

**KITSAP COUNTY
HAZARD IDENTIFICATION &
VULNERABILITY ASSESSMENT**

**Revision
October 2008**

Prepared by

Kitsap County Department of Emergency Management
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KITSAP COUNTY HAZARD IDENTIFICATION & VULNERABILITY ANALYSIS

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EXECUTIVE SUMMARY

Every four years, communities in Washington State must update their Comprehensive Emergency Management Plans (CEMP). To support this update, The Hazard Identification and Vulnerability Assessment (HIVA) is reviewed concurrently with the CEMP to validate hazards in the community to include natural, manmade and technological. The HIVA has been reviewed and updated by the Kitsap County Emergency Management Staff and any changes will be incorporated into the CEMP. Revisions to the HIVA are noted below.

Since the last update in 2004 the following events have occurred in Kitsap County:

Date	Type	Declared	Comments
09/01/2005	Hurricane Katrina	National Disaster	Kitsap Co. supported response
01/27/2006	Severe Winter Storm	Presidential Declaration	Approved for Public Assistance only
11/02/2006	Severe Weather	County/State	Did not meet criteria for Presidential declaration
12/14/2006	Severe Weather/windstorm	County/State	Did not meet criteria for presidential declaration
12/03/2007	Severe Flooding	Presidential Declaration	Approved for both Public and Individual Assistance

New to this update you will find a chronological table of Kitsap County Disaster History. See Attachment 1, page 7.

Although severe winter storms continue to be our “bread and butter” events, our greatest risk continues to be earthquakes. As such, the Department of Emergency Management continues to prepare our staff and public for the next significant earthquake. Any earthquake of a “Nisqually” or greater event will have a significant affect on people, economy and the environment. Within reason, preparing for the greatest all-hazard event, will prepare us for event of lesser magnitude.

As you review this HIVA, consider the following:

- Except for isolated incidents (fire, hazardous material incident) there is no hazard identified that would require an entire evacuation of Kitsap County and its four cities including terrorist events.
- Kitsap County plans for all-hazards response utilizing the National Incident Management Systems (NIMS) and by training all response personnel utilizing the Incident Command System.
- The HIVA helps to assign weight and focus on vulnerabilities and insure the county and four cities prepare themselves for the likelihood of an event.

Updates to this plan include:

- Enhance Tsunami Planning
- Kitsap County Superfund Sites
- Closed and Abandoned Landfills
- Epidemic (animal and human)

We welcome your comments to this HIVA. Comments can be directed to the:

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HAZARD IDENTIFICATION & VULNERABILITY ASSESSMENT

KITSAP COUNTY

2008 Revision

I. INTRODUCTION

a. Mission Statement

The mission of the Kitsap County Department of Emergency Management is to prepare for, respond to, recover from, and mitigate any emergency or disaster that affects Kitsap County and its cities.

b. Authority

In accordance with WAC 118-30-060, a Hazard Identification and Vulnerability Assessment (HIVA) is required for the development of the Kitsap County Comprehensive Emergency Management Plan:

WAC 118-30-060 Emergency plan. (1) Each political subdivision shall maintain a current plan of operations which shall be based on hazard analysis. . . .

c. Background

The HIVA is an element of hazard mitigation allowing emergency managers to set goals according to the public need for protection. This document enhances public and private agency understanding and awareness, influencing the adoption of hazard mitigation programs. The findings revealed in the hazard vulnerability analysis also serve as a basis for preparedness, as well as influencing effective response and recovery programs.

d. Purpose

The Mission Statement of Kitsap County Department of Emergency Management is *to prepare for, respond to and recover from and mitigate any emergency or disaster that affects Kitsap County and its cities*. In order to prepare and plan for emergencies which have the potential to strike the County, it is necessary to understand the hazards that potentially could impact it, as well as the history of activity within Kitsap County, and how vulnerable the citizens of the County may be to those hazards. This analysis covers hazards most threatening to Kitsap County as determined by history, geologic projections and social and technological trends. Without an understanding of the hazards and their potential, it is impossible to appropriately meet the criteria of our mission statement. This analysis serves as a basis from which we develop plans, educate the public, provide training for our first responders, and

develop exercises to practice the skills and knowledge taught in an effort to better prepare ourselves for any hazard which may occur within the County.

This HIVA is not a detailed study of hazards and their impacts, but rather a description of those hazards which are felt to be the greatest threat potential to Kitsap County, its citizens, environment, personal and public property, and our economy.

This document serves as the revised 2008 Hazard Identification and Vulnerability Assessment (HIVA) of Kitsap County, Washington. It discusses those hazards which are a potential threat to the residents of the county, and is not meant to be an inclusive list. It covers both natural and technological hazards.

This document consists of three (3) major parts:

- Part 1:** Includes a profile of the County, detailing its history, geographic makeup, demographics, and economy.
- Part 2:** Provides information concerning natural hazards which may have a potential threat to create emergencies or disasters within our area.
- Part 3:** Details technological and social hazards which may have the potential of impacting our county.

Each of the designated hazards is described through six different venues:

- **Hazard Definition:** clarifies the specific event being discussed.
- **Hazard Identification:** identifies areas in the County where the hazard is likely to occur or may be a problem.
- **History:** provides historical context.
- **Vulnerability Analysis:** details the elements which make the hazard a threat to the community, as well as defining those areas and/or populations most susceptible to the hazard/threat.
- **Effects:** details the potential damage resulting from the incident involved in the hazard/threat.
- **Mitigation:** details mechanisms, practices or procedures which can be utilized to limit or eliminate any portion of the potential damages sustained from the hazard/threat.

II. KITSAP COUNTY PROFILE

a. History

Native Americans were the first known inhabitants of what would become Kitsap County. The Suquamish were the area's principal tribe. They and others around Puget Sound formed a tribal confederation that was ruled by Chief Kitsap, one of the confederation's greatest leaders. Kitsap ruled the confederations from Old Man House on Agate Pass (at present-day Port Madison). Because of the alliance, tribes of the Puget Sound confederation engaged widely in

intertribal commerce and trade, making them the first in the region to engage in such activities.

White explorers first came upon what would become Kitsap County in 1792 when Captain George Vancouver in command of the H.M.S. Discovery charted Puget Sound. Vancouver's report on Puget Sound stimulated the interest of the fur industry. Several fur companies vied for trapping rights in the new territory with the Hudson's Bay Company eventually holding a virtual monopoly in the area.

In 1841, Lt. Charles Wilkes – in command of the U.S.S. Vincennes and U.S.S. Porpoise – charted Puget Sound for the United States government. The expedition was done in anticipation of the U.S. gaining full sovereignty over the region (which at the time was ruled by the U.S. and Great Britain under the Joint Occupation Treaty of 1818). Present day Kitsap County was among the areas charted by the Wilkes party. Perhaps the most striking of their observations was that of the harbor at Port Orchard, which they found to be “deep enough for the largest class vessels, with a bold shore and a good anchorage.” Fifty years later, the harbor became the site of the Puget Sound Naval Shipyard.

With U.S. sovereignty the territory became opened to settlement. However, before that could occur, there lay the task of clearing dense stands of virgin Douglas fir that reached all the way to shore. As a result, the 1850's saw logging emerge in Kitsap County. At first, harvested logs were shipped straight to California and other world markets by clipper ship. In 1853 – the year Washington became a territory – companies were formed in California to secure market niches for finished lumber. The result was the first lumber mills in Kitsap County – the J.J. Felt & Co. mill at Appletree Cove (later moved to Port Madison) and the Pope & Talbot mill at Port Gamble.

The end of the Indian Wars of 1855-56 saw the Suquamish and Clallam tribes cede land to the United States. Settlement increased which, in turn, fueled industry expansion. In 1857, the area's major logging concerns initiated the establishment of Slaughter County (pop. 400), soon renamed Kitsap, the Salish word for *brave*.

In the years following the Civil War, Kitsap County enjoyed great prosperity as many new settlers came to the area. Long Lake, Colby, Olalla, Poulsbo, Silverdale, Brownsville, and Sydney were settled about 1884. Before its opening in 1891, rumors of the proposed Puget Sound Navy Yard (now PSNS) generated a real estate boom along Sinclair and Dyes Inlets and resulted in the planting and settlement of Tracyton, Chico, Manette Point, Charleston, and Bremerton. In 1893, new residents, primarily farmers and small businessmen, had the county seat moved to Sydney (renamed Port Orchard in 1903), where it has remained.

The dense inland forest prevented the establishment of roads and railroads and caused settlements to be concentrated along the shore. The *Mosquito Fleet*, an assorted collection of small steamers, plied the waters of the Sound between 1910 and 1930. They were a vital means of transporting passengers, mail and commodities between towns in Kitsap County and Seattle.

By the 1930s, road transportation had improved tremendously. More and more residents were driving automobiles. In 1930 the Manette Bridge was built linking Manette and Bremerton. The Tacoma Narrows Bridge opened to traffic in 1940, only to collapse that very same year, and then opening again in 1950. The Warren Avenue Bridge opened to traffic in 1958. Bridges such as these eventually pushed the Mosquito Fleet into obsolescence.

Few sectors have had as great an employment and economic impact on Kitsap County as the military – more specifically the U.S. Navy. The county hosts the Puget Sound Naval Shipyard (Bremerton), Naval Submarine Base (Bangor), and Naval Undersea Warfare Engineering Station (Keyport).

b. Geographic Characteristics

Kitsap County is located between the metropolitan areas of Seattle and Tacoma and the wilderness of the Olympic Mountains. It is bounded by Hood Canal on the west, Admiralty Inlet on the north, Puget Sound on the west, and Mason and Pierce counties to the south. Its landmass totals 393 square miles, ranking 36 in area among counties in Washington. Kitsap County has 228 miles of salt-water frontage – more than any other county in Washington. Most of the land area consists of remnants of a glacial drift plain. The surface is composed generally of flat-topped rolling hills separated by valleys and bays. The land rises from sea level to maximum altitudes of 400 to 600 feet, except for Green Mountain and Gold Mountain west of Bremerton. These hills, formed from ancient volcanic rocks, cover about 20 square miles and rise to an altitude of 1,761 feet.

c. Climate

Kitsap has a moderate climate with mild, wet winters and cool, dry summers. Mean annual precipitation ranges from 26 inches in the north to nearly 80 inches in the vicinity of Green and Gold Mountains.

d. Demographic Characteristics

Kitsap County has four incorporated cities. Bremerton, Kitsap's most populated city, is home of the area's largest employer, the Puget Sound Naval Shipyard. Port Orchard, across Sinclair Inlet from Bremerton, is known for its downtown shops and antiques. Poulsbo, on the northern shore of Liberty Bay, is known as "Little Norway" because of its many residents of Norwegian descent. Winslow became the City of Bainbridge Island in 1992, after citizens voted to annex the entire island in 1990. Bainbridge Islanders enjoy a beautiful, rural setting just minutes from the cultural and recreational attractions of Seattle. It is also home to the state's most heavily traveled ferry runs.

As of April 1, 2007 the total population of Kitsap County was 244,800 excluding military personnel residing on one of Kitsap County's four military installations. Of that figure, 170,000 reside in unincorporated county areas. The remaining population lives in the

following cities:

Bainbridge Island	23,080
Bremerton	35,810
Port Orchard	8,350
Poulsbo	7,560

e. Economy

Over half of the working inhabitants of Kitsap County are employed by Federal, State, County or Municipal government agencies. The remaining are employed in the fields of fishing, construction, manufacturing, transportation, public utilities, wholesale, retail, financial, insurance, real estate and services.

