

CITY OF SEASIDE MEMORANDUM

To: Mayor & City Council
From: Community Development Department
Date: May 11, 2015
Subject: Resolution #3839, Natural Hazards Mitigation Plan Adoption

Background:

The City Council adopted a draft of Seaside's Annex to the County's Natural Hazards Mitigation Plan (NHMP) on February 11th, 2013. The County's Plan, along with all of the other local city annexes were then updated and sent to Oregon Emergency Management (OEM) for preliminary review prior to submittal to the Federal Emergency Management Agency (FEMA). Based on OEM's comments, minor modifications were made to Seaside's draft plan, along with all of the other segments of the County's plan, before it was submittal to FEMA.

FEMA has now provided pre-approval of the updated plan subject to adoption by resolution by the County and all of the local jurisdictions. Approval by FEMA is required in order for a jurisdiction to be eligible for funding assistance from three federal programs: The Pre-Disaster Mitigation Grant Program (PDMGP), the Hazard Mitigation Grant Program (HMGP), and the Flood Mitigation Assistance (FMA) program.

The attached resolution (Res. #3939) will formally adopt Seaside's amended annex to the County's NHMP. This will be combined with the entirety of the Clatsop County NHMP currently slated for adoption by the Board of Commissioners on May 13th. These plans are dynamic documents that can be updated at any time; however, FEMA requires formal updates every five years.

Recommended City Council Action:

After hearing any public comments on Resolution 3839; review Seaside's annex to the Clatsop County NHMP, and determine if the resolution should be read by title only, prior to adoption.

RESOLUTION #3839

A RESOLUTION OF THE CITY OF SEASIDE, OREGON, ADOPTING THE CITY OF SEASIDE'S ANNEX TO THE CLATSOP COUNTY NATURAL HAZARDS MITIGATION PLAN

WHEREAS, response to and recovery from major emergencies and disasters requires proper pre-planning; and

WHEREAS, the City of Seaside has updated there draft annex to the Clatsop County Natural Hazards Mitigation Plan created in 2013; and

WHEREAS, the adoption of a Clatsop County Natural Hazards Mitigation Plan is required to seek assistance through FEMA for Pre-Disaster Mitigation, Hazard Mitigation and Flood Mitigation funds; and

WHEREAS, the use of the Natural Hazards Mitigation Plan will assist the City to better plan for and mitigate natural hazards in a more effective manner, so as to better protect and serve our citizens in times of crisis; and

WHEREAS, the adoption of the Natural Hazards Mitigation Plan provides a collaborative and community-wide view of the specific hazards and recommended mitigation strategies; now, therefore,

THE SEASIDE CITY COUNCIL RESOLVES AS FOLLOWS:

SECTION 1. The City Council hereby adopts the City of Seaside Annex to the Clatsop County Natural Hazards Mitigation Plan attached to this resolution.

SECTION 2. The City's Natural Hazards Mitigation Plan Annex will be available for viewing on the City website and the entire County Plan is available via the County website or in office of the Emergency Management Division.

SECTION 3. This Resolution shall become effective upon Council adoption.

PASSED by the Council of the City of Seaside this 11 day of May, 2015.

SUBMITTED to the Mayor and APPROVED by the Mayor this 12 day of May, 2015.



DON LARSON, MAYOR

ATTEST:



Mark J. Winstanley, City Manager

Volume III: City Addendum

Seaside

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Overview

The City of Seaside has developed this addendum to the Clatsop County multi-jurisdictional Natural Hazards Mitigation Plan (NHMP) in an effort to increase the community's resilience to natural hazards. The addendum focuses on the natural hazards that could affect Seaside, Oregon, which include coastal erosion, wildfires, droughts, floods, landslides, volcanoes, winter storms, tsunamis, earthquakes, and tornadoes. This plan addresses the specific challenges and sensitivities faced by the city, as well as the local resources to mitigate these risks. It is impossible to predict exactly when disasters may occur, or the extent to which they will affect the City. However, with careful planning and collaboration among public agencies, private sector organizations, and citizens within the community, it is possible to minimize damage and speed recovery from natural disasters.

This addendum provides a set of actions that aim to reduce the risks posed by natural hazards through education and outreach programs, the development of partnerships, and the implementation of preventative activities such as infrastructure improvements. Natural disaster planning is prudent both economically and socially; it can profoundly reduce the loss of hundreds, if not thousands of lives, and ensure an easier path to recovery after a significant event.

This addendum to the County's Multi-Jurisdictional Plan is comprised of the following sections:

- 1) Public Outreach: This section describes the process the city used to develop the plan, city staff's participation, and the stakeholder committees involvement in the planning process.
- 2) Community Profile: This chapter provides background information about the city's demographics, infrastructure and socio-economic conditions.
- 3) Hazard Assessment: The Hazard assessment includes a description of potential natural hazards that could trigger emergency conditions in Seaside. This information is intended to supplement the hazard information in the County NHMP by identifying risks that are specific to Seaside or vary from the concerns in the County's broader plan.
- 4) Action Items: The Plan includes a list of recommended action items based on input from the city staff and community stakeholders.

Section 1:

Public Outreach

The City of Seaside has taken several steps to build public support for the Natural Hazard Mitigation Plan and develop coalitions to oversee implementation of the plan's action items. The involvement of community groups as well as the emergency responder community and city administrators will ensure that the plan reflects progress on the ground towards a more resilient and prepared Seaside.

1.1 Stakeholder Involvement

Tsunami Advisory Group

The Tsunami Advisory Group (TAG) is a volunteer group of citizens that meets regularly to organize outreach events and support the city's efforts to prepare for a Cascadia Subduction Zone (CSZ) earthquake and tsunami event. The TAG influenced the development of the plan's recommendations for future action through the group's independently drafted *Tsunami Strategic Investment Plan, Seaside, Oregon: Education, Evacuation and Survival, 20,000 refugees for 20 Days by 2020*, which was completed by the group in 2009 and updated in 2012. TAG members were also asked to review a working draft of the city's NHMP, and were considered the technical advisory committee for the plan.

Emergency Preparedness Committee

The City of Seaside operates the Emergency Preparedness Committee (E-PREP) to coordinate internal hazard planning and community preparedness activities across city departments. The committee is composed of all department heads, as well as the director of the Seaside visitor's Bureau and the communication director for the Seaside Police Department. In the event of an emergency, this committee will be responsible for staffing the Seaside Emergency Operation Center (EOC) and coordinating the city's response and recovery efforts, in partnership with outside agencies as needed. The E-PREP Committee completed the City's Emergency Operation Plan in 2010. This document defines how the City of Seaside will organize and respond to incidents.¹ The E-PREP Committee served as a local stakeholder advisory group for the Seaside Addendum planning process.

City of Seaside Staff

The initial Seaside Addendum was compiled and written by City Planning Director Kevin Cupples, with assistance from RARE (Resource Assistance for Rural Environments) participants Joe Otts and Sarah Bronstein. Sarah Bronstein was contracted through the RARE program as an Emergency Preparedness Assistant for the City, a position which included coordinating school outreach and organizing the restocking of tsunami supply barrels in addition to assisting with the City's NHMP Addendum. Five year updates will be accomplished by current planning staff.

Clatsop County

This Addendum was initiated as part of a County-wide planning effort that began in 2006, when FEMA awarded Clatsop and Lincoln Counties a grant to support the development of Natural Hazard Mitigation Plans for both counties and the cities in their jurisdiction. This grant was acquired through a partnership with the Oregon Partnership for Disaster Resilience (OPDR) at the University of Oregon's Community Service Center and Oregon Emergency Management (OEM). The grant was awarded in 2006, and planning efforts began in 2007. Although Seaside was included in the initial planning process, the city's plan was not finished at that time. Since the beginning of the County-wide Natural Hazard Mitigation Planning Process in 2007, the City of Seaside's Planning Director, Kevin Cupples, and the School District Superintendent Doug Dougherty, have been members of Clatsop County's NHMP Steering Committee.

Seaside's plan addendum has now been completed concurrently with the County's NHMP 2013 update. This addendum is consistent with the updated county plan, and is intended to be implemented in conjunction with county-wide planning efforts. The Seaside Addendum will be updated on a five year basis by the E-PREP Committee, TAG, and planning staff to maintain consistency with the County-wide NHMP.

In addition, the city E-PREP group will continue to meet regularly to consider updates to the Seaside City Addendum. Any formal updates generated at these meetings will be presented to the city council on an annual basis for review and adoption.

1.2 Planning Timeline

June – October, 2012: Background Research

- Gather data and background information, including city history, local hazard maps, and census data. Review existing plans and policies.

December, 2012: Plan and Guideline Review

- Review adopted plans for the neighboring jurisdictions of Astoria, Cannon Beach and Gearhart.
- Refine plan outline based on these examples.
- Review FEMA's Local Plan Review Guide for guidance.

January 1-10th, 2013: Assemble Stakeholders

- Alert all stakeholder groups (TAG, E-PREP, OEM and OPDR) of pending rough draft and timeline for review and comments. Solicit components of plan from specific groups.
- January 8th 2013: City Department Heads Meeting. Planning Director Kevin Cupples alerted E-PREP members of the timeline for the plan.

- January 10th, 2013: Tsunami Advisory Group Meeting. City planning staff attends to provide the timeline for the plan and solicit plan components regarding recommended infrastructure improvements for tsunami hazard mitigation.

January, 2013: Rough Draft Development

- Identify elements of TAG Strategic Investment Plan and any additional projects and/or mitigation measures to include in the plan.
- Include tsunami debris component (modeled after County's draft language).
- Prepare a school campus relocation component with input from School District.

Seaside NHMP Rough Draft Comment Period: January 25th – February 6th, 2013

- Consolidate all updated information into working draft and submit draft to TAG, County Emergency Management, E-PREP, OPDR and Seaside Public School District for review and comment.
- Submit amended plan draft to E-PREP for final comment.

February, 2013: Public Review and Plan Adoption

- City Planning Department submits final draft to City Council for review, February 7th, 2013.
- Plan is presented to City Council, Monday, February 11th, 2013. Opportunity for public comment and recommendation by the Council on plan submittal. Council approves draft for submittal pending FEMA approval.
- Forward plan to County Emergency Manager Director & State Emergency Management Director for final review & submittal to FEMA.
- Once FEMA has approved the plan, submit to City Council for final adoption.

Clatsop County NHMP Steering Committee Meetings & Coordination

- **Clatsop County Emergency Management conduct county wide steering committee meetings to discuss NHMP update process. These activities are documented in the County Plan**
- **County provides draft city addendum with comments from OEM.**
- **May 27, 2014, review update drafts, discuss FEMA approval process and future plans for the committee.**
- **October 31, 2014: City draft addendum addressing OEM comments is submitted to Clatsop County for final inclusion into the county plan for FEMA review**

Plan Adoption

The Seaside City Council adopted the final City of Seaside Addendum to the Clatsop County Natural Hazard Mitigation Plan by the adoption of **Resolution 3839 on May 11, 2015.**

Section 2 Community Profile

The following section describes the City of Seaside 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 populations that may be impacted by natural hazards. 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, directives, 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 risk assessment, should be used as the local level rationale for the risk reduction actions identified in this addendum. The identification of actions that reduce the City's sensitivity and increase its resilience assist in reducing overall risk.

2.1 Geography & Climate

The City of Seaside is located on the Oregon Coast at the southern end of the Clatsop Plains and about 18 miles south of the mouth of the Columbia River (Figure 2.1). The Necanicum River bisects the town and flows out to the ocean at the northern edge of town.

The City of Seaside's climate is considered moderate. Summer temperatures average in the 50's and 60's, while winter temperatures range from the high 30's to 40s, respectively (see Table 2.1). But while the temperatures are mild year round due to the city's proximity to the ocean, the city also experiences high levels of precipitation and occasional high winds. The city receives approximately 75.74 inches of precipitation annually (see Table 2.2).ⁱⁱ Winter storms are of particular concern to the city because of the potential damage caused by strong winds accompanied by heavy rainfall.

Table 2.1 Normal Temperatures in Seaside, OR

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Max °F	51.6	54	55.8	58.4	61.9	64.8	67.7	69	69.6	63.6	55.7	51.6	60.3
Mean °F	45.1	46.7	48	50.4	54.2	57.5	60.3	61.2	59.8	54.6	48.7	45	52.6
Min °F	38.5	39.4	40.2	42.4	46.5	50.2	52.9	53.3	50	45.5	41.7	38.4	44.9

Source: NOAA

Table 2.2 Average Precipitation in Seaside, OR

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Inch	10.3	9.57	8.44	5.74	3.96	3	1.63	1.34	3	6.07	11.38	11.34	75.74

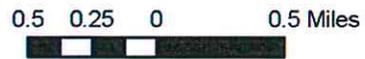
Source: NOAA

Figure 2.1 Map of Seaside

 Seaside City Limits



Disclaimer:
This data was produced using Clatsop County GIS data. The data is maintained by Clatsop County to support its governmental activities. Clatsop County is not responsible for any map errors, possible misuse, or misinterpretation.



Source: Clatsop County

2.2 Population & Demographics

Seaside sits at the mouth of three primary rivers that combine to form a tidally influenced estuary: the Necanicum River, Neawanna Creek and Neacoxie Creek. This site was once populated by three villages of the Clatsop Tribe of Native Americans, who relied heavily on salmon and shellfish for their diet. The tribe dwindled following the arrival of Lewis and Clark’s party in 1805 and the subsequent western settlement of the area, with most members moving to the Grand Ronde Reservation by the late 1800’s. In 1852, two entrepreneurs purchased 6,112 acres and constructed a summer boarding house, establishing Seaside as a summer tourism destination for Portland residents. By 1900 Seaside – named after one of the first established “summer houses,” the Seaside House, – had evolved into two separate towns, Seaside and West Seaside, on separate sides of the Necanicum River. By 1902 the combined population was 500 and during the summer, populations would rise to 5,500-10,500. The two cities, Seaside and West Seaside (incorporated in 1899 and 1905, respectively), merged in 1913.ⁱⁱⁱ

Table 2-3 shows population trends between 1980 and 2010 for Seaside, Clatsop County, and the State of Oregon. Seaside grew by 1,264 persons or 24.3% between 1980 and 2010. Little growth occurred in Seaside during the 1980s. Seaside grew at an average annual rate of 1.0% from 1990 to 2000. This growth rate is lower than Oregon’s 2.0% growth rate, but higher than the 0.7% growth rate of Clatsop County. Between 2000 and 2010, Seaside grew at an average annual rate of 0.9%, a rate more than twice that of the County but still less than the state of Oregon overall (see Table 2.3).

