The City Of Canby

Natural Hazards Mitigation Plan Addendum

Prepared for

City of Canby
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In cooperation with

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Natural Hazards Mitigation Plan Addendum

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Section 1:
Planning Process

The City of Canby Natural Hazards Mitigation Plan includes resources and information to assist city residents, public and private sector organizations, and others interested in participating in planning for natural hazards. The mitigation plan provides a list of activities that may assist the City of Canby in reducing risk and preventing loss from future natural hazard events. Canby has developed this plan as an addendum to the Multi-Jurisdictional Clackamas County Natural Hazards Mitigation Plan in an effort to take a more regional approach to planning for natural hazard scenarios.

1.1 2003 Plan Development

In 2003 the City of Canby developed an addendum to Clackamas County's Natural Hazards Mitigation Plan. The planning process was a collaborative effort between public agencies within the city, non-profit organizations, the private sector, and regional and state organizations. The Canby Emergency Management Committee (EMC) guided the plan development process. The EMC was comprised of representatives from:

- Canby Chamber of Commerce
- Canby Community Emergency Response Teams
- Canby Finance Department
- Canby Fire District No. 62
- Canby Police Department
- Canby Public Works
- Canby School District
- Canby Telephone Company
- Canby Utility Board
- Canby Waste Water Treatment Plant
- Clackamas Amateur Radio Emergency Service
- Clackamas County Emergency Management
- First Student Transportation

The Canby EMC had a regular meeting schedule to complete the planning process, and the residents of the City of Canby had an opportunity to participate in the county-wide public workshops designed to gain citizen input. The planning process is described in Appendix B of the Clackamas County Natural Hazards Mitigation Plan.

Since the adoption of the plan in October 2003, the EMC met monthly throughout 2007. Due to personnel changes the last EMC meeting was held in December 2007. The EMC reconvened in 2008 with great interest in restructuring the addendum to better mitigate Canby's risks to natural hazards.

1.2 2009 Plan Update

In the fall of 2007, the Oregon Partnership for Disaster Resilience (OPDR / the Partnership) at the University of Oregon's Community Service Center partnered with Oregon Emergency Management, Resource Assistance for Rural Environments (RARE),

Clackamas County, and cities within Clackamas County to develop a Hazard Mitigation Grant Program (HMGP) planning grant proposal. The City of Canby joined the Partnership by signing a memorandum of understanding for this project. FEMA awarded the Partnership with a grant to support the development and update of city addenda in Clackamas County, and Canby's local planning efforts began in November, 2008. RARE provided a staff person ('RARE Participant') to facilitate and document the city's addendum development process.

Who Participated in Developing the Plan?

From November, 2008 through February, 2009, Canby's Emergency Management Committee reconvened to serve as the steering committee for Canby's plan update process. The RARE Participant, in partnership with Clackamas County Emergency Management, facilitated and documented the plan update process. The EMC was comprised of the following representatives:

- Dwayne Barnes, Canby Public Works Director
- Barbara Benson, Canby Utility Executive Assistant
- Jeff Crowther, Canby Public Works Department
- Matilda Deas, Canby Community Development & Planning Department
- Carol Meeuwsen, Canby School District
- Dan Mickelsen, Canby Public Works Department
- Tom O'Connor, Canby Fire District
- Kim Scheafer, Canby City Recorder
- Jorge Tro, Canby Police Lieutenant

Plan Update Process

The RARE Participant developed and facilitated three plan update meetings with the EMC on November 24th, 2008, January 22nd, 2009, and February 26th, 2009. Minutes from each of Canby's 2008-2009 EMC plan update meetings can be found in Appendix A.

November 24, 2008: the RARE Participant met with members of the EMC to discuss the reasons and benefits of having a natural hazards mitigation plan. The RARE participant reviewed the plan update process, update requirements, and staff assistance and time requirements. The group also brainstormed potential members to add to the EMC.

January 22, 2009: the RARE Participant facilitated a meeting with the Canby EMC to discuss the plan's maintenance process and risk assessment. The group revisited the initial plan's mission & goals and discussed whether or not the coordinating body and convener remained applicable. The plan's mission & goals remain applicable to the plan's purpose, but the convener and public involvement sections needed updating. Next, the group discussed each of the natural hazards described within the plan, and reviewed and updated the city's list of community assets. Additionally, the group identified hazard 'events' that occurred between October, 2003 and January, 2009. Lastly, the EMC reviewed and updated the 2003 vulnerability assessment for each hazard.

February 26, 2009: the RARE Participant facilitated the final EMC meeting. The group discussed the final portions of Section 1: Planning Process by creating a plan

maintenance and formal review process. The EMC then reviewed the plan's mitigation actions, and discussed whether actions were completed, deleted, or deferred. For all deferred actions the RARE Participant documented any progress made and reasons for deferment. The EMC additionally developed new action items to address new vulnerabilities identified in the January 22nd risk assessment meeting.

Plan Update Changes by Section

Section 1: Planning Process

What are the Plan's Mission and Goals?

During the county's 2007 plan update process, the county goals changed slightly to include an action word in each goal statement. The City of Canby has chosen to adopt the same mission and goals as the county. As such, the city's mission and goals have been altered to reflect the slight change in the county's goals.

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

The coordinating body remains the same, but the Emergency Management Committee no longer meets at a regular time. The EMC also added representatives from the business community during the last five years. Thus, the meeting time and representative recommendations stated in the 2003 plan were removed. The convener is now a representative from Canby Police Department, not Canby Fire District No. 62. Sets of bullet points were added to describe the duties of the coordinating body and convener in more detail.

Economic Analysis of Mitigation Projects

This section was removed from the plan because this information is now detailed in Section 5.

Formal Review Process

The section was subdivided into two sections: semi-annual meetings and five year update. The EMC will now meet semi-annually, instead of annually. The plan will be formally reviewed once every five years and follow the county plan update schedule. The update process will begin one year before the plan is due, rather than giving the EMC 90 days to finish the update. The tasks stated in the formal review process remain the same, but a list of questions which will be asked during future plan meetings was added.

Continued Public Involvement

The EMC decided that holding annual public meetings would not be the best use of their resources, and instead decided to hold public meetings when deemed necessary by the EMC. The group would like to create a brochure for the public, if resources allow. All other public involvement strategies remain the same.

Section 2: Community Profile

The Community Profile was updated to reflect the most recent data available. Figure 1, "Understanding Risk" was added at the introduction to the community profile. Two tables providing data on population change and estimates were removed from the plan, as they were no longer applicable. Numerous tables were added to the community profile:

- Tables 2.2 Population by Race and 2.3 Disabled Populations were added to the "Population and Demographics" section.
- Tables 2.4 Housing Types in 2000 and 2.5 Age of Housing Structures, were added to the "Housing and Community Development" subsection.
- Table 2.6 Employment by Industry was added to the "Employment and Industry" subsection.
- Table 2.7 Transportation Used to Commute to Work was added under the "Transportation and Commuting Patterns" subsection.

Additionally, the plan now includes a sub-section that lists existing plans and policies. The purpose of this addition is to begin identifying a process by which mitigation requirements can be incorporated into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate.

Section 3: Hazard Assessment

The subsection entitled "Federal Criteria for Hazard Assessment" was removed. The EMC felt that this section did not add to the plan in any meaningful way.

The City of Canby has acquired geographic information system mapping capabilities since the plan's development in 2003. As such, the "Hazard Assessment Mapping Methodology" section was updated to reflect this new technology.

The EMC reviewed the list of community assets and marked assets outside of city limits with an asterisk (*). The group additionally removed "Red Cross Shelter" designations from community asset listings. Because shelter listings frequently change, the EMC did not want to identify shelters that no longer exist. The EMC additionally added the following community assets: Riverside School, Canby Ferry, Canby Disposal, Willamette Falls Health Center, Thelma's Place, Village on the Lochs, Canby Fairgrounds, and American Steel.

Section 4: Natural Hazards

Updated hazard sections now include documentation of hazard events that occurred between 2003 and 2009, including damages and mitigation efforts that resulted. Hazard histories did not change for wildfire, earthquake, or volcano but all other hazards have new information. New mitigation efforts were identified for all hazards except volcano. Each hazard section now includes probability and vulnerability estimates as compared to the Clackamas County Natural Hazards Mitigation Plan. Lastly, natural hazard sections now include maps, where possible.

Many of the city's 2003 mitigation strategies have not yet been implemented and are still included in the plan. For all actions that have been deferred, the EMC has made minor changes if any (i.e., changes to coordinating organization, timeline, or ideas to implementation). Each action now has a 'status of completion' description as well. One wildfire action item was completed and moved to the 'existing mitigation strategies' section. The following action items were added to the 2009 addendum: LT-MH#2, ST-FL#2, and ST-WF#1.

Eight action items were removed from the plan. One action item sought to protect known flood hazards outside of city limits. The Canby Natural Hazards Mitigation Plan only

covers areas within city limits; therefore the action item was not pertinent. Another action item called for an erosion study to be conducted on the banks of the Molalla River. The group is aware of the properties and infrastructures at risk to stream bank erosion and does not believe that a study will provide additional knowledge. Instead the group believes focusing on education outreach pieces to private property owners would be a better use of time and resources. The remaining six actions were removed because they focused on preparedness, response, and recovery. Since these actions were not focused on mitigation, the EOC decided to remove them from the natural hazards mitigation plan.

Section 5: Mitigation Planning Priority System

The mitigation planning priority system was changed to reflect the group's desire to review action items during semi-annual meetings, rather than ranking the action items at this time. The previous system required the group to rank action items when updating the addendum using hazard priority, plan goals addressed, and criticality of need, large number of population served, and likelihood of success as ranking criteria. The group determined this system was confusing and unlikely to produce an action item ranking that truly reflects the group's intentions. The new system allows the group to evaluate action items based on current conditions and resources.

1.3 Multi-Jurisdictional Planning Effort

The City of Canby is dedicated to taking a regional approach to planning for natural hazards. The City of Canby has representation on the Clackamas County Emergency Management Committee to ensure that the city's interests are represented in the larger scale planning effort. The city will partner with the county in implementation of appropriate action items, and will work with other jurisdictions to reduce losses from future natural hazards.

1.4 What is the Plan Mission?

The City of Canby concurs with the mission statement developed during the Clackamas County planning process.

The mission of the Clackamas County Natural Hazards Mitigation Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural hazards. This can be achieved by increasing public awareness, documenting the resources for risk reduction and loss-prevention, and identifying activities to guide the county towards building a safer, more sustainable community.

1.5 What are the Plan Goals?

The City of Canby concurs with the goals of Clackamas County Natural Hazards Mitigation Plan:

The plan goals describe the overall direction that Clackamas County agencies, organizations, and citizens can take to work towards mitigating risk from natural hazards. The goals are stepping-stones between the broad direction of the mission statement and the specific recommendations outlined in the action items.

Protect Life and Property

- Implement activities that assist in protecting lives by making homes, businesses, infrastructure, critical facilities, and other property more resistant to losses from natural hazards.
- Reduce losses and repetitive damages for chronic hazard events while promoting insurance coverage for catastrophic hazards.
- Improve hazard assessment information to make recommendations for discouraging new development and encouraging preventative measures for existing development in areas vulnerable to natural hazards.

Promote Public Awareness

- Develop and implement education and outreach programs to increase public awareness of the risks associated with natural hazards.
- Provide information on tools, partnership opportunities, and funding resources to assist in implementing mitigation activities.

Enhance Natural Systems

- Balance watershed planning, natural resource management, and land use planning with natural hazard mitigation to protect life, property, and the environment.
- Preserve, rehabilitate, and enhance natural systems to serve natural hazard mitigation functions.

Encourage Partnerships and Implementation

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementation.
- Encourage leadership within public and private sector organizations to prioritize and implement local, county, and regional hazard mitigation activities.

Augment Emergency Services

- Establish policy to ensure mitigation projects for critical facilities, services, and infrastructure.
- Strengthen emergency operations by increasing collaboration and coordination among public agencies, non-profit organizations, business, and industry.
- Coordinate and integrate natural hazard mitigation activities, where appropriate, with emergency operations plans and procedures.

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

The plan maintenance process includes a schedule for implementing, monitoring, evaluating, and reviewing this plan addendum. It is essential to have this process to ensure plan sustainability.

Plan Adoption

In 2003, the City of Canby adopted its addendum to the Clackamas County Multi-Jurisdictional Natural Hazards Mitigation Plan.

The Canby Natural Hazards Mitigation Plan Addendum will be updated every five years in accordance with the Disaster Mitigation Act of 2000, and in coordination with the county's plan update schedule.

The Canby City Council will be responsible for adopting future updates and revisions to the city's addendum. This governing body has the authority to promote sound public policy regarding natural hazards.

Coordinating Body

The Emergency Management Committee (EMC) will serve as the coordinating body for Canby's Natural Hazards Mitigation Plan. Roles and responsibilities of the coordinating body include:

- Serving as the local evaluation committee for funding programs such as the Pre-Disaster Mitigation Grant Program, the Hazard Mitigation Grant Program funds, and Flood Mitigation Assistance program funds;
- Prioritizing and recommending funding for natural hazard risk reduction projects;
- Encouraging stakeholders, and relevant hazard mitigation organizations and agencies to implement and/or report on implementation of the plan's identified action items;
- Evaluating and updating the Natural Hazards Mitigation Plan following a disaster;
- Evaluating and updating the Natural Hazards Mitigation Plan in accordance with the prescribed maintenance schedule; and
- Developing and coordinating ad hoc and/or standing subcommittees. The EMC will engage relevant organizations, agencies, and/or neighboring communities as technical advisers in hazard mitigation as needed.

Convener

The Canby Police Department will serve as the plan's convener. Roles and responsibilities of the convener include:

- Coordinating natural hazards mitigation plan meeting dates, times, locations, agendas, and member notification;
- Facilitating and documenting semi-annual natural hazards mitigation plan meetings;
- Assigning representatives to the coordinating body from appropriate city committees, including but not limited to the current EMC and community representatives, as needed;
- Serving as a communication conduit between the coordinating body and the public and/or key plan stakeholders;
- Identifying emergency management-related funding sources for natural hazard mitigation projects;

- Facilitating the incorporation, maintenance, and update of the city's natural hazard risk GIS data elements;
- Utilizing the risk assessments as a tool for prioritizing proposed natural hazard risk reduction projects; and
- Facilitating and documenting the plan's five-year update.

Implementation through Existing Programs

The plan is strategic and non-regulatory in nature, meaning that it does not necessarily set forth any new policy. It does, however, provide: (1) a foundation for coordination and collaboration among agencies and the public in the city; (2) identification and prioritization of future mitigation activities; and (3) aid in meeting federal planning requirements and qualifying for assistance programs. The mitigation plan works in conjunction with other city plans and programs including the Comprehensive Land Use Plan, Capital Improvements Plan, Building Codes, as well as the Clackamas County Natural Hazards Mitigation Plan, and the State of Oregon Natural Hazards Mitigation Plan. The mitigation actions described in Section 4 below are intended to be implemented through existing plans and programs within the city. Implementation opportunities are further defined in action items (see Section 4) when applicable.

Formal Review Process

Plan maintenance is a critical component of the natural hazards mitigation plan addendum. Proper maintenance of the plan ensures that this plan will maximize the city's efforts to reduce the risks posed by natural hazards. This section includes a process to ensure that regular review and update of the plan occurs. The EMC and local staff are responsible for implementing this process.

Semi-Annual Meetings

The EMC will meet on a semi-annual basis to review, implement and update information in the addendum. During the first meeting, the EMC will:

- Discuss funding opportunities for the implementation of mitigation strategies;
- Review existing action items to determine appropriateness for funding;
- Educate and train new members on the plan and mitigation in general; and
- Identify issues that may not have been identified when the plan was developed.

During the second meeting of the year, the EMC will:

- Review existing and new risk assessment data, and incorporate this information into the plan;
- Document success in implementing mitigation actions and/or applying for funding;
- Discuss the addition and/or subtraction of mitigation actions from the plan;
- Discuss methods for continued public involvement;
- Document successes and lessons learned during the year; and
- Generate a list of members that should be included in future meetings.

The Canby Police Department will be responsible for organizing, facilitating, and documenting the outcomes of semi-annual meetings.

Five-Year Review of Plan

Local mitigation plans must be updated and resubmitted to the Federal Emergency Management Agency (FEMA) for approval every five years in order to maintain eligibility for federal hazard mitigation assistance programs. Plan updates must demonstrate that progress has been made in the past five years for local mitigation plans to fulfill commitments outlined in the previously approved plan.

This plan will be updated every five years in accordance with the Disaster Mitigation Act of 2000. Because this is an addendum to the Clackamas County Natural Hazards Mitigation Plan, the addendum must be updated in conjunction with the county's five-year plan update schedule. As such, Canby must update this addendum by September 2012 (and then again five years thereafter). Sufficient time should be allotted for plan update activities and FEMA review, meaning the city should begin the plan update process by September 2011. Additional time will be needed if the city intends to pursue application for mitigation planning grants, and/or contracting for technical or professional services.

During the five-year plan update process, the city must review and revise its plan to reflect changes in development, progress in mitigation efforts, and changes in priorities. The following questions should help the EMC in determining how the mitigation plan should be updated (i.e., questions must be addressed in the plan update):

- Have public involvement activities taken place since the plan was adopted?
- Are the plan goals still relevant?
- Is mitigation being implemented through existing planning mechanisms (such as comprehensive plans, or capital improvement plans)?
- Are there new hazards that should be addressed?
- Have there been hazard events in the community since the plan was adopted?
- Have new studies or previous events identified changes in any hazard's location or extent?
- Has vulnerability to any hazard changed?
- Have development patterns changed? Is there more development in hazard prone areas?
- Do future annexations include hazard prone areas?
- Did the plan identify the number and type of existing and future buildings, infrastructure, and critical facilities in hazards areas?
- Are there new high risk populations?
- Did the plan document and/or address National Flood Insurance Program repetitive loss properties?
- Is there an action dealing with continued compliance with the National Flood Insurance Program?
- Did the plan identify data limitations?
- Did the plan identify potential dollar losses for vulnerable structures?
- What is the status of each mitigation action?
- Are there completed mitigation actions that have decreased overall vulnerability?
- Are there new actions that should be added?

- Are changes to the action item prioritization, implementation, and/or administration processes needed?
- Do changes need to be made within the five year update schedule?

The Canby Police Department will be responsible for organizing the EMC to address plan update needs. The EMC will be responsible for updating any deficiencies found in the plan, and for ultimately meeting the Disaster Mitigation Act of 2000's plan update requirements.

Continued Public Involvement & Participation

The City of Canby is dedicated to involving the public in the review and ongoing development of the Natural Hazards Mitigation Plan. During the addendum development process, OPDR's website (www.OregonShowcase.org) served as an outreach tool to the community. OPDR's website was used to provide local contact information and updates on the planning process. Additionally, drafts of Canby's addendum were posted on OPDR's website to facilitate EMC review. Once the EMC created a final draft of the addendum, the EMC posted a press release on the city's website to ask for public comment on the addendum (see press release language below). For two weeks, the public was able to review a draft of the plan that was posted on the city's website. The EMC asked the public to review and provide comments to the city for incorporation into the final addendum. No comments were received.

> *The Emergency Management Committee has created a final draft of the Natural Hazards Mitigation Plan Addendum. A copy of this document can be found on the City's website at www.ci.canby.or.us. Comments regarding this document should be directed to Acting Police Chief Jorge Tro at troj@ci.canby.or.us. The last day public comments will be accepted is July 13, 2009.*

The City of Canby will ensure continued public input and involvement over the next five years. The public will have the opportunity to provide feedback about the plan though a variety of forums. Copies of the plan will be catalogued and kept at City Hall, the planning department, the police department, the chamber of commerce, the public library and the fire station. In addition, the plan and any proposed changes will be posted on the city website. This site will also contain an email address and phone number to which people can direct their comments and concerns. If resources become available, the EMC will create a brochure to advertise and describe the plan to the public. Additionally, the final adopted and approved plan will be posted on the University of Oregon's Scholar's Bank Digital Archive and Clackamas County Emergency Management website.

