



City of Sedro-Woolley
Natural Hazard Plan
June 5, 2003

INTRODUCTION

The City of Sedro-Woolley, in partnership with other local governments and tribes, has been an active participant in the planning process to develop the **Skagit County Natural Hazards Mitigation Plan**. The City of Sedro-Woolley's portion of the plan reflects contributions from the Building, Planning, Engineering, Public Works, and Finance departments of the City.

These offices and departments have created an overall profile of the City of Sedro-Woolley based on size, population, growth trends, economic base and current/future predominant land uses. From this profile, City of Sedro-Woolley was segmented into 3 distinct "neighborhoods" based on geography, land use, and hazard risk elements that are specific to each. The use of these neighborhood profiles has allowed for the development of area-specific risk assessments and has thereby promoted efficient mitigation planning.

City of Sedro-Woolley Overview:

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Population of Jurisdiction: 8,685 and growing rapidly

Estimated Geographical Size: 3.40 square miles

Principal Economic Base: Retail and Commercial

Economic Characteristic: Economically disadvantaged

The three neighborhoods are defined as follows:

- 1) The Residential - North Neighborhood is defined according to Land Use/Zoning regulations and is predominantly residential housing. This neighborhood is bordered to the south by Cook Rd. and SR 20.
- 2) The Residential - South Neighborhood is defined according to Land Use/Zoning regulations and is predominantly residential housing. This neighborhood is bordered to the north by Cook Rd. and SR 20.
- 3) The Central Commercial/Industrial Neighborhood is defined according to Land Use/Zoning regulations and is predominantly commercial and industrial. This neighborhood encompasses the central area within the city

bordered by the north and south residential neighborhoods, and includes the SW arm containing United General Hospital.

The City of Sedro-Woolley, because of geographical, geological and topographical diversities, is subject to a wide variety of hazards. This document is intended to identify the types of hazards that pose a high degree of risk of occurrence, and the mitigation measures that are currently in place to reduce or mitigate loss to health, life, property, and the environment.

The City of Sedro-Woolley has adopted the 1997 edition of the Uniform Codes (Building, Fire, Mechanical and Plumbing) [SWMC 15.04.020]. The purpose of these codes is to provide minimum standards to safeguard life and limb, health, property and public welfare. In addition to the general standards for construction, the Building Code provides for geographically specific requirements for seismic design, high wind design and high snow load design.

The City of Sedro-Woolley adopted the Flood Damage Prevention Ordinance as a part of the Unified Development Code, Section 14.34, [SWMC 17.66]. The purpose of this ordinance is to protect life and health, minimize public money expenditure, minimize the need for rescue and relief associated with flooding, and minimize prolonged business interruption and to minimize damage to public facilities and utilities.

The City of Sedro-Woolley adopted the Critical Areas Ordinance as a part of the Unified Development Code, Section 14.24, [SWMC 17.65.110] Within this ordinance are requirements and restrictions relating to steep, unstable or otherwise hazardous slopes, which could impact human safety during earthquakes, sliding and erosion. The purpose of this portion of the Critical Areas Ordinance is to safeguard citizens, property and resources through identification of hazardous areas, requirements for mitigation through engineered design and construction methods; and, when design and construction methods cannot reduce risks to acceptable levels, to prohibit building and construction.

Hazard Mitigation analyses conducted by City of Sedro-Woolley staff and Summit GIS (consultants) was based on the best currently available information and data regarding the characteristics of the neighborhoods identified, the natural hazards that threaten the people, property, and environment of these neighborhoods as well as the impacts these neighborhoods have suffered in past disasters. This information includes the following:

- United States Census data (year 2000),
- Assessor tax records,
- FEMA Flood insurance Rate Maps,
- Skagit County GIS data of various types,
- Department of Natural Resources data,
- US Geological Survey elevation and slope data,

- Natural Resource Conservation Soil Data,
- Washington State Geological Survey Geological Data,
- City of Sedro-Woolley native data sets,
- Summit GIS, Inc. data sets,
- Plus numerous other information as available.