Table 2.3 Population Trends, Seaside, Clatsop County, and Oregon, 1980-2010

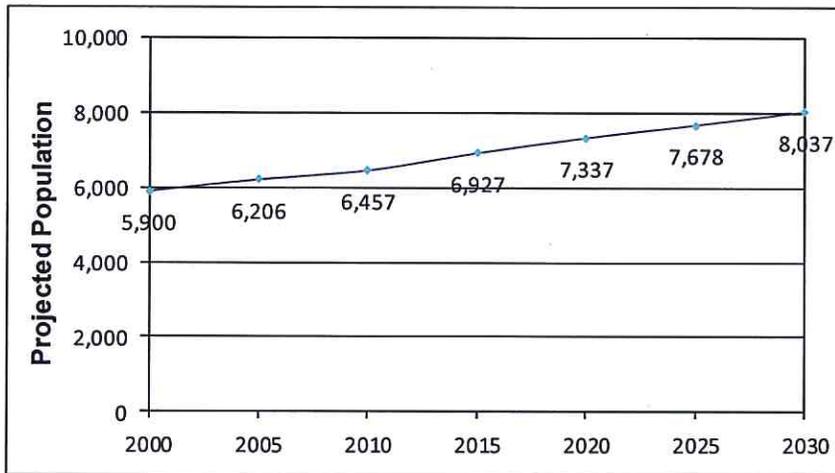
Year	Seaside	AAGR	Clatsop County	AAGR	Oregon	AAGR
1980	5,193		32,489		2,633,105	
1990	5,359	0.3%	33,301	0.2%	2,842,321	0.8%
2000	5,900	1.0%	35,630	0.7%	3,421,399	2.0%
2010	6,457	0.9%	37,039	0.4%	3,831,074	1.2%
Change 1980-2010						
Number	1,264		4,550		1,197,969	
Percent	24.3%		14.0%		45.5%	

Source: US Census

AAGR = Average Annual Growth Rate

The county coordinated 2030 population forecast for Seaside is 8,037 (Figure 2.2). The coordinated forecast indicates Seaside will add 1,580 persons between 2010 and 2030, an increase of nearly 25%. The forecast assumes an average annual growth rate of 1.2%—a figure slightly higher than the growth experienced between 2000 and 2010.

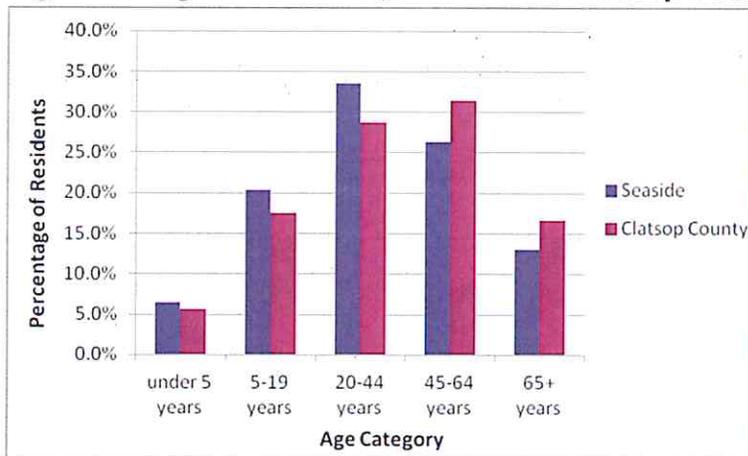
Figure 2.2 Population Forecast, Seaside UGB, 2000-2030



Source: 2000, 2010 population from US Census, 2005-2030 estimates from county coordinated population forecast.

The resiliency and recovery rates after a disaster vary among population groups, with some being more sensitive to natural hazards than others. A disproportionate burden is placed upon dependent populations, particularly children, the elderly, the disabled, minorities, and low income persons. Portions of Seaside’s residents fall into these special needs populations. Over 8% of the city’s households report speaking a primary language other than English at home. Between 2006 and 2010, an estimated 17.3% of all individuals and 15.2% of families in Seaside were living below the federal poverty level over at least a 12 month period.^{vi} Approximately 17% of residents are over 65 years of age, and 25% are between the ages of 0 and 19 (see Figure 2.3).

Figure 2.3 Age Distribution, Seaside and Clatsop County, 2010



Source: US Census, 2010

2.3 Employment & Economics

From 2006-2010, an estimated 32.8% (1,011 individuals) of Seaside's employed population 16 years and over were working in "service occupations," 24.4% (754 individuals) in "sales and office occupations," and 26.1% (805 individuals) in "management, professional, and related occupations." An additional 9.5% (294) of the employed population were classified under "production, transportation, and material moving occupations" and 7.1% (220 individuals) under "natural resources, construction, and maintenance occupations."^{iv}

Seaside's economy is heavily reliant on tourism. Currently, there are over 300 vacation rental dwellings and approximately 1,350 transient room accommodations divided up among 37 buildings within the city. In 2002, the top four employers in Seaside were the Seaside School District (187), Providence Seaside Hospital (185), Safeway (160), and the City of Seaside (80).^v Table 2.4 shows a breakdown of employment in Seaside by industry. 3,446 employees work in tsunami prone areas within the city, and are considered an at-risk population in the event of a local tsunami incident.

Median income can be used as an indicator of the strength of the region's economic stability. From 2006-2010, the median household income in Seaside was about \$36,670. This is more than \$15,000 below the 2006-2010 national median household income of \$51,914, and nearly \$6,000 below the \$42,211 median household income for Clatsop County.^{vi} Although it can be used to compare areas as a whole, this number does not reflect how income is divided among area residents.

Table 2.4 Employment by Industry, City of Seaside, 2006-2010

Industry	Percent
Arts, entertainment, recreation, accommodation and food services	29.0%
Educational, health and social services	21.1%
Retail trade	16.9%
Professional, scientific, management, administrative, and waste management services	7.8%
Construction	6.6%
Finance, insurance, real estate and rental and leasing	4.4%
Manufacturing	4.1%
Transportation and warehousing, utilities	2.7%
Other services (except public administration)	2.4%
Information	2.0%
Public administration	1.7%
Agriculture, forestry, fishing and hunting, and mining	0.9%
Wholesale trade	0.4%

Source: US Census, 2006-2010 American Community Survey 5-Year Estimates

2.4 Housing

Housing type and year-built dates 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 older homes are not built to current building codes and pose a greater seismic risk than newer structures. In addition, FEMA began assisting communities with floodplain mapping in 1978, and communities have developed ordinances that require homes in the floodplain to be elevated to one foot above Base Flood Elevation.

In 2010, the City of Seaside had 4,638 housing units. Of those, 28.4% (1,317) were owner occupied, 35.6% (1,652) were renter occupied, and 36.0% were vacant (1,669). Of the vacant housing, 75.7% (1,264) are for seasonal, recreational, or occasional use.^{vii} Around 65% of the city's housing stock was built prior to 1980, before stronger seismic building codes were put into place. Other housing characteristics for Seaside are provided in Tables 2.5 and 2.6.

Table 2.5 Housing Type, City of Seaside, 2006-2010 Estimates

Housing Type	Percentage
Single-Family and Duplexes	67.0%
Multi-Family	32.9%
Mobile Home	4.5%
Boat, RV, van, etc.	0.3%

Source: US Census, 2006-2010 American Community Survey 5-Year Estimates

Table 2.6 Housing Structure Age, City of Seaside, 2006-2010 Estimates

Year Built	Percent of Structures
1980-2009	35.4%
1960-1980	24.1%
Before 1960	40.5%

Source: US Census, 2006-2010 American Community Survey 5-Year Estimates

According to the 2010 American Community Survey 5-year estimates, the median rent in Seaside from 2006-2010 is estimated at \$741/month, and the average home value is estimated at \$263,600.

Of all developed land in the City of Seaside, 87% lies within DOGAMI's estimated local tsunami inundation zone. This area includes 4,790 residents.^{viii}

2.5 Land Use & Development

Development in Seaside is mostly on a two-mile strip between the Pacific Ocean and Neawanna Creek (see Figure 2.4). The city's central core has undergone revitalization and new construction in recent years to cater to the tourist and service industries. Although infill development continues to occur in this area, most new development occurs in the outer areas away from the central business district.

Building permits issued for new residential dwellings fluctuated between 6 and 54 per year between 2001 and 2011, with an average of 31 permits issued each year (see Table 2.7). The number of units built exceeded the number of buildings permits, indicating that some multi-family residential structures were built.

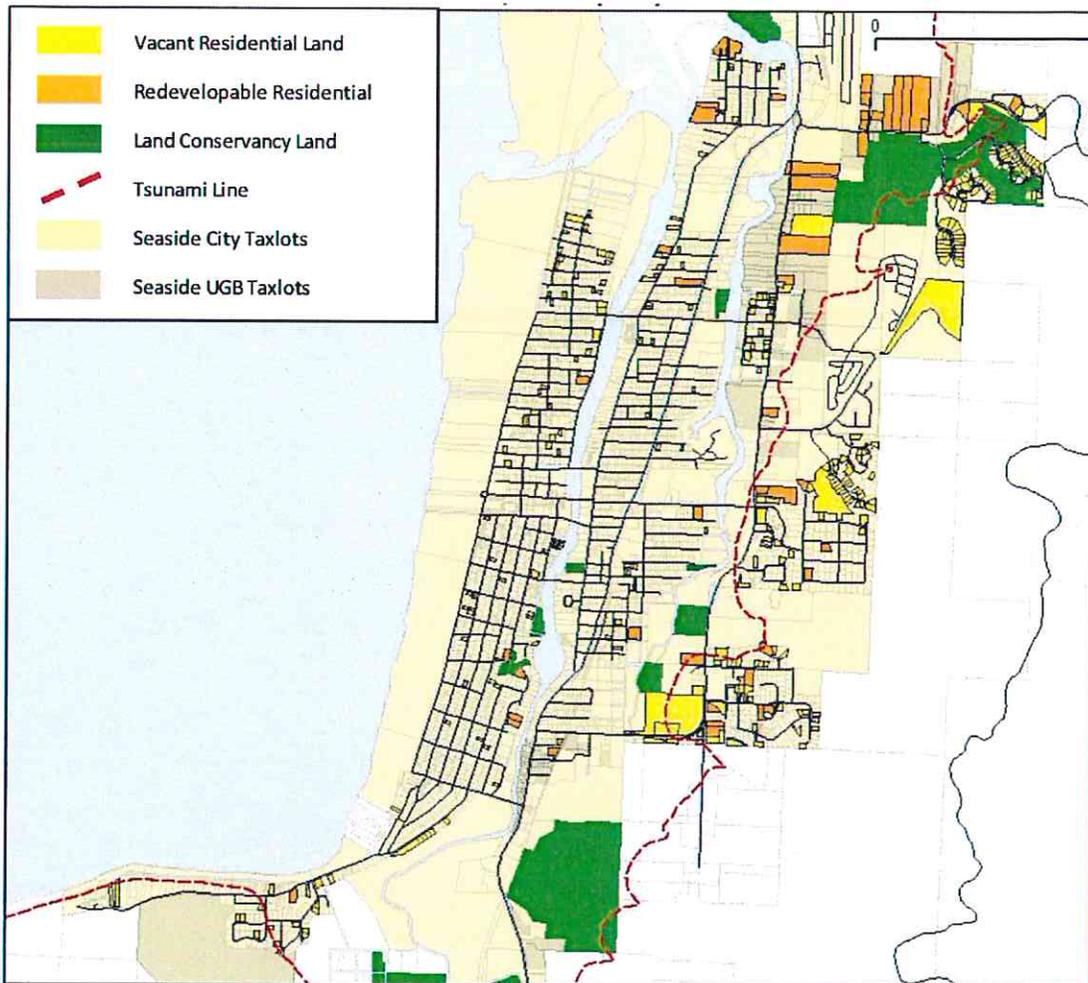
Table 2.7 Building Permits Issued in Seaside, 2001-2011

Year	Building Permits	Units Built
2001	19	19
2002	48	55
2003	35	43
2004	41	63
2005	46	47
2006	40	95
2007	54	54
2008	27	27
2009	6	6
2010	17	17
2011	10	10

Source: US Census, Current Construction Reports

Additional growth is limited by water bodies and designated rural land uses surrounding the city's Urban Growth Boundary (UGB). The city's Comprehensive Plan identifies land use needs and designations within the city and the UGB. A buildable lands assessment conducted in 2012 found that, based on current development trends, housing demand by 2032 will require the development of 1,425 new housing units, of which 61% will be ownership units and 39% will be rental units. This far exceeds current available capacity of buildable lands. (See Figure 2.4)

Figure 2.4 Residential Buildable Lands



Source: Clatsop County, City of Seaside, Johnson Reid LLC

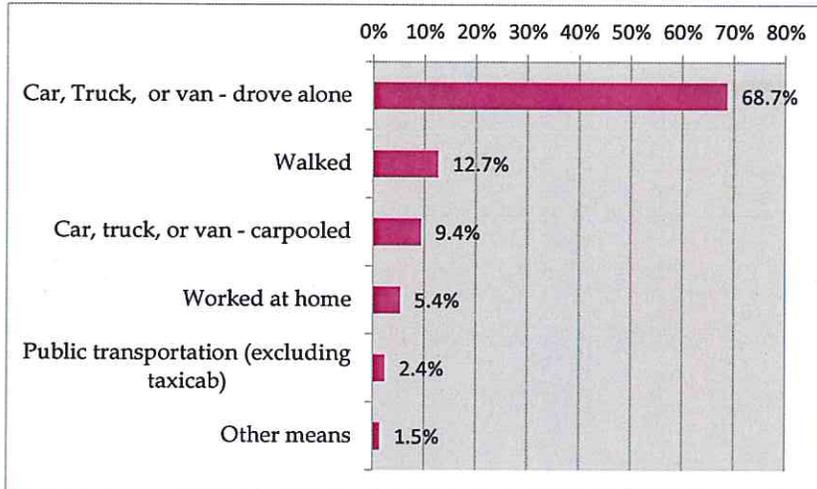
In the 2007 Study by the US Geological Survey titled *Variations in City Exposure and Sensitivity to Tsunami Hazards in Oregon*, Seaside was found to have the highest level of exposure and sensitivity to tsunami hazards of any Oregon Coast community, due to the location of both a high *number* and *percentage* of dependent population facilities, public venues, overnight tourist facilities, and vulnerable or dependent population centers within tsunami-prone areas.^{ix}

2.6 Transportation

Transportation is an important consideration when planning for emergency service provisions. Growth within the city will continue to put pressure on both major and minor roads. Figure 2.6 depicts the transportation system in Seaside, as defined in the city's Transportation System Plan. Currently both residents and employees of Seaside rely heavily on U.S. Highway 101, which runs north-to-south through Seaside and is the only

major arterial road in or out of the city. The reliance on this facility makes Seaside especially vulnerable to road closures due to flooding, landslides, accidents or windfalls. Seaside is primarily dependent on private vehicles, with 68.7% of all commute trips made by single occupancy vehicle, although a significant percentage, 12.7%, walk to work (see Figure 2.5).