**Attachment 1
Kitsap County Emergency/Disaster History**

Date	Type	Declared	Comments
10/62	Columbus Day windstorm	County – yes State – yes Federal – yes: major	
05/65	Earthquake	County – yes State – yes Federal – yes: major	
01/74	Severe storms, snowmelt flooding	County – yes State – yes Federal – yes: major	
05/80	Mt. St. Helens eruption	County – yes State – yes Federal – yes: major	
12/03/82	Windstorm, high tides, extensive power outages, flooding, erosion issues	County – yes State – yes Federal – yes: major	Look at Damage Assessment sheets re: Point-No-Point (Damage Report per household/community) Damage assessed at \$785,000
11/90	High tides, severe storms, strong winds, slides, flooding	County – yes State – yes Federal – yes: major FEMA-883-DO-WA and FEMA-896-DO-WA	Mitigation info sent to: County: DCD, PW Cities: Bremerton, BI, PO Private: \$510,000 Public: \$1.5 million
12/90	Storms, high winds, flooding	County – yes State – yes Federal – yes: major	
01/29/92	Heavy rains, winds	No	Affected area: Hwy 160, evacuation of homes west of the Clambake due to slides; Vinland comm.; slides, erosion issues, bulkheads; no dollar loss
01/20/93	Inauguration Day Storm: gale-force winds, power outages (all)	County – yes State – yes – beginning 1/20/93 Federal – yes FEMA-981-DR-WA	Kitsap denied 2 die; multiple issues; approx \$5 million loss
12/94		County – yes State – denied IA & PA	No declaration awarded; SBA given private as contiguous of Pierce and Mason; dollar loss unkn
11&12/95	Flooding, wind	County – yes State – yes Federal – yes; major Declared 1/96	Kitsap denied
02/96	Flooding	County – yes State – yes Federal – yes	
04/23/96	Rolling Bay Walk, Bainbridge Isl	BI – declared No other asst.	Mudslide: home into bay; evacuated Rolling Bay Walk

Date	Type	Declared	Comments
12/96	Holiday Blast: ice, snow, flooding	County – yes State – yes Federal – DO-1159WA Declared 01/97	and homes along Mtn. View Public: \$10 million Private: approx \$10 million
03/97	Flooding	County – yes State – yes Federal – yes: major Declared 4/97	
02/24/99	Flooding, slides	County – yes	
02/28/01	Nisqually Earthquake	County – yes State – yes Federal – yes DR-1361; declared 3/01	
9/11/01	Terrorist Attack	County: yes State: 01-2382 Federal: yes	
1/07/02	Floods	County: State: 02-0038 Federal:	
10/15-10/23 2003	Floods	County: State: 03-2662 Federal: 1499, 11/7/03	
9/01/05	Katrina	County: 169-2005, 10/3/06 State: 9/4/05 Federal:	Kitsap did not receive funding.
1/27-2/4 2006	Severe Winter Storm	County: 0018-2006, 1/30/06 State: 06-0230,1/12/06 Federal: DR-1641, 5/17/06 Maj	Kitsap received funding for roadways and OT hours of responders.
11/2- 11/11 2006	Severe storm, floods, landslides, mudslides	County:198-2006, 11/22/06 State:06-6783 Federal: DR-1671, 12/12/06 Maj	Kitsap denied. Did not reach \$ threshold on damages.
12/14/06	Severe windstorms, landslides, & mudslides	County: 198-2006, 11/22/06 & 198A-2006, 12/16/07 State: (063783) then 06-3616, Federal: DR 1682, 2/14/07 Maj	Kitsap denied. Did not reach \$ threshold on damages.
12/03/2007	Severe Flooding	County 12/03/2007 State and Federal	Presidential both Public and Individual Assistance

III. NATURAL HAZARDS

a. Drought

Hazard

A drought is defined as "a period of abnormally dry weather, sufficiently prolonged for the lack of water to cause a serious hydrologic imbalance (i.e., crop damage, water supply shortage, etc.) in the affected area."

Effects

The possibility of a prolonged drought exists in Kitsap County. Normally, average annual rainfall is about 64 inches; however, there is a considerable difference in precipitation levels within the County. Several consecutive, hot, dry summer months can create parched and tinder-dry conditions.

Extremely dry conditions could force the closure of forests to recreation, hunting, camping and hiking. Camp fires and outdoor burning are often limited for a couple of months each summer and longer during extremely dry conditions.

Mitigation efforts should include public information on water conservation, which would discourage unnecessary water waste. The mitigation activities listed under FOREST-URBAN INTERFACE FIRES also apply due to the increased potential for forest fires during a drought.

Large areas supplied by one water system might have to resort to rationing. Residents on private wells should be prepared with water barrels in the event their wells become temporarily dry.

History

Historically, drought has not commonly been considered a problem in the area west of the Cascade Mountain Range. In spite of this, Kitsap County has felt the effects of drought many times in the past and will continue to do so in the future. Multiple measurable and documented droughts have hit the region in the past 100 years but the following three are the most notable:

- April 1934 – March 1937: The longest drought in the region's history.
- October 1976 – September 1977: The worst drought on record. Stream flows averaged between 30% and 70% of normal. Temperatures were higher than normal, which resulted in algae growth and fish kills.



- January – March 2001: the second driest winter on record in 106 years. Stream flows approached the low levels of the 1976-77 drought.

Vulnerability

Kitsap County's population and industries continue to grow, so does the demand for water. As usage approaches the limit of available water, any decrease in the normal flow will tend to exacerbate past problems. The county does not need a full-blown drought to experience a water shortage.

Kitsap County is vulnerable to drought in the logging and wood products industries as well as the recreational areas. Loss of income from hunters, campers and tourists would not have a devastating effect on Kitsap County economics.

Besides the forests, local agriculture can be devastated by a prolonged drought. A shortage of water will also impact certain industries that depend on inexpensive water supplies, such as laundries and restaurants. In the event of severe drought, the fire fighting capabilities of fire agencies can be impacted.

Conclusions

Droughts will continue to occur in Kitsap County. Drought-related forest and other wildfire will continue to occur in the County. During periods of drought, County and City governments must perform public education concerning water conservation and, when needed, institute water conservation activities such as prohibition of lawn watering and car washing.

b. Earthquakes

Hazard

The Puget Sound region is entirely within Seismic Risk Zone 3, requiring that buildings be designed to withstand major earthquakes measuring 7.5 in magnitude. It is anticipated, however, that earthquakes caused from seductions plate stress can reach a magnitude greater than 8.0.



With recent studies greatly enhancing the abilities of scientists to focus on active faults, scientists have paid particular attention to seven active faults in the Puget Lowland capable of generating damaging earthquakes. These faults include: the Seattle faults (2), Tacoma fault, Darrington-Devils Mountain fault, Utsalady Point fault, and two Whidbey Island faults.

The Puget Lowland faults are of particular concern because a great portion of the area is heavily urbanized and populated. The 2000 Census indicates that the four-county central Puget Sound area encompassing King, Kitsap, Pierce and Snohomish counties, where a number of the faults are found, has a population base of approximately 3.2 million people, or about 60 percent of the state's population, and much of the state's economic base.

Should an earthquake of 7.0 or greater occur within our region, according to the 2001 Washington State HIVA:

An earthquake with such a magnitude [7.0+] today would cause tremendous damage and economic disruption throughout the central Puget Sound region. Preliminary estimates of damage and loss developed for a multi-disciplinary group preparing a scenario for a magnitude 6.7 event on the fault showed such a quake would result in extensive or complete damage to more than 58,000 buildings with a loss of \$36 billion, more than 55,000 displaced households, and up to 2,400 deaths and 800 injuries requiring hospitalization.

See Figures 1 through 6.

Effects

Effects of a major earthquake in the Puget Sound basin area could be catastrophic, providing the worst-case disaster short of drought-induced wild fire sweeping through a suburban area. Hundreds of residents could be killed and a multitude of others left homeless.

In Kitsap County, depending on the time of day and time of year, a catastrophic earthquake could cause hundreds of injuries, deaths and hundreds of thousands of dollars in property damage.

A severe earthquake could level or severely damage older buildings, especially those constructed of non-reinforced masonry. Newer structures, built under recent building codes,

would probably sustain less damage, but are vulnerable to the soil conditions of the building site.

A severe earthquake would also do major damage to County and City utilities. Depending on the earthquake epicenter and duration of the earthquake, major damage or failure of Casad Dam could occur. Water systems in the County would suffer ruptured mains and possible failure of local water reservoirs.

Electrical and natural gas utilities would also suffer major damage. Failed transformers and downed electrical lines would create massive power failures in the County. Ruptured gas lines would create conditions for large fires and explosions.

Public communication facilities (i.e., radio, television, and telephone systems) would be damaged. Surviving telephone systems would likely be overloaded almost instantly. Radio and television services may take days or weeks to recover. Emergency services (i.e., fire, medical, search and rescue) would be instantly overwhelmed by the amount of damage and injury throughout the County.

County and City Public Works Departments would be very hard-pressed to establish a working road net for essential services, especially if bridges become damaged. At a minimum, bridges in an affected area would have to be inspected prior to use. Emergency food and shelter would be needed for possibly thousands of persons forced from their homes or isolated by damaged roads and bridges.

Since a catastrophic earthquake would likely affect more communities than Kitsap County, the likelihood of immediate assistance from sources outside the County would be remote.

Earthquakes of lesser magnitude or further from the County would cause less damage and displacement, but the County could find itself faced with a large influx of refugees. Depending on the damage and injuries caused by an earthquake, businesses may close, unemployment may rise and economic loss might occur.

History

The part of Washington State east of the Cascades has historically been subject to shallow, though infrequent, smaller earthquakes up to a magnitude of 6.0. See Figure 2. The western part of Washington State is vulnerable to the following earthquake risks:

- A magnitude of 7.5 event of 40 or more kilometers in depth.
- A magnitude of 6.5 event at a shallow depth in the vicinity of Mt. St. Helens.
- A magnitude of 7.5 event at a shallow depth anywhere in western Washington of uncertain probability.

- Subduction-plate earthquakes can reach magnitudes greater than 8.0.

Vulnerability

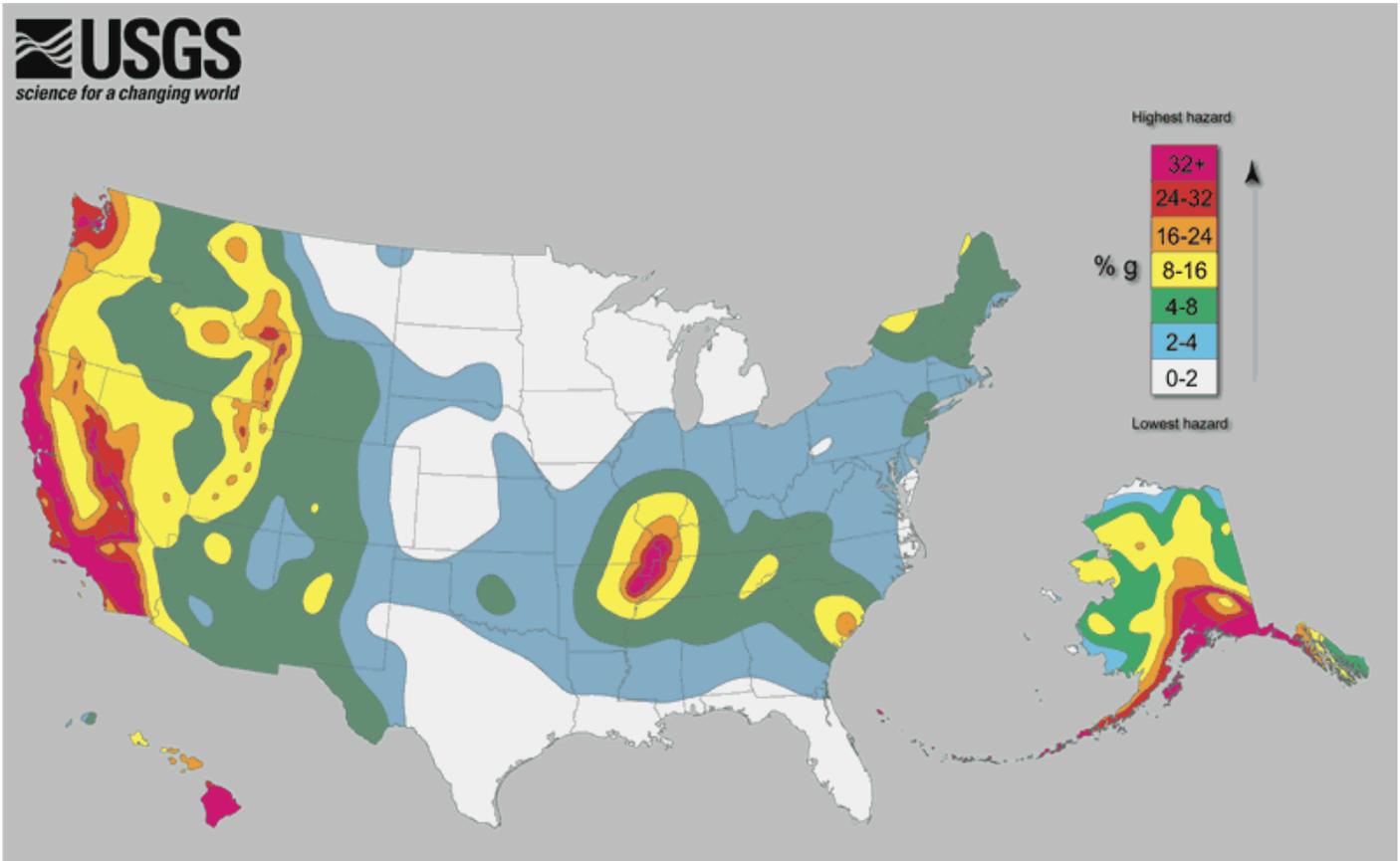
Kitsap County will remain vulnerable to earthquakes. The largest estimated magnitude is 8.0, which would be catastrophic in nature.

Conclusions

Kitsap County will experience major earthquake effects. Mitigation efforts must be instituted and maintained to decrease potential problems from major earthquakes. They are:

- Examination, evaluation and enforcement of effective building and zoning codes.
- Public education on what to do before, during and after an earthquake.
- Development of appropriate County and City government response plans. Response should include detailed immediate action to save resources such as water and gas supplies. Plans should be realistically exercised at the County and City levels to insure workability and relevance to disaster response.

