

HAZARD IDENTIFICATION VULNERABILITY ANALYSIS

OKANOGAN COUNTY, WA

FEBRUARY, 2004

OKANOGAN COUNTY HAZARD IDENTIFICATION/VULNERABILITY ANALYSIS

INTRODUCTION

The purpose of this analysis is to provide general information on potential hazards which may threaten or cause loss of life or injury, along with property and environmental damages in Okanogan County. The information discussed in this analysis serves as the basis for county level preparedness planning. Additionally, this information serves as a foundation for initiating effective mitigation, emergency response, and recovery activities.

The following thirteen (13) hazards may not be inclusive of all that could affect Okanogan County, these are the focus of this analysis.

| <u>Natural</u> | <u>Technological</u> |
|-----------------------|-----------------------------|
| Floods | Dam Failures |
| Earthquakes | Terrorism |
| Droughts | Hazardous Materials |
| Slides | Utility outages |
| Volcano | Urban fires |
| Severe Storms | Civil disturbances |
| Wildland fire | |

Data gathered from many sources is presented in this document from a historical perspective and provides a general overview of problems which could arise in the future.

AREA CHARACTERISTICS

The County is located in the north central part Washington State with a land area of 5,268 square miles, (3,379,840 acres) making it the largest county in the state of Washington. Only a small portion of the land is in private ownership due to the amount of state and federal land (Mainly the Okanogan National Forest, and Colville Indian Reservation). The county is bounded on the North by Canada, Douglas County and the Columbia River on the South, Chelan, Skagit, and Whatcom Counties on the West, including the North Cascades National Park, and Ferry County on the East. Grand Coulee Dam is located at the Southeast corner of the county, while the Cascade mountains form a natural barrier on the west side.

Land ownership: Land use practices in Okanogan County are closely related to land ownership. Within the County, land ownership can be grouped into four major categories which include Federal Government (U.S. Forest Service & Bureau of Land Management), State Government (Department of Natural Resources & Department of Fish and Wildlife), Corporate Private, and Private. 87% of lands within Okanogan County are public ownership, with the remaining 13% in some form of private ownership. Most of the west side of the county is forest land, including the Pasayten Wilderness, Sawtooth Wilderness, Loomis Forest (DNR), and other USFS land.

The County contains:

| AGENCY | ACRES | SQ MILES | PERCENT |
|-------------|---------------------|-------------|-------------|
| ALLOTTED | 66,217.73 | 103.47 | 2% |
| BIA INTRUST | 29,116.88 | 45.50 | 1% |
| BLM | 5,506.92 | 8.60 | 0% |
| CCT | 390,360.46 | 609.94 | 11% |
| CITY | 1,343.27 | 2.10 | 0% |
| COUNTY | 937.03 | 1.46 | 0% |
| PRIVATE | 953,301.17 | 1,489.53 | 28% |
| PUD | 1,505.54 | 2.35 | 0% |
| STATE | 300,226.95 | 469.10 | 9% |
| STATE FW | 57,494.90 | 89.84 | 2% |
| US | 65,331.49 | 102.08 | 2% |
| US FW | 2,818.97 | 4.40 | 0% |
| USFS | 1,500,604.73 | 2,344.69 | 44% |
| WATER | 26,035.96 | 40.68 | 1% |
| | 3,379,840.00 | 5268 | 100% |

Demographics:

The 2000 census figures estimate Okanogan County with a population of 39,560 which is an increase of 5,560 over the 1990 census. The City of Omak is the largest incorporated area with an estimated population of 4,705.

Additionally there are various local events which can temporarily increase the County's population, including: Omak stampede, Okanogan County Fair, Barter/Family Fair in Tonasket, and the 49'er days in Winthrop.

Major rivers and lakes:

The Columbia River; Okanogan River (beginning in Canada, then travelling 75 miles from Oroville to Brewster), Similkameen River(which feeds into the Okanogan), Chewuch River(which feeds into the Methow), Methow River; Twisp River(which feeds into Methow), Omak Lake, Osoyoos Lake and Palmer Lake. There is a major confluence of rivers in the Brewster/Pateros area, where the Methow and Okanogan rivers join the Columbia. Every year the snowpack levels are carefully watched, in anticipation of the runoffs, of which begin in the wilderness areas and Canada, then flow down into the Okanogan, and ultimately into the Columbia.

Geology:

Okanogan's topography embraces four widely differing geologic provinces. On the west are the Cascades, born of ancient seabed uplifted, eroded, penetrated by molten rock, and subjected to folding and great pressure. On the east are the Okanogan highlands, underlain by great beds of gneiss, a rock derived from other rock in cataclysmic pressure and folding, formed underground, and later uplifted and stripped of its cover. To the south in the Columbia basalt plateau, a portion of an area created by repeated upwellings of molten rock which covers parts of four states. Finally, the oldest of all, is the ridge of ancient seabed rocks running from the central part of the county northward, folded, and then carved by erosi on into its present forms. Over these dissimilar landforms ice spread

(during ice age), and when receded, left slabwalled valleys with polished sides, canyons cut by runoff, hanging valleys and waterfalls, benches and cliffs of sediment, silt and gravel in the valley bottoms (alluvium of glacial origin), and scratches in rocks on high points. (Source: Okanogan County, A Profile, by Glen and Elizabeth Widell, 1973, Page 4, and Geography of the Okanogan Valley, by Robert Nelson Young, 1948, pages 1-7).

Physiography/Land Use:

For emergency planning purposes, important physiographical features are elevation and slope. The land area comprising Okanogan County has an extremely rugged topography which is marked by steep slopes and exposed rock faces. Within the County the elevation ranges roughly from 8,920' above sea level near the Cascade Mountain crest on the west side of the county, to 760' feet above sea level near Wells Dam. The County is divided into different areas, by reasons of highways, rivers, and mountain passes. The Methow valley, on the west side of Loup Loup pass contains considerable forested areas, wilderness, with only some land suitable for crops and livestock, primarily along the Methow river valley. The Okanogan river valley stretching from Oroville to Brewster, contains the main cattle and fruit growing operations, due to the wide flat expanses on either side of the river. To the east is the highlands, with large ranches and farms, in both private lands and in the Colville reservation, typified by higher elevations, and more extremes of climate and temperature. Roads leading east out of Oroville, Tonasket, and Omak all have an approximate 1000ft of elevation gain as they rise up to the plateau to the east.

Soils:

The soils of the valley are all alluvial in nature. Most of the arable land is on either constructional or destructional terraces. Most of the valley's soils are porous, and water erosion is only slight to moderate. Intermittent flash floods can and do damage the localized top soils.

Climate:

| Average | Jan | April | July | Oct | Avg. annual |
|-------------------------|------|-------|------|------|-------------|
| Maximum temperature (F) | 31.0 | 67.8 | 92.1 | 65.2 | 63.2 |
| Minimum temperature | 17.4 | 38.4 | 57.9 | 38.6 | 38.2 |
| Mean temperature | 24.2 | 53.1 | 75.0 | 51.8 | 50.7 |
| Precipitation in inches | 1.23 | .88 | .28 | .89 | 11.65 |

For Okanogan, elevation 835 feet (Source, Chronicle Newspaper).

The climate of Okanogan County is characterized by warm, dry summers and relatively cold winters. Hot, sunny summer days are common, reaching an average maximum July temperature of 92.1 F in lower valley elevations. The January minimum average is 17.4 F in lower elevations. the average mean low is 24.2 F. , and the average mean high is 75.0F. The average mean range is about 50 F. However, highs above 100 F. and lows down to -30 F. are not uncommon in outlying and higher elevations. Highest recorded temperature is 114 F., and the lowest is -23 F., but this is only at a recording station. It is typical for the temperature to stay in the single digits or low teens for several continuous weeks during the winter months.