In some cases the experience, knowledge and judgment of local officials representing City of Sedro-Woolley government were used in the planning, including assumptions and approximations that were believed to be reasonable. In addition, straightforward, simplified technical analyses were used for tasks such as estimating property values, determining the size of populations affected, and so forth. The reliance on the judgment of knowledgeable officials and simplified analyses is considered acceptable at this stage to allow the participating organizations to complete the tasks needed to develop this multi-jurisdictional natural hazards mitigation plan. As the planning continues in future years, or at the time when a proposed mitigation initiative is intended to be funded and/or implemented, the participating organizations/jurisdictions recognize that additional information and analyses may be required.

Repetitive Loss Properties

Several properties are located within the floodplain and are considered repetitive loss properties. These are located at the southern most border of the City, in the floodplain, next to the Skagit River.

Current Hazard Mitigation Codes/Plans/Ordinances cited below:

- Comprehensive Land Use Plan
- Adopted Land Use/Zoning Code
- Adopted Fire or Life Safety Code
- Adopted Building Code (1997 Uniform Building Code)

Hazard Type	Mitigation
<p>FLOODING A small portion of the City of Sedro-Woolley is located within the 100-year floodplain, while a moderate amount is located within the 500 year floodplain. Flooding events in 1990 and 1995 have both come close to causing significant damage to structures and property within the City.</p>	<p>The City's Comprehensive Plan Goals and Policies and the Skagit County Countywide Planning Policies (CPPs) directly address flood hazard reduction:</p> <p>Skagit County and Cities and Towns, in cooperation with appropriate local, state and Federal agencies, shall develop and implement flood hazard reduction programs, consistent with and supportive of the Corps Feasibility Study. (CPP 10.13)</p> <p>The purpose of the Floodplain Management chapter (SWMC 17.66) is to protect human life and property; minimize the expenditure of public money; ensure that those who occupy the areas of special flood hazard assume responsibility for their actions and maintain the city's flood insurance eligibility while avoiding regulations which are unnecessarily restrictive or difficult to administer.</p> <p>Skagit County and Cities and Towns shall work together to provide ongoing public education about flooding in a coordinated and consistent program, and shall adopt a flood hazard reduction plan, that works together with the natural and beneficial functions of floodplains. (CPP 10.15)</p> <p>SW Comp Plan Policy LU 4.2: Implement a community flood-preparedness program.</p> <p>Under requirements of the state Growth Management Act, the Comprehensive Plan also identifies, designates, and protects wetlands, aquifer recharge areas, and frequently flooded areas. This is done through numerous education, incentive, and protection and conservation measures contained in Comprehensive Plan Critical and Sensitive Areas Goals and Policies and Development Regulations (SWMC 17.65 & SWMC 17.66).</p> <p>Policy LU 4.1: Promote open space, recreation, and agriculture as the highest and best use of land in flood-prone areas.</p> <p>Policy CSA1.6: Develop funding mechanisms to</p>

permit the City acquisition of sensitive/open space areas for the public benefit. Integrate public park and/or trail systems with natural areas where appropriate, but ensure that such uses do not degrade the natural function of these areas.

Policy CSA2.12: Preserve natural stream environments along the Skagit River. Restrict development within 200 in compliance with the Shoreline Management Act.

The purpose of the Floodplain Management chapter in the Sedro-Woolley Municipal Code is to protect human life and property; minimize the expenditure of public money; ensure that those who occupy the areas of special flood hazard assume responsibility for their actions; and maintain the city's flood insurance eligibility while avoiding regulations which are unnecessarily restrictive or difficult to administer.