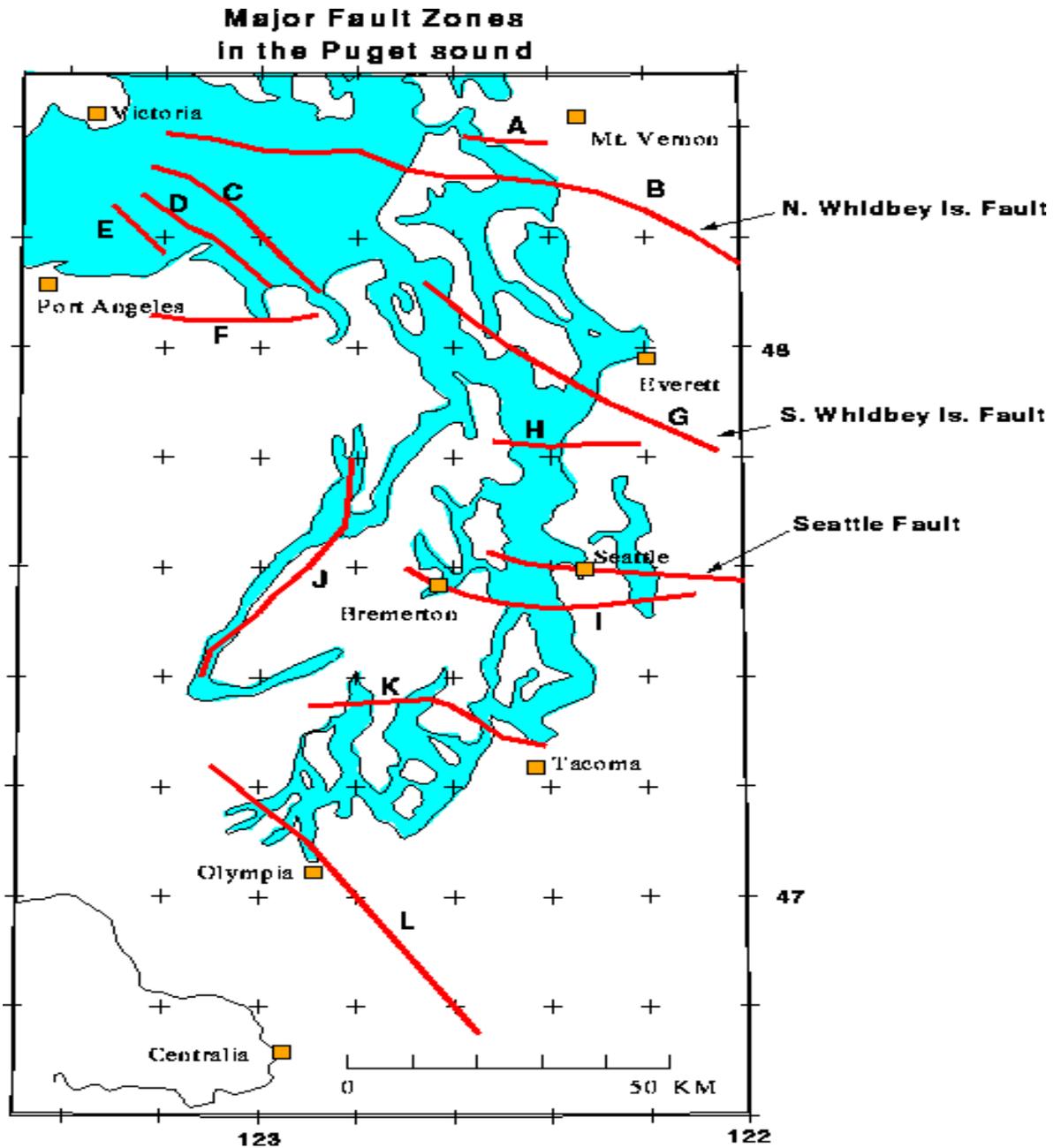
**FIGURE 1
SEISMIC ZONE MAP**



Available at: http://earthquake.usgs.gov/research/hazmaps/products_data/48_States/index.php (2007)

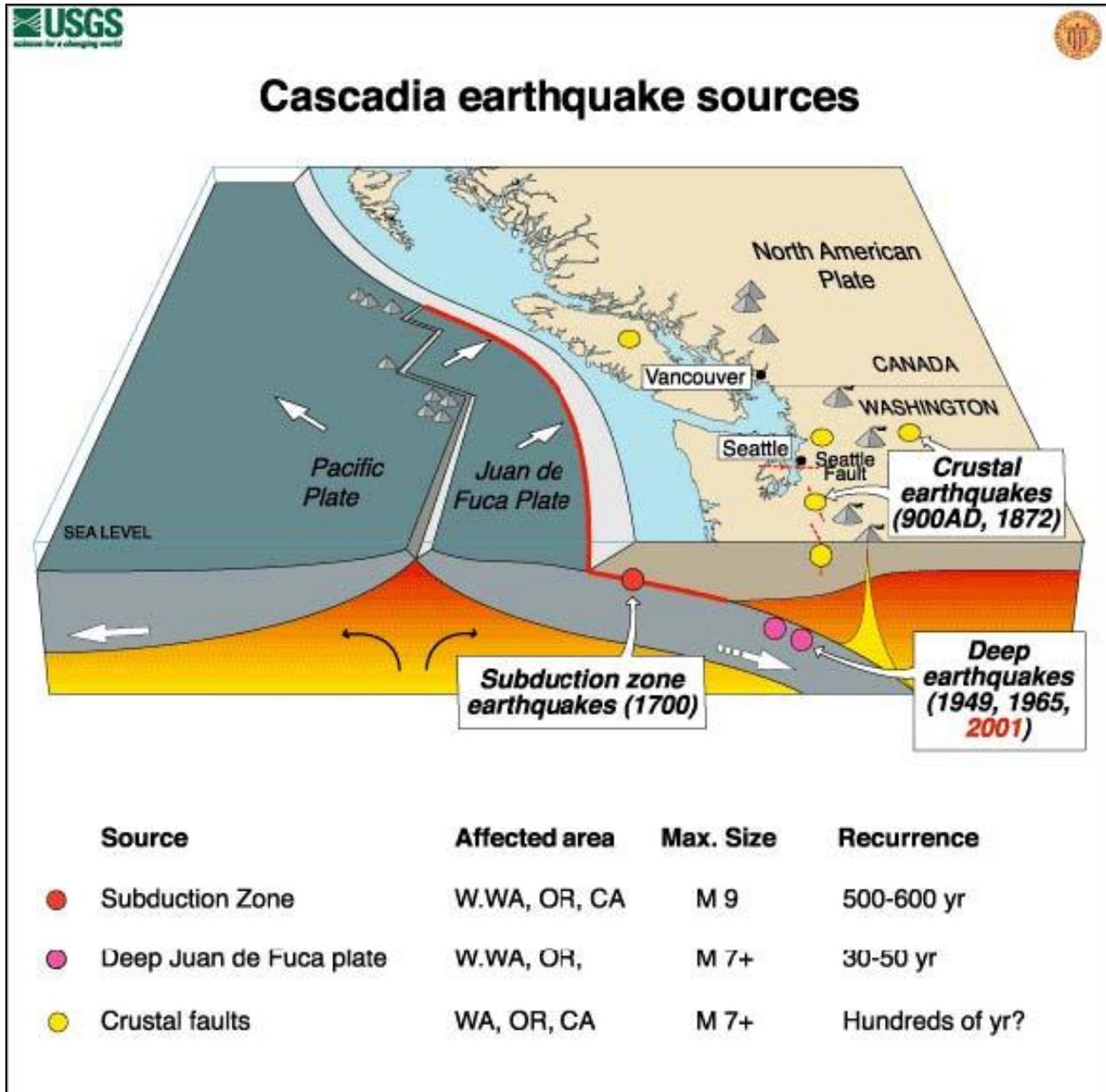
A seismic zone map is based on a statistical compilation of the number and the magnitude of past earthquakes.

FIGURE 2
MAJOR FAULT ZONES IN THE PUGET SOUND AREA



Map from Pacific Northwest Seismograph Network
(Gower and others, 1985, "Seismotectonic Map of the Puget Sound Region, Washington", USGS Map I-1613)

**FIGURE 3
EARTHQUAKE SOURCES**

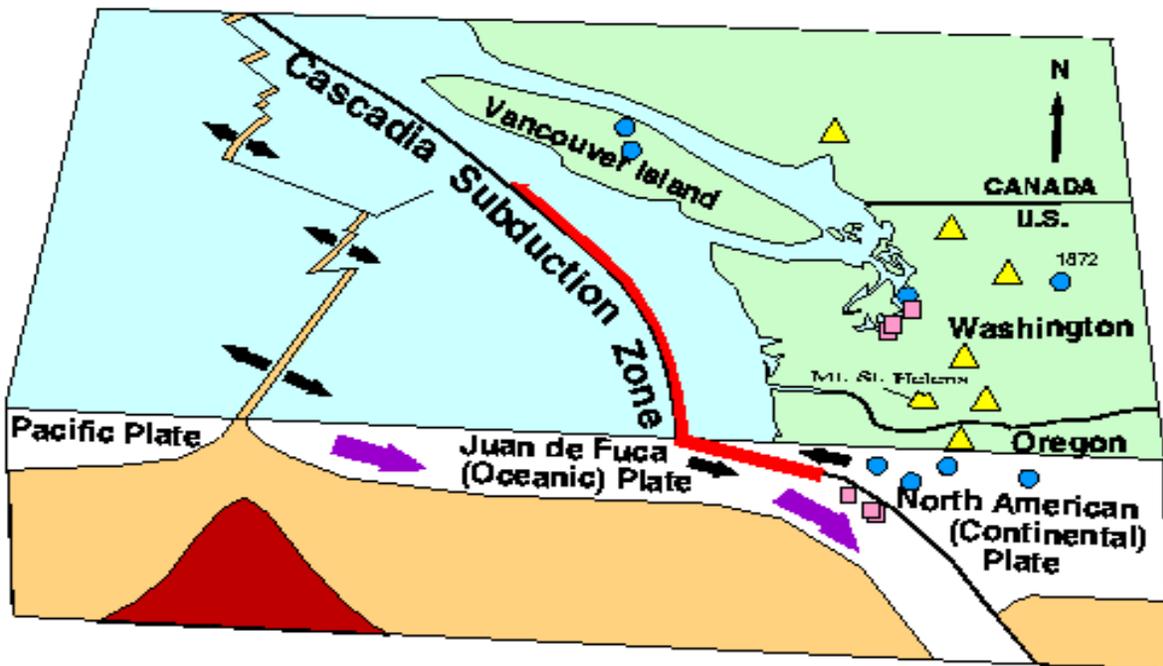


Map from Pacific Northwest Seismograph Network

**FIGURE 4
SUBDUCTION MAP**

Damaging Pacific Northwest earthquakes can arise from three distinct source zones:

- Deep earthquakes beneath the Puget Sound have damaged Seattle and Olympia
- Shallow faults can cause intense local shaking – urban areas are especially vulnerable
- An offshore subduction zone fault can cause strong shaking across the entire region.

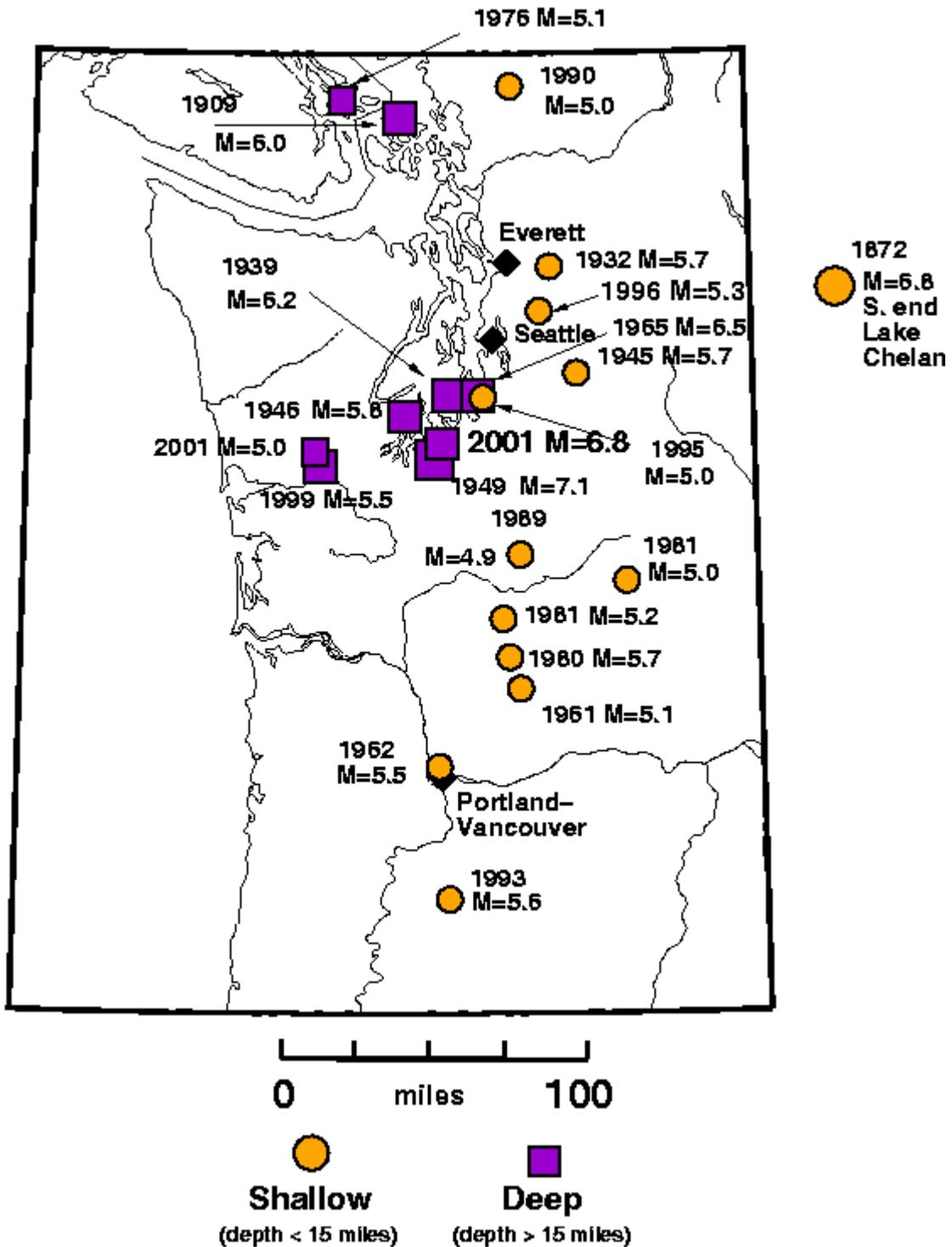


- Deep Earthquakes (40 miles below the Earth's surface) are within the subducting oceanic plate as it bends beneath the continental plate. The largest deep Northwest earthquakes known were in 1949 (M 7.1), 1965 (M 6.5), and 2001 (M 6.8).
- Shallow earthquakes (less than 15 miles deep) are caused by faults in the North American Continent. The Seattle fault produced a shallow magnitude 7+ earthquake 1,100 years ago. Other magnitude 7+ earthquakes occurred in 1872, 1918, and 1946.
- Subduction Earthquakes are huge quakes that result when the boundary between the oceanic and continental plates ruptures. In 1700, the most recent Cascadia Subduction Zone earthquake sent a tsunami as far as Japan.
- ▲▲ Mt. St. Helens/Other Cascade Volcanos