Frost is a significant concern in the county, due to the fruit industry. Next to precipitation, killing frosts are the most important climatic phenomena in the valley. Typical frost free seasons are about 137-150 days in Okanogan county. The location of crops, in relation to

the valleys bottoms and depressions, is critical in relation to the frosts and whether or not fruit is damaged each year.

The average annual precipitation in the lower elevations is just over 11 inches, increasing with elevation to about 35 inches. The bulk of this precipitation falls as snow which reaches 100 inches or more in the upper watersheds (U.S. Forest Service, 1996). Snow melt conditions do not always follow seasonal patterns. Several damaging floods of record (1933, 1948, 1956, 1961, 1990, and 1995) have occurred in the months of November, December, June and July. These floods were caused by different weather conditions including rain on early snow pack and rain on late winter snow.

The month of July sees thunderstorms in the area. These storms mostly bring dry lightning which has been the cause of major fires in the area. Sometimes these storms do have moisture, which has caused flash flooding.

Winds are a factor in two forms: first, they are a significant eroding factor at the mouth of the Okanogan, due to the fairly high velocities reached at the Columbia Valley. Second, they are a factor in winter storms, reaching velocities of 50-70 mph. (Source: Geography of the Okanogan Valley, by Robert Nelson Young, 1948, pps 1-34).

CONCLUSION

With the increase in growth and development there is more and more stress placed on the infrastructures of Okanogan County. There have been some considerations given to fire safety in the interface areas, but very little else. The only real solution is to require, by law, that emergency planners are incorporated into the overall planning process. Rural residents are changing their attitudes. They still want to be away from the population base and away from government control, but are demanding more services from government. This is especially true from public safety. People want the right to build where they choose, even in areas that are susceptible to natural disaster. Then when disaster strikes, they want government to make them whole again. This pattern is being played out more and more. Government and the populous must realize that there needs to be regulations if people expect help after a disaster. If there are no growth regulations, then the populous must understand that they have the responsibility to take care of themselves after disaster strikes.

Disaster preparedness education is a must. In order to help the populous survive disasters, they must be given the tools to survive. A well organized public preparedness education program will give the public these tools.

FLOODS

GENERAL BACKGROUND

Flooding is one of the most common of the natural occurring hazards in Okanogan County. The steep drainage areas with populated canyon bottoms, typical of all North Central Washington, has presented reoccurring problems throughout the history of the area. Basically, the two types of flooding common in Okanogan County are stage and flash flooding. Stage flooding is usually seen during periods of heavy rains, especially upon existing snow packs during early winter and late spring. Flash floods are more likely to occur during the summer months, during thunderstorm season.

EFFECTS

Floods have caused loss of life, personal injuries and damage to property, along with damage to roads, bridges, utility systems, etc. Secondary events from major flooding by polluted water includes the spread of disease and contamination. This increases the health risk for those people returning to homes in areas that had been flooded.

HISTORY AND VULNERABILITY

Historically, flooding has been one of the most common natural hazards in Okanogan County. The most notable historical floods occurred in 1894, 1948, and 1972, with the flood of 1894 being a “90 year flood”.

Stage flooding is becoming more and more common. In more recent years, significant flooding has taken place in 1991, 1996, 1998, and 1999.

Flash flooding has caused deaths in the area and is a threat to local populated areas due to the topographical make up of the County. Flash flooding has occurred as recently as 2001, with the washout of a road near Chesaw, and the loss of one life. Severe thunderstorm or rapid snow melt also poses a constant threat of extensive damage and death. The following is a brief summary of floods:

| | | |
|-------------|--------|---------------------------------------|
| Flash Flood | 1916 | Salmon Creek |
| Flash Flood | 1926 | Whitestone/Loomis area |
| Flash Flood | 2001 | Chesaw Flash Flood - Road Washout |
| Flood | 1884 | 6ft deep at Omak |
| Flood | 1894 | 92 year flood - destroyed Conconully |
| Flood | 1900's | Floods in Omak |
| Flood | 1904 | Okanogan and Riverside areas |
| Flood | 1936 | wall of water took out Chopaka school |
| Flood | 1948 | 30 year flood on the Methow river |
| Flood | 1972 | 80 year flood |
| Flood | 1973 | |
| Flood | 1978 | |
| Flood | 1995 | |
| Flood | 1998 | Cougar Creek flood |
| Flood | 1998 | Oroville - Toroda Creek Flood |
| Flood | 1999 | Floods in Methow |

HAZARD AREAS

The Okanogan River, Similkameen River, and Methow River and other perennial streams in Okanogan County follow an annual cycle with peak streamflow in April and May and low streamflow in August and September. Normally streamflow in many of the smaller drainages are intermittent seasonally, while drainages in lower elevations are often dry. Hazardous areas found along stream courses for most types of residential or recreational development include those areas within the 100 year flood plain boundaries.

The primary cause of flash flooding which can occur in any drainage area in the county is high intensity rainfall. Although infrequent, and usually of short duration, high intensity rain fall has been seen in all seasons in the past. Of special concern is the months of July and August, during the thunderstorm season.

The threat of flash flooding is increased in an area that has suffered from a major wildland fire. Not only is there a greater amount of loose debris, most of the ground cover has been burnt away. Without ground cover more soil and debris will be allowed to flow, increasing the chance of debris dams. Historically, major flash floods and mud flows have occurred following major wildland fires in the county. Due to the consecutive seasons of significant forest fires in Okanogan county, the threat of flash flooding is at an all time high.

Depending upon the characteristics of a particular watershed, peak flows may be reached from less than one hour to several hours after rain begins. The debris dams and mudslides accompanying rapid runoff conditions make narrow canyons and alluvial fans at the mouth of the canyons extremely hazardous areas. Present problem areas for flash flooding include drainages in the Methow/Twisp area where forest fires occurred in the last two summers. Stage flooding problem areas are: 1) in the Oroville flood plain south of Lake Osoyoos, 2) where the Similkameen and Okanogan rivers meet, 3) all along the Okanogan where the river meanders as it travels to the south end of the county, and 4) the Methow river, especially where the Twisp and/or Chewuch rivers join.

With land becoming scarce, there is more development along the hazard areas, which will continue until more restrictive land use planning is implemented in Okanogan County.

CONCLUSIONS

Mitigative and preparedness practices to reduce the potential for private and public damages should reflect:

1. Strict floodplain zoning/regulations, including flash flood hazard areas.
2. Public education to alert the public of flooding hazards.
3. Requirements for flood insurance for building in flood plains.
4. Establishment of a system to monitor watersheds that have been recently
. burned or significantly clear-cut of timber.
5. Good rehabilitation practices after a major fire.
6. Continued emergency response planning.

WILDLAND FIRE

GENERAL BACKGROUND

For most years wildfire season in the State of Washington runs from mid May through October. In Eastern Washington, any prolonged period of low precipitation presents a potentially dangerous problem. In Okanogan County the probability of a wildland fire starting at a particular location depends upon fuel conditions and topography, time of year, weather conditions and the level of human activities occurring that day.

EFFECTS

The effects of wildland fire on Okanogan County varies with the intensity of the fire which is affected by fuel types, topography and time of year. Significant effects of wildland fire include loss of life, personal injury, damage to private and public property and economic impact. Fires in the past have caused economic impact on local businesses, as well as government, due to loss of tax revenue. Wildland fires also cause negative impacts on watersheds which increases the soil erosion, and stream degradation that contributes to potential flooding in the County.

HISTORY AND VULNERABILITY

The geographical location and climate of Okanogan County makes the entire county vulnerable to wildland fires. Although many wildland fires have been human caused, the most devastating wildland fires have been natural occurring. The thunderstorm season of late July and early August brings dry lightning. During this period each year, hundreds of ground strikes by lightning are recorded, resulting in multiple fires have been going in the county at the same time. Recent fires have shown that Okanogan County is extremely vulnerable to wildland fires and that their effects are devastating.