All new construction and substantial improvements shall be anchored to prevent flotation, collapse, or lateral movement of the structure. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage, and using methods and practices that minimize flood damage.
(SWMC 17.66.070)

In all buildings, construction materials used below the base flood elevation must be resistant to damage by flood waters. (SCC 14.34.160)

New residential construction and substantial improvement of any residential structure, including any manufactured home, shall have the lowest floor, including basement, elevated one foot or more above base flood elevation, fully enclosed areas below the lowest floor that are subject to flooding are prohibited, or shall be designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwater. Designs for meeting this requirement must either be certified by a registered engineer or architect or must have a minimum of two openings having a total net area of not less than one square inch for every square foot of

enclosed area subject to flooding shall be provided, the bottom of all openings shall be no higher than one foot above grade, openings may be equipped with screens, louvers, or other coverings or devices provided that they permit the automatic entry and exit of floodwater.

New nonresidential construction and substantial improvement of any commercial, industrial, or other nonresidential structure shall either have the lowest floor, including basement, elevated one foot or more above the level of the base flood elevation; or together with attendant utility and sanitary facilities, shall be flood proofed so that below one foot above the base flood elevation the structure is watertight with walls substantially impermeable to the passage of water; have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this section based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the Planning Director.

No encroachments, including fill, new construction, substantial improvements, and other development shall be allowed unless certification by a registered professional engineer or architect is provided demonstrating that encroachments shall not result in any increase in flood levels during the occurrence of the base flood discharge.

Construction or reconstruction of residential structures is prohibited within designated floodways, except for repairs, reconstruction, or improvements to a structure which do not increase the ground floor area; and repairs, reconstruction, or improvement of a structure, the cost of which does not exceed 50 percent of the market value of the structure before the "start of construction" on any improvement, or the "start of construction" on any repair or restoration of a damaged ..structure.

	<p>Work done on structures to comply with existing health, sanitary, or safety codes, as required by the local code enforcement officer, or to "historic structures", as most recently defined by the National Flood Insurance Program, shall not be included in the fifty percent.</p> <p>Through federal and state grants, a significant number of repetitive loss properties, in areas prone to flooding, have been purchased by the County and the buildings either demolished or removed.</p>
<p style="text-align: center;">EARTHQUAKE</p> <p>The City of Sedro-Woolley is located in seismic zone 3 as determined by the Uniform Building Code. Damage and loss due to earthquake was experienced as recently as the 2001 Nisqually earthquake.</p>	<p>All new buildings not meeting the strict prescriptive requirements of the UBC are required to have their structural elements designed by a professional engineer or registered architect. Such design is required to include seismic analysis of the building in addition to wind, gravity and other forces.</p> <p>Building permits are issued for repair of seismically damaged buildings, normally based on a site inspection by the field inspection staff. All repair construction must meet the current building code requirements for seismic design.</p> <p>In areas of the County with steep or unstable slopes, or with soil prone to liquefaction, geotechnical reports, prepared by a professional engineer, are required as part of a building permit application. Such reports must include an analysis of the effects of a seismic event.</p>
<p style="text-align: center;">HIGH WINDS</p> <p>The City of Sedro-Woolley is located in a borderline high wind area. The design wind speed for City of Sedro-Woolley is 80 mph. The entire city is also classified as exposure B (1997 UBC), where forests and hills provide some protection from winds.</p>	<p>SWMC 15.04.020. The 1997 Uniform Building Code, including provisions for high winds.</p> <p>All new buildings not meeting the strict prescriptive requirements of the building code for adequate wall bracing, are required to have their structural elements designed by a professional engineer or registered architect utilizing the wind design requirements of the building code.</p>
	<p>Mitigation: SWMC 17.65.110 Standards for</p>

LANDSLIDE

Portions of City of Sedro-Woolley are prone to landslide due to steep slopes, soil erosion, fractured rock faces, etc.

geologically hazardous areas. No development or grading shall be allowed in areas of known or suspected risk of land movement, erosion, landslide, seismic activity, slump or earth flow, mud or debris flow, or rockfall, or on top of mines or tunnels of any kind, except when stabilization of the identified hazardous conditions based on established and proven engineering techniques which ensure protection of public and private property. Appropriate conditions may be attached to any approval by the city.