Map from Pacific Northwest Seismograph Network

FIGURE 5

Selected Earthquakes since 1872



Map by The Pacific Northwest Seismic Network

FIGURE 6
WASHINGTON STATE EARTHQUAKES

Washington State Significant Earthquakes					
Date	Time (PST)	Latitude Longitude	Depth (Km)	Mag	Location
December 14, 1872	2140	48°48' 121°24'	shallow	7.4	North Cascades
December 12, 1880	2040	47°30' 122°30'		5.5	Puget Sound
April 30, 1882	2248	47°00' 123°00'	deep	6.0	Olympia area
November 29, 1891	1521	48°00' 123°30'		5.0	Puget Sound
March 6, 1893	1703	45°54' 119°24'	shallow	4.9	Southeast Washington
January 3, 1896	2215	48°30' 122°48'		5.7	Puget Sound
March 16, 1904	2020	47°48' 123°00'		5.3	Olympics eastside
January 11, 1909	1549	48°42' 122°48'	deep	6.0	Puget Sound
August 18, 1915	0605	48°30' 121°24'		5.6	North Cascades
January 23, 1920	2309	48°36' 123°00'		5.5	Puget Sound
July 17, 1932	2201	47°45' 121°50'	shallow	5.2	Central Cascades
July 15, 1936	2308	46°00' 118°18'	shallow	5.7	Southeast Washington
November 12, 1939	2346	47°24' 122°36'	deep	5.7	Puget Sound
April 29, 1945	1216	47°24' 121°42'		5.5	Central Cascades
February 14, 1946	1914	47°18' 122°54'	40	6.3	Puget Sound
April 13, 1949	1155	47°06' 122°42'	54	7.1	Puget Sound
August 5, 1959	1944	47°48' 120°00'	35		Northwest Cascades
April 29, 1965	0728	47°24' 122°24'	63	6.5	Puget Sound
February 13, 1981	2209	46°21' 122°14'	7	5.5	South Cascades
April 13, 1990	2133	48°51' 122°36'	5	5.0	Deming
January 28, 1995	1911	47°23' 122°21'	16	5.0	17.6 km NNE of Tacoma
May 2, 1996	2104	47°46' 121°57'	7	5.3	10.2 km ENE of Duvall
June 23, 1997	1113	47°36' 122°34'	7.4	4.9	5.5 km NE of Bremerton
July 2, 1999	1743	47°05' 123°28'	41	5.1	8.2 km N of Satsop
February 28, 2001	1054	47° 09' 122° 43'	52.4	6.8	17.6 km NE of Olympia

*Table extrapolated from WA State 2001 HIVA

c. Forest - Urban Interface Fires

Hazard

Forest fires and urban interface fires are possible in Kitsap County. Sources of ignition include lightning, arson, recreational activities, debris burning by individuals or logging companies and carelessness with fireworks. Individuals cause about 80% of forest fires with about 20% attributed to natural causes.



Effects

With much of the County in various stages of forestation, nearly all areas are vulnerable to fire. Many individual homes and developments border forestland. Drought conditions often increase the fire danger in early fall. Recent history of fires in the County indicate that most were human-caused and extinguished before major damage occurred.

Forest products help sustain the Kitsap County economy. Forest fires would result in the loss of timber resources, wild life habitats, watersheds and recreational areas as well as increased vulnerability to flooding and landslides.

History

It is difficult to trace the fire history of this area back more than 350 years. However, old-growth trees and fire scars suggest fires about 450, 480, 540, and 670 years ago. Historically, wildland fires were not considered a hazard. Fire is a normal part of most forest and range ecosystems. Fires historically burned on a fairly regular cycle.

The burning cycle in western Washington appears to have occurred approximately every 100 – 150 years. Due to a preponderance of evidence being obliterated by logging, major windstorms toppling older trees, and more recent fires in the area, it is difficult to determine if this fact remains true in current times. However, recorded information of fires in the area indicates Kitsap County has had an active history of fires. As communities expand farther into forested lands, and the desire continues to maintain the wilderness ambiance, interface fires are becoming a significant hazard, having the potential for loss of life and destruction of property.

Vulnerability

Kitsap County's forests will remain vulnerable to forest and wild land fires. The probability of forest and wild land fires will continually change depending on variables such as drought effects, lightning strikes, careless campers, etc.

Conclusions

The following steps should be accomplished to preclude major loss of life and reduce the actual number of fires and hazard areas:

1. Since the vast majority of forest and wild land fires are started by humans, fire prevention education and enforcement programs can significantly reduce the total number of forest fires.
2. An effective early fire detection program and emergency communications system are essential. The importance of immediately reporting any forest fire must be impressed upon local residents and people utilizing the forest areas.
3. An effective warning system is essential to notify local inhabitants and visitors in the area of the fire. An evacuation plan detailing primary and alternative escape routes is also essential.
4. Fire-safe development planning by County and City government planners is essential.
5. Encourage citizens to incorporate defensible space planning when landscaping their property.
6. Road criteria should ensure adequate escape routes for new sections of development in forest areas with both ingress and egress planned.
7. Road closures should be increased during peak fire periods to reduce the access to fire prone areas.

d. Flooding



Chico Creek after Dec.07 Flood

Hazard

Flooding is the most common hazard occurring in Kitsap County. Heavy, prolonged rain in the fall, winter or spring months often result in saturated ground and high stream flows. Due to ground saturation, Kitsap County businesses and homes located in low-lying areas tend to flood during prolonged periods of rain. Wind-driven tidal flooding is also possible along the inland waters. Flooding is due to runoff, ground saturation, or tidal flooding.

Effects

Floods may result in loss of life as well as damage to residences, business establishments, public buildings, roads and bridges, utilities, agricultural land, fish and shellfish habitats, stream banks and flood control structures.

History

Kitsap County issued disaster or emergency declarations for flooding in 1990, 1994, 1995, 1996, 1997, 1999, 2003, and 2007. Historically, flooding occurs to some extent in Kitsap County every year. Hood Canal and Puget Sound beaches are often affected by flood tides compounded by heavy rainfall and high tides.

Vulnerability

Kitsap County will always be vulnerable to flooding, especially in the areas surrounding major population centers.

Conclusions

The Growth Management Act (RCW 36.07A) requires that all cities, towns and counties in the state identify critical areas, and establish regulations to protect and limit development in the areas designated as critical areas. Critical areas, as defined by state law, are areas which frequently flood, such as floodplains, as well as areas subject to high tides driven by strong winds. The Growth Management Act is a fundamental tool in mitigation planning for jurisdictions with respect to flooding events (as well as several other natural disasters). This type of mitigation involves flood plain planning and management coordinated by local, state and federal agencies. RCW 86.12, Flood Control by Counties, provides counties with the power to take flood control action by levying taxes, condemning property and undertake flood control activities directed toward a public purpose located within their jurisdiction. Further, RCW 82.26, State Participation in Flood Control Maintenance, which establishes the Flood Control Assistance Account Program, provides state funding for local flood hazard management planning and implementation efforts. RCW 86.16, Floodplain Management,

states that prevention of flood damage is a matter of statewide public concern. Newly adopted statewide building codes and regulations applied to structures during construction also aid in mitigation. FEMA Flood Maps provide additional avenues for information to residents, while the National Flood Insurance Program provides homeowners and renters the ability to purchase insurance coverage for flood damage. Where building has already occurred on flood plains, mitigation efforts include emergency preparedness in the form of sandbags, building materials, 3-day evacuation kits, and alternate shelter as part of each resident's preparation for possible flooding.

e. Land Shift (Slides/Erosion)

Hazard



The term landslide refers to the down-slope movement of masses of rock and soil. Slides range in size from thin masses of soil a few yards wide to deep-seated bedrock slides. Slides are commonly categorized by the form of initial failure, but they may travel in a variety of forms along their paths. This travel rate may range in velocity from a few inches per month to many feet per second, depending largely on slope, material and water content. The recognition of ancient, dormant slide masses are important as they can be reactivated by earthquakes or unusually wet winters. Also, because they consist of broken materials and disrupted ground water, they are more susceptible to construction-triggered sliding than adjacent undisturbed material.

Erosion refers to the gradual removal of soil through wind or water action. Erosion may be induced or increased by failure to use ground covers to protect soil from wind or drainage systems that allow good dispersal of storm water. Slopes on waterfronts can also be severely undercut by normal wave action, or large waves produced by storms.

Effects

Landslides typically and primarily cause damage to roads, railroads, sewer and water lines, homes, and commercial buildings.

Severe slides may impact shipping and travel routes to the extent that economic loss results. This loss can be particularly severe on tourism and recreational businesses. Uncontrolled water flow frequently causes erosion, which in turn can cause landslides. Erosion can also move soil, causing gullies, which ruins land and deltas by covering the more valuable land.

The effects of erosion are usually much less dramatic than landslides, but the final results may be more costly.

History

Kitsap County is subject to landslide or soil erosion due to wind, water and flooding at all times of the year. Kitsap County's most recent history, the winter storm of 1996, caused the death of a family of four on Bainbridge Island and destroyed millions of dollars in both public and private property.

Vulnerability

Kitsap County continues to be impacted by landslides and erosion issues with each new winter storm. Soil erosion continues to occur, especially at steep slopes and construction sites during wind and rain storms.

Conclusions

The most significant effects of landslides are injury or death, disruption of transportation and the destruction of property.

In conjunction with the Growth Management Act (RCW 36.70A), Kitsap County and its local jurisdictions have identified slide hazard areas, and requires geotechnical investigation and preventative improvements before development can take place on top of or below slopes subject to sliding through the various Critical Areas Ordinances passed within each city. However, the County needs to conduct more public education concerning construction of single-family structures in slide hazard areas and to reduce efforts to develop these areas. Additionally, human-caused erosion at building sites must be controlled through good engineering and construction practices. Likewise, farming must conform to established erosion control practices to conserve topsoil.

f. Severe Storms

Hazard

Although Kitsap County has a moderate marine climate, storm activity involving rain, wind, snow and ice does affect the County.

Storms have caused major damage to portions of Kitsap County. Lightning storms and hailstorms are less frequent but do occur. There is a remote possibility of a tornado causing destruction in the County.



Effects

High winds have caused extensive damage through the County in past years. The main effects of local storms include disruption of electrical power, accidents, transportation problems, flooding, landslides and damage to residences and other buildings. School closures are also possible. Businesses may function at reduced capacity as employees may have difficulty getting to work or are dealing with storm related problems at home.

There are many private roads in the County which individuals must themselves maintain or as a cooperative group. Citizens can become frustrated if private snow removal equipment is inoperable or if extensive damage occurs to private roads and bridges. Realtors could make a point of informing or reminding clients that they are responsible for their own road maintenance when purchasing property on private roads.

History

High winds have caused extensive damage through the County in past years. The most noted storm was the "Columbus Day" (hurricane type) storm of 1962. Severe winds also occurred during the Inauguration Day storm of 1993. Other storms that have severely impacted Kitsap County have occurred in: 2006, 1986, 1985, 1980, 1979, 1973, and 1971. The most severe snowstorms that have occurred in Kitsap County were: 1996, 1990, 1985, 1971, 1969, 1961, 1951, 1950 and 1949. Historically, the most severe storms occur during the autumn and winter months from October through February.

Vulnerability

Kitsap County remains highly vulnerable to the effects of rain, snow and windstorms.

Conclusions

Mitigation efforts include effective warning through the media. Three (3) day preparedness kits help people weather the storm if they are without normal utilities and comforts. Well-packed kits could be easily transported if an evacuation was deemed necessary/possible. For those residents living in elevations prone to snowstorms, a 14-day preparedness kit is highly recommended. Any kit should include prescription medications.

g. Tsunamis, High Waves, Seiches

Hazard

A tsunami consists of a series of high-energy waves that radiate outward like pond ripples from the area in which the generating event occurred. Typically they are triggered by earthquakes, volcanic activity, and submarine landslides or in the case of Puget Sound, most often by local landslides from surrounding bluffs.