SELECTED RECENT WILDLAND FIRES

| YEAR | NAME | ACRES | LIFE |
|------|-------------------|-------------------|------|
| 2000 | Rockhull | 9,252.40 | |
| | 2000 Total | 9,252.40 | |
| 2001 | Boundary | 305.71 | |
| 2001 | Windy Peak | 227.29 | |
| 2001 | Long Swamp | 336.31 | |
| 2001 | Thirtymile | 6,093.13 | 4 |
| 2001 | Cape LaBelle | 260.02 | |
| 2001 | Bailey | 2,160.18 | |
| 2001 | St Mary's Mission | 33,034.07 | |
| 2001 | Virginia Lake | 36,653.14 | |
| 2001 | Libby South | 3,763.47 | |
| 2001 | Gambles Mill | 5,390.79 | |
| 2001 | Dan Canyon | 52.75 | |
| 2001 | Libby South | 0.04 | |
| 2001 | Goose Lake | 1,281.76 | |
| 2001 | Indian Dan | 584.26 | |
| | 2001 Total | 90,142.93 | |
| 2002 | Haley Creek | 207.99 | |
| 2002 | Lemanasky | 129.89 | |
| 2002 | Pickens | 2,338.13 | |
| | 2002 Total | 2,676.01 | |
| 2003 | Needles | 28,157.91 | |
| 2003 | Isabel | 4,530.73 | |
| 2003 | Farewell | 79,784.28 | |
| 2003 | Sweet Grass | 179.31 | |
| 2003 | Fawn Peak | 71.09 | |
| 2003 | Nine Mile | 1,587.71 | |
| 2003 | Crestview | 323.97 | |
| | 2003 Total | 114,634.98 | |

HAZARD AREAS

Okanogan County's dry summer climate, topography, large forested area, and open grasslands, combined with heavy recreational use makes the entire county susceptible to wildland fire. Wildfires in the summer months are difficult to suppress. This has resulted in long term resource loss, increased flood potential and loss to private and public property.

As Okanogan County grows and citizens keep building further out into the forested areas (interface areas - where the homes meet the forest) the potential for a major conflagration grows. Building in the interface areas adds to the human factor and increases the chance of fire starts. This coupled with a lack of understanding of what fire can do in the wildlands and the use of combustible roofing materials, increases the potential of devastating losses.

This lack of knowledge is not only on the part of the rural residents. Elected officials and planners are not taking into consideration fire behavior, construction techniques and what resources are needed to combat a fire (water supply, road access, defensible spacing) when allowing development.

CONCLUSION

The short and long term consequences of wildland fire on people and the natural environment has made it necessary to develop a strategy for reducing the potential of large scale fires. The following steps should be taken to reduce the potential for loss of life and property:

1. The development and maintenance of a strong fire prevention plan involving all levels of government.
2. The enhancement of interlocal agreements on all levels of government. This is to ensure a more efficient fire response and provide a better sharing of manpower and resources.
3. The enhancement and maintenance of disaster procedures including communications for multi-agency response to wildland fires.
4. Development of interagency suppression pre-fire plans and initial attack agreements for fire fighting in the interface areas.
5. Development of zoning and development codes for high wildfire hazard areas.
6. Wildfire prevention education of both the homeowner and recreationist.

EARTHQUAKE

GENERAL BACKGROUND

Earthquakes are unpredictable and strike without warning. Until recently the cause of earthquakes has not been understood. In the 1970's geologist developed the theory of "plate tectonics", which is now commonly accepted by the scientific community. This theory states that the surface of the earth is comprised of about ten fifty-mile thick plates which are supported by the earth's mantle of molten rock. These plates are constantly rotating around their own fixed axis. Individual plates, which lie primarily under bodies of water, normally

rotate about five times faster than land bearing plates. This is an average of four inches per year compared to three-fourths of an inch annually (Row, 1983). The release of energy in the weaker areas where the plates contact each other is now thought to be the cause of earthquakes.

Where are future earthquakes likely to occur in the State of Washington? Historically, the Puget lowland from Olympia to the Canadian border has been the most seismically active part of the State. Over half of the thirteen most strongly felt earthquakes have occurred within that region (Noson, 1980). Earthquakes in Eastern Washington have been generally small in magnitude, but much shallower in depth. These shallow, moderate magnitude earthquakes often cause considerable damage in the immediate vicinity of the earthquake (Noson, 1985).

EFFECTS

Earthquakes can range in intensity from slight tremors to great shocks and may last from a few seconds to as long as five minutes. After the initial shock, additional shocks (aftershocks) may occur over a period of several days. Depending upon the magnitude of a given earthquake, the primary effect of actual ground movement may include fatalities and/or injuries from collapsed buildings, bridges, dams or other structures, landslides or avalanches severing transportation routes, disruption or failure of electric, telephone, gas, water, sewer and other essential utilities.

Secondary effects in an earthquake damaged area can include fires from ruptured gas mains or downed power lines, contamination or lack of water from ruptured water and sewer lines, hampered rescue efforts due to damaged equipment or roads, and the risk of aftershocks creating more damage.

HISTORY AND VULNERABILITY

From the early 1900's to the present, over 130 earthquakes have been recorded in North Central Washington. Damage by earthquakes has been low in the County.

What may have been the largest earthquake in the history of the Pacific Northwest occurred on December 14, 1872. Due to poor record keeping in a predominately frontier area, scientists have been unable to determine an exact intensity for that incident. However, general consensus indicates a range of 7 - 8 on the Richter Scale was not unlikely. Most scientists agree that the epicenter of this earthquake was located in the Northern Cascades, Okanogan area within a zone extending from Lake Chelan in the south to Southern British Columbia in the north (Coombs, 1979). Other earthquakes have been recorded in historical records in 1895 and 1920. In addition, there have been other more severe quakes on the west side of the state, whereas small effects have been felt in Okanogan County.

HAZARD AREAS

There is not a particular area of the county that has been identified as being more at risk than another area.

It should be noted that Okanogan County is in the "Back-Arc" region (McCrumb, et al) and that earthquakes in this region have a more shallow epicenter than on the west side of the Cascades. Seismic activity in Eastern Washington occurs at depths less than 8 km. The shallow depths will lend itself to more aftershocks than occur at the deeper depths (McCrumb, et al).

CONCLUSION

Earthquakes can occur anywhere, at anytime and without warning. Because a majority of earthquakes are not associated with known faults, they are also very unpredictable. Past geological studies indicate areas prone to earthquakes may experience long periods of inactivity. These areas may be building tension which can lead to a major earthquake.

Due to the unpredictability of earthquakes, forecasting when or where they next one will occur in Okanogan County is impossible. Although past earthquakes have been in the form of milder tremors, the potential for a major earthquake cannot be ruled out. The probability that an earthquake will occur in Okanogan County is high, however mild. The question of when, where and of what magnitude remains to be seen. Land use planning and building codes should reflect potential effects of earthquakes in Okanogan County. Development of disaster response plans and general preparedness of emergency response agencies are effective mitigation techniques which may lessen the confusion and damages prior to a major earthquake incident.

Another effective area of mitigation is that of public education and preparedness. The public must be made aware of what could happen and how they can prepare for such events. They must realize that after an earthquake, or any other disaster, government may not be able to assist them immediately. Citizens must be able to take care of themselves for three days after a disaster.

DROUGHT

GENERAL BACKGROUND

A drought or a protracted period lacking precipitation is a climatic condition which can be severe enough to threaten human life. A drought occurs when precipitation levels are low enough that soil moistures or ground and surface water levels are below a minimum for sustaining plant and animal life. Ground moisture deficiencies affect dryland agricultural crops and often disrupt normal human activities. Worldwide desertification and/or extremely protracted droughts are caused when the prevailing westerly winds or jet stream currents reorient themselves in new positions on a long term basis. This is known as the "El Nino" effect and it causes some regions to experience drier than normal conditions, while other areas thousands of miles away experience higher than normal rainfall.

