting or increasing the number of action items for each natural hazard.

- The meeting was over at 7:30 p.m.

# 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 are 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 and 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
- Proprietor 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 by 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 Appendix C-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 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.

## Resources


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- Federal Emergency Management Agency, *Benefit/Cost Analysis of Hazard Mitigation Projects, Riverine Flood*, Version 1.05, Hazard Mitigation Economics Inc., 1996.

- Goettel & Horner Inc., *Earthquake Risk Analysis Volume III: The Economic Feasibility of Seismic Rehabilitation of Buildings in The City of Portland*, Submitted to the Bureau of Buildings, City of Portland, August 30, 1995.

- Goettel & Horner Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects Volume V, Earthquakes*, Prepared for FEMA's Hazard Mitigation Branch, October 25, 1995.

- Horner, Gerald, *Benefit/Cost Methodologies for Use in Evaluating the Cost Effectiveness of Proposed Hazard Mitigation Measures*, Robert Olson Associates, Prepared for Oregon State Police, Office of Emergency Management, July 1999.

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- VSP Associates, Inc., *A Benefit/Cost Model for the Seismic Rehabilitation of Buildings, Volumes 1 & 2*, Federal Emergency Management Agency, FEMA Publication Numbers 227 and 228, 1991.

- VSP Associates, Inc., *Benefit/Cost Analysis of Hazard Mitigation Projects: Section 404 Hazard Mitigation Program and Section 406 Public Assistance Program, Volume 3: Seismic Hazard Mitigation Projects*, 1993.

- VSP Associates, Inc., *Seismic Rehabilitation of Federal Buildings: A Benefit/Cost Model, Volume 1*, Federal Emergency Management Agency, FEMA Publication Number 255, 1994.

# 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*.

**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 floodways 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 whom, 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.

## Master List – 2016 Action Items

# Appendix E

## 2016 Plan – Albany Action Item Proposal Forms

| Lead Organization | Action | Type of Hazard | Objective | Term | Time Line | Internal/External Partners |
|---|---|---|---|---|---|---|
| Emergency Management | 1.1 As the City of Albany's Strategic Plan is updated, incorporate and link the Natural Hazard Mitigation Plan objectives into the Strategic Plan. | Multi-Hazard (MH) | #1 – Establish and maintain methods to ensure plan implementation. | LT | 2 – 5 yrs | Steering Committee |
| City PIO | 2.1 Develop and implement six communication and outreach opportunities to inform the community of the status of the Natural Hazard Mitigation Plan. | Multi-Hazard (MH) | #2 – Provide leadership to promote, communicate, and support disaster safety messages and activities. | LT | 2 – 5 yrs | All Departments |
| Fire Department | 2.2 Develop and implement a public education strategy for those households within identified high-risk areas in the City of Albany and contract rural fire districts. | Wildfire (WF) | #2 – Provide leadership to promote, communicate, and support disaster safety messages and activities. | LT | 2 – 5 yrs | Emergency Management, Linn & Benton Counties |
| Emergency Management | 2.3 Update emergency notification procedures for ash fall events | Volcano (VO) | #2 – Provide leadership to promote, communicate, and support disaster safety messages and activities. | LT | 2 – 5 yrs | All Departments |
| Emergency Management | 3.1 Provide NHMP awareness training to City Staff to incorporate NHMP aspects into their daily work. | Multi-Hazard (MH) | #3 – Incorporate mitigation into planning and policy development. | LT | 2 – 5 yrs | All Departments |
| Community Development | 3.2 Evaluate what can be done to improve the City's current rating in the National Flood Insurance Program's Community Rating System. | Flood (FL) | #3 – Incorporate mitigation into planning and policy development. | ST | 1 – 2 yrs | All Departments |
| Community Development | 3.3 Look at the need to update applicable city codes to reduce risk and prevent flood impacts. | Flood (FL) | #3 – Incorporate mitigation into planning and policy development. | LT | 2 – 5 yrs | All Departments |

# Master List – 2016 Action Items

| | | | | | | |
|---|---|---|---|---|---|---|
| Community Development | 3.4 Continue participation in the National Flood Insurance Program | Flood (FL) | #3 – Incorporate mitigation into planning and policy development. | LT | 2 – 5 yrs | All Departments |
| Community Development | 3.5 Explore development of an ordinance/program to address seismically deficient buildings. | Earthquake (EQ) | #3 – Incorporate mitigation into planning and policy development. | LT | 2 – 5 yrs | Emergency Management |
| Emergency Management | 3.6 Develop a Flood and Dam Failure Warning and Response Plan. | Flood (FL) | #3 – Incorporate mitigation into planning and policy development. | ST | 1 – 2 yrs | All Departments |
| Emergency Management | 4.1 Review hazard maps and update vulnerability and risk for hazards which affect the City, partnering with local, State, and Federal agencies. | Multi-Hazard (MH) | #4 – Support the enhancement of City vulnerability assessment activities. | ST | 1 – 2 yrs | Community Development & GIS |
| Emergency Management | 4.2 Develop pre-storm strategies for coordinated debris removal following wind and winter storms. | Severe Weather (SW) | #4 – Support the enhancement of City vulnerability assessment activities. | LT | 2 – 5 yrs | IT/GIS, Linn & Benton County Road Department, OEM, FEMA, Utilities |
| Public Works Operations | 4.3 Evaluate capability of water and wastewater treatment facilities to deal with ash fall and determine what changes may need to be made. | Volcano (VO) | #4 – Support the enhancement of City vulnerability assessment activities. | LT | 2 – 5 yrs | Emergency Management |
| Public Works Operations | 4.4 Evaluate ash impact on the storm water drainage system and develop mitigation if necessary. | Volcano (VO) | #4 – Support the enhancement of City vulnerability assessment activities. | LT | 2 – 5 yrs | Emergency Management |
| Parks & Recreation | 4.5 Evaluate the impact of ash fall-out on HVAC systems in City facilities. | Volcano (VO) | #4 – Support the enhancement of City vulnerability assessment activities. | LT | 2 – 5 yrs | All Departments |
| Emergency Management | 4.6. Continue reviewing DOGAMI hazard maps to identify any changes or amendments to future potential landslide areas within the city of Albany | Landslide (LS) | #4 – Support the enhancement of City vulnerability assessment activities. | LT | 2 – 5 yrs | Community Development |

# Master List – 2016 Action Items

| | | | | | | |
|---|---|---|---|---|---|---|
| Emergency Management | 5.1 Develop specific emergency evacuation or shelter-in-place plans for residential areas that are near significant hazardous material storage facilities and heavy industrial areas. | Earthquake (EQ) | #5 – Ensure continuity of City emergency services functions. | LT | 2 – 5 yrs | GIS, Mid-Valley LEPC, Linn & Benton Counties' Emergency Management |
| Emergency Management | 5.2 Evaluate City emergency transportation routes with City, County, and State partners. | Earthquake (EQ) | #5 – Ensure continuity of City emergency services functions. | LT | 2 – 5 yrs | GIS, Public Works, ODOT, Linn & Benton Counties' Road Department |
| Emergency Management | 5.3 Update emergency response planning for ash fall events. | Volcano (VO) | #5 – Ensure continuity of City emergency services functions. | LT | 2 – 5 yrs | All Departments |
| Emergency Management | 6.1 Assist K-12 schools to develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings. | Multi-Hazard (MH) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | GAPS |
| Emergency Management | 6.2 Develop and implement a non-structural retrofit program for City staff offices and workspaces. | Earthquake (EQ) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | Community Development, Insurance Companies, Utilities |
| Emergency Management | 6.3 Evaluate neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1950 homes and homes with cripple walls. | Earthquake (EQ) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | Community Development, GIS |
| Public Works Engineering | 6.4 Evaluate City-owned bridges to determine which need to be seismically updated and seek appropriate funds | Earthquake (EQ) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | Emergency Management, Linn & Benton Counties, State of Oregon, FEMA |
| Public Works Operations | 6.5 Conduct a vulnerability analysis of Albany's wastewater collection system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit them. | Earthquake (EQ) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | Emergency Management, Building Department, FEMA, OEM |
| Public Works Operations | 6.6 Conduct a vulnerability analysis of Albany water distribution system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit them. | Earthquake (EQ) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | Emergency Management |

# Master List – 2016 Action Items

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|---|---|---|---|---|---|---|
| Public Works Operations | 6.7 Evaluate the necessity for seismic valve protection for City of Albany reservoirs, and if determined necessary, seek funding to retrofit them. | Earthquake (EQ) | #6 – Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure. | LT | 2 – 5 yrs | Emergency Management |
| Emergency Management | 7.1 Provide educational awareness material on how to develop emergency plans and assemble 14 day kits to City employees. | Multi-Hazard (MH) | #7 – Increase citizen awareness and promote risk reduction activities through education and outreach. | ST | 1 – 2 yrs | All Departments, Red Cross |
| Emergency Management | 7.2 Provide eight educational and outreach articles to explain how to develop an emergency plan and assemble 14 day kits to Albany residents. | Multi-Hazard (MH) | #7 – Increase citizen awareness and promote risk reduction activities through education and outreach. | ST | 1 – 2 yrs | PIO, Red Cross, Fire Department, Utilities |
| Community Development | 7.3 Develop an education and outreach program to provide awareness to residents of the flood hazard in their area and the availability of flood insurance. | Flood (FL) | #7 – Increase citizen awareness and promote risk reduction activities through education and outreach. | ST | 1 – 2 yrs | PIO, Emergency Management, FEMA |
| Emergency Management | 7.4 Develop an education and outreach program to give residents information about earthquake hazards and the availability of structural and non-structural mitigation opportunities. | Earthquake (EQ) | #7 – Increase citizen awareness and promote risk reduction activities through education and outreach. | ST | 1 – 2 yrs | Community Development, PIO, FEMA, Red Cross |
| Emergency Management | 7.5 Provide five educational and outreach opportunities to residents on earthquake hazards and the availability of earthquake insurance. | Earthquake (EQ) | #7 – Increase citizen awareness and promote risk reduction activities through education and outreach. | LT | 2 – 5 yrs | Community Development, PIO, FEMA, Red Cross |
| Emergency Management | 8.1 Promote response, mitigation, and recovery planning for local businesses to continue operating after a disaster. | Multi-Hazard (MH) | #8 – Develop collaborative programs that encourage local businesses to plan for disasters. | LT | 2 – 5 yrs | Red Cross, Chamber of Commerce, PIO, Downtown Association, FEMA |
| Emergency Management | 9.1 Develop a non-structural retrofit program aimed at making childcare facilities, schools, city offices, and local businesses more resistant to the impact of an earthquake. | Earthquake (EQ) | #9 – Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. | LT | 2 – 5 yrs | Red Cross, Chamber of Commerce, PIO, Downtown Association, FEMA |
| CARA | 9.2 Develop public/private partnerships to seek outside funding for retrofitting structures in the downtown and historic districts. | Earthquake (EQ) | #9 – Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. | LT | 2 – 5 yrs | SHIPO, Emergency Management, Downtown Association, Chamber of |

# Master List – 2016 Action Items

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | Commerce |
| Public Works Operations | 9.3 Implement Santiam-Albany Canal bank improvement projects. | Flood (FL) | #9 – Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. | LT | 2 – 5 yrs | State of Oregon |
| Fire Department | 9.4 Work with Linn and Benton Counties to implement the community wildland fire protection strategies necessary for the City of Albany and contract rural fire districts to reduce fire risk. | Wildfire (WF) | #9 – Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. | LT | 2 – 5 yrs | Linn & Benton Counties, Rural Fire Boards |
| Public Works Operations | 9.5 Support local agency programs that promote measures to reduce water use during drought emergencies. | Drought (DR) | #9 – Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. | LT | 2 – 5 yrs | Emergency Managements, Linn & Benton Counties, Water Sheds, State of Oregon |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| MH-LT Action 1.1: Objective 1: Establish and maintain methods to ensure plan implementation. |
| **Proposed Action Title/Description:** |
| As the City of Albany's strategic plan is updated, incorporate and link the Natural Hazard Mitigation Plan objectives into the Strategic Plan. |
| **Rationale for Proposed Action:** |
| Having links between the mitigation plan and other applicable city plans provides the opportunity for discussion about mitigation. This assures that mitigation opportunities are in everyone's thoughts and there are discussions that will take place on events that can help in reducing the effects of natural hazards on the community. |
| **Ideas for Implementation:** |
| • Identify a list of city plans that should be linked to the hazard mitigation plan.<br>• Provide that list to the Steering Committee at one of their meetings for review and approval.<br>• Have the Steering Committee discuss how this process will be implemented.<br>• Have the Steering Committee develop a time frame for implementation given the different review times for each plan.<br>• Implement the Steering Committee's plan. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | | **External Partners:** |
|---|---|---|
| All City Departments | | |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: These efforts occur as the planning process takes place. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| MH-LT Action 2.1: Objective 2: Provide leadership to promote, communicate, and support disaster safety messages and activities. |
| **Proposed Action Title/Description:** |
| Develop and implement six communication and outreach opportunities to inform the community on the status of the Natural Hazard Mitigation Plan. |
| **Rationale for Proposed Action:** |
| The Steering Committee made a comment to enhance public awareness of the mitigation plan by making more information about the Natural Hazard Mitigation Plan available to the public. They want to provide an opportunity for public input between plan update times and give people a better idea of what the mitigation plan is about and how it benefits them. |
| **Ideas for Implementation:** |
| • Identify methods we can use to provide information to the public, taking into account the different ways individuals receive their news.<br>• Develop ideas of what we want the public to know about the mitigation plan and where they can find the information.<br>• Develop a schedule of when we will release information to the public about the mitigation plan.<br>• Take advantage of successes as they become available to share with the public. |

| | | |
|---|---|---|
| **Lead Organization:** | City PIO | |
| **Internal Partners:** | | **External Partners:** |
| All City Departments | | Linn & Benton Counties Emergency Management, City Emergency Management |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Two of the six communications to the public took place. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| WF-LT Action 2.2: Objective 2: Provide leadership to promote, communicate, and support disaster safety messages and activities. |
| **Proposed Action Title/Description:** |
| Develop and implement a public education strategy for those households within identified high-risk areas in the City of Albany and contract rural fire districts. |
| **Rationale for Proposed Action:** |
| Linn and Benton Counties have wildfire plans that provide information pertaining to hazards in our city and contract fire areas. It is important for the city to work with the counties and contract fire districts to make people aware of the hazard that exists and what they can do to mitigate it. |
| **Ideas for Implementation:** |
| • Identify those locations in Linn and Benton Counties where wildfire problems exist.<br>• Develop a plan on how information can be shared with the homeowners who live in these areas about the problem.<br>• Work with our partners at the County and Fire District levels to implement strategies for implementation.<br>• Record the contacts so that follow-up can be made to see what the homeowner's progress has been. |

| **Lead Organization:** | Fire Department |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| Emergency Management, PIO | Linn & Benton Counties' Planning Departments and Emergency Management, Linn & Benton Counties Fire Defense Boards |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| **Status** | Continued: No action has been taken at this time. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| VO-LT Action 2.3: Objective 2: Provide leadership to promote, communicate, and support disaster safety messages and activities. | | |
| **Proposed Action Title/Description:** | | |
| Update emergency notification procedures for ash fall events. | | |
| **Rationale for Proposed Action:** | | |
| Because volcano ash can have such a devastating impact on many aspects of emergency response, the City needs to review and develop specific response plans for its emergency personnel. This includes Police, Fire, and Public Works personnel. | | |
| **Ideas for Implementation:** | | |
| • Identify where the source of the volcano ash could come from.<br>• Identify what the impact of the ash might be on emergency responders, i.e. vehicles, personnel, and equipment.<br>• Develop strategies for how to deal with each of the impacts and how we need to be prepared.<br>• Develop a draft plan for departmental review.<br>• Modify and finalize as necessary. | | |
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | **External Partners:** |
| All City Departments | | Linn & Benton Counties' Emergency Management |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No action has been taken at this time. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| MH-LT Action 3.1: Objective 3: Incorporate mitigation into planning and policy development. | | |
| **Proposed Action Title/Description:** | | |
| Provide NHMP awareness training to City staff to incorporate Natural Hazard Mitigation Planning aspects into their daily work. | | |
| **Rationale for Proposed Action:** | | |
| • Improve the ability of staff to respond to emergencies.<br>• Integration.<br>• Identify areas to apply mitigation. | | |
| **Ideas for Implementation:** | | |
| • Identify the City staff, by department, who should receive the training and also the positions that should be trained when there are staff changes.<br>• Develop a training program, stressing the point the Steering Committee wants to make to the staff.<br>• Conduct training and overview of the hazard mitigation plan.<br>• Consider refresher training or training for new employees. | | |
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | |
| All City Departments | | |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Training to the Fire Department staff was accomplished. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| FL-ST Action 3.2: Objective 3: Incorporate mitigation into planning and policy development. |
| **Proposed Action Title/Description:** |
| Evaluate what can be done to improve the City's current rating in the National Flood Insurance Program's Community Rating System. |
| **Rationale for Proposed Action:** |
| An improvement in the City's present National Flood Insurance Program's Community Rating System would mean a savings in flood insurance premium costs for residents. The City had a rate improvement in 2006 from an 8 to a 7. The City was reviewed again in September 2010, which resulted in a rate improvement from a 7 to a 6. |
| **Ideas for Implementation:** |
| • Research and determine what it would take to move to the next level to improve the City's rate.<br>• Evaluate the options which would assist to improve the City's rate and determine how and when they might be implemented.<br>• Determine any cost associated with each of the fire options.<br>• Establish a plan to implement options that are determined appropriate for the City. |

| **Lead Organization:** | Community Development |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| All City Departments | Community Rating System-Insurance Services Office (CRS-ISO) |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |

| **Status** | Modified: The City's rating was improved in 2010 from 7 to 6. The next opportunity to improve the City's rating will be in 2016. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| FL-LT Action 3.3: Objective 3: Incorporate mitigation into planning and policy development. |
| **Proposed Action Title/Description:** |
| Look at the need to update applicable city codes to reduce risk and prevent flood impacts. |
| **Rationale for Proposed Action:** |
| Having the applicable code updates to prevent building within the flood way or flood zone will reduce the impact flooding has on the City and its residents. New laws and requirements mandate that the City review and update local codes on a regular basis. |
| **Ideas for Implementation:** |
| • Identify where potential problems may exist.<br>• Identify where problems have been in the past.<br>• List the codes that need to be updated.<br>• Develop a plan on how and what code changes need to take place.<br>• Get council approval for the changes. |