Seiches are basically a series of standing waves in an enclosed or partially enclosed body of water. Seiches are normally caused by earthquake activity, and can affect harbors, bays, lakes, rivers and canals.

Effects

Much of Kitsap County is surrounded by water from the Puget Sound to the Hood Canal. With so much shoreline in the county, a tsunami, high waves, or a seiche would have a devastating affect on Kitsap County residents. Flooding would occur, property damage would be sustained, and residents would be displaced.

Aside from the tremendous hydraulic force of the tsunami waves themselves, floating debris carried by a tsunami can endanger human lives and batter inland structures. Ships moored at piers and in harbors often are swamped and sunk or are left battered and stranded high on the shore. Breakwaters and piers collapse, sometimes because of scouring actions that sweep away their foundation material, and sometimes because of the sheer impact of the waves.

Port facilities, naval facilities, ferry terminals, fishing fleets, and public utilities are frequently the backbone of the economy of the affected areas, and these are the very resources that generally receive the most severe damage. Until debris can be cleared, wharfs and piers rebuilt, utilities restored, and the fishing fleets re-established, communities may find themselves without fuel, food, transportation, and employment. Wherever water transport is a vital means of supply, disruption of coastal systems caused by tsunamis can have far reaching economic effects.

Seiches create a “sloshing” effect on bodies of water and liquids in containers. This primary effect can cause damage to moored boats, piers and facilities close to the water. Secondary problems, including landslides and floods, are related to accelerated water movements and elevated water levels.

History

An earthquake-induced landslide in 1949 at Salmon Beach in the Tacoma Narrows generated a 6 to 8-foot tsunami that hit Gig Harbor. It moved both directions within the Narrows, probably reaching portions of south Kitsap County. East Passage and Colvos Passage form a direct connection from the area where the Seattle Fault crosses Puget Sound and Kitsap

County. Because of this, it is highly likely that any tsunami generated by the large earthquake on that fault propagated south to at least some portions of the County.

Vulnerability

Kitsap County is vulnerable to tsunamis, high waves and seiches due to our vulnerability to storms (e.g., rain causing landslides) and earthquakes. Among the most vulnerable elements of the community are the marine enterprises, public port facilities, defense establishments and the hundreds of private residences lining the shorelines of Sinclair and Dyes Inlets. Located on filled ground, over-water, or at the foot of steep shoreline bluffs, the structures housing employees, customers, military personnel, visitors or residents are in harm's way for tsunami inundation and strong currents, landslides, and soil failure during and after strong ground shaking.

Vulnerability issues include:

- Loss of life
- Debris
- Natural resources damage
- Transportation infrastructure
- Utilities
- Shoreline development

Conclusions

Earthquakes and other underwater disturbances could occur and cause general or localized damage from a tsunami or a seiche. The damages sustained from a tsunami or a seiche may range from insignificant to catastrophic.

Education of the affected populations, proper zoning, and suitable structural design can aid in reducing the disastrous effect of this natural hazard. If warning is received early enough (2 to 5 hours), which is possible for tsunamis generated at a distance, hasty preventive action can be taken: people can be evacuated, ships can clear harbors or seek safer anchorage, buildings can be closed, shuttered, and sandbagged. For tsunamis generated by local earthquake or landslide events, however, the time from initiation of a tsunami to its arrival at shore can be less than a minute, and there is no time for warnings to be issued. Residents in areas susceptible to tsunamis should be made aware of the need to seek higher ground if they feel strong ground shaking, either from a landslide or earthquake.

Tsunamis or seiches that occur in Kitsap County have the potential to cause property damage and casualties. Public education on tsunamis and seiches are normally included in disaster preparedness classes as a subset of earthquake damage. Although much work has been done on disaster preparedness for the public by local governments and emergency planners, everyone needs to recognize the dangers and effects of tsunamis and seiches as a component of the earthquake hazard, and as a potential component of severe storms with large amounts of rainfall which can cause landslides into our inlets, ultimately causing a tsunami or seiches.

For a more detail look at Tsunamis effecting Kitsap County please review:

***Reducing Earthquake-Tsunami Hazards in Pacific Northwest Ports and Harbors
SINCLAIR INLET PORT AND HARBOR COMMUNITY
HAZARDS, VULNERABILITIES AND MITIGATION ACTIONS***

You will find this report at Kitsap County Emergency Management web page at
http://www.kitsapdem.org/pdfs/kc_plans/SeaGrant_Final_Plan.pdf

h. Volcanos/Ashfall

Hazard

Volcanic eruption can cause damage in Kitsap County primarily by ashfall. The probability of ashfall depends on wind direction and the volcanic source of the eruption causing the ashfall. The degree of hazard depends on the kind of eruption and proximity to the vent. Most of the dangers are to persons in the near vicinity of the volcano. Other dangers, such as mudflows and ashfall, may exist tens of miles downstream and downwind.



Effects

One potential effect on Kitsap County from volcanic eruption from active volcanoes, all of which are in the Cascade Mountain Range on the eastern side of Puget Sound, is ashfall. Prevailing winds, however, are to the east.

Ashfall normally accompanies the eruptions of andesitic and dacitic volcanoes. These volcanoes tend to erupt lava so thick and charged with gases that they explode into ash rather than flow. A one-inch deep layer of ash weighs an average of ten pounds per square foot. Ash is harsh, acid, gritty, smelly, and thoroughly unpleasant. Although the gases are usually too diluted to constitute danger to a normal person, the combination of acidic gas and ash may cause lung damage to the very young, very old or infirm, or those already suffering from respiratory problems. Extremely heavy ash can clog breathing passages and cause death. Short-term exposure has not been found to be harmful to persons in normal health. When an ash cloud combines with rain, sulphur dioxide combines with water to form diluted sulfuric acid that may cause minor, but painful burns to skin, eyes, and mucous membranes (nose, throat, etc.). Acid rains may affect water supplies, strip and burn foliage, strip paint, corrode machinery, and dissolve fabric.

Heavy ashfall blots out light. Sudden heavy demand for electric light and air conditioning may cause a drain on power supplies, leading to a partial or full power failure. Ash clogs water courses and machinery of all kinds and causes electrical short circuits. It drifts onto roadways, railways and runways, where it is slippery. Its weight may cause structural collapse. Because it is easily carried by winds and air currents, it remains a hazard to machinery and transportation for months after the eruption.

Pockets or clouds of toxic gases kill with chemical poisons, internal or external burns, or asphyxiate by shutting out oxygen. Carbon dioxide, an example of the latter, is heavier than air, odorless and colorless and may collect in low areas on or near both active and inactive volcanoes. Gases, mixed with ash, make up the eruptive cloud or "smoke" of the volcano.

Ashfall would be expected to vary from non-existent to light, depending on wind direction at the time of the eruption and the amount and type of tephra ejected.

Any significant ashfall would cause damage to the unprotected moving parts of any machinery, especially motor vehicles. Damage would also occur to electrical equipment due

to short circuits.

Persons with respiratory ailments may be affected; persons who do not have respiratory ailments probably would not show any effect due to ashfall.

Clean up of ash would tend to be long term since ash must eventually be absorbed by the earth. Ashfall in Kitsap County would probably not cause significant damage except to equipment used extensively in areas most affected by ashfall.

Volcanic earthquakes, often centered within or beneath the volcano, are usually one of three kinds: pre-eruption earthquakes caused by explosions or steam or underground magma movements, eruption earthquakes caused by explosions and collapse of walls inside the volcano, or post-eruption earthquakes caused by magma retreat and interior structural collapse.

Although volcanic earthquakes are strong near the volcano, they are generally confined there. There are some exceptions, as with the "St. Helens Fault Zone", where a tectonic fault (earth's crustal structure) is closely associated with the volcano. Tremors may cause large rockfalls, snow avalanches, landslides, and building collapse. Since all northwest volcanoes are in a regular seismic zone, tremors should be evaluated for their volcanic potential by qualified geophysicists or seismologists.

History

There are no volcanoes in Kitsap County; however, the proximity to potentially active volcanoes in the Cascade Mountains to the east could impact the county. When Mt. St. Helens erupted on May 18, 1980, heavy ash from a west wind blanketed much of Eastern Washington. Subsequent eruptions on May 25 and June 12 similarly affected Western Washington, although to a lesser degree.

Vulnerability

Although Kitsap County is vulnerable to minimal ashfall, the transportation routes to the County could be severely impacted. Evacuation from Pierce and Thurston Counties might also impact Kitsap County should Mt. Rainier erupt.

Conclusions

Volcanoes in Washington State have a history of eruption and will continue to erupt. Volcanic ashfall is one of the serious consequences of volcanic eruption. The possibility of significant ashfall on Kitsap County is considered small. An eruption of the closest dormant volcano, Mount Rainier, is possible, but the actual effect on Kitsap County would likely be minor. County and City government must maintain plans to ensure essential services are available in the event of significant ashfall.

V. TECHNOLOGICAL HAZARDS

a. Dam Failure



Hazard

Dam failure may be caused by flooding, earthquakes, poor construction, lack of maintenance and repair, incorrect operational activities, or acts of vandalism or terrorism.

Effects

Dam failure can result in loss of life and damage to property including structures, roads, utilities and crops. Depending on location, dam failure can result in lowered tax base, lack of power profits or other significant economic loss. Kitsap County has twenty dams that are listed with the State Department of Ecology. See *Figure 7 Kitsap County Dams*.

A dam failure at Casad Dam would result in extensive property damage and endangerment to life. The City of Bremerton, owners and operators of the dam, carefully monitor the dam and maintain updated emergency plans as well as hold emergency exercises. The dam has been evaluated by State Department of Ecology Dam Safety Engineers as a very stable structure, able to withstand anticipated seismic events. Local authorities are responsible for warning and evacuation should a break occur. The dam, located in Kitsap County, could affect residents and businesses along the Union River, located in Mason County.

History

Dam failure has not been a major concern for the residents of Kitsap County. There has been no history of lives lost, property loss, or other damage as the result of dam failures.

Vulnerability

Kitsap County is very vulnerable to dam failure with twenty dams inside Kitsap County.

Conclusions

Dams are located throughout Kitsap County. To assure dam safety, routine inspections should occur. The State Department of Ecology inspects all dams in Kitsap County. The Department of Ecology is taking action to obtain emergency plans from all dam owners.

**ATTACHMENT 1
KITSAP COUNTY DAMS**

Name of Dam	Type	Spillway Type	River/Stream Built On	Year Completed	ID#
Battlepoint Park Resv. Dam	RE	Uncontrolled	Tr- Port Orchard	1977	1346
Bremerton National Airport Detention Dam					1732
Bremerton Resv. No. 3	RE	Controlled	Charleston Crk-Offstream	1900	241
Bremerton Resv. No. 4	RE	Uncontrolled	Tr- Puget Sound	1917	1207
Casad Dam	VA	Uncontrolled	Union River	1956	171
Cattail Lake	RE	Uncontrolled	Cattail Creek	1954	154
Devils Hole	RE	Uncontrolled	Devils Creek	1959	155
Erickson Resv. Dam	RE	Uncontrolled	Tr-Manzanita	1965	1149
Glud Pond Dam Noname 328	RE	Uncontrolled	Steel Creek	1932	1163
Jarstad Lake Dam	RE	Uncontrolled	Tr-Gorst Creek	1935	1206
Kitsap Lake Dam	OT	Controlled	Kitsap Creek	1965	551
Koura Dam	RE	Uncontrolled	Tr-Murden Cove	1949	1336
Lewis Dam	RE	Uncontrolled	Tr-Big Beef Crk.	1973	189
Mac's Pond Dam					1705
McCormick Woods Div. 1 Dam No.1	RE	Uncontrolled	Anderson Creek		1599
Olympic View Landfill Detention Pond					11
Olympic View Landfill Leachate Lagood No. 1					10
Tahuya River Dam	RE	Uncontrolled	Tahuya River	1962	188

Temp. Sewage Lagoon	RE	Uncontrolled	Offstream Hood Canal	1977	365
William Symington Dam	RE	Uncontrolled	Big Beef Creek	1965	190

Source: Washington State Department of Ecology January 15, 2004

b. Energy Emergency

Hazard

Energy emergencies can include fuel shortages in the form of gasoline, heating fuel and electricity. Oil embargos, terrorism and economic turmoil can help to create these shortages. Severe storms or other natural disasters may disrupt power, creating electrical interruption and shortages.



Effects

Any disruption in the supply of energy, no matter the source, causes human suffering and economic loss. Most of the possible shortages are beyond the local capabilities to control. Abiding by rationing rules and working to restore local utilities would be about all Kitsap County could do in an energy crisis.

History

The most common type of energy incident is a power outage. Although short-term (a few hours) outages frequently occur, during winter windstorms in particular, no significant county-wide outages have occurred that have required long term remedial attention. In addition to windstorms, power outages of multiple days duration for portions of the county have happened during snow and ice storms. The last major example of an ice storm was the December 1996 storm, which left some people in the rural areas of the county without power for several days. The last major windstorm which impacted our area occurred in December 2006, which left many people in the rural areas of the county without power for several days, in some cases, in excess of one week.

Gasoline shortages during 1973-1974 and in 1979 created long lines at gas stations for both commercial and private vehicles.

In the fall of 2000, major producers of electricity on the West Coast created an energy emergency through market manipulation, artificially inflating prices that grossly increased the cost/kilowatt hour. Doing so was highly detrimental not only to the financial well being of power distributors, but also to that of the individual homeowner, business owners and especially to industries that relied on large quantities of very cheap power.