Figure 2.5 Transportation Type Used to Commute to Work in Seaside

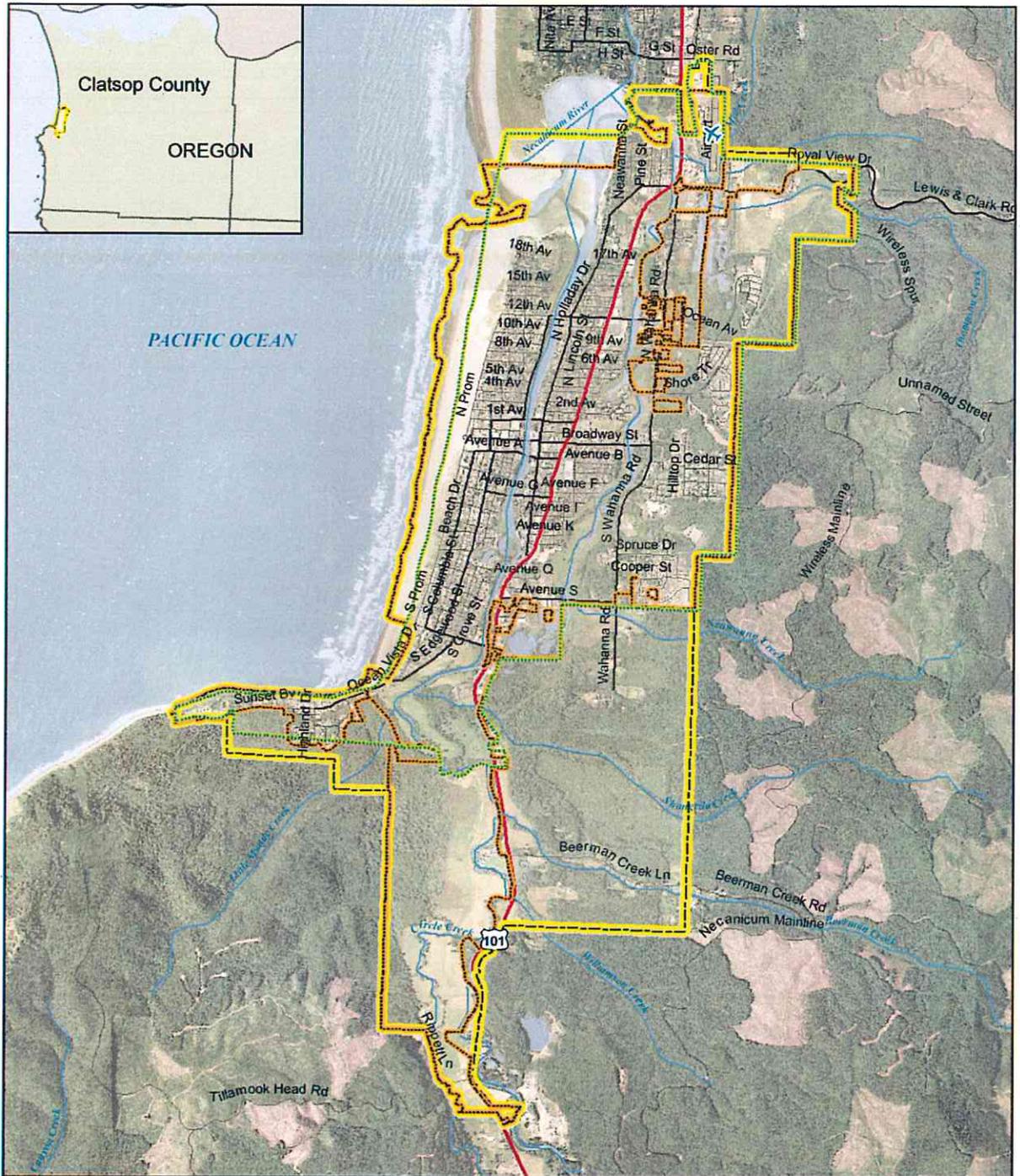


Source: US Census, 2006-2010 American Community Survey 5-Year Estimates

Currently, Seaside is served by the Sunset Empire Transportation District. The bus connects Cannon Beach, Seaside, Gearhart, Warrenton and Astoria. There are four bus stops in Seaside. Seaside maintains an airport; the airport is a small airstrip, generally useable by light single engine and twin aircraft only.^x

Seaside has 12 major bridges within the urban growth boundary, nine of which are owned and operated by the City of Seaside. There are six bridges in Seaside crossing the Necanicum River; these bridges are located on Avenue U, Avenue G, Avenue A, Broadway (one way east to west), 1st Avenue and 12th Avenue (Figure 2.5). Four bridges cross Neawanna Creek at Avenue S, Broadway and 12th Avenue, and on highway 101 at the northern end of town. The bridge crossing the Neawanna to the north on Highway 101 and the Dooley Bridge to the south on Highway 101, are maintained by the Oregon Department of Transportation. Only four of these bridges, located at 1st and 12th Avenues over the Necanicum and at Broadway and 12th over the Neawanna, are considered seismically sound enough to withstand a significant earthquake. All other bridges may fail to some degree in an earthquake, which poses a significant risk if the earthquake is large enough to trigger a tsunami requiring immediate evacuation to high ground.

Figure 2.6 Seaside Transportation System



LEGEND

Study Area	Major Collector
Urban Growth Boundary	Minor Arterial
City of Seaside Boundary	Local Road
	Highway 101

0 1
 Miles

**Transportation System Plan
Study Area**
 City of Seaside, Oregon
 Transportation System Plan

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2.7 Critical Facilities & Infrastructure

Critical facilities are those that support government and first responders' ability to take action in an emergency. The following facilities are critical systems that provide essential services to the residents of Seaside and surrounding communities. Damage to, or destruction of, these infrastructure systems would cause significant hardship to residents, and significantly hamper short and long term relief efforts after an incident.

Public Facilities

- 911 Call Center
- City Administrative Offices
- Police and Fire Stations
- Public Works Facilities
- Bridges and Roads
- Seaside Airport
- Water and Sewage Treatment Facilities
- Water Reservoirs and South Fork Diversion Supply Line
- Seaside High School, Broadway Middle School, and Seaside Heights Elementary
- Convention Center
- Community Center
- Seaside Public Library

Private Utilities and Social Services

- Natural Gas Lines (Provided by Northwest Natural Gas)
- Electric Utility Lines (provided by Pacific Power and Light)
- Providence Seaside Hospital
- Churches
- Adult Care Facilities

Transient Accommodations

- Hotels, Motels, timeshares and Bed and Breakfasts
- Vacation Rental Dwellings

2.8 Historic & Cultural Resources

Historic and cultural resources such as historic structures and landmarks can help to define a community and may also be sources of tourism dollars. Because of their role in defining and supporting the community, protecting these resources from the impact of disasters is important.

The National Register of Historic Places lists three buildings as historic sites within the City of Seaside: the William and Nellie Fullam House (781 S. Prom), the Haller-Black House (841 S. Prom), and the Charles Preston House (141 Avenue I).^{xi}

Seaside is the site of the Saltworks, the western-most camp of the Lewis and Clark Expedition party. Today the approximate site of the original Saltworks has been recreated on Lewis and Clark Avenue and preserved as a National Historic Site on the Lewis and Clark Trail.

In addition to these formally recognized sites, there are a number of known archaeology sites located throughout Seaside. Most of these sites are significant Native American village sites that are protected under Oregon State Law.

Seaside is also a major tourist destination. Tourist and recreation facilities such as the Seaside Civic Convention Center, the oceanfront promenade, and the park system accommodate and support the tourist industry. Seaside hosts a number of events that take advantage of the natural environment including the Beach Volleyball Tournament, the Hood-to-Coast Relay, the Lewis and Clark Kite Exposition, the Sand Sculpture and Beach Festival, and the Lewis and Clark Saltmakers Return. Many of these events are located on the beach and "The Promenade." The Promenade is a 1.5-mile concrete walkway that parallels oceanfront beach. The Promenade runs from 12th Avenue on the north end to Avenue U on the south end.

2.9 Government Structure and Institutions

The City of Seaside currently has the following departments^{xii}:

City Council: The City Council consists of six elected members and the Mayor. Each councilperson serves a four-year term. They meet on the 2nd and 4th Monday of every month.

City Manager: The City Manager is the administrative head of the city government. In addition to the daily operation of the city, he implements policies and goals set by the City Council. In the event of an emergency, the City manager acts as the Incident Commander, as stated in the city's Emergency Operation Plan. The City Manager is responsible for preparation and monitoring of the annual budget, approval of expenditures by departments and has general supervision over all city real property. He is also responsible for enforcement of all ordinances, franchises, leases, contracts and permits of the city.

Assisting him are eight department heads: Police Chief, Planning Director, Fire Chief, Public Works Director, Human Resources Director/Assistant to the City Manager, Library Director, Convention Center Manager and Building Official.

Human Resources: Human Resources provides personnel support for all city departments with information needed to recruit and select qualified employees, address labor regulations, compensation, classification, training and personnel policies and procedures. The department also manages the City's Risk Exposure and Insurance Programs, which include property, casualty, liability, employee benefits and workers' compensation coverage.

Police Department: The Department currently has a Chief of Police, a Lieutenant, one Property/Person Crime Detective, eleven sworn Patrol Officers, a Community Service Officer, and seven full time communication personnel.

Seaside Police Department is a full service law enforcement agency with 24 hour patrol, communications coverage and 911 services. Seaside's 911/Communication Center services three law enforcement agencies, five fire agencies, four communities and rural southern Clatsop County.

A motorcycle patrol with three certified motor officers operates throughout the tourist season and during the rest of the year as needed. A Bicycle Patrol operates during the major tourist season which provides faster response time to calls in the center of town and high visibility of law enforcement in crowded areas.

Public Works: The Public Works Department is responsible for the City of Seaside's infrastructure including, water, sewer, streets, storm drainage, parks and public buildings. The staff of twenty plus employees maintains both water and wastewater treatment plants, a convention center, community center, library, police and fire stations, public works building, and city hall; as well as many miles of sanitary sewer and water lines, and streets.

Community Development: The Community Development Department consists of the Building and Planning Departments. The Building Department handles permits for mechanical, plumbing, building and demolition related work. The Planning Department works to create, maintain and implement land use ordinances and long range plans, and reviews development proposals to ensure consistency with these plans.

Convention Center: The Seaside Civic & Convention Center is a city owned and operated convention, tradeshow and multipurpose facility. When convention or trade show events are not booked, the facility schedules community, education, cultural, religious, athletic, and entertainment events.

Fire Department: The Seaside Volunteer Fire and Rescue Department was established in 1904. The department serves the city of Seaside and the surrounding rural fire protection district. In addition, a mutual aid agreement in Clatsop County allows the Department to assist all other city and rural fire departments throughout the county.

Since the department was created, it has remained an all-volunteer department, with the exception of three full time paid positions: Fire Chief, Fire Marshall, and Training Officer. Forty-two volunteers respond twenty-four hours a day to fire and EMS incidents. The department provides structure and wildland fire protection, rescue and heavy extrication, and EMS service from the first responder to the paramedic level. The Department also provides surf rescue with seasonal lifeguards. Within the County there is a hazardous materials team and high-angle rescue team to supplement Seaside's emergency response.

The Department provides education and organizational support for the Community Emergency Response Team (CERT) volunteers. This group provides assistance during emergencies and works on public outreach and preparedness activities.

City Library: The Seaside Public Library dedicates itself to collecting and distributing information and ideas in a variety of formats. The Library building also serves as a community gathering place for meetings and events. The Library is advised by a five-member appointed Board of Trustees.

Municipal Court: The Seaside municipal court handles transactions for traffic citations and tickets.

Business Office: The business office handles receivables and payables. It currently processes water and sewer bills, business licenses and transient room tax assessments.

2.10 Existing Plans & Policies

Seaside has existing plans, ordinances and technical reports that guide and influence land use, land development, and population growth. 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 Clatsop County multi-jurisdictional NHMP includes a range of recommended action items to reduce the city's vulnerability to natural hazards. Many of these recommendations are consistent with the goals and objectives of the county's existing plans and policies. Linking existing plans and policies to the NHMP helps identify what resources already exist that can be used to implement the action items identified in the Plan. Implementing the natural hazards mitigation plan's action items through existing plans and policies increases their likelihood of being supported and kept up to date. Completing these action items will help maximize the efficient use of the county's resources.

Table 2.8 documents the plans and policies already in place in Seaside.

Table 2.8 Existing Plans, City of Seaside

Name	Date of Last Revision	Author/Owner	Description
City of Seaside Comprehensive Plan	Revised 10/24/96	City of Seaside	The Seaside Comprehensive Plan is an official public document that is adopted by the city as the policy guide to development decisions.
Seaside Zoning Ordinance	Updated Sept 2004	City of Seaside	The purpose of this Ordinance is to further the objectives and goals of the Comprehensive Plan and to provide the public health, safety and general welfare of the citizens of Seaside through orderly community development.
City of Seaside Emergency Operations Plan	Adopted 2010	City of Seaside	Coordinates the City's response to incidents using an Incident Command System
City of Seaside Transportation System Plan	Adopted 2010	City of Seaside	Lists transportation projects to be pursued within the next twenty years.
City of Seaside Water System Master Plan	Adopted 2005	City of Seaside	Includes a comprehensive analysis of Seaside's water distribution system. Makes recommendations for facility improvements based on current deficiencies and future needs.
City of Seaside Wastewater Engineering Report	Adopted 2006	City of Seaside	Report inventories current wastewater treatment system and sewer main system. Includes assessment of current and future needs.
City of Seaside Airport Layout Plan	Adopted 2010	City of Seaside	Documents the current layout of the Seaside Airport, and includes plans for future improvement projects.
City of Seaside Parks Master Plan	Adopted 2004	Sunset Empire Parks and Recreation District	Inventories city open space and proposes future capital improvement projects.