A public meeting will also be held when deemed necessary by the EMC, such as after a natural disaster. The meetings will provide the public a forum for which they can express concerns, opinions, or ideas about the plan. The EMC will be responsible for advertising the public meetings and maintaining public involvement through the webpage, and the Canby Herald Newspaper.

1.7 What are the Mitigation Strategies Identified by the City of Canby?

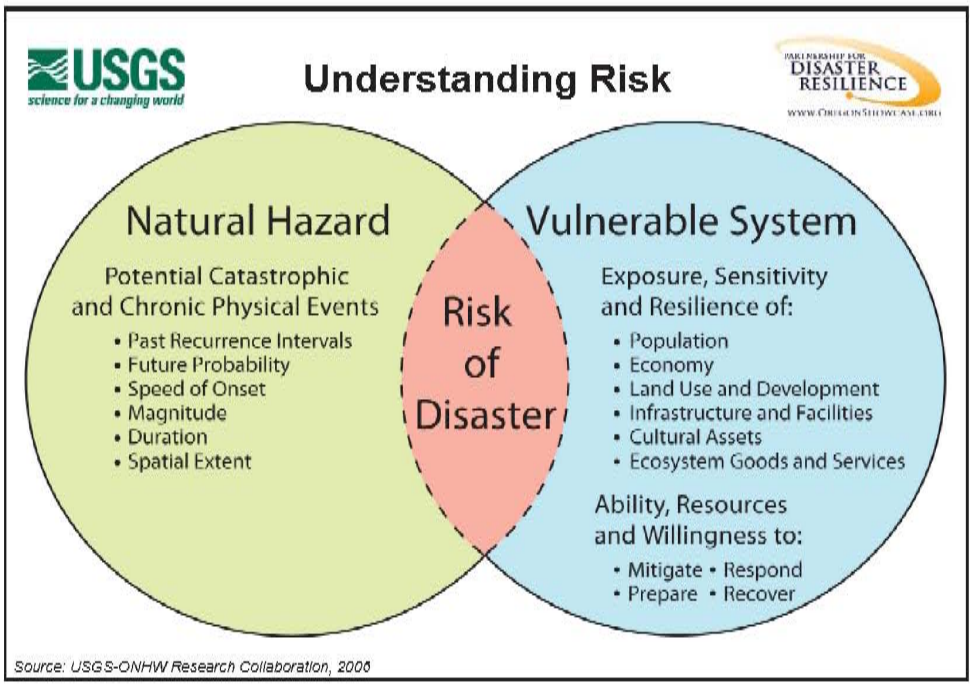
The *action items* are a listing of activities in which county agencies and citizens can be engaged to reduce risk. Each action item includes an estimate of the timeline for implementation. *Short-term action items (ST)* are activities that county agencies may implement with existing resources and authorities within one to two years. *Long-term action items (LT)* may require new or additional resources or authorities, and may take between one and five years to implement. The action items are organized within the following matrix, which lists all of the multi-hazard and hazard-specific action items included in the mitigation plan.

Action Item	Action Item Title	Coordinating Organization	Timeline	Alignment with Plan Goals				
				Protect Life and Property	Promote Public Awareness	Enhance Natural Systems	Encourage Partnerships and Implementation	Augment Emergency Services
ST Flood #1	Evaluate and upgrade surface water management infrastructure and identify appropriate mitigation strategies.	Public Works	Short Term Ongoing	X		X	X	X
ST-Flood #2	Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.	Planning and Building Departments	Short Term Ongoing	X	X	X	X	X
LT-Flood #1	Identify mitigation strategies to address flooding issues in the bottom lands.	Canby Utility	Long Term 3-5 years	X	X	X		X
LT Landslide #1	Reduce the vulnerability of property owners in landslide-prone areas.	Planning and Building Departments	Long Term 3-5 years	X	X	X	X	X
ST Wildfire #1	Promote fire-resistant strategies for new and existing developments	Fire District and City Planning	Short Term Ongoing	X	X	X	X	X
LT Severe Storm #1	Obtain funding to bury power lines subject to frequent failures to reduce power outages from the windstorm and sever winter storm hazard, where possible.	Canby Utility	Long Term Ongoing	X			X	X
LT Earthquake #1	Conduct seismic evaluations and upgrades on identified critical/essential facilities and infrastructure for implementing appropriate structural and non-structural mitigation strategies.	Emergency Management Committee	Long Term 3-5 years	X	X		X	X
ST Multi Hazard #1	Update and revise the Canby Emergency Operations Plan.	Canby Fire District/City of Canby	Short Term 1-2 years	X		X		X
ST Multi Hazard #2	Ensure there are adequate shelter facilities in hazard-free zones to serve Canby residents. Identify potential shelter sites and evaluate their relative structural risks/structural deficiencies. Seek funding for upgrades on shelter sites if needed.	Emergency Management Committee	Short Term Ongoing	X	X		X	X
ST Multi Hazard #3	Develop, enhance, and implement education programs designed to reduce the losses from natural hazards.	Emergency Management Committee	Short Term Ongoing	X	X		X	X
ST Multi Hazard #4	Integrate the goals and action items from the Canby Natural Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate.	Emergency Management Committee	Short Term Ongoing	X	X		X	
LT Multi Hazard #1	Improve the hazard assessment in the Canby Natural Hazards Mitigation Plan.	Emergency Management Committee	Long Term Ongoing	X	X	X	X	
LT Multi Hazard #2	Identify and pursue finding opportunities to develop and implement hazard mitigation activities.	Emergency Management Committee	Long Term Ongoing	X				X

Section 2:
Community Profile

The following section describes the City of Canby from a number of perspectives in order to help define and understand the city's sensitivity and resilience to natural hazards. Sensitivity factors can be defined as those community assets and characteristics that may be impacted by natural hazards, (e.g., special populations, economic factors, and historic and cultural resources). Community resilience factors can be defined as the community's ability to manage risk and adapt to hazard event impacts (e.g., governmental structure, agency missions and directives, and plans, policies, and programs). The information in this section represents a snapshot in time of the current sensitivity and resilience factors in the city when the plan was developed. The information documented below, along with the hazard assessments located in Section 3: Hazard Assessment should be used as the local level rationale for the city's mitigation strategies. The identification of actions that reduce the city's sensitivity and increase its resilience assist in reducing overall risk, or the area of overlap in Figure 1 below.

Figure 1 Understanding Risk[i]



2.1 Geography and the Environment

The City of Canby encompasses 2,413 acres in the Willamette Valley. The Valley is nestled between the Coast and Cascade Mountain Ranges and varies from 20 to 40 miles wide and 130 miles long extending from Eugene-Springfield in the south to Portland in the north. The Canby area is bordered to the west and south by the Molalla River and to the north by the Willamette River. The confluence of the Molalla River and Willamette River occurs just north of the city.

The City of Canby is located on a relatively flat terrain and, with few exceptions, only gentle changes in the topography of less than 30 feet occur within the city limits and Urban Growth Boundary (between 140 to 170 feet above mean sea level). The southwest portion of the city drops abruptly at the Molalla River to an elevation of approximately 80 feet. This is very evident when approaching the city from the west on Knights Bridge Road or Highway 99 E and from the south across Goods Bridge on Ivy Street. This drop along the Molalla River establishes a natural boundary for the area.

At the northern border of the Urban Growth Boundary, the topography gradually changes. This area slopes to the Willamette River, dropping from an elevation of approximately 130 feet to 100 feet at the city's wastewater treatment facility. To the east of Canby, the topography changes very little until beyond the urban growth boundary, where the ground has undulating gentle hills in the southeastern areas and steep rocky cliffs in the northeastern areas along the Willamette River.

The City of Canby lies in the heart of very productive agricultural lands, and has used drywells to manage storm water runoff generated from agriculture and development. When dry wells are ineffective, storm water is permitted to drain to surface water drainage ways or is collected and conveyed to the adjacent Molalla and Willamette Rivers.

Major Rivers

Willamette River

The Willamette River is the major waterway in the Willamette Valley, and it drains a total of 11,500 square miles. The Willamette provides significant recreational opportunities, serves as a major transportation link, provides water for agricultural, municipal and industrial uses and provides habitat for significant wildlife populations. The Canby Ferry provides transportation across the Willamette, and is one of three ferries still in operation on the Willamette River.

Molalla River

The Molalla River watershed area is 344 square miles and is located within Clackamas County, Oregon. Its headwaters start southwest of Mt. Hood and its North Fork tributary begins 0.6 miles southeast of Cougar Lake.

The floodplains of the Molalla River provide an important habitat for waterfowl, wading birds, deer, small mammals, reptiles and amphibians. Today, logging and recreational uses are the primary activities in the upper reaches of the Molalla River. All of Canby's drinking water originally comes from the Molalla River.

Climate and Precipitation

The climate in the Canby area is temperate. Summers are warm with daily temperatures averaging from 70^{o}F to 75^{o}F with occasional hot days where the temperature exceeds 100^{o}F. Winters are cool with average daily temperatures of about 40^{o}F. Freezing temperatures occur periodically throughout the winter with lows in the teens.

Due to the temperate climate, snowfall is rare, but can occur annually. Accumulations from 1 to 4 inches of snow have been recorded during December and January. Unofficially, accumulations of as much as 12 inches of snow have been reported in the Canby area for short periods.

Normal rainfall, as recorded at the North Willamette Experimental Station for the period from 1961 through 1990, averages 41 inches per year. The driest months of the year are July and August with normal precipitation of less than 1 inch per month. During these two months, several weeks may pass without precipitation. Frequent rain showers occur during the wettest months: November, December, and January. During these months rainfall normally exceeds 6 inches per month.

Minerals and Soils

The United States Department of Agriculture Soil Conservation Service (SCS) information was used in identifying soil types in Canby. The classifications of each soil type indicate the effects the soil features will have on the infiltration and drainage of storm water in the Canby area.

The predominant soil, Canderly Sandy Loam, consists of deep and somewhat excessively drained soils on terraces with depths of 60 inches or more. These soils have moderately rapid permeability of 2.0 to 6.0 inches per hour and have an available water capacity of about 5.5 to 7.0 inches. Runoff from this series is slow and the hazard of water erosion is slight.

Latourell Loam Series are also present here and are deep, well drained soils with a moderate permeability similar to that of the Canderly soils. Latourell soils have greater water availability than that of the Canderly series with a range of about 8 to 12 inches. Runoff from this series is also slow and the hazard of water erosion is again slight. Depth to ground water is generally greater than 60 inches.

Only two small inclusions of Amity Silt Loam are present in the Canby area. These are somewhat poorly drained soils, having a moderately slow permeability of 0.6 to 2.0 inches per hour in the upper layer declining to 0.2 to 0.6 inches per hour in the lower. This soil can extend to a depth of 60 inches or more. The Depth to Water Table is from 6 to 18 inches in the winter and spring.

The McBee Silt Clay Loam is only present in one isolated location Northeast of Canby. This is a deep moderately well drained soil having a moderate permeability of 0.6 to 2.0 inches per hour. Runoff is slow and the hazard from erosion is slight. However, the water table is generally at a depth of 24 to 36 inches in the winter and early spring, and the soils are located in areas subject to occasional but brief periods of flooding in the winter.

Other Significant Geologic Features

Continued erosion by Willamette Valley river systems, as well as earth-shaking earthquakes and weathering of the area through geologic time has carved the Willamette Valley into the shape it is today. In the Canby area, this has resulted in a terrace overlooking the Willamette and Molalla Rivers. The significant geologic features in the Canby areas are described in the Clackamas County Natural Hazard Mitigation Plan.

2.2 Population and Demographics

As shown in Table 2.1 below, Canby's population grew at a rapid pace between 1970 and 1980, far more rapidly than either Clackamas County, or the State of Oregon overall. Canby's rapid population growth slowed significantly between 1980 and 1990 (to approximately the same rate Clackamas County was experiencing). Canby's growth is still increasing at a fast pace, with growth rates continuing to be significantly higher than Clackamas County and the State of Oregon. Table 2.2 shows the estimated population growth between the 2000 Census and 2008.

Table 2.1 Population Change from 1970 to 2008

Year	Canby	Percent Change	Clackamas County	Percent Change	Oregon	Percent Change
1970	3,818		166,088		2,091,533	
1980	7,659	101.0%	241,919	45.70%	2,633,105	25.9%
1990	8,983	17.3%	278,850	15.30%	2,842,321	7.9%
2000	12,790	42.4%	338,391	21.30%	3,421,399	20.4%
2008 estimate	15,165	18.6%	376,660	11.30%	3,791,075	10.8%

Source: Portland State University Population Research Center

Table 2.2 Population Change Estimates from 2000 to 2008

Year	Population Estimates	Percent Change
2000	12,790	
2001	12,790	0.00%
2002	13,440	5.10%
2003	13,910	3.50%
2004	14,110	1.40%
2005	14,385	1.90%
2006	14,705	2.20%
2007	15,140	3.00%
2008	15,165	0.20%

Source: Portland State University Population Research Center

Disaster impacts in terms of loss and the ability to recover vary among population groups following a disaster. Historically, 80% of the disaster burden falls on the public. Of this number, a disproportionate burden is placed upon special needs groups, particularly children, the elderly, the disabled, minorities, and low income persons. Portions of Canby's residents fall into these special needs populations. According to the 2000 Census, approximately 7.4% of Canby's population had an income below the poverty level. The 2008 estimated household income for Canby is $63,244, with a median household income of $52,507.[ii] More information on the city's special needs populations are shown in Tables 2.3 and 2.4.

Table 2.3 Population by Race in 2000

Race	Number	Percent
White	10,453	80.70%
Hispanic or Latino	2,069	16%
Two or more races	225	1.70%
Asian	138	1%
American Indian or Alaska Native	37	0.30%
Black	19	0.10%
Native Hawaiian and other Pacific Islander	7	0.05%

Source: US Census, 2000

Table 2.4 Disabled Population in 2000

Age	Number of People
5 to 15	262
16 to 64	2,520
65 and older	1,214
Total	3,996
Percent of Population	31.2%

Source: US Census, 2000

2.3 Land and Development

Canby's planning and building departments enforce building and zoning codes to promote public safety and preserve the quality of life. Canby is predominately residential, with a variety of other land uses interspersed.

According to the Canby School District Enrollment Projection Update, Canby will be indirectly affected by decisions made by Metro, the planning authority for the Portland metropolitan region. While Canby lies outside of Metro's Urban Growth Boundary and is beyond its jurisdiction, the city will nonetheless be affected by Metro's boundary decisions. If little or no adjustment is made to the Portland Metropolitan UGB, land values within the boundary are likely to appreciate more rapidly over time. Canby, with its available land and proximity to the Portland metropolitan area, may over time become even more attractive to developers and prospective homeowners.

Canby has developed a comprehensive plan for its industrial growth. The Canby Industrial Park has been developed with water, electricity, natural gas, sewer, communications and road access. Within the city limits, 154 acres have been designated for light industrial use and 25 acres for heavy industrial use. Within Canby's urban growth boundary, another 240 acres is designated for light industry and 70 acres for heavy industry. Total figures are 394 acres for light industrial use and 94 for heavy industrial.

2.4 Housing and Community Development

Housing type and age are important factors in mitigation planning. Certain housing types tend to be less disaster resistant and warrant special attention: mobile homes, for example, are generally more prone to wind and water damage than standard stick-built homes. Generally the older the home is, the greater the risk of damage from natural disasters. This is because stricter building codes have been developed following

improved scientific understanding of plate tectonics and earthquake risk. For example, structures built after the late 1960s in the Northwest and California use earthquake resistant designs and construction techniques. In addition, FEMA began assisting communities with floodplain mapping during the 1970s, and communities developed ordinances that required homes in the floodplain to be elevated to one foot above Base Flood Elevation.

As of 2000, Canby had 4,790 housing units of which 4,500 were occupied and 290 were vacant. Of these housing units 67%, are owner-occupied and 33%, are renter occupied. The median year housing structures were built is 1978, meaning a good portion of the city's housing stock was built before stricter seismic and floodplain building codes were put in place. The median value of an owner-occupied home in 2000 was $168,900.

Table 2.4 Housing Types in 2000

Units in structure	Number	Percent
Single family home	3,379	70.50%
Multi family	1,146	23.90%
Mobile Home	265	0.60%

Source: US Census, 2000

Table 2.5 Age of Housing Structures

Year structure built	Number of Structures	Percent of Structures
1990 to 1999	1,528	31.9%
1980 to 1989	587	12.2%
1970 to 1979	1,363	28.5%
1960 to 1969	628	13.1%
1950 to 1959	208	0.4%
1940 to 1949	181	0.4%
1939 and earlier	295	0.6%
Median	1978	

Source: US Census, 2000

Canby's landscape and population is changing rapidly, and its parks and recreation system has been attempting to respond to these changes. Canby is quickly leaving its agricultural roots behind and becoming more similar to its metropolitan neighbors to the north in terms of affluence, ethnic diversity and growth rate. Some of the major socioeconomic and land use trends affecting the future provision of park and recreation services in Canby are as follows: [iii]

- Canby is experiencing population growth at a significantly higher rate than the statewide average. By the year 2020, the city's coordinated population projection indicates Canby will have 21,000 residents, resulting in a 64 percent increase from 2000. This influx of residents will increasingly strain Canby's ability to provide quality parks and recreation facilities.
- Single and multi-family housing is being developed at a rapid pace, especially on the fringes of the urbanized area. Portland's land use policies could increase the demand for additional housing in and around Canby in the future as people look for homes in less dense urban areas.

- The residents least served by park and recreation facilities live in Canby's far northwest, northeast, and south neighborhoods.
- Canby's population is aging, following statewide and nationwide trends. Many sections of Canby's population area are growing, especially those in the 5 to 17, 45 to 54, and 55 to 64 year old age brackets. People between 45 and 64 years old continue to be one of the fastest growing segments of the population. Because there is a correlation between age and mobility limitations, meeting the needs of mobility-limited residents, as they age, will become increasingly important.
- The number of children in Canby is also increasing as the population increases. Birth rates are rising and families are moving to Canby with young children. There will be an increase in elementary and high school enrollment levels in the near future, which will increase the need for parks and recreation facilities and programs for youths.
- Canby is growing more ethnically diverse. The Hispanic population is the largest and fastest growing minority population in Canby. Because of this growth, understanding and meeting the parks and recreation needs of minority residents is becoming increasingly urgent.

2.5 Employment and Industry

Canby is an excellent area for local and commercial businesses. The City of Canby is relatively self-sufficient regarding public utilities. Canby Telcom provides technologically advanced telecommunications services. Canby operates its own electric and water service (uncommon in Oregon), enabling lower utility rates as compared to other Oregon cities. The business district includes a thriving downtown core as well as flourishing businesses along Highway 99E. A broad spectrum of products, services and specialty stores meet the shopping and business needs within the community.

The Canby area has a multitude of attractions tied to the bountiful nursery industry, which attract thousands of visitors annually. Many festivals and special events are organized by these enterprises. In Clackamas County, 75 percent of the nursery acreage is in the vicinity of Canby.

Canby citizens work in a variety of industries, with 'educational, health and social services' being the largest industry. Table 2.6 provides more information on Canby's employment.

Table 2.6 Employment by Industry in 2000

Industry	Male	Female	Totals
Educational, health and social services	164	958	1,122
Manufacturing	710	206	916
Retail Sale	477	349	826
Professional, scientific, management, administrative, and waste management services	315	234	549
Finance, insurance, real estate and rental and leasing	255	230	485
Construction	424	55	479
Arts, entertainment, recreation, accommodation and food services	124	217	341
Other services	166	170	336
Wholesale Trade	263	61	324
Transportation and warehousing, and utilities	215	62	277
Agriculture, forestry, fishing, and hunting, and mining	148	43	191
Public administration	104	82	186
Information	44	119	163

Source: US Census, 2000

Table 2.7 below shows the total number of employed residents located in the 97013 Zip Code for 2005. The largest employment sector was agriculture with 1,165 employees in the area. Manufacturing and retail constitute the second and third largest employers. In total, the Canby Zip Code has 6,761 employees representing 710 establishments. Table 2.8 displays the six largest employers in Canby for 2008.