Vulnerability

Kitsap County, like other rural communities, is vulnerable to energy emergencies. By adhering to rationing rules and implementing emergency plans, the effects on the public during such an emergency could be reduced.

Conclusions

Kitsap County residents could be affected by an energy emergency and should prepare, as with all other hazards that could affect the community, for a minimum of 3-5 days.

c. Hazardous Sites/Materials

Hazard



Kitsap County, along with state and federal agencies, has been aggressive in identifying contaminated or suspected contaminated sites throughout the County. See Attachment 1 *Kitsap County Confirmed and Suspected Contaminated Sites*, Attachment 2 *Kitsap County EPA Superfund Sites*, Attachment 3 *Bremerton-Kitsap County Health District Closed and Abandoned Landfills in Kitsap County, May 2, 1997*.

Kitsap County has been a major military community since World War II and the home to many forest/wood treatment facilities. The disposal of waste products, both military and civilian generated has changed dramatically throughout the years. Kitsap County and its cities are identifying both contaminated and suspected contaminated sites, closed and abandoned landfills, and current generators of bulk chemicals and their locations throughout Kitsap County.

Effects

A major spill of a bulk chemical stored in Kitsap County could cause major loss of life, injuries and property damage. Building private homes, schools and public facilities on abandoned landfills or at Superfund sites could be devastating to building occupants, causing unsafe working or living conditions.

History

For purposes of this section of the Kitsap County Hazard Vulnerability Analysis, hazardous materials will be limited to etiological materials (i.e., those organisms that have a pathogenic effect on life and the environment and can exist in normal ambient environments) and chemical materials (i.e., those materials that do not exhibit etiological or radiological properties). Radioactive materials (i.e., those materials that emit alpha or gamma radiation) are addressed in a different section of this assessment.

Hazardous materials are classified in three states: gas, solids and liquids. They may be stored at high or low pressure and may be affected by the environment in which an incident takes place (i.e., heat, cold, rain, wind etc.).

Hazardous chemicals are stored and used in many locations within the County. Bulk users of hazardous chemicals are included in Attachment 4, *SARA Title III Kitsap County Facilities 2002 Tier II Reporters (available upon request to Kitsap County Department of Emergency Management)*. Small amounts of hazardous chemicals are commonly stored in homes and businesses, including local government, throughout the County.

Small amounts of non-regulated chemicals (usually household materials) are routinely disposed of by dumping them into the environment through waste collection systems or directly into the ground or water. Hazardous etiological materials are primarily infectious waste such as laboratory cultures and samples, blood and blood products, bandages, hypodermic needles and scalpels. Generators of such waste include hospitals, clinics, nursing

homes, home care agencies, veterinarians and drug users, but there exists other less obvious potential for contact and infection in our day-to-day lives.

Federal, State or County standards governing the disposal of hazardous etiological materials are limited. At present, most such materials are disposed of through common disposal systems (contracted disposal companies). Incineration is the preferred method.

Incidents and accidents have occurred in Kitsap County concerning hazardous chemicals. Likewise, areas surrounding Kitsap County have also experienced hazardous chemical accidents, such as the 1994 incident in Dalco Passage between Tacoma and Vashon Island which was potentially catastrophic in nature, impacting 21 miles of coastal area from the Narrows Bridge to Eagle Harbor on Bainbridge Island.

Vulnerability

Kitsap County has limited response capability to hazardous material incidents through its fire districts/departments, the Washington State Patrol, and the Department of Ecology. Washington State Patrol is Incident Commander for hazardous material incidents in selected areas of Kitsap County not designated otherwise. For large incidents involving hazardous material outside the scope of response capabilities by local responders, the local military installations, Puget Sound Naval Base - Bangor and Puget Sound Naval Base-Bremerton, as well as the Naval Shipyard provide response.

In addition to the hazards of stored chemicals, the hazards of transporting chemicals to destinations both within and outside the County exist. Chemicals are transported over the extensive road net. Accidents involving the transportation of chemicals could be just as catastrophic as accidents involving stored chemicals, possibly more so, since the location of a transportation accident would not be predictable.

A spill of bulk hazardous materials could result in fire, explosion, toxic cloud, or direct contamination of people and property. The effects may involve a local site or square miles. Health problems may be immediate, as from corrosive effects on skin and lungs, or may take time to display symptoms, such as cancer from a carcinogen. Damage to property could range from immediate destruction through explosion to permanent contamination by a persistent hazardous substance.

Unregulated household chemicals present a significant danger due to improper disposal. Small amounts of some substances, such as pesticides, can have a disastrous effect if they reach a water supply.

The most significant danger connected with small amounts of unregulated substances, however, is improper disposal of material connected with automobiles. Illegal dumping of gasoline, oil, solvents, anti-freeze, etc., is very common and widespread. The danger

here is the steady accumulation in the earth, water supplies and on salt-water beaches of materials that will eventually impact the environment and the people who depend on the environment for pure water and other resources.

While the danger of hazardous etiological substances is not widely documented, certain elements of society have been impacted. Medical practitioners, first responders and other public employees occasionally contract disease such as Acquired Immune Deficiency Syndrome (AIDS) through accidental contact with contaminated needles or blood products. Intravenous drug users commonly spread diseases such as AIDS or Hepatitis through sharing contaminated needles.

The danger of hazardous etiological substances to the general public is no less real and can exist in a variety of situations. Attachments 1, 2, 3, 4 and 5 identify to current and prospective residents of Kitsap County the "vulnerable" areas of the community.

Conclusions

Major amounts of hazardous chemicals are moved on highways and railways, including through Kitsap County. Virtually each household and business in the County stores and uses varying amounts and types of hazardous chemicals. Major chemical spills, primarily oil and fuel, can occur in Kitsap County, both on land and in the waterways.

Hazardous chemical shipments to bulk users, wholesalers and retailers are done in accordance with Federal and State law, yet the potential for a catastrophic spill of bulk hazardous chemicals continues to exist.

The Puget Sound Naval Shipyard, Naval Base Kitsap - Bangor and Naval Base Kitsap – Bremerton has trained Hazardous Materials Response Teams. However, Kitsap County fire agencies have limited hazardous material response capabilities, which could place the community at risk in the event of a major incident. At present time, however, the State of Washington and private industry, along with the military, will support the County when necessary for response purposes to hazardous material incidents.

Non-regulated and household chemicals also present a significant danger to the environment. The County has developed, through the Moderate Waste Facility, a positive and aggressive system to collect and properly dispose of discarded household chemicals. This includes public education as well as a collection system.

The positive and educational initiative already underway in Kitsap County regarding hazardous etiological materials should aggressively continue and expand from public employees to the general public.

Through land-use planning, most communities do not build on "known" contaminated sites.

**ATTACHMENT 1
KITSAP COUNTY SUPERFUND SITES**

Site #	County	Town	Zip Code	Site Name
Site # 1	KITSAP	BAINBRIDGE ISLAND	98110	WYCKOFF CO./EAGLE HARBOR
Site # 2	KITSAP	BREMERTON	98310	OLYMPIC VIEW SANITARY LANDFILL
Site # 3	KITSAP	BREMERTON	98314	PUGET SOUND NAVAL SHIPYARD COMPLEX
Site # 4	KITSAP	BREMERTON	98314	USNAVY DRMO YARD BREMERTON SHIPYARD
Site # 5	KITSAP	BREMERTON	98312	JACKSON PARK HOUSING COMPLEX (USNAVY)
Site # 6	KITSAP	KEYPORT	98345	NAVAL UNDERSEA WARFARE STATION (4 AREAS)
Site # 7	KITSAP	MANCHESTER	98353	USNAVY PUGET SOUND FISC DEPT
Site # 8	KITSAP	MANCHESTER	98353	OLD NAVY DUMP/MANCHESTER LAB(USEPA/NOAA)
Site # 9	KITSAP	MANCHESTER	98353	USDOC NOAA MANCHESTER FIELD STATION
Site # 10	KITSAP	PORT ORCHARD	98366	NORSELAND MOBILE ESTATES
Site # 11	KITSAP	PURDY	98366	STRANDLEY/MANNING SITE
Site # 12	KITSAP	SILVERDALE	98315	BANGOR NAVAL SUBMARINE BASE
Site # 13	KITSAP	SILVERDALE	98315	BANGOR ORDNANCE DISPOSAL (USNAVY)

Source: Environmental Protection Agency @ <http://cgi.hsh.com/superfund/superfund.fxp> (April 17, 2008)

**ATTACHMENT 2
CLOSED AND ABANDONED LANDFILLS IN KITSAP COUNTY**

Kitsap County Health District
Solid and Hazardous Waste Program

CLOSED AND ABANDONED LANDFILL LIST

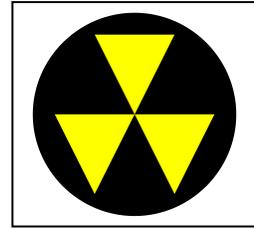
	Site Name	MTCA ¹ Ranking	Parcel ID #	Parcel Acreage ³	Address	Street Name
ABANDONED LANDFILLS	1 Arper Dickey Rd. Landfill	NFA ²	19250110112000	5.3	9546	DICKEY RD.
	2 Blue Cascade Childress Dump	Awaiting assessment	47510000040009 47510000030000	4.8 4.3		BERRY LAKE RD. BERRY LAKE RD.
	3 Constitution Avenue Landfill	5	22240120702002 22240120752007	14.3 0.2	520 520	NATIONAL AVE. NATIONAL AVE.
	4 Eglon Dump	NFA	04270210222001 03270220292003	276.1 5.3		HANSVILLE RD. HANSVILLE RD.
	5 Head of Bay Dump	2	33240130012001	8.0	3050	ST HWY 16
	6 Holly Dump	Awaiting assessment	16240240011001	233.1		SEABECK-HOLLY RD.
	7 Howerton-Silverdale Landfill	2	18250140112005	9.6		DICKEY RD.
	8 Indianola Dump	5	02260230072009	24.4		SOUTH KINGSTON RD.
	9 Kitsap County Sanitary Landfill	3	19250120012000	30.0		DICKEY RD.
	10 Port Orchard Landfill	4	34240130352000	14.5	1260	LLOYD PKY.
	11 Poulsbo Dump	NFA	25260110192003	20.0		STENBOM LN.
	12 RGS-Windjammer Site	NFA	06240140062007 06240140312006	4.1 1.9	5566	WINDJAMMER CT. WINDJAMMER CT.
	13 Skirving Dump	2	20240130052002 20240140012004	40.0 20.0		WERNER RD. WERNER RD.
	14 Suquamish Dump	Awaiting assessment	30260210012005	200.0		TOTTEN RD.
	15 USN Bremerton Auto Wrecking	1	01230140221005	6.6	4275	ST HWY 3
	16 Victory Station Landfill	4	06230120632002	5.0		VICTORY DR.
	17 VIP Landfill	3	37480010140003	0.5		OYSTER BAY AVE.
	18 Vockrodt Dump	4	45020030230002	2.4		NATIONAL AVE.
	19 Spain Property	Awaiting assessment	5230210062004	1.0	3939	MENZIES RD.
	20 Crown Hill Elementary	Awaiting assessment	15240120272005	10.6	1500	ROCKY POINT RD.
	21 Zink Dump	5	12230140122002	10.0		PERDEMCO LN.
CLOSED LANDFILLS	22 Bainbridge Island Landfill	Remedial action completed	33250220012001	40.0	7215	VINCENT RD.
	23 Hansville Landfill	1	09270210052007	72.5	31645	HANSVILLE RD.
	24 KRM Landfill	Not ranked	28240130682008	17.7	3020	SHERMAN HEIGHTS RD.
	25 Morrison Demolition Landfill	Not ranked	47990000010204	48.0	1004	SPENCER RD.
	26 Norseland Landfill	Remedial action completed	11230130011000	559.9	5626	IMPERIAL WAY
	27 Olalla Dump	Not ranked	01220110292003	44.7	13250	BANDIX RD.
	28 Olympic View Sanitary Landfill	1	03230140091000 02230130031009 10230110011005 10230110041002 10230110031003 10230140011009	37.5 13.0 40.0 36.6 30.0 37.5	9820 9820 9820 9820 9820 9820	BARNEY WHITE RD. BARNEY WHITE RD. BARNEY WHITE RD. BARNEY WHITE RD. BARNEY WHITE RD. BARNEY WHITE RD.

1 Model Toxic Control Act
2 No Further Action
3 Since actual landfill size is unknown on many historic landfills, actual size of landfill may be less than parcel acreage.

swwqbd1/shw/common/SHWwebpage/contsites/landfills.xls 2/2005

Source: Kitsap County Health Dept. Available at: http://www.kitsapcountyhealth.com/environmental_health/solid_waste/docs/landfill_list.pdf

d. Radiological Incidents



Hazard

Nuclear facilities exist in the Puget Sound area. Puget Sound Naval Shipyard and Naval Submarine Base Bangor are both located in Kitsap County. Puget Sound Naval Shipyard decommissions nuclear submarines, recycles gray water, and stores, until shipped, spent fuel rods from the nuclear submarines. It is also the home of modern nuclear aircraft carriers and submarines. Navy Base Kitsap Bangor is home to numerous nuclear power submarines some of which are designed to carry nuclear weapons.