EFFECTS

Locally, droughts have left a major impact on individuals and the agriculture, timber and hydroelectric industries. Lack of snowpack has forced ski resorts and other recreation based companies into bankruptcy. The primary effects of drought in Okanogan County include loss of fruit and dryland crops, loss of range and domestic animals, wildlife and wildlife habitat, and extreme increase in the danger for wildland fires. Secondary effects involve social and economic hardships due to crop losses, energy curtailment, temporary unemployment, domestic and municipal water shortages and increased number of major wildfires.

HISTORY AND VULNERABILITY

All areas of Okanogan County and the State of Washington are vulnerable to drought conditions. Although not subject to severe annual precipitation deficiencies, periodically Okanogan County experiences seasonal dry spells lasting two to three months. However,

since the early 1920's there have been approximately 13 droughts statewide which have particularly impacted Okanogan County. During these particular low water years, agriculture, forestry and hydroelectric interests have felt the impact, especially in non-irrigated farm, range and forest land areas.

HAZARD AREAS

Because of the increased fire danger, forested and grassland areas of Okanogan County can become extremely hazardous areas during prolonged drought situations. Populated areas in the county, including cities can be directly affected by low streamflows. Hazardous conditions, including domestic and municipal water shortages affect the ability of local government to effectively fight fires or provide sufficient water and sewage services.

CONCLUSIONS

Okanogan County is vulnerable to drought conditions. Significant mitigation measures which have been taken in the past by various federal, state and local agencies to lessen drought impacts have included: water surveys and measuring snow packs; studying fire-weather cause and effect; closing roads to unnecessary activity; placing limitations on irrigation and power usage; establishing minimum stream flows in the interest of fisheries; prohibiting logging, mining and recreational use within the national/state forested areas; and providing disaster funds to economically stricken farm areas.

SLIDES

GENERAL BACKGROUND

This section of the Okanogan County Hazard Analysis refers to any material or debris which tends to flow down steep slopes. This includes snow, rocks, mud and other earthen materials.

Snowslides or avalanches are basically of two types, loose snow and slab. Loose snow avalanches start at a point or over a small area. Slab avalanches, on the other hand, start when a large area of snow begins to slide at the same time. Snow avalanches grow in size and the quantity of snow involved increases as they descend. Steep slopes, usually from 30 to 50 degrees, and snow, are the only requirement for avalanches. The forces generated by moderate or large avalanches can damage or destroy most man made structures (U.S. Forest Service, Knipple, 1996).

Landslides of rock, mud and other earthen materials can range in size from thin masses of soil a few yards wide, to deep-seated bedrock slides greater than six miles across. Travel rates may range in velocity from a few inches per month to many feet per second. Old slide areas and slumps can be reactivated by earthquakes or unusually wet winters. These areas are also more susceptible to construction triggered sliding than adjacent undisturbed material (Satterlund, 1972).

Increasingly, more and more people are recreating, working and building in potentially hazardous areas with little caution or preparation. Development pressure in rural areas and at recreation sites in the mountains brings added exposure to people and their structures.

EFFECTS

Slide effects on individual or public organizations include partial damages or destruction of significant portions of highways and railroads, utility lines, private and public property. Other major effects involve the loss of natural resources and the cost of debris removal.

HISTORY AND VULNERABILITY

Okanogan County is particularly vulnerable to slide hazards. The Cascade Mountains receive extensive precipitation due to their size and orientation to the flow of Pacific marine air. In Okanogan County, specifically in the Methow area, avalanche season can begin in November and continue into early summer. In the higher alpine areas, the avalanche season continues year round. Because of increased winter recreational use in the Methow Valley, a larger amount of people are becoming exposed to avalanche risks. Landslides can occur in almost any part of the County. At the location known as "Riverbend", located on Highway 20 near the city of Methow, rock and mudslides occur on a regular basis, in both fall and early spring, when conditions, such as rain, changing temperature, and wet snow are present. Further up Highway 20, at Washington pass, which is closed during the winter, avalanches are frequent and common while road crews are attempting to keep the road open (fall), or open the road back up (spring). Finally, in many rugged areas in the forests of the Methow, skiers, snowboarders, snowshoers, and snowmobilers both create, and are subject to avalanches that occur every winter season as recreational activities push further and further back into the wilderness. With the additional hazard of flashfloods (see elsewhere), landslides can and do occur at many locations around the county, especially where roads are below cumulative drainages.

HAZARD AREAS

Areas vulnerable to landslides are identified largely by steep slope classifications, soil types, conditions of bedrock materials and water content or unstable soils. Under the right conditions any steep sloped area of Okanogan County may be classified as a potential hazard area. The ever increasing pressure for development in or near the mountains and narrow valleys brings added exposure to people and their structures.

CONCLUSION

Normally slides are the cumulative result of a series of events. Slides often occur on steep slopes after severe storms, wildfires, earthquakes or construction activity in slide prone areas. Because of the steep topography and narrow valleys of Okanogan County, the potential for slides is high all year round. Theoretically, the utilization of land use controls in highly vulnerable areas, development of a good disaster response plan, and public education could reduce the potential for property damage and loss of life due to slide hazards.

Recognition of hazardous conditions and identification of historically prone landslide areas are especially important for future land use development planning. Often man-made structures, both public and private, are constructed on top of or below bluffs and slopes which are subject to land sliding. Additional development is occurring on alluvial plains and at the mouths of narrow restricted canyons. Other areas subject to landslides are the mountain pass highway routes and areas located below watersheds which have been devegetated in wildfires or heavily logged.

VOLCANO

GENERAL BACKGROUND

The Cascade Mountain range contains hundreds of extinct volcanoes. Although the majority of them located in Washington State are inactive, there are five classified as active and one as dormant. Volcanoes are considered active if they have erupted within recent historical time, or are showing present signs of activity. Accordingly, Mt. Baker, Mt. St. Helens, Mt. Rainier and Glacier peak are all considered active. Dormant volcanoes are those that have not shown signs of erupting within the last 10,000 years. Mt. Adams is considered dormant, but it is capable of renewed activity. Both the active and dormant volcanoes of Washington are of the composite category. This means that eruptions are usually accompanied by an explosive issue of steam, cinder, ash or lava flows.

EFFECTS

The degree of hazard depends on the kind of eruption and proximity to the eruptive vent. Most of the dangers are to people in the near vicinity of the volcano. As demonstrated by the 1980 eruption of Mt. St. Helens, the primary effects in Okanogan County are more likely to result from ash fallout. Depending upon the severity of the eruption and the areas of the downwind plume, these effects may include immobilization of transportation, telephone communication short circuits, power failures, respiratory or other health problems. Secondary problems include economic cost for cleanup, ash disposal problems and structural failures due to the density of ash, where one inch of ash weighs ten pounds to the square foot.

HISTORY AND VULNERABILITY

All of the active and dormant volcanoes in the State indicate the presence of heat and on occasion emit steam and hydrogen sulfide gas. Mt. St. Helens is the most active of the volcanoes in the State. Studies indicate that it may have been active every few hundred years for centuries with the most recent series of eruptions occurring in the early 1980's to present.

Past studies of Mt. Rainier and Mt. Baker outlined in the Washington State Hazard Analysis indicate their latest eruption activity may have occurred in the early and mid 1800's. Glacier Peak, located closest to Okanogan County, may have erupted as recently as the 17th century. Many geologists feel there is still a definite chance these volcanoes will erupt again.

HAZARD AREAS

Presently there are no active or dormant volcanoes in Okanogan County. However, Glacier Peak is located west of the County, west of Chelan County, at the east end of Snohomish County. This volcano was formerly thought to be inactive, but recent studies have shown steam issues from its flanks. This mountain is also the site of three hot springs which indicates there is heat somewhere within it. Scientists have only recently indicated that this volcano has potential for eruption.