2.11 Community Organizations and Programs

In planning for natural hazard mitigation, it is important to know what social organizations exist within the community because of their existing connections to the public. Often,

actions identified by the plan involve communicating with the public or specific subgroups within the population (e.g. elderly, children, low income). The City of Seaside should use existing organizations as resources for implementing such communication-related activities because these service providers already work directly with the public on a number of issues.

The Countywide Community Organizations and Programs table can be found in Section 2: Community Overview of the Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan.

Table 2.9 highlights social service organizations that are active within the community and may be potential partners for implementing mitigation actions or providing resources to citizens in the event of an emergency.

Table 2.9 Seaside Community Organizations and Programs

Name and Contact Information	Description	Notes
Community Emergency Response Team (CERT)	Volunteer citizen emergency first responder group organized by the Seaside Fire Department	Provides support to emergency response teams – often arrive at an incident before formal help can arrive. In a large scale emergency when the emergency response community is stretched thin, CERT may be the only immediate available community aid.
Elks 324 Ave A Seaside OR 97138 (503) 738-6651	Elks lodge	
Helping Hands Ministries 1530 South Roosevelt Seaside OR 97138 (503) 717-1425	Criminal and Drug Rehabilitation	Housing, emergency food and clothing, job training
Our Lady of Victory Catholic Church 120 Oceanway Seaside OR 97138 (503) 738-6161	Meal Services	Free meals on site
Our Savior's Lutheran Church 320 First Avenue Seaside OR 97138 (503) 738-6791	Food Bank	Provides emergency food
Restoration House 208 N Holladay Seaside OR 97103 (503) 717-1102	Hostel / Shelter	Men's halfway house

Seaside Chamber of Commerce 7 N. Roosevelt Seaside, OR 97138 (503) 738 6391	Professional Association promoting economic development and the business community	Can mobilize large groups of volunteers. The Ambassador program has 30+ volunteers.
Seaside Headstart 1225 2nd Ave Seaside OR 97138 (503) 738-0873	Child & Family Development Preschool program for those who meet income guidelines &/or special needs children ages 3-4.	Child and Family Services
Seaside Youth Center 1140 Broadway Seaside OR 97138 (503) 738-3311	Youth and Senior Center	Youth and senior resources
South County Food Bank 880 Avenue A Seaside OR 97138	Food Bank	Provides emergency food to local residents 5 days a week.
STARS (Seaside Tsunami Amateur Radio Society)	Ham Radio Club	Can provide emergency communication when internet and phone lines are down.

Section 3

Risk Assessment

The following hazards have been addressed in the Clatsop County NHMP. In addition to the county's assessment of natural hazards, the City of Seaside also conducted a local assessment of hazards. The results of this analysis are summarized in Table 3.1 below.

Table 3.1 City Hazard Analysis Matrix

<i>Rating Factor: High = 10 points; Moderate = 5 points; Low = 1 point Score Multiplied by Weight Factor (WF)</i>													
Hazard	Rating Criteria with Weight Factors											Total Score	
	History ¹	(WF =2x)	Vulnerability ²	(WF =5x)	Max Threat ³	(WF =10x)	Probability ⁴	(WF =7x)					
Severe Weather	High	10	20	High	10	50	High	10	100	High	10	70	240
Utility Failure, Resource Shortage	High	10	20	High	10	50	High	10	100	High	10	70	240
Flood	Med.	5	10	High	10	50	High	10	100	Med.	5	35	195
Tsunami	Low	1	2	High	10	50	High	10	100	Med.	5	35	187
Earthquake	Low	1	2	High	10	50	High	10	100	Med.	5	35	187
Mudslide/Landslide	Low	1	2	Med.	5	25	Med.	5	50	Low	1	7	84
Community Fire	Low	1	2	Med.	5	25	Med.	5	50	Low	1	7	84
Dam Failure	Low	1	2	Med.	5	25	Med.	5	50	Low	1	7	84
Health Epidemic	Low	1	2	Med.	5	25	Med.	5	50	Low	1	7	84
Special Event	Low	1	2	Med.	5	25	Med.	5	50	Low	1	7	84
Accidents: Transportation/ Mass Casualty	Low	1	2	Low	1	5	Med.	5	50	Low	1	7	64
Hazardous Materials Incidents	Low	1	2	Low	1	5	Med.	5	50	Low	1	7	64
Terrorism and Civil Disorder	Med.	5	10	Low	1	5	Low	1	10	Med.	5	35	60
Accidents: Industrial	Low	1	2	Low	1	5	Low	1	10	Low	1	7	24
Volcanic Activity	Low	1	2	Low	1	5	Low	1	10	Low	1	7	24

Notes:

- History addresses the record of previous major emergencies or disasters. Weight Factor is 2. Rating factors: high=4 or more events in last 100 years; moderate=3 events in last 100 years; low=1 or 0 events in last 100 years.
- Vulnerability addresses the percentage of population or property likely to be affected by a major emergency or disaster. Weight Factor is 5. Rating factors: high=more than 10% affected; moderate=1%-10% affected; low=less than 1% affected.
- Maximum Threat addresses the percentage of population or property that could be affected in a worst case incident. Weight Factor is 10. Rating factors: high=more than 25% could be affected; moderate=5%-25% could be affected; low=less than 5% could be affected.
- Probability addresses the likelihood of a future major emergency or disaster within a specified period of time. Weight Factor is 7. Rating factors: high=one incident within a 10-year period; moderate=one incident within a 50-year period; low=one incident within a 100-year period."

Source: City of Seaside Emergency Operations Plan

3.1 Coastal Erosion

Much of the City's frontage on the Pacific Ocean is protected by a mixture of foredunes and manmade structures. Significant storms or rising ocean levels may reduce or remove these structures, suddenly or gradually. Additionally, the entire municipal ocean front is at high risk for coastal erosion due to its proximity to the ocean.

Clatsop County describes coastal erosion as a 'chronic' hazard along the Oregon Coast, especially on sand spits, bluffed coastline, and dune-backed beaches. Damages caused by chronic hazards are usually gradual and cumulative. As such, the County estimates a 'high' probability that coastal erosion will continue to occur along the County's coastline. The same is true for the City of Seaside.

Likewise, the County estimates a 'high' vulnerability to coastal erosion, meaning more than 10% of the population or regional assets are likely to be affected by this hazard. Due to the City's large amount of development along its coastline, Seaside estimates the same level of vulnerability. This risk poses a particular economic hazard to Seaside, since current zoning, as well as market pressure, has resulted in a concentration of tourism attractions, vacation rentals and hotels along or near the shoreline. Coastal erosion would have a high impact on the city's economic base.

Current Mitigation Activities

- The City of Seaside has an adopted Foredune Management Plan (adopted as part of the Comprehensive Land Use Plan) for the beach front that separates Seaside's developed uplands from the intertidal zone. This plan regulates activities such as dune grading and vegetative stabilization. The plan prohibits the removal of sand from the beaches (a practice that was common in Seaside's recent past) and protects the sand dunes that are underlain by a cobble beach. This plan permits foredune maintenance activities that limit the impacts from wind erosion and deposition within the developed upland areas, while also limiting the potential flooding risks resulting from winter storms. The Foredune Management Plan requires periodic updates in order to permit maintenance activities by private property owners that reduce beach erosion and impacts from winter storms.
- Much of the Promenade, the concrete boardwalk that parallels the beach, is also protected by a seawall structure and railing. This structure has been in place for decades and it provides added shore land protection from winter storm waves. This structure requires periodic maintenance in order to prevent wave run up and erosion of the developed uplands that parallel the oceanfront. Currently the Seaside Public Works Department monitors and maintains the structure.

- The mouth of the Necanicum River Estuary separates the City of Seaside from the City of Gearhart. The location of the river mouth is not static due to the dynamic forces associated with the confluence of the rivers and ocean. The City of Seaside Waste Water Treatment Plant was built at the northern end of Seaside near the river mouth to take advantage of the natural mixing zone there. At one point in 1949 the river's southern migration was threatening to erode the upland and damage the treatment plant. The U.S. Army Corp of Engineers helped establish a rip rap revetment to prevent the erosion from damaging the plant. Although the revetment is not currently exposed or threatened by erosion, a southern shift of the river channel could once again threaten the treatment plant and require additional action by the Corp of Engineers to maintain the integrity of the revetment. The City Public Works Department continues to monitor this situation for any threats.
- A narrow segment of high ground and a city street, Sunset Boulevard, provides access from the southern end of Seaside to Tillamook Head. This street provides access to the residential development in "The Cove" area, but more importantly, it is one of the designated tsunami evacuation routes leading to a high ground assembly area on Tillamook Head. Although not severe, this area has been subjected to damage from storm waves and log debris in the past. The city streets crew clears Sunset Boulevard of storm debris as needed, which maintains critical access from the southern portion of Seaside.

3.2 Drought

Clatsop County's Plan adequately describes the causes and characteristics of droughts, as well as the location and extent of a potential drought event. Clatsop County has no record of a severe drought, and the same is true for Seaside. Drought is averted as a result of the area's high rainfall, especially during winter months. Clatsop County estimates a 'low' probability that drought will occur, meaning no more than one incident is likely within a 75-100 year period. Likewise, the County estimates a 'low' vulnerability to drought hazards, meaning less than 1% of the population or regional assets would be affected by a drought. Both estimates are true for Seaside as well.

Potential drought-related community impacts are adequately described within Clatsop County's Drought Hazard Annex.

Current Mitigation Activities

- The city is fortunate that it rarely suffers from drought conditions; however, the availability of water can become limited during the late summer months when the city sees the most visitors and stream flows are lower. The city periodically reviews its water curtailment and conservation provisions to ensure they are adequate to limit the impacts from drought conditions when they occur.

3.3 Earthquake

Seaside's location along the Oregon Coast makes it susceptible to a Cascadia Subduction Zone (CSZ) earthquake. The entire community of Seaside is vulnerable to such an event, although damage from an earthquake may be more severe in the downtown area where buildings are older and sit on fill that has liquefaction potential. A severe earthquake may also trigger a tsunami – this hazard is addressed separately in Section 3.6 of this plan.

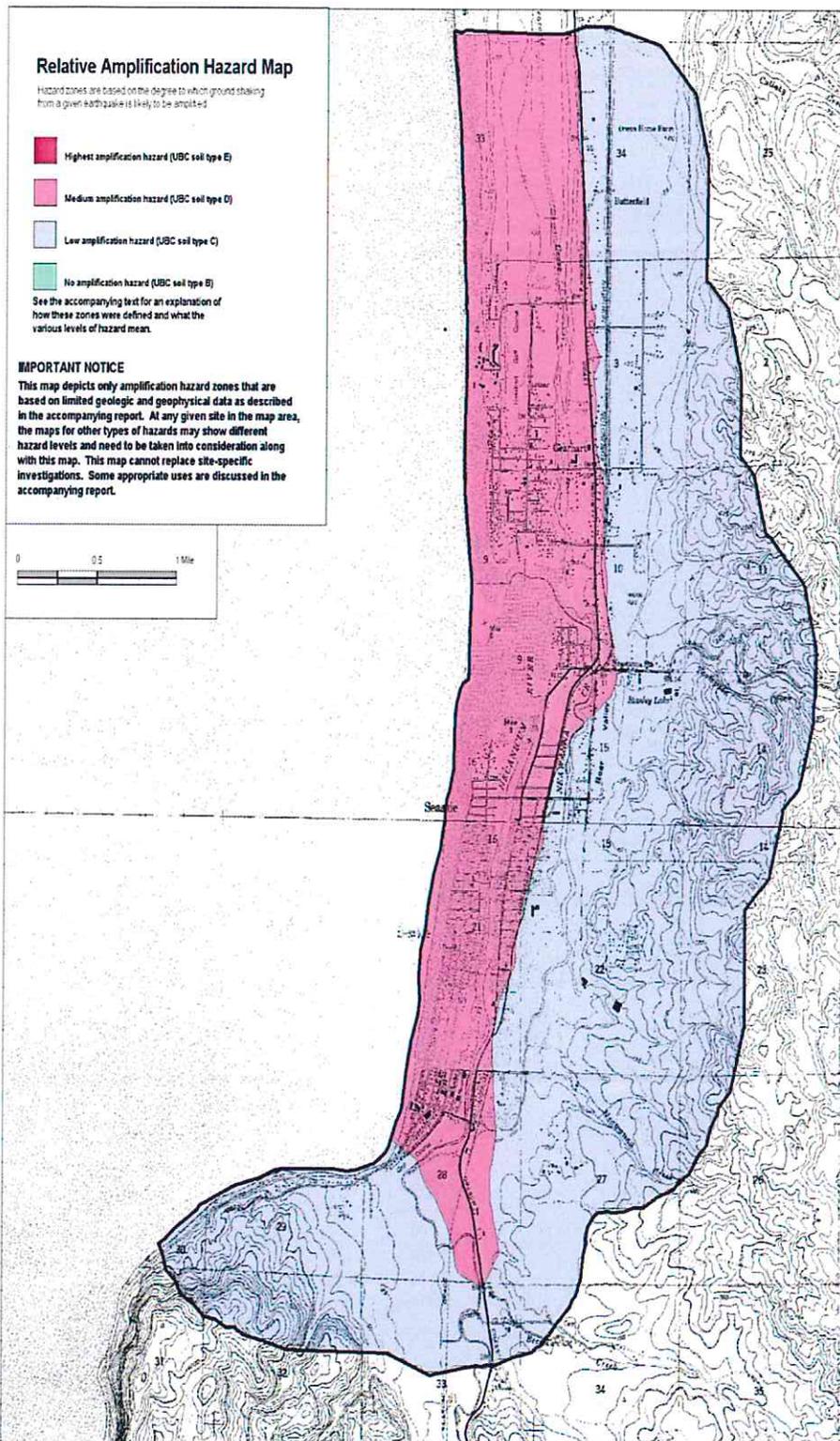
Clatsop County's Natural Hazards Mitigation Plan adequately describes the causes, characteristics, and location of earthquake hazards for the region. The County's Plan additionally identifies all previous occurrences that have affected the City. It is difficult to estimate recurrence intervals, but the state has experienced seven Cascadia Subduction Zone (CSZ) events in the last 3500 years – some of which were likely as large as magnitude (M) 9. 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. The last CSZ event occurred approximately 300 years ago, in 1700. Based on this information, Clatsop County estimates a 'high' probability that an earthquake will occur in the future. Seaside agrees.