Table 2.7 Employees Working in Zip Code 97013 in 2005

Industry Sector	Establishments	Average 2005 Employment
Total Private	672	6,016
Agriculture, Forestry, Fishing & Hunting	53	1,165
Manufacturing	56	962
Retail Trade	71	864
Construction	109	721
Accommodation and Food Services	38	368
Health Care and Social Assistance	43	358
Wholesale Trade	36	274
Transportation and Warehousing	17	197
Information	12	159
Finance and Insurance	36	124
Administrative and Waste Services	30	116
Professional and Technical Services	46	108
Arts, Entertainment, and Recreation	11	107
Real Estate and Rental and Leasing	31	81
Other Services, Ex. Public Admin	74	377
Confidential	9	39
Total Public	29	745
Total	**701**	**6,761**

Source: Oregon Employment Department

Table 2.8 Largest Employers in Canby in 2008

Business	Number of Employees
Johnson Controls Battery Group, Inc	245
Kendal Floral	119
S R Smith, LLC	105
Northwest Machine Works, Inc	100
American Steel	85
JV Northwest, Inc	85

Source: City of Canby Economic Development

2.6 Transportation and Commuting Patterns

Transportation is an important consideration when planning for emergency service provisions. Growth within the city will put pressure on both major and minor roads, especially if the main mode of travel is by single occupancy vehicles. How people travel to work is indicative of the prevalence of single occupancy vehicle travel, and can help predict the amount of traffic congestion and the potential for accidents. Table 2.9 shows the different methods city residents use to travel to work.

Table 2.9 Transportation Used to Commute to Work

Means of transportation	Number	Percent
Drive Alone	4,653	76.60%
Carpool	774	12.70%
Work at Home	300	4.90%
Walk	198	3.30%
Other	58	0.90%
Public Transit	54	0.80%
Bicycle	40	0.70%

Source: US Census 2000

The Union Pacific rail line, which divides Canby by separating the North side from the South, passes through Canby 24 times a day. In addition, more than 8 different commercial truck lines serve the motor freight needs of business and industry in Canby. Intrastate freight rates for truckers are regulated by the Oregon Public Utility Commission, which considers Canby to be within Portland's local cartage zone. This results in lower rates for shipments to and from Portland.

The Portland International Airport meets the national and international transportation needs of Canby area residents and businesses, and is about 45 minutes from Canby. Aurora State Airport is located 5 miles west of Canby. The Mulino Airport lies approximately 8 miles southeast of Canby.

Canby Area Transit (CAT) is a local transit service that provides shuttle transportation to scheduled route locations within Canby. This transit service also provides frequent shuttle service to area businesses and neighborhoods.

The Canby Ferry, one of three ferries still in operation on the Willamette River, can transport nine vehicles per trip across the Willamette River to Wilsonville. This ferry is a unique tourist attraction in Canby.

The City of Canby is accessible from the Interstate 5 corridor and Interstate 205 via State Highway 99E. The transportation system provides direct connections to the surrounding communities of Oregon City, Woodburn and Salem as well as the greater Portland metropolitan area. Commuter traffic volumes are very high: 1999 Average Daily Traffic (ADT) figures indicate 18,400 vehicles on Highway 99E at the eastern Canby city limits and 25,700 vehicles on Highway 99E at western city limits at the Molalla River.

2.7 Existing Plans and Policies

Communities often have existing plans and policies that guide and influence land use, land development, and population growth. Such existing plans and policies can include comprehensive plans, zoning ordinances, and technical reports or studies. Plans and policies already in existence have support from local residents, businesses and policy makers. Many land-use, comprehensive, and strategic plans get updated regularly, and can adapt easily to changing conditions and needs.

The City of Canby's Natural Hazards Mitigation Plan Addendum includes a range of recommended action items that, when implemented, will reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the city's existing plans and policies. Linking existing plans and policies to the Natural Hazards Mitigation Plan helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the plan's action items through existing plans and policies increases their likelihood of being supported and getting updated, and maximizes the city's resources. The following list documents the plans and policies already in place in Canby:

Plan: Canby Municipal Code
Date of Last Revision: October 15, 2008
Author/Owner: City of Canby
Description: The purpose of the Municipal Code is to set rules and regulations on construction and activities within the city.
Relation to Natural Hazard Mitigation:

- Title 8 Health and Safety, Chapter 8.12.090 Surface Waters and Drainage: Ensures water on private property drains correctly.
- Title 12 Streets, Sidewalks, and Public Places, Chapter 12.32 Tree Regulations: Ensures trees are cared for and trimmed properly and timely.
- Title 12 Streets, Sidewalks, and Public Places, Chapter 12.36 Telecommunications Facilities: Requires new facilities to be undergrounded
- Title 13 Public Services, Chapter 13.16 Sewer Use: Sets discharge standards to reduce the chance of sewer back ups.
- Title 15 Building and Construction, Chapter 15.12 Flood Hazard Protection: The purpose of this chapter is to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions.
- Title 15 Building and Construction, Chapter 15.20 Erosion Control: This chapter provides requirements for development and construction related activities in order to control the creation of sediment and to prevent the occurrence of erosion.
- Title 16 Planning and Zoning, Chapter 16.37 Riparian Overlay Zone: The Riparian Overlay Zone is intended to be used in conjunction with the city's underlying base zones to assure future development of the site will provide ample protection for riparian areas.
- Title 16 Planning and Zoning, Chapter 16.39 Wetlands Overlay Zone: This overlay zone is intended to be used in conjunction with they city's underlying base zones to assure future development will provide ample protection for locally significant wetlands.
- Title 16 Planning and Zoning, Chapter 16.40 Hazard Overlay Zone: This overlay zone is intended to be used in conjunction with the city's underlying base zones to assure the development of the site will not result in an unacceptable level of risk because of hazardous conditions.

Plan: Canby Comprehensive Plan
Date of Last Revision: January, 2007
Author/Owner: City of Canby
Description: The purpose of the Comprehensive Plan is to establish broad city goals and specific policies which will realize or achieve those goals. The policies are intended to

provide sufficient guidance for evaluating a wide variety of proposed actions, and for making daily decisions about matters covered by the plan.
Relation to Natural Hazard Mitigation:

- Land Use Element: Buildable Lands
  - Policy No. 4: Canby shall limit development in areas identified as having an unacceptable level of risk because of natural hazards.
- Environmental Concerns Element
  - Policy No. 1-H: Canby shall restrict urbanization in areas of identified steep slopes
  - Police No. 2-H: Canby shall continue to participate in and shall actively support the federal flood insurance program.
  - Policy No. 3-H: Canby shall seek to inform property owners and builders of the potential risks associated with construction in areas of expansive soils, high water tables, and shallow topsoil.

Plan: Canby Public Facilities Plan
Date of Last Revision: 2006
Author/Owner: City of Canby
Description: A public facility plan, as defined in OAR 660-11-0005 (1), is "a support document or documents to a comprehensive plan. The facility plan describes the water, sewer and transportation facilities which are to support the land uses designated in the appropriate acknowledged comprehensive plans within an urban growth boundary containing a population greater than 2,500. Certain elements of the public facility plan also shall be adopted as part of the comprehensive plan, as specified in OAR 660-11-045."
Relation to Natural Hazard Mitigation: Mitigation actions that relate to public facilities upgrades should be aligned with the measures and policies found in the Public Facilities Plan.

Plan: Canby Parks Master Plan
Date of Last Revision: 2002
Author/Owner: City of Canby
Description: The five goals for park, recreation and open space are ... preserve remaining valuable areas such as wetlands, riparian habitat, and other valuable natural areas for educational, recreational, cultural and scientific uses; secure and promote the development of properties and facilities for present and future recreational needs; improve and promote diversification of recreational programs and facilities; promote and enhance natural beauty and wholesome recreational activities; and provide recreational properties and facilities which are safe, clean, and well-maintained.
Relation to Natural Hazard Mitigation: Mitigation actions that relate to Canby parks should be consistent with goals and policies stated in the Parks Master Plan.

Plan: Canby Transportation System Plan
Date of Last Revision: 2000
Author/Owner: City of Canby
Description: In accordance with the Transportation Planning Rule (TPR), OAR 660 Division 12, a comprehensive analysis of the transportation system within the City of Canby has been prepared. Included is an analysis of existing conditions, identification of

short-term and long-term transportation system improvements, a transportation system plan, a transportation finance plan, and a description of the transportation system plan's compliance with the Transportation Planning rule.

Relation to Natural Hazard Mitigation: Mitigation actions relating to improving transportation facilities should be linked with goals and policies found in the transportation system plan.

Section 3:
Hazard Assessment

3.1 Definition of a Hazard Assessment

Conducting a hazard 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. Hazard assessments are subject to the availability of hazard-specific data. The three levels of a hazard 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 hazard identification data. The City of Canby identified six major hazards that consistently affect this geographic area. These hazards – floods, landslides, wildfires, earthquakes, severe storms: wind and winter, and volcanoes – were identified through an extensive process that utilized input from the EMC. The geographic extent of each of the hazards has been identified by the City of Canby EMC using the best available data and local knowledge.

2) ***Vulnerability Assessment/Inventorying Assets*** combines hazard identification with an inventory of the existing (or planned) property and population exposed to a hazard. A detailed description of the vulnerability of these assets is located in the specific hazard sections.

3) ***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 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. Unfortunately, there is insufficient data for conducting a risk analysis for the natural hazards affecting the incorporated municipality. However, this need is identified in the action plan, and a complete risk assessment will be conducted when resources are available.

3.2 Hazard Assessment Mapping Methodology

The information used to identify the hazards was derived from digital databases on Canby's Geographic Information System (GIS). Canby obtains its data from Clackamas County, Metro, the Department of Geology and Mineral Industries (DOGAMI), and the Federal Emergency Management Agency (FEMA) and Canby produces some data in-house as well. To estimate the value of acres affected by flood and landslide hazards, the city's tax lot data was intersected with the hazard layers.

3.3 Community Assets: Vulnerability Assessment

This section outlines the resources, facilities and infrastructure that, if damaged, could significantly impact public safety, economic conditions, and the environmental integrity of the City of Canby. The starred items are not located within city limits, but Canby's emergency services will respond to these areas in some situations. The city will try to coordinate efforts with other agencies for assets located outside city limits, but they will not be considered for any mitigation activities because they are not within the city's jurisdictional boundaries. Community assets were defined as follows:

Critical Facilities: Those facilities and infrastructure necessary for emergency response efforts.

- Fire Station 62 (EOC #1)
- City of Canby Public Works Building (EOC#2)
- Canby Police Department
- Telephone Central Station
- Water Treatment Facilities (including reservoirs, intake structures and raw water pump houses)
- Canby City Hall Complex
- Canby Area Transit (CAT) and City of Canby Finance Building
- 3 Power Substations
- Canby Utility
- Waste Water Treatment Facilities

* Fire Station 65 (EOC #3)

Essential Facilities: Those facilities and infrastructure that supplement response efforts.

- Canby High School
- Trost Middle School
- Canby Christian Church
- Canby Adult Center
- United Methodist Church
- Medical Clinics
- Clackamas County Event Center
- First Student Transportation

* Riverside School

Critical Infrastructure: Infrastructure that provides services for the City of Canby.

- Telephone Lines
- Gas Lines
- Power Lines
- Transportation Networks
- Bridges
- Railroads
- Water Treatment, Storage and Distribution Lines
- Wastewater Collection
- NW Natural Pipeline Data
- Pacific Pride Storage Tanks

- Communication Towers
- Canby Disposal
* Canby Ferry

Vulnerable Populations: Populations that have special needs or require special consideration.

- Mobile Home Parks
- Village on the Lochs
- Canby Adult Center
- Hope Village
- Rackleff House
- Adult Foster Homes
- Countryside Living
- Canby City Schools
- Willamette Falls Health Center
- Thelma's Place
* Riverside RV Park

Cultural or Historical Assets: These assets include those facilities that augment or help define community character, and if lost would represent a significant loss for the community.

- Clackamas County Fairgrounds
- Fine Arts Center
- Canby Depot Museum
- Canby Chapel
* Barlow House
* Canby Ferry
* Macksburg Church
* Three Rivers Farm
* Riverside School

Economic Assets/ Population Centers: Economic Centers are those businesses that employ large numbers of people, and provide an economic resource to the City of Canby. If damaged, the loss of these economic centers could significantly affect economic stability and prosperity. ***Population Centers*** usually are aligned with economic centers, and will be of particular concern for evacuation/notification during a hazard event.

- Johnson Controls
- Shimadzu
- JV Northwest
- Fred Meyer
- Safeway
- Thriftway
- SR Smith
- Sprague Controls
- Potter Industries
- Willamette Plastics
- American Steel
- Wilson Construction (transient)

- Post Office
- All multi-family dwelling structures
- Canby Grove
- Redwood Terrace Apartments
- Pioneer Industrial Park
- First Student Transportation
- Churches
- Canby City Schools

* Pat's Acres Race Track

* Canby Fairgrounds

Environmental Assets: Environmental assets are those parks, green spaces, wetlands, and rivers that provide an aesthetic and functional service for the community.

- Canby City Parks
- Canby Utility Bottom Lands
- Willow Creek

* Molalla River State Park

Hazardous Materials: Those sites that store, manufacture, or use potentially hazardous materials.

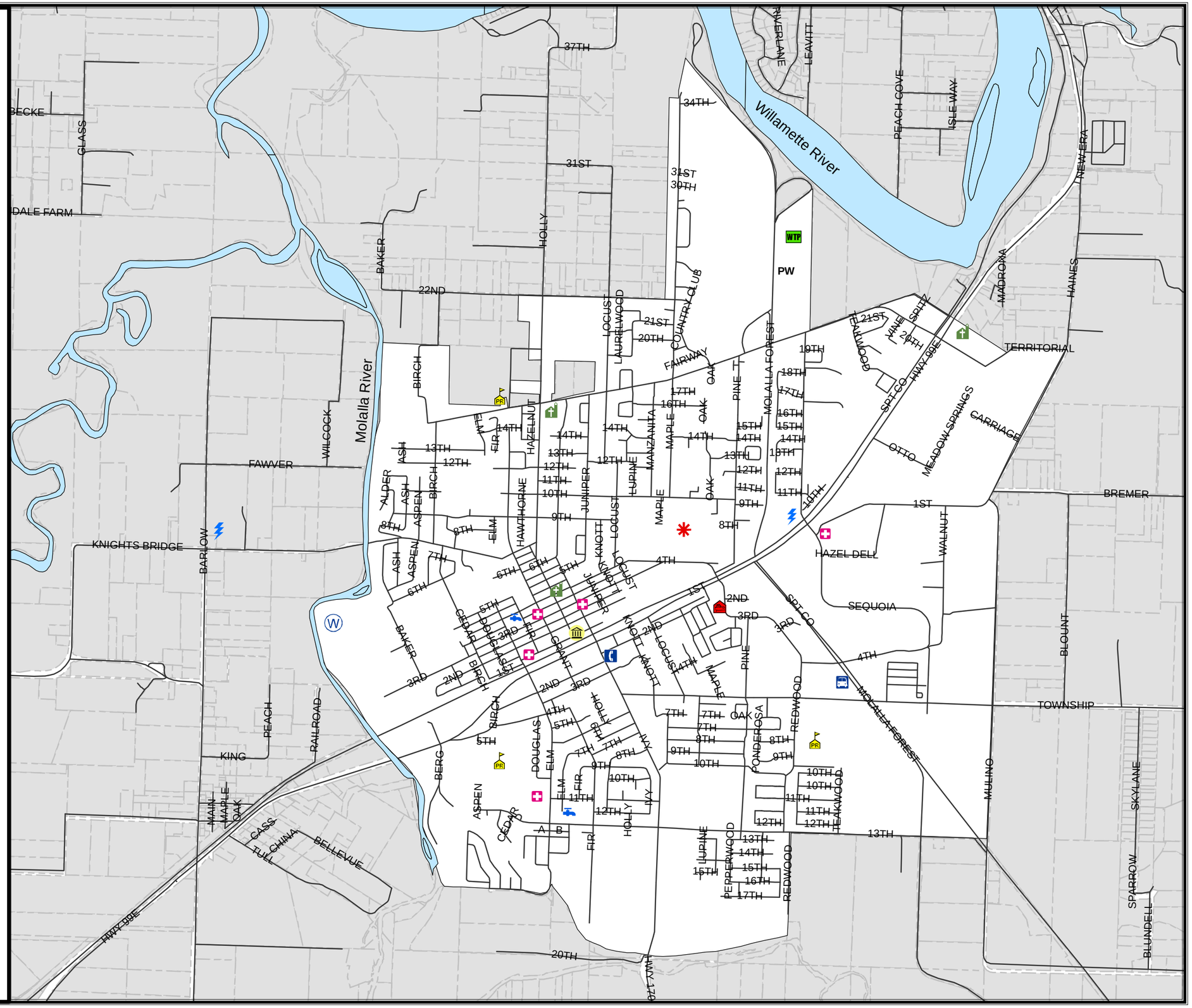
- BBC Steel
- Wilco
- JV Northwest
- Beco Welding
- Rail Road
- Johnson Controls Inc.
- SR Smith
- Pacific Pride Fuel Storage Tanks
- Wastewater Treatment Facility
- Water Treatment Facility
- OBC Northwest, Inc.
- American Steel

Canby

The Garden Spot

Critical and Essential Facilities Map

- WTP — Wastewater Treatment Plant
- Fire Station 62- EOC #1
- First Student Transporation
- Clackamas County Fairgrounds
- Telephone Central Station
- Water facilities
- Medical Clinics
- City Hall Complex (Police, CAT, CU, Finance)
- Power Substations
- **PW** — Public Works Building -EOC #2
- W — Water Intake
- PR — Potential Shelters-Schools
- Potential Shelters-Churches



The information depicted on this map is for general purposes only. The City of Canby cannot accept any responsibilty for errors, ommissions, or positional accuracy. There are no warranties, expressed or implied, including the warranty of merchantability or fitness for a particular purpose, accompanying this product. However, notification of errors would be appreciated.

City of Canby GIS
170 NW 2nd Avenue
Canby, Or 97013

April 2009

Section 4:
Natural Hazards

4.1 Flooding

The City of Canby has several large rivers and smaller tributaries that are susceptible to annual flooding events. Principle flood sources include the Molalla River and the Willamette River. Overall, Canby's flooding hazard is less of a concern to the city than other hazards represented in this mitigation plan.

Flooding Profile

The causes and characteristics of flooding hazards are adequately described within the Clackamas County Natural Hazards Mitigation Plan. Likewise, historical large-scale flooding events have been described in Section 6 of the Clackamas County Natural Hazards Mitigation Plan, and are applicable to the City of Canby as well. The following events require further explanation regarding impacts to the City of Canby.

- On January 1, 2006 the Molalla River reached flood stage, requiring homes to be sandbagged. Access to the areas near the river was limited.
- On January 2, 2009 the Molalla River again reached flood stage, damaging the access road to the water intake facilities.

Flooding Hazard Assessment

Hazard Identification

The location of Canby's flood hazard is best described by the city's Flood Insurance Rate Maps (FIRM). The Flood Map on page 36 below shows the city's 100-year floodplain boundaries in addition to the 1996 flood line. Currently, the city estimates that 102 acres of the city are within, or intersecting the 100-year floodplain, which is 4.23% of the city's 2,413 acres. The value of land within the floodplain amounts to $11,286,708.

The extent of flooding hazards in Canby primarily depends on climate and precipitation levels. Withdrawals for irrigation and drinking water, as well as stream and wetland modifications or vegetation removal can influence water flow as well.

The probability of flooding events in Canby was determined using scientific data, historical occurrences, and local knowledge. Canby's Emergency Management Committee estimates that the probability of floods occurring is 'high,' meaning one major flooding event is likely to occur within a 10 year period. This estimate is the same as the county's 'high' probability estimate.

Vulnerability Assessment

Canby's Emergency Management Committee estimates the city's vulnerability to flooding to be 'moderate,' meaning between 1% and 10% of the population and community assets would be affected. This is in agreement with the county's 'moderate' estimate.