An engineering geologic study approved by the city establishing that the site is stable for the proposed use and development. The study shall include, at a minimum an index map, project description, to include: location; topography; drainage; vegetation; discussion of previous work; and discussion of field exploration methods, site geology, to include: site geologic map; description of bedrock and surface materials including artificial fill; location of any faults, folds, etc.; and structural data including bedding, jointing, and shear zones, discussion and analysis of any slope stability problems, discussion of any off-site geologic conditions that may pose a potential hazard to the site or that may be affected by on-site developments, suitability of site for proposed development from a geologic standpoint, specific recommendations for cut slope stability, seepage and drainage control, or other design criteria to mitigate geologic hazards, if deemed necessary by the engineering geologist to establish whether an area to be affected by the proposed development is stable, additional studies and supportive data shall include cross sections showing subsurface structure; graphic logs of subsurface explorations; results of laboratory tests; and references.

Signature and certification number of an engineer or engineering geologist registered in the State of Washington, additional information or analyses as necessary to evaluate the site. Vegetation cover shall be maintained or established for stability and erosion control purposes.

A minimum buffer of twenty-five feet shall be

maintained between any confirmed geologically hazardous site and any structures. This buffer may be increased, on a case-by-case basis, consistent with the recommendations of the engineering geologic study.

Diversion of storm water into those areas shall be prohibited. The principal sources of information for determining geologic hazardous areas are the United States Department of Agriculture Soil Conservation Service, the United States Geological Survey, the Department of Natural Resources Division of Geology and Earth Resources. Approved site specific engineering geologic studies shall be used to identify the extent and severity of the hazardous conditions on the site, and to update the geologic hazards data base.

Mitigation: SWMC 17.65.120 Standards for hillsides and steep slopes.

The provisions of SWMC 17.65 shall apply to development proposed on slopes of twenty percent or greater. No subdivision, short plat, planned residential development or binding site plan shall create any new lot or parcel which cannot be developed under the provisions of this section. Grading and stripping of vegetation, and lot coverage by structures and impervious surfaces is limited to no more than twenty percent of such slopes located on an individual site, except on a case-by-case basis, subject to planning commission review with public notice as provided for variances.

Approval shall not be granted unless the proposed development does not exceed the lot coverage in the general requirements of the underlying district; the additional lot coverage, grading or stripping shall not decrease the stability of the slope; increase erosion, sedimentation or drainage flow from the property, adversely impact or remove significant large or specimen trees or wooded areas, adversely impact "high priority" sensitive areas as defined in SWMC 17.65.050.

Measures shall be employed to minimize grading or filling to accomplish the development. Disturbed

areas shall be compacted if necessary and revegetated as soon as practical, and before annual wet season. Buildings shall be clustered to reduce alteration of terrain and provide for presentation of natural features. Creation of building sites through mass pad grading and successive padding or terracing of building sites shall be avoided. Road grades shall be consistent with city specifications. One-way streets may be allowed. Revegetation of all graded areas is the responsibility of the developer and shall occur as soon as feasible following the final grading. Maintenance of the slopes shall be the responsibility of the developer until the property ownership is transferred.

Grading, stripping or any other development on land over thirty-five percent slope with a vertical relief of ten or more feet shall be subject to planning commission review with notice as provided for variances. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least ten feet of vertical relief.

Approval shall not be granted unless an engineering geologic study approved by the city establishes that the site is stable for the proposed development, and any conditions or recommendations based on the study are incorporated into plans and construction of the development. Access to the site is approved by the city and the fire department pursuant to the engineering geologic study and associated conditions. Care shall be taken in the construction of access roads to minimize terrain alterations which detract from the natural features of the site. Elevations of proposed structures, and revegetation plans shall be required to insure preservation or rapid reestablishment of the visual quality of the site. A plan for storm drainage and erosion control is approved by the city, and, when applicable, by the county drainage district and/or Department of Fisheries.