The earthquake hazard maps in figures 3.1 – 3.4 were developed by the Department of Geology and Mineral Industries. The figures illustrate the location of the amplification, liquefaction, earthquake induced landslide, and relative earthquake hazards in Seaside.

Clatsop County estimates a 'high' vulnerability to earthquake hazards, meaning more than 10% of the population or regional assets would be affected by a major emergency or disaster. As shown by the figures below, the City has a moderate risk of amplification, and a very high risk of liquefaction. The majority of the City's developed lands are located in Zone A – the highest hazard area for earthquakes. Additionally, as described in Section 2.4, about 65% of the City's housing stock was built prior to 1980, before stronger seismic building codes were put into place. The combination of these hazards makes Seaside extremely vulnerable to high magnitude earthquake events.

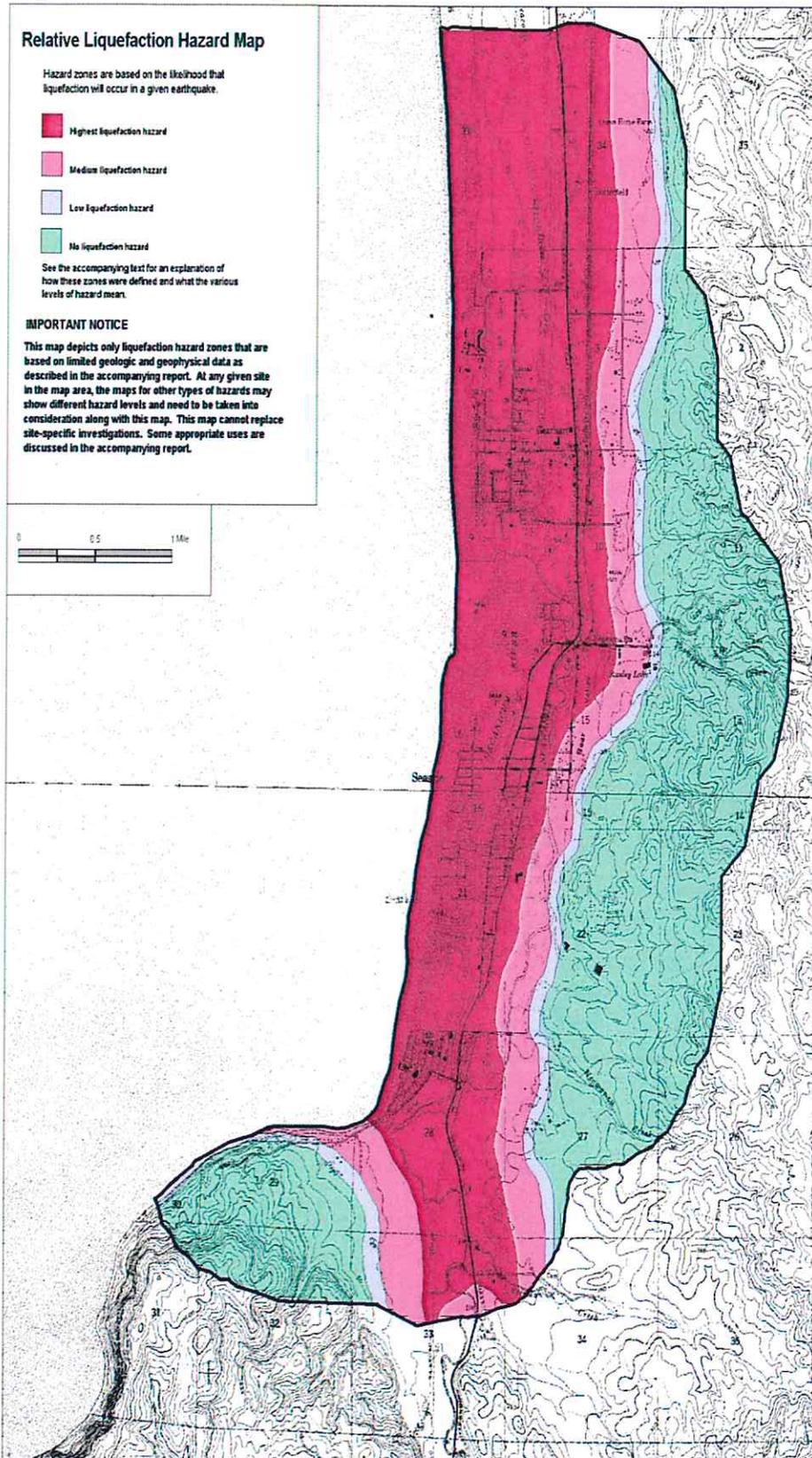
Figure 3.1 Relative Amplification Hazard Map

The majority of the city's built lands are located in areas of medium amplification hazards.



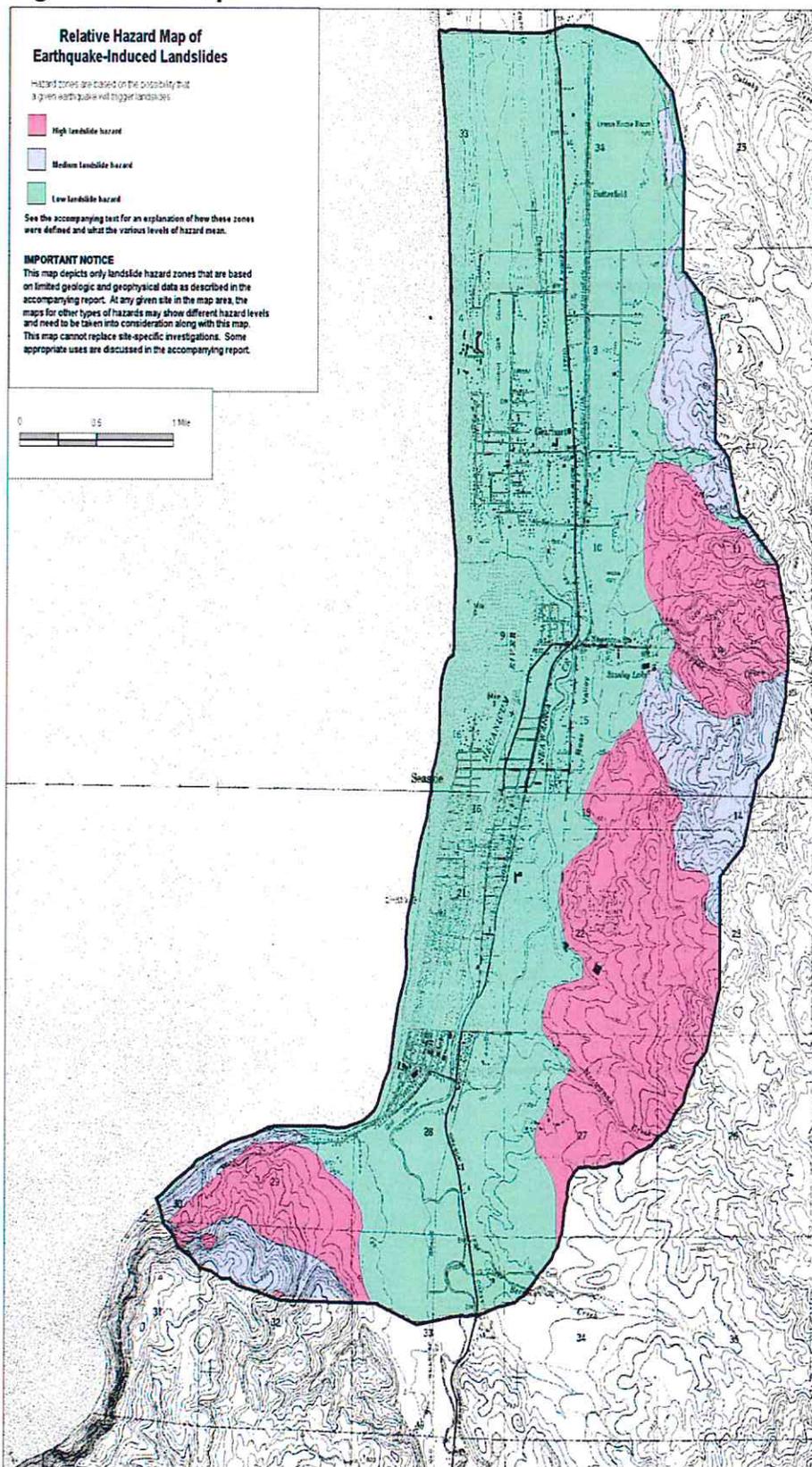
Source: Oregon Department of Geology and Mineral Industries

Figure 3.2 Relative Liquefaction Hazard Map



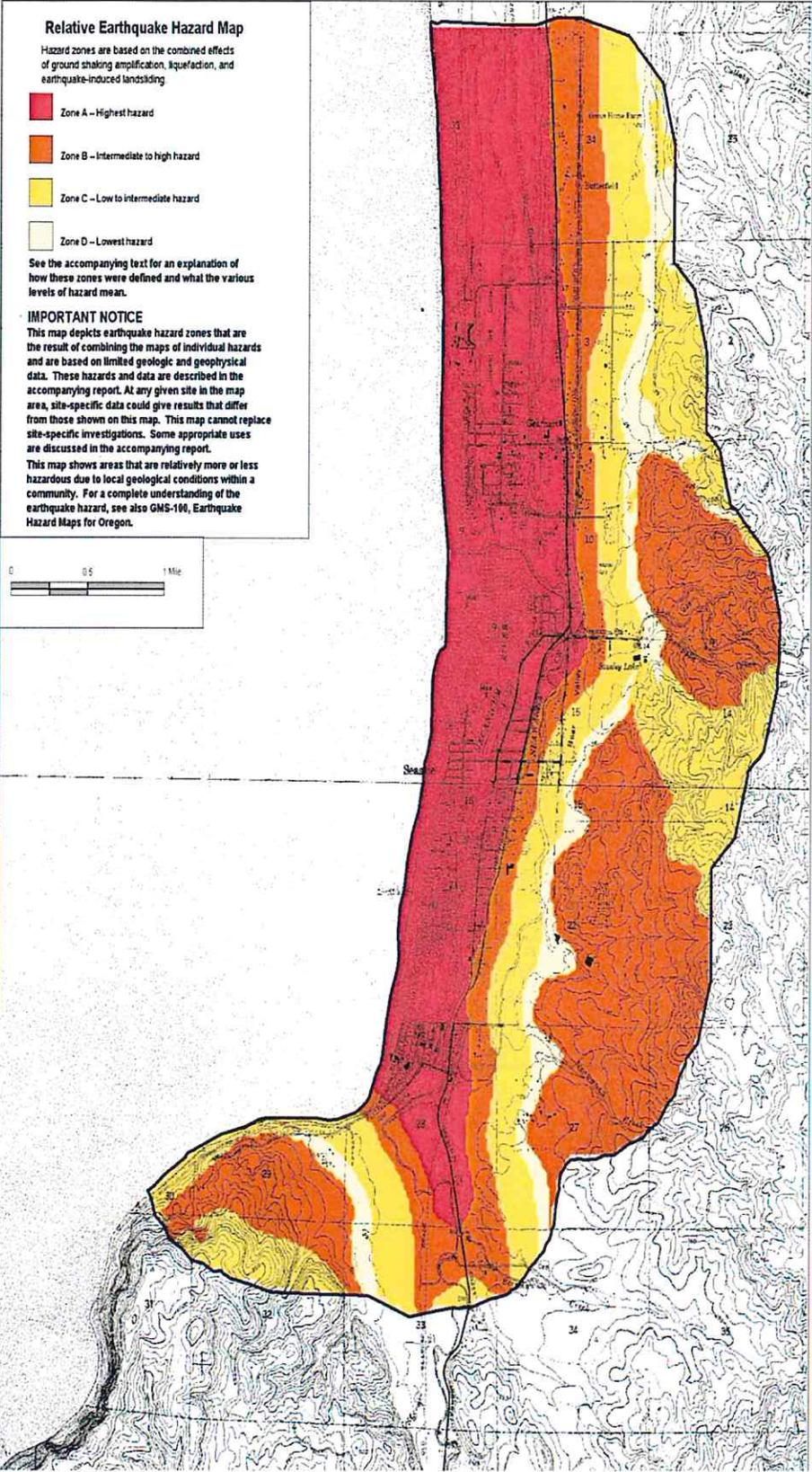
Source: Oregon Department of Geology and Mineral Industries

Figure 3.3 Earthquake-Induced Landslides



Source: Oregon Department of Geology and Mineral Industries

Figure 3.4 Relative Earthquake Hazard



Source: Oregon Department of Geology and Mineral Industries

In 2006, DOGAMI conducted a seismic needs assessment for public school buildings, acute inpatient care facilities, fire stations, police stations, sheriffs' offices and other law enforcement agency buildings. Buildings were ranked for the "probability of collapse," in this case meaning structural damage, due to the maximum possible earthquake for any given area. Within Seaside, the following buildings were rated as 'moderate' or 'high.' No buildings in Seaside were assigned the 'very high' rating.