CONCLUSION

Because of the distance from the State's active volcanoes to Okanogan County, the largest potential threat is volcanic ash. Thus, the effects of volcanic activity upon Okanogan County depends on the locations of the volcano and the prevailing wind direction. Under certain

conditions, heavy ash fallout in Okanogan County would have the same effects as the 1980 Mt. St. Helens ashfall in adjacent Eastern Washington counties.

Since volcanoes usually provide some warning prior to an eruption, there is normally time to prepare, warn and inform the public. In the interim, local departments should develop good disaster response plans and procedures to cope with the various problems presented by an eruption.

SEVERE STORMS AND WINTERS

GENERAL BACKGROUND

Washington State is subject to a number of severe storm conditions such as thunder & lightning, wind, snow, ice and hail. Since severe weather disturbances often represent the extremes in wind, cold, precipitation or other weather phenomena, direct damage to the natural and built environment have occurred statewide.

Depending upon the time of year, additional hazards resulting from a severe storm can include wildfires, flashfloods, avalanches or landslides. Severe thunder, hail, wind and winter storms are common in all parts of Okanogan County. Severe local storms occur when the interior of British Columbia is under the influence of high barometric pressure, and a deep low pressure center from over the Pacific approaches the Washington coast. At this latitude, severe storms normally approach Okanogan County from the south or southeast. Although the intensity of major storms has often been reduced by the Cascades, the storms are still severe by the time they reach Okanogan County.

Basically, there are four types of severe storms that occur in Okanogan County. These are snowstorms, ice storms, thunderstorms and windstorms. Snowstorms can range in intensity from heavy snows of 6 inches or more in a 24 hour period to full scale blizzards characterized by low temperatures and strong winds of 35 MPH or more, bearing large amounts of snow. Freezing rain or drizzle is called an ice storm. Moisture fills in liquid form but freezes on impact. Severe thunderstorms are defined as those with sustained winds or gusts of 50 knots or greater (58 MPH) and/or hail of 3/4 or more in diameter. Past major windstorm velocities in the area have ranged from 45 to 69 MPH with gusts to 116 MPH (US Dept. of Commerce, National Weather Service, 1995).

In addition to the Pacific storms, Okanogan County experiences severe winters due to extreme cold coming down from the Frazier River Valley. When the jetstream conditions are right, the cold air comes south and east from Canada, with the resulting cold many degrees below zero, and staying there for continuously for weeks.

EFFECTS

The primary effect of a severe local storm is immobility due to the disruption of transportation and utility systems. Primary effects normally vary with the intensity of the storm. In some cases transportation accidents can occur from accumulation of snow, ice, hail or dust from accompanying winds. Other primary effects may include loss of life and injury from accompanying flashfloods, fires or avalanches. Secondary effects can include severe wind erosion of dry soils, overtaxing of electric utilities during severe weather conditions, crop damages or loss from hail, agricultural damages created from inflated prices and finally temporary shortages of necessities in the storm impacted area.

HISTORY AND VULNERABILITY

Historically, Okanogan County has been subject to many types of storms, varying in intensity from mild to severe. Common types of storms in this area include rain, thunder, snow, ice, hail, wind, and blizzards, etc. Recently, the County Commissioners proclaimed Okanogan County to be a disaster area when golf ball sized hail, with severe wind and rain storms buffeted the county in 1995. Severe storms occur every winter in Okanogan County.

The selected history of severe storms and winters in Okanogan goes back over 150 years:

| | |
|---------------|-----------|
| Severe Winter | 1846-1847 |
| Severe Winter | 1861-1862 |
| Severe Winter | 1879-1880 |
| Severe Winter | 1888-1889 |
| Severe Winter | 1889-1890 |
| Severe Winter | 1890-1891 |
| Severe Winter | 1892-1893 |
| Severe Winter | 1893-1894 |
| Severe Winter | 1904-1905 |
| Severe Winter | 1906-1907 |
| Severe Winter | 1908-1909 |
| Severe Winter | 1915-1916 |
| Severe Winter | 1916-1917 |
| Severe Winter | 1940-1941 |
| Severe Winter | 1968-69 |
| Storm Damage | 1995 |
| Storm Damage | 1996 |
| Thunderstorm | 1901 |
| Tornado | 1997 |

HAZARD AREAS

All areas of Okanogan County are vulnerable to the threat of severe storms. Due to topography and climatological conditions, the higher mountainous areas are often the most exposed to the effects of these storms. Normally the mountainous terrain and the north/south orientation of the Cascades tend to isolate severe storms into localized areas of the County. For example, higher elevations will receive snowfall, while the valley areas will not. Periodically though, individual storms can generate the force to impact the entire County at one time. Recently, long term cold, followed by rain and cooling, resulted in glare ice conditions on Highway 97, the main north/south corridor, for many consecutive miles between Omak and Brewster. This led to multiple traffic accidents, and even the temporary closing of the highway. Although this degree of icing is rare, this is typical of the occasional "freak" storm that comes upon the county. From high winds to ice storms, there are all types of winter storms or variations thereof that take place during the course of any given year. Finally, conditions change rapidly, as in the above road icing example. It is not uncommon to have a snowstorm at night, with sunshine the next day, demonstrating the speed of changing conditions in Okanogan County.

CONCLUSION

The potential for a severe storm always exists. Although most storms in Okanogan County create minor problems and utility outages, emergency plans should reflect weather warning and other procedures to notify the public. Public agencies and departments should develop emergency response plans and coordination procedures. Public education and preparedness programs can be developed to help mitigate hazards prior to major storms.

DAM FAILURE

GENERAL BACKGROUND

A dam is a barrier of earth, rock or other material that obstructs the flow of water. In the past, dam failures have been caused by flooding, misoperation, poor construction, lack of maintenance or repair, vandalism, terrorism, earthquakes, etc. Because of an increasing rate of dam failures nationwide, Congress passed the National Dam Inspection Act of 1978 (PL 92-367) which resulted in the inventorying of all dams in the U.S. and the inspection of 8,639 non-federal dams nationally.

EFFECTS

The failure of a dam can have many impacts. Loss of life and property, damage to stream channels, crop damage and utility outages are significant primary effects created by the resulting flashflooding. Secondary effects include lower tax bases, lack of irrigation or power profits and other long term economic, recreational and wildlife habitat losses.

HISTORY AND VULNERABILITY

There are approximately 46 dams located in Okanogan County, most of which are over 50 years old. Most dams in Okanogan County are for irrigation use and are earthen constructed dams. Some were constructed in the early 1900's, and are almost a century old.

Many of these dams do not have spillways or mechanisms to control flow. In the event of a severe storm, debris could accumulate creating a potential hazard. The Dam Safety Division of the Washington State Department of Ecology reports that dam failures, historically, have been equally divided into three categories:

1. overtopping with erosion resulting in failure
2. slope instability within the dam structure
3. water intrusion via percolation and subsequent failure

There have been three recorded dam breaks in the history of Okanogan County. The 1938 dam break wiped out the town of Malott. Twenty-five homes were destroyed, seventy-five people left homeless, and one-half mile of state highway was destroyed. Only due to several men racing to town in their pickup truck was loss of life avoided. The Sid White earthen dam failed due to seepage through animal burrows. This in turn caused a second dam to fail, dumping debris in the town of Riverside. In the case of the dam above Lake Osoyoos, the east side earthen dam failed because of human error, and the diversion was not shut off in time.

| | | |
|-----------|------|--|
| Dam Break | 1938 | Wagner Mill dam broke - wiped out Malott |
| Dam Break | 1971 | Dam Break - Sid White dam near Omak |
| Dam Break | ??? | Dam above Lake Osoyoos failed |

