LAKE VALLEY FIRE PROTECTION DISTRICT

Local Hazard Mitigation Plan

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"Hazard mitigation is the development and implementation of actions intended to diminish or eliminate losses sustained as a result of a natural, human caused or technological hazard."

SECTION I INTRODUCTION

The Lake Valley Fire Protection District (LVFPD or District) is a special district that was formed in 1947 to provide fire protection along the California's south shore of Lake Tahoe (See Attachment A). LVPFD is a combination paid and volunteer fire protection district with 24 full-time, 3 apprentice firefighter medics, 20 person fire crew and 20 volunteer personnel. A five-member board of directors governs the LVFPD. The Board meets once a month to handle district business and pay district bills. Day to day operations is led by the Fire Chief and three Battalion Chiefs.

The area of the LVFPD is approximately 83 square miles located 200 miles northwest of San Francisco, CA and 58 miles southwest of Reno, Nevada in the Sierra Nevada Mountain Range. LVFPD provides fire, rescue, and emergency medical services to the community of Meyers, permanent population 12,000, and automatic and mutual aid to neighboring communities. Seasonal tourist fluctuations may swell the population of Meyers to over 50,000. Below is LVPFD's Mission Statement.

> "It is the mission of the Lake Valley Fire Protection District to protect our community, its people, and environment, by providing the highest level of fire suppression, emergency medical, disaster, hazardous materials, and fire prevention services to all residents and visitors within our District."

The LVFPD is **responsible** for the protection of life, property and the environment from fire and hazardous materials. The LVFPD is **responsible** for providing emergency medical assistance and advanced life support to all those who live and visit our District. The LVFPD protects life, property and the environment by enforcing state and local fire ordinances designed to safeguard the community. Although not directly responsible for, the LVFPD does render aid to victims of manmade and natural hazards such as structural collapses, avalanches, and flooding. Direct responsibilities for many hazards that may be found within our District are the responsibility of El Dorado County and their many departments, South Tahoe Public Utility District, Sierra Pacific Power Company, and Avista Utilities.

What are the land use zones?

Figure 1 on the next page describes the land use within the LVFPD. The highest percentage of land within the LVFPD is classified as general forest and park land. No high density residential exists within the District. The low density residential within the District is at 85 percent built out. Under current regulations, no new subdivisions are allowed to be constructed. The town center is less than a few square miles.

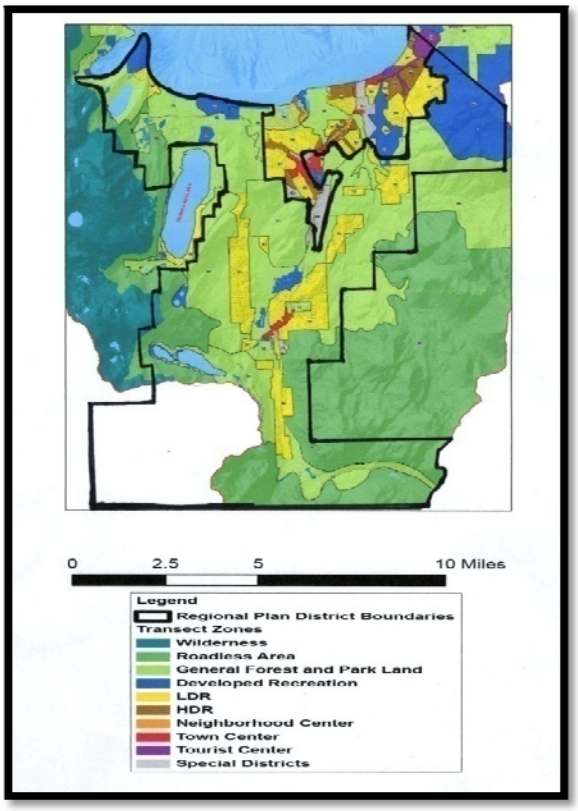

Figure 1 Zoning Map for the Lake Valley Fire Protection District

What is hazard mitigation?

Hazard mitigation is the development and implementation of actions intended to diminish or eliminate losses sustained as a result of a natural, human caused or technological hazard.

Why develop a natural hazards mitigation strategy?

The importance of having a strategy for responding to emergency incidents was realized almost immediately by the original European settlers of the region. Mountains can be dangerous places in any season. In order for settlers to exist and thrive in the Lake Tahoe Basin, the ability to respond to and recover from natural disasters was a prerequisite. That prerequisite continues to be a necessity today.

Today though, there is much more to be lost in the event of a disaster. The amount of resources potentially threatened by a disaster grows annually as citizens make improvements to the land. Naturally, as a result of this growth, the costs associated with recovering from a natural disaster continue to climb.

The full cost of the damage resulting from natural hazards – personal suffering, loss of lives, disruption of the economy, and loss of tax base – is difficult to measure. Our District is subject to many types of natural hazards: floods, winter storms, landslides, avalanches, earthquakes, and wildfires, all of which can have significant economic and social impacts. Some, such as winter storms are seasonal and strike in predictable locations. Others, such as wildfires can occur anytime of the year and almost anywhere in the District.

What are the benefits of hazard mitigation?

There are many benefits to be realized in the creation and implementation of a natural hazards mitigation plan.

- **Save lives and protect property** – The District can save lives and reduce the amount of property damage by mitigating the effects of natural hazards. For example, the District can identify areas with high threat potentials to natural hazards, use zoning ordinances to guide the development of these properties, and subsequently facilitate a safer place for its citizens and their possessions.

- **Reduce impact of future disaster events** – By identifying hazards before they happen, the District can effectively plan for natural hazards and mitigate the damaging influences of hazards. Natural disasters are going to occur. This plan's goal is to reduce their effects. In essence, this plan is the modern day equivalent to the old saying that, "An ounce of prevention is worth a pound of cure." Applicable words for the original settlers of the area, words that are still applicable today.

- **Enable post-disaster funding** – In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. With the federal Disaster Mitigation Act of 2000, the importance of hazard mitigation is reinforced as a primary tool in local and state natural disaster response preparedness. As such, this Act requires that an approved mitigation plan be in place prior to receiving any post-disaster Hazard Mitigation Grant Program funds. LVFPD's Local Hazard Mitigation Plan (LHMP) will fulfill this requirement.

- **Hasten recovery from disasters** – In the development of a hazards mitigation strategy, the District will be better prepared to react, respond, and recover from a future natural disaster by knowing in advance particular mitigation measures appropriate in post-disaster response scenarios.

- **Demonstrate a dedication to improving our communities' safety and wellbeing** By having a natural hazards mitigation plan in place, the citizens of LVFPD can rest assured that the District is committed to safeguarding the people and their possessions from unforeseen future natural disasters.

Who does the natural hazards mitigation plan benefit?