When a building is proposed, the applicant shall demonstrate that it is not feasible to either transfer the density (in the case of residential buildings) or develop on a portion of the site which is less sloped, or unique characteristics of the site, such as but not

	limited to vistas or solar exposure, could be better utilized by the proposed siting of structures with less or equal overall disturbance of the property than would occur otherwise under the provisions of this chapter.
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Potential Mitigation Projects

Below is a list of possible mitigation projects that need to be performed in the City of Sedro-Woolley.

FLOODING

Wastewater Treatment Plant

The sewer treatment plant is located within the 100-year floodplain, and could be disabled if a large flooding event or lahar were to occur. If it were to become inoperable then a serious human health hazard would exist. This facility should be mitigated in some way, by being moved out of the floodplain or being protected in place.

Relocate Public Works Shops and Offices

The Street, Parks, and Cemetery department shops and offices are located in the floodplain. These should be mitigated in place or moved out of the floodplain.

Purchase repetitive loss properties in the floodplain

There are several properties in the floodplain that have been repeatedly damaged by past flood events. These properties should be purchased and converted to open space or recreational use.

United General Hospital (UGH)

UGH is located within the 100-year floodplain, and could be disabled if a large flooding event or volcanic lahar were to occur. Should this facility fail, the nearest hospital is 8 miles away in Mount Vernon. This facility should be mitigated in some way, by being moved out of the floodplain or being mitigated in place.

Riverfront Park Landfill Site

Riverfront Park, located at the very southern end of the city limits, is an old abandoned landfill. When flooded, this site has been known to have garbage enter the floodwaters. This site should be excavated and the materials disposed of properly, or mitigated in place.

Brickyard Creek

Brickyard Creek has had a significant amount of its floodwater storage capacity eliminated due to development. With very little storage capacity left, any discharges into the stream system immediately surge downstream. Increasing this storage capacity would help to keep discharges from being so large and fast. Fisheries has identified a potential site for additional flood storage on property south of Jones Road and west of the railroad, known as the Belles property.

Alluvial Fan Hazards

Alluvial Fans are known to exist in parts of Skagit County, but there hasn't been an alluvial fan hazard previously identified in Sedro-Woolley. A survey of possible alluvial fan hazards by a Professional Geologist in Sedro-Woolley would help clarify if these hazards exist in Sedro-Woolley or not. Any such properties at risk could then be purchased as a mitigation measure to help reduce future losses.

EARTHQUAKE

Sedro-Woolley City Hall

City Hall has had numerous studies that indicate it would suffer significant damage in the event of an earthquake. This facility should be retrofitted or replaced so that it can survive an earthquake.

VOLCANO

Lahar Early Warning System

The US Geological Survey has designed a number of systems that automatically detect lahars as they descend neighboring valleys. These systems then automatically trigger various types of early warning systems, such as sirens or telephone based warning systems.

COMMUNICATIONS

Community Early Warning System

Could be built to help provide broad community notice for evacuation in the event of flooding, Lahars, Dam Failures, etc. Such an early warning system would typically be a series of sirens that could be triggered in the event the City needed to be evacuated.

Telephone Based Early Warning System

A computerized early warning system would automatically dial every telephone number within a specified area, and play a recorded message to whoever picked up the phone. Such a system could be very useful for a variety of natural and man made problems.

Tone Radio Based Early Warning System

Tone Radios turn on when triggered by a central transmitter, and then information or instructions are announced over the radio. Such a system is currently used for various types of weather radios, for tornados and severe storms hazard areas. A similar system could be put into place for warning of flooding, lahars, and other related natural hazards.

Earthquake Early Warning System

Such a system could warn residence of an impending earthquake. Technology doesn't currently exist for such a system, but will likely be possible in the future.