HAZARD AREAS

The following chart shows the dams and flood plains downstream from the dams:

| Dam | Nearest Downstream Community | Construction Date/Owner | Stream | HAZ_CD |
|---|-------------------------------------|--------------------------------|---------------|---------------|
| DAM_NM | STRM_NM | BUILT_DT | SURF_NR | HAZ_CD |
| Sinlahekin Dam No. 3 | Sinlahekin Creek | 1950 | 211 | H |
| Sinlahekin Dam No. 2 | Sinlahekin Creek | 1949 | 10 | S |
| Sinlahekin Dam No. 1 | Sinlahekin Creek | 1949 | 83 | H |
| Fanchers Dam | Antoine Creek | 1926 | 28 | H |
| Bonaparte Lake Dam | Bonaparte Creek | 1957 | 170 | L |
| Schallow Lake Dam | Coulee Creek | 1954 | 10 | L |
| Moccasin Lake Dam | Tr-Thompson Creek-Offstream | 1969 | 27 | S |
| Patterson Lake Dam | Rader Creek | 1924 | 150 | S |
| Little Green Lake Dam | Tr-Salmon Creek | 1959 | 50 | S |
| Enloe Dam | Similkameen River | 1905 | 2400 | H |
| Leader Lake Dam | Tr-Tallant Creek | 1910 | 185 | H |
| Conconully Dam | Salmon Creek | 1910 | 550 | H |
| Spectacle Lake Dike | Okanogan River-Offstream | 1969 | 399 | H |
| Owhi Lake Dam | Little Nespelem Creek | 1916 | 500 | L |
| Salmon Lake Dam | Salmon Creek-Offstream | 1921 | 330 | H |
| Rabel Dam | Tr-Benson Creek | 1940 | 11 | S |
| Hawkins Dam | Tr-Benson Creek | 1940 | 4 | S |
| Beaver Lake Dam | Beaver Creek | 1910 | 31 | L |
| Fish Lake Dam | Coulee Creek | 1920 | 100 | L |
| Sasse Reservoir Dam | Tr-Okanogan River | 1910 | 3 | L |
| Blue Lake Dam | Tr-Sinlahekin Creek | 1923 | 160 | L |
| Whitestone Lake Dam | Tr-Okanogan River | 1930 | 192 | S |
| Libby Lake Dam | North Fork Libby Creek | 1911 | 10 | S |
| Chalfa Dam | Tr-Benson Creek | 1940 | 9 | S |
| Beth Lake Dam | North Fork Beaver Creek | 1969 | 22 | S |
| Davis Lake Dam | Tr-Bear Creek | 1974 | 61 | L |
| Leader Lake Saddle Dam | Tr-Tallant Creek | 1910 | 185 | H |
| Horse Spring Coulee Dam | Horse Springs Coulee | 1924 | 0 | L |
| Sullivan Pond Dam | Tr-Chewack River | 1948 | 30 | L |
| Wolf Creek Diversion Detention Dam | Wolf Creek Diversion Channel | 1960 | 8 | S |
| Alder Gold-Copper Co Tailings Dam No. 1 | Tr-Methow River | 1945 | 50 | L |
| Alder Gold-Copper Co Tailings Dam No. 2 | Tr-Methow River | 1945 | 22 | L |
| Campbell Lake Dam | Tr-Beaver Creek | 1948 | 11 | L |
| Brown Lake Dam | Tr-Johnson Creek | 1984 | 62 | L |
| Osoyoos Lake Control Dam | Okanogan River | 1986 | 5800 | H |
| Pearrygin Lake Dam | Lake Creek | 1921 | 210 | S |
| Wright Ponds-West Pond Dam | Tr-Pearrygin Creek | 1925 | 18 | L |
| Peters Reservoir No. 2 | Tr-Methow River | 1959 | 3 | L |
| Stout Reservoir Dam | Tr-Chiliwist Creek | 1958 | 5 | S |
| Crazy Rapids Reservoir Dam | Okanogan River-Offstream | 1980 | 6 | L |
| Indian Dan Canyon Dam | Indian Dan Canyon Creek | 1951 | 32 | L |
| Chewack Canal Diversion Dam | Chewack River | 1945 | 2 | L |
| Wolley Dam | Tr-Columbia River | 1983 | 8 | L |
| Conconully Sewage Lagoon No. 1 | Salmon Creek-Offstream | 1978 | 8 | L |
| Conconully Sewage Lagoon No. 3 | Salmon Creek Offstream | 1978 | 2 | L |
| Conconully Sewage Lagoon No. 2 | Salmon Creek-Offstream | 1978 | 4 | L |

CONCLUSION

There are many older dams located on streams in Okanogan County. Most of the older earth dams which are fifty years old and older, can be considered potentially hazardous during certain climatological situations or during/after an earthquake. Presently, the State Department of Ecology, Dam Safety Division is responsible for inspecting private and other non-federal dams for safety conditions.

Currently the Federal Energy Regulatory Commission requires non-federal hydroelectric dam owners to develop emergency response procedures as a licensing requirement.

HAZARDOUS MATERIALS

GENERAL BACKGROUND

Today there are several thousand substances in daily use that can cause local emergencies, or adversely affect a substantial number of people. An increasing number of chemicals, petroleum products, radioactive materials, biological toxins and other hazardous substances are spilled as the result of highway, rail and waterway accidents, and other unscheduled events. On occasion these events can reach major disaster proportions. The manufacture, use, transportation, storage, and disposal of hazardous materials and dangerous wastes poses a risk to the public health, safety, and the environment. Presently dangerous substances are found throughout the state and county in all modes of transportation shipments, as well as in manufacturing and storage facilities.

EFFECTS

Any incident in which hazardous materials are involved can rapidly escalate from a minor incident to a full scale disaster. The hazardous properties of chemicals, motor fuels, radioactive substances and other dangerous materials range from explosive and/or highly flammable to poisonous, with the capability of contaminating the air, water, and ground. The potential loss of life, extensive property damage and other environmental contamination is always high when hazardous materials are present. The effects of a hazardous materials incident can vary depending on the material involved, quantities, location, time of day, weather conditions, and the proximity to populated areas.

Effects from a release of a hazardous substance may cause immediate health concerns, death, chronic health problems, and may interfere with the development of a human fetus.

HISTORY AND VULNERABILITY

Because of major transportation routes and the large agricultural based economy, incidents involving hazardous materials can occur at anytime or place in Okanogan County. Statistically, the majority of statewide incidents involving hazardous substances have been transportation related spills of petroleum products. This is also true for Okanogan County. Gasoline and other petroleum products must be shipped in from outside the county. Hence, every day in Okanogan, there are tankers hauling gasoline to the stations in Okanogan County. When this is combined with the road conditions often found in the county during the winter months (see above), the chances of an accident and associated spill are high.

In addition, there are many large tanks containing Anhydrous Ammonia, for use in the fruit packing industry, which have themselves become the target of persons wanting this chemical for drug preparation.

HAZARD AREAS

All areas of Okanogan County are vulnerable to the effects of a hazardous materials incident. There is greater vulnerability in areas adjacent to:

Cold storage warehouses. In these areas you will find Anhydrous Ammonia, Sometimes Chlorine and Methyl Bromide used at these facilities.

Ag-Chemical warehouses. In these are stored many toxic materials. Most are in Wettable Powder form, however there are still liquids and compressed gases kept at these sites.

Water treatment facilities. Most of the potable water and waste water treatment sites use Chlorine in their treatment. In addition to these sites, places like public swimming pools also treat their water.

Major transportation routes. Okanogan County has two major highways, SR 20 and SR 97. While SR20 (the North Cascades Highway) is only open to the west side in the summer months, there is significant truck and recreational traffic during that time. The main highway, SR97, is a major connection to Canada, as a means of commerce between the two countries. Trucks either turn at Tonasket, and head east towards Spokane (which is open year round), or head south to Wenatchee, and then anywhere in the U.S. Hence, all manner of goods move up and down Highway 97, which runs the entire length of the county. There are no major railroad lines through the county, although there is one private line that runs daily up along the Okanogan River to Oroville to pick up wood products. The main hazard here is the trucks hauling petroleum products and other hazardous materials along these main highways.