- Seaside High School: *high*
- Broadway Middle School; *moderate*
- Providence Seaside Hospital: *moderate*
- Seaside Fire and Rescue: *moderate*

In addition to the structures listed above, the City's infrastructure is highly vulnerable to a severe earthquake event. Sewer lines, water lines, power lines, water tanks, reservoirs, and cell towers are vulnerable assets. The City would expect significant damage to roads and bridges following a Cascadia Subduction Zone event. The following bridges are expected to fail in a CSZ event:

- 24th Avenue at 101
- Lewis and Clark Road
- Avenue A (over the Necanicum)
- Avenue G (over the Necanicum)
- Avenue S (Over the Neawanna)
- Avenue U (Over the Necanicum)
- Dooley Bridge at 101

Bridge failure causes additional concern if the earthquake is strong enough to trigger a tsunami, as these bridges become critical elements of the city's evacuation routes to high ground. For the sake of tsunami evacuations, it is important only that the bridges be able to sustain foot traffic during the evacuation. However, structural integrity is still important, as the degree to which the bridges withstand an earthquake will influence the flow of goods and services during relief efforts after an event.

Current Mitigation Activities

- The City of Seaside currently provides building permit and inspection services in accordance with the State's adopted building code.

Recommended Action Items

- Develop a cost benefit analysis for the seismic retrofit of Seaside's bridges as part of a program to strengthen the city's evacuation route system (See Section 3.6). As part of this analysis, contract an engineering report to analyze the seismic stability and risk of collapse for each of the city's bridges.

- As part of a Community Self-Sustainability Program, promote the seven step approach to preparedness identified in the Oregon Emergency Management (OEM) Publication "Living on Shaky Ground" (or similar publications) to mitigate earthquake impacts to residents, employees and customers.
- Develop a program to provide additional seismic upgrade information for those older dwellings built prior to 1980 in an effort reduce their elevated risk of earthquake damage.

3.4 Flood

The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan adequately identifies the previous occurrences of floods for the City of Seaside. The Clatsop County Multi-Jurisdictional Natural Hazard Mitigation Plan ranked the vulnerability of floods as moderate. The County Plan also indicates that the probability of floods is high. The City of Seaside ranked the probability of floods as moderate, and the vulnerability as high. The County's Flood Insurance Rate Map (Figure 3.5) highlights the location of the flood hazard in Seaside. The City's current effective date for the Flood Insurance Rate Maps is September 17, 2010. City Staff rated the probability of flooding as moderate and the vulnerability as high due to the large number of tax lots within the flood plain, but the low frequency (100 years and 500 years) of events that would impact these areas.

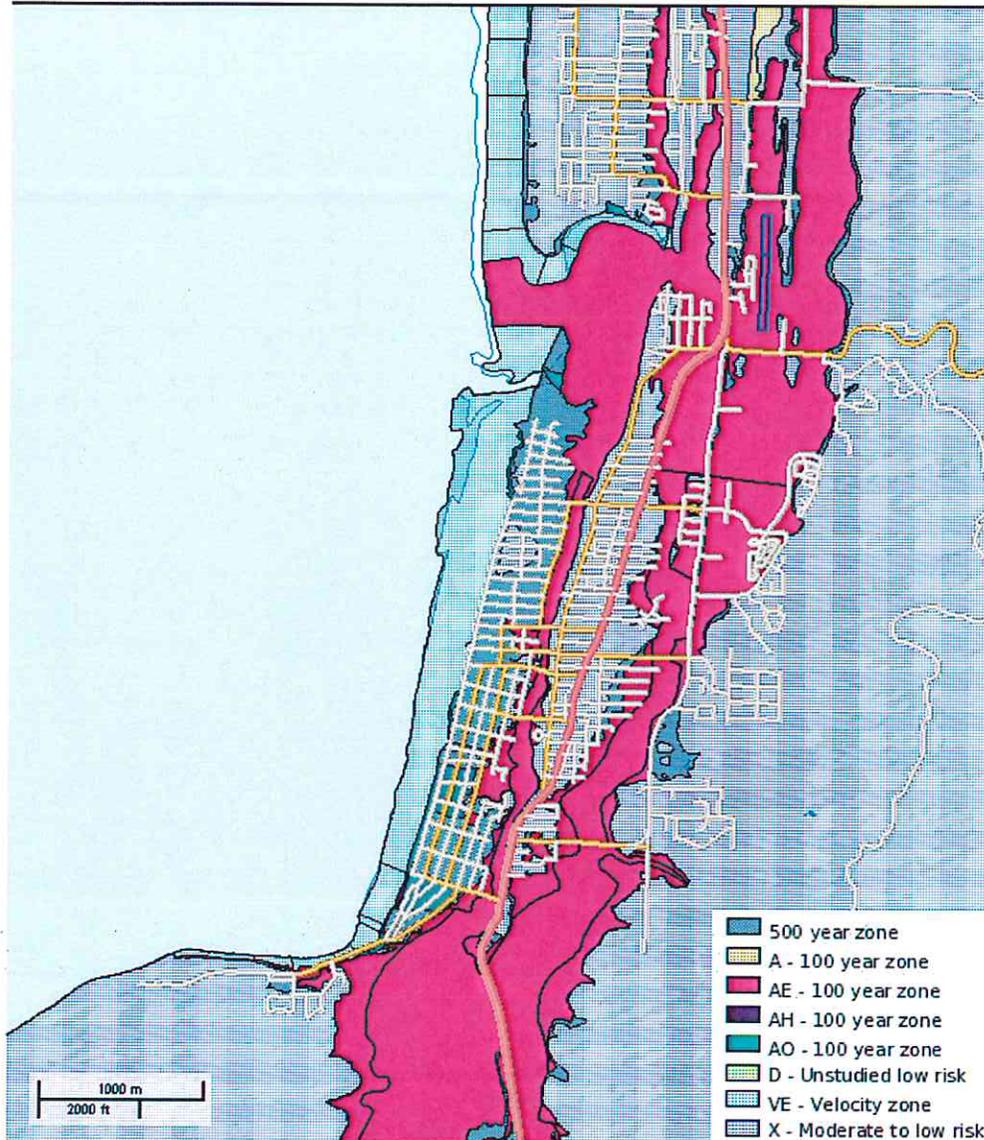
The City of Seaside is a participant in the National Flood Insurance Program. The City has a total of 948 policies under the NFIP. Half of those policies are located in the 100 year flood plain. Since the implementation of the Flood Insurance Rate Maps (FIRMs), however, there have been a total of 359 policies, and 215 of those have been in A zones (151 in A01-30&AE zones and 64 in AO zones). The total coverage for the City under the NFIP is \$234,814,600. There have been 15 claims since 1978, with \$72,602 paid on those claims.

Seaside is at risk of flooding from two primary sources: riverine flooding and ocean flooding. The riverine flooding generally occurs during periods of heavy rainfall that cause the streams that drain the hills east of Seaside to overflow their banks. Ocean flooding results from exceptionally high tides or tsunamis. On some occasions, high tides and riverine flooding can combine to produce flooding in the City.

A flooding hazard that frequently impacts the safety and the well-being of Seaside residents is the annual riverine flooding of Highway 101 between the south limits of the City and the junction of Highways 26 and 101. During periods of heavy rainfall each winter season, the roadway becomes impassable by floodwater from the Necanicum River, often closing the road to passenger vehicles. While the flooding causes little damage to structures, it interrupts commerce along the only North-South roadway on the Oregon Coast and one of the major transportation route between the North Oregon

Coast and the Portland-Vancouver metro area on the Interstate 5 corridor. It also impairs ambulance, police, and fire services.

Figure 3.5 FEMA Flood Map of Seaside



Source: Clatsop County Webmaps

Current Mitigation Activities

- The City of Seaside has partnered with the Cities of Cannon Beach, Gearhart, Warrenton, and Astoria, the Port of Astoria, Clatsop County, and the Oregon Department of Transportation (ODOT) to form the U.S. Highway 101 Flood Study Consortium. The group contracted a hydrology study to analyze the cause of annual flooding along Highway 101 South of Beerman Creek and make recommendations to ease the impacts of flooding on the highway. The hydrology study determined that removal of a berm to the west of the highway would reduce the frequency and

severity of highway flooding. ODOT and the Consortium worked together to remove the berm with the assistance of the North Coast Land Conservancy (NCLC). Removing the berm will reduce flooding by restoring the wetlands that the berm affected when it was constructed in the 1970's, allowing water to filter naturally away from the road and reducing flooding by 50%. Once this mitigation project is complete, local agencies will assess the effect on flood incidents and determine if future mitigation efforts are necessary.

Recommended Action Items

- The City of Seaside maintains compliance with the National Flood Insurance Program. To improve the program in the future, the City will apply for FEMA's Community Rating System^{xiii} as a means to further reduce the risks from flood damage while reducing flood insurance rates.

3.5 Landslide

Clatsop County's Plan identifies a number of locations within the County that are at risk of landslides. Due to Seaside's location along the coast, landslides primarily occur during rain and/or coastal erosion events. Beyond this, regional landslides can cause regional commerce and transportation difficulties.

Clatsop County estimates a 'high' probability that landslides will occur in the future, meaning one incident is likely within a 10-35 year period, and a 'moderate' vulnerability. Seaside estimates a 'low' probability and history of such an incident, but a moderate vulnerability and threat from mud or landslides. Particular areas at risk of damage in landslides are Highway 101 south of Beerman Creek Road, and Lewis and Clark Road to the North. A landslide along Highway 101 South of Beerman Creek Road could pose a significant hardship to Seaside residents and employees, cutting off access to and from Highway 26 and communities to the south. Other potential community impacts are adequately described in Clatsop County's Landslide Hazard Annex.

Current Mitigation Activities

- In accordance with the City of Seaside Zoning Ordinance, continue to require Hazard Mitigation Plans within steep slope areas and those areas identified as having an elevated risk of geologic instability. Periodically review these provisions in an effort to improve their potential to reduce the risks posed by landslides.

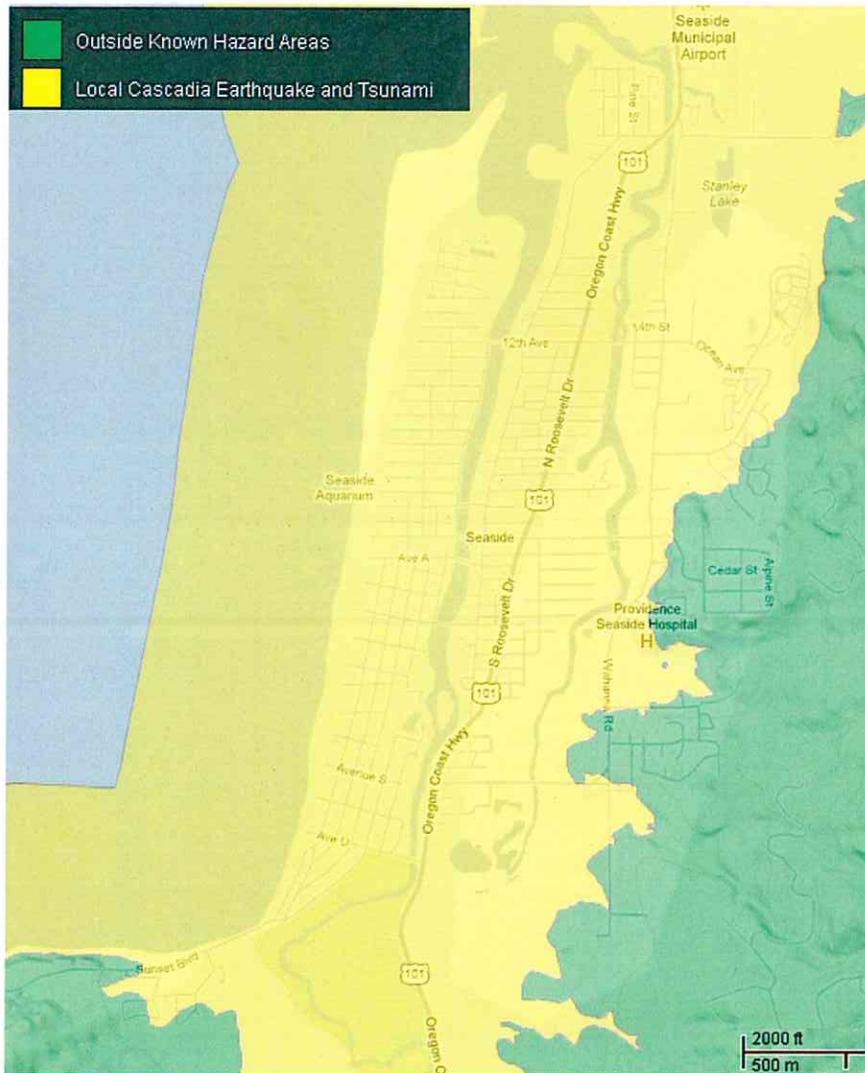
3.6 Tsunami

Seaside's location along the Oregon Coast makes it susceptible to impacts from both a local tsunami (triggered by a Cascadia Subduction Zone earthquake less than 100 miles from the shoreline) and a distant tsunami (triggered by a remote earthquake event along the Pacific Rim). The Clatsop County Multi-Jurisdictional NHMP ranked the vulnerability

of the community to tsunamis as high and the probability of a tsunami as moderate. This rating is consistent for Seaside as well.

Seaside has been assessed in a report by USGS as having the highest *exposure* (the number of facilities within the hazard inundation zone) and the highest *sensitivity* (the percentage of the community's assets within the inundation zone) to tsunamis of any city on the Oregon Coast.^{xiv} As shown in Figure 3.6, the inundation zone of a local tsunami very closely matches the development pattern of the city: 87 percent of the city's developed land lies in the tsunami hazard area, including most of Seaside's residential areas, civic and public infrastructure, and businesses. Typical local tsunami wave heights occurring in the Pacific Ocean have been 20 to 65 feet at the shoreline. However, due to local conditions, a few waves have been much higher – as much as 100 feet.^{xv} A distant tsunami would have a far lesser impact and would result in much smaller waves, achieving at most about half the height of a local event.