Effects

Radioactive materials from a release or accident may cause harm to humans and animals. It may enter the human food chain via crops or dairy products. Another aspect contributing to the hazard is public perception. Even if not exposed to an actual physical threat, many people may panic, believing radiation may have affected them.

History

In Washington State, there have been no radiological releases affecting local jurisdictions from any nuclear power generating system or nuclear weapon.

Vulnerability

There is always a remote possibility of an event involving a radiological release, but the considerable safeguards and extraordinary safety record of personnel and systems, we consider this vulnerability small. Although, current terrorism activities and the potential use of “dirty bombs” create a radiological release scenario of possibility.

Conclusions

Military Bases receive, ship, and store nuclear materials. Although great safety precautions are used and the risk is quite low, an accident could occur. Basic local planning, training and exercises are needed to mitigate and respond to potential incidents.

Because of the local military installations, Kitsap County could be considered a target for terrorists using radiological weapons. Its location close to major cities also places it at risk. There are no fallout shelters and little indoor space to place refugees. Mitigation efforts on the local level would involve having written materials available on shelter-in- place procedures, and having individuals trained in radiological monitoring.

Nuclear accidents/incidents involving facilities in Kitsap County or the transportation of materials through Kitsap County could have an impact on the communities in near proximity to them. Emergency plans and procedures need to address the County's response and recovery activities, regardless of the probability of such occurrence.

e. Search and Rescue Emergencies

Hazard

Kitsap County has many recreational areas attracting hunters, hikers, fishermen, etc., who may find themselves lost or in trouble. Brush picking and mushroom picking also bring possibilities for search and rescue missions.



Effects

Due to heavy terrain and vast rural recreation areas in Kitsap County, the possibility exists for hikers and campers to become lost. Injury or death may occur if they are not found within a reasonable amount of time. Small children and the elderly often wander off and require search operations.

History

Kitsap County has been conducting Search and Rescue operations since 1971 and continues to train and coordinate resources with surrounding counties. The Kitsap County Sheriff's office and the Kitsap County Department of Emergency Management coordinate all Search and Rescue operations in Kitsap County.

Vulnerability

Kitsap County, due to the terrain, heavily forested areas and high number of recreational areas, is vulnerable for missing/lost individuals.

Conclusions

People will be in hazardous situations, which require search and rescue response. The number of persons at risk will probably increase as the population of the County grows or when a catastrophic incident occurs.

County, State, and Federal search and rescue and support agencies, with local volunteer groups, are capable of most wilderness search and rescue missions in Kitsap County.

Mitigation involves support of such programs as Hug-a-Tree for children, encouraging adults to obtain survival skills before heading out into the wilderness, and placing "trip plan" information with the Forest Service.

More emphasis needs to be placed on developing a resident capability to deal with Urban Search and Rescue (USAR) situations. This need will become more critical as the county continues the present growth trend.

f. Terrorism Or Civil Disorders

Hazard

Terrorism involves any despicable act directed against government, business or society in general which is meant to cause death or injury, destroy property or disrupt normal agency or business functions. It comprises a political effort to oppose the status quo by inducing fear in the civilian population through the widespread and publicized use of violence, including murder, injury, and destruction. The FBI defines terrorism as “the unlawful use of force or violence against persons or property to intimidate or coerce a government; the civilian population; or any segment of it, in furtherance of political or social objectives”.



Effects

The effects of terrorism include, but are not limited to death, injury and a feeling of fear and helplessness in the general population. It can destroy property, lifelines and the basic social fabric. On a large scale, it destroys major portions of a large city’s infrastructure creating physical and economic hardship for some time in addition to the initial death and destruction. Long term psychological damage to a portion of the population is also possible.

History

Although Kitsap County has not experienced major civil disorders, our community is made up of a very diverse population to include members of nation-wide militia organizations.

Vulnerability

On September 11, 2001 the entire nation was initiated into the world of international terrorism. The nation watched in horror the televised attacks and the frantic search and recovery operations at the Twin Towers of the World Trade Center, the Pentagon, and in a rural field in Pennsylvania. This event turned our attention from domestic to international terrorism.

Terrorist groups are constantly emerging. Copy groups taking their cues from other notorious groups such as Al Qaeda would not hesitate to utilize chemical and biological materials. Recent incidents such as the spread of anthrax through the mail system create events that will receive national as well as international attention.

Other possible scenarios besides chemical and biological include nuclear threat, most likely the detonation of a “dirty bomb” – a device using a conventional explosive packaged with radioactive material. Its primary destructive power is creating panic and fear. Explosive incidents account for 70 percent of all terrorist attacks worldwide. Bombs are terrorist’s weapon of choice. Cyber terrorism is a relatively new phenomenon used to potentially disrupt our society and exploit our increasing reliance on computers and telecommunication networks. As a result of these hazards, the United States government has implemented counter-terrorism measures to help secure the safety of this nation and its citizens. A vulnerability assessment

has been done for every county in Washington as well as the rest of the nation. As home to important military installations and our close proximity to Seattle's economic, financial, and population centers, Kitsap County's vulnerability to the effects of terrorism is substantial.

Conclusions

A terrorism event could occur in Kitsap County. This could be anything from a bomb threat at a local school to an attack on a military base. Law enforcement as well as citizens should be aware of this possibility and be alert for instances of suspicious activity.

Usually, the plans and systems developed for other problems can serve as templates for developing a comprehensive counter-terrorism program. Hazardous material emergency response plans and procedures are helpful in this arena. First responders must remember they are targets and that proactive steps need to be taken to protect the crime scene and the evidence. Just like preparedness issues with all potential sources of disaster, public education is needed to help the citizens of our county recognize the threat.

g. Transportation - Mass Casualty Incident (MCI)



Hazard

Transportation systems in Kitsap County include road, air and maritime. Use of these systems and supporting transportation vehicles create the opportunity for accidents, emergencies, and disasters. Transportation hazards may be natural or human caused.

Highway Accident. Aside from normal vehicular traffic accidents, the main highway system of Kitsap County represents a relatively moderate transportation MCI hazard threat. The main highway system includes: Highway 16, Highway 3, Highway 303, Highway 305 and other major roadways. Ice and excessive rainfall, frequently a contributing factor in large highway MCI's are relatively rare meteorological events in Kitsap County. However, private, county and school districts regularly use more lightly traveled urban and rural roadways. Thus all road surfaces must be considered as locations of potential vehicular emergencies.

Marine Accident. The Washington State Ferry System operates ferry runs from four locations in Kitsap County: Southworth, Bremerton, Bainbridge Island and Kingston. Ferries run from approximately 4 a.m. until after midnight seven days a week. One-way trips take from 30 minutes to one hour depending on the run. The ferries transport a substantial number of passengers, especially during summer weekends. The outstanding safety features of the vessels, the effective control of Puget Sound marine vehicular traffic by the U.S. Coast Guard's Vessel Traffic System (VTS), and the Ferry System's excellent safety record are all responsible for ensuring that risk of a marine transport MCI as a result of a ferry accident is low in Kitsap County. The threat of terrorist attack on a ferry is a real one and must be considered when planning for an MCI incident on the water.

Aviation Accident. Although Kitsap County's Bremerton National Airport does not house any commercial carriers offering regularly scheduled flights at this time it is used by private and commercial aircraft. The hazard could be represented by the crash of a single aircraft involving a large number of passengers, a mid-air collision, an accident involving ground structures (residential area, industrial complex, etc. of any combination of the above). Because Kitsap County lies in the flight path of Seattle Tacoma National Airport, there is always the potential of an airline accident occurring over the county.

Effects

In the unlikely event of an emergency involving a ferry or other vessel on the Sound, Kitsap County response forces will most likely only play a supporting role. The U.S. Coast Guard has the primary responsibility for safety and rescue on the open waterways. The cities of Bremerton and Bainbridge Island, as well as county fire and law agencies could be requested to provide emergency medical assistance, traffic and crowd control, media facilities, staging areas, temporary morgues and other disaster support.

The effects of a major disaster involving the highway system would depend on the location of

the accident. As is the case with most emergencies, rural areas will be impacted more than urban areas. Local fire and law forces could quickly be overtaxed. All fire districts have contracted assistance, in the form of mutual aid, available to them; thus the problem of emergency forces being overtaxed by a highway accident should only be temporary.

The emergency medical force is another area that could be temporarily overextended, as emergency transportation will probably be lacking initially. Consequently, on-scene personnel may have to set up a triage system and/or rely on aid cars for emergency transportation until enough ambulances can respond. In addition, hospitals are generally not staffed for handling a large number of emergency cases at one time.

The convergence of humanity often accompanying major accidents may also be a problem, especially when the accident has blocked a major roadway. If the detour has to rely on a minor roadway or one containing a traffic bottleneck it could tie up several more law enforcement personnel. Relatives of victims, media personnel and curious bystanders could cause problems if effective crowd control measures are not established immediately.

History

Over the years there have been several major accidents in Kitsap County many times caused by heavy fog, freezing rain, wind or ice forming on bridges and overpasses. These types of accidents happen every year. Occasionally tank trucks, chemical trucks, busses or other vehicles, which could lead to a major accident are involved. Some of these have closed down the highways for portions of a day, however, none has caused large long term evacuation or closure of the highways for long periods of time.

Kitsap County has been the scene of airplane crashes over the years. Most of these have been small craft with one or two people on board.

Kitsap County has not experienced a major accident involving a state ferry, but a few incidents have occurred.

- 1991: The ferries Sealth and Kitsap collided in heavy fog just north of Bremerton, injuring one woman.
- 1994: The ferry Kitsap collided with a pleasure craft as it was proceeding to a Bremerton dock.

Vulnerability

The ferry system does present a potential for an emergency situation. Based on the past safety record, the potential for an “accidental” incident is small. This could arise from a collision with another vessel, striking an object, structural failure, or adverse weather. The potential exists for a terrorist attack on a ferry and the ferry system is addressing this possibility by creating new surveillance and preparedness plans.

The only real threat posed by the highway transportation system would be an accident involving one or more passenger carrying vehicles. This accident could occur anywhere in Kitsap County but chances are it would occur on one of the County’s major roadways. School busses and private carriers are the conveyances most likely to be involved in an emergency situation. Based on the sheer number of school busses the most likely time for an accident would be from 6:00 – 9:00 a.m. and 2:30 – 4:30 p.m. Monday through Friday, from September through June. The smaller number of private carriers has the potential to become involved in an accident anytime. Due to a potential for heavy rains and snow and ice, the November through March period is the most likely time for a major emergency arising from the highway transportation system.

All parts of Kitsap County are vulnerable to an aircraft accident. Any area containing a major flight pattern has the potential for a mid-air collision or an incident arising from an equipment malfunction or pilot error. However, since most incidents occur during takeoff or landing, the threat to Kitsap County is small.

Conclusions

The possibility of a major transportation accident involving mass casualties taking place in Kitsap County is substantial, and is growing as the county population and industrial base expand. The two major effects of transportation accidents are human injury and hazardous materials releases.

The source and location of transportation accidents vary but the response is typically the same. Response is focused on determining the presence of hazardous materials and then assisting the injured.

h. Epidemics (Animal And Human)

Hazard



An epidemic refers to the outbreak and rapid spread of a disease in a community affecting a significant number of people or animals in a relatively short period of time. This section focuses first on animal epidemics, and secondly on human epidemics. It must be understood, however, that many diseases can infect both animals and humans. These diseases are called zoonotic diseases; a zoonotic disease agent has a nonhuman vertebrate as its usual host, but possesses the capability to infect humans. Zoonotic diseases are a serious and growing public health concern throughout the world. Most of the recent emerging and re-emerging infections have involved zoonotic disease agents. If a zoonotic disease, such as influenza, can spread widely within human populations, or if a zoonotic disease, such as rabies, spills over frequently from animal reservoirs, they can have serious socio-economic impacts.

Part I: Animal Epidemics

Effects

Diseases which can cause epidemics in animals could gain a foothold in Kitsap County in a number of ways. Exotic diseases could be brought in with legally or illegally imported animals from some other part of the country or world. Another potential disease source includes infected animals traveling across the border from neighboring states or British Columbia. Avian diseases could be brought in by birds on their annual migration between Alaska and Canada, or from areas as far south as Mexico or South America. Contaminated garbage tossed overboard from a ship off the coast has been identified as a potential disease vector when it washes up on shore and is eaten by animals. Public health practitioners, veterinary practitioners, and medical practitioners need to be educated about the potential for animal epidemics that could cause significant economic loss and possible widespread human disease, and need to understand their role in the surveillance and prevention of these diseases.

Washington Administrative Codes (WAC 246-101-101 and WAC 246-101-405) detail public health responsibilities of veterinarians. All veterinarians are required to report certain conditions to their local health district and/or the Washington Department of Health. The list of diseases includes those which are of significant public health concern, such as anthrax, West Nile virus, plague, and rabies. Certain diseases with zoonotic potential, eradicated animal diseases, and suspected foreign animal diseases (Foot and Mouth Disease, exotic Newcastle disease) are also reportable to the Washington Department of Agriculture. For diseases reportable to both Public Health and the Department of Agriculture, veterinarians can make just one report, and the agencies will reciprocally share the report.