Another area of hazard is the lack of resources and advanced trained personnel. Most area fire fighters (volunteers) have not been trained to the First Responder – Awareness level. This means they cannot respond in a to a chemical release. In the event of a large scale hazardous materials incident, outside resources will have to be called in through the Department of Ecology. This response takes time, so if there is no responsible party to mitigate the release, local responders will have to allow the release to continue until properly trained personnel can arrive.

CONCLUSION

As the population increases, so does the demand for products that require hazardous chemicals. This increase in the amount being shipped lends itself to a potential hazard. Although safety is constantly stressed in the transportation industry, equipment malfunctions and human error can occur, making the potential for a hazardous materials incident quite high. Any local incident has the potential of becoming a large scale disaster. Today the quantity of materials being transported, plus the complex nature of these hazardous materials, presents a problem so large that no single agency or industry is capable of handling all of the possible problems that may arise.

ENERGY EMERGENCIES

GENERAL BACKGROUND

During the 1970's a number of events collectively called the "energy crisis" resulted in the focusing of public attention on future energy supplies. These events included the OPEC oil embargo, rapid increase in fossil fuel prices, inflation in costs for siting and construction of thermal generation facilities, a period of low water years in the Pacific Northwest, and a growing public concern with the safety and cost of nuclear power plants. Public concern was expressed in a variety of forms due to the many types of energy resources such as petroleum, natural gas, electricity, solar, etc., and the causes for their shortages.

By the mid 1980's the Pacific Northwest was again facing an "energy crisis", although of a different nature. This crisis was primarily the result of the over reaction to the events of the 1970's. Recent events have seen the collapse of the region's joint hydrothermal program, (BPA and public and private utilities) which brought about the largest default of public bonds in the nation's history.

Okanogan PUD obtains 1/3 of its power from Wells Dam, located at the south end of the county, although the dam is not owned by Okanogan PUD. The other 2/3 of the power for the county is purchased from BPA.

EFFECTS

In a majority of cases, long term energy emergencies in Okanogan County are due to world and regional politics. At the same time temporary or short term consequences are often due to disruption of services by storms and other weather conditions. The primary effects of energy emergencies include inconvenience to customers, reduced home heating capability, reduced agricultural capability, commercial and industrial cutbacks and increased unemployment. Secondary effects include an impact on alternate energy resources, supplies, and costs. For example, large numbers of individuals converting to wood fuel as a heating source, increase air pollution levels and inflate the cost of firewood. Additionally, this diminishes firewood supplies on public lands.

HISTORY AND VULNERABILITY

Petroleum shortages can occur at any time, depending on events in the politically volatile Middle East. Although imports have decreased substantially, the United States remains dependent upon imports for approximately 35% of its petroleum needs. Hydroelectric dams produce roughly 80% of the electricity in the Pacific Northwest. Low water years in the 1970's and the resulting overbuilding of regional thermal (coal fired and nuclear plants) power facilities at a time coinciding with low power demands, resulted in a default of the bonds financing Washington nuclear plants 4 & 5. Questions concerning the region's electric utilities liability for repayment are currently being resolved. Perhaps this may result in significant electricity rate increases in the region for an extended period of time. In 2001 BPA raised the rates for wholesale electricity to Okanogan PUD by 50%, in response to the national energy situation.

With the exception of World War II's rationing, specific energy shortages in Okanogan County were uncommon until the 1970's. Then petroleum shortages occurred as a result of the 1973-74 OPEC oil embargo and the Iran cut-off of 1979. Electrical shortages also occurred in 1973-74 and 1977-78, and again in 2001, due to drought conditions and insufficient water to operate hydroelectric dams at a needed capacity. At the same time, the

Okanogan County Public Utility District #1 was forced to purchase emergency power from the BPA grid to meet local demands. PUD acquired six temporary gensets to augment existing power supplies to the county in 2001. In addition, PUD purchased sixteen 1.6 megawatt diesel generators, with a total production capability of 25.6 megawatts, or approximately 1/3 of the county's daily average electrical need of 75-90 megawatts.

HAZARD AREAS

Short term power outages can occur in Okanogan County at any time. Normally this is the result of a storm, auto accident or human error. This type of temporary energy loss generally affects service in isolated portions of the County and is of relatively short duration. Long term shortages of imported petroleum products, however will impact the entire County and affect the United States at large. Judging from past events, future petroleum shortages would likely be caused from political incidents in the Middle East resulting in trade embargoes of long duration. If outside (BPA) power was to be arbitrarily cut off from the county, there would only be enough power from internally generated sources, including the 16 genset PUD site, and the Colville tribe co-gen plant, to produce about 35 megawatts of power, which would only supply critical infrastructure and core county electrical needs. Outlying areas, such as Twisp (co-op), and Oroville, would probably be cut off from the supply. If Wells dam could be relied upon as a power source also, then the county might be able to cover all it's needs.

CONCLUSION

Future energy emergencies are likely to occur due to numerous factors. Locally, energy emergencies can occur as a result of a drought affecting generating capacity at hydroelectric facilities, tremendous increases in local power rates, or as the result of a worldwide energy embargo. Because of this, most facilities or entities that require non-interruptible power must plan an alternate power supply system that could take over in emergencies. Additional local government provision should be made for the effective conservation of available energy resources in the area. In a large scale energy emergency, local government would also be involved with public education programs on energy conservation and establishing priorities for restoration of energy resources at vital facilities.

URBAN FIRE

GENERAL BACKGROUND

While the probability of a major urban conflagration is low, major urban fires are possible in many of the older buildings within the urban areas and in outlying areas next to the grass and forested lands. Fire hazards in the older buildings are high due to the construction materials which were used at the time (sawdust insulation, etc.), the original electrical wiring, and minimum spaces between buildings. Fire hazards to the homes built in or near to grass/forested lands are somewhat high due to their location, and a lack of defensible space, especially when occupants have not cleared around the house.

EFFECTS

The most significant effect of a structure fire is the potential for the loss of life and injuries, as fire can occur without warning. Secondary effects include damage to personal property, loss of housing, and short or long term economic and employment losses.

HISTORY AND VULNERABILITY

Major urban fires can occur throughout the year in every Okanogan County community. Most urban fires, however, have been limited to single structures. Most of the small communities in Okanogan County cannot afford to maintain a paid fire department, so they rely on volunteer firefighters, and mutual aid for handling major incidents. In the case of wildland fires, if the fire gets in the vicinity of residences, local volunteer firefighters are called in to protect the structures. In the summer of 2003, a fire started under suspicious circumstances in the city of Okanogan quickly spread up the hill above the Virginia Grainger Administration Building, and destroyed five homes before it could be contained. Firefighters from all over the county were called in to help suppress and stop the fire before it became and even bigger disaster. Damage was estimated to be several million dollars. Although there are a number of fire districts in the county, there is still much acreage, including land with residences, that is only protected by DNR, as required by state law. At the height of the fire season, there are simply not enough resources to protect those residences with a quick response time, and residences are left to fend for themselves for long periods until fire personnel arrive. Every year the County Commissioners put a burn ban in place during the time of greatest fire risk, and every year persons are found to be burning, such as in burn barrels, in spite of the countywide ban. The RockyHull fire in 2000, which burned over 9000 acres, was started by an illegal burn barrel that got out of control.

Okanogan County has not seen many major urban fires, but there have been some. In 1892, the city of Conconully was destroyed by fire. In 1904, Brewster was also destroyed. Throughout the years, every city has had it's share of fire, which has destroyed local businesses. Sprinkler systems, not required until very recently, are virtually non-existent. Modern building codes, with fire wall separation requirements, are not in effect except for those residences constructed in the last few years, due to the age of the building infrastructure in the county. Hence, a real vulnerability exists.