The LVFPD LHMP was conceived, developed, written, and adopted as a community planning document. The primary recipients of the benefits of this plan are the citizens of the LVFPD itself. It is anticipated that various agencies located adjacent the County will also benefit from this plan, the knowledge it provides, and the future natural hazard mitigation funding the plan enables.

The information within this plan is generally applicable to the entire County and will be incorporated in El Dorado County's Multi-Hazard Mitigation Plan. This information provides a framework for hazard mitigation within District and is the primary natural hazard mitigation document for the County, plan participants, and plan stakeholders.

Does the District already have a plan?

The LHMP is a planning tool for use by the LVFPD in its efforts to reduce future losses from natural and/or man-made hazards. The LVFPD completed a similar planning tool called a Community Wildfire Protection Plan (CWPP) for the California Portion of the Lake Tahoe Basin

November 20 2004 (See Attachment B). Participants in the development of the CWPP are listed below:

- California Department of Forestry and Fire Protection
- California State Parks
- California Tahoe Conservancy
- C.G. Celio & Sons Co.
- El Dorado County Supervisors Office
- Fallen Leaf Fire Department
- Lahontan Regional Water Quality Control Board
- League to Save Lake Tahoe
- Meeks Bay Fire Protection District
- North Tahoe Fire Protection District
- Steve Holl Consulting
- Tahoe Basin Fire Safe Council
- Tahoe Regional Planning Agency (TRPA)
- United States Forest Service
- Wildland Rx

Planning workshops to develop the CWPP were conducted as follows and included input from the public.

- May 13, 2004; Initial Meeting
- September 28, 2004: Public meeting LVFPD Station 7
- November 3, 2004: Agency Workshop
- November 17, 2004: Public meeting
- November 24, 2004 to December 10, 2004: Public comment period.

On April 8, 2005 the CWPP for LVFPD was signed by the CALFIRE, Amador-El Dorado Unit, District 5 Supervisor El Dorado County, and the Chair of the LVFPD. The CWPP, although a great planning document for mitigating the threat of a wildland fire, does not address other hazards that exist within the District. In development of a LHMP, the LVFPD will move beyond our threat of wildfire and assess additional vulnerabilities and look to eliminate and mitigate potential hazards to personnel, property, and environment.

On October 30, 2000, the President signed into law the Disaster Mitigation Act of 2000 (DMA 2000). The purpose of DMA 2000 is to:

• Establish a national disaster mitigation program that will reduce loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from disasters, and
• Provide a source of pre-disaster hazard mitigation funding that will assist States and local governments in accomplishing that purpose.

DMA 2000 amends the Robert T. Stafford Disaster Relief and Assistance Act by, among other things, adding a new section, 322 – Mitigation Planning. This places new emphasis on local mitigation planning. It requires local governments to prepare and adopt a Local Hazard Mitigation Plan (LHMP) as a condition to receiving Hazard Mitigation Grant Program (HMGP) project grants/funding. Local governments must review and if necessary, update the mitigation plan annually to continue program eligibility. A LHMP must be approved by the Federal Emergency Management Agency (FEMA).

Is the District involved in El Dorado County's Multijurisdictional Hazard Mitigation Plan?

As a special district the LVFPD has the option of filing a standalone plan or an addendum to El Dorado County's (EDC) Multijurisdictional Hazard Mitigation Plan (MHMP). The LVFPD submitted a LHMP in March of 2009 to the California Emergency Management Agency (CALEMA) and to FEMA as an addendum to the EDC MHMP. Unfortunately, the LVFPD was not involved in the original planning process for the EDC MHMP. Without public input, a true mitigation plan could not be developed. LVFPD's LHMP was returned to LVFPD for improvement in May 2009.

LVFPD is participating in the county's five-year update of the EDC MHMP to be completed in October of this year. Because of an immediate need by the District to have a LHMP to receive hazard mitigation funding, staff has chosen to pursue the project as a standalone local document. The LVFPD LHMP committee created a process for public participation in the planning process in June 2009. The LVFPD participation in EDC's update will allow LVFPD's completed LHMP to be included as an addendum. The LVFPD used the hazardous mitigation plan development process recommended by FEMA in their State and Local Mitigation Planning how-to guide. Planning steps undertaken by the Lake Valley Fire Protection District include:

1. Organize Resources
2. Assess Risks
3. Develop a Mitigation Plan
4. Implement the Plan and Monitor Progress

COMMUNITY PARTICIPATION IN PLANNING PROCESS

LVFPD's LHMP was adopted by the Board of Directors on August 25, 2008. LVFPD's LHMP did not include sufficient public input and was rejected by FEMA in May of 2009. LVFPD's Fire Chief appointed members of a plan development team to address the concerns by FEMA and to redraft the LHMP. The members of the plan development team include LVFPD's Fire Safety Officer, LVFPD's Fire and Fuels Division Supervisor, and a representative from the Fire Safe Council. LVFPD's plan development team met on May 29, 2009 (See Attachment C) and created a process for community participation. The LVFPD Board of Directors adopted a new resolution on September 10, 2009 (See Attachment D).

LVFPD's Planning Team Developments

LVFPD's planning team met again on June 4, 2009 and developed an outreach letter for homeowners in our District (See Attachment E). The outreach letter along with a survey (see Attachment F) was posted on our website www.lakevalleyfire.net (see Attachment G) and placed at our front desk. The outreach letter and survey were distributed to the public during a presentation on our LHMP at our regularly scheduled Board of Directors' meeting on June 12, 2009 (see Attachment H).

LVFPD's planning team met on June 11, 2009 and June 12, 2009 to develop flyers for a state and local government and large business owners meeting (see Attachment I). The flyer was distributed to the following:

- South Tahoe Public Utility District
- El Dorado County Public Health
- El Dorado County Sheriff's Department
- El Dorado County Engineering Department
- El Dorado County Transportation Department
- Tahoe Paradise Park District
- California Highway Patrol Local Office
- Lahontan Water Quality Control Board
- Tahoe Regional Planning Agency
- Heavenly Lake Tahoe
- Nevada Energy
- Fallen Leaf Lake Fire Department
- City of South Lake Tahoe Fire Department
- United State Forest Service
- CAL FIRE
- Barton Memorial Hospital
- Lake Tahoe Unified School District
- Tahoe Resource Conservation District
- Sierra Club
- League to Save Lake Tahoe
- Nevada Fire Safe Council

A public service announcement was posted in the local paper and on the newspaper's website (see Attachment J) and flyer (see Attachment K) was distributed for a public meeting to assess risk within the District and a meeting to comment on the draft plan. Public meeting flyers were distributed by email and posted at the following locations:

- Lira's Market
- El Papagyo
- Post Office
- Downtown Café
- Getaway

Planning Team Meetings

On June 30, 2009 a meeting for state and local agencies and large business owners was held at LVFPD's Headquarter Station (see Attachment L). The following organizations were represented (see Attachment M):

- El Dorado County Sheriff's Department Office of Emergency Services
- Nevada Fire Safe Council
- Lake Valley Fire Protection District
- California Highway Patrol
- Fallen Leaf Lake Fire Department
- South Tahoe Refuse
- Heavenly Lake Tahoe

During the June 30, 2009 meeting, LVFPD's planning team successfully accessed the risk to the District and developed the District's LHMP (see Attachment N). A facilitator focused the group on listing the hazards within the District. All possible hazards that could occur with the District were listed by those in attendance. All had an opportunity to rank, using post-it-notes, the hazards by their likelihood to occur. Hazards identified were consolidated based on the type of hazard. For example, Environmental contamination, water contamination, and chemical spills were grouped as one hazard. In most cases the pre-hazard mitigation by the District to the grouped hazard would be the same. Wildfire and fire in general was of greatest concern to the group followed by severe storms including flooding, ice and snow events resulting in fuel shortages, dam failure, and power/natural gas outages. The third hazard of concern to the group was debris slides including landslides and avalanches. Very little discussion was generated regarding earthquake.

Additional meetings held for public participation on July 2, 2009 and July 13, 2009, as announced to the public via a public service announcement in the paper and on local radio, were unattended.

Planning Team Surveys

Surveys are an effective way to gather information about a particular group. Two surveys were conducted recently; one specifically for the hazard mitigation plan (see Attachment F) and the other for a tax assessment the District considered imposing. Both surveys are discussed in detail below.

With the hazard mitigation survey, individuals were given an opportunity to voice their concern regarding particular disasters affecting their community. Table 1 below contains the results of the survey. The results of the survey are closely related to the findings of the June 30, 2009 planning meeting where wildfire and fire in general were of greatest concern. Drought was a concern noted by the community. At the June 30, 2009 plan development meeting drought was discussed as it affects the forest and the threat of wildfire. The second greatest concern to the community was the impact of wind or winter storm events followed by landslide/debris flow and the third greatest concern. The survey also noted earthquakes as a major concern. During the June 30, 2009 planning meeting, earthquakes were also discussed, but determined to be more the responsibility of the local building department. The LVFPD will continue to work cooperatively with local agencies on a response plan.

Table 1: Results of the pre-hazard mitigation plan survey regarding individual disaster concerns.

Natural Disaster	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Drought	**8%**	**33%**	**33%**	**17%**	**8%**
Dust Strom	**0%**	**8%**	**8%**	**33%**	**42%**
Earthquake	**0%**	**17%**	**33%**	**33%**	**8%**
Flood	**0%**	**8%**	**25%**	**25%**	**25%**
Landslide/Debris Flow	**0%**	**25%**	**17%**	**25%**	**25%**
Wildfire	**83%**	**0%**	**17%**	**0%**	**0%**
Household Fire	**42%**	**33%**	**8%**	**0%**	**8%**
Wind Storm	**0%**	**25%**	**33%**	**17%**	**17%**
Winter Storm	**0%**	**25%**	**33%**	**17%**	**8%**
Other	**0%**	**0%**	**8%**	**0%**	**8%**

In February of 2009, the LVFPD sent out a survey to determine the community's willingness to support a tax designed to reduce fire hazard fuels adjacent to and inside the neighborhood. Close to 5,000 surveys were mailed. We successfully received almost 500 responses. The survey was completed on May 12, 2009. Table 2 on the next page contains the results of the tax assessment survey.

Table 2: Tax assessment survey results as of May 12, 2009 for the Lake Valley Fire Protection District

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**No Response**
How concerned are you about the possibility of another wildfire like Angora striking again here in South Lake Tahoe?	**Not concerned**									**Very concerned**	
Question 1	20	12	7	15	30	22	36	73	50	205	7
	4%	**3%**	**1%**	**3%**	**6%**	**5%**	**8%**	**15%**	**10%**	**43%**	1%
How likely do you think it is that another catastrophic wildfire will occur in our District?	**Not likely**									**Very likely**	
Question 2	17	15	12	17	44	32	61	94	31	146	8
	4%	**3%**	**3%**	**4%**	**9%**	**7%**	**13%**	**20%**	**6%**	**31%**	2%
How important do you think it is for your fire district to offer services such as chipping, defensible space inspections, tree marking, and clearing the forest of hazardous fuels in our community?	**Not important**									**Very important**	
Question 3	21	12	14	8	14	10	33	42	54	261	8
	4%	**3%**	**3%**	**2%**	**3%**	**2%**	**7%**	**9%**	**11%**	**55%**	2%
How willing would you be to support a tax up to $25 on an unimproved parcel and up to $70 per year on an improved parcel if needed by the fire district to continue the above mentioned services to help prevent another catastrophic wildfire?	**Not willing**									**Very willing**	
Question 4	101	12	13	6	31	22	26	53	38	171	4
	21%	**3%**	**3%**	**1%**	**6%**	**5%**	**5%**	**11%**	**8%**	**36%**	1%

Results of the tax assessment survey describe how concerned our community is with regard to wildfire. Based on the results of question 3, the community would like the LVFPD to assist homeowners with services designed to help homeowners protect their home and to clear the forest of hazardous fuels. Based on the results of question 4, over half of those surveyed are willing to pay for such services.

With input from the community, the LVFPD assessed the risk and developed the hazardous mitigation plan. Wildfire and fire in general was of greatest concern to the group followed by severe storms including: flooding, ice and snow events resulting in fuel shortages, dam failure, and power/natural gas outages. The third largest concern to the group was landslides including avalanche. Based on public input and review of LVFPD's mission statement, the LVFPD has the greatest responsibility to protect life, property and the environment from wildfire and other fire hazards.

How to Use This Plan

This plan is divided into three separate sections.

- **Section I** Introduction and Overview
- **Section II** Lake Valley Fire Protection District Jurisdictional Risk Assessment
- **Section III** Lake Valley Fire Protection District Hazards Mitigation Strategy

The first section is an introduction to and an overview of Lake Valley Fire Protection District (LVFPD or District) and the natural hazards that affect the District. This section acts as a primer to natural hazards mitigation, providing definition of what natural hazard mitigation is, justification for the creation of a natural hazard mitigation plan, and a set of goals that might be realized as a result of enacting the LVFPD Local Hazard Mitigation Plan (LHMP). Section I also documents the planning process. Section II is a natural hazards identification and risk assessment for LVFPD. Potential losses are analyzed and future development trends examined as part of this section. Section III is the natural hazard mitigation strategy portion of the plan. This section includes a prioritization process in which natural hazards are rated. From the rating, mitigation measures for LVFPD ranked. Implementation of mitigation strategies is discussed, as is the plan maintenance process.

SECTION II RISK ASSESSMENT

LVFPD has identified several hazards that are examined and addressed within this Local Hazards Mitigation Plan. These hazards were identified via several avenues of research.
The first method utilized input from community members involved in the plan process as described above. Second, a thorough review of applicable literature pertaining to the county historic record of natural hazards was undertaken, incorporating data from numerous local, county, state, and federal organizations. Third, governmental support from the California Emergency Management Agency (CALEMA) and the Federal Emergency Management Agency (FEMA) was utilized. Invaluable aide was provided by CALEMA, including information, guidance, and

supervision. Written plan guides, on-line support, and personal assistance all helped smooth the plan-writing process. FEMA guides and website support also provided important resources.

HAZARDS IN THE COMMUNITY

The County of El Dorado conducted a thorough hazard identification and analysis for the development of their Multi Jurisdictional Hazard Mitigation Plan. The County's plan addressed a wide range of hazards that can, and have impacted all areas of the county, including those areas located in the jurisdiction of the LVFPD. The LVFPD board of directors has adopted the EDC MHMP as a development and mitigation planning guide (see Attachment D). Many hazards including some of the hazards identified in the EDC MHMP are listed below along with their definitions.

Natural Hazards

- Wildland fires: Wildfire is an unplanned, unwanted wildland fire, including authorized and unauthorized human-caused fires, lightening strikes, escaped wildland fire use events, and escaped prescribed fire projects. Fires are particularly prevalent in the summer and fall, when fallen branches, leaves, and other material can dry out and become highly flammable. Wildfires tend to be most common and severe during years of drought and on days of strong winds. With extensive urbanization, these fires often involve destruction of suburban homes located in the wildland urban interface, a zone of transition between developed areas and undeveloped wildland.

- Severe Thunderstorms: A thunderstorm forms when moist, unstable air is lifted vertically into the atmosphere. Severe weather associated with these storms includes hail, strong winds, thunder, lightning, and intense rain. Some can form into more severe storms if the conditions exist to enhance and prolong development. Severe thunderstorms are defined as convective storms with frequent lighting, accompanied by local wind gusts of 60 miles per hour, or hail that is 2 centimeters in diameter or larger. Lightning heats nearby air to about 18,000 degrees instantly, almost twice the temperature of the Sun's surface. The heating creates a shock wave that is heard as thunder. Dry lightning is a term for thunderstorms which produce no precipitation at the surface. This type of lightning is the most common natural cause of wildfires within LVFPD. Lightning strikes can also cause death, injury, and property damage.

- Flooding: A flood is a temporary overflow of an expanse of water that submerges land, such as from a river or lake. As a result some of the water flows or sits outside of the normal perimeter of the body of water. Causes can range from abnormal snow melt due to untimely warm weather during the winter, to storm events depositing too much rain on already saturated soil. Floods may cause loss of life, property damage, water supply contamination, and loss of power.

- Drought: A drought is an extended period of months or years when a region experiences a deficiency in its water supply. This occurs when a region receives consistently below average precipitation, either in the form of rain or snow. It can have a substantial impact on

the ecosystem, tourism and agriculture of the affected region. Although droughts can persist for several years, even a short, intense drought can cause significant damage and harm the local economy. Having adequate drought mitigation strategies in place can greatly reduce the impact.

- Landslides: Landslides are caused when the stability of a slope changes from a stable to an unstable condition. Natural causes include erosion due to loss of vegetation and soil structure. Weakening of a slope can also occur through saturation by snowmelt, or heavy rains. The potential for this type of landslide increases after a wildfire event. Earthquakes can add loads to barely-stable slopes causing liquefaction and destabilizing of slopes. Human causes which include earthwork, construction, and forestry activities can alter the shape of a slope, or imposes new loads on an existing slope.

- Avalanches: Avalanches are caused by an over-burden of snow pack that is too massive and unstable for the slope that supports it. A massive avalanche could potentially damage and interrupt fire service for extended periods of time.

- High Winds: Significantly high winds can occur at all times of the year, especially during winter storms and thunderstorms. Falling objects, property damage, downed trees and downed power lines are dangerous risks associated with high winds.

- Ice & Snow Events: A winter storm is an event in which the dominant varieties of precipitation are forms that only occur at cold temperatures, such as snow or sleet, or a rainstorm where ground temperatures are cold enough to allow ice to form. Large snowstorms can be quite dangerous. A 6 inch snowstorm can make unplowed roads impassable, and it is possible for roofs to collapse due to the weight of the snow load. Standing trees and power lines can also be brought down by the weight of the snow, especially if it is wet or very dense. Even a few inches of dry snow can form drifts many feet high under windy conditions.

  An ice storm involves rain, which freezes upon impact. Ice forming on the roads will make them impassable, disrupting travel and making emergency response and repairs difficult. An ice coating one-fourth inch in thickness is heavy enough to damage trees, and overhead wires disrupting power and communication.

- Earthquakes: California has often been associated with geologic events and there are several active and inactive faults within the Lake Tahoe basin. Earthquakes can cause a variety of hazards including damage to buildings and bridges, disruption of communications, gas, electric, water, recycled water, and sewer lines. Earthquakes can also often cause flash floods, fires, landslides, and avalanches. Lakes in seismically active areas, such as Lake Tahoe, are significantly at risk from a tsunami or sieches. Geological evidence indicates that the shores of Lake Tahoe may have been hit by sieches and tsunamis as much as 33 feet high in prehistoric times. Local researchers have called for the risk to be factored into emergency plans for the region.

The University of Reno is actively researching the potential threat of a level 6 or 7 earthquake in the Tahoe basin area. More information is available at the university's website (http://www.seismo.unr.edu/htdocs/WGB/LakeTahoeTsunami/) Information and the potential threat to LVFPD operations and its residents will be further reviewed.

Human Hazards

- Contamination: The uncontrolled distribution of material in a given environment. The hazards to people and the environment from contamination depend on the nature of the contaminant, the level of contamination, and the extent of the spread of contamination.

- Waterborne Disease: Waterborne diseases are caused by pathogenic microorganisms which are directly transmitted when contaminated drinking water is consumed. Contaminated drinking water, used in the preparation of food, can be the source of food borne disease through consumption of the same microorganisms.

- Fire/Arson: Arson is the crime of maliciously, voluntarily, and willfully setting fire to woodlands or to the buildings, or property of others.

- Fuel Shortage: An inadequate supply of fuel necessary for all vehicles including emergency response vehicles and backup generators.

- Dam Failure: Breech of a dam can occur with little warning. Intense storms may produce a flood in a few hours or even minutes from upstream locations. Flash floods occur within six hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breeching.

- Terrorism/Sabotage: The willful destruction or impairment of facilities or equipment necessary for the continued operation of water and sewer systems.

- Canal Failure: Flooding due to a breach of an embankment or channel allowing the uncontrolled flow of water.

- Chemical Spill: Chemicals have the ability to react when exposed to other chemicals under certain physical conditions. When chemical reactions are not properly managed, they can create harmful or catastrophic consequences, such as toxic fumes, fires, and explosions. These reactions may result in death and injury to people, damage to physical property, and severe effects on the environment.

- Wastewater Spill: Uncontrolled discharge of sewage or unprocessed waste causing contamination of drinking water, recreational facilities, and the environment.

Technological Hazards

- Power Outage: Power failure can be a defect in a power station, damage to a power line or other part of the distribution system, a short circuit, or the overloading of electricity mains.

- Natural Gas Outage: An unexpected disruption in natural gas supply. Utility services are often jeopardized by natural and man-made disasters. Weather related occurrences can lead to loss of heat, resulting in frozen pipes and safety hazards such as fire and explosion.

- Heating, Ventilation Air Conditioning (HVAC) Failure: Plumbing & HVAC failures have been the cause of leakages and flooding in numerous buildings. This results in lost time and damage to property, due to failure of boilers, fire water pipes, drainage lines, and can cause associated electric fires. Leakages in plumbing systems are caused by improper assembly of joints, sub-standard fittings, corrosion, pressure surges, traffic loads and non compatible pumping equipment.

- Road Closure: Inability to respond to and move material, personnel, and supplies where needed.

- Communication Failure: Inability to communicate with the staff or public regarding safety, and the efficient movement of material, personnel, supplies and equipment.

- Supervisory Control and Data Acquisition (SCADA) Failure: Refers to an industrial control system monitoring and coordinating a process. The process can include water treatment and distribution, wastewater collection and treatment, electrical power transmission and distribution, and large communication systems.

- Computer Failure: Computers are performing more tasks in the office and workplace than ever before. It can affect communication, information systems, engineering, accounting, purchasing, billing, payables and payroll.

HAZARDS SPECIFIC TO THE LAKE VALLEY FIRE PROTECTION DISTRICT

With input from the community, the LVFPD categorized each hazards above as it pertains to our community. Many of the above hazards were determined to be either beyond an actionable scope within our community or not within the jurisdictional authority of the LVFPD. Table 3 on the next page list hazards by category and associated hazards within the category as developed through the LVFPD planning process.

Table 3: Hazard category, associated hazards, including extent and probability with the LVFPD.

Category	Hazard	Associated Hazard	Location
1	Fire	wildland, other fires	All areas affected by the hazard
2	Severe Storm	lightning, flooding, dam failure, landslides, high winds, ice and snow events, fuel shortage, power outage, natural gas outage, road closures	All areas affected by the hazard
3	Debris Slides	landslide, avalanche	Forested land adjacent to community
4	Earthquake	seiche wave, structural collapse, fuel shortage, power outage, natural gas outage, road closures	All areas affected by the hazard
5	Human Hazards	contamination, chemical spill, wastewater spill, waterborne disease,	Community adjacent to water treatment facility, hospital and Highway 50

Category 1 Fire Hazards

Wildfire

As outlined in the Community Wildfire Protection Plan (CWPP) for the California Portions of the Lake Tahoe Basin Section 2 Lake Valley Fire Protection District, wildland fire is perhaps the most dangerous natural disaster threat in the LVFPD (see Attachment O). Annually, as winter precipitation diminishes and the seasonal snow pack melts, the possibility of fire concurrently increases. Generally, the wetter the winter, the lower the wildfire threat during the following dry summer months. Other climatic variables can, and often do, skew that simplified statement though. When the precipitation fell, whether the precipitation was snow or rain, when the moisture melted, how fast the melt-off occurred, and wind characteristics; all of these considerations as well as others are seasonal indicators as to the potential severity of wildland fires during the dry summer season.

Regardless of the seasonal environmental variables that act as indicators of wildland fire potential, most wildland fire events are caused by human actions. Whether the ignition source is a discarded cigarette, an unattended campfire, or an act of arson, it is people who have the greatest impact on and control over the number of wildland fires in a fire season. Mother Nature can also be responsible for igniting wildland fires. Lightning is an especially dangerous element during the dry summer season.

Wildland fires also tend to originate in lesser developed areas. These natural lands pose a difficult problem for fire suppression personnel. First, natural lands tend to contain a denser variety of vegetation, providing more fuels to ignite and spread a fire. Fires can grow rapidly in these denser fuel environments. Second, fire fighting personnel are usually located farther from these lesser developed areas. The extended time it takes for fire suppression personnel to reach and react to a wildland fire further complicates the effort to contain and extinguish a newly ignited wildland fire.

Certain fuel types such as chaparral tend to burn with a regularity that is somewhat predictable, but the risks in the Tahoe Basin are different due to 100 years of forest mismanagement, human intervention and fire suppression. The fire hazard has been incrementally increasing annually until the present, and now communities in the Tahoe Basin are at extreme risk and the probability of an urban fire disaster increases each fire season. Forest fuels reduction projects in the Tahoe Basin can actually reverse this problem and in the process restore a more natural forest structure that improves the environment. Fuels reduction in the Basin is also environmental restoration. It should be made clear that 2007 was not an aberration; rather it was the culmination of 100 years of forest fuel buildup. It is clear that now these events will become common, the only question is whether wildland fire events will also become urban fire disasters.

Wildfire Hazard Assessment

Wildland fire danger is a seasonal hazard and provides some measure of awareness and predictability to the hazard. The threat of wildland fire increases as winter snowpack melts, summer temperatures rise, and forest fuels become dry and susceptible to fire. The summer months of June, July, August, and September are traditionally the wildland fire season in the LVFPD. Fire season can extend later into the year until appreciable precipitation arrives in the fall.

Table 4 below is a breakdown of wildland fire calls for the LVFPD over the last two years. As shown in the table below, the number of wildland fire call is minimal in comparison to the many other emergency calls LVFPD receives.

Table 4. Wildland fire calls for the LVFPD from July 1, 2007 to July 1, 2009

Period	Total Calls	Other Fire Calls	Probability
2007-2008	1226	34	2.8%
2008-2009	1246	16	1.3%
Average	1236	25	2.0%

The Table 4 does reflect that in 2007, there were two fires that resulted in home ignitions with high suppression and replacement costs. The suppression costs of the Angora Fire were approximately $12,500,000 for a 3070 acre fire consuming 254 homes. The Washoe Fire had suppression costs of over $250,000 for a 20 acre fire that consumed four homes beyond the original home that ignited the fire.

Responsibility

The California Department of Forestry and Fire Protection (CALFIRE) is responsible for providing wildland fire protection on all State and private timberlands, watersheds, and rangelands in El Dorado County. For much of El Dorado County, the CDF contracts out this responsibility to the United States Forest Service (USFS). While, in general, the USFS is adequately prepared to protect developed areas in the instance of wildland fire, Forest Service fire fighters are not equipped, trained, or legally permitted to fight structural fires.

Despite having a sound community wildfire protection plan in place, which identifies communities with the greatest threat and fuel reduction strategies to reduce the threat, wildland fire remains as the greatest concern to the District. According to the National Fire Danger Rating System wildland fire severity classifications for El Dorado County, many areas of the county that presently contain or are planned to contain residential development have moderate or high wildland fire hazard ratings. The CALFIRE also has a fire rating system called the Fire Hazard Severity Classification System which considers quantity of flammable vegetation within a critical fire area, weather, and slope. As displayed in Figure 2 below the entire LVFPD is rated as "very high severity."

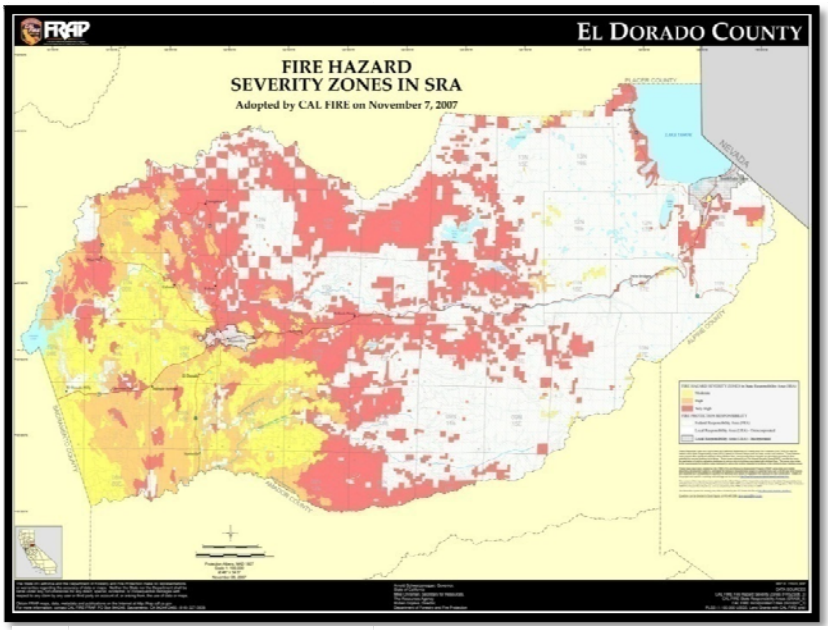

Figure 2 CALFIRE Fire Hazard Severity Map forEl Dorado County.

The Insurance Services Office of California has given communities low fire insurance ratings that indicate a high potential for fire occurrence. The ratings are on a scale of one (1) to ten (10) with ten being the worst fire potential rating possible. Main portions of the LVFPD is rated 5 while some portions are rated at 9. These ratings only substantiate the high potential for wildland fire throughout the LVFPD.

Of greatest concern in assessing wildland fire hazard is the threat to human life that wildland fire poses. The LVFPD geography promotes swift movement of fire once one has been ignited. Combined with possibly high fuel loading due to large urban wildland interface areas, and dry summer conditions, the District's high-relief landscape and strong localized wind patterns only enhance the rapid spread of fire. There are relatively few population clusters in the District, but the hazard is obviously still a very prevalent one as indicated in the previous rating scales. Three variables dictate the level of hazard a wildland fire potentially presents:

- The location of the fire's origin.
- The weather at the time of the fire.
- The time of year the fire ignited.

The further the fire's point of ignition is to the primary responder to the fire, the greater the opportunity for the fire to grow and establish itself. The longer it takes a fire fighting team to arrive on scene, the greater the potential for a wildland fire to spread. The weather at the time the fire starts weighs tremendously into how the fire might spread. If the fire starts during a period of high humidity or cooler temperatures, again the potential for rapid spread is lessened. If the fire starts during low humidity and high temperatures, the potential growth of the fire is substantially

increased. The time of year when the fire starts is critical as well. If a fire ignites early in the summer when fuels are still relatively wet, the growth of the fire is hampered. But if the fire is ignited late in the summer when fuels are tinder-dry, then the potential for a large wildland fire grows exponentially. These three variables act as an indicator of the potential size of a wildland fire. The presence of wind equates to additional growth of the fire.

Wildland fires can have devastating effects that are essentially measured in terms of how much area is burned in the fire. The more area that burns, the greater the impact to the following:

- Loss of forest can have a serious impact on wildlife and wildlife habitat. Restoration of wildlife habitat could take decades to evolve back into pre-fire habitat conditions.
- Loss of timber in a wildland fire event could impact the economic health of the District for decades.
- Recreational opportunities could be deteriorated or reduced as a result of fire. Campgrounds and other recreational features could be destroyed or damaged.

Just as important are the environmental hazards created in the aftermath of wildland fire. Burnt slopes could become unstable without vegetation. Steep slopes could suffer landslides and mudslides when winter precipitation arrives. Mud and debris could choke streams and rivers, diminishing water quality and endangering fish habitat. As witnessed by the Angora Fire, recreational access roads could be damaged or washed away, reducing or eliminating recreational opportunities. As witnesses by the Angora Fire, the economic health of the county was jeopardized. Loss of revenue from the tourism and recreation industry might impact District revenues and consequently lower the level of District services. As witnessed by the Angora fire, recreational industry might see a reduction in camping, fishing, hiking, biking, sight-seeing, and other recreational activities, lowering sales and transient occupancy tax revenues to the County. The service industry and the real estate industry could be impacted as well.

Depending on the size and location of the fire, transportation and communication infrastructure could be seriously affected. As witnessed by the Angora Fire, electrical power poles and transmission lines could be lost to flames. Underground utilities could be damaged, including transmission cables, gas pipelines, and water delivery systems. Roads could be closed for an extended length of time, or open on a reduced access schedule.

Loss of power also complicates daily routines. Lack of electricity and/or natural gas can make cooking, cleaning, and heating impossible for many. More catastrophic is the potential loss of homes, structures, and lives if a wildland fire enters a home site. This becomes more and more a possibility as homes are built in the District.

Probability and Risk

There is scientific certainty that the risk of catastrophic loss due to wildfire in the Tahoe Basin has increased significantly over the last couple of decades. It is also true that small lots averaging ¼ acre in size and dense construction in the Tahoe Basin increases the risk to many homes from even small fires. There is not a reliable estimate for the frequency of the fire events, but is a high

degree of probability that a fire in the wildland urban interface will occur at some time in the near future. Figure 3 represents the past fire history in the LVFPD.

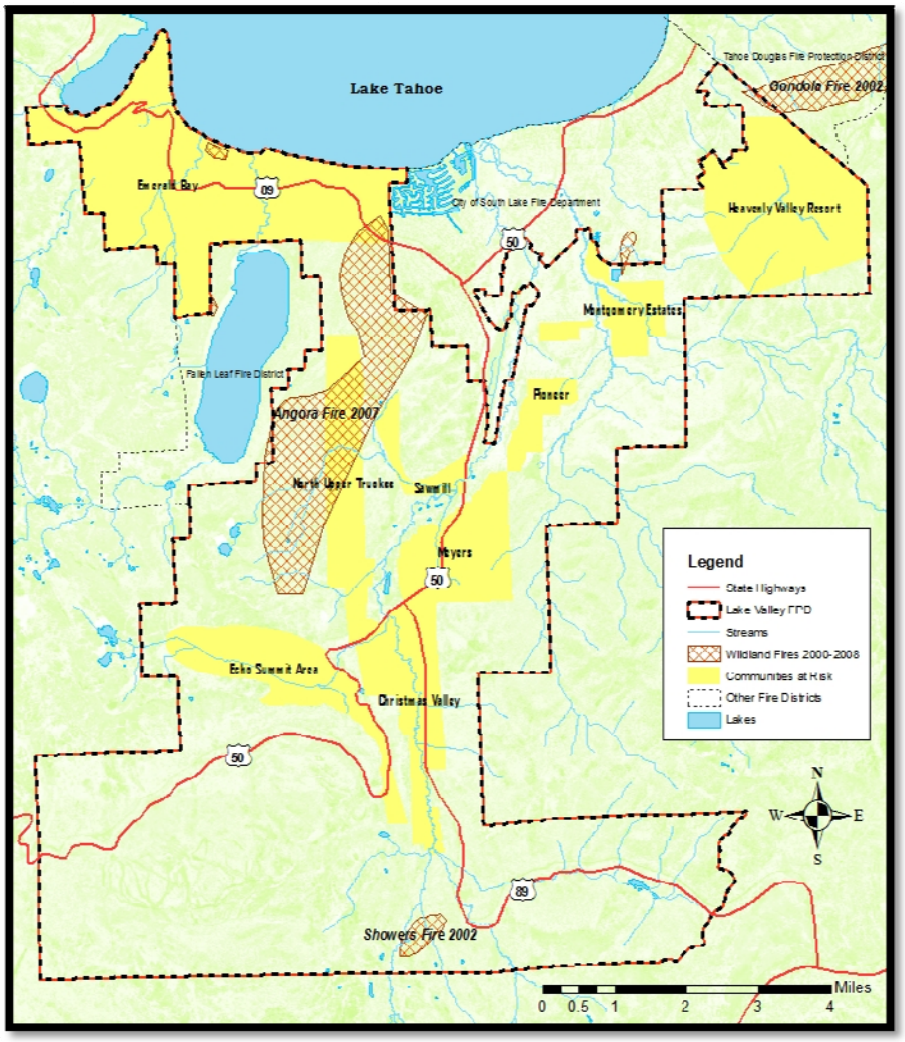

Figure 3. Past fire history in the Lake Valley Fire Protection District.

The potential for future damage is certain, but the timing is in question. With each passing year, the potential for future damage increases if actions are not taken to mitigate the risk. The forests adjacent to communities of the Tahoe Basin are grossly overstocked with dead, dying and suppressed trees. Combined with heavy surface fuel loading, these forests do and can support catastrophic wildfire. This situation has grown incrementally worse during the current decade as millions of trees that died during the beetle infestations of the late 1980's and early 1990's are now falling and increasing the forest surface fuel loading. The hazard has incrementally increased since the later 1990's. Fire suppression prevented fires that would have ordinarily thinned developing Sierra Nevada mixed conifer forests and limited the growth of lodgepole pine in favor of riparian hardwoods. This combination of even-aged regeneration and total fire suppression has allowed the forests adjacent to the urban environments to develop into dense stands where fire suppression is now impossible during extreme fire weather. Extreme fire weather has a direct effect on communities that include a high percentage of residences with wood shake shingle roofs and lot sizes that average less than ¼ acre in very tightly build developments. In total, the potential for future damages includes approximately 42,000 businesses and homes in the Tahoe Basin.

Wildland fires are naturally occurring hazard events that have and will happen again in the LVFPD. The probability and risk of a wildland fire is seasonal in nature, with the greatest potential for a wildland fire being during the dry months of summer and early fall. Many variables combine to dictate the severity of risk for wildland fire occurrence. These considered, there is a

high probability of a wildland fire within the LVFPD, and a **high risk** associated with this natural hazard.

Conclusion

Wildland fires will inevitably happen in the future. The areas dry summer climate enables an annual seasonal threat to wildland fire, a threat that is periodically realized in potentially devastating fashion. Citizens have an opportunity to minimize the threat of wildland fire by creating defensible space around structures, which includes appropriate landscaping. Use of fire resistant roofing assists in protecting structures from wildland fire. Because of residents ability to be prepared for the possibility of wildland fire, damage to property and the threat to human life is decreased. To be able to most effectively address the threat of wildland fires, citizens, families, and businesses should:

- Consult with fire officials for specific advice and guidelines to protect both their lives and their property.
- Develop defensible spaces around all structures on their property in accordance with state law.
- Work cooperatively with their neighbors to create defendable communities.
- Replace wood shake roofs with Class A noncombustible roofing.
- Construct new homes in accordance with new building standards for high severity zones.
- Have an escape plan, including alternative travel routes.

The LVFPD shall maintain services such as chipping, defensible space inspections, tree marking, clearing the forest of hazardous fuels in our community.

OTHER FIRES

Structure Fires

Deaths from fires and burns are the fifth most common cause of unintentional injury deaths in the United States and the third leading cause of fatal home injury (http://www.cdc.gov/ncipc/factsheets/fire.htm). The United State's mortality rate from fires ranks sixth among the 25 developed countries for which statistics are available. Although the number of fatalities and injuries caused by residential fires has declined gradually over the past several decades, many residential fire-related deaths remain preventable and continue to pose a significant public health problem.

On average in the United States in 2006, someone died in a fire about every 162 minutes, and someone was injured every 32 minutes. Four out of five U.S. fire deaths in 2005 occurred in homes. In 2006, fire departments responded to 412,500 home fires in the United States, which claimed the lives of 2,580 people (not including firefighters) and injured another 12,925, not including firefighters. Most victims of fires die from smoke or toxic gases and not from burns. Smoking is the leading cause of fire-related deaths. Cooking is the primary cause of residential fires.

In 2005, residential fires caused nearly $7 billion in property damage. Fire and burn injuries represent 1% of the incidence of injuries and 2% of the total costs of injuries, or $7.5 billion each year. Males account for $4.8 billion (64%) of the total costs of fire/burn injuries. Females account for $2.7 billion (36%) of the total costs of fire/burn injuries. Fatal fire and burn injuries cost $3 billion, representing 2% of the total costs of all fatal injuries. Hospitalized fire and burn injuries total $1 billion, or 1% of the total cost of all hospitalized injuries. Non-hospitalized fire and burn injuries cost $3 billion, or 2% of the total cost of all non-hospitalized injuries.

Approximately half of home fire deaths occur in homes without smoke alarms. Most residential fires occur during the winter months. Alcohol use contributes to an estimated 40% of residential fire deaths.

Motor Vehicle Fire

A motor vehicle contains many types of flammable materials, including flammable liquids like gasoline and oil as well as solid combustibles such as upholstery. Fuel leaks from ruptured fuel lines also can rapidly ignite. Vehicles house multiple potential sources of ignition including electrical devices that may short circuits, hot exhaust systems, and modern car devices such as air bag detonators. Also, car batteries pose a fairly unique hazard in themselves: hydrogen gas evolved in the electrolysis reaction ignites readily in fire conditions and can result in an explosive dispersion of battery acid. However, in most cases a large battery is less dangerous than a gas tank. Accidental car fires are declining but deliberate car fires (arson) are increasing. Many car fires are deliberate. It is common for joyriders to set fire to stolen cars: abandoned cars are commonly set on fire by vandals. It is often the case in non-arson auto fires that the bulk of the fire is (at least initially) contained in the engine compartment of the vehicle. In most vehicles, the passenger compartment is protected from engine compartment fire by a firewall.

Other Fire Assessment

Fire is a threat to any community. The LVFPD receive alarm calls for all types of fire. Residential and commercial structure fires, motor vehicle fires, dumpster fires, and transformer or electrical fires can happen at any time of the year. Table 5 below is a breakdown of fire calls for the LVFPD over the last two years.

Table 5. Fire calls other than wildland fires for the LVFPD from July 1, 2007 to July 1, 2009

Period	Total Calls	Other Fire Calls	Probability
2007-2008	1226	37	3.0%
2008-2009	1246	25	2.0%
Average	1236	31	2.5%

The LVFPD statistics may not reflect the national average. The LVFPD has a meaningful foundation of codes and ordinances in place to use as guidance within implementation of a natural hazard mitigation strategy. Of primary importance is the LVFPD's Ordinance 2007-02 which adopts the 2007 edition of the California Fire Code, regulating and governing the safeguarding of life and property from fire and explosion hazards arising from the storage, handling and use of hazardous substances, materials and devices, and from conditions hazardous to life or property in

the occupancy of buildings and premises in the District. The ordinance acts as the template for all future development in the District.

Ordinance 2007-02 contains Section 903.2.7.1 regarding automatic sprinkler systems installed in Group R, Division 3 occupancies. Section 905.5.3 of the ordinance covers installation of fire alarms and detection systems. Automatic sprinklers, fire alarms and detection systems are known to save lives. Sprinkler heads operate quickly to minimize the threat from heat, flames and toxic smoke. The National Fire Protection Association has no record of a multiple-death fire (killing three or more people) in a residential property where a complete sprinkler system was installed and operated properly. Ninety percent of the deaths in residential fires could have been prevented by using sprinkler systems. Fire alarms or detection systems are devices that sense the presence of visible or invisible particles produced by combustion. Once detected fire alarms or detection systems sound an alarm within the room or suite within which it is located. The largest percentage of fire deaths in the home occurs at night while people are asleep. Therefore, a working smoke alarm can provide an early warning that can make the difference between life and death. According to studies published by the National Fire Protection Association, having a smoke alarm cuts an individual's risk of dying in a fire by nearly half.

LVFPD's fire marshal has over 15 years in fire safety education and prevention. Several of LVFPD staff are trained prevention officers. Every year, prevention staff inspects local businesses for compliance with the State and Local fire codes. Prevention staff is available at all times to meet with residents to discuss fire safety and review concerns. LVFPD participates in an annual fire prevention day and annual school fire safety education. LVFPD's strong prevention and education program continues to reach all residents in the District.

Probability and Risk

Loss due to other types of fires in the LVFPD is significant. The probability of future events is 2.5% based on an average of fire calls over the past two years (see Table 4 above). Of the 2.5% a smaller percentage actually resulted in fire damage. Two or three actual structures are lost or damaged every year resulting in one or two million dollars in damages.

Fire events have and will happen again in the LVFPD. The exact probability and severity of a fire is in the District is unknown, with the greatest potential for fire in summer when the tourist population increases. These considered, there is a **low probability** of some type of fire within the LVFPD, and a **low to moderate risk** associated with this natural hazard.

Conclusion

Fires will inevitably happen in the future. Citizens have an opportunity to minimize the threat of fire by adhering to current fire and building standards. Because of residents ability to be prepared for the possibility of causing a fire, damage to property and the threat to human life is decreased. To be able to most effectively address the threat of fires, citizens, families, and businesses should:

- Install early warning devises such as smoke detectors and CO detectors in every room.
- Have commercial or residential structure inspected by LVFPD's fire prevention staff.

- Determine adequate and safe distance from water supply.
- Have an escape plan, including alternative routes.

The LVFPD shall maintain services such as reviewing building plans for fire safety and offering fire prevention education. The LVFPD shall continue to pass ordinances to protect the public.

Category 2 Severe Storms

Severe Storms

The climate of the LVFPD is inherently conducive to severe storm weather events and severe weather events can happen at any time of the year. These severe weather events can be broken down into three categories:

1. severe ice and snow events
2. severe wind events
3. severe rain or thunderstorm

Severe Winter Storm

During the winter months, the District can experience strong winter storms. Four climatic factors together work to create a higher than average potential for severe winter storms: high altitude, orographic (mountain) barriers, prevailing storm tracks, and air masses.

- The District's location in a basin along the crest of the Sierra Nevada naturally gives the area a high average elevation. Elevation ranges from about 6,240 feet to over 7,440 feet, with the majority of the District being in excess of 6,300 feet.

- The LVFPD is located along the crest of the Sierra Nevada mountain range. The mountain range acts as a barrier to approaching air masses which approach the mountains from the west. The mountains act as a lifting mechanism as air masses migrate over them, increasing the chance for precipitation.

- The winter storm track for the LVFPD funnels storm systems from a semi permanent low pressure system in the Gulf of Alaska southward to the California coast following the Westerlies, a global atmospheric wind pattern that provides a relatively consistent westerly flow of air throughout most of the year.

- Air masses typical of the LVFPD are classified as marine polar. The District's proximity to the Pacific Ocean, in conjunction with the aforementioned storm track, brings cold and moist marine polar air masses over the city throughout much of the year, especially during the winter months.

Putting all four of these climatic variables together equals a higher than average potential for severe winter weather events. Cold moisture-laden air masses are carried from the Gulf of Alaska southward with the Westerlies. Following the storm track, this moist air encounters the Sierra Nevada, becomes unstable as it is forced over this natural barrier, and provides large amounts of precipitation before migrating eastward. In the winter months, heavy snows might be the result, with extremely strong winds accompanying the precipitation.

An example of a severe winter weather event in the District is the winter storm of December, 2004. In a three day span, five to six feet of snow fell in many areas within the District accompanied by "ferocious" winds. At higher elevations within the District, as much as ten feet of snow was reported to have fallen. The combination of heavy snows and strong winds knocked out power. Many residents of the county went without power for several days. County offices and local schools were shut down. Every resident of the District