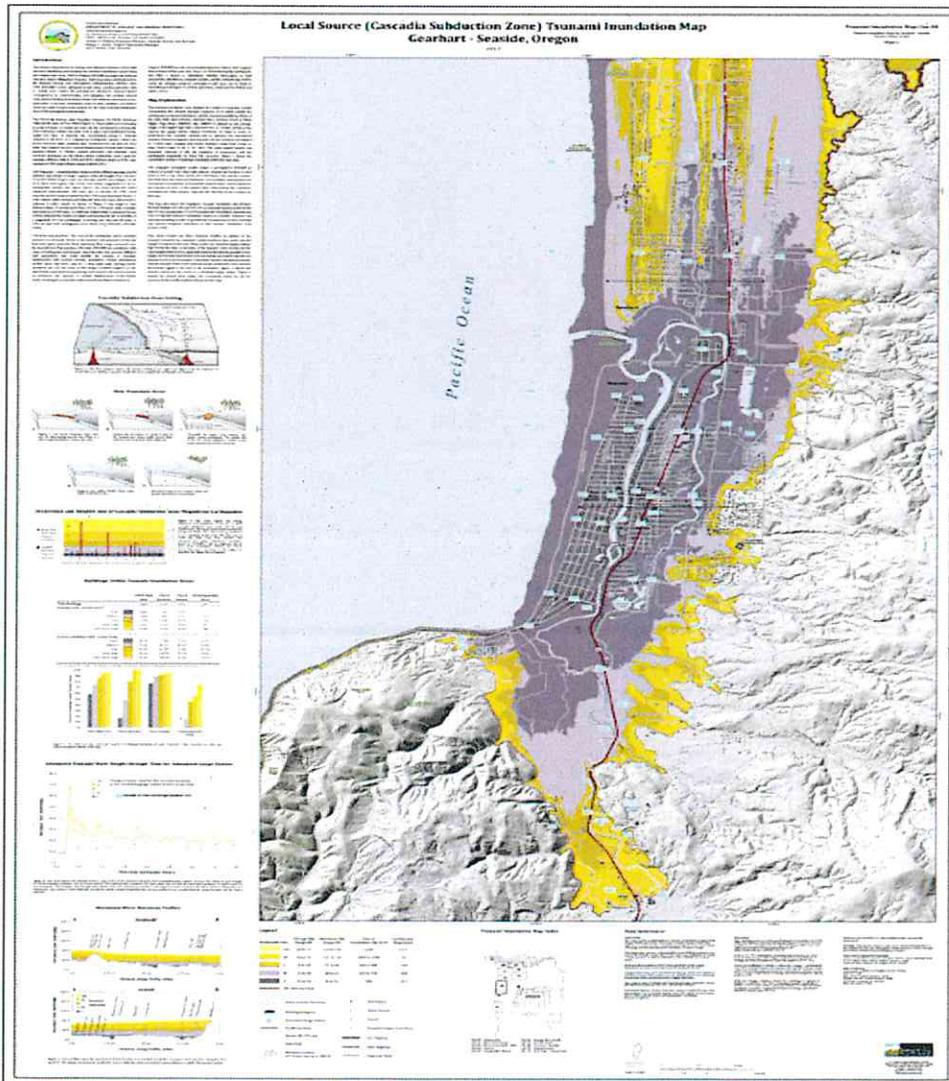
Figure 3.6 Tsunami Inundation Zone in Seaside



Source: Department of Oregon Geological and Mineral Industries

The Oregon Department of Geology and Mineral Industry published new Cascadia Tsunami Inundation Zone map for the Seaside area in the summer of 2013. As depicted in Figure 3.7, the map displays the output of computer models representing five selected tsunami scenarios, all of which include the earthquake-produced subsidence and the tsunami-amplifying effects of the splay fault. Each scenario assumes that a tsunami occurs at Mean Higher High Water (MHHW). To make it easier to understand this scientific material and to enhance the educational aspects of hazard mitigation and response, the five scenarios are labeled as “T-shirt sizes” ranging from Small, Medium, Large, Extra Large, to Extra Extra Large (S, M, L, XL, XXL). The map legend depicts the respective amounts of slip, the frequency of occurrence, and the earthquake magnitude for these five scenarios. Although the likelihood of the XXL scenario is very low, each scenarios provides valuable information that can be used for mitigation planning.

Figure 3.7 Tsunami Inundation Zone in Seaside



Source: Department of Oregon Geological and Mineral Industries

Of particular concern to the city is the location of Seaside's schools within hazard prone areas. Table 3.2 illustrates the number of students and staff at each building in the district.

Table 3.2 Staff and Students at Seaside School District Buildings

School	Number of Students	Number of Staff (FTE)
Cannon Beach Elementary	80	19 (10.11)
Gearhart Elementary	315	35 (27.63)
Seaside Heights Elementary	360	49 (38.98)
Broadway Middle School	340	36 (30.57)
Seaside High School	470	57 (50.24)
District Office		12 (12)
Total	1565	208 (169.53)

Source: Seaside School District, 2013

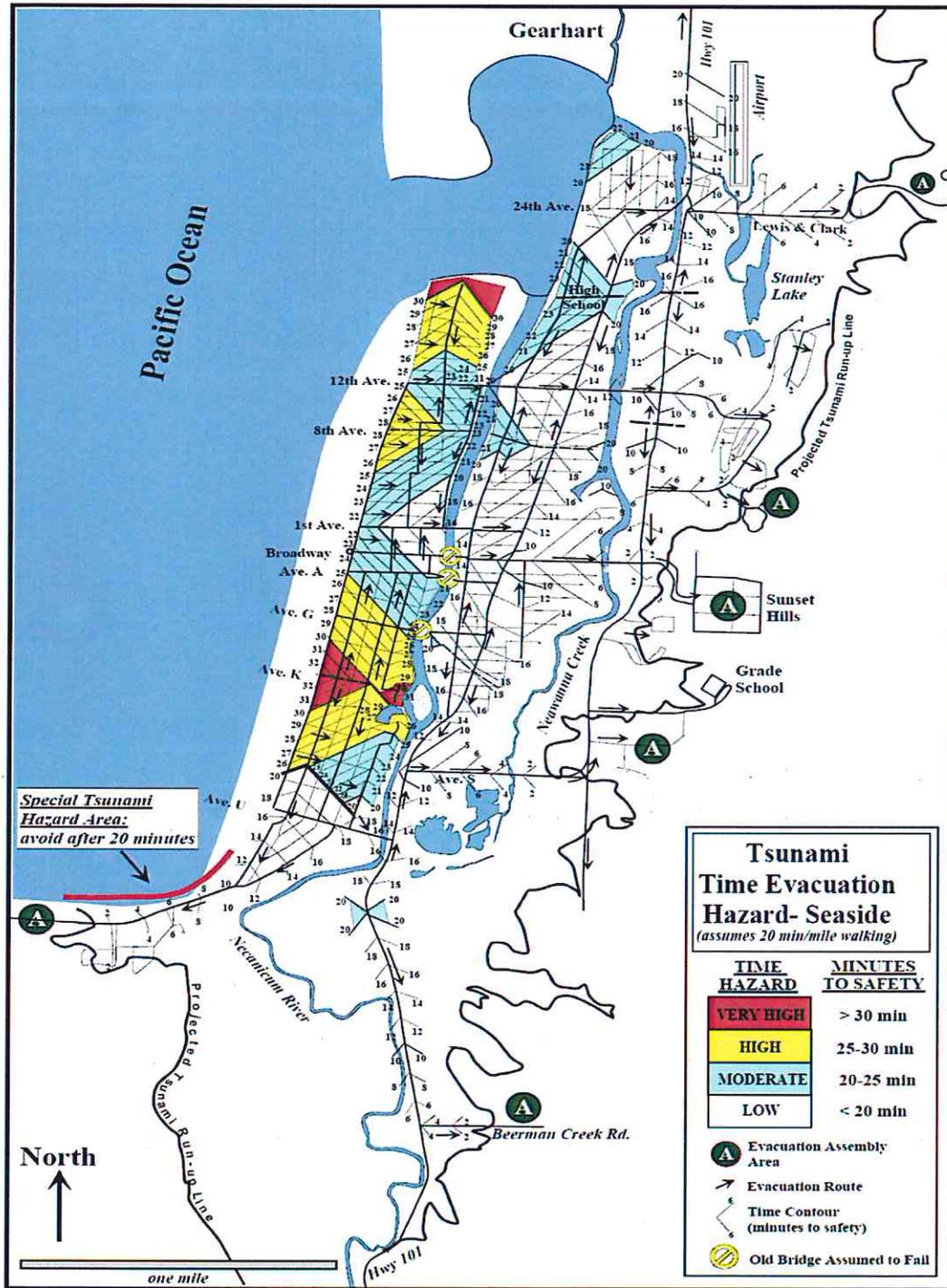
Studies indicate that when a Subduction Zone Earthquake occurs, a tsunami would likely strike the coast in Seaside within 15-20 minutes. The students and staff at Gearhart Elementary School must evacuate on foot three-quarters of a mile, then hope the tsunami inundation is not higher than average since they can only evacuate to an elevation of 45 feet. Broadway Middle School must hope that a retrofitted bridge is still standing in order for them to evacuate to higher ground. Cannon Beach Elementary School and Seaside High School must each evacuate on foot 1.2 miles. The students and staff of Seaside High School also need to cross a retrofitted bridge on their way out of the tsunami inundation zone. Under the best conditions, it takes the Cannon Beach Elementary School students 25 minutes to get to ground that would not be under the threat of inundation. Under the conditions they will be encountering, this simply is not enough time to evacuate an entire school safely. A Cascadia Subduction Zone event could result in many students and staff becoming casualties of collapsing buildings or incapacitated by the tsunami.

Evacuation from most developed regions in Seaside to high ground requires passage over Neawanna Creek and the Necanicum River. Currently, only four bridges in Seaside, located at 1st and 12th Avenues over the Necanicum and at Broadway and 12th over Neawanna Creek, are considered seismically sound enough to withstand a subduction zone earthquake. This leaves regions of town underserved by evacuation routes, with walking evacuation times of 20 minutes or more to high ground, assuming a walking rate of 3 mph (See Figure 3.8).

The Tsunami Advisory Group (TAG) has developed a preliminary tool for assessing the project prioritization of bridge construction or replacement, using the number of households served as a criterion (See Table 3.3).

Seaside also faces risks associated with debris which may wash ashore after distant tsunamis. Tsunami debris can result in pollution of Seaside's public beaches as well as the potential introduction of exotic species which may harm the Pacific marine ecosystem.

Figure 3.8 Current Tsunami Evacuation Times



Source: Tom Horning, Chair, Tsunami Advisory Group

Table 3.3 Bridge Project Prioritization (based on residents served)

Present Bridges	Area Served	Total Tax Lots	Undeveloped Tax Lots	Developed Tax Lots	Residents (assuming 5/ household)	Comments:
12th Avenue West	20th to 8th Avenue	410	69	340	1700	Not all can beat the 20 minute deadline. Vertical evacuation near north Prom needed.
First Avenue	8th Avenue to Avenue K	1199	101	1098	5490	Must funnel from Avenue K; up to 13 minutes excess evac time; need footbridge Avenue S
Avenue U	Avenue K to Avenue U	394	36	358	1790	Must funnel from Avenue K; up to 13 minutes excess evac time; need footbridge Avenue S
Overland to Tillamook Head	South of Avenue U	608	86	522	2610	Provided evacuation takes less than 20 minutes, passage is secure
New Bridges	Area Served	Total Tax Lots	Undeveloped Tax Lots	Developed Tax Lots	Residents	
Avenue G Necanicum	Avenue C to K	284	28	256	1280	Evacuation assumes First Avenue Bridge <i>has</i> been replaced
Avenue G Necanicum	Broadway to K	822	61	761	3805	Evacuation assumes First Avenue Bridge <i>has not</i> been replaced
Avenue A Necanicum	Broadway to C	538	20	518	2590	Condos & Motels south of Turnaround primarily
Avenue S Neawanna	Dooley Br. To Avenue I	339	117	222	1110	Must use Avenue S bridge; assumed brief traverse if bridge is down; sufficient time to evac.
Avenue S Necanicum (Foot)	Avenue G to U	574	52	522	2610	MOST IMPORTANT BRIDGE FOR SAVING LIVES
Avenue F Neawanna (Foot)	Broadway to K	822	61	761	3805	Needed ONLY if Avenue G Necanicum has been replaced; east Necanicum can use East Broadway Br.
24th Avenue Hwy 101	18th to 26th Avenue	estimated 180	est. 35	145	725	
22nd Avenue Neawanna (Foot)	18th to 26th Avenue	estimated 181	est. 36		1250	<i>Includes High School students & faculty, who also can evacuate via 12th Neawanna</i>

Current Mitigation Activities

- The City operates the Emergency Preparedness Committee as an ongoing official City Committee, to oversee the city's response to emergency situations and implement the City Emergency Operations Plan as needed.
- In 2010, the City of Seaside amended their comprehensive plan in an effort to help facilitate Urban Growth Boundary (UGB) expansions above the inundation zone line. The requested amendment was initiated by Providence Seaside Hospital and establishes site criteria for relocation of public schools or hospitals above the 80 foot contour line.
- The City Planning Department has hired a temporary Emergency Preparedness and Planning Assistant through RARE (Resource Assistance for Rural Environments) to conduct natural hazard public education and outreach.
- The City collaborated with the Tsunami Advisory Group to purchase and stock 110 barrels full of emergency food, water and medical supplies. These barrels, carrying enough supplies to support 2,000 people for three days, have been stored in the private residences of volunteers in high ground areas surrounding each Tsunami Assembly Area. In the event of an emergency, it will be the responsibility of the volunteer barrel keepers to place the barrels on the sidewalk for public use.
- The City of Seaside has installed Emergency Warning Sirens throughout the city. In the event of a distant tsunami, these sirens will broadcast a message alerting people outside to the threat in both English and Spanish. This system is tested on the first Wednesday of every month from October through May.
- The city has implemented an ordinance (Seaside Code Section 150.04) that requires all new dwellings and tenant spaces to provide and maintain a public alert certified weather radio. This is to help notify residents and business occupants e ordinance is intended to residents and building occupants of potential tsunami or weather related hazards. Currently, the city purchases qualified radios and provides them to residents at a reduced cost. This program should be maintained.
- The City of Seaside has contracted with an engineering firm to conduct a feasibility study of the construction of a pedestrian bridge at one of two locations: over the Necanicum River at Avenue S, or over the Neawanna at Avenue F. Construction of the bridge would be funded through Urban Renewal district funding.
- The City conducts educational outreach events (e.g. drills, movies, preparedness fairs, newsletters) annually as part of national Earthquake and Tsunami Awareness Month.