HAZARD AREAS

Every incorporated and unincorporated community in Okanogan County has a potential for a major urban fire. Areas where older structures were built extremely close together and primarily constructed of wood have the greatest risk for a major structural fire. These structures, residential, commercial and industrial, exist in every community and populated area of the County.

CONCLUSIONS

Although the probability of a large scale urban fire is slight, it is still a possibility. Mitigation or minimizing of losses by local fire agencies can occur in two areas of activity, fire prevention and preplanning of fire responses. An important aspect of planning for major fire response is the development of mutual aid agreements with nearby local, state, and federal fire agencies, as appropriate. This strategy expedites response time and helps contain or control fires before they spread to major size. Fire prevention and public education on fire hazards have proved to be effective in reducing the number of fires within a community. Also the continued enforcement of fire and building codes are successful in reducing future fire hazards in newer buildings and those presently under construction.

CIVIL DISTURBANCE

GENERAL BACKGROUND

A civil disorder can be defined as a public disturbance involving acts of violence by a group of people. Such disturbances create the threat of danger or results in the damage or injury to people and property. A civil disturbance can cover a wide range of violence and disruptive behavior, from full scale rioting or picket line violence to public demonstrations and unruliness at public parks and festivals.

EFFECTS

Violence can flare up with little or no provocation or without apparent cause. Widespread violence and vandalism can spread rapidly and result in death and injuries, destructive fires, or the disruption of services. Secondary effects can include loss or damage to private and public property, a lowered tax base and other long term economic losses.

HISTORY AND VULNERABILITY

Past civil disturbances in Okanogan County have been relatively minor in scope and have resulted in less than significant damages. However, there have been occurrences of civil disturbance, notably at the Stampede, a yearly rodeo event held at the Stampede grounds in Omak each August. One year, there were several hundred people, of the thousands that typically attend the event, that became unruly after many hours of partying, and the resultant law enforcement intervention required the calling of local fire departments, to use hose/water as means of disbursement. In addition, the local lumber mill, located on the Colville Tribe side of the Okanogan River, closed down several years ago, resulting in many jobs being lost, including the associated retirement benefits. In the course of that closure, there were significant protests by the employees and members of the community, which led to a very volatile situation, requiring heightened law enforcement presence.

HAZARD AREAS

The hazards of civil disturbances cannot be limited to geographical boundaries. However, the potential for damages seems greater in the populated areas of the County.

CONCLUSION

A civil disturbance can occur due to a variety of reasons. They often start as a public gathering and can erupt into protest demonstrations or riots with little warning. There are various events occurring throughout Okanogan County annually. Although peaceful in nature, there remains the potential for violence and/or general unruliness. The occurrence of a violent demonstration seems remote, however the concern needs to be addressed. Preparation for rodeos and high use weekends must include local level planing of traffic control, additional security, fire precautions and increased law enforcement activities.

TERRORISM

GENERAL BACKGROUND

The US Department of Justice defines terrorism as a "A violent act or an act dangerous to human life, in violation of the criminal laws of the United States or any segment to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives". 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 thereof in furtherance of political or social objectives".

EFFECTS

The scope of damage that can be created by terrorists is only limited by the groups goals and their imagination. Primary effects of terrorism may include: kidnapping, death, illness, arson, bombings, releasing of toxins, vectors and biological agents and disruption of services.

HISTORY AND VULNERABILITY

Although there have been few acts of terrorism committed by terrorist groups in Okanogan County, the potential for this type of incident is present. Okanogan County is vulnerable to many terrorist acts from global or local groups or even individuals. These acts may include bombings, arson, radio nuclide or toxin dispersal, or dispersal of biological agents (CBRNE). Various events within the county can assemble many people for a weekend, such as rodeos, music festivals, fairs, or holiday celebrations. These assemblies could be potential terrorist targets. Okanogan County, via Highway 97, is a main entry point from Canada, which includes not only those transporting drugs, but potential terrorists as well.

HAZARD AREAS

Depending upon the individual or group cause, almost any facility, organization or activity in Okanogan County could be a potential target for terrorist activity. Likely targets in Okanogan County would be political figures, infrastructure, events, children, animals, local, state and federal facilities, hydroelectric facilities and the associated distribution infrastructure, major industry and warehouses, and communications facilities. Recently, a disgruntled citizen, upset over property taxes, gained access into the county courthouse, and was almost ready to light off multiple gasoline bombs, when he was discovered. This was prosecuted as an act of terrorism, albeit individual, against the county.

CONCLUSION

Little terrorist activity has occurred in Okanogan County, however, as we participate in a global society this issue must be addressed. Terrorist acts are difficult to prevent, however, mitigation may limit the effect of the terrorist activity. Mitigative precautions should involve: the training of response personnel and elected officials and the development of policies and procedures relating to the response to suspected terrorist acts.

FINDINGS AND RECOMMENDATIONS

FINDINGS

The information presented in this document indicates Okanogan County has been and will continue to be vulnerable to many natural and technological emergencies and/or disasters. Historically major disasters include the 1872 earthquake, the floods of 1894, 1948, 1972 and 1995; the 1980 eruption of Mt. St. Helens, the severe winter and drought years, the three dam breaks, and the recent years of devastating forest fires. These provide excellent examples of the type of disaster emergencies that Okanogan County faces.

Today, with higher population densities and increasing use of Okanogan County as a year around recreational area, the potential for loss of life or damage to property and the natural environment in a disaster situation is becoming greater than ever before. This poses many problems for those involved in disaster response and recovery operations because limitations are imposed by several conditions. For example, as most emergency operations cannot be performed without sufficient preparation time, the geographical remoteness of the County can limit response time and/or capabilities. Also because of the infrequency of major emergencies, there is a general lack of familiarity with disaster procedures. Finally, there are limited resources at the local level for dealing with major incidents. For example, the local Search and Rescue volunteers would be a primary resource for urban and wilderness emergencies, including notification, crowd control, and rescue operations. There is simply not the resources that are commonly available in more populated counties.

In a disaster, these problems can be compounded by federal, state and local jurisdictional questions. In the case of the Methow River redirecting its course recently, and putting a house built (legally) on the river's edge, county officials could only watch as the house was destroyed, putting a bridge at risk, due to conflicting directions from various federal agencies. This was in spite of having a C.E.M.P. in place.

To prepare for and to help mitigate the effects of a disaster it is recommended that:

1. County and City comprehensive plans and zoning ordinances further identify or regulate development in known hazard areas throughout the County.
2. Development of planning, response and recovery procedures be accomplished, especially pertaining to:
 - a. Direction and Control / Incident Command System (ICS)
 - b. Resource Management
 - c. Warning
 - d. Emergency Public Information
 - e. Communications
 - f. Training and Education
3. Development of local, state and federal inter-agency relationships and define chain of command and jurisdictional issues.
4. The Emergency Management Council review goals and define Emergency Management Department's direction and priorities.
5. Support from elected officials and direction from those officials to have departments participate in the disaster planning for the County.

6. Public Education programs regarding home preparedness and learning to be self sufficient for at least three days must be stressed.

CONCLUSION

In conclusion, this analysis provides a general overview of natural and technological caused problems which may affect Okanogan County in the future. At the present, this information reflects the need for further preparedness. Continued comprehensive review and revision of the Okanogan County Comprehensive Emergency Management Plan is necessary to incorporate and address these conditions. It is emphasized that to be effective, agencies and departments who would normally respond in a disaster situation must participate in the emergency planning, updating and revision process. This will promote a better understanding of the plan and provide more realistic objectives reflecting local capabilities including individual departmental responsibilities in a disaster. Finally, community involvement in preparing the Natural Hazards Mitigation Plan will help to identify significant natural hazards, the degree of vulnerability, and the resources needed and available to deal with those hazards when they become disasters.