| | |
|---|---|
| **Lead Organization:** | Community Development |

| **Internal Partners:** | **External Partners:** |
|---|---|
| All City Departments | Oregon Department of Land Conservation and Development |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| | |
|---|---|
| **Status** | Modified: In 2010 Community Development updated applicable codes pertaining to floods. |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| FL-LT Action 3.4: Object 3: Incorporate mitigation into planning and policy development. | | |
| **Proposed Action Title/Description:** | | |
| Continue participation in the National Flood Insurance Program | | |
| **Rationale for Proposed Action:** | | |
| Participation in the National Flood Insurance Program (NFIP) is important to the City because it ensures residents can purchase flood insurance and it helps reduce the risk of flood by following the standards of the NFIP. The City has been a participant in this program since 1985. The last evaluation of the City's administration of the NFIP was conducted in 2011, and the City was found to be in good standing with the requirements of the program. | | |
| **Ideas for Implementation:** | | |
| The Steering Committee made a commitment in one of its meetings to continue its participation in the National Flood Insurance Program. | | |
| **Lead Organization:** | Community Development | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management, Public Works Engineering | | Federal Emergency Management Agency, Region X, National Flood Insurance Program, Oregon Department of Land Conservation and Development |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Modified: The City continues to participate in the NFIP. As of 2015, the City was in good standing with the national program. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 3.5: Objective 3: Incorporate mitigation into planning and policy development. |
| **Proposed Action Title/Description:** |
| Explore development of an ordinance/program to address seismically deficient buildings. |
| **Rationale for Proposed Action:** |
| Having an ordinance/program to address seismically deficient buildings would be very useful. The problem is the impact it has on a community or the property owner, and what the risk benefit might be. The Building Division has had discussions on this subject, but has been reluctant to develop any language that might impact the development of the downtown area. |
| **Ideas for Implementation:** |
| • Identify all buildings that would be impacted by an ordinance or program.<br>• Continue discussions through the Building Division with the Planning Division and other City departments.<br>• Determine what the financial impact of such an ordinance might be.<br>• Have discussions with the community. |

| | |
|---|---|
| **Lead Organization:** | Community Development |

| **Internal Partners:** | **External Partners:** |
|---|---|
| Emergency Management, Building Division | |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| | |
|---|---|
| **Status** | Continued: The Building Division has had some discussions about this with Community Development, but because of the remodeling cost and economic conditions, it has taken no further action. |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| FL-ST Action 3.6: Objective 3: Incorporate mitigation into planning and policy development. |
| **Proposed Action Title/Description:** |
| Develop a Flood and Dam Failure Warning and Response Plan. |
| **Rationale for Proposed Action:** |
| The City of Albany currently does not have a response plan for flood events that may be caused by riverine flooding, local flooding or flooding from a dam failure; developing a plan will assist the community in dealing with local flood hazards as well as to reduce the risk to first responders.<br><br>Flood events tend to pose a variety of hazards to a community as they build, crest, and subside. At different points in the life of a flood, people are displaced, damage occurs, and finally a cleanup is initiated by governmental agencies responsible for floodplain management. Disruption of normal public utilities and the presence of flood debris and damage can produce safety and health hazards. A comprehensive Flood and Dam Failure Warning and Response Plan is one of several tools available to coordinated and guide an effective response to a flood event. |
| **Ideas for Implementation:** |
| • Follow the Community Rating System guidelines for developing a flood response and dam failure response plan.<br><br>• Use the dam inundation maps produced by the U.S. Army Corps of Engineers to evaluate impacts from flooding if dams that affect Albany were to fail.<br><br>• Use flood insurance rate maps to evaluate impacts from riverine flooding. |

| | |
|---|---|
| **Lead Organization:** | Emergency Management |

| **Internal Partners:** | **External Partners:** |
|---|---|
| All City Departments | Linn & Benton Counties' Emergency Management, U.S. Army Corps of Engineers |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |

| | |
|---|---|
| **Status** | New Action Item. |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| MH-ST Action 4.1: Objective 4: Support the enhancement of the City vulnerability assessment activities. | | |
| **Proposed Action Title/Description:** | | |
| Review hazard maps and update vulnerability and risk for hazards which affect the City, partnering with local, state, and federal agencies. | | |
| **Rationale for Proposed Action:** | | |
| It is important to know and understand all the hazard maps we have and make sure they are the most current. In many cases, after the initial receipt of a map, if it is not used on a regular basis you forget the maps exist. To make sure we have the most current information, we need to develop a schedule to review our information. | | |
| **Ideas for Implementation:** | | |
| • Identify all hazard maps the City has.<br>• Identify what department uses each map.<br>• Determine which is the most recent copy of each map.<br>• Find out what local, state, or federal partner provided each map.<br>• Develop a schedule to review the maps. | | |
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | **External Partners:** |
| IT (GIS), Public Works, Building Division, Community Development | | Linn & Benton Counties' Emergency Management |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |
| **Status** | Continued: Some work has been completed on this, but a more in-depth review will be made. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| SW-LT Action 4.2: Objective 4: Support the enhancement of the City vulnerability assessment activities. |
| **Proposed Action Title/Description:** |
| Develop pre-storm strategies for coordinated debris removal following wind and winter storms. |
| **Rationale for Proposed Action:** |
| • Developing pre-storm strategies for debris removal after wind and winter storms can assist the City in coordinating its response efforts<br>• Coordinating resources assists the City in more efficiently and effectively using resources and responding when a wind or winter storm does happen.<br>• Pre-planning debris locations and strategies will assure quicker response to the removal of debris and assist the public in their efforts to remove debris from their property. |
| **Ideas for Implementation:** |
| • Identify and prioritize areas most likely to have debris to be removed following a wind or winter storm.<br>• Identify departments and agencies that would assist with debris removal.<br>• Work with departments, agencies, and private organizations that can assist in developing coordinated strategies for removing debris after a wind or winter storm.<br>• Identify tasks and responsibilities for each department and agency.<br>• Identify routes to respond to prioritized areas.<br>• Identify locations for depositing collected debris, or methods for dealing with collected debris.<br>• Identify a method of separating debris picked up, and where each type will go.<br>• Identify methods for responding to reports of debris caused by wind and winter storms.<br>• Work with Linn and Benton Counties' Road Department to coordinate responses and collection sites. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| Public Works | IT (GIS), Linn & Benton Counties' Road Departments, OEM, FEMA, Utilities |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: The City has the regional Debris Plan and will be working on adding information to the Linn & Benton section with city-specific information. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| VO-LT Action 4.3: Objective 4: Support the enhancement of the City vulnerability assessment activities. | | |
| **Proposed Action Title/Description:** | | |
| Evaluate the capability of water and wastewater treatment facilities to deal with ash fall and determine what changes may need to be made. | | |
| **Rationale for Proposed Action:** | | |
| Because volcano ash has not affected Albany since the 1980's, no planning has occurred on the effect it might have on the water and wastewater treatment facilities. The wastewater treatment plant has had a major remodel that was completed in 2010, a new water treatment plant was built in 2009, and the old plant is still in use. Public Works feels it is important to understand what the impact of ash might be on these facilities. | | |
| **Ideas for Implementation:** | | |
| • Identify where volcano ash might most likely come from.<br>• Determine when it might most likely take place.<br>• Evaluate each facility to determine where ash might most likely impact that facility.<br>• Determine what mitigation action might need to be taken for each facility.<br>• Take the corrective action. | | |
| **Lead Organization:** | Public Works Operations | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management | | DOGAMI |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| VO-LT Action 4.4: Objective 4: Support the enhancement of the City vulnerability assessment activities. |
| **Proposed Action Title/Description:** |
| Evaluate ash impact on the storm water drainage system and develop mitigation if necessary. |
| **Rationale for Proposed Action:** |
| Because we have not had an ash problem since 1980, Public Works would like to have a better understanding of what effect it might have on the City's storm water drainage system. Storm water runs directly to the Willamette River, and the City is responsible for this run-off. To be better prepared for response and recovery we need to understand what effect ash might have on the system and the river. |
| **Ideas for Implementation:** |
| • Identify where volcano ash might most likely come from.<br>• Determine when it would most likely take place.<br>• Evaluate how the ash might get into the storm water drainage system.<br>• Determine what mitigation action might need to be taken on each facility.<br>• Take the corrective action. |

| | |
|---|---|
| **Lead Organization:** | Public Works Operations |

| **Internal Partners:** | **External Partners:** |
|---|---|
| Emergency Management | State DEQ, DOGAMI |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Modified: Word Transportation taken out. No work has been done on this. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| VO-LT Action 4.5: Objective 4: Support the enhancement of the City vulnerability assessment activities. |
| **Proposed Action Title/Description:** |
| Evaluate the impact of ash fall-out on HVAC systems in City facilities. |
| **Rationale for Proposed Action:** |
| Because volcano ash has not affected Albany since the 1980's, no planning has occurred on the effect it might have on the water and wastewater treatment facilities. The use of HVAC systems is extensive throughout the City. These systems are much more complicated today than they were in the 1980's, and for the most part cannot be shut down with the pull of a switch. We need to have a better understanding of our response procedures at each facility and then how we will recover from an event. |
| **Ideas for Implementation:** |
| • Identify where volcano ash might most likely come from.<br>• Determine when it might most likely take place.<br>• Evaluate each facility to determine where ash might most likely impact that facility.<br>• Determine what mitigation action might need to be taken for each facility.<br>• Take the corrective action. |

| | | |
|---|---|---|
| **Lead Organization:** | Parks & Recreation/Facility Maintenance | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management, All City Departments | | DOGAMI |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| LS-LT Action 4.6: Objective 4: Support the enhancement of the City vulnerability assessment activities. |
| **Proposed Action Title/Description:** |
| Continue reviewing DOGAMI hazard maps to identify any changes or amendments to future potential landslide areas within the city of Albany |
| **Rationale for Proposed Action:** |
| According to DOGAMI landslide maps the city of Albany two locations where potential landslide could occur. One location is on the Calapooia river on the North East bank North of the 53 street developments. No buildings are location in the immediate area. The second location is on West Thornton Lake Drive NW between the West end of NW Thornton Lk Pl and NW Kouns D. Four separate locations are identified. Homes are located in these areas along with public infrastructure. |
| **Ideas for Implementation:** |
| • Identify the areas within the city where landslide concerns have been located<br>• Continue to monitor DOGAMI Oregon HazVu: Statewide Geohazards viewer to determine if any changes in locations have been identified<br>• Monitor actual events that may have occurred during the year to see if they are in areas different than what DOGAMI has show<br>• Make any reports to the Steering Committee to keep them updated |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| Community Development | DOGAMI |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| **Status** | New Action Item |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 5.1: Objective 5: Ensure continuity of City emergency functions. |
| **Proposed Action Title/Description:** |
| Develop specific emergency evacuation or shelter-in-place plans for residential areas that are near significant hazardous material storage facilities and heavy industrial areas. |
| **Rationale for Proposed Action:** |
| Having written plans for each of the hazardous materials facilities in Albany will help to implement any required evacuation or shelter-in-place order, allowing us to train for and exercise what we need to do. It will also allow us to do preparedness training with the residents and businesses in the hot zones. |
| **Ideas for Implementation:** |
| • <br>• Identify all the hazardous material sites in the City.<br>• Determine what distances will be used to draw the circles for each of the facilities.<br>• Identify the number and location of residents, businesses and the Vulnerable Population.<br>• Work with partners to develop preparedness messages.<br>• Work on response plans with the first responders.<br>• Work with GIS to develop maps.<br>• Put the plans together.<br>• Train and exercise the plans with the first responders. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| All City Departments, GIS | Linn & Benton Counties' Emergency Management, Mid-Valley LEPC, Linn-Benton Vulnerable Population Committee |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| **Status** | Continued: There have been some maps developed with evacuation circles, and the Mid-Valley LEPC is putting out an evacuation plan to meet this action. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| EQ-LT Action 5.2: Objective 5: Ensure continuity of City emergency services functions | | |
| **Proposed Action Title/Description:** | | |
| Evaluate City emergency transportation routes with City, County, and State partners. | | |
| **Rationale for Proposed Action:** | | |
| In order to have an evacuation plan that will work, the City needs to have a good understanding of which routes will work best. We also need to know which programs might occur for each hazard. A windstorm event will have different road hazards than will an earthquake, snow or ice event. We need to be ready for each type of natural hazard event. | | |
| **Ideas for Implementation:** | | |
| • Identify the hazards that might require evacuation.<br>• Determine what major routes will need to be used to move the large volume of vehicles required for an evacuation.<br>• Identify and map bridges, culverts, and other obstacles which might hamper a street being used as an emergency route.<br>• Develop a plan on the use of the routes and provide an outline of responsibilities for all the participants.<br>• Finalize the plan, train on it, and exercise it.<br>• Update it as needed. | | |
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | **External Partners:** |
| Public Works, Police, Fire | | Linn & Benton Counties' Road Departments, ODOT |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Emergency routes have been identified, as well as bridges, culverts, train track locations, and intersections. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| VO-LT Action 5.3: Objective 5: Ensure continuity of City emergency services functions | | |
| **Proposed Action Title/Description:** | | |
| Update emergency response planning for ash fall events. | | |
| **Rationale for Proposed Action:** | | |
| Because volcano ash has not affected Albany since the 1980's, no planning has occurred about how our emergency responders, Police, Fire, and Public Works will respond during one of these emergencies. We need to develop one so we are prepared before the event and won't need to play catch-up. | | |
| **Ideas for Implementation:** | | |
| • Identify what effect ash will have on our vehicles and equipment.<br>• Determine what hazards ash might have on our personnel who will need to be in the field.<br>• Look at mitigation action that will need to be taken for the two items listed above.<br>• Develop response procedures for Police, Fire, and Public Works.<br>• Conduct training and exercises on those procedures. | | |
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | **External Partners:** |
| All City Departments | | DOGAMI |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this action. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| MH-LT Action 6.1: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. |
| **Proposed Action Title/Description:** |
| Assist K-12 schools develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings |
| **Rationale for Proposed Action:** |
| • Schools may function as shelters.<br>• High concentration of vulnerable populations.<br>• Minimize emergency response and recovery action. |
| **Ideas for Implementation:** |
| • Review and assess most recently available information.<br>• Develop partnership with school district to identify hazards and potential corrective actions.<br>• Identify Key Facilities.<br>• Identify vulnerable facilities. |

| | |
|---|---|
| **Lead Organization:** | Emergency Management |

| **Internal Partners:** | **External Partners:** |
|---|---|
| Police, Fire | GAPS |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| | |
|---|---|
| **Status** | Continued: Work with LBCC has been completed, will work with GAPS. |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 6.2: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. |
| **Proposed Action Title/Description:** |
| Develop and implement a non-structural retrofit program for city staff offices and workspaces. |
| **Rationale for Proposed Action:** |
| Inexpensive methods are available to lessen the damage earthquakes can cause to private homes and businesses, and public facilities. Widespread implementation of these measures would reduce earthquake losses, which would reduce the impact on emergency services after an earthquake event. |
| **Ideas for Implementation:** |
| • Seek private and public funds to support a mitigation program to non-structurally retrofit residences and businesses to reduce potential damage should an earthquake occur.<br>• From existing mitigation materials available at the Federal and State levels, identify ideas and concepts which would work in our community.<br>• Develop the best method of providing information to the Community, both residents and businesses, the examples of non-structural projects which might work for them.<br>• Develop a plan to provide workshops to show residents and businesses how they can provide protection to themselves at little-to-no cost.<br>• Develop a plan to provide and implement non-structural mitigation idea in City of Albany facilities. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| Community Development | Insurance companies, Utilities |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| **Status** | Continued: No work has been done on this. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 6.3: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. |
| **Proposed Action Title/Description:** |
| Evaluate neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1950 homes and homes with cripple walls. |
| **Rationale for Proposed Action:** |
| Homes built pre-1950 and with cripple walls are more susceptible to earthquake damage because earthquake building requirements were less strict. This means these homes will be especially susceptible to earthquake damage, meaning to more injuries and greater property loss. |
| **Ideas for Implementation:** |
| • Develop a plan to identify the general areas of the City where residences of this age and type are located.<br>• Work with GIS to develop a method of plotting homes on a map layer for future use.<br>• Look for funding sources to pay for someone to conduct a survey to find these types of homes and record their addresses.<br>• Look for funding sources to retrofit these homes to lessen their vulnerability during an earthquake.<br>• Create an intern program to conduct the work that needs to be done for this project. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | | **External Partners:** |
|---|---|---|
| Community Development, GIS | | |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Over 1/3 of the residential buildings have been evaluated; will continue to look for opportunities to complete the work. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| EQ-LT Action 6.4: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. | | |
| **Proposed Action Title/Description:** | | |
| Evaluate city owned bridges to determine which need to be seismically updated and seek appropriate funds. | | |
| **Rationale for Proposed Action:** | | |
| Acquiring funds to repair the City-owned structures, bridges, and infrastructure needing to be updated can assist the City in reducing the damage from an earthquake, and ensure the City can recover more quickly. | | |
| **Ideas for Implementation:** | | |
| • Create a list of all City-owned bridges and infrastructure.<br>• Determine ownership of the bridges and infrastructure from the created list.<br>• Determine whether the bridges and infrastructure have had assessments completed on them.<br>• List those with completed assessments, and those without assessments.<br>• Prioritize the bridges and infrastructure without assessments.<br>• Determine the cost of conducting an assessment.<br>• Determine draft cost of upgrading any of the bridges and infrastructure assessed. | | |
| **Lead Organization:** | Public Works Engineering | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management | | ODOT, Linn & Benton Counties' Road Departments, Linn & Benton Counties' GIS Departments, Linn & Benton Counties' Emergency Management |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Modified: Action was modified to include City-owned bridges to be evaluated for funding purposes. The City has no ability to go after funds for State and County Bridges. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| EQ-LT Action 6.5: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. | | |
| **Proposed Action Title/Description:** | | |
| Conduct a vulnerability analysis of Albany's wastewater collection system to identify elements with the potential for failure and seek funding alternatives to seismically retrofit them. | | |
| **Rationale for Proposed Action:** | | |
| The City recently upgraded its wastewater treatment plant and brought it up to current standards. It now needs to conduct an evaluation of the collection system which will include everything outside of the treatment facility. This will help to identify potential problems the system could have after an earthquake and allow us to work toward mitigating those problems. | | |
| **Ideas for Implementation:** | | |
| • Identify all the elements of the collections system that need to be evaluated.<br>• Determine what will be evaluated within the system.<br>• Identify how the system will be evaluated.<br>• Identify who will evaluate the system.<br>• Implement a program to conduct the evaluation. | | |
| **Lead Organization:** | Public Works Operations | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management, Building Department | | FEMA, OEM |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this item. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| EQ-LT Action 6.6: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. | | |
| **Proposed Action Title/Description:** | | |
| 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 them. | | |
| **Rationale for Proposed Action:** | | |
| The City purchased the water system from Pacific Power in the 1980's. It has made great strides in upgrading that system over the last 30 years, but has not conducted a seismic evaluation of the system. They City now needs to conduct an evaluation of this collection system to identify potential problems the system could have after an earthquake and allow us to work toward mitigating those problems. | | |
| **Ideas for Implementation:** | | |
| • Identify all the elements of the collections system that need to be evaluated.<br>• Determine what will be evaluated within the system.<br>• Identify how the system will be evaluated.<br>• Identify who will evaluate the system.<br>• Implement a program to conduct the evaluation. | | |
| **Lead Organization:** | Public Works Operations | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management, Building Department | | FEMA, OEM |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this action item. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 6.7: Objective 6: Implement structural and non-structural mitigation of private residences and businesses, and publicly-owned facilities and infrastructure. |
| **Proposed Action Title/Description:** |
| Evaluate the necessity for seismic valve protection for City of Albany reservoirs, and if determined necessary, seek funding to retrofit them. |
| **Rationale for Proposed Action:** |
| The City has several reservoirs spread throughout the city. Some are located on flat ground and others on higher elevations in the city. The City needs to conduct an evaluation of these reservoirs to determine whether seismic valves might protect the reservoirs from losing their water in the event of an earthquake breaking a line and draining the reservoir. Some discussion has taken place about this concept, but nothing has been moved forward. |
| **Ideas for Implementation:** |
| • Identify all the reservoirs.<br>• Map their locations in the city.<br>• Discuss the relative advantages and disadvantages of the valves.<br>• Make a decision about whether to use the valves or not.<br>• Seek funding to purchase the valves. |

| | | |
|---|---|---|
| **Lead Organization:** | Public Works Operations | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management, Building Department | | |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Pubic Works has purchased some valves; installation will take place soon. Additional valves are being evaluated and will be installed within the next five years. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| MH-ST Action 7.1: Objective 7: Increase citizen awareness and promote risk reduction activities through Education and outreach. |
| **Proposed Action Title/Description:** |
| Provide educational material on how to develop emergency plans and assemble 14 day kits to City employees. |
| **Rationale for Proposed Action:** |
| • Conducting outreach to educate the public and special needs groups on the importance of having emergency kits, supplies, and plans better prepares the citizens for natural hazard events, helping reduce the City's overall risks.<br>• Citizens who are better prepared to personally deal with a natural hazard reduce the need for emergency services, are able to assist their neighbors, and will decrease damage to the City's infrastructure.<br>• Citizens who are better prepared for a natural hazard emergency have a greater survival rate. |
| **Ideas for Implementation:** |
| • Encourage the development of 14 day kits.<br>• Encourage elderly and special needs populations to make plans for emergency supplies and care before an event occurs.<br>• Partner with others in the promotion of 14 day kits.<br>• Set up a meeting with City employees to promote 14 day kits. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| PIO, Fire Department | Red Cross, Utilities, Linn & Benton Counties' Emergency Management, FEMA, OEM |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |
| **Status** | Continued: Much of the material has been collected and some classes actually presented. A formal five year plan will be developed to get more employees to participate in family preparedness. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| MH-ST Action 7.2: Objective 7: Increase citizen awareness and promote risk reduction activities through Education and outreach. |
| **Proposed Action Title/Description:** |
| Provide eight educational and outreach articles to explain how to develop an emergency plan and assemble 14 day kits to Albany residents. |
| **Rationale for Proposed Action:** |
| Providing preparedness education to our residents is a long-term, ongoing process. The key is getting them to understand they need to be responsible for themselves and their families. They need to develop a family plan and both home and travel kits. Over the last several years we have provided written material to our residents in the City's quarterly newsletter. We have also participated in preparedness fairs put on by our partners. We are committed to getting the word out to our residents about personal responsibilities. |
| **Ideas for Implementation:** |
| • <br>• Identify what we want the message to be at each presentation.<br>• Collect and provide examples of plans and kits.<br>• Identify partners we want to work with.<br>• Develop a plan for the next two years.<br>• Implement the plan. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| PIO, Fire Department | Red Cross, Utilities, Linn & Benton Counties' Emergency Management, Samaritan Albany General Hospital |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |

| **Status** | Continued: Much of this work has been taking place over the last three years. There have been a number of articles in the City's quarterly newsletter. A more formal plan needs to be developed. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| FL-ST Action 7.3: Objective 7: Increase citizen awareness and promote risk reduction through education and outreach. |
| **Proposed Action Title/Description:** |
| Develop an education and outreach program to provide awareness to residents of the flood hazard in their area and the availability of flood insurance. |
| **Rationale for Proposed Action:** |
| The City participates in the National Flood Insurance Program and because of that has a responsibility to educate our residents about flood awareness and flood insurance. The City has done a good job of getting the message out to residents, but needs to take a more active role in the future, and identify more specifically who is in the floodplain and what do they need to do to be more aware of flood hazards. We need to increase the number of people who purchase flood insurance. Pursuing this action item will assist with improving the City's rating in the Community Rating System (CRS), which in turn provides discounts on flood insurance for residents in the City. |
| **Ideas for Implementation:** |
| • Identify who is in the floodplain or floodway.<br>• Try to determine who has purchased flood insurance.<br>• Provide education and outreach on flood hazards and what homeowners can do.<br>• Provide information about flood insurance, including dam failure, to those in the floodplain.<br>• Follow the Community Rating System guidelines for creating a program for public information and flood insurance promotion.<br>• Identify potential grant programs to assist residents and mitigate impacts of flooding. |

| | | |
|---|---|---|
| **Lead Organization:** | Community Development | |
| **Internal Partners:** | | **External Partners:** |
| PIO, Emergency Management, PW Engineering and Operations | | FEMA, Linn & Benton Counties' Emergency Management, CRS-ISO, FEMA-NFIP, Region X, Local businesses |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |
| **Status** | Modified: The CRS has changed, and past practices for public outreach and insurance promotion are no longer given the same amount of credit when determining the City's rating. Following CRS guidelines to create a program for public information and insurance promotion will garner more points toward the City's CRS, which helps lower flood insurance rates for city residents. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-ST Action 7.4: Objective 7: Increase citizen awareness and promote risk reduction activities through education and outreach. |
| **Proposed Action Title/Description:** |
| Develop an education and outreach program to give residents information about earthquake hazards and the availability of structural and non-structural mitigation opportunities. |
| **Rationale for Proposed Action:** |
| Though the City ranks earthquakes as a high priority, we have not had an earthquake we could feel since 1993. We still need to provide preparedness information to our residents because if an earthquake does occur, it will have the most devastating long-term effect on city families. In the past we talked about the potential of a local earthquake, its long-term effects, and the need for homeowners to be prepared. We will continue to work with partners to spread this message. |
| **Ideas for Implementation:** |
| • Identify partners to work with to provide preparedness information about earthquakes.<br>• Identify potential problem areas within the City, both residential and commercial.<br>• Develop messages for businesses and homeowners.<br>• Develop a plan of when and where to present the preparedness message.<br>• Implement the plan. |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| PIO, Community Development | FEMA, Red Cross, Linn & Benton Counties' Emergency Management |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| 1 – 2 years | | |
| **Status** | Continued: Some of this has been done through articles in the City's newsletter. A more formal plan will be developed for the next two years. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 7.5: Objective 7: Increase citizen awareness and promote risk reduction activities through education and outreach. |
| **Proposed Action Title/Description:** |
| Provide five education and outreach opportunities to residents on earthquake hazards and the availability of earthquake insurance. |
| **Rationale for Proposed Action:** |
| Though the City ranks earthquakes as a high priority, we have not had an earthquake we could feel since 1993. We still need to provide preparedness information to our residents because if an earthquake does occur, it will have the most devastating long-term effect on city families. In the past we talked about the potential of a local earthquake, its long-term effects, and the need for homeowners to be prepared. We will continue to work with partners to spread this message. |
| **Ideas for Implementation:** |
| • Look for partners to work with to provide education about earthquakes.<br>• Develop two messages, one each for businesses and residents.<br>• Develop kits to use as examples.<br>• Look for non-structural examples that can be used in both businesses and homes. |

| | | |
|---|---|---|
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | **External Partners:** |
| PIO, Community Development | | FEMA, Red Cross, Linn & Benton Counties' Emergency Management |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Some of this has been completed through the City's newsletters. A formal plan will be developed. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| MH-LT Action 8.1: Objective 8: Develop collaborative programs that encourage local businesses to plan for disasters. |
| **Proposed Action Title/Description:** |
| Promote response, mitigation, and recovery planning for local businesses to continue operating after a disaster. |
| **Rationale for Proposed Action:** |
| Working with local businesses is important because many businesses impacted by a natural hazard will not reopen. The City of Albany comprises some 80% of small businesses that can be seriously affected by a severe hazard, therefore we need to make as much information available as possible so businesses have the opportunity to provide information to their employees and reopen after a significant event. |
| **Ideas for Implementation:** |
| • Identify partners the City can work with.<br>• Locate existing preparedness information from outside sources to assist businesses and their employees.<br>• Develop a plan on how best to share preparedness information. |

| | | |
|---|---|---|
| **Lead Organization:** | Emergency Management | |
| **Internal Partners:** | | **External Partners:** |
| PIO | | Red Cross, Chamber of Commerce, Downtown Association, FEMA, Linn & Benton Counties' Emergency Management, Mid-Valley LEPC |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this item. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 9.1: Objective 9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. |
| **Proposed Action Title/Description:** |
| Develop a non-structural retrofit program aimed at making child care facilities and schools, city offices and local businesses more resistant to the impact of an earthquake. |
| **Rationale for Proposed Action:** |
| • Assisting schools and childcare facilities to develop vulnerability assessments and mitigation projects for tier facilities can improve the safety of the children using the facilities and mitigate the effect that a natural hazard would have on the City.<br>• Vulnerability assessments and mitigation projects can assist in reducing the City's overall earthquake risk.<br>• Non-structural retrofits will reduce or eliminate injuries to children if an earthquake occurs. |
| **Ideas for Implementation:** |
| • Develop a list of all K-12 schools, childcare facilities, and other schools within the City of Albany.<br>• Determine if any schools have already had their seismic vulnerability analyzed.<br>• For facilities which have had an assessment, find out when the assessment was done to determine if a new assessment should be completed to address new seismic standards.<br>• For facilities which have had no seismic vulnerability analysis completed, work with each facility to perform an analysis.<br>• Use vulnerability assessments to identify mitigation projects.<br>• Create programs to cover the costs of the projects or to cost-share the costs of the projects with facilities (i.e. the City pays for 75% and the facility pays for 25% of identified projects). |

| **Lead Organization:** | Emergency Management |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| PIO, Fire Department, Building Department | GAPS, State of Oregon, Linn & Benton Counties' Emergency Management, Local Red Cross, OEM, FEMA, Private schools and childcare facilities |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| **Status** | Continued: No work has been done on this action. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| EQ-LT Action 9.2: Objective 9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. |
| **Proposed Action Title/Description:** |
| Develop public/private partnerships to seek outside funding for retrofitting structures in the downtown and historic districts. |
| **Rationale for Proposed Action:** |
| The City downtown area is made up of many older, non-reinforced masonry buildings. There is the potential for extensive damage to many of the buildings and injury to employees and shoppers if an earthquake were to occur. We have responsibility to provide an opportunity for businesses to be aware of structural changes to the building that can help mitigate this damage. The cost for this mitigation is quite high, and in order to be successful some type of financial assistance is normally necessary. Presently for the downtown area, the City has a program through CARA that has provided assistance on two projects. |
| **Ideas for Implementation:** |
| • Determine which buildings might be at risk in the downtown and historic districts.<br>• Evaluate the cost of mitigating these buildings.<br>• Provide information to CARA.<br>• List the benefits to taking structural retrofitting. |

| | | |
|---|---|---|
| **Lead Organization:** | CARA | |
| **Internal Partners:** | | **External Partners:** |
| Emergency Management | | SHIPO, Economic Development, Downtown Association, Chamber of Commerce |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: Two buildings in the downtown area have been assisted with seismic upgrading when they remodeled. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| FL-LT Action 9.3: Objective 9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. |
| **Proposed Action Title/Description:** |
| Implement Santiam-Albany Canal bank improvement projects. |
| **Rationale for Proposed Action:** |
| • To restore the hydraulic capacity of the canal.<br>• To reduce the in-flow of water from property along the canals, from the headgates to Albany.<br>• To prevent bank failure during high rain events. |
| **Ideas for Implementation:** |
| • Sediment/vegetation removal.<br>• Bank repairs.<br>• Reroute storm water away from canal.<br>• Flow testing.<br>• Reduce the number of obstructions in the canal. |

| | |
|---|---|
| **Lead Organization:** | Public Works Operations |

| **Internal Partners:** | **External Partners:** |
|---|---|
| Emergency Management | |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Modified: Significant work has been completed on the Santiam-Albany Canal over the last five years. | |

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** |
|---|
| WF-LT Action 9.4: Objective 9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. |
| **Proposed Action Title/Description:** |
| Work with Linn and Benton Counties to implement the community wildland fire protection strategies necessary for the City of Albany and contract rural fire districts to reduce fire risk. |
| **Rationale for Proposed Action:** |
| Linn and Benton Counties have wildfire plans that provide information pertaining to hazards in our city and contract fire areas. It is important for the City to work with the Counties and the contract fire districts to make people aware of the hazard that exists, and what they can do to mitigate it. The wildland fire problem in the City is very small when compared to either Linn or Benton County's potential. |
| **Ideas for Implementation:** |
| • Identify where the risk is for the City of Albany and the Rural Fire Districts.<br>• Determine through evaluation of both the Linn and Benton Wildfire Plans what their preparedness message is.<br>• Develop a plan to implement these preparedness messages to the homeowners in each of the counties.<br>• Map the action taken and record the preparedness action for future reference.<br>• Develop a plan to follow up and continue to provide preparedness information to homeowners. |

| **Lead Organization:** | Fire Department |
|---|---|

| **Internal Partners:** | **External Partners:** |
|---|---|
| Emergency Management | Linn & Benton Planning Departments, Rural Fire Districts |

| **Timeline:** | | **If available, estimated cost:** |
|---|---|---|
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |

| **Status** | Continued: No work has been done on this action. |
|---|---|

# 2016 Plan – Albany Action Item Proposal Forms

| **Proposed Action Item Identification:** | | |
|---|---|---|
| DR-LT Action 9.5: Objective 9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City. | | |
| **Proposed Action Title/Description:** | | |
| Support local agency programs that promote measures to reduce water use during drought emergencies. | | |
| **Rationale for Proposed Action:** | | |
| Drought has not been and will likely not be a problem for the City of Albany. The City still has a responsibility to be prepared should a drought occur. Therefore it will develop a plan and work with agencies in both Linn and Benton Counties so it can respond to a drought disaster. | | |
| **Ideas for Implementation:** | | |
| • Identify agencies in both Linn and Benton Counties who work on water projects.<br>• Identify at the State level which agencies work drought problems and what the State of Oregon drought plan is.<br>• Evaluate the impact a drought might have on the City.<br>• Draft a Drought Plan. | | |
| **Lead Organization:** | Public Works Operations | |
| **Internal Partners:** | | **External Partners:** |
| PIO, Emergency Management | | Water districts, State of Oregon |
| **Timeline:** | | **If available, estimated cost:** |
| Short Term (0-2 yrs) | Long Term (2-5 or more yrs) | |
| | 2 – 5 years | |
| **Status** | Continued: No work has been done on this action. | |

# Appendix F: 2016 Action Items by Hazard

| City of Albany: Natural Hazard Mitigation Plan Matrix | | | | | | Alignment with City of Albany Strategic Plan Themes | | | | Alignment with City of Albany Strategic Plan Goals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Multi-Hazard (MH) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #1: Establish and maintain methods to ensure plan implementation.** | | | | | | | | | | | | | | | |
| MH-Long Term | Action 1.1. 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 | 2 – 5 years | High/City staff funding | | | | | | | | | | |
| **Objective #2: Provide leadership to promote, communicate, and support disaster safety messages and activities.** | | | | | | | | | | | | | | | |
| MH-Long Term | Action 2.1. Develop and implement six communications and outreach opportunities to inform the community on the status of the Natural Hazard Mitigation Plan. | City PIO | All Departments | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| **Objective #3: Incorporate mitigation into planning and policy development.** | | | | | | | | | | | | | | | |
| MH-Long Term | Action 3.1. Provide NHMP awareness training to City staff to incorporate Natural Hazard Mitigation Planning aspects into their daily work. | Emergency Management | All Departments | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| **Objective #4: Support the enhancement of the City vulnerability assessment activities.** | | | | | | | | | | | | | | | |
| MH-Short Term | Action 4.1. Review hazard maps and update vulnerability and risk for hazards which affect the city, partnering with local, state, and federal agencies. | Emergency Management | Community Development & GIS | 1 – 2 years | Medium/ City staff funding | | | | | | | | | | |

| Multi-Hazard (MH) Action Items | | Lead Organization | Internal/ External Partners | Timeline | Priority/ Funding Source | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objective #6: Implement structure and non-structural mitigation of publicly-owned facilities and infrastructure.** | | | | | | | | | | | | | | | |
| MH-Long Term | Action 6.1. Assist K-12 schools to develop vulnerability assessments and mitigation projects to improve safety in their most vulnerable buildings. | Emergency Management | GAPS | 2 – 5 years | Low/City staff funding | | | | | | | | | | |
| **Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.** | | | | | | | | | | | | | | | |
| MH-Short Term | Action 7.1. Provide educational awareness material on how to develop emergency plans and assemble 14 day kits to residents of Albany. | Emergency Management | All Departments Red Cross | 1 – 2 years | High/City staff funding | | | | | | | | | | |
| MH-Short Term | Action 7.2. Provide eight educational and outreach articles to explain how to develop an emergency plan and assemble 14 day emergency kits to residents of Albany. | Emergency Management | PIO, Red Cross, Fire Department, Utilities | 1 – 2 years | High/City staff funding | | | | | | | | | | |
| **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 | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |

| City of Albany: Natural Hazard Mitigation Plan Matrix | | | | | | Alignment with City of Albany Strategic Plan Themes | | | | Alignment with City of Albany Strategic Plan Goals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Flood (FL) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #3: Incorporate mitigation into planning and policy development.** | | | | | | | | | | | | | | | |
| FL-Short Term | Action 3.2. Evaluate what can be done to improve the city's current rating in the National Flood Insurance Program's Community Rating System. | Community Development | All Departments | 1 – 2 years | High/City staffing funding | | | | | | | | | | |
| FL-Long Term | Action 3.3. Look at the need to update applicable city codes to reduce risk and prevent flood impacts. | Community Development | All Departments | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| FL-Long Term | Action 3.4. Continue participation in the National Flood Insurance Program | Community Development | Emergency Management, Public Works, Engineering | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| FL-Short Term | Action 3.6. Develop a Flood and Dam Failure Warning and Response Plan. | Emergency Management | All Departments | 1 – 2 years | High/City staff funding | | | | | | | | | | |
| **Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.** | | | | | | | | | | | | | | | |
| FL-Short Term | Action 7.3. Develop an education and outreach program to give residents awareness of the flood hazard in their area and the availability of flood insurance. | Community Development | PIO, Emergency Management, FEMA | 1 – 2 years | High/City staff funding | | | | | | | | | | |
| **Objective #9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the city.** | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FL-Long Term | Action 9.3. Implement Santiam-Canal bank improvement projects. | Public Works Operations | State of Oregon | 2 – 5 years | High/City staff funding | | | | | | | | | | |
| **City of Albany: Natural Hazard Mitigation Plan Matrix** | | | | | | **Alignment with City of Albany Strategic Plan Themes** | | | | **Alignment with City of Albany Strategic Plan Goals** | | | | | |
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Earthquake (EQ) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #3: Incorporate mitigation into planning and policy development.** | | | | | | | | | | | | | | | |
| FL-Long Term | Action 3.5. Explore development of an ordinance/program to address seismically deficient buildings. | Community Development | All Departments | 2 – 5 years | Low/City staff funding | | | | | | | | | | |
| **Objective #5: Ensure continuity of City emergency services function.** | | | | | | | | | | | | | | | |
| EQ-Long Term | Action 5.1. Develop specific emergency evacuation or shelter-in-place plans for residential areas that are near significant hazardous material storage facilities and heavy industrial areas. | Emergency Management | GIS, Mid-Valley LEPC, Linn Benton Emergency Management | 2 – 5 years | High/City staff funding | | | | | | | | | | |
| EQ-Long Term | Action 5.2. Evaluate City Emergency Transportation routes with city, county, and state partners. | Emergency Management | GIS, Public Works, Linn Benton Road Departments | 2 – 5 years | High/City staff funding | | | | | | | | | | |

| **Objective #6: Implement structural and non-structural mitigation of publicly-owned facilities and infrastructure.** | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EQ-Long Term | Action 6.2. Develop and implement a non-structural retrofit program for City staff offices and workspaces. | Emergency Management | Community Development, Insurance Companies, Utilities | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| EQ-Long Term | Action 6.3. Evaluate neighborhoods and the number of wood-frame residential buildings that may be particularly vulnerable to earthquake damage, including pre-1950 homes. | Emergency Management | Community Development, GIS | 2 – 5 years | Low/City staff funding | | | | | | | | | | |
| EQ-Long Term | Action 6.4. Evaluate city-owned bridges to determine which need to be seismically updated and seek appropriate funds. | Public Works, Engineering | Emergency Management, Linn & Benton Counties, State of Oregon, FEMA | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| EQ-Long Term | Action 6.5. Conduct a vulnerability analysis of Albany's wastewater collection system to identify elements with the potential for failure and seek to find alternatives to seismically retrofit it. | Public Works Operations | Emergency Management | 2 – 5 years | Medium/ City staff funding - Grants | | | | | | | | | | |
| EQ-Long Term | Action 6.6. 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 it. | Public Works Operations | Emergency Management | 2 – 5 years | Medium/ City staff funding - Grants | | | | | | | | | | |
| EQ-Long Term | Action 6.7. Evaluate the necessity for seismic valve protection for City of Albany reservoirs and if determined necessary, seek funding to retrofit them. | Public Works Operations | Emergency Management | 2 – 5 years | High/City staff & capital funding | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objective #7: Increase citizen awareness and promote risk reduction activities through education and outreach.** | | | | | | | | | | | | | | | |
| EQ-Short Term | Action 7.4. Develop an education and outreach program to give residents information about earthquake hazards and the availability of structural and non-structural mitigation opportunities. | Emergency Management | Community Development, PIO, FEMA, Red Cross | 1 – 2 years | Medium/ City staff funding | | | | | | | | | | |
| EQ-Long Term | Action 7.5. Provide five educational and outreach opportunities to residents on earthquake hazards and the availability of earthquake insurance. | Emergency Management | Community Development, PIO, FEMA, Red Cross | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| **Objective #9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City.** | | | | | | | | | | | | | | | |
| EQ-Long Term | Action 9.1. Develop a non-structural retrofit program aimed at making child care facilities, schools, city offices, and local businesses more resistant to the impact of earthquake. | Emergency Management | Red Cross, Schools, PIO, Chamber of Commerce, Downtown Association, FEMA | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |
| 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, Downtown Association, Chamber of Commerce | 2 – 5 years | Low/City staff funding | | | | | | | | | | |

| City of Albany: Natural Hazard Mitigation Plan Matrix | | | | | | Alignment with City of Albany Strategic Plan Themes | | | | Alignment with City of Albany Strategic Plan Goals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Severe Weather (SW) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #4: Support the enhancement of the City vulnerability assessment activities.** | | | | | | | | | | | | | | | |
| SW-Long Term | Action 4.2. Develop pre-storm strategies for coordinated debris removal following wind and winter storms. | Emergency Management | Public Works, GIS, Linn & Benton Road Department, OEM, FEMA, Utilities | 2 – 5 years | High/City staff funding - grants | | | | | | | | | | |

| City of Albany: Natural Hazard Mitigation Plan Matrix | | | | | | Alignment with City of Albany Strategic Plan Themes | | | | Alignment with City of Albany Strategic Plan Goals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Wildfire (WF) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #2: Provide leadership to promote, communicate, and support disaster safety messages and activities.** | | | | | | | | | | | | | | | |
| WF-Long Term | Action 2.2. Develop and implement a public education strategy for those households within identified high risk areas in the city of Albany and contract rural fire districts. | Fire Department | Emergency Management, Linn & Benton Counties | 2 – 5 years | High/City staff funding | | | | | | | | | | |
| **Objective #9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City.** | | | | | | | | | | | | | | | |
| WF-Long Term | Action 9.4. Work with Linn and Benton counties to implement community wildland fire protection strategies necessary for the City of Albany and contract rural fire districts to reduce fire risk. | Fire Department | Linn Benton Counties, Rural Fire Boards | 2 – 5 years | Medium/ City staff funding | | | | | | | | | | |

| City of Albany: Natural Hazard Mitigation Plan Matrix | | | | | | Alignment with City of Albany Strategic Plan Themes | | | | Alignment with City of Albany Strategic Plan Goals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Volcano (VO) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #2: Provide leadership to promote, communicate, and support disaster safety messages and activities.** | | | | | | | | | | | | | | | |
| VO-Long Term | Action 2.3. Update emergency notifications procedures for ash fall events. | Emergency Management | All Departments | 2 – 5 years | Low/City staff funding | | | | | | | | | | |
| **Objective #4: Support the enhancement of the City vulnerability assessment activities.** | | | | | | | | | | | | | | | |
| VO-Long Term | Action 4.3. Evaluate capability of water and wastewater treatment facilities ability to deal with ash fall and determine what changes may need to be made. | Public Works Operations | Emergency Management | 2 – 5 years | Low/City staff funding | | | | | | | | | | |
| VO-Long Term | Action 4.4. Evaluate ash impact on storm water drainage system and develop mitigation action if necessary. | Public Works Operations | Emergency Management | 2 – 5 years | Low/City staff funding | | | | | | | | | | |
| VO-Long Term | Action 4.5 Evaluate the impact of ash fall-out on HVAC systems in the City facilities. | Parks & Recreation | All Departments | 2 – 5 years | Low/City staff funding | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objective #5: Ensure continuity of City emergency services function.** | | | | | | | | | | | | | | | |
| VO-Long Term | Action 5.3. Update emergency response planning for ash fall events. | Emergency Management | All Departments | 2 – 5 years | Low/City staff funding | | | | | | | | | | |

| **City of Albany: Natural Hazard Mitigation Plan Matrix** | | | | | | **Alignment with City of Albany Strategic Plan Themes** | | | | **Alignment with City of Albany Strategic Plan Goals** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Landslide (LS) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #4: Support the enhancement of the City vulnerability assessment activities.** | | | | | | | | | | | | | | | |
| LS-Long Term | Action 4.6. Continue reviewing DOGAMI hazard maps to identify any changes or amendments to future potential landslide areas within the city of Albany | Emergency Management | Community Development, DOGAMI | 2 – 5 years | Low/City staff funding | | | | | | | | | | |

| City of Albany: Natural Hazard Mitigation Plan Matrix | | | | | | Alignment with City of Albany Strategic Plan Themes | | | | Alignment with City of Albany Strategic Plan Goals | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Objectives** | **Action Items** | | | | | Great Neighborhoods | Safe City | Healthy Economy | Effective Government | Create diverse neighborhoods | Effective Stewardship | Ensure a safe community | Provide safe, sufficient systems | Create an identifiable downtown core | Effectively deliver city services |
| **Drought (DR) Action Items** | | **Lead Organization** | **Internal/ External Partners** | **Timeline** | **Priority/ Funding Source** | | | | | | | | | | |
| **Objective #9: Develop partnerships with external partners to implement hazard-specific mitigation projects in the City.** | | | | | | | | | | | | | | | |
| DR-Long Term | Action 9.5. Support local agency programs that promote measures to reduce water use during drought emergencies. | Public Works Operations | Emergency Management, Linn & Benton Counties, Water sheds, State of Oregon | 2 – 5 years | High/City staff funding | | | | | | | | | | |

Appendix G:

# City of Albany Specific HAZUS Run

Material to be added at a later date.

# Appendix H:
# City of Albany 2009 Hazard Analysis

## Introduction

Hazard effects are variable and severity will differ depending on such factors as location, time of occurrence, population, location, intensity, duration, response capabilities and mitigation efforts taken before the occurrences.

The Federal Emergency Management Administration (FEMA) classifies the causes of hazards as:

- Natural
- Technological (human caused)
- National security events (warfare or civil disturbance)

Natural hazards can include earthquakes, floods, severe weather, and fires. Technological hazards include hazardous materials releases and large scale transportation accidents. National security hazards include armed attack on the country by armed military forces, terrorist attacks, sabotage and civil insurrection. Since the terrorist attacks of September 11, 2001, the federal government has placed a high priority on the use of weapons of mass destruction (WMD) by terrorists as a real threat to the nation. This analysis will now include the threat of WMD events as a potential hazard.

The purpose of this hazard analysis is to identify and classify hazards that are potentially harmful to the City of Albany and its residents. The method used in this analysis provides a sense of hazard priorities, also known as relative risk. It does not predict the occurrence of a particular hazard, but it does "quantify" the risk of one hazard compared with another. By doing this analysis, planning can then be focused where the risk is the greatest. This information will allow us to establish priorities, and to address preparation, response and mitigation measures to overcome the effects of the hazards on the community.

The method for determining a random order for hazards affecting the City of Albany is prescribed by Oregon Emergency Management (OEM). This hazard analysis methodology was first developed by the Federal Emergency Management Agency (FEMA) circa 1983, and gradually refined by Oregon Emergency Management (OEM) over the years. During 1984 the predecessor agency to OEM (Emergency Management Division) conducted workshops around the State of Oregon that resulted in all of Oregon's 36 counties producing an analysis using this methodology. Since then several cities have also conducted an analysis using this method. These analyses are updated by the local governments on a cycle not longer than five years.

The City of Albany Hazard Analysis Matrix used by individuals to score the 16 individual hazards affecting the City of Albany are found as figure #1, pages 31 of 33, at the end of this document.

The City of Albany has adopted a Hazard Mitigation Plan and the Regional Hazard Mitigation Master Plan. One element of these plans is a method for analyzing the effects a hazard may have on a particular location or structure. These methods detail the cost versus benefit in determining the need for mitigating the hazard. A copy of this description can be located in the RHMMP and the City of Albany Hazard Mitigation documents and provides a good starting point for more effective hazard mitigation.

# Community Profile

## Albany's History

The first settlers to the Albany area were farmers who came in the 1840's. Agriculture, production, and processing were the Albany area's first industry. For more than four decades, 1845 to 1885, wheat was the principle crop in Linn County.

In 1850, Albany's first post office was established. By 1851, Albany was designated as the county seat and the first courthouse was built in 1853.

The first steamboat arrived in Albany in 1852. Steamboats brought the farmers and townspeople their necessities. Boats running upstream carried mail, sheep, cattle, kerosene and everyday items for the farms, homes and mills. The California Stage Company began operation in Oregon in 1860, with stages leaving daily from Portland to Sacramento.

In 1871, the first locomotive arrived in Albany. The world's longest wooden railroad drawbridge was built in 1888 for the Albany-Corvallis run. The Santiam Canal which brought water, water power and transportation to the city was completed in 1874. In 1875, fifteen manufacturing plants such as sawmills, flour mills and a twine mill were powered by water power. In 1887, electricity was first generated by water power from the canal.

Albany became the manufacturing and transportation hub of the Willamette Valley. Foundries, blacksmith shops, furniture factories, tanneries, a bag factory, carriage factories, flour and flax mills, a twine factory, creameries and sawmills supplied local farmers and processed their crops. Today Albany remains the seat of Linn County and continues to be called the "Hub of the Willamette Valley" due to its location at the junction of US Highways 99 and 20 and Interstate 5. Albany is 24 miles south of Salem, the state capital, and 69 miles south of Portland.

The City of Albany operates under the provision of its own charted and applicable state law. It has a City Manager/Council form of government. The City Council consists of seven members who are elected by the citizens of Albany. The City of Albany provides a full range of municipal services including fire and police protection, street construction, maintenance and lighting, planning, zoning, and general administrative services. It also operates water, storm and waste water systems.

## Linn County History

The first known inhabitants of the Willamette valley were tribes and bands generally classified as the Kalapuya (or the Calapooia). Molalla bands also ranges along the western slopes of the Cascade mountain range. The first non-Native American visitors to the Willamette Valley were fur trappers and traders from the Hudson Bay Company in 1828. Large scale immigration over the Oregon Trail began in 1843.

In 1847, the Provisional Legislature created Linn County from the southern portion of Champoeg (later Marion) County. The boundaries were altered in 1851 and 1854 with the creation of Lane and Wasco Counties. The county consists of 2,297 square miles and is bounded on the north by Marion County, on the east by Deschutes and Jefferson Counties, on the south by Lane County, and on the west by Benton County. Linn County was named for U.S. Senator Lewis F. Linn of Missouri who was the author of the Donation Land Act that gave free land to settlers in the West.

The county seat was originally located in Calapooia (Brownsville), but in 1851 the Territorial Legislature passed an act establishing Albany as the county seat. A special election in 1856 reaffirmed Albany as the county seat. The Spaulding School in Brownsville served as the first courthouse. A new courthouse was erected in Albany in 1853 but was destroyed by fire in 1861. A third courthouse was built in 1865, and remodeled in 1890 and 1899. The present courthouse was constructed in 1940 adjacent to the earlier courthouses.

The 2007 estimated population is 113,264 up from the 2000 census population of 103,069.
Principle industries are agriculture and food products, wood products, rare metals, and manufacturing. Linn County's economy relies heavily on the lumber and wood products industry; and in 1990, this industry accounted for 40 percent of the county's manufacturing jobs.

## Benton County History

Benton County was established by the Provisional Legislature in 1847. It was named in honor of Senator Thomas Hart Benton of Missouri. Carved from Polk County, Benton County stretched from the Polk County boundary south to the California border and from the Pacific Ocean east to the Willamette River. Umpqua, Lane, Douglas, Jackson, Lincoln, Josephine, Curry, and Coos Counties were created from portions of the original Benton County. Today Benton County occupies 679 square miles of the central Willamette Valley and is bordered on the east by the Willamette River and Linn County, on the west by the summit of the Coast Range and Lincoln County, on the north by Polk County, and on the south by Lane County.

The city of Marysville, later renamed Corvallis, became the county seat in 1851. The first county courthouse was erected in 1854. The second courthouse, built in 1889, is the oldest in Oregon that is still used for its original purpose. It was extensively renovated in 1976 to restore and preserve the historic character of the building. Nearby buildings provide offices not located in the courthouse.

Benton County was created out of land originally inhabited by the Klickitat Indians. All Indian claims to land within Benton County were ceded in the Treaty of Dayton in 1855. In 1862, Corvallis became the site of the Oregon State Agricultural College, known today as Oregon State University. Along with the university, agriculture, lumber, and wood products form the economic base of the county. The estimated 2007 population is 81,428 compared to the 2000 Census population of 78,153.

# Method Used to Rank the Hazards

The City of Albany used the State of Oregon's recommended method of scoring hazards. We first determined what hazards had occurred or were most likely to occur in and around Albany. This created a list of 16 hazards. We then developed a matrix that listed all of these hazards in one column and for each hazard, we had three categories that each of the hazards were to be scored for. These included Vulnerability, Maximum Threat (Severity), and Probability. A fourth category, History, was scored by the developer of the Hazard Analysis plan, after all the historical data was collected for each hazard.

Copies of the Hazard Analysis Matrices were sent to 145 individuals, 59 were returned and used for ranking. These people were selected for their professional emergency response work, business background in the city, volunteerism in the community, participation in City of Albany boards and commissions, and responsibility as department directors, managers, or first line supervisors for the City of Albany. Copies were also sent to the Emergency Managers of Linn and Benton Counties.

As the scoring matrix results came in they were entered in an Excel spreadsheet that scored each hazard with the weight assigned to each of the four categories. This provided each of the hazards with an overall score, which ranked the hazard from 1, being the most hazardous, to 16, being the least hazardous. The results are listed below.

# Hazards Analysis Criteria

In analyzing the risk posed by specific hazards, a rating criteria and weighting factor have been used. This formula is based on point values shown immediately below:

| | | |
|---|---|---|
| High | = | 8 - 10 points |
| Moderate | = | 4 - 7 points |
| Low | = | 1 - 3 point |

A. **Event History:** Based on the number of occurrences of incidents that have taken place in the last 100 years. **Weighting Factor is 2.**

| | | |
|---|---|---|
| High | = | 4 or more events in last 100 years |
| Moderate | = | 2-3 events in last 100 years |
| Low | = | 1 or 0 events in last 100 years |

B. **Vulnerability:** Represents **adverse** impacts to citizens, visitors, and emergency responders. It is important to consider only **adverse** effects. Many hazards occur which do not significantly impact people. **Weighting Factor is 5.**

| | | |
|---|---|---|
| High | = | More than 10 percent affected |
| Moderate | = | 1-10 percent affected |
| Low | = | Less than 1 percent affected |

C. **Maximum Threat:** **T**his is an assessment of severity of the hazard in terms of injuries and fatalities, personal property damage, and infrastructure damage. **Weighting Factor is 10.**

| | | |
|---|---|---|
| High | = | More than 25 percent could be affected |
| Moderate | = | 5-25 percent could be affected |
| Low | = | Less than 5 percent could be affected |

D. **Probability:** Based on the likelihood of an occurrence within a specified period of time**.** **Weighting Factor is 7.**

| | | |
|---|---|---|
| High | = | One incident within a 10 year period |
| Moderate | = | One incident within a 50 year period |
| Low | = | One incident within a 100 year period |

**Hazard Analysis Matrix for City of Albany, Oregon as of November 19, 2008**

| Priority | Weight Factor | 2X | 5X | 10X | 7X | Total | Priority Group |
|---|---|---|---|---|---|---|---|
| | **Hazard** | **History** | **Vulnerability** | **Max Threat (severity)** | **Probability** | | |
| 1 | High Wind Storm | 25.00 | 48.30 | 75.70 | 64.50 | 213.50 | High |
| 2 | Utility Failure | 25.00 | 49.75 | 73.50 | 58.10 | 206.35 | High |
| 3 | Ice Storm | 24.50 | 46.95 | 71.95 | 62.90 | 206.30 | High |
| 4 | Snow Storm | 25.00 | 43.15 | 61.25 | 57.60 | 187.00 | High |
| 5 | Earthquake | 17.50 | 47.70 | 93.00 | 27.65 | 185.85 | High |
| 6 | Hazardous Materials | 25.00 | 32.90 | 67.05 | 44.20 | 169.15 | Medium |
| 7 | River Floods | 25.00 | 34.50 | 56.00 | 48.60 | 164.10 | Medium |
| 8 | Water System Failure | 7.50 | 47.65 | 70.45 | 27.60 | 153.20 | Medium |
| 9 | Contagious Disease | 7.20 | 33.95 | 61.65 | 32.15 | 134.95 | Medium |
| 10 | Health Threat/Bio Terrorism | 2.50 | 32.80 | 69.30 | 17.50 | 122.10 | Medium |
| 11 | Volcano Ash | 7.50 | 33.00 | 59.85 | 15.95 | 116.30 | Low |
| 12 | Dam Failure | 2.50 | 32.25 | 61.00 | 19.70 | 115.45 | Low |
| 13 | Weapons of Mass Destruction/Terrorism | 2.50 | 32.00 | 62.75 | 15.10 | 112.35 | Low |
| 14 | Wildland/Urban Interface Fire | 2.50 | 17.95 | 37.30 | 37.60 | 95.35 | Low |
| 15 | Civil Disturbance | 5.00 | 19.40 | 37.50 | 19.70 | 81.60 | Low |
| 16 | Landslide/Debris Flow | 5.00 | 14.20 | 30.85 | 26.35 | 76.40 | Low |

# Hazard Analysis Results

| High Wind Storm | |
|---|---|
| **Definition** | Extreme winds associated with severe winter storms, severe thunderstorms, downbursts, and very steep pressure gradients. |
| **Description** | Large-scale extreme wind phenomena are experienced over every region of the United States. Historically, high wind events are associated with severe thunderstorms and blizzards. It is often difficult to separate windstorms and tornado damage when winds get above 70 knots. |
| **Historical Occurrence** | It appears statistically that one high wind storm occurs each 10 years though in the last decade wind storms have occurred more often which has had some impact on the city.<br><br>Since 1880, there have been 12 significant high 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 of the storms individuals were 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 (1107) and 2002 (1405) high wind events were Presidentially Declared Disasters. In December 2005 (1632) a wind storm moved up the Willamette Valley bringing strong winds to the central and southern valley.<br><br>In all of the 13 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 4 hours to several days before all the power to the communities and neighborhoods was restored. In the earlier part of the 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.<br>All of the storms caused significant damage to buildings, trees and infrastructure. The building and infrastructure damage has risen over the last 30 years as more buildings have been constructed in Albany. |
| **Probability** | 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 we since our last significant wind storm was in 2002 we can expect at least 1 more significant wind storm to occur by 2012. |
| **Vulnerability** | When a wind storm does occur it will affect the entire population. The first will be because of the power lost that will occur to the residential and businesses in the community. Like with ice events power will be interrupted because of downed power lines due to trees blowing over or tree branches falling on power lines. Power companies have been proactive in the area by implementing mitigation programs that cut back tree branches at least 10 feet from power lines. For wind events this will help keep limbs from falling out of the trees on to the power lines. Secondary to the power outage will be debris in the road ways that will cause driving hazards for the public and emergency service personnel. Rural areas outside the city are more at risk because of the number of trees, but the problem exists within the city as the city strives to increase the number of trees is has for beatification and livability goals. Debris clearing becomes a top priority for the city after high wind storms. |

Worksheet Total 213.50

Rank out of 16: **1**

Priority Group: **High**

**Last updated: 02/02/2009**

| Utility Failure | |
|---|---|
| **Definition** | The loss of electricity to the residents, businesses and emergency service facilities. |
| **Description** | Every year, wind, snow, ice and severe rain storms, auto accidents, and equipment failure cause periodic power loss in different areas of the city. Power failures affect both residential and business in the community and can create severe emergency situations. Most power outages are short in duration lasting not more than three or four hours depending on the severity of the break. Weather outages tend to be the longest in duration because of the wide areas that can be affected. Auto accidents are more localized and tend to be shorter in duration.<br><br>Repairs for the larger power system outages are made from power distribution stations and substations outward to the end users. Typically residential customers farthest away from the problem will be connected last. After major weather emergencies, ice, storms snow storms and earthquakes, re-connection delays could be measured in days to weeks. |
| **Historical Occurrence** | No historical data pertaining to exactly when power failures have occurred in Albany exist. Small localized power outages occur on a regular basis averaging 2 – 3 a month. Depending on the density of the area affected these outages can have an impact on 10 – 200 people.<br><br>In 2003 and 2004 rather large area power failures occurred do to equipment failure at the Bonneville substation and a Presidential Declared ice storm. Typically complete grid failures have not occurred in Albany, even in the Columbus Day Storm of 1964 power to many portions of the city were still available. Power outage on May 19, 2010 affected 40,000 people for up to 1- 2 hours. July 7, 2010 a power outage affected up to 20,000 people lasted up to 2 hours in some areas.<br><br>Generally localized power outages occur because of traffic accidents, ice storms, snow storms, wind storms, transformers that going bad, or trees that fall across lines. When these localized outages occur, the power companies will have power restored within 1 – 2, hours and if it is a more extensive outage power will be restored within 4 hours. |
| **Probability** | It is likely there will continue to be power outage somewhere in the city of Albany and the surrounding area on the same regularity that exists now. It is unlikely there will be a complete power failure without some type of catastrophic event taking place. Our local system has considerable redundancy as electricity is provided from several feeder sources. Even smaller outages are being mitigated by the power company which has implemented an aggressive tree trimming program beginning in about 1997. This program has significantly reducing the chances of power lines breaking because of limbs falling during wind, ice and snow storms. |
| **Vulnerability** | Residents and businesses are very susceptible to power outages. Since most individuals or business do not have back up power sources they are at the mercy of the power company to get the problems repaired. 75% of the city has it power provided by above ground power lines which means an outage could occur at any time. Historically a very small portion of the community is normally affected by power outages when they have occurred. Large outages have been rare. |

Worksheet Total 206.35

Rank out of 16: **2**

Priority Group: **High** **Last updated: 07/09/2010**

| Ice Storm | |
|---|---|
| **Definition** | Severe winter condition that affects day-to-day activities and includes freezing rain, and heavy sleet. |
| **Description** | Winter Ice Storms generally occur between November and February in Oregon. Ice storms result in fallen trees, broken tree limbs, downed power lines and utility poles, fallen communications towers and impassable transportation routes. Severe ice storms have caused electric power losses over large areas of Linn and Benton Counties, including the city of Albany, rendering up to 18,000 customers without power. Generally during these events transportation routes are nearly impossible to use. Because of the lack of experience in driving in these conditions many accidents occur when individuals use the roadways. |
| **Historical Occurrence** | 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. Climatologist George Taylor of Oregon State University states that, on average, one ice storm occurs every 10 years. Ice storms generally have created wide spread power outages because of downed power lines due to iced power lines that have broken, tree's that have fallen over power lines or branches that have fallen onto power lines or traffic accidents that have damaged power poles. Secondary to the power problem is the transportation route problems. The area is not set up to deal with routine ice problems like other areas of Oregon or the United States. Therefore when they do occur there is no immediate de-icing program to assist in getting the roads usable. This leads to many accidents on the roadway which creates increased difficulties for emergency responders. Generally ice storms are not storms that occur in a very short period of time, but rather develop over a 1 – 4 hour period, and can last for 1 – 4 days. The 2003 -2004 ice storm was a Presidential Declared Disaster for Oregon (1510). |
| **Probability** | 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. |
| **Vulnerability** | Past historical records indicates our entire city and surrounding populations are vulnerable to power outages during ice storms. During the last such storm there were 18,000 customers initially without power. After one day the outage was isolated to a small geographic area which included North Albany. Power was out for as long as 2 ½ days in this area. In addition to power concerns, the entire population is affected by the road conditions and is susceptible to a higher rate of traffic accidents. Requests for emergency service personally generally increase by 100% during ice storms, putting a strain on emergency personnel. |

Worksheet Total 206.30

Rank out of 16: **3**

Priority Group: **High** **Last updated: 12/04/2008**

| Snow Storm | |
|---|---|
| **Definition** | Severe winter weather conditions that affect day-to-day activities and include heavy snow or sometimes blowing snow. |
| **Description** | Snow storms generally can occur between November and February in Oregon. Heavy snows can immobilize transportation systems, down trees and power lines, and collapse buildings. Heavy snows of more than six inches in a 12-hour period can cause hazardous conditions in the community and slow or stop the flow of commerce. Heavy snows can disrupt emergency, medical, and law enforcement services. Loose snow begins to drift when the wind speed reaches 9 to 10 mph under freezing conditions. |
| **Historical Occurrence** | 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.<br><br>The following are the dates, one day amounts and total storm accumulations for those storms: |

| 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” | 18” |
| **January 9 – 18, 1950** | | 54.7” |
| **January 25 – 31, 1969** | | 24 to 30” |
| **December 29 - 1971** | 1.3” | |
| **February 1 – 8, 1989** | | 6” |
| **February 14 – 16, 1990** | | 2 – 4” |
| **February - 1993** | 6” | |
| **Winter 1998 - 1999** | | 2 – 5” |
| **December - 2003** | | 3.8” |

| | |
|---|---|
| **Probability** | 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 have been one every 6 years. During this time there have been small storms but generally not a significant amount of snow falls to be recorded or to cause problems to people and property. Snowfall 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 4-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. |

| | |
|---|---|
| **Vulnerability** | 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 break to quickly causing many accidents. This will put a strain on emergency services. Also snowfall means lower temperatures which have a tendency to mean more structure fires created by using unsafe heating methods. In large snowfalls, 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 day. Home owners are often not prepared for the cold weather associated with snow fall which means that broken water pipes often occur. Snowfall typically does not have as significantly high an impact on the total population of the city as freezing rain or extreme cold weather will. |

Worksheet Total 187.00

Rank out of 16: **4**

Priority Group: **High**

**Last Revised 12/04/2008**

| Earthquake | |
|---|---|
| **Definition** | Any shaking or vibration of the earth caused by the sudden release of energy that may impose a direct threat on life and property. |
| **Description** | An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. This shaking can cause buildings and bridges to collapse disrupt gas, electric, and phone service; and sometimes trigger landslides, flash floods, and fires. The three general causes of earthquakes now recognized are: tectonic, volcanic and artificially produced. |
| **Historical Occurrence** | There has been one earthquake that has done 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,<br>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.<br><br>The largest earthquakes in the state of Oregon before 1993 were reported on August 8, 1910, and September 21, 1993, both 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.<br><br>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 magnitude quake 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. |
| **Probability** | Though it is likely that another earthquake will occur, knowing when is really impossible to predict. The last one to do damage in Albany was in 1961, 43 years ago. It is likely that an earthquake which will do damage in Albany will occur in the next 20 years. |
| **Vulnerability** | 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 to it. The majority of the buildings in the downtown are un-reinforced masonry anywhere from one to seven stories. At this time the majorities of the second stories and above are unoccupied, but there is a push to refurbish many of the second stories in the downtown area into living space. Bringing these buildings up to present day earthquake code 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.<br><br>Most homes in the city are single story levels, but the majority are now built to the present day earthquake level so in a significant earthquake it would be anticipated that many of the homes will be moved off their foundations. Most of Albany is located on |

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| | flat land, but there are many homes in the North Albany area that are built in multiple levels on sloped land. Many of these homes are newer and have been built to a higher standard. Still it would be expected that a large number of homes would be damaged not only form the earthquake, but also from moving land they are built on.<br><br>Infrastructure damage in the way of water and sewer would have a large impact on the citizens of Albany after an earthquake. The city's water 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, which has not been seismically updated. This is true for the water treatment plant which was built during the 1950's and 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.<br><br>The city has quite a few bridges that are not seismically upgraded. Two that are major traffic routes between Albany in Linn County and Albany in Benton County. Both go over the Willamette River and after a significant earthquake will be out of service. In addition to these larger bridges there are many smaller bridges and culverts that are underneath the city's 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 section of town to the other safely.<br><br>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 not built to and has not been upgraded to the newest standard. It can be expected that if a significant earthquake occurs major damage will take place at this facility.<br><br>The type and magnitude of an earthquake will have different affects on the city. For the most part the city is not prepared to with stand a major event. The affect on the citizens and its infrastructure will be catastrophic |

Worksheet Total 185.85

Rank out of 16: **5**

Priority Group: **High** **Last update 12/04/2008**

## Hazardous Materials

**Definition**

Release of chemical substances or mixtures that present danger to public health or safety during transportation.

**Description**

A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Each year chemicals are transported across the county via truck and train. Hazardous substances are categorized as toxic, corrosive, flammable, irritant, or explosives. Hazardous materials incidents generally affect a localized area, and the use of planning and zoning can minimize the area of impact.

**Historical Occurrence**

According to Oregon State Fire Marshal records pertaining to Hazardous Material Transportation Accidents, the Albany Fire Department has responded to 47 hazardous material incidents since 1986. Albany is known as the hub of the Willamette Valley because Interstate 5, Hwy. 20, Hwy. 99, and Hwy. 34 go through or near Albany. We have a rail yard within the city limits and rail tracks that go north, south, east and west. Some of the chemicals that we have responded to include Zirconium, Natural Gas, Diesel Fuel, Chlorine, Mercury, Gasoline and Argon. Much of the material does pass through Albany, but much is also coming into the area to be unloaded at one of the many businesses in Albany that use Hazardous Materials. The majority of incidents involve Diesel Fuel and Gasoline.

| Year | Number of Incidents |
|---|---|
| 1986 | 3 |
| 1988 | 2 |
| 1989 | 3 |
| 1990 | 4 |
| 1991 | 5 |
| 1992 | 7 |
| 1993 | 8 |
| 1994 | 3 |
| 1995 | 6 |
| 1996 | 1 |
| 1997 | 1 |
| 1999 | 2 |
| 2000 | 3 |
| 2002 | 1 |
| 2003 | 7 |
| 2004 | 2 |

- No Reports from State Fire Marshal's Office are available after 2004.

**Probability**

There are 4 main highways that go through or next to the city of Albany. The volume of traffic has increased each year with no expected decrease occurring. As Albany increases in population, which has seen a 2 to 2.5 % increase each year, there will be a proportional increase in traffic volume, both for residential and business vehicles. As the number of autos and truck traffic increase the number of accidents involving hazardous materials will also increase. Better protective action by the federal and state government

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| | to regulate truck transportation has helped to decrease the number of truck traffic accidents. More commercial building will create an increase in large truck traffic which will increase the likelihood of having an accident involving hazardous materials. Any accidents resulting from these types of vehicles will be limited to hydrocarbon releases, but there are efforts to increase the industrial property within the city which will increase the truck traffic to these areas. These vehicles will carry more toxic chemicals to their site.<br><br>Albany has a rail yard which in the last three years has seen more activity on the smaller lines headed West and East and South and North. There have been an increased number of smaller derailments seen on these lines which have resulted in hazardous materials spills. All of these spills have been of diesel fuel and all of the derailments have been at low speed. Most of the cars for the rail systems are transporting non-hazardous materials, primarily lumber and metal. |
| **Vulnerability** | Depending on the location of the accident, a hazardous materials transportation accident will affect a small percentage of the population. Because the primary transportation releases have been hydrocarbons there is a smaller risk associated than if it were a more serious chemical. Hydrocarbon releases at this time pose a problem to the sewer system and ground contamination. Few problems occur to the atmosphere that would require sheltering in place or evacuation.<br><br>Because of the truck and rail traffic that does occur in the city and the types of chemicals these transpiration vehicles carry, it is likely that a leak of a more toxic chemical will occur in the future and that it will affect up to 10% of the population or 400 people directly and another 10%, or 400 people, indirectly. Generally, spills of smaller sizes with less toxic chemicals will take between 2 – 4 hours to work through, while a more serious chemical spill may take up to 48 hours to deal with, and affect 20% of the population directly and another 15% indirectly. |

Worksheet Total 169.15

Rank out of 16: **6**

Priority Group: **Medium**

**Last updated 03/02/2009**

## Hazardous Materials

**Definition**

Release of chemical substances or mixtures that present dangers to public health or safety during production or handling at a fixed facility.

**Description**

A hazardous substance is one that may cause damage to persons, property, or the environment when released to soil, water, or air. Chemicals are manufactured and used in ever increasing types and quantities. As many as 500,000 products pose physical or health hazards and can be defined as "hazardous." Each year, over 1,000 new synthetic chemicals are introduced. Hazardous substances are categorized as toxic, corrosive, flammable, irritants, or explosives. Hazardous materials incidents generally affect a localized area and the use of planning and zoning can minimize the area of impact.

**Historical Occurrence**

Albany has a number of industrial operations that utilize and produce hazardous material. In the Millersburg and Albany area, exotic and special metals are produced by OreMet Titanium and Teledyne Wah Chang and other local facilities. Quantities of Chlorine and Ammonia are used at several facilities within Albany.

According to Oregon State Fire Marshal Records since 1986, there have been a total of 64 responses to fixed site locations by the Albany Fire Department to hazardous material incidents. Some of the chemicals involved have included, Chlorine Gas, Propane, Ammonia, Hydrofluoric Acid, Diesel Fuel, Nitrogen Dioxide and Magnesium. Over the years there have been incidents that have required evacuation of localized residential areas around a business where a release has occurred, but these are rare, with most chemicals that have been released not leaving the business property. The number of incidents by years are found in the table below:

| Year | Number of Incidents |
|---|---|
| 1986 | 4 |
| 1987 | 1 |
| 1989 | 4 |
| 1990 | 6 |
| 1991 | 6 |
| 1992 | 8 |
| 1993 | 6 |
| 1994 | 2 |
| 1995 | 4 |
| 1996 | 3 |
| 1997 | 3 |
| 1998 | 4 |
| 1999 | 3 |
| 2000 | 4 |
| 2002 | 4 |
| 2003 | 2 |
| 2004 | 1 |

- 1988 and 2001 had no responses.
- No Reports from State Fire Marshals Officer Available after 2004

**Probability**

It is likely that there will be another chemical release from a fixed site sometime in the future. The chart above indicates an average of 2 - 4 releases over the last several years. The number of releases in the last 9 years is fewer than the previous 5 years.

| | |
|---|---|
| | Historically, fewer chemical spills are getting offsite and better planning and response training is assuring better methods of dealing with spill s that do occur. |
| **Vulnerability** | Generally the percentage of the community affected by a fixed site chemical spill is small. |

## River Floods

**Definition**

A rising or overflowing of a tributary or body of water that covers adjacent land not usually covered by water or when the volume of water in a stream exceeds the channel's capacity.

**Description**

Floods are the most common and widespread of all natural disasters, except fire. Most communities in the United States can experience some kind of flooding after spring rains, heavy thunderstorms, winter snow thaws, waterway obstructions, and levee or dam failures. Often it is a combination of these elements that causes damaging floods. Floodwaters can be extremely dangerous. The force of six inches of swiftly moving water can knock people off their feet and two feet of water can float a car. Floods can be slow, or fast-rising, but generally develop over a period of days. Flooding is a natural and expected phenomenon that occurs annually, usually restricted to specific streams, rivers or watershed areas.

**Historical Occurrence**

The rainy season in western Oregon runs from October through May, while eastern Oregon experiences its rainy or snowy season from late autumn through early spring. Strong storm systems develop in the upper level flow over the Pacific 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 several 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. Bankfull 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 Bankfull stage (21.2 feet). The 11 greatest observed floods during 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 |

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|---|---|
| | The flood of 1964 did not make this list. This flood, which was the largest prior to 1996, 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, the flood would have been as high as the December 1861 flood, which was estimated at 41 feet river stage, 208 feet elevation, or 16 feet above flood stage.<br><br>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 became a Presidential Declared Disaster and had impact throughout most of Oregon. Since that time there has not been significant flooding in or around Albany. The 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 4th, 5th, or 6th greatest floods in Albany's history. |
| **Probability** | Flood records for the City of Albany indicates there is no regular schedule, 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 the City of Albany has seen over the last 150 years. The time period between the 1964 and 1996 flood was 32 years. Two major floods occurred in 1943 and 1945 and are the only recent examples of flooding to have occurred within a three-year period. These floods took place before the dams were built on the rivers upstream of the city. Since then, only the 1964 and 1996 floods have occurred.<br><br>It is very likely another flood will occur in the future which will equal either the 1964 or 1996 flood. When it will occur is very difficult to predict since may factors need to come together to create a major flood for this area. |
| **Vulnerability** | Since the dams were built upstream of the City of Albany, the community is at little risk of a major flood event. The 1964 flood did do major damage to areas around the City of Albany. Since then, mitigation activities have been implemented to ensure similar flooding doesn't take place in the future.<br><br>The east side of the Willamette River is quite high in relation to the west side. It would take a large flood to do any damage to the core of the city. The west 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. More work needs to be done to elevate the roads in that area above the 100-year flood level. The roads were the major problems during the 1996 flood. Few, if any, structures were affected by river flooding.<br><br>Drainage flooding in the east and north part of the city did do damage to quite a few homes in these areas. Since the 1996 flood a number of mitigation projects have taken place that will ensure these same types of flooding do not occur in future. |

Worksheet Total 164.10

Rank out of 16: **7**

Priority Group: **Medium** **Last updated 12/04/2008**

| Water System Failure | |
|---|---|
| **Definition** | Failure to provide water processing for the purpose of storage, or for the stored water to reach customers/residents using the water. |
| **Description** | Situations can occur which create power outages to the city's water treatment plant, due to power failures, internal electrical problems, or motor problems. The distribution system could have broken pipes, or a malfunctioning pump motor that would not allow water to be distributed to the storage tanks. The water itself could be contaminated which would eliminate a source of water for the treatment plant to process. Typically, because of the redundancy in the larger diameter water distribution systems, water will get to different parts of the city one way or another; one broken pipe will not create a system failure. In smaller feeder lines to residents or businesses, this may not be true. These lines, if broken, can cause a system failure to that area. |
| **Historical Occurrence** | The present water treatment plant was built in 1918 and has over 190 miles of pipes. The City of Albany purchased the system from Pacific Power in 1984. Historical data prior to 1984 is not available. Since the purchase of the water system, Albany has experienced at least four situations in which water was not able to be produced, or the water being produced was not able to be transmitted through the system to homes or storage facilities. Three of these incidents had to do with transformers and these were caused by an electrical panel that caught fire. None of these incidents caused the plant or distribution system to be down for more than 12 hours.<br><br>A new transformer supplying the water plant was installed in the summer of 2002. There has never been a complete water distribution failure of the system, but there have been sections of the system that have failed for up to 18 hours.<br><br>The potential for more widespread failure exists as several of the larger parts of Albany, such as North Albany and southwest Albany near Linn-Benton Community College, have only one feeder source. No redundancy in the system exists at this time for these areas. The age of the system as a whole provides a problem as many of the pipes are over 50 years old and in need of upgrading. Many leaks are present in the system today, but they are too numerous to repair at this time.<br><br>Another area of concern is the water source. Albany has only one at this time: a canal that begins on the Santiam River in Lebanon, Oregon, and travels 18 miles to Albany's Calapooia River, as the source. If this water source becomes contaminated, the city is not able to produce any potable water. Beginning in 2004 the City of Albany and City of Millersburg began a joint water venture that will provide the city with a second source of water. It will also expand the reservoir capacity for the city to nearly double what it presently is. |

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| **Probability** | Complete failure of the water system could occur in at least three different situations:<br><br>(1) It would take place if there was contamination to Albany's intake water source. Until recently there was only one water supply source; the Santiam River intake in Lebanon. Contamination of this water source would completely shut down the city's ability to make water. It would be necessary to use water in the reservoir system and to conserve water by all users, residential, commercial, and industrial. A second source of water will be coming on-line in mid 2005, which will mean that two intake locations would have to be contaminated to produce complete shutdown. Another likelihood would be the contamination of the Santiam River upstream from the 1st intake location. The 2nd location is downstream from the first.<br><br>(2) Power failure to the water plant. At this time there are two locations where water is treated. The chances are less that a major power failure would occur at both locations at the same time. The ability to be able to treat water at two different locations increases our storage of water. If a total power failure occurred, we would need to rely on the water stored in our reservoirs until power came back on at one of our treatment locations. At this time, no backup power is available at either of the treatment sites so resumption of water treatment could only occur when the power was restored.<br><br>(3) Electrical or mechanical failure within the plant which would halt the treatment of water. This scenario would likely take place at one of the two locations and with two sites available to treat water, interruption of water service would likely not be severe. |
| **Vulnerability** | If any one of the three above mentioned failures were to occur at this time it would likely have a mild to severe impact on the residents, commercial businesses and industrial plants within the cities of Albany and Millersburg. It could also have a significant impact on fire service, depending on the severity of the failure, as the water used for firefighting may need to come from the reservoirs. In addition, because the City of Albany provides water to the City of Millersburg, those residents and businesses would also be impacted. A total of 45,000 to 50,000 people could be affected. The good news is if one plant were to go off-line, the other would be able to provide the necessary treated water to all the locations in Albany and Millersburg.<br><br>Typically during the year there may be one or two water disruptions which occur due to water main failure or hydrant damage due to motor vehicle accidents. These disruptions are much localized and generally affect 50 to 200 people at any one time. These types of disruptions will continue to occur from year to year since they are due to the age of the water system or an accident which occurs to the system.<br><br>Major vulnerability has been reduced with the addition of a second water plant in Millersburg and continued update of the City of Albany's present water system. If generators were to be added to each of the two plants, it would eliminate power failure as one of the three factors causing severe water problems to the city. Routine scheduled maintenance of plant equipment would reduce another of the three causes of water plant failures.<br><br>Contamination of water will always be a concern and, absent completely enclosing all water sources, will need to be something to deal with on a continuing basis. Monitoring systems at the water intake locations will help reduce a contamination problem but will never eliminate it. |

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| | | Worksheet Total | 153.20 |
| Rank out of 16: | **8** | | |
| Priority Group: | **Medium** | **Last updated 03/25/2009** | |

| Contagious Disease | |
|---|---|
| **Definition** | A very communicable disease capable of spreading rapidly from one person to another by contact or close proximity. |
| **Description** | A contagious disease can be caused by natural processes, or maybe be intentionally set to infect the populace. In any case, it is anticipated that approximately 35% of the populace could become infected, and disruption of normal services would be seen for six weeks to six months, depending on how the disease cycles though the community. |
| **Historical Occurrence** | There have been three significant contagious disease outbreaks in the United States in the past 100 years, although only the Influenza Epidemic of 1918–1919 caused significant fatalities within the county. |
| **Probability** | Contagious diseases that pose a health risk to people have always existed. While the spread of many of these diseases has been controlled through vaccination and other public health efforts, terrorist acts worldwide have raised concerns about the possibility of a biological attack. That makes it important for people to understand what can and would be done to protect the public from the spread of dangerous contagious diseases. |
| **Vulnerability** | Each year we have a flu season that affects a small portion of the community. The severity of this season is different each year. It is most likely this cycle will not change in the future. A more wide-spread and contagious outbreak will likely occur at some point in the future. The good news is that we will have advance warning of its spread and proactive action can be taken to minimize the impact on the community. |

Worksheet Total 134.95

Rank out of 16: **9**

Priority Group: **Medium**

**Last Updated 03/25/2009**

| Health Threat/Bio-Terrorism | |
|---|---|
| **Definition** | Use of biological agents against persons or property in violation of the criminal laws of the United States for purpose of intimidation, coercion, or ransom. |
| **Description** | Access to chemical and biological materials is easy to obtain. A chemical attack would tend to be directed toward localized areas and possibly concentrate on water supplies. Biological agents could be spread by aerosol in small to large assemblies of people. Smallpox is difficult to release but very contagious and could cause extensive casualties. |
| **Historical Occurrence** | Though there has been a history of use of this method in the state of Oregon, there has been no history of a biological or chemical agent used in the City of Albany for the purpose of intimidation, coercion or ransom. |
| **Probability** | Because of the size of Albany's population, the fact that it has no political significance, and has no major industry or business that would attract terrorists, it is unlikely that a health threat/bio-terrorism event caused for the purpose of intimidation, coercion or ransom will occur in Albany.<br><br>It is more likely that health threats caused by transportation accidents and accidental releases at fixed sites will occur.<br><br>Bio-terrorism, though always possible, is unlikely to occur in Albany. |
| **Vulnerability** | Because of the potential associated with one of these events, if one was to occur, depending on the location and type of event, 0 - 50 percent of the people in Albany could be affected.<br><br>A chemical attack would have the smallest number of potential victims, as this would be localized event, much like a chemical release acts now. 1 – 5 % if the population could be affected.<br><br>A biological agent would have the highest number of potential victims anywhere from 5 – 50 percent of the population. Biological agents are not necessarily localized problems as they can be spread from one person to another. They do not necessarily affect an individual right away, so one may not know they have been infected and have become a carrier. This type of situation can cause wide-spread problems in the community. |

Worksheet Total 122.10

Rank out of 16: **10**

Priority Group: **Medium** **Last updated 12/04/2008**

| Volcanic Ash | |
|---|---|
| **Definition** | Fallout of ash resulting from the explosion of a volcano somewhere in the world carried via high level air currents. |
| **Description** | The eruption of Mt. Saint Helens in 1980 showed that air currents can move ash a considerable distance. Volcanic ash dispersed into the atmosphere can provide non-radioactive fallout that would cover everything in the area. Such fallout can be abrasive and cause damage to painted surfaces, reciprocal and jet engines. |
| **Historical Occurrence** | Except for Mt. St. Helens, no other volcanic eruption in the immediate area or the world has had an effect on Albany.<br><br>Volcanic activity in the Pacific Northwest appears to be entering a more active cycle. In 1980, the eruption of Mt. St. Helens in Washington State demonstrated the destructive effects of a volcanic event. Mt. Hood has recently experienced ground movement and minor venting. Theoretically, an eruption may occur in the cascade range at 60-year intervals. Intensity of such eruptions is unpredictable. If an eruption originates from the earth's interior, it can produce lava flows or violent explosions spewing rock, gasses, and debris, as occurred with Mt. St. Helens. It is more likely that a non-lava explosion will occur once every 100 years. Volcanic ash thrown into the atmosphere can provide a non-radioactive fallout that can cover everything in the area. In 2004 there was once again activity in the dome of the area. The dome is building up and clouds of steam have been released. There also has been underground movement taking place at the mountain.<br><br>The three most active volcanoes in Oregon are Mt. Hood, Three Sisters, and Newberry Crater. Mt. Hood last erupted about 200 years ago. Three Sisters erupted about 2,000 years ago, but since 1997 a broad area centered three miles west of the South Sister has domed upward by more than 5 inches. Scientists think that this doming reflects the ongoing accumulation of magma at a depth of 3 to 4 miles. Newberry Crater erupted about 1,300 years ago.<br><br>In Washington State, Mt. Baker erupted in the mid-1800s; Glacier Peak erupted at least six times in the past 4,000 years; Mt. Rainier has had four eruptions and numerous lahars in the past 4,000 years; Mt. St. Helens erupted on May 18, 1980; and Mt. Adams experienced a series of small eruptions about 1,000 years ago.<br><br>In Northern California, Mt. Shasta, last erupted in 1786, and has erupted on an average of once every 300 years. Medicine Lake has erupted at least eight times in the past 4,000 years, most recently about 900 years ago. It is the largest volcano in the Cascades. The most recent volcanic eruptions in California occurred at Lassen Peak from 1914 to 1917. An explosive eruption on May 22, 1915 produced a large pyroclastic flow, lahars and ash that fell as far away as Elko, Nevada, (300 miles to the East). |
| **Probability** | It is likely that a volcanic eruption will occur at sometime in the future from Mt. St. Helens, the Three Sisters or Mt. Hood. Since many of the volcanic activities are measured in 100's of years it may be a while before we see something occur like what happened with Mt. St. Helens. |

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| **Vulnerability** | If an eruption was to occur, the entire city population could be affected depending on which mountain erupted, whether it was a magma eruption or a steam eruption, and what direction the winds, at both lower and higher levels, were traveling. This will be one of those events where either the whole population is affected or none of the population will be affected. |

Worksheet Total 116.30

Rank out of 16: **11**

Priority Group: **Low** **Last updated 12/04/2008**

| Dam Failure | |
|---|---|
| **Definition** | A break, or imposed threat from any water retention fixture which may endanger population downstream of the containment area. |
| **Description** | Dams are constructed for a variety of uses, including flood control, erosion control, water supply impoundment, hydroelectric power generation, and recreation. Flooding, operating error, poor construction, lack of maintenance, damage due to burrowing animals, vandalism, terrorism, and earthquakes can all cause dam failure. Dams are classified into three categories based on the potential risk to people and property should a failure occur:<br><br>**High Hazard** – If the dam was to fail, lives would be lost and extensive property damage could result.<br><br>**Moderate Hazard** – Failure could result in loss of life and significant property damage.<br><br>**Low Hazard** – Failure results in minimal property damage only.<br><br>Dam hazard potential classifications have nothing to do with the material condition of a dam, only the potential for death or destruction due to the size of the impoundment and the characteristics of the area downstream of the dam. |

| | |
|---|---|
| **Historical Occurrence** | The Corps of Engineers-controlled dams on the Willamette and Santiam have a high vulnerability and maximum threat rating, but the probability is low. No dam failures have occurred since the dams on the mentioned rivers have been built.<br><br>Before the U.S Army Corps of Engineers (USACE) dams on the North Santiam, South Santiam and Willamette rivers were built, cities in the Willamette Valley were subject to 25 year storm events in which severe flooding occurred. USACE officials estimated that during the February 1996 flood event, the levels of the Willamette River in Albany would have been 5 to 6 feet higher at the maximum flood stage. This would surely have inundated a large part of North Albany and the western portion of Albany.<br><br>A dam failure can either be slow in nature or catastrophic, depending upon a number of variables, such as the strength of containment structure, the amount and velocity of water released, and the distance of affected structures from the failure.<br><br>The worst case event would be a catastrophic failure of the Hills Creek Dam on the Middle Fork of the Willamette River, near Oakridge. Flood flows from such a failure would breach Lookout Point and Dexter Dams and continue down the Willamette River to Willamette Falls at Oregon City. Albany would be impacted by this type of an event. The Hills Creek Dam failure would create water levels at approximately 216 feet above sea level in Albany. It would take 24 hours to get to Albany, and 31 hours to reach the peak elevation. Lookout Point Dam failure would provide water levels at approximately 210 feet above sea level in Albany. This would take 27 hours to get to Albany and 35 hours to reach peak elevation. Cougar Dam on the McKenzie River would provide a flood elevation of 207 feet, take 51 hours to get to Albany, and 57 hours to reach peak elevation.<br><br>On the Santiam River we have Green Peter Dam and Foster Dam which could fail. The results of these dams failing would not have the same impact on Albany as would the others since they are located on the Santiam River and its influence on the Willamette River is downstream of Albany. The impacts of these dam failures would be felt on the north and northeast portions of Albany having to do with Burkhart Creek between Knox Butte and the airport. |

| | |
|---|---|
| **Probability** | There are a number of events that could occur to trigger a dam failure. They include overtopping, erosion, landslides, earthquakes, terrorism, and seepage. Information quoted in the Sweet Home Hazard Mitigation Plan indicates the probability of a dam failure is 0.1% per year or less than once in 1,000 years. It is unlikely that a dam failure will occur, unless an earthquake or terrorist attack was to trigger a failure.<br><br>Dams build in the 1960's were designed to a ground shaking level of 0.10 g; today this same dam would need to be built to a 0.21 g level. This indicates all the dams which were built in the 1960's, that would affect the City of Albany, were built at the lower ground shake level and could be affected by an earthquake of medium size.<br><br>Terrorism has always been a concern, but after September 11, 2001 more awareness on the need to provide for security at dams was identified and plans were developed to provide more security.<br><br>Dams are inspected on a regular basis. |
| **Vulnerability** | A dam failure on the Santiam river will have much smaller impact on Albany since the river enters into the Willamette river downstream of the city. Only the north and north-east parts of Albany will be affected. This part of Albany has a smaller population base and sits on higher ground. In this situation the Willamette river would rise because of the high volumes of water entering the river, but the effect on Albany upstream would still be minimal. 5 – 10% of the population may be affected.<br><br>A dam failure on the Willamette River would have a greater affect on Albany as the water level would come to the 4th or 5th Street level. These are the levels of flooding that occurred in the 1890's in Albany. Though the effects on the east bank of the river in Albany would be primarily to businesses, the west side would have a greater impact on residential buildings. In either case the impact to the population of Albany would still be small when compared to the total population, about 5 – 10 %.<br><br>Whether the dam failure occurred on the Santiam or the Willamette river it would take 8 – 10 hours for the water to arrive in Albany. This would be ample time to implement an evacuation and response procedure for this event. |

Worksheet Total 115.45

Rank out of 16: **12**

Priority Group: **Low** **Last updated 03/25/2009**

| Weapons of Mass Destruction/Terrorism | |
|---|---|
| **Definition** | Any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals, disease organisms, radiation or radioactivity, or explosion, or fire. |
| **Description** | In the case of chemical, biological, and radioactive agents, their presence may not be immediately obvious, making it difficult to determine when and where they have been released, who has been exposed, and what danger is present for first responders and medical technicians. Although there is a sizable body of research on battlefield exposures to WMD agents, there is limited scientific understanding of how these agents affect civilian populations. |
| **Historical Occurrence** | There is no historical data to indicate that a WMD/Terrorist event has occurred in Albany or the surrounding area. Though nothing has occurred, there is the potential for a terrorist attack because of the federal businesses in this area. Albany has many rare metal manufacturing plants which have contracts with the federal government. |
| **Probability** | Because of the population of the City and the lack of credible targets, it is unlikely that a terrorist attack will occur. |
| **Vulnerability** | If one was to occur, at least 25 percent of the population would likely be affected. |

Worksheet Total 112.35

Rank out of 16: **13**

Priority Group: **Low** **Last Updated 12/04/2008**

| Wildland/Urban Interface Fires | |
|---|---|
| **Definition** | An uncontrolled fire that threatens life and property in either a rural or wooded area that is beyond normal day-to-day response capabilities. |
| **Description** | Grass and Wildland fires can occur when conditions are favorable such as during periods of drought, when natural vegetation would be drier and more subject to combustibility. |

**Historical Occurrence**

Because of the rural nature of Albany and surrounding areas, grass fires have been a major concern. Agriculture has been a major industry in and around the city and the growing of grass seed continues to be the major crop for many farmers.

Burning fields has been used as a sterilization method for grass crops for many years. In the early years, there was little effort given to when and how fields were burned. This created some very large grass fires that would often burn thousands of acres. Depending on the wind, the grass fires would burn from one fire district into another. Restrictions on the number of acres to be burned and the condition of the fields were implemented in an effort to control these fires. In the early 1990's, a controlled grass fire caused a major vehicle wreck on I-5; from that more restrictions were created further reducing the number of acres that were allowed to be burned. It required buffers between fields and water requirements on-site. Over the years, the number and intensity of grass fires has decreased through preventive measures. The table below lists the year and the number of grass fires responded to by the Albany Fire Department:

| Year | Number of Fires |
|---|---|
| 1991-92 | 63 |
| 1992-93 | 69 |
| 1993-94 | 65 |
| 1994-95 | 83 |
| 1996-97 | 11 |
| 1997-98 | 25 |
| 1998-99 | 44 |
| 1999-2000 | 42 |
| 2000-2001 | 41 |
| 2001-2002 | 39 |
| 2005 | 48 |
| 2006 | 69 |
| 2007 | 43 |
| 2008 | 59 |

There have been no urban interface fires in Albany, but there are two general locations in and around the City of Albany where urban interface fires would have an impact on homes: one location is in North Albany. Most of this area is hilly, wooded or field where individual homes or subdivisions have been built over the years; the other location is in Northeast Albany, at Knox Butte, where a large subdivision is built on the top of the Butte. The Butte is covered with trees, and grass fields surround the Butte at its base.

**Probability**

A grass or urban interface fire will occur in the future.

**Vulnerability**

A grass fire will have little effect on the population as these generally occur in less densely populated areas. An urban interface fire would have more of an impact on the population as it would occur in subdivisions where more people live. It would also affect traffic routes in and out of these locations.

| | | | |
|---|---|---|---|
| | | Worksheet Total | 95.35 |
| Rank out of 16: | **14** | | |
| Priority Group: | **Low** | **Last Updated 03/25/2009** | |

| Civil Disturbance | |
|---|---|
| **Definition** | Mass demonstrations or direct conflict by large groups of citizens, as in marches, protest rallies, riots, and non-peaceful strikes. |
| **Description** | People assembled together in a manner to substantially interfere with public peace constitutes a threat, whether it's by use of unlawful force or violence against another person, causing property damage or attempting to interfere with, disrupting, or destroying the government, political subdivision, or a group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target group or institution. Most events are within the capacity of local law enforcement. |
| **Historical Occurrence** | The traditional type of civil disturbance involving demonstrations, rioting, looting, and other violent disorderly behavior has not been a problem in Albany nor has it posed much of a potential threat to the citizens of Albany. There are no records of any civil disturbance that required intervention by the police department. |
| **Probability** | It is unlikely that a civil disturbance will occur in Albany. |
| **Vulnerability** | A very small percentage of the people in Albany would be affected by a civil disturbance. |

Worksheet Total 81.60

Rank out of 16: **15**

Priority Group: **Low** **Last Updated 12/04/2008**

| Landslide/Debris Flow | |
|---|---|
| **Definition** | A downward and outward movement of slope-forming materials reacting under the force of gravity. |
| **Description** | Landslides occur when masses of rock, earth, or debris move down a slope. Landslides may be very small or very large, and can move at slow to very high speeds. Many landslides have been occurring over the same terrain since prehistoric times. They are activated by storms and fires and by human modification of the land. New landslides occur as a result of rainstorms, earthquakes, and various human activities. |
| **Historical Occurrence** | There are no historical records of landslides in the Albany area. The only known debris flows occurred prior to the flood-control dams being built in the 1950s. Prior to that there were indications of the Willamette and Calapooia Rivers having debris flows of trees when flooding occurred. In the late 1800s, the forests along the Willamette and Calapooia Rivers were very extensive and major flooding would cause trees to be swept down the river causing log jams.<br><br>Because of the flat land on which Albany is located, there are not many locations where landslide/debris flows can take place. The following are a few locations that have been identified as potential sites:<br><br>One location is in North Albany, along Springhill Road, where Springhill begins to parallel the Willamette River. Those hills have been identified as potential Rapidly Moving Landside areas.<br><br>Another area is West Thornton Lake Drive, between North Albany Road and the 2500 block of West Thornton Lake Drive. There are five locations that have been identified as having Potential Rapidly Moving Landslide possibilities. All locations are North of West Thornton Lake Drive.<br><br>The final potential Rapidly Moving Landslide area is located on the west side of Knox Butte between the hill and Scravel Hill Road. One of the two sites encompasses the road going up to the subdivision with landslide areas on the west and east side. The other location is on the west side and below the subdivision. |
| **Probability** | It is unlikely that any landslide or debris flows will occur unless an extremely high amount of rain occurs or an earthquake takes place. A dam failure, depending on whether it occurred on the Willamette or Santiam River could create a debris flow. |
| **Vulnerability** | Though by percentage few people within the city would be affected by a landslide, it could have an impact on some transportation routes. More people and business would be affected by a debris flow, if one were to occur. |

Worksheet Total 76.40

Rank out of 16: **16**

Priority Group: **Low** **Last Updated 03/25/2009**

**Figure #1**

**HAZARD ANALYSIS**
**City of Albany**

City of Albany Emergency Management is conducting a hazard analysis to provide the City with a sense of hazard priorities, or relative risk. The analysis doesn't predict the occurrence of a particular hazard, but "quantifies" the risk of one hazard compared to another. By doing this we can focus on the hazards with the greatest risk.

Your assistance is requested to score each of the hazards likely to occur in the city of Albany, which is shown on the attached Hazard Analysis Matrix Worksheets 1 & 2.

Below you will find Section 1, Definition, which describes the three criteria to be scored for each hazard. They are: Vulnerability, Maximum Threat (Severity), and Probability. Please review and become familiar with these terms. Section 2, Scoring, provides an explanation of how each hazard will be scored within each of the three criteria. There are three scoring ranges: Low, Medium, and High. Within each of these ranges there is flexibility to provide actual points: 1-3 for low, 4-7 for medium, and 8-10 for high.

What to do? Start with the first hazard - Winter Ice Storm. If you believe the next winter ice storm will affect greater than 10 percent of the population, as defined, then you would score its Vulnerability high. In the "high" range you can narrow the score from 8 to 10. Assign the score you feel most appropriately ranks Vulnerability for this particular hazard. Next, rate the Maximum Threat (Severity) and then Probability, using the same process you did for Vulnerability. Follow this same procedure for each of the hazards listed on the worksheets.

1. **Definitions:**

   **The following categories are used in conducting this hazard analysis:**

   **VULNERABILITY:** Represents **adverse** impacts to citizens, visitors, and emergency responders. It is important to consider only **adverse** affects. Many hazards occur which do not significantly impact people.

   **MAXIMUM THREAT (Severity):** This is an assessment of severity of the hazard in terms of injuries and fatalities, personal property damage, and infrastructure damage.

   **PROBABILITY:** This indicates the likelihood of a specific hazard occurring in a specified period of time.

2. **Scoring:**

   The following categories are considered in determining ranking:

   **VULNERABILITY:**

| | | |
|---|---|---|
| **LOW** | **If** (<1% affected) | **Score** 1 - 3 points |
| **MEDIUM** | **If** (1 - 10% affected) | **Score** 4 - 7 points |
| **HIGH** | **If** (>10% affected) | **Score** 8 - 10 points |

   **MAXIMUM THREAT (Severity):**

| | | |
|---|---|---|
| **LOW** | **If** (<5% affected) | **Score** 1 - 3 points |

| | | |
|---|---|---|
| **MEDIUM** | **If** (5 - 25% affected) | **Score** 4 - 7 points |
| **HIGH** | **If** (>25% affected) | **Score** 8 - 10 points |

**PROBABILITY:**

| | | |
|---|---|---|
| **LOW** | **If** (>1 chance per 100 years) | **Score** 1 - 3 points |
| **MEDIUM** | **If** (>1 chance per 50 years) | **Score** 4 - 7 points |
| **HIGH** | **If** (>1 chance per 10 years) | **Score** 8 - 10 points |

**CITY OF ALBANY**
**HAZARD ANALYSIS MATRIX**
**WORKSHEET 1**

| HAZARDS | VULNERABILITY | MAXIMUM THREAT (Severity) | PROBABILITY |
|---|---|---|---|
| **Ice Storm** | | | |
| **Snow Storm** | | | |
| **Earthquake** | | | |
| **River Flood** | | | |
| **Utility Failure** | | | |
| **Hazardous Material** | | | |
| **Weapons of Mass Destruction/Terrorism** | | | |
| **Dam Failure** | | | |
| **Volcano Ash** | | | |
| **Landslide/Debris Flow** | | | |

DATE: _

COMPLETED BY:_

**CITY OF ALBANY**
**HAZARD ANALYSIS MATRIX**
**WORKSHEET 2**

| HAZARDS | VULNERABILITY | MAXIMUM THREAT (Severity) | PROBABILITY |
|---|---|---|---|
| **High Wind Storm** | | | |
| **Civil Disturbance** | | | |
| **Health Threat/Bio Terrorism** | | | |
| **Water System Failure** | | | |
| **Contagious Disease** | | | |
| **Wildland/Urban Interface Fire** | | | |

DATE: _

COMPLETED BY:_

# Appendix I:
# Floodplain Management Planning Committee

## Floodplain Management Planning Committee

The Floodplain Management Planning Committee was created to:

1) Update the flood hazard section and its related action items for the Natural Hazard Mitigation Plan, and
2) Create a Flood Information and Insurance Promotion Public Outreach Plan (Appendix J).

Following the Community Rating System (CRS) guidelines, the Committee was made up of eight individuals, half from within, and half from outside of the City of Albany government. City staff members consisted of individuals with expertise in floodplain management, public information/outreach, emergency services, public works operations and natural resource protection. Business professionals from outside of the City administration represented the real estate, lending, and insurance industries. The Floodplain Manager and CRS Coordinator, Melissa Anderson, served as the project manager for the Committee. A list of the Committee members and their representing organization is listed below.

| Floodplain Management Planning Committee | Organization Representing |
|---|---|
| Linda Jane (L.J.) Feasel[1] | Hagan Hamilton Insurance Services |
| Bill Higby[2] | Banker / Lender |
| Gail Moldovan | Hagan Hamilton Insurance Services |
| Jessica Pankratz | Town and Country Realty |
| Loren Roth | Citizens Bank |
| David Martineau, CFM | City of Albany Senior Planner |
| Kristin Preston | City of Albany Wastewater Superintendent |
| Marilyn Smith | City of Albany Public Information Officer |
| Darrel Tedisch | City of Albany Emergency Management Specialist |

## Committee Meetings

The committee met six times: June 16, July 13, August 18, September 29, October 13, and November 17, 2015. Each meeting was open to the public and announced on the City of Albany monthly calendar. Meetings included an agenda, attendance and minutes. All original agenda and minutes are on record with

[1] Linda Jane (L.J.) Feasel participated during the first half of the committee meetings to update the Flood section of the NHMP.
[2] Bill Higby participated during the last half of the committee meetings to create a program for public information.

the City of Albany, Community Development department's Natural Hazard Mitigation Plan file. A summary of each committee meeting with those in attendance is provided below.

**June 17, 2015**

**Attendance:** In attendance were L.J. Feasel, Gail Moldovan, Jessica Pankratz, Loren Roth, David Martineau, Kristin Preston, Marilyn Smith and Darrel Tedisch. No members were absent. (Bill Higby joined the committee in September.)

**Meeting Summary:** The meeting began with introductions and an explanation of the purpose of the committee: 1) updating the flood hazard section of the Natural Hazard Mitigation Plan (NHMP), and 2) creating a public outreach plan. An overview of the National Flood Insurance Program (NFIP) and the CRS was provided. Darrel Tedisch provided an over view of the NHMP. Handouts were distributed of the existing NHMP and samples of public outreach plans. Binders were provided to the committee to organize the meeting material. The meeting concluded with the topics to be covered for the next meeting in July.

**July 13, 2015**

**Attendance:** In attendance were L.J. Feasel, Gail Moldovan, Jessica Pankratz, Loren Roth, David Martineau, Kristin Preston, Marilyn Smith and Darrel Tedisch. No members were absent.

**Meeting Summary:** The meeting began with an overview of other relevant studies (e.g. Oregon NHMP, Benton and Linn County NHMP, Albany Emergency Operations Plan). Handouts were provided. Updates on the Hazard Analysis and Action Items were provided by Darrel Tedisch. An update to the Community Profile section of the NHMP was provided by David Martineau. Committee input was solicited on the flood hazard section and related action items of the NHMP. The meeting concluded with the topics to be covered for the next meeting in August.

**August 18, 2015**

**Attendance:** In attendance were Gail Moldovan, Jessica Pankratz, Loren Roth, David Martineau, Kristin Preston, Marilyn Smith and Darrel Tedisch. L.J. Feasel was absent.

**Meeting Summary:** Prior to the meeting, a draft update to the flood hazard section of the NHMP and related action items was distributed to the committee for their review. The meeting time was spent on soliciting input on the draft flood hazard section of the NHMP and the related action items. An overview of the relationship between the CRS and the NHMP was also provided. The meeting concluded with the topics to be covered for the next meeting in September.

**September 29, 2015**

**Attendance:** In attendance were Bill Higby, Gail Moldovan, Jessica Pankratz, Loren Roth, David Martineau, Kristin Preston, Marilyn Smith and Darrel Tedisch. No members were absent. (L.J. Feasel moved out of state and retired from the committee.)

**Meeting Summary:** Prior to the meeting, a draft update to the flood hazard section of the NHMP and related action items was distributed to the committee for their review. The meeting began with collecting any final comments on the flood hazard section and action items in order to publish a final draft. The meeting moved on to begin the public outreach plan. An overview of the elements of the plan was presented, which include: an assessment of the city's public information needs, conducting a flood insurance assessment, identifying target audiences and target areas, identifying existing outreach programs, creating public outreach messages, and preparing a plan for public outreach projects. The meeting concluded with the topics to be covered for the next meeting in October.

**October 13, 2015**

**Attendance:** In attendance were Bill Higby, Gail Moldovan, Jessica Pankratz, Loren Roth, David Martineau, Kristin Preston, Marilyn Smith and Darrel Tedisch. No members were absent.

**Meeting Summary:** This meeting was a working lunch meeting. Findings from the flood hazard and flood insurance assessment were presented to the Committee. An overview of existing public outreach projects was provided and Committee input was collected on other projects conducted by the City. A list of existing and proposed target audiences was identified. A table of public outreach messages and flood response messages was distributed and input was collected from the Committee. A working draft of a public outreach plan was presented for initial Committee input. The meeting concluded with the topics to be covered for the next meeting in November.

**November 17, 2015**

**Attendance:** In attendance were Gail Moldovan, Jessica Pankratz, David Martineau, Kristin Preston and Marilyn Smith. Members Bill Higby, Loren Roth and Darrel Tedisch were absent.

**Meeting Summary:** Prior to the meeting, a draft of the flood information and insurance promotion public outreach plan was distributed to the Committee for their review. A reporter from the Democrat Herald newspaper attended the first part of the meeting to collect information about the Committee and floodplain management activities going on in the City. An overview of the draft public outreach plan was presented. Input was solicited from the Committee on each section of the draft plan. The Committee concluded with a discussion of plan implementation and the annual review of plan implementation by the Committee.

## Open House

A public open house for the NHMP update was held on September 14, 2015. A public open house was also held on November 9, 2015, at which time, the draft of the flood hazard section of the NHMP, and a draft of the public information and insurance promotion public outreach plan and was available for public review input. A complete summary of those public meetings is presented in Appendix B of this NHMP.

# Appendix J:

# Flood Information and Insurance Promotion Public Outreach Plan

## Introduction

This Flood Information and Insurance Promotion Public Outreach Plan is intended to meet the criteria for a Program for Public Information and Coverage Improvement Plan under FEMA's Community Rating System. This program coordinates all flood-related public information and outreach programs citywide. Outreach projects are coordinated so that key flood-related messages are delivered where public information is needed and so that messages are consistent as they are delivered to various target audiences within the city.

This plan includes a flood hazard assessment and flood insurance assessment, identifies target areas and audiences, provides an inventory of existing public outreach efforts, outlines flood information messages and flood response messages, identifies a list of outreach projects, and concludes with plan implementation.

This plan was created by the Floodplain Management Planning Committee and City staff. A description of this committee's volunteer efforts and make-up is described in Appendix I of this Natural Hazard Mitigation Plan.

### Flood Hazard Assessment

An in-depth assessment of flood risk and flood hazard vulnerability is included in the Flood Hazard Section of this Natural Hazard Mitigation Plan. That analysis describes how flooding can affect the whole community in terms of transportation, public health, critical facilities, infrastructure, the economy, and natural areas. It also identifies how residential properties are most at risk to flood hazards, in particular the North Albany area. These findings are described below.

**Developable Land in the Floodplain is Primarily Residential:** In the City of Albany, almost half of the land area in the floodplain is protected from development through open space zoning, while the majority of the remaining land area within the floodplain is zoned for residential single-family uses. There is a total of 1,431 acres of land that is located within the 100-year floodplain and 47% of that total is zoned open space, while 46% is zoned for residential development. Therefore, the vast majority of the land that could be developed within the floodplain is zoned for residential uses. Table 1 identifies the land area in the floodplain within each zoning district.

**Table 1:**
**Total Land Area in the Floodplain by Zoning District***

| Zoning District | Acres | Percentage |
|---|---|---|
| CB -- Central Business | 1 | 0% |
| CC -- Community Commercial | 16 | 1% |
| HD -- Historic Downtown | 1 | 0% |
| HI -- Heavy Industrial | 13 | 1% |
| HM -- Hackleman Monteith | 1 | 0% |
| LI -- Light Industrial | 17 | 1% |
| MUC - Mixed Use Commercial | 27 | 2% |
| OP -- Office Professional | 0 | 0% |
| OS -- Open Space | 668 | 47% |
| RC -- Regional Commercial | 21 | 1% |
| RM -- Residential Medium Density | 49 | 3% |
| RMA -- Residential Med. Density Attached | 0 | 0% |
| RR -- Residential Reserve | 229 | 16% |
| RS-10 -- Residential Single Family | 68 | 5% |
| RS-5 -- Residential Single Family | 35 | 2% |
| RS-6.5 -- Residential Single Family | 284 | 20% |
| WF -- Waterfront | 1 | 0% |
| **TOTALS** | **1,431** | **100%** |

* Data collected in June, 2015

**Ninety Percent of Existing Buildings in the Floodplain are Residential:** In Albany, there are 992 buildings located in the floodplain and 900 of those buildings are located in residentially-zoned land. Table 2 below illustrates this fact by listing the number of buildings located in the floodplain within each zoning district.

**The Majority of Existing Residential Buildings in the Floodplain are in North Albany:** Of the 900 residential buildings in the floodplain, 548 are in the Residential Reserve (RR) zoning district. The RR zoning district is only located in the North Albany area; therefore, 60% of the existing residential buildings are in North Albany. Table 2 below shows the number of buildings located in the floodplain within each zoning district.

| Table 2: Number of Buildings in the Floodplain by Zoning District* | |
|---|---|
| **Zoning District** | **No. of Buildings** |
| CB -- Central Business | 1 |
| CC -- Community Commercial | 17 |
| HD -- Historic Downtown | 1 |
| HI -- Heavy Industrial | 19 |
| HM -- Hackleman Monteith | 5 |
| LI -- Light Industrial | 1 |
| MUC - Mixed Use Commercial | 11 |
| OS -- Open Space | 33 |
| RC -- Regional Commercial | 4 |
| RM -- Residential Medium Density | 138 |
| RR -- Residential Reserve | 548 |
| RS-10 -- Residential Single Family | 62 |
| RS-5 -- Residential Single Family | 27 |
| RS-6.5 -- Residential Single Family | 125 |
| **TOTAL** | **992** |

* Data collected in June, 2015

**Summary:** Based on this information, one can conclude that flood hazards are primarily a residential issue in the City of Albany, with North Albany residents and property owners most likely to be impacted by flooding. Therefore, ***target audiences are residents and property owners in the floodplain, with target areas in the North Albany residential zones***.

## Flood Insurance Assessment

Since flooding primarily impacts residential properties in the City, the flood insurance assessment focuses on flood insurance policies for residential properties.

**Only 40% of Residential Assessed Improvement Value is Covered by Flood Insurance:** There are approximately 973 parcels in residential use that are located in the regulatory floodplain. The approximate improvement value on those parcels is $155 million (improvement value does not include land value). As of April 30, 2015, the City had 266 policies in force with an insurance in-force whole amount of approximately $61.5 million (or 40% of $155 million), a difference of $93.5 million in assessed improvement value that is not covered by flood insurance.

**The Majority of Flood Insurance Policies are in North Albany:** Of the 266 flood insurance policies in the City, approximately 67% are for property in North Albany. A distribution of the flood insurance policies in the City is illustrated in Figure 3, National Flood Insurance Policies Map.

# National Flood Insurance Policies

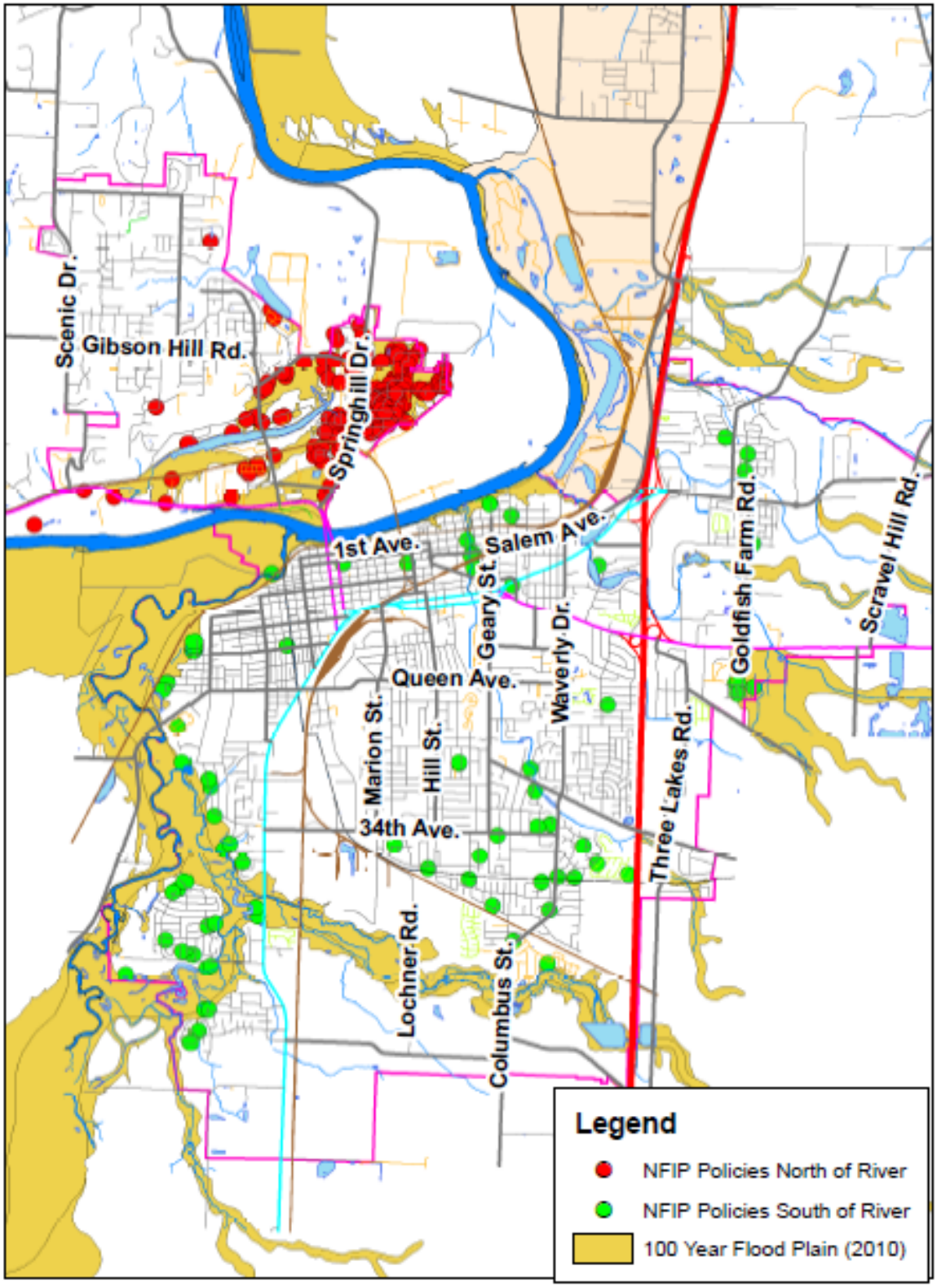


**Figure 3: National Flood Insurance Policies Map**

**Repetitive Loss Properties are in North Albany:** Repetitive loss is a term for any property on which the National Flood Insurance Program (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. In 2015, there are two repetitive loss structures in the community, both of which are residential properties located in North Albany.

**Summary:** Less than half of the assessed improvement value of residential properties located in the floodplain is covered by flood insurance. The majority of flood insurance policies are in North Albany. The properties that have suffered repetitive losses are also in North Albany. Therefore, ***target audiences for promoting flood insurance are residents and property owners in the floodplain, with target areas in the North Albany residential zones***.

## Inventory of Public Outreach

Table 4 describes the existing public outreach efforts that are being conducted within the City of Albany, target audiences, City departments responsible for the outreach effort, and the potential for new public outreach efforts.

## Target Audiences

In order to reach the entire community, existing target audiences and outreach efforts were evaluated against the potential for new outreach projects, the flood hazard assessment, and the flood insurance assessment. Existing and new target audiences were identified to create a more comprehensive public outreach program.

**Existing Target Audiences:**

- General public
- Visitors to City Hall
- Property owners in the 100-year floodplain
- Repetitive loss property owners
- *City Bridges* newsletter recipients
- Real estate professionals
- Motorists
- Park users
- Media

**New Target Audiences:**

- Residents in the 100-year floodplain
- Residents and property owners in the 500-year floodplain in North Albany
- Title companies
- Home builders and retrofit specialists
- Property Managers
- Neighborhood associations
- School teachers
- Youth

| Audience | Existing Outreach Effort | Assignment | Potential New Outreach |
|---|---|---|---|
| General City Population | Floodplain web pages | Floodplain Manager | Link to Keep It Clean webpage |
| General City Population | Keep It Clean webpage | Public Works | Floodplain information and links to other pages |
| General City Population | Emergency Response Information before, during and after a flood event | Emergency Management<br>Floodplain Manager | Flood response messages and links to other pages |
| Visitors to City Hall: Community Development, Public Works and Fire depts. | City Hall display case<br>Floodplain newsletter<br>FEMA floodplain brochures<br>Emergency preparedness brochures | Floodplain Manager<br>Emergency Management | List of professional contractors skilled in retrofitting and restoration |
| *City Bridges* newsletter recipients | Articles on:<br>Flood hazard awareness and flood insurance<br>Stormwater management and water quality<br>Emergency preparedness | Floodplain Manager<br>Public Works<br>Emergency Management | |
| Properties owners in the SFHA | Annual floodplain newsletter | Floodplain Manager | Expand outreach to renters and to 500-year floodplain in N. Albany<br>Spanish language newsletter<br>Booth at home shows |
| Repetitive loss property owners | Annual letter to property owners | Floodplain Manager | |
| Real estate professionals | Annual presentation | Floodplain Manager | Invite homebuilders to event<br>Prepare handout for real estate agents |
| Motorists | Signs at Lochner Road: "When Flooded, Turn Around. Don't Drown" | Emergency Manager<br>Floodplain Manager | Add a picture under the sign illustrating a car floating in the water |
| Parks users | High water mark signs at Monteith Riverpark | Floodplain Manager | Locate brochure next to high water mark signs and replenish during summer concert season<br>Place signs or brochures with historic flood pictures at picnic shelter in Bryant Park and at softball diamonds |
| Youth | Safety Camp | Police and Fire | Flood Hazard Education w/mascot |
| Youth | Fire Dept. Treasure Hunt | Fire | Flood Hazard Education w/mascot |
| Youth | Super Science Saturday | Parks & Recreation | Flood Hazard Education w/mascot |
| Youth | Watershed health education | Public Works | Floodplain education w/mascot |
| Youth | Eco Rangers water education | Public Works | Floodplain education w/mascot |
| Teachers | Teacher newsletter | Public Works | Floodplain education |
| Neighborhood Assoc. | Watershed Health Education | Public Works | Floodplain education |
| General City Population | Stormwater curb markers and signs at catch basins | Public Works | |

**Table 4: Existing Outreach Efforts**

## Flood Information and Insurance Promotion Messages

The Community Rating System recommends that flood information be delivered based on specific topics and desired outcomes. Flood information and insurance promotion messages are presented in Table 5. This table shows the applicable Community Rating System topic, key messages, and desired outcome for each flood information message that will be delivered at times of low flood hazard. Expanded public outreach messages are included in Table 8 at the end of this plan.

| CRS Topic | Public Outreach Message | Outcome |
|---|---|---|
| 1. Know your flood hazard | A. Water knows no boundaries | Increase the number of flood inquiries and the number of people using the website |
| | B. Know your flood risk | |
| | C. Learn more about the flood hazard in your area: contact Community Development at 541-917-7550 or go to www.cityofalbany.net | |
| 2. Insure your property for flood hazard | D. Make sure you have contents coverage | Increase flood insurance coverage |
| | E. Everyone is eligible to obtain flood insurance | |
| | F. Are you covered? Protect your investment | |
| 3. Protect people from the hazard | G. Avoid flood waters | Reduce injuries during flood events |
| | H. Are you ready? Prepare yourself before a flood | |
| | I. Turn Around. Don't Drown | |
| 4. Protect your property from the hazard | J. Retrofitting your home could save you money | Reduce property damage during flood events |
| | K. Don't wait: mitigate | |
| | L. Keep flood vents under your home open | |
| 5. Build responsibly | M. Get a permit before you build | Mitigate negative impacts of flooding on development |
| | N. Use flood-resistant materials and proper vents | |
| | O. Build high, stay dry | |
| 6. Protect natural floodplain functions | P. Preserve and restore native vegetation and trees to reduce flood damage | Reduce negative impacts of development on natural floodplain function |
| | Q. Keep It Clear, Keep It Clean | |
| | R. If you see dumping or debris in ditches, creeks or drains, contact Public Works at 541-917-7600 | |

**Table 5: Flood Information and Insurance Promotion Messages**

**Flood Response Messages**

The Community Rating System provides credit for Flood Response Preparation that develops a plan for public information to be implemented during and after a flood. Table 6 identifies messages that will be delivered during or after a flood.

| CRS Topic | Flood Response Message | Outcome |
|---|---|---|
| 1. Know your flood hazard | A. Stay informed | Widely disseminate information about the flood event |
| | B. Identify high flood risk and areas of actual flooding | |
| | C. In emergency, call 911 | |
| 2. Insure your property for flood hazard | D. If your home has suffered flood damage, call your insurance agent to file a claim | Increase efficiency of flood insurance claims after flood events |
| | E. After the flood, call the City if you have flood damage | |
| 3. Protect people from the hazard | F. Check for structural damage before re-entering your home | Reduce injuries during flood events |
| | G. Avoid flood waters – it's NEVER safe to swim, walk or drive through flood waters | |
| | H. Turn Around, Don't Drown | |
| | I. Stay away from power lines and electrical wires | |
| | J. Get to higher ground and avoid areas subject to flooding | |
| 4. Protect your property from the hazard | K. Mitigate flood risks when doing repairs | Reduce property damage during flood events |
| | L. Report debris blockages by calling Public Works at 541-917-7600 | |
| | M. Sandbags are available at Public Works Operations (405 Davidson Street NE) | |
| 5. Build responsibly | N. Get a permit for repairs | Reduce future negative impacts of flooding on development |
| | O. Use flood-resistant materials | |
| | P. Substantially damaged properties may need to be mitigated when repaired | |

**Table 6: Flood Response Messages**

## Outreach Projects

Table 7 summarizes proposed outreach projects and flood response messages. Outreach projects are intended for distribution during periods of low flood hazard. Flood response messages are to be made ready during periods of high flood hazard and delivered during and after a flood.

| Code | Outreach Project | CRS Topics | | | | | | Audience | Responsibility | Timing |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| OP1 | Information flyer – direct mailing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Property owners and residents in the 100-year floodplain | City (CD) | Annual |
| OP2 | Information flyer – direct mailing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Property owners and residents in the North Albany 500-year floodplain | City (CD) | Annual |
| OP3 | Letter – direct mailing, with retrofit info | ✓ | ✓ | | ✓ | ✓ | | Repetitive loss property owners | City (CD) | Annual |
| OP4 | Information flyer for real estate professionals to hand to clients | ✓ | ✓ | | ✓ | ✓ | | Real estate professionals, residents and property owners | Stakeholder | Annual |
| OP5 | Training for industry professionals | ✓ | ✓ | ✓ | ✓ | ✓ | | Real estate and building industry professionals | City (CD) | Annual |
| OP6 | *City Bridges* newsletter/other articles | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | General city population, Media | City (PIO, PW, EM, CD) | Semi-annual |
| OP7 | Window display at City Hall | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | General city population | City (CD) | Annual |
| OP8 | Information flyer at City Hall | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | General city population | City (CD) | Ongoing |
| OP9 | FEMA brochures at City Hall | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | General city population | City (CD) | Ongoing |
| OP10 | City website floodplain information | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | General city population | City (CD) | Ongoing |
| OP11 | City website "Keep It Clean" program | | | | | | ✓ | General city population | City (PW) | Ongoing |
| OP12 | Turn Around Don't Drown signs | | | ✓ | | | | Motorists | City (Fire) | Ongoing |
| OP13 | High watermark signs | ✓ | | ✓ | | | | Park users | City (CD & Parks) | Ongoing |
| OP14 | Information flyer next to high watermark signs | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Park users | City (CD & Parks) | Summer Concert Season |
| OP15 | Stormwater curb markers and catch basin Signs | | | | | | ✓ | General city population | City (PW) | Ongoing |
| OP16 | Safety Camp | ✓ | | ✓ | | | ✓ | Youth | City (Police and Fire) | Annual |

| Code | Outreach Project | CRS Topics | | | | | | Audience | Responsibility | Timing |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | | | |
| OP17 | Fire Dept. Treasure Hunt | ✓ | | ✓ | | | ✓ | Youth | City (Fire) | Annual |
| OP18 | Watershed health education | ✓ | | | | | ✓ | General City Population, Youth | City (PW) | Annual |
| OP19 | City website Eco Rangers water education | ✓ | | | | | ✓ | General City Population, Youth, Teachers | City (PW) | Annual |
| OP20 | Teachers newsletter | ✓ | | ✓ | | | ✓ | Teachers | City (PW & CD) | Annual |
| OP21 | Community events (America's Night Out, Home Show, Farmers' Market) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | General City Population, property owners and residents in the floodplain, Neighborhood associations | City (PW & CD) | Annual |
| FR1 | Main City web page during flood event | ✓ | | ✓ | ✓ | | | All, Media | City: Public Information Officer (PIO), Emergency Management (EM) and Floodplain Mgr. (FPM) | N/A |
| FR2 | Main City web page after flood event | | ✓ | | ✓ | ✓ | | All, Media | PIO, EM & FPM | N/A |
| FR3 | Radio PSAs during flood event | ✓ | | ✓ | ✓ | | | All, Media | PIO | N/A |
| FR4 | Radio PSAs after flood event | | ✓ | | ✓ | ✓ | | All, Media | PIO | N/A |
| FR5 | Social media messages during flood event | ✓ | | ✓ | ✓ | | | All, Media | PIO | N/A |
| FR6 | Social media messages after flood event | | ✓ | | ✓ | ✓ | | All, Media | PIO | N/A |

**Table 7: Outreach Projects and Flood Response Messages**

## Implementation

In order for this plan to be effective and sustainable, it needs to be monitored and evaluated on a regular basis. The Community Development Department's Floodplain Manager / Community Rating System Coordinator will oversee the implementation and evaluation of the plan with the assistance of the Floodplain Management Planning Committee. This planning committee will meet at least once a year (and may meet more if needed), to evaluate the progress of the plan implementation and to make recommended changes as warranted. An annual evaluation report will be prepared to summarize the progress of plan implementation and to make recommendations.

| CRS Topic | Expanded Public Outreach Messages |
|---|---|
| **1. Know your flood hazard** | ***Water knows no boundaries:*** 25% of claims are located outside of the 100-year floodplain. Flooding can happen anywhere, but certain areas are especially prone to serious flooding. |
| | ***Know your flood risk:*** In a high-risk area, your home is more likely to be damaged by flood than by fire; 100-year flood event is a flood that has a 1% chance of occurring every year (not just every 100 years) |
| | ***Learn more about the flood hazard in your area:*** Contact the Community Development Department for more information at 541-917-7550. Floodplain Maps, Elevation Certificates and LOMCs are available on the City website. |
| **2. Insure your property for flood hazard** | ***Make sure you have contents coverage:*** Just a few inches of water can cause major damage to your home and its contents. |
| | ***Everyone is eligible to obtain flood insurance:*** Flood insurance is available for everyone in the City of Albany, within and outside of floodplains. The City participates in NFIP and CRS to make sure everyone can get flood insurance and at improved rates. |
| | ***Are you covered? Protect your investment:*** Most homeowners' insurance does not cover flood damage. Flood insurance will protect you from the financial devastation caused by floods. |
| **3. Protect people from the hazard** | ***Avoid flood waters.*** It is NEVER safe to swim or walk through flood waters. Moving water can move a car; imagine what it can do to you. |
| | ***Are you ready? Prepare yourself before a flood****:* Being prepared for a flood will help keep your family safe and help minimize flood damage. |
| | ***Turn Around. Don't Drown:*** More than half of the deaths from flooding each year occur in vehicles. It takes just 12 inches of rushing water to carry away a small car. |
| **4. Protect your property from the hazard** | ***Retrofitting or elevating your home could save you money:*** Retrofitting with flood vents or elevating your home could save on flood insurance. |
| | ***Don't wait: Mitigate:*** Retrofitting your home will protect your investment and reduce flood damage |
| | ***Keep flood vents and flow through area under your home open:*** *Open vents = less flood damage. Open flood vents equalize water pressure to reduce damage from floods.* |
| **5. Build responsibly** | ***Get a permit before you build:*** *For more information, contact Community Development at 541-917-7553* |
| | ***Use flood-resistant materials and proper vents:*** *Examples include "Smart Vents," Concrete, Cement Board, Metal Doors and Cabinets, etc.* |
| | ***Build high, stay dry:*** *Building above the base flood elevation is not only a requirement, but will protect your investment, facilitate financing and reduce flood insurance* |
| **6. Protect natural floodplain functions** | ***Preserve and restore native vegetation and trees to reduce flood damage.*** Find out more about the natural benefits of floodplains on the City website |
| | ***Keep It Clear, Keep It Clean:*** Keep storm drains, ditches and waterways clean from debris and pollutants to reduce damage from floods |
| | ***If you see dumping or debris in ditches, creeks or drains, contact the Public Works Department at 541-917-7600*** |

**Table 8: Expanded Outreach Messages**