Reasons for the recent increase in emerging infections include globalization of the economy; increased world travel; ecological changes such as agricultural shifts, migration, urbanization, deforestation, or dam construction; and increased contact with animals due to development and travel. Globalization and increased travel place more people at risk for these diseases, as well as increase the spread and emergence of infectious diseases in the United States. In many cases animal epidemics are the result of poor animal husbandry. The majority of zoonotic diseases are preventable through educating the public of the zoonotic potential of these diseases so that they may take precautions to minimize the risks of infection. For example, the spread of Bovine Spongiform Encephalopathy (BSE), also known as "Mad Cow Disease," has made headlines throughout the world. BSE is a transmittable, slowly progressive and ultimately fatal neurological disorder of adult cattle. The discovery of an infected cow leads to the destruction of a large portion of herds. The primary source of transmission is from the feeding of sheep and cow remains to livestock, and possibly through the injection of hormones taken from the pituitary glands of slaughtered cows to improve breeding.

Foot and Mouth Disease (FMD) is a highly contagious viral disease of cattle and swine, as well as sheep, goats, deer, and other cloven-hoofed animals. Although rarely transmissible to humans, FMD is devastating to livestock and has critical economic consequences with potentially severe losses in the production and marketing of meat and milk. The disease is difficult to control, and has occurred in over 60 percent of the world. In today's highly mobile environment, there exists the potential that FMD could be accidentally introduced and disseminated in the United States. If FMD were to spread here, the cost of containment and eradication could reach billions of dollars, causing extraordinary economic damage.

With the exception of pets, all animals entering Washington are required to have a certificate of health. For some species, tests or vaccinations are required. Dogs, cats and ferrets are required to have a current rabies certificate. However, there is limited control over companion animals entering from other states. Many people with pets move into Washington on a regular basis. This is especially true in areas such as Kitsap County who have military personnel continually transferring into or out of the area. In many instances, pet owners do not know that current rabies vaccination status is required to legally bring their pets into the State. The lack of entrance stations to enforce the certification regulations leaves our community open to the importation of diseased animals from other parts of the country. In addition, the Department of Agriculture enforcement officers have occasionally caught dog and cat breeders attempting to bring in animals with forged health certificates. In March 2007, two puppies from India (not a canine rabies free country) were shipped to SeaTac Airport. One of the puppies stayed in Washington and the other was shipped to Alaska. A health certificate accompanied the puppy to Alaska and was certified by a veterinarian who stated "to the best of my knowledge the animal(s) have not been exposed to rabies or other communicable diseases and did not originate within a rabies quarantine area." Upon the death of the puppy in Washington and a positive rabies test, the second puppy was euthanized and also tested. Although the test was negative, it is likely the second puppy was in the incubation period and the virus could not be detected. As a result of this incident, eight people who may have had contact with the puppies, including airline, customs, and veterinary clinic

personnel were treated prophylactically against rabies.

A new threat to disease control in the animal population in the county is the popularity of exotic pets, such as potbellied pigs or unusual rodents. Potbellied pigs can become infected with many diseases that could infect not only other potbellied pigs but also agricultural swine and in some cases humans. A monkeypox outbreak in 2003 in the Midwestern United States resulted in forty-seven confirmed and probable human monkeypox cases resulting from direct or indirect contact with infected prairie dogs. The outbreak was traced to rodents imported from Ghana and destined for the pet trade. These rodents spread the virus to a number of susceptible non-African species with which they were co-housed, including prairie dogs.

The effects of animal epidemics include such diverse problems as: economic loss due to either the direct death of livestock and/or the necessity for euthanasia due to exposure; the need for disposal of the carcasses before they become a secondary health hazard; loss of primary food supplies, such as the possible loss of meat and/or dairy products and animal byproducts such as wool; and the loss of recreation such as has happened in Washington State with the death of a majority of the coastal razor clam population.

Another effect, the one which threatens us the most, is the possibility that an animal epidemic may also infect the human population. Two examples of zoonotic diseases that have recently become prominent are Lyme disease and West Nile virus. Both of these diseases are zoonotic and were only more recently transferred to human populations. Another example mentioned previously, rabies, is an obvious case of a zoonotic disease that has been with us for centuries. It is also very possible that many of the epidemics that decimated portions of the world's population had their origin in animal populations.

History

In Kitsap County there has been historic evidence of rabies and psittacosis, as well as a few other diseases. Most of these have not occurred in epidemic proportions. In the early part of this century rabies was considered a major problem appearing in epidemic proportions, not only in Washington, but also throughout the United States. In the United States, one to four human rabies deaths occur each year. World-wide, however, there are more than 50,000 human rabies deaths per year, most in developing countries. In Washington State, bats are the only documented reservoir for rabies, with over 20 captured bats testing positive in 2007. The Health Department reports approximately 10% of tested bats are carriers of the disease. Generally, bats do not attack people, although there are incidents where animals and people have been bitten without provocation or have had bats in their sleeping areas without knowing that they were bitten. In other parts of the country, various other species, such as raccoons, coyotes, and skunks, are known rabies reservoirs. There have been no cases of rabies in the pet population within Kitsap County in the recent past. Nonetheless, due to the serious consequences of rabies the Health Department monitors it carefully.

Psittacosis, an infectious disease causing diarrhea, wasting, nasal discharge, and sometimes death in birds, is another zoonotic disease that occurs sporadically

throughout the county. It can be transmitted to humans and manifests itself as atypical pneumonia accompanied by a high fever. It has occasionally been brought into the County with migratory flocks or through birds imported by pet stores for sale to the general public.

Lyme disease, best known for affecting humans, is carried by deer ticks, and exists in other animals besides humans and deer. No cases of infected disease have been reported within Kitsap County to date. For years all canine cases appeared to get their infections in other parts of the country. That is no longer the case, and the disease has been diagnosed in areas where it was previously unseen. Unlike most other ticks the deer tick is native to Western Washington. Some evidence is beginning to point to other tick species possibly operating as vectors of the disease.

Vulnerability

The possibility of catastrophic disease affecting animals within the confines of Kitsap County is a very real, although seldom considered threat. Epidemics, both animal and human, are usually introduced from outside the immediate area, in many cases by vectors or from foreign countries.

In addition, diseases imported from other countries could create the worst epidemics in the future. Many diseases that we have not worried about for years, if not decades, not to mention some that have never existed in Washington, still exist in many parts of the world. These include such diseases as African Swine Fever, African Horse Sickness, Foot and Mouth Disease, and anthrax. Diseases such as BSE and avian influenza demonstrate the potential severity of an epidemic on both livestock and humans.

Conclusions

The frequency of emerging and re-emerging infections has been increasing. A disease is classified as emerging if it has appeared for the first time, has increased in incidence, or has been reported in new areas. The notion of emerging infectious diseases appeared in the late 1980's when major outbreaks occurred around the globe. This surprised many scientists who considered infectious diseases to be maladies of the past or limited to the developing world. The majority of these emerging diseases are zoonotic diseases. These zoonotic diseases may present as an epidemic in animals. Mitigation for animal epidemics revolves around prevention. If diseases that can cause epidemics are prevented from entering Kitsap County or the State of Washington, we will be in much better shape than attempting to contain a disease that is already established.

First, increasing compliance with the health or rabies certificate requirements would go a long ways towards prevention. While many animals entering Washington are required to have testing and vaccinations, many of their owners are unaware of the requirements. There is limited control over companion animals entering from other states, and without controlled entrance stations at Washington's borders this will never be totally effective. A beginning mitigation effort would be to increase education of the public in both the legal requirements and the rationale concerning importation of animals.

An education program aimed at the public about the requirements relating to animal bites would be beneficial. Generally the public is unaware that the State requires that all animal bites be reported to their local public health jurisdiction.

Interstate movement of animals is regulated by the U.S. Department of Agriculture Animal/Plant Inspection Services and the Washington Department of Agriculture Food Safety/Animal Health Division. Both agencies also cooperate in the detection, diagnosis and control of foreign animal disease, as well as cooperative disease eradication programs such as for Brucellosis, tuberculosis, pseudo rabies, salmonella in poultry, and scrapie in sheep. As such, primary mitigation measures are funneled through either or both of these agencies. Any flow of illegal exotic birds into the United States for sale in pet stores and to private owners needs to be eliminated. All legally imported birds should be properly quarantined and checked to be disease-free before sale. Also, more backyard poultry flocks should participate in the voluntary screening program for avian influenza.

Following through with the State's requirements that all garbage from foreign ships be incinerated, or, in the case of food waste, "cooked" by licensed cooks before being used for animal food, will continue to help prevent the importation of diseases from foreign ports.

Vaccinating animals in an effort to prevent diseases within the local populations should be continued. Research into disease prevention should continue, as should enforcement of the sanitation laws related to animal husbandry.

Part II: Human Epidemics

Hazard

The latest scourge to catch the attention of the public is West Nile Virus. According to the Washington State Department of Health, as of March 2008, this mosquito-transmitted disease has not yet reached the State of Washington. Currently, there have been no reported incidents of West Nile Virus in Kitsap County.

A safe water supply, effective sewage and waste disposal, and aggressive monitoring and treatment of potential disease outbreaks by public health officials have kept Kitsap County relatively free of many of the serious epidemics in existence.

However, neither the state of Washington nor Kitsap County are immune to epidemics. Some, such as the flu, pass through on a regular basis. Others are either much more irregular, such as measles, or are perhaps still developing as a full grown epidemic, as appears to be happening with AIDS. A number of diseases have had an effect on the population's health in the County. A few of these include:

- Acquired immune deficiency syndrome (AIDS) while relatively new in Kitsap County, only being discovered nationally in 1981, is currently considered epidemic in the United States. At present time, AIDS is on the decline within

Kitsap County, with only 6-10 cases diagnosed per year.

- Measles has been a major childhood disease ever since settlers with a European heritage moved into Washington during the 1800s. Much of it has been controlled; however in 1990 Washington experienced the largest measles outbreak since 1979. Kitsap County has not experienced any measles cases during the recent years.
- Hepatitis B, a serious, highly contagious liver disease has been frequent in Washington, although Kitsap County has experienced only minimal cases.
- Tuberculosis (TB) is another of those diseases which has been around for many years. The development of strains that resist treatment, combined with lifestyles that allow the disease to be transferred easily, has allowed its resurgence the past few years. Many people, once they become symptomatic, will continue to infect others until they themselves are located and given treatment. When left to themselves, many of those who initially resist treatment will also fail to complete treatment once the symptoms begin to disappear. This could lead to a later resurgence and also contribute to the development of resistant strains. This is especially true in the denser urban cores. To counter this, many Health Departments have initiated a program of aggressive follow up to make sure that individuals complete a full course of their treatment. Without these preventative measures we could in the future see a dramatic increase in the disease rate. It is estimated that between six and ten new cases are diagnosed in the County annually, mostly in foreign-born individuals.
- The standard fall/winter flu season creates its own epidemic on a yearly basis with some strains causing greater damage than others do. In cases like this, the elderly are hit the hardest, resulting in a number of deaths attributable to flu each year.
- The highly publicized E-Coli epidemic in January of 1993, caused by tainted hamburger at fast food restaurants was an excellent example of how an epidemic we are not familiar with can suddenly enter our environment, infect a number of people, and cause a great deal of suffering before we even realize it is happening.
- Another disease that has come to the foreground in Washington is Lyme Disease. While the first reported case in Washington was in 1987. To date, Kitsap County has not experienced any cases of Lyme Disease within our region.

- Hantavirus Pulmonary Syndrome (HPS) is another of those emerging diseases. Since the disease's recognition in 1993 through October 2007, there have been 34 reported cases of HPS in Washington State with 11 (32%) associated deaths. Between 1 and 5 cases occur annually with a geographic distribution throughout the state. The median age of cases in Washington State is 36 years (range 19–75 years). The death rate and median age of cases in Washington are similar to the national rates (DOH, 2008). There have been no cases of HPS reported within Kitsap County.

In addition to these, there are many other diseases that affect numbers of the population on a regular basis. In addition, not all of these are associated with things we are able to identify easily.

Effects

The impacts could include loss of life or either short or long term debilitation for the victims. It could include economic hardship for the individuals or their families. Lost work time affects not only the employee, but also the employer. Loss of productivity due to individual illnesses is a major business problem today without taking into account the effects of a major epidemic. In addition, a serious epidemic would likely cause a strain on current public health and medical resources in Kitsap County.

Any upward trend in disease cases could potentially strain medical resources and charitable organizations who support patients without other resources. This could put a greater financial drain on the medical system which will have to either absorb some of the costs, of at least emergency room care if not long term care, or begin refusing service to the indigent who cannot pay for treatment. Since refusing treatment to the poor has unacceptable moral and social overtones, medical facilities will have to absorb the costs in some other way or charge higher fees to offset the costs.

Vulnerability

While the effects of disease on the population have been minor, the potential for large epidemics continues to exist. A disease of epidemic proportions in Kitsap County would very likely be brought in by persons, animals, or materials from elsewhere. In addition, the potential for an epidemic would increase dramatically in the event of a major disaster, such as an earthquake. In such a case, disease may reach a larger population due to the absence or breakdown of normal intervening factors.

Conclusions

Basic mitigation measures include, but are not limited to: maintain sewage and waste disposal systems; promote and fund both childhood and adult immunization programs; support and provide health education in the schools and on a community level to address disease transmission and prevention; target the mechanism of transmission of individual diseases, such as drug usage for diseases like HIV infection and Hepatitis B; maintain

strict health standards for food service employees and eating establishments; maintain strict health standards for food products; utilize accepted and recommended infection control practices in medical facilities. The community education programs should be targeted in particular at high risk groups for blood born pathogens and sexually transmitted diseases. Both active and passive surveillance methods need to continue to be used.

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