Approximately 4.23% percent of the total land area in Canby is exposed to the flooding hazard, and in some areas this hazard presents potential life safety hazards. Multi-family housing structures, including Redwood Terrace Apartment Complex and Canby Grove, may be affected by flooding. Critical facilities exposed to the flood hazard include the water treatment facility main river intake structure, the wastewater treatment facility, backwash ponds, and the city's public works facility. In flooding events these facilities may be exposed to high waters and services can be interrupted. Additionally, Willow Creek Pump Station, servicing Willow Creek Estates and Redwood Terrace Apartments, does not pump properly and cannot treat all raw sewage during flooding events. The pump station can overflow across the road and expose the area to raw sewage.

Bridges and culverts are also vulnerable to flooding because debris and sediment can choke culverts and undermine bridges, causing surface water drainage problems. Canby relies on bridges for transportation and connection to other main highways. Canby could potentially be isolated if the bridges were to fail. Knights Bridge and Goods Bridge are particularly exposed. Roadways exposed include S. Ivy (Hwy 170) and SW/SE 1st Ave (Hwy 99E).

The City of Canby is a participant in the National Flood Insurance Program (NFIP) with 14 policies in force totaling $3,370,200. The city's most current effective Flood Insurance Rate Map is dated June 17th, 2008 (Initial FIRM 11/16/1973). Canby's last Community Assistance Visit (CAV) was on November 19, 1993, and no Community Assistance Contacts (CAC) or CAV's have occurred since. At this time, there have only been 2 losses in Canby. Total payments for these losses amount to $67,370.56. Finally, Canby has 0 repetitive loss properties.[iv]

Risk Analysis

Flow velocity models can assist in predicting the amount of damage expected from different magnitudes of flood events. The data used to develop these models is based on hydrological analysis of landscape features. Changes in the landscape, often associated with human development, can alter the flow velocity and the severity of damage that can be expected from a flood event. Using GIS technology and flow velocity models such as multi-hazard HAZUS, it is possible to map the damage that can be expected from flood events over time. It is also possible to pinpoint the effects of certain flood events on individual properties.

At the time of publication of this plan update, data was insufficient to conduct a risk analysis for flood events in Canby. The city has addressed this issue in LT-MH #1 in Section 4.7, and will be completing a risk assessment as data and resources become available.

Existing Flood Mitigation Activities

Flood mitigation activities listed here include current mitigation programs and activities that are being implemented by Canby agencies or organizations.

Flood Mitigation Project

Emerald Park is an area designated as open space along the Willamette River. The development of this park has enhanced the wetlands in the area, which will assist in flood water retention. Willow Creek wetlands also assist in reducing flood waters by increasing the infiltration capacity of the soils in this area.

City Codes Pertaining to Flooding

Canby Comprehensive Plan: Environmental Concerns Element:

Police No. 2-R: Canby shall maintain and protect surface water and groundwater resources.

Implementation Measures:

A. Where practical, allow functional septic systems to remain in use, but require the owners of any failing systems within the city to connect to the city sewerage system.
B. Work closely with Clackamas County and State DEQ sanitarians to assure that sanitation requirements are met, both in and around the city.

Policy No. 2-H: Canby shall continue to participate in and shall actively support the Federal Flood Insurance Program.

Implementation Measures:

A. Continue to enforce the provisions of the "H" overlay zone which restricts development in areas of the identified flood hazards.
B. In reviewing development proposals, prevent the creation of additional building sites in hazardous locations, encourage the clustering of development in the most appropriate locations, and require proof from a registered surveyor or engineer that proposed buildings will have habitable floor elevations at least one foot above the flood levels identified in the engineer's mapping.

Policy No. 3-H: Canby shall seek to inform property owners and builders of the potential risks associated with construction in areas of expansive soils, high water tables, and shallow topsoil.

Implementation Measures:

A. Copies of the publication "Geology and Geologic Hazards of Northwestern Clackamas County, Oregon, 1979" by the State Department of Geology and Mineral Industries, will be kept on file in City Hall and made available to those who are interested.
B. If deemed necessary on a case-by-case basis, the Planning Commission may require developers to record a written statement disclosing to potential purchasers that their properties may be exposed to some risk because of physical construction limitations.
C. If, through the development process, the Planning Commission finds that special conditions of approval are necessary to mitigate or minimize the risks associated with construction in such areas, the Commission may impose such conditions.

Canby Municipal Code

- Title 16 Planning and Zoning, Chapter 16.37 Riparian Overlay Zone: The Riparian Overlay Zone is intended to be used in conjunction with the city's underlying base zones to assure future development of the site will provide ample protection for riparian areas.
- Title 16 Planning and Zoning, Chapter 16.39 Wetlands Overlay Zone: This overlay zone is intended to be used in conjunction with they city's underlying base zones to assure future development will provide ample protection for locally significant wetlands.
- Title 15 Building and Construction, Chapter 15.12 Flood Hazard Protection: The purpose of this chapter is to promote the public health, safety, and general welfare, and to minimize public and private losses due to flood conditions.
- Title 13 Public Services, Chapter 13.16 Sewer Use: Sets discharge standards to reduce the chance of sewer back ups.
- Title 8 Health and Safety, Chapter 8.12.090 Surface Waters and Drainage: Ensures water on private property drains correctly.

Flood Mitigation Action Items

The flood mitigation action items provide direction on specific activities that organizations and residents in Canby can undertake to reduce risk and prevent loss from flood events. Each action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

ST-FL#1: Evaluate & upgrade surface water management infrastructure and identify appropriate mitigation strategies.

Ideas for Implementation

- Develop storm water grate management system to keep grates open and clear of debris.
- Implement the actions stated in the storm water master plan to address areas of known flooding

Coordinating Organization: Public Works
Timeline: Short Term Ongoing
Status: *Partially Complete.* The storm water master plan is currently being updated. The city received a grant for developing new subdivision design standards for surface water, and another grant to address the flooding problem near the library.

ST-FL#2: Ensure continued compliance in the National Flood Insurance Program (NFIP) through enforcement of local floodplain management ordinances.

Ideas for Implementation

- Community Assistance Visits (CAV) are scheduled visits to communities participating in the NFIP for the purpose of: 1) conducting a comprehensive assessment of the community's floodplain management program; 2) assisting the community and its staff in understanding the NFIP and its requirements; and 3) assisting the community in implementing effective flood loss reduction measures when program deficiencies or violations are discovered. Actively participate with DLCD and FEMA during Community Assistance Visits.

- Conduct an assessment of the floodplain ordinances to ensure they reflect current flood hazards and situations, and meet NFIP requirements.
- Coordinate with the county to ensure that floodplain ordinances and NFIP regulations are maintained and enforced.
- Consider participating in the National Flood Insurance Program's Community Rating System (CRS). CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements.

Coordinating Organization: Planning and Building Departments
Timeline: Short Term Ongoing
Status: *Added during the 2009 plan update*. This will be an ongoing action.

LT-FL#1: Identify mitigation strategies to address flooding issues in the bottom lands.
Ideas for Implementation:

- Protect source water intake structures (2 pumping stations: Springs Gallery, River Caisson Building).
- Improve and stabilize access roads leading to water intake structures

Coordinating Organization: Canby Utility
Timeline: Long Term 3-5 Years
Status: *Partially Complete.* The water wash ponds were elevated above the flood line. The water intake structures are elevated out of the 100 year floodplain.

Canby

The Garden Spot

100 Year Flood Map

100 Year Flood Flood

Canby Urban Growth Boundary

1996 Flood

April 2009

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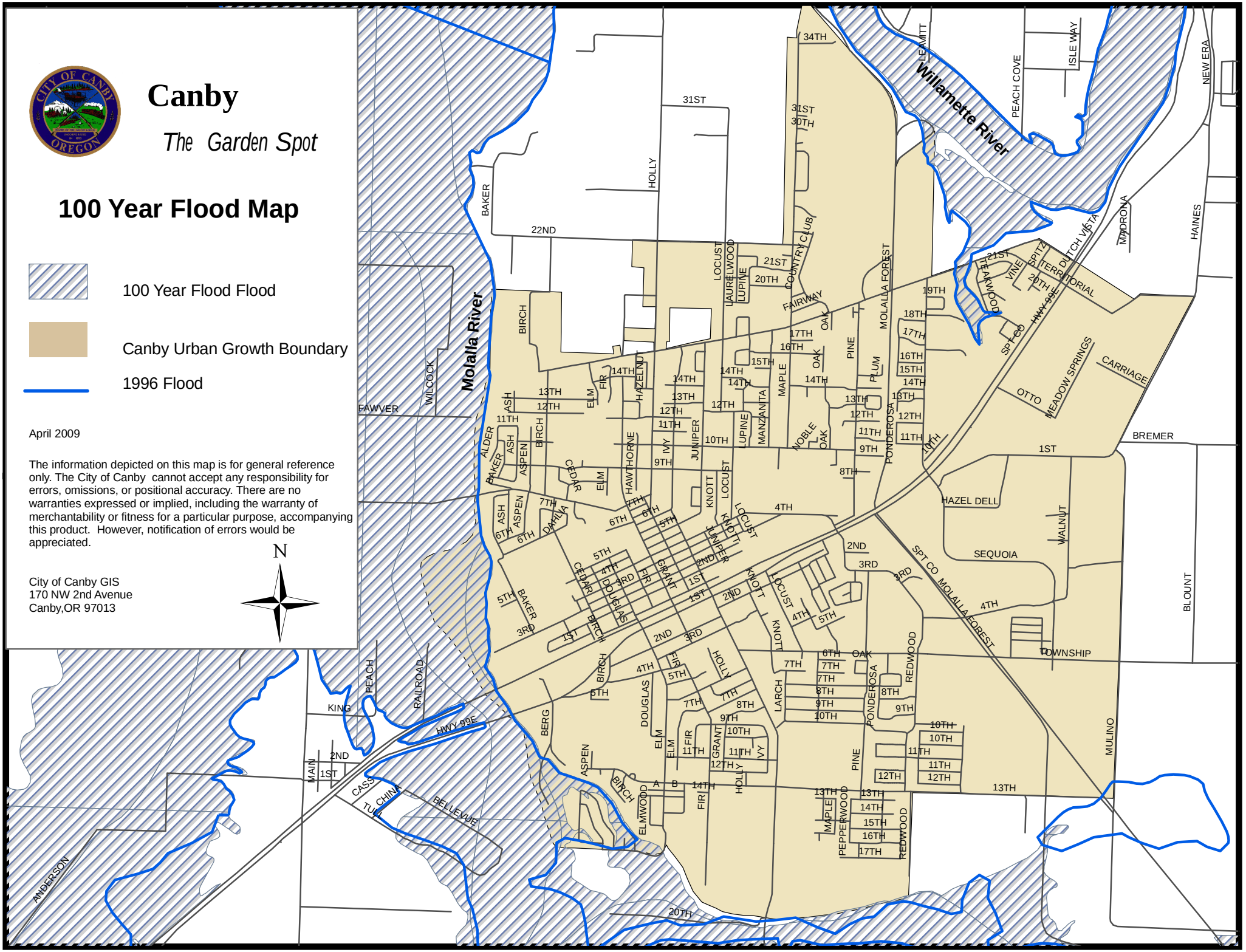


4.2 Landslide

Landslide Profile

The causes and characteristics of landslide hazards are adequately described within the Clackamas County Natural Hazards Mitigation Plan. Likewise, historical large-scale landslide events have been described in Section 7 of the Clackamas County Natural Hazards Mitigation Plan, and are applicable to the City of Canby as well. One event requires further explanation:

- On January 7, 2009 two slides occurred in private yards after the intense winter storm. About three feet of earth fell 30 to 50 feet from the back yard of a home on North Baker Drive. Another home on Alder Creek Lane in Knights Bridge Estates lost approximately 10 feet of its back yard.

Landslide Hazard Assessment

Hazard Identification

Mapping landslide and debris flow allows the city to estimate damage due to a given event location and to help prevent future losses in landslide prone areas. The location of the potential landslide hazard is depicted on the Landslide Hazard Map (see page 40 below), and was created by mapping areas within the city that have a 25% or greater slope. Approximately 16 acres or 0.7% of the city's land area has a 25% or greater slope. If landslides were to occur in these areas, the estimated value of potentially-affected property amounts to $1,723,936.

The location and extent of Canby's landslide hazards are also documented within Clackamas County's Natural Hazards Mitigation Plan. The county's plan includes maps for debris flow hazards, slump and earth flows, and percent slope.

The probability of landslide events in Canby was determined using scientific data, historical occurrences, and local knowledge. Canby's Hazard Mitigation Advisory Committee estimates that the probability of landslides occurring is 'high,' meaning one event is likely within a 10-35 year period. This estimate is in agreement with the county's probability rating.

Vulnerability Assessment

Landslide events within the city have not significantly impacted residents or caused major property damage in the past but landslides could potentially inhibit traffic flow, and cause damage to roads and buildings. Canby's Emergency Management Committee estimates that the city has a 'low' vulnerability to landslides, meaning less than 1% of the population and/or community assets would be affected by a landslide event. This is in agreement with the county's 'low' rating.

Although less than 1% of the city's land area is subject to landslides, there are a few steep slopes that have a greater potential for failure. The area most susceptible to landslides is along the Molalla River, and extends south from 6th Street up to the northern city limits. The nearest critical facilities to this hazard include Canby Utility's main river intake, Springs Gallery, and pump houses, but the landslide map shows the water intake outside

of the mapped hazard. A few residential properties are also in this hazard zone. Please see Clackamas County's Natural Hazards Mitigation Plan for a more comprehensive description of potential landslide-related impacts.

Risk Analysis

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 damage estimates within the city due to a specific landslide or debris flow event. At the time of publication of this plan update, Canby was unable to perform a quantitative risk assessment due to insufficient data and lack of software needed to conduct this type of analysis. The city has addressed this issue in action item LT-MH#1 in section 4.7 and will be completing a risk assessment as data and resources become available.

Existing Landslide Mitigation Activities

Landslide mitigation activities listed here include current mitigation programs and activities that are being implemented by Canby agencies or organizations.

Landslide Mitigation Projects

The City of Canby has identified steep slopes that may be susceptible to the landslide hazards. In 2007 Canby Public Works abandoned a storm line that had gone over a hill on North Baker Drive. This storm line was rerouted out of the hazard zone to reduce the possibilities of future damage due to landslides.

Incorporated Municipality Codes Pertaining to Landslides

Canby Comprehensive Plan: Environmental Concerns Element

Policy No. 1-H: Canby shall restrict urbanization in areas of identified steep slopes.

Implementation Measures:

A. Continue to regulate property divisions to prevent the creation of lots in areas which are inaccessible or unbuildable because of steep slopes.
B. The Planning Commission may require a certified statement from a registered engineer or engineering geologist prior to construction in areas of steep slopes identified by "H" overlay zoning.

Policy No. 3-H: Canby shall seek to inform property owners and builders of the potential risks associated with construction in areas of expansive soils, high water tables, and shallow topsoil.

Implementation Measures:

A. Copies of the publication "Geology and Geologic Hazards of Northwestern Clackamas County, Oregon, 1979" by the State Department of Geology and Mineral Industries, will be kept on file in City Hall and made available to those who are interested.
B. If deemed necessary on a case-by-case basis, the Planning Commission may require developers to record a written statement disclosing to potential purchasers that their properties may be exposed to some risk because of physical construction limitations.

C. If, through the development process, the Planning Commission finds that special conditions of approval are necessary to mitigate or minimize the risks associated with construction in such areas, the Commission may impose such conditions.

Canby Municipal Code

- Title 15 Building and Construction, Chapter 15.20 Erosion Control: This chapter provides requirements for development and construction related activities in order to control the creation of sediment and to prevent the occurrence of erosion.

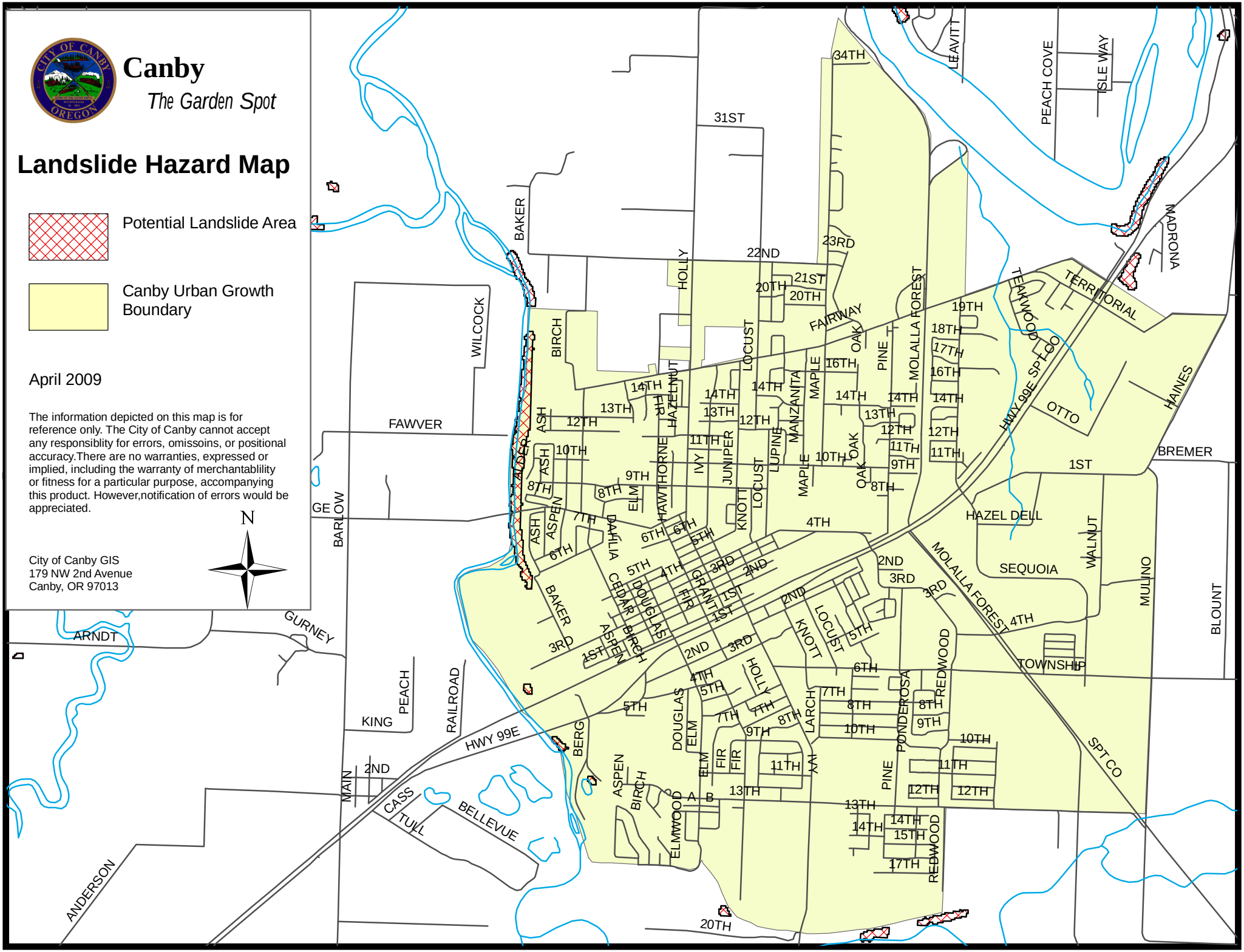
Landslide Mitigation Action Items

The landslide mitigation action item provides direction on specific activities that organizations and residents in Canby can undertake to reduce risk and prevent loss from landslide events. The action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

LT-LS #1: Reduce the vulnerability of property owners in landslide-prone areas.
Ideas for Implementation:

- Conduct a study to identify appropriate mitigation strategies for problem areas including buildings and infrastructure in the bluff area;
- Develop public information to emphasize economic risk when building on potential or historical landslide areas;
- Update the landslide hazard map when LIDAR data becomes available; and
- Review the planning and building codes and make updates or changes to the safe harbor code, if necessary.

Coordinating Organization: Planning and Building Departments
Timeline: Long Term 3-5 Years
Status: *Deferred from 2003 plan.* The actions were not implemented due to limited resources. The 2009 update placed "Planning and Building Departments" as the new coordinating organization.


Canby
The Garden Spot
Landslide Hazard Map
Potential Landslide Area
Canby Urban Growth Boundary
April 2009
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WALNUT
SEQUOIA
MULINO
BLOUNT
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4.3 Wildfire

Wildfire Profile

The causes and characteristics of wildfire hazards are adequately described within Clackamas County's Natural Hazards Mitigation Plan. Likewise, historical large-scale wildfire events have been described in Section 8 of the county's plan, and are applicable to City of Canby as well. As such, the events will not be repeated here.

Wildfire Hazard Assessment

Hazard Identification

The location of Canby's wildfire hazard was identified using the Wildfire Risk Explorer advanced mapping tool on the Oregon Explorer website.[v] The map below on page 44 shows that the majority of Canby is in a 'moderate' wildfire hazard zone. Areas near the Molalla River have a 'low' wildfire hazard, and no areas within the city have a 'high' hazard rating. Very little wildland-urban interface exists within city limits. One area of wildland-urban interface is in the northeast portion of Canby, as seen in areal photographs. A heavily wooded area borders the north and south boundaries of the sewage treatment facility and public works building/EOC #2. The Willamette Valley Country Club and farmlands border the east and west boundaries. The public works building/EOC #2 has defensible space protecting the buildings, reducing risk.

Wildland-urban interface areas are not designated by geography alone, however, and certain conditions must be present for significant interface fires to occur (i.e., hot, dry, windy weather; inability of fire protection forces to contain or suppress the fire; the occurrence of multiple fires that overwhelm resources; and a large fuel load, or dense vegetation). Likewise, the severity of a wildfire is affected by the severity of these conditions.[vi] Please see Clackamas County's Natural Hazards Mitigation Plan for a more comprehensive description of the conditions that create and/or exacerbate wildfire events.

The probability of a wildfire occurring within Canby was determined using scientific data, historical occurrences, and local knowledge. The Emergency Management Committee estimates that the probability of wildfire is 'moderate,' meaning one incident is likely to occur in a 35 to 75 year period. This is in agreement with the county's 'moderate' probability rating.

Vulnerability Assessment

The Emergency Management Committee estimates that the city's vulnerability to wildfires is 'moderate,' meaning 1-10% of the population and/or community assets could be affected in a large-scale wildfire event. This estimate is in agreement with the county's 'moderate' rating. Past wildfire events within the state have shown that property can be easily damaged or destroyed since structures, vegetation and other flammables will all serve as fuel. Other items that might affect the outcome of a wildfire are access to the location and to water, response time from the fire station, and the availability of personnel and equipment. Weather, such as hot dry winds and drought, can also play a part in wildfire events. Please see Clackamas County's Plan for more information regarding potential wildfire-related impacts.

Risk Analysis

Key factors included in assessing wildfire risk include ignition sources, building materials and design, community design, structural density, slope, vegetative fuel, fire occurrence, and weather, as well as occurrences of drought. At the time of publication of this plan, data and modeling software were insufficient to produce a wildfire hazard map or conduct a risk analysis. The city has addressed this issue in action item LT-MH#1 in section 4.7 and will be creating a map and completing a risk assessment as data and resources become available.

Existing Wildfire Mitigation Activities

Incorporated Municipality Codes Pertaining to Wildfires

Canby Municipal Code No. 8.12.060 Weeds and Noxious Growth.

No owner or person in charge of property may permit weeds or other noxious vegetation to grow upon his property. It shall be the duty of an owner or person in charge of property to cut down or to destroy weeds or other noxious vegetation as often as needed in order to prevent the weeds or noxious vegetation from becoming unsightly or from becoming a fire hazard or from maturing or going to seed.

Local Fire Prevention/Education Programs

The Canby Fire District #62 covers 52 square miles with a population of 32,000. The district is comprised of a suburban mix of residential properties, light industry and agriculture, which includes the entire city limits of Canby. Canby Fire has made public awareness a top priority with fire prevention and education services. Annually, wildfire guides are distributed to the district's urban homeowners to educate them in pre-fire prevention activities by the Fire District personnel and CERT teams.

The Canby Fire Department offers the following fire prevention/ education services for its residents.

- Home fire safety inspections
- Assistance developing home fire escape plans
- Business inspections
- Woodstove installation inspections
- Free smoke detectors
- Fire extinguisher operation classes
- Community Emergency Response Team training
- School, church, and civic groups fire safety education presentations
- Fire cause determinations
- Urban interface training on defensible space
- Proper rural addressing of residences

In addition to education programs, Canby Fire District #62 has identified alternative firefighting water sources on their maps – a completed action item from the 2003 addendum. The district also participated in the update of the Clackamas County Community Wildfire Protection Plan.

Wildfire Mitigation Action Items

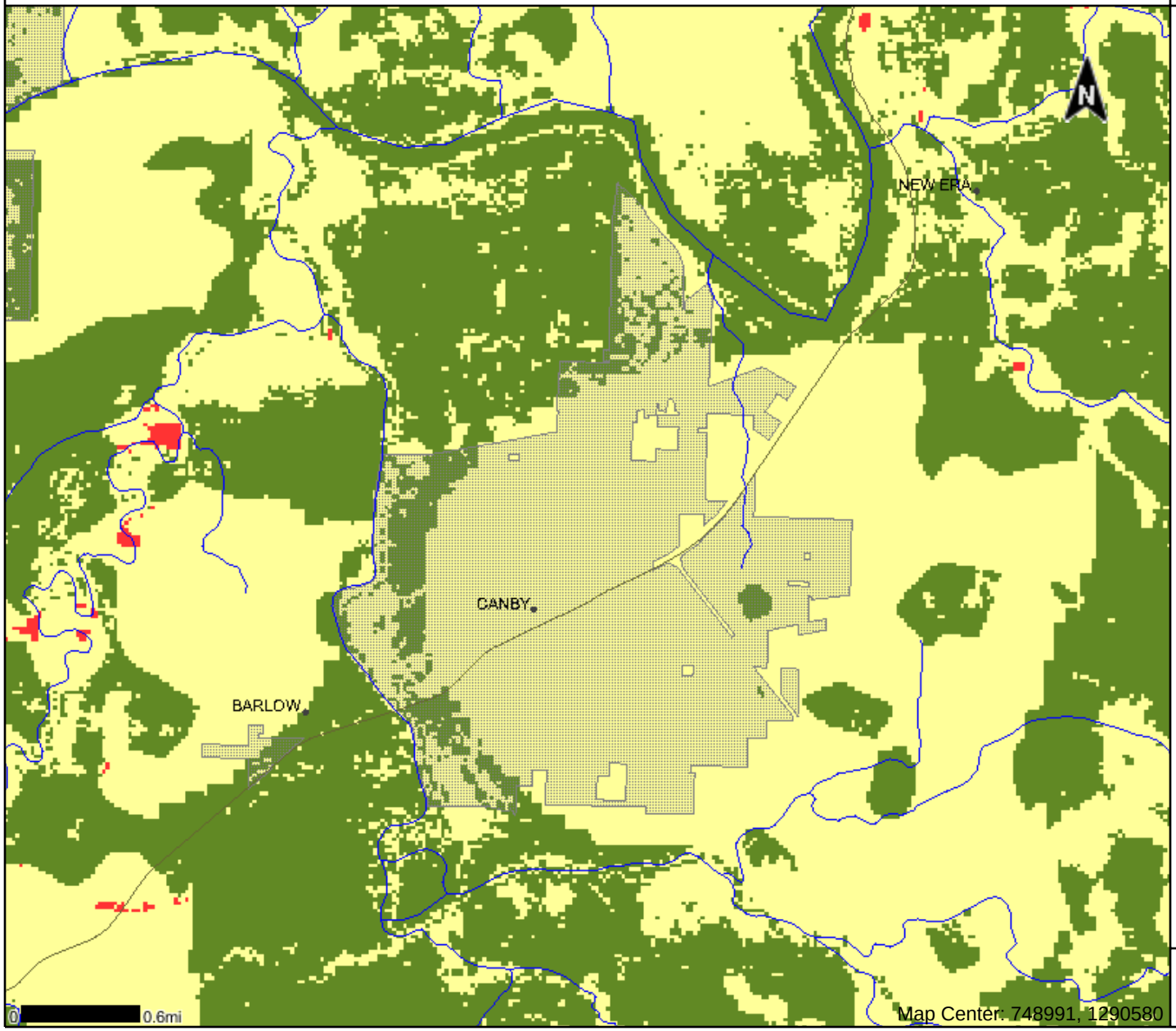
The wildfire mitigation action item provides direction on specific activities that organizations and residents in Canby can undertake to reduce risk and prevent loss from wildfire events. The action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

ST WF#1: Promote fire-resistant strategies for new and existing developments.
Ideas for Implementation:

- Continue to coordinate with the fire department to ensure that site plans are reviewed for future building sites;
- Continue to require street design that facilitates the movement of fire fighting equipment;
- Continue to review roofing standards and develop recommendations for promoting non-combustible roofing;
- Promote use of sprinkler systems in residential construction; and
- Maintain awareness of potential city growth into the wild land urban interface.

Coordinating Organization: Fire District and City Planning
Timeline: Short Term Ongoing
Status: *Added during the 2009 plan update.* Yet to be completed.

Wildfire Hazard Map



Legend

- Rivers
- Highways
- Cities
- City Limits 2005
- CAR Overall Rating
  - 1: Low: Total weighted score of 0-9
  - 2: Moderate: Total weighted score of 10-16
  - 3: High: Total weighted score of 17+
  - Unknown

Scale: 1:50,000

DO NOT USE FOR NAVIGATION

4.4 Severe Storms: Wind and Winter

Severe Storm Profile

The causes and characteristics of severe storms are adequately documented in Clackamas County's Natural Hazards Mitigation Plan. Likewise, historical large-scale severe storm events have been described in Sections 9 and 10 of the Clackamas County Plan, and are applicable to City of Canby as well. As such, the events will not be repeated here. One incident requires further explanation:

- From December 15th to 26th, 2008 a severe winter storm blanketed much of the State of Oregon, effectively shutting down most day-to-day operations within Clackamas County and making emergency equipment difficult to use. In Canby, numerous roofs, carports and barns were severely damaged or collapsed. The gutters at Knight School plugged up with ice and great amounts of water backed up. Water came through the roof and damaged the ceiling over the entry of the school, requiring the ceiling to be replaced.

Severe Storm Hazard Assessment

Hazard Identification

Clackamas County's Natural Hazards Mitigation Plan adequately describes the location and extent of wind and winter storms. Canby Utility developed a map that shows the location of overhead electrical systems (see Canby Utility Overhead Electrical System Map on page 48 below). The utility company chose to map these systems because the majority of severe storm events result in power outages. Although electrical systems comprise less than 5% of the city's total land area, cumulative effects from power outages can impact the entire city. Overhead power lines are located on the following streets throughout the city:

- N Knights Bridge Road
- N. Birch Street
- N. Cedar Street
- Grant St
- N Hawthorne Ct
- N Holly
- N Ivy St
- N Juniper between NE 5th and NE 10th
- N Juniper Ct
- N Pine St
- Dahlia Place
- NW 6th Ave
- NW 5th Ave
- Between NW 4th Ave and 5th Ave
- Between NW 3rd Ave and 4th Ave
- Between NW 2nd Ave and 3rd Ave
- NE/NW 1st Ave
- NE 3rd Ave

- NE 4th Ave
- NE 5th Ave
- 99E between S Elm St. and S Birch St., between Grant St. and Ivy St., and between S Knott and S Pine
- SW 2nd Ave
- SW 3rd Ave
- SW 4th Ave
- SW 5th Ave
- SW 6th Ave
- SW 7th Ave
- SW 13th Ave
- S Fir between SW 6th and SW 7th, and South of 13th Ave
- S Douglas St
- S Elm St
- S Redwood St
- S Teakwood St between SE 11th and SE 13th
- S Ivy St
- S Knott
- S Locust
- S Twp Road

The probability of severe storm events in Canby was determined using scientific data, historical occurrences, and local knowledge. The Emergency Management Committee estimates that the probability of severe winter storms and wind storms is 'high,' meaning one incident is likely to occur within a 10 to 35 year period. The winter storm probability rating is in agreement with the county's rating. Canby's wind storm probability rating is higher than the county's 'moderate' rating, because the city is more exposed to windstorms than the rest of the county. Canby is primarily surrounded by farmland, meaning the city does not have dense tree coverage to reduce wind speeds. .

Vulnerability Assessment

Severe storms can be life threatening, cause major infrastructure damage, and can be difficult to manage in terms of response and recovery. Winter storms can cover the road networks with snow and ice, impeding transportation to schools and medical facilities. Both winter storms and windstorms can also topple trees, down power lines, and cause widespread power outages.

Telephone Central Station and City Hall Complex are critical facilities located adjacent to vulnerable power lines. Canby Utility, Public Works, and Canby Telephone would be strained during a severe storm event as they work to clear roads and repair or replace power distribution and/or transmission lines, and maintain telephone lines for communication. Additionally, the area along 99E from South Elm to South Ivy St. is particularly vulnerable to damaged power lines from fallen tree limbs. Please see Clackamas County's Natural Hazards Mitigation Plan for more information regarding potential storm-related impacts.

Canby's Emergency Management Committee estimates a 'moderate' vulnerability to wind and winter storms, meaning 1-10% of the city's population and/or community assets could be affected by a major event. This rating is in agreement with the county's 'moderate' winter storm vulnerability rating, but is higher than the county's 'low' vulnerability rating for wind storms. Canby's wind storm vulnerability is higher than the county's rating because much of the city's population and community assets are affected in severe wind storm events.

Risk Analysis

Factors that should be included in a storm risk analysis include population and property distribution in the hazard area, the frequency of storm events, and information on trees, utilities, and infrastructure that may be impacted by severe storm events. Modeling software is required to predict potential losses from a particular storm event. At this time, Canby is unable to perform a quantitative risk assessment due to insufficient data. The city has addressed this issue in action item LT-MH #1 in Section 4.7 and will be completing a risk assessment as data and resources become available.

Existing Severe Storm Mitigation Activities

The City of Canby has a tree inventory and is currently reviewing and updating the street tree ordinance. Canby Utility is on a two year tree trimming contract to trim trees around power lines. Canby Utility undergrounds all new facilities so they are not susceptible to fallen branches and ice buildup. Lastly, Canby Public Works now has a means for applying a de-icer and sand to roads.

Severe Storm Mitigation Action Items

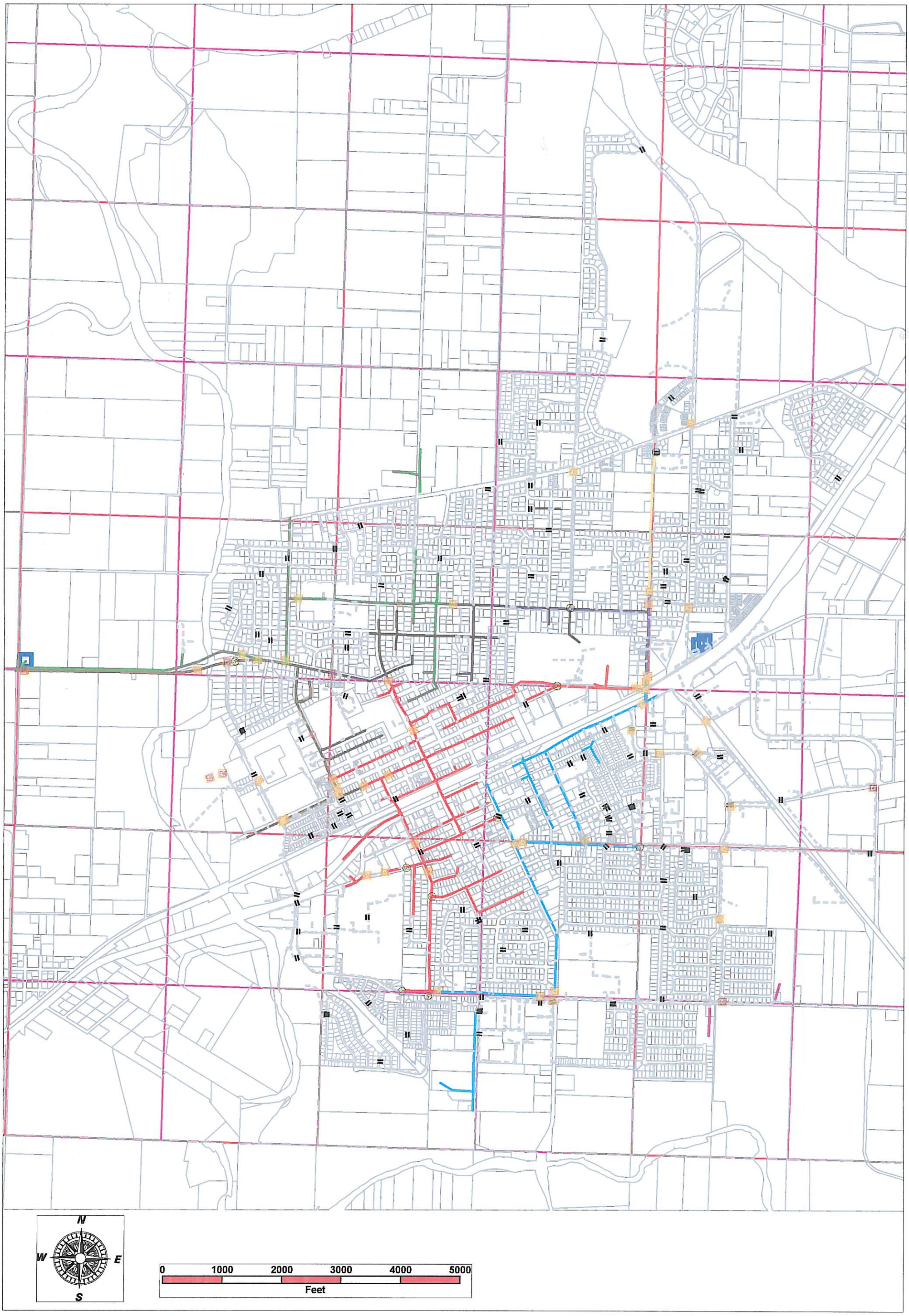
The severe winter storm mitigation action item provides direction on specific activities that organizations and residents in Canby undertake to reduce risk and prevent loss from severe storm events. The action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

LT-SS #1: Attain funding to bury power lines subject to frequent failures to reduce power outages from the windstorm and severe winter storm hazard where possible.
Ideas for Implementation:

- Partner with PGE to continue hazardous tree inventory and mitigation programs;
- Ensure there are back up underground lines to major businesses & employers; and
- Continue regular tree trimming practices.

Coordinating Organization: Canby Utility
Timeline: Ongoing
Status: *Partially Complete.* Canby Utility did some undergrounding under SE 2nd street and all new development is underground. Today, about 70% of utilities are located underground. Canby Utility also finished a big tree trimming project last summer and the city has an inventory of trees.

Canby Utility
Overhead Electrical System



4.5 Earthquake

Earthquake Profile

Clackamas County's Natural Hazards Mitigation Plan adequately describes the causes and characteristics of earthquake hazards for the region. Likewise, the county's plan adequately documents past earthquake occurrences. Historical records count over 56 earthquakes in the Portland area. The more severe ones occurred in 1877, 1880, 1953 and 1962. The most recent severe earthquake was the March 25, 1993 Scotts Mills quake. It was a 5.6 magnitude quake with aftershocks continuing at least through April 8.

Three potential source zones capable of generating damaging earthquakes are thought to exist in the region. These include the Portland Hills Fault Zone, Gales Creek-Newberg-Mt. Angel Structural Zone, and the Cascadia Subduction Zone.

- Portland Hills Fault Zone: a series of NW-trending faults that vertically displace the Columbia River Basalt by 1,130 feet and appear to control thickness changes in late Pleistocene (approx. 780,000 years ago) sediment[vii]. The fault zone extends along the eastern margin of the Portland Hills for a distance of 25 miles, and lies about 2 miles northeast of Oregon City.
- Gales Creek-Newberg-Mt. Angel Structural Zone: a 50-mile-long zone of discontinuous, NW trending faults that lies about 17 miles southwest of Oregon City. These faults are recognized in the subsurface by vertical separation of the Columbia River Basalt and offset seismic reflectors in the overlying basin sediment.[viii]
- Cascadia Subduction Zone: a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year.[ix] Scientists have recently found evidence that11 large, tsunami-producing earthquakes have occurred off the Pacific Northwest coast in the past 6,000 years. These earthquakes took place roughly between 300 and 5,400 years ago with an average occurrence interval of about 510 years. The most recent of these large earthquakes took place in approximately 1700 A.D. [x]

Earthquake Hazard Assessment

Hazard Identification

Clackamas County's Natural Hazards Mitigation Plan adequately describes the location and extent of potential earthquakes in the region. Below, Figures 2 - 5 further detail the city's earthquake-related landslide, amplification, and liquefaction risks. As shown in the figures, Canby has a relatively low risk of experiencing earthquake-induced landslides, amplification, or liquefaction. Areas immediately outside of city limits have higher risks for all three.

The probability of earthquake events in Canby was determined using scientific data, historical occurrences, and local knowledge. The EMC estimates the probability of an earthquake occurring is 'high,' meaning one event is likely to occur within a 10-35 year period. This is in agreement with the county's 'high' rating as well.

Paleoseismic studies along the Oregon coast indicate that the state has experienced seven Cascadia Subduction Zone (CSZ) events possibly as large as M9 in the last 3,500 years. These events are estimated to have an average recurrence interval between 500 and 600 years, although the time interval between individual events ranges from 150 to 1000 years. Since Clackamas County's Natural Hazards Mitigation Plan was updated in 2007, better earthquake probability estimates have surfaced. Scientists now estimate that the chance in the next 50 years of a great subduction zone earthquake is between 10 and 20 percent assuming that the recurrence is on the order of 400±200 years.[xi] Crustal and deep intraplate earthquakes remain difficult to predict.

Vulnerability Assessment

Canby's Emergency Management Committee estimates that the city's vulnerability to an earthquake is 'high,' meaning more than 10% of the population and assets would be affected in a large-scale event. This is in agreement with the county's rating.

Community assets within the 'intermediate to high hazard' zone in southwest Canby (see Figure 2 on page 52 below) include Canby High School, OBC Northwest (a hazardous materials site), SR Smith, Canby Square Shopping Center (including Safeway), and Canby Community Park. The community assets in the 'intermediate to high hazard' zone in northeast Canby include the wastewater treatment plant and public works building/EOC #2. Additionally, the Relative Earthquake Induced Landslide Hazard Map (see Figure 3 on page 53 below) shows potential landslides occurring along the banks of the Molalla and Willamette Rivers, and along the ridge that runs west of North Baker Drive and cuts through the southwest corner of Canby. Portions of this ridge are in 'high landslide hazard' zones.

In 2007 DOGAMI released the results of the Statewide Seismic Needs Assessment, which evaluated the collapse potential of education and emergency services buildings. Fortunately, the report found that all school and most emergency service buildings in Canby have a 'low' collapse potential. Only the Canby Police Department received a 'moderate' collapse potential rating. Additional information and findings from this report can be found at http://www.oregongeology.org/sub/projects/rvs/OFR-O-07-02-SNAA-onscreen.pdf.

Risk Analysis

Clackamas County's Natural Hazards Mitigation Plan provides a quantitative analysis of nine potential earthquake scenarios for the county. This analysis includes an estimation of fatalities, direct damage losses, number of buildings in complete damage state, and number of people requiring shelter. Canby currently does not have the resources to conduct a local risk assessment for the earthquake analysis; as such, the data reported in the county's plan is the best quantitative risk assessment for Canby's earthquake hazard.

Existing Earthquake Mitigation Activities

The City of Canby has adopted the Unified Building Code (UBC), which sets the minimum design and construction standards for new buildings. Many existing buildings

in Canby have been retrofitted to satisfy current building standards. Structures that have been retrofitted include the Canby Telecom switching room and water reservoir.

The Canby School District has developed seismic preparation procedures and conducts drills in accordance with the Office of Emergency Management guidelines. These drills include "duck, cover and hold on" and familiarization with exit routes and methods of exiting the building during an earthquake.

Earthquake Mitigation Action Items

The earthquake mitigation action item provides direction on specific activities that organizations and residents in Canby can undertake to reduce risk and prevent loss from earthquake events. The action item is followed by ideas for implementation, which can be used by the steering committee and local decision makers in pursuing strategies for implementation.

LT EQ#1: Conduct seismic evaluations and upgrades on identified critical/essential facilities & infrastructure for implementing appropriate structural and non-structural mitigation strategies.

Ideas for Implementation:

- Obtain funding to perform evaluations;
- Prioritize seismic upgrades based on criticality of need and population served; and
- Coordinate with agencies responsible for maintaining the bridges surrounding Canby to upgrade them to meet current seismic code.

Coordinating Organization: Emergency Management Committee

Timeline: Long Term 3-5 Years

Status: *Partially Complete.* City buildings, fire stations, police station and schools were seismically evaluated. The Canby Telecom control center was earthquake retrofitted, and the 13th Ave. Reservoir has seismic work planned.

Figure 2: Relative Earthquake Hazard

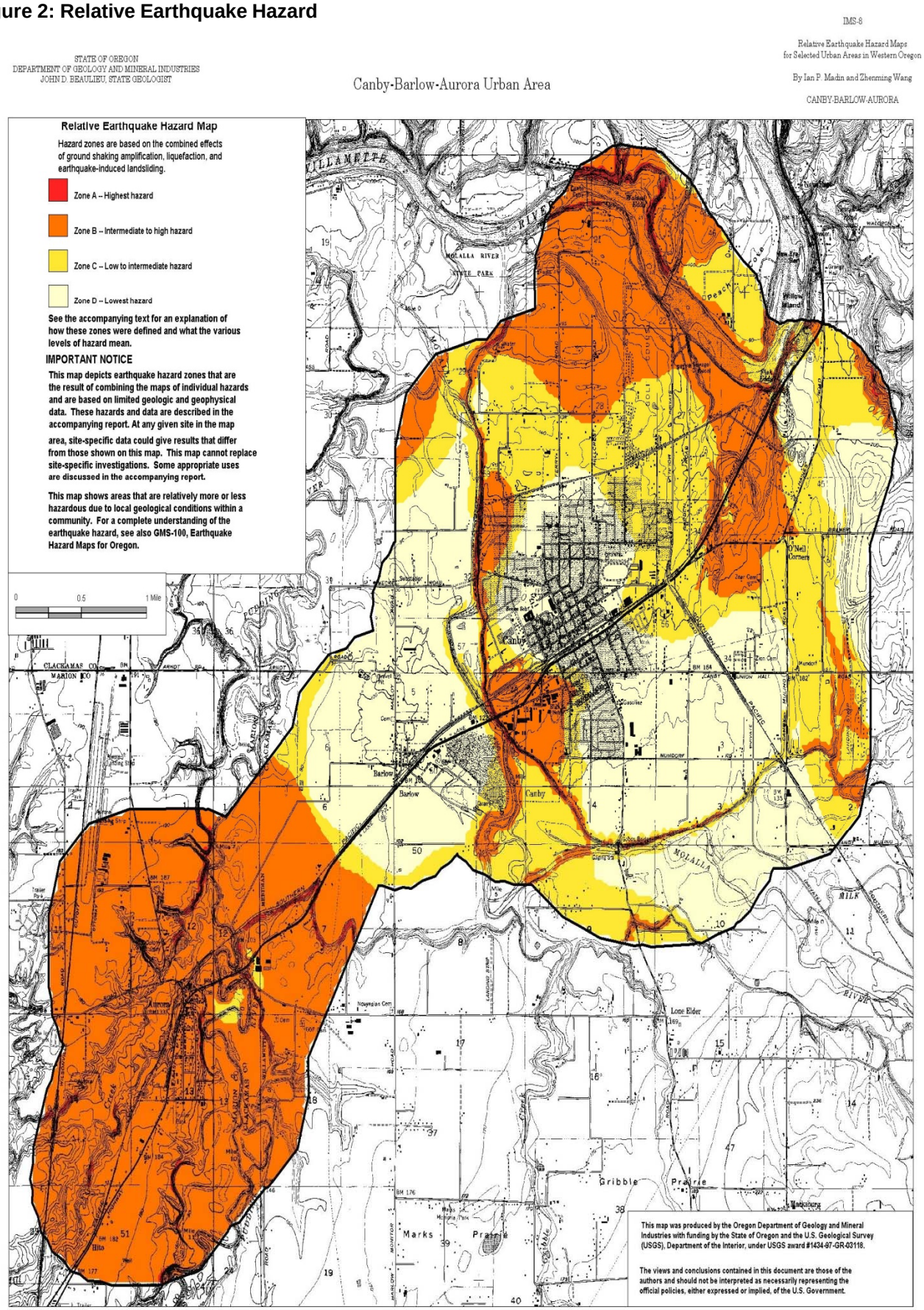


Figure 3: Earthquake-Induced Landslides

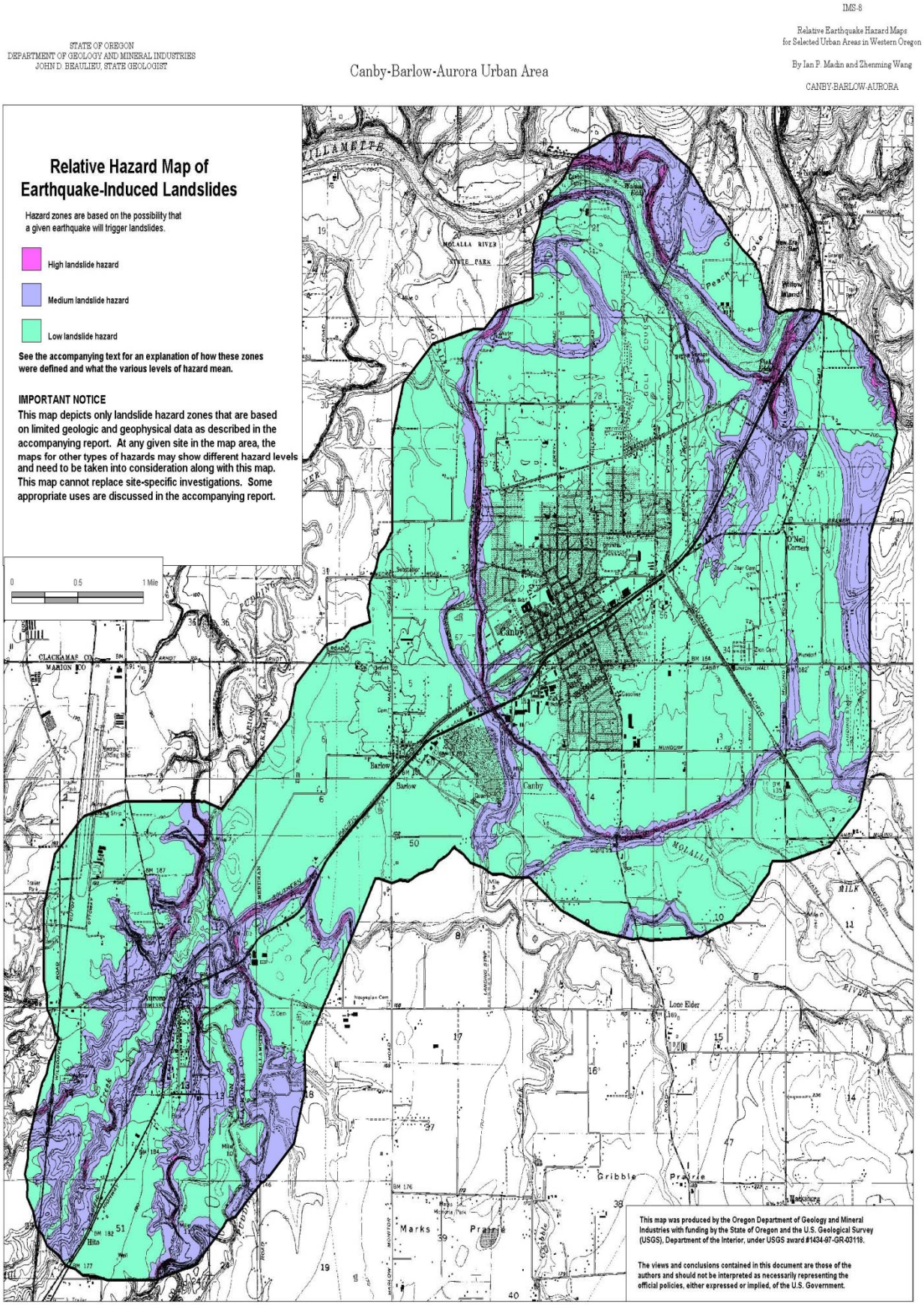


Figure 4: Relative Amplification Hazard

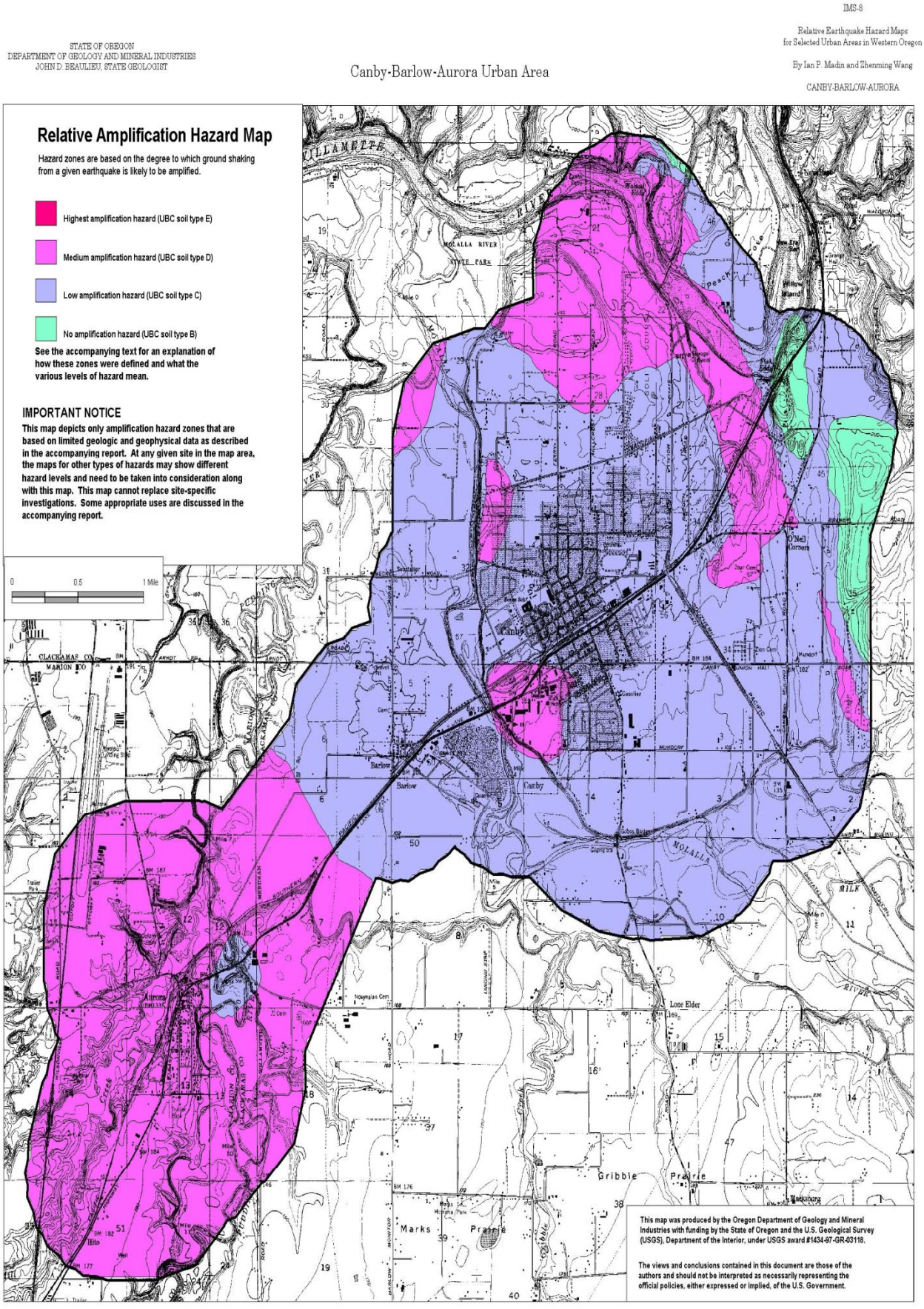
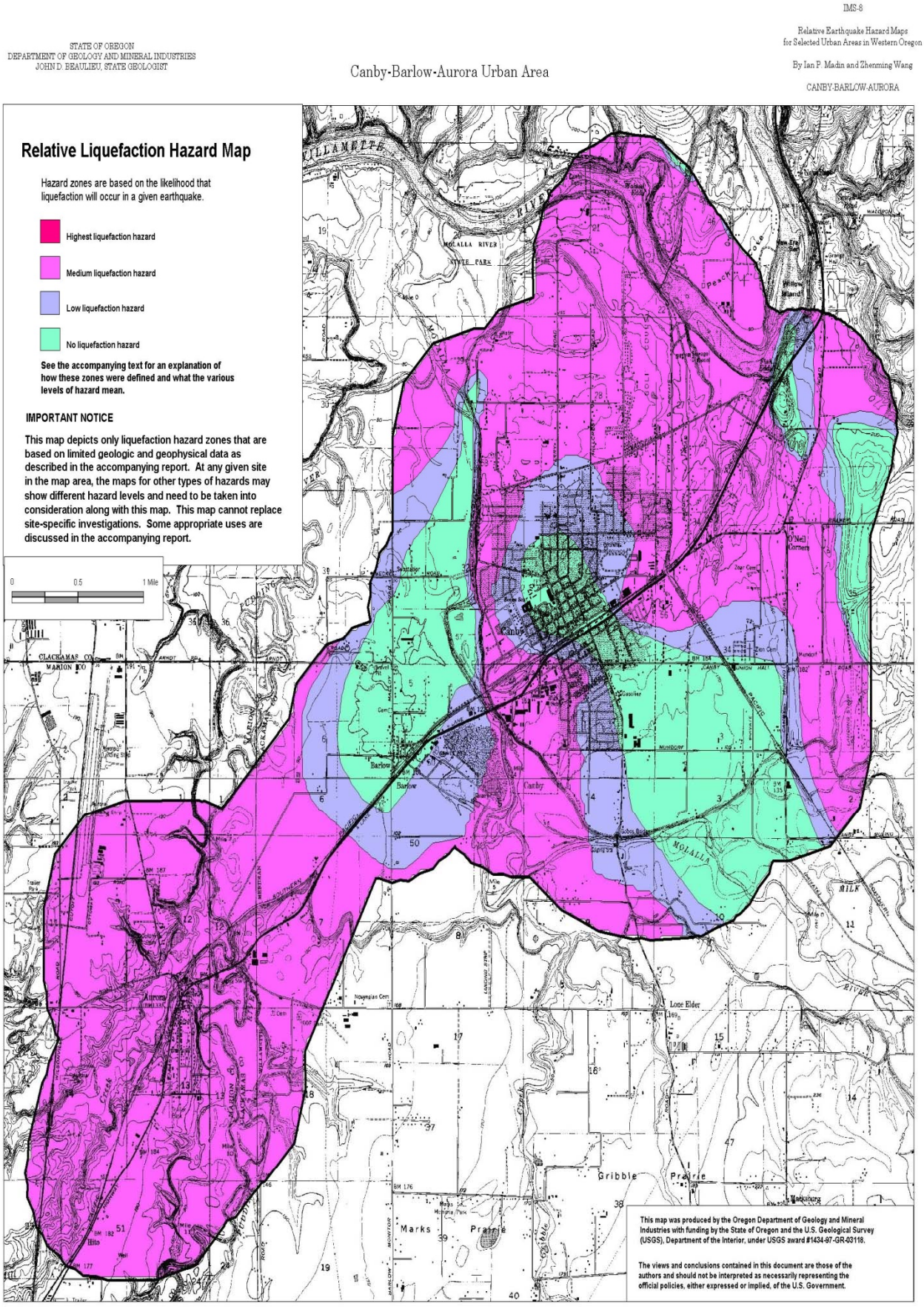


Figure5: Relative Liquefaction Hazard



4.6 Volcanic Eruption

Volcano Profile

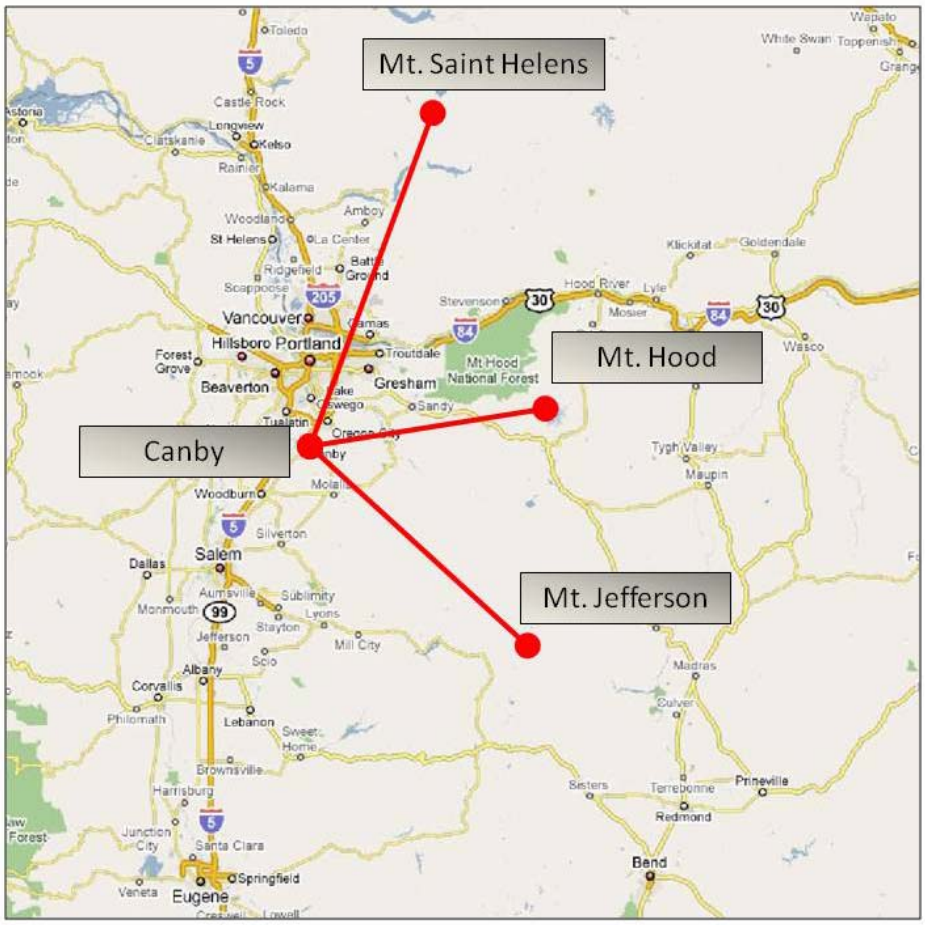
Clackamas County's Natural Hazards Mitigation Plan adequately describes the causes and characteristics of volcano-related hazards, as well as the history of volcanic events.

The historical large-scale volcanic eruptions have been described in Section 12 of the County Plan, and are applicable to City of Canby. As such, the events will not be repeated here.

Volcanic Eruption Hazard Assessment

Clackamas County's Natural Hazards Mitigation Plan adequately describes the location and extent of potential volcano-induced damages. Immediate danger areas for volcanic eruptions lie within a 20-mile radius of the blast site, and ashfall is likely to affect communities downwind of the eruption. Mount Hood, Mount Jefferson, and Mount Saint Helens are the closest of the cascade volcanoes to Canby (see Figure 6 below). Additionally, Mount Adams is located north of Mount Hood, and the Three Sisters lie to the south of Mount Jefferson.

Figure 6 Locations of Volcanoes in Relation to Canby



Due to Canby's distance from volcanoes, the city is unlikely to experience the immediate effects that eruptions have on surrounding areas (i.e., mud and debris flows, or lahars). Depending on wind patterns, however, the city may experience ashfall. The eruption of Mount St. Helens in 1980, for example, coated the Willamette Valley with a fine layer of ash.

Mount Jefferson's last eruptive episode culminated about 15,000 years ago. The volcano is capable of large explosive eruptions, meaning areas downwind are at risk of experiencing ashfall. The largest eruption of Mount Jefferson occurred between 35,000 and 100,000 years ago, and caused ash to fall as far away as the present-day town of Arco in southeast Idaho. Although an event has not occurred in a long time, experience at explosive volcanoes elsewhere suggests that Mount Jefferson cannot be regarded as extinct.[xii]

Mount Hood's last eruption ended shortly before the arrival of Lewis and Clark in 1805. When Mount Hood erupts again, it will severely affect areas on its flanks and far downstream in the major river valleys that head on the volcano. Likewise, volcanic ash may fall on areas up to several hundred kilometers downwind.[xiii] Please see Clackamas County's Natural Hazards Mitigation Plan for more details regarding Mt. Hood and Mt. Jefferson, as well as additional Cascade volcanoes.

The probability of volcanic eruptions in Canby was determined using scientific data, historical occurrences, and local knowledge. The Emergency Management Committee estimates the probability of a volcanic eruption to be 'low,' meaning no more than one incident is likely to occur within a 75 to 100 year period. This is in agreement with the county's 'low' rating.

The EMC estimates that Canby has a 'high' vulnerability to volcanic eruptions, meaning more than 10% of the population could be affected in a large-scale event. This is in agreement with the county's 'high' vulnerability rating as well.

Hazards related to volcanic eruptions (i.e., potential community impacts) are adequately described in the Clackamas County Natural Hazards Mitigation Plan. Although the City of Canby is unlikely to experience lahars or lava flows, tephra (sand-sized or finer particles of volcanic rock that is ejected rapidly into the air from volcanic vents) drifts downwind from the explosions and can form a blanket-like deposit of ash. Tephra is a public health threat, and can damage agriculture and transportation systems (i.e., aircraft and on-the-ground vehicles). Tephra can also clog drainage systems and create major debris management problems. Within Canby, public health would be a primary concern, and keeping transportation routes open/accessible would be important as well.

Existing Volcanic Eruption Mitigation Activities

The existing volcanic hazard mitigation activities are conducted at the county, regional, state, and federal levels and are described in the Clackamas County natural Hazards Mitigation Plan. As such, the information will not be repeated here.

Volcanic Eruption Mitigation Action Items

The City of Canby does not believe that implementing volcano-related mitigation activities will be cost-effective at this time. As such, the city has not identified volcanic-eruption mitigation action items. Canby will partner with Clackamas County, however, on the implementation of mitigation strategies that benefit both jurisdictions.

4.7 Multi-Hazard

Multi-Hazard Action Items (MH)

Multi-hazard action items are those activities that pertain to all seven hazards in the mitigation plan: flood, landslide, wildfire, severe winter storm, windstorm, earthquake, and volcanic eruption.

ST-MH #1: Update and revise the Canby Emergency Operations Plan.
Ideas for Implementation:

- Assign appropriate city staff to lead the EOP update process; and
- Work with the consulting firm hired by Clackamas County to update the EOP.

Coordination Organization: Canby Fire District/City of Canby
Timeline: Short Term 1-2 Years
Status: *Partially Complete.* The update process is in progress.

ST-MH #2: Ensure there are adequate shelter facilities in hazard-free zones to serve Canby residents. Identify potential shelter sites and evaluate their relative structural risks/structural deficiencies. Seek funding for upgrades on shelter sites if needed.
Ideas for Implementation:

- Identify and contact non Red Cross potential shelter sites to ensure they are structurally suitable under disaster scenarios;
- Obtain funding to enhance the resilience of emergency shelter sites; and
- Contact Red Cross shelter sites to renew and maintain agreements annually.

Coordinating Organization: Emergency Management Committee
Timeline: Short Term Ongoing
Status: *Deferred and altered from 2003 plan.* The 2009 update placed the Emergency Management Committee as the new coordinating organization. Action not implemented due to lack of organizational authority. The 2009 update includes evaluating the structural integrity of shelters and seeking funding for upgrades.

ST-MH #3: Develop, enhance, and implement education programs designed to reduce the losses from natural hazards.
Ideas for Implementation:

- Gather hazard-related information and public information materials, and disseminate to public through local publications;
- Identify property owners in hazard zones, and conduct a target mailing to disseminate hazard information;
- Publicize hazard information as the seasons for the hazards approach. These include earthquake awareness month in April, wildfire prevention in summer, and flood and severe storm information in winter;
- Hold a community meeting with the neighbors along the steep slopes of the Molalla River, and in identified landslide areas. Provide them with the proper contacts and resources for dealing with erosion control and slope stabilization on their property. Educate them on mitigation practices they can employ to better protect their property.

Coordination Organization: Emergency Management Committee
Timeline: Short Term Ongoing

Status: *Partially complete.* The county fair (Canby Fairgrounds) includes a "Safety Street" where police, fire, the forestry department, and other service organizations provide information on safety, preparedness, mitigation tips, etc. Canby Fire District educates youth on fire prevention and safety in schools, and have "Fireman Troy" and "Hotshot the Cougar" mascots to assist in educating. The Fire District website provides information on fire prevention and mitigation. Canby Utility promotes vegetation management in their newsletters. The City of Canby puts out notices in their newsletters on preparedness for bad weather and tips on reducing damages. Canby School District educates students on earthquakes and practices earthquake drills.

ST-MH #4: Integrate the goals and action items from the Canby Natural Hazard Mitigation Plan into existing regulatory documents and programs, where appropriate.
Ideas for Implementation:

- Use the mitigation plan to help the city's Comprehensive Land Use Plan meet State Land Use Planning Goal 7, designed to protect life and property from natural disasters and hazards through planning strategies that restrict development in areas of known hazards;
- Integrate the city's mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas;
- Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant at the state level; and
- Incorporate the Canby Mitigation Plan into deed restrictions and conditions of approval where appropriate.

Coordinating Organization: Emergency Management Committee
Timeline: Short Term Ongoing
Status: *Partially Complete.* Complied with the recent FEMA mandate and incorporated the mandate into code.

LT-MH #1: Improve the hazard assessment in the Canby Natural Hazard Mitigation Plan.
Ideas for Implementation:

- Continue to update the hazard assessment as the county and/or Canby acquires better data and new development occurs;
- Contract with the county or other service provider to conduct quantitative risk analysis for the natural hazard in Canby;
- Update GIS hazards maps as information becomes available;
- Use new data to guide public outreach programs and update educational outreach pieces; and
- Update codes and city policies when new data and information becomes available as required by state planning goal 7.

Coordinating Organization: Emergency Management Committee
Timeline: Long Term Ongoing
Status: *Partially Complete.* The city now has GIS capability and they paid to have a LIDAR study done.

LT-MH #2: Identify and pursue funding opportunities to develop and implement hazard mitigation activities.

Ideas for Implementation:

- Develop incentives for Special Service Districts, citizens, and businesses to pursue hazard mitigation projects;
- Allocate city resources and assistance to mitigation projects when possible; and
- Partner with other organizations and agencies to identify grant programs and foundations that may support mitigation activities.

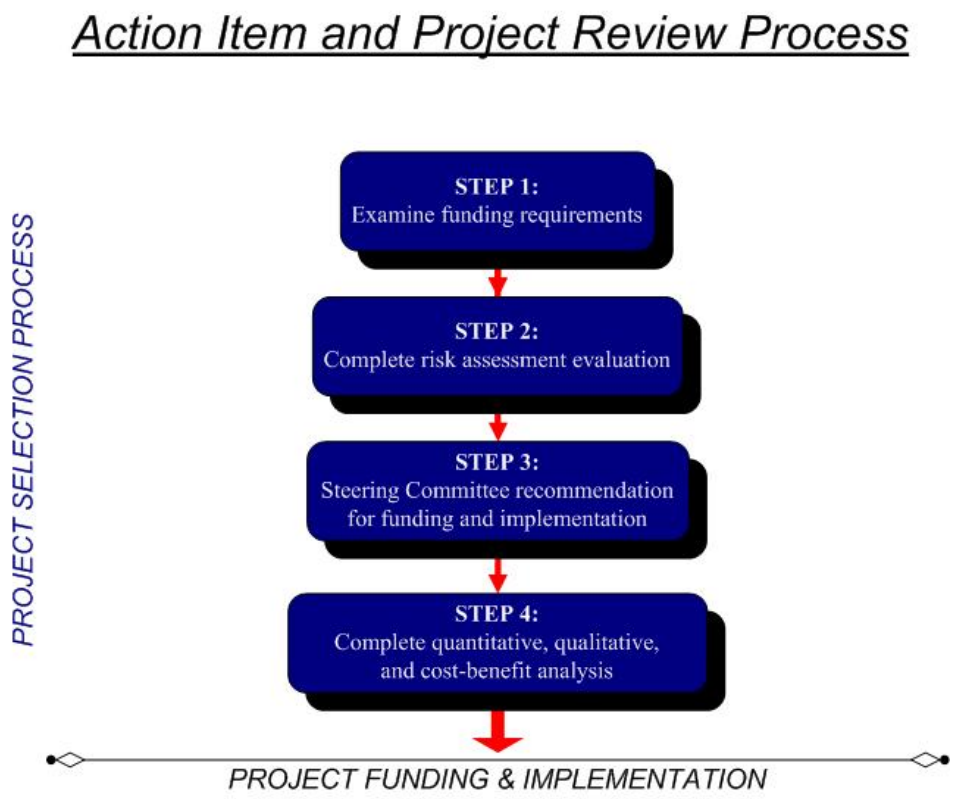
Coordinating Organization: Emergency Management Committee
Timeline: Long Term Ongoing
Status: *Added during the 2009 plan update.* Yet to be completed.

Section 5:
Mitigation Planning Priority System

5.1 Action Item Prioritization Methodology

The Disaster Mitigation Act of 2000 (via the Pre-Disaster Mitigation Program) requires that jurisdictions identify a process for prioritizing potential actions. Potential mitigation activities often come from a variety of sources; therefore the project prioritization process needs to be flexible. Projects may be identified by EMC members, local government staff, other planning documents, or the risk assessment. Figure 7 illustrates the project prioritization process.

Figure 7: Project Prioritization Process



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2008.

Step 1: Examine Funding Requirements

The Emergency Management Committee will identify how best to implement individual actions within the appropriate existing plans, policies, or programs. The EMC will examine the selected funding source's requirements to ensure that the mitigation activity would be eligible through the funding source. The EMC may consult with the funding entity, Oregon Emergency Management, or other appropriate state or regional organizations about the project's eligibility.

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 program (FMA), National Fire Plan (NFP), Community Development Block Grants (CDBG), local general funds, and private foundations.

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 EMC 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, vulnerable community assets at risk, and the probability of future occurrence documented in the plan.

Step 3: Committee Recommendation

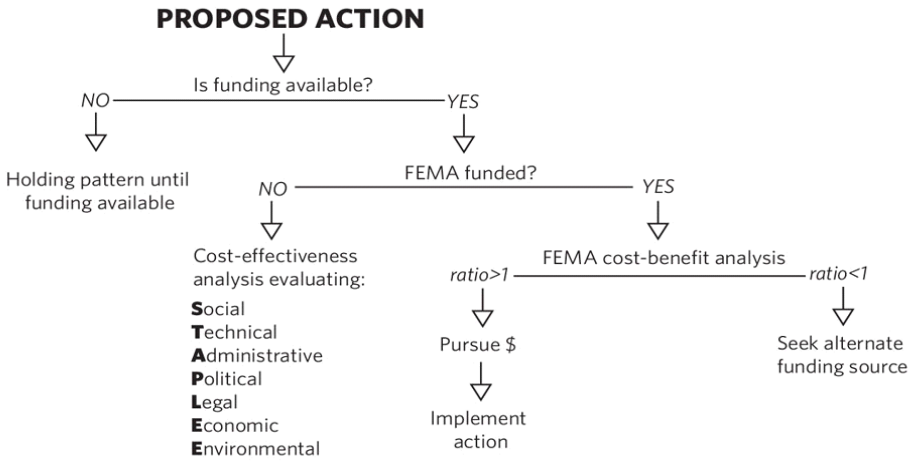
Based on the steps above, the EMC will recommend whether or not the mitigation activity should be moved forward. If the EMC decides to move forward with the action, the coordinating organization designated on the action item form will be responsible for taking further action and, if applicable, documenting success upon project completion. The EMC will convene a meeting to review the issues surrounding grant applications and to share knowledge and/or resources. This process will afford greater coordination and less competition for limited funds.

The EMC and the community's leadership have the option to implement any of the action items at any time, (regardless of the prioritized order). This allows the EMC to consider mitigation strategies as new opportunities arise, such as funding for action items that may not be of the highest priority. This methodology is used by the EMC to prioritize the plan's action items during the quarterly review and update process.

Step 4: Complete Quantitative and Qualitative Assessment, and Economic Analysis

The fourth step is to identify the costs and benefits associated with natural hazard mitigation strategies, measures or projects. Two categories of analysis that are used in this step are: (1) benefit/cost analysis, and (2) cost-effectiveness analysis. Conducting benefit/cost analysis for a mitigation activity assists 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. Figure 8 shows decision criteria for selecting the appropriate method of analysis.

Figure 8: Benefit Cost Decision Criteria



Source: Community Service Center's Partnership for Disaster Resilience at the University of Oregon, 2006.

If the activity requires federal funding for a structural project, the EMC will use a Federal Emergency Management Agency-approved cost-benefit analysis tool to evaluate the appropriateness of the activity. A project must have a benefit/cost ratio of greater than one in order to be eligible for FEMA grant funding.

For non-federally funded or nonstructural projects, 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 prioritize 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.

Section 6:
Resource Directory

The Canby Resource Directory is a supplement to the Clackamas County Master Resource Directory. It provides contact information for locals that are currently involved in hazard mitigation activities. The Emergency Management Committee may look to the organizations in the Resource Directories for partnership opportunities and technical assistance in action item implementation.

The Emergency Management Committee will continue to add contact information for organizations currently engaged in hazard mitigation activities. This section may also be used by various community members interested in hazard mitigation information and projects.

Agency	Contact Information	Type of Assistance
Canby Police Department	Address: 122 N. Holly Phone: 503-266-1104 Fax: 503-266-9316 Website: www.canbypolice.com	Law Enforcement
Canby Fire District #62	Address: 221 Pine Street Phone: 503-266-5851 Fax: 503-266-1320 Website: www.canbyfire.org	Fire Information
Canby Planning & Building Dept.	Address: 170 NW 2nd Ave. P.O. Box 930 Phone: 503-266-7001 Fax: 503-266-1574	Regulatory Codes and Ordinances
Canby Public Works	Address: 1470 NE Territorial Rd P.O. Box 930 Phone: 503-266-4021 x298 Fax: 503-266-7238	Motor Pool, Parks Maintenance, Public Works Dept, Street & Sewer Dept, Wastewater
Canby City Hall	Address: 182 North Holly Street P.O. Box 930 Phone:503-266-4021 Fax: 503-266-7961	City Administration
Canby Utility	Address: 154 NW 1st Ave. Phone: 503-266-1156	Water and Electricity
Canby Telecom	Address: 190 SE 2nd Ave. Phone: 503-266-8111 Website: www.canbytel.com	Communications
Canby Area Chamber of Commerce	Address: 191 SE 2nd Ave Phone: 503-266-4600 Fax: 503-266-4338 Website: www.canbyareachamber.org	Information Dissemination
Canby School District	Address: 1130 S. Ivy Street Phone: 503-266-7861 Fax: 503-266-0022 Website: www.canby.k12.or.us	Education Programs

[i] USGS - Partnership for Disaster Resilience Research Collaborative, 2006.

[ii] *Pop-Facts: Demographic Quick Facts Report*, Claritas Market Place, November 4, 2008

[iii] City of Canby Parks and Recreation Master Plan, 2001.
http://www.ci.canby.or.us/Departments/parks/MasterPlan/Ch2.htm

[iv] Department of Land Conservation and Development, March 2009.

[v] Oregon Department of Forestry, Institute for Natural Resources at OSU, and Oregon State University Libraries. *Wildfire Risk Explorer Advanced Mapping Tool.*
http://oregonexplorer.info/Wildfire/mappingtools/maps.aspx?Res=16166

[vi] Marion County Natural Hazards Mitigation Plan, Wildfire Chapter.

[vii] Madin, Ian, 1990. *Earthquake-hazard geology maps of the Portland metropolitan area, Oregon; text and map explanation: Portland, OR.* Oregon Department of Geology and Mineral

Industries.

[viii] Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996. *Tectonics of the Willamette Valley, Oregon.* U.S. Geological Survey Professional Paper 1560

[ix] Goldfinger, C., L. D. Kulm, R. S. Yeats, C. Hummon, G. J. Huftile, A. R. Niem, C. G. Fox, and L. C. McNeill, 1996. *Oblique strike-slip faulting of the Cascadia submarine forearc: the Daisy Bank fault zone off central Oregon*, in Subduction Top to Bottom, G. E. Bebout, D. Scholl, S. Kirby and J. P. Platt (Editors), American Geophysical Monograph 96, 65–74.

[x] The Cascadia Region Earthquake Workgroup, 2005. *Cascadia Subduction Zone Earthquakes: A magnitude 9.0 earthquake scenario.* http://www.crew.org/PDFs/CREWSubductionZoneSmall.pdf

[xi] NOAA, 1993. Tsunamis affecting the West Coast of the United States: 1806-1992.

[xii] United States Geological Survey, Cascades Volcano Observatory. Vancouver, Washington.
http://vulcan.wr.usgs.gov/

[xiii] United States Geological Survey, Cascades Volcano Observatory. Vancouver, Washington.
http://vulcan.wr.usgs.gov/

Appendix A
Planning & Public Process

MINUTES

Meeting: Canby Natural Hazard Mitigation Plan Introductory Meeting
Date: November 24, 2008
Time: 10:00am to 11:00pm
Location: Canby City Hall

1. Attendees:
    a. Dwayne Barnes, Public Works Director
    b. Matilda Deas, Building Department
    c. Jeff Crowther, Public Works Department
    d. Tom O'Connor, Canby Fire District
    e. Laurel Reimer, Clackamas County Emergency Management
    f. Kim Scheafer, City Recorder
    g. Jorge Tro, Canby Police Lieutenant
    h. Jay Wilson, Clackamas County Emergency Management

2. Project Overview
    a. The group reviewed the handout (see handout below)

3. Today's needs
    a. The group came up with the following as potential participants
        i. Canby Utility
        ii. Canby School District
        iii. Northwest Natural Gas
    b. Laurel may need assistance gathering information on the following:
        i. Employment and economics
        ii. Land use and development
        iii. Historic and cultural resources
        iv. Community organizations and programs
        v. Existing mitigation activities
    c. Matilda can help Laurel find this information using Claritas information
    d. Matilda will also be able to create maps using GIS
    e. The group will need to think about their critical facilities and infrastructures. The list will be updated and added to at the first meeting

4. Planning Process

First Planning Meeting:

During this meeting we will discuss the following:

- Review benefits of having a plan
- Review plan update requirements
- Gather information about meetings and public involvement that have taken place
- Plan Mission Statement, Goals, and Objectives
- Determine who will be the Coordinating Body
- Determine who will be the Convener
- Review community profile data and get feedback
- Review hazard data and history and get feedback
- Discuss community issues related to each hazard addressed in the plan
- Review next steps – action item updates

Second Planning Meeting:

During this meeting we will discuss the following:

- Review status of existing mitigation actions
- Review and gather feedback on proposed actions
- Review plan implementation components and update as necessary
- Discuss the formal review process and plan maintenance
- Discuss continued public involvement
- Review timeline for city review, OPDR review, FEMA review
- Review process for adoption

5. Next meeting will be December 9th or 18th in the morning

HANDOUT

What is 'natural hazards mitigation'?

Natural hazards mitigation is defined as permanently reducing or alleviating the losses of life, property and injuries resulting from natural hazards through long and short-term strategies.

Engaging in mitigation activities provides jurisdictions with a number of benefits, including reduced loss of life, property, essential services, critical facilities and economic hardship; reduced short-term and long-term recovery and reconstruction costs; increased cooperation and communication within the community through the planning process; and increased potential for state and federal funding for recovery and reconstruction projects.

Why develop a natural hazards mitigation plan?

A natural hazards mitigation plan provides a community with a set of goals, action items, and resources designed to reduce risk from future natural disaster events. The process of developing a mitigation plan can also forge new partnerships among community organizations, businesses, and local citizens. These partnerships can lead to the development and implementation of risk reduction strategies that assist the community in reducing losses from any future natural disaster events.

In 2000, Congress approved the Disaster Mitigation Act of 2000 (DMA2K). DMA2K set forth requirements for communities to develop and adopt local natural hazard mitigation plans to become eligible for mitigation grant funding, including FEMA's Hazard Mitigation Grant Program (HMGP), and Pre-Disaster Mitigation (PDM) Grant Program.

What does a mitigation plan do?

Natural hazards mitigation plans document knowledge about the problems associated with natural hazards in a community. A mitigation plan articulates goals that will guide the community in implementing short- and long-term risk reduction activities, recommending appropriate mitigation action items, and identifying resources to implement activities. Preparing a mitigation plan for your community can reduce public and private costs resulting from natural disaster events. Successes in risk reduction and loss prevention are achieved by implementing programs that address and mitigate the potential impacts natural disasters may have on society, the economy, and the environment.

How will the county help with this process?

In an effort to assist each city in their addendum development process, Clackamas County partnered with the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon to hire a Resource Assistance for Rural Environments Participant (RARE Participant). The RARE Participant was hired using funds made available through the Hazard Mitigation Grant Program, and she will work with each

participating city in developing an addendum to Clackamas County's Natural Hazards Mitigation Plan. The planning processes will occur between February and August 2009.

The RARE Participant will be responsible for developing and facilitating all natural hazards mitigation plan meetings within each city. Likewise, the RARE Participant will be responsible for documenting the results of each meeting, and preparing a draft addendum for all cities involved.

SIGN IN SHEET

Kim Scheafer	Scheaferk@ci.canby.or.us
Jorge Tro	troj@ci.canby.or.us
Dwayne Barnes	barnesd@ci.canby.or.us
Matilda Deas	deasm@ci.canby.or.us
Tom O'Connor	tomo@canbyfire.org
Jeff Crowther	crowtherj@ci.canby.or.us

Meeting: Canby Natural Hazard Mitigation Plan Meeting 1
Date: January 22, 2009
Time: 8:30am to 12:00pm
Location: Canby City Hall

AGENDA

1. Meeting Attendees
    a. Carol Meeuwsen, Canby School District
    b. Kim Scheafer, City of Canby
    c. Tom O'Connor, Canby Fire District
    d. Jorge Tro, Canby Police
    e. Barbara Benson, Canby Utility
    f. Matilda Deas, Canby Public Works
    g. Dan Mickelsen, Canby Public Works
    h. Laurel Reimer, Clackamas County Emergency Management/RARE Participant

2. Planning Process Discussion
    a. Laurel explained the "disaster cycle" to the group, stating that after an event the cycle goes from response to recovery to mitigation and finally to preparedness. Laurel emphasized that the natural hazard mitigation plan (NHMP) focuses on the mitigation portion of the disaster cycle.
    b. Laurel then showed the group the "understanding risk" diagram, saying natural hazards are chronic and potential events. We cannot always predict or control them, and they will happen. 'The vulnerable system' is the City of Canby. These are things that can be controlled. The "risk of disaster" is the overlap between natural hazards and vulnerable systems. The goal of a NHMP is to separate the two bubbles so humans can limit or mitigate any issues that can arise from the area of overlap.
    c. Lastly, Laurel explained why existing plans, policies, community organizations and programs are helpful for NHMPs. Ideally mitigation would be an element of every city plan, making it easier to infuse mitigation planning into numerous facets of the city. In the mean time, it is good to identify the plans that could have natural hazard mitigation elements in the future when those plans are updated. The group added the comprehensive plan, water master plan, stormwater plan, wastewater plan, transportation system plan, and emergency procedures to the list already created. Community organizations and programs can be used to implement natural hazard preparedness and mitigation strategies.
    d. Next, Laurel asked the group how the plan has been monitored and updated since the plan was adopted in 2003.

i. The Emergency Management Committee, identified as the Coordinating Body in the 2003 plan, held regular monthly meetings through 2007. The last meeting was in December 2007.

e. Laurel asked the group if they would like to update their mission and goals or concur with the County's Mission and Goals.
   i. The group concurred with the County's mission and goals.
f. Laurel asked the group who will be the Coordinating Body.
   i. The Emergency Management Committee (EMC) will be the coordinating body.
   ii. The EMC does not have regularly scheduled meetings but meets multiple times a year.
   iii. The 2003 plan recommended a representative from the business community or chamber of commerce be added, and this was accomplished. (who was added?)
g. Laurel asked who will serve as the Convener.
   i. The Convener changed from Canby Fire District #62 to the Canby Police Department.
h. Laurel asked the group how they will keep the public involved.
   i. The group stated they will have the plan available for viewing online. They will have hard copies available at City Hall, in the Planning Department, the Chamber of Commerce, the Police Department, the Public Library, and the Fire Station.
   ii. The group said they will hold a public meeting when deemed necessary by the EMC, such as after a natural disaster.
   iii. The group discussed creating a brochure to advertise the plan. Laurel will try to find example brochures and present them to the group at a later time.

3. Critical/Essential Facilities & Infrastructure
   a. Laurel asked the group to review and update the list of critical and essential facilities & infrastructure from the 2003 plan.
   b. The group noticed that a few of the assets listed were not within the city limits, but in some cases their emergency services respond in those areas. The group decided to star these items and make a note saying these items are not within city limits but the city will try to coordinate efforts with other agencies. Because these items are not within Canby's political jurisdiction, they will not be considered for any mitigation actions.
   c. Under "essential facilities" the group decided to take off the Red Cross Shelter designation because the list of Red Cross shelters is constantly being updated, and they do not want to advertise a potential shelter in the case it is not used as a shelter.
   d. The group added Riverside School under essential facilities

e. The group added Canby Ferry and Canby Disposal under "critical infrastructure."
f. The group added Willamette Falls Hospital, Thelma's Place, and Village on the Lochs under "Vulnerable Populations". They also changed "Canby Area Schools" to read "Canby City School."
g. Under "historical and cultural resources" the group starred Three Rivers Farm, Macksburg Church, Barlow House, Riverside School, and Canby Ferry to inform readers that these are located outside of city limits.
h. Under "Economic Assets/Population Centers" the group added Canby Fairgrounds and American Steel, changed Canby School District to Canby City Schools, and starred Pat's Acres Race Track.
i. Under "Environmental Assets" the group took out Wait Park, Canby Community Park and Eco Park, and instead wrote "Canby City Parks". The group also clarified that Bottom Lands should say Canby Utility Bottom Lands. Lastly, the group starred Molalla River State Park.
j. Under "Hazardous Materials" the group added American Steel and clarified that JB North West should read JV North West. Tom O'Connor will check if the Fire Department has more information on hazardous materials sites.

4. Mitigation Planning Priority System Discussion
    a. Laurel asked the group to review the mitigation planning priority system from the 2003 plan to see if they wanted to continue using that ranking system. The group decided to keep the same hazard rankings from the 2003 plan because not enough has happened in the last 5 years to warrant redoing the entire ranking.
    b. Rather than redoing the hazard rankings, the group decided to look at the County's probability and vulnerability ratings and determine if and why Canby's ratings are different.
    c. The group determined that they did not want to rank their action items using the point system from the 2003 plan. This will be talked about further at the second planning meeting.

5. Hazard Identification
    a. Laurel created a handout detailing each of the following hazards: flood, landslide, wildfire, earthquake, severe storm, and volcano. The group went over each hazard and added information on impacts, history, mitigation efforts, and compared Canby's probability/vulnerability to the county's ratings.
    b. Flood
        i. Exposed critical facilities include water reclamation ponds (backwash ponds)

ii. The group added culverts to the list of exposed critical facilities. Hwy 170 is referred to as S. Ivy, and Hwy 99E is referred to as SW or SE 1st Ave.
iii. The 2003 plan included some areas that are not within Canby's city limits. The group decided to make a note in the plan that these streets may be serviced by Canby emergency services, however they are not to be included for mitigation actions. These areas include S. Alder Creek Lane, Vale Garden, and Anderson Road.
iv. The Willow Creek Pump Station (servicing Willow Creek Estates & Redwood Terrace Apartments) does not pump properly in floods and cannot treat all raw sewage. The pump station overflows across the road and exposes the area to raw sewage.
v. On January 1st, 2006 the Molalla River flooded, requiring homes to be sandbagged. As a result, access to homes and businesses in this area was limited.
vi. On January 2nd, 2009 the Molalla River flooded and caused damage to access road at the water intake facilities.
vii. The group agreed with the county's hazard ratings of High probability and Medium vulnerability.

c. Landslide
    i. The group added the following to areas impacted by landslides:
        1. The Molalla River has steep slopes all along it's banks, these areas are susceptible
        2. North Baker between Knights Bridge Road and 6th
        3. Landslides could possibly affect the water intake structures. In the past, land has slide straight down and not hit the water intake structures, but if the land were to slide far enough the structures could get hit.
    ii. On January 7th, 2009 landslides occurred in the private back yards of two homes. One slide occurred on North Baker Road. It was estimated that three feet of land slid, falling 30 to 50 feet. A home on Alder Street in Knights Bridge Estates lost 10 feet of its back yard.
    iii. The City agreed with the County's High probability and Low vulnerability ratings.
    iv. Mitigation steps already taken include: In 2007 Canby Public Works abandoned a storm line that had gone over a hill on North Baker. This storm line was rerouted out of the hazard zone.
d. Wildfire

i. The group did not have any additional history or impacts, stating Canby has a very tame topography and very little urban/wildland interface.
ii. The group agreed with the county's ratings of Moderate for probability and Moderate for vulnerability.
iii. Mitigation steps taken include: Canby Fire District #62 identified alternative firefighting water sources on their maps. They also participated in creating/updating the Clackamas County Wildfire Protection Plan.

e. Earthquake
   i. Mitigation Steps taken: Retrofits include:
      1. Canby telephone switching room
      2. Water reservoir
      3. The SE 4th Street Bridge that crosses the railroad tracks may have been retrofitted
   ii. The public schools had an earthquake assessment done, and most schools fared quite well

f. Severe Storm: Wind and Winter
   i. The group stated from December 15th to 26th, 2006 a winter storm affected the City. Numerous roofs and carports were damaged or caved in and a few barns collapsed. Knight School's gutters plugged up with ice, causing water to back up and leak through the roof. The ceiling was damaged in the entry of the school, needing to be replaced. The iced roads made it very difficult to maneuver emergency equipment.
   ii. Canby agreed with the county's winter storm ratings of high probability and moderate vulnerability. They disagreed on the county's wind ratings. Canby changed both county ratings for wind, changing probability from low to moderate, and vulnerability rating from low to moderate. The reason for this is because Canby is more exposed to high winds than much of the county.
   iii. Mitigation steps taken include: a tree inventory was taken, Public Works now has a street sander and a means for applying de-icer to streets. Canby Utility is on a two year tree trimming contract to trim trees around power lines. Canby Utility also undergrounds all new facilities to they aren't susceptible to wind and winter storm events. Lastly, the City is currently reviewing and updating their street tree ordinance.

g. Volcano
   i. A potential impact could be maneuvering emergency vehicles over heavy ash covered streets. The water quality could also be affected. Volcanic ash mixed with some

precipitation on a sub station can be very dangerous and potentially conducts electricity.

ii. The group agreed with the county's low probablility and high vulnerability scores.

6. Next Time: Action Items
    a. Laurel handed out the action item worksheet and asked the group to be thinking about action items to correspond with the identified vulnerabilities. At the next meeting we will discuss action items and the formal review process.
    b. The next meeting was scheduled for Thursday, February 26th from 8:30am to 12 noon at Canby City Hall.

Natural Hazard Mitigation Plan Update Meeting

City of Canby
January 22, 2009
8:30 to 12:00

First	Last	Agency	Job Title	Email	Roundtrip Mileage
Carol	Meeuwsen	Canby School Dist.	Information Tech.	meeuwsec@canby.k12.or.us	R
Kim	Scheafer	City of Canby	City Recorder	scheaferk@ci.canby.or.us	Ø
Tom	O'Connor	Canby Fire District	Division Chief	tomo@canbyfire.org	2
Jorge	Tro	Canby Police	Lieutenant	troje@ci.canby.or.us	Ø
Barbara	Benson	Canby Utility	Exec. Assistant	bbenson@canbyutility	Ø
Matilda	Deas	Public Works	Long Range Planner	deasm@ci.canby.or.us	Ø
DAN	MICKELSEN	PUBLIC WORKS	LEADMAN	MICKELSEND@CI.CANBY.OR.US	2.5

Meeting: Canby Natural Hazard Mitigation Plan Meeting 2
Date: February 26, 2009
Time: 8:30am to 12:00pm
Location: City Hall

MINUTES

1. Meeting Attendees
    a. Carol Meeuwsen, Canby School District
    b. Jorge Tro, Canby Police
    c. Barbara Benson, Canby Utility
    d. Kim Scheafer, City of Canby
    e. Matilda Deas, City of Canby
    f. Tom O'Connor, Canby Fire District
    g. Jay Wilson, Clackamas County Emergency Management
    h. Laurel Reimer, Clackamas County Emergency Management

2. Formal Review Process and Plan Maintenance
    a. Laurel provided the committee with a handout of questions to answer for maintaining the plan.
    b. The group decided they will assign representatives to the committee, not the City Council
    c. The committee will meet twice a year, once in the spring and again in the fall
    d. At each meeting the committee will identify funding for the implementation of mitigation strategies, evaluate the effectiveness of the plan, develop new mitigation strategies to reduce losses from natural hazards, and detail any new hazard events.
    e. The NHMP will be formally evaluated every 5 years in conjunction with the county's update schedule. This puts the next Canby update at September, 2012.
    f. The convener will be responsible for initiating the update process.
    g. The convener or designee will be responsible for updating the NHMP.
    h. The plan will have a one-year timeline for update. The update process will begin one year before the update is due, meaning the plan will next be updated beginning in September 2011.
    i. Laurel included a list of questions the committee should ask for future meetings. This list will be included in updated addendum.
    j. The convener will submit the updated addendum to OEM.

3. Review Anatomy of an Action Item
    a. Laurel provided the committee with a handout that detailed the parts of an action item and explained ideas for implementation, coordinating organization, timeline, and status.

4. Update and Brainstorm Action Items
   (120 minutes)
   a. Laurel provided the committee with a handout of the 2003 action items, as well as a few recommended action items.
   b. The group reviewed the 2003 action items and listed any accomplishments.
   c. The updated list of action items can be viewed in a separate attachment

5. Next Steps
   a. Finally, Laurel told the group how the rest of the update process will go. Laurel will create a draft and send it to the committee for review. Once the committee has reviewed it, the document will be sent to the Oregon Partnership for Disaster Resilience for review, and then returned for a second committee review if changes need to be made. Finally the document will be FEMA for pre-approval.
   b. Once FEMA has pre-approved the addendum, it will come back to the city for adoption by the City Council. Once the plan is adopted it will be sent to FEMA for formal approval.

Natural Hazard Mitigation Plan Update Meeting 2

City of Canby
February 26, 2009
8:30 to 12:00

First	Last	Agency	Job Title	Email	Roundtrip Mileage
Carol	Meeuwsen	Canby School District	Pub/Tech Mgr	meeuwsec@canby.k12.or.us	3
Jorge	Tro	Canby Police	Lieutenant	trojc@ci.canby.or.us	—
Barbara	Benson	Canby Utility	Exec. Asst.	bbenson@canbyutility.org	-
Kim	Scheafer	City of Canby	City Recorder	scheaferk@ci.canby.or.us	-
Matilda	Deas	City of Canby	Long Range Planning	deasm@ci.canby.or.us	—
Tom	O'Connor	Canby Fire District	Division Chief	tomo@canbyfire.org	—
Jay	Wilson	CC Emerg. Mgmt	Haz Mit. Coord.	jaywilson@co.clackamas.or.us	