Recommended Action Items

- Continue to pursue a proactive approach to tsunami and natural disaster preparedness through appropriate planning, education, and development of pre-disaster mitigation measures by building on existing activities and partnerships. The City will:
 - Continue to conduct evacuation drills.
 - Work collaboratively with the Seaside School District to help promote all-hazard preparedness education for students and their families.
 - Support the Seaside CERT program through continuing education, recruitment, and equipment purchase.
 - Support efforts to provide a local, regional, or countywide coordinator/education provider. This could be a RARE Student, Americorp, Grad Student Intern; private contractor; or some other form of employee or partnership with another agency like SeaGrant.
 - Adopt an event scenario that can be used to help plan for events and identify needed mitigation measures.
 - Advocate for State & Federal funding and activities that will promote emergency preparedness, hazard mitigation, & community resiliency within the City and the Coastal Region.
 - Continuing to work with other departments and community groups (E-PREP, TAG, Seaside Tsunami Amateur Radio Society [STARS], and the Community Emergency Response Team [CERT]) to plan for emergencies and promote the improvement of emergency infrastructure.
- The City of Seaside will work with Seaside Downtown Development Association, the Chamber of Commerce, and TAG to help develop a recognition program for Tsunami Ready Businesses.
- The Building and Planning Department will conduct an engineering evaluation of existing multi-story structures within the tsunami inundation zone to determine their potential to be utilized as vertical evacuation structures following a Cascadia Subduction Zone Earthquake.
- The City of Seaside will work to encourage Pacific Power Co. to underground overhead utilities along major evacuation routes leading to high ground assembly areas. This measure would facilitate rapid evacuation by eliminating the impediments created by failure of overhead utility lines and power poles along evacuation routes.
- The Planning and Public Works Departments will evaluate improved methods of marking, signing, and lighting major evacuation routes leading to high ground assembly areas and provide upgraded demarcation of select evacuation routes. This would reduce confusion and improve evacuation efficiency (especially at night)

when time to evacuate is very limited. In Seaside, this becomes even more important due to the large percentage of tourist and non-resident that are unfamiliar with appropriate evacuation routes.

- The City Planning Department will partner with Seaside Tsunami Amateur Radio Society (STARS), TAG, the county-run Radio Amateur Emergency Service (RACES), and the private club Amateur Radio Emergency Services (ARES) to establish a network of planned emergency communication stations. During evacuation drills and in the event of a tsunami, volunteer Ham radio operators will be stationed at each assembly area with an easily identified red tent to relay messages, call for help and provide communication assistance to residents.
- With two parallel river systems running the length of Seaside, the location and stability of bridge crossings will play a vital role when evacuating the inundation zone due to a local tsunami following a Cascadia Subduction Zone event. Failed bridges or indirect evacuation routes that require evacuation times that exceed 20 minutes will be life threatening. Therefore the following mitigation measures related to bridges are very important:
 - Conduct an engineering evaluation of all existing bridges along evacuation routes within the tsunami inundation zone to determine their potential to be utilized for pedestrian evacuation immediately following a Cascadia Subduction Zone Earthquake. Although many of the existing bridges may not be suitable for vehicular traffic after a subduction zone earthquake, no formal study by a qualified engineer has been done to determine the likelihood of them standing, so they could be used for evacuation immediately prior to a tsunami event.
 - Develop new earthquake resistant bike/pedestrian bridges along critical evacuation routes. These bridges will address multiple needs; however, the location and prioritization of establishing foot bridges should strongly consider the elimination of long evacuation times for the greatest number of individuals.
 - In conjunction with planning to provide new foot bridges, existing vehicular bridges along evacuation routes that are subject to failure should be upgraded to current seismic standards sufficient to withstand a Cascadia Subduction Zone Earthquake. Prioritization of bridge replacement should strongly consider the elimination of long evacuation times for the greatest number of individuals. The list of bridges in need of retrofit include (not in order of priority):
 - Avenue U
 - Avenue G
 - Avenue A
 - Avenue S
 - West Broadway
 - Lewis & Clark, Stanley Lake (controlled by Clatsop County)
 - Highway 101 Neawanna Creek Bridge (controlled by ODOT)
 - Highway 101 Dooley Bridge (currently ODOT's)

- The Seaside School District will continue to plan and work towards moving all of their school facilities above the inundation zone, combining them into a single campus that would also be capable of providing an assembly and shelter facility well above the elevation of a likely tsunami inundation. This facility would also provide a site that would accommodate additional supply cache storage for evacuees.
- The City will work with Red Cross to secure additional Red Cross disaster relief trailers and recruit local volunteers willing to be trained in their deployment and use. The city has five distinctive evacuation assembly areas but it only has one disaster relief trailer. Additional trailers are needed to supply each of the assembly areas and trained volunteers to oversee their use.

3.7 Volcano

The Clatsop County Natural Hazard Mitigation Plan adequately describes the City's risk to volcanic events. Generally, a volcanic event that affects the County is likely to affect Seaside as well. The causes and characteristics of a volcanic event are appropriately described within the County's Plan, as well as the location and extent of potential hazards. Previous occurrences are well-documented within the County's Plan, and the community impacts described by the County would generally be the same for Seaside as well. Seaside is very unlikely to experience anything more than a small amount of volcanic ash during a volcanic event. The County estimates a 'low' probability of future volcanic events and a 'low' vulnerability to future eruptions. The County's probability and vulnerability estimates are accurate for Seaside as well. Ash cleanup is the only potential impact identified for this risk category. At this time, city staff estimate that it is unlikely that ash from a volcanic eruption in the Cascade Range will be transported to Seaside based on prevailing wind patterns.

3.8 Wildfire

The Clatsop County Natural Hazard Mitigation Plan adequately describes the causes and characteristics of wildfires, as well as the County and City's history of wildfire events. Seaside has no recorded history of wildfire, and County wildfires are mostly related to debris burns. Clatsop County has completed a Community Wildfire Protection Plan (CWPP) to be included in the Clatsop County Hazard Mitigation Plan. Seaside Fire Marshall Chris Dugan served on the steering committee for the CWPP. The Seaside Fire Department works in collaboration with the fire departments of neighboring cities and the Oregon Department of Forestry through a mutual aid agreement. According to this agreement, the Oregon Department of Forestry may be dispatched for wildland fires in Seaside by request.

Clatsop County estimates a high probability that wildfires will occur in the future. Seaside, however, has wildfires as having a low probability of occurrence, based on a low history of such incidents in the past.

Clatsop County estimates a moderate vulnerability to wildfire events, meaning 1-10% of the population of regional assets are likely to be affected by a major event. Wildfires are most likely to occur in wildland-urban interface areas.^{xvi} The properties bounded on the east by commercial forest land and those bordered on the south by forested state parks (Ecola State Park) are interface areas at risk of wildfires. Within these interface areas, the city infrastructure most at risk is the city water treatment plant located at Peterson Point. Additionally, there are numerous wooded areas throughout the community, making the spread of fire from one area of the City to another a possibility. The natural mitigation factor is the maritime climate which reduces the rate at which vegetation dries during the summer months. Potential community impacts are adequately described in Clatsop County's Wildfire Hazard Annex.

Current Mitigation Activities

- The City of Seaside Fire Department continues to collaborate with the County to ensure compliance with the Clatsop County Wildfire Prevention Plan.
- The City will continue to promote fire safety through the issuance of burn permits, and actively enforces the prohibition of recreational fires in beach grass or driftwood piles.
- The Seaside Fire Department operates a wildland firefighter training certification program.

Recommended Future Actions

- Implement a fuel reduction program around the water treatment plant to minimize risk of wildfire damage.

3.9 Wind and Winter Storms

The Clatsop County NHMP adequately describes the causes and characteristics of wind and winter storms, as well as the location and extent of wind and winter storm hazards. The region's (and City's) history of events are adequately described within the County's Plan as well. Because coastal wind storms typically occur during winter months, they are sometimes accompanied by ice, freezing rain, flooding, and very rarely, snow. More than likely, however, the coast's winter will just be windy, cold, and wet.

The County estimates a 'high' probability that wind and winter storms will occur in the future. Windstorms occur yearly, and the more destructive storms occur once or twice per decade. The County additionally estimates a 'high' vulnerability to windstorms, meaning more than 10% of the population or regional assets would be affected by a major windstorm event. Both estimates are true for the City as well.

Seaside's long, narrow configuration on the Pacific shoreline makes it very vulnerable to windstorms blowing in from the ocean. Winter storms with snow and ice that are severe in nature are relatively uncommon along the coastal strip. Because of the infrequent nature, many drivers lack necessary skills and equipment to continue routine travel, and many homes are not constructed to adequately protect their plumbing systems from freezing. Additionally, roughly 26.5% of the homes in the community are for vacation use and not occupied year-round.^{xvii} During prolonged periods of freezing weather, it is common to find water pipes broken with water running unchecked into homes and onto the ground. When this becomes widespread, the public water reservoirs drain with resultant loss of flow needed for fire protection and public health.

Current Mitigation Activities

- The City has installed a generator at the City offices to supply power for daily operations during severe storms. A generator was installed at the convention center following the winter storms of 2007. With this back-up energy supply, the convention center may be used as a community shelter during a prolonged power outage. This would not be a viable shelter following a tsunami. See section 3.10 (All Hazards) for further discussion concerning actions intended to address prolonged power outages.
- The City currently negotiates with Pacific Power Co. and private developers to install underground utilities in conjunction with street improvement projects whenever practical.
- The City Building and Planning Departments provide building permit and inspection services in accordance with the State's adopted building code. This code provides standards for construction based on wind loads.

3.10 All Hazards

Some Mitigation strategies are effective for multiple hazards. What follows are the City's recommended actions which will address risks posed by multiple hazards.

Recommended Future Actions

- Review, revise, and make necessary updates to the City of Seaside Natural Hazard Mitigation Plan by resolution not less than one time each year, and participate with Clatsop County's and multi-jurisdiction plan adoption not less than one time each five years based on the dates of plan adoption.
- Ensure the use of a cost-benefit analysis to ensure that mitigation action items are cost effective and meet mitigation criteria.

- Evaluate City Ordinances and Capitol Improvement Plans not less than one time each five years to determine if reasonable modifications can be made to support mitigation efforts that would reduce the potential risk from natural hazards.
- Evaluate critical facilities and structures exposure to natural hazards and consider practical mitigation measures, up to and including relocation, in an effort to minimize their exposure risk.
- Provide preparedness information on the city's web site.
- Provide backup generator power capabilities and fuel sources for critical infrastructure, emergency equipment, and public utilities for use during disaster events.
- Designate a hazard debris management site for the interim storage of debris following a winter storm or distant tsunami, and develop a Hazard Debris Management Plan.
- Prepare and implement a community disaster preparedness program.
 - Develop a Community Self-Sustainability Program to prepare food, shelter, hygiene, water, communication, and assistance in the event of a disaster. Follow a "map your neighborhood" approach to identify those with special skills, special equipment, resources and special medical or mobility needs.
 - Identify leaders in designated areas who will implement a neighborhood based approach to community resiliency. Encourage each community member to have adequate supplies and personal plans that will raise their level of all hazard preparedness.
- Educate the community about hazard risks and hazard mitigation. Encourage participation in mitigation and community sustainability programs by holding a periodic outreach event such as national night out and preparedness workshops.
- Continue to support the Seaside CERT team with training and supplies. Support the launch of a TeenCERT program at Seaside High School to educate youth and their families about preparing for disasters, and train youth to be the first responders for their school in the event of an emergency.

Section 4 Action Items

The City of Seaside addendum includes action items that, when implemented, will reduce the city's vulnerability to natural hazards. These recommendations are consistent with the goals and objectives of the city's existing plans and policies. Action items are listed in the Recommendation Table below, and are organized by hazard.

Recommended Action	Priority (ST = short term, LT = long term, OG = ongoing)	Lead Department
ALL HAZARDS		
Provide preparedness information on city's website.	OG	Planning Department
Periodically update Seaside Addendum.	OG	E-PREP
Evaluate City Ordinances and Capital Improvement Plans not less than one time each five years to support hazard mitigation efforts.	OG	E-PREP, Planning Department, Public Works
Designate a hazard debris management site/Develop a Hazard Debris management Plan.	ST/LT	Public Works Department
Provide back-up generator power capabilities and fuel sources to critical facilities and disaster gathering sites.	ST	Public Works Department
Implement a community disaster preparedness program, including neighborhood resource mapping, and establishment of neighborhood leaders to conduct ongoing outreach.	LT	Planning Department, TAG
Conduct National Night Out events or other community resiliency events and conduct preparedness workshops.	LT	Planning Department
Provide ongoing support for Seaside CERT program and development of a Seaside TeenCERT program.	OG	Seaside Fire Department, Seaside High School
EARTHQUAKE		
Develop a cost-benefit analysis for bridge seismic retrofits and engineering report of current bridge stability.	ST	Public Works Department

Promote a “seven step” approach to preparedness.	OG	Planning Department
Develop a program to provide seismic upgrade information to property owners and encourage upgrades.	LT	Building and Planning Departments
FLOOD		
Apply for FEMA’s National Flood Insurance Program Community Rating System.	ST	Planning Department
TSUNAMI		
Conduct school education and outreach.	OG	School District
Support efforts to provide a local, regional or county-wide outreach coordinator	ST	Planning Department, TAG
Adopt an event scenario.	ST	TAG, City Council, Planning Department
Continue to conduct evacuation drills.	OG	TAG, E-PREP, STARS
Develop a Tsunami Ready Business certification program.	ST	Planning Department, Seaside Downtown Development Association, Chamber of Commerce.
Conduct an engineering evaluation of existing multi-story buildings within the inundation zone to be utilized as vertical evacuation structures.	LT	Building and Planning Department.
Upgrade symbols, markings and signage along select evacuation routes.	LT	Public Works and Planning Department
Develop emergency communication stations at assembly areas.	ST	STARS, Planning Department
Construct new pedestrian evacuation bridges along critical evacuation routes.	LT	Public Works Department
Reconstruct existing bridges along evacuation routes that are projected to fail in an earthquake.	LT	Public Works Department
Relocate public school buildings to one consolidated campus on high ground.	LT	School District
Secure trailers to store disaster relief supplies out of inundation zone.	LT	Planning Department, E-PREP, TAG

WILDFIRE		
Implement a fuel reduction plan around water treatment plant.	OG	Fire Department

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- ^{iv} United States Census Bureau. 2006-2010 American Community Survey 5-Year Estimates: Selected Economic Characteristics: *Seaside City, Oregon*. Retrieved from: <http://factfinder2.census.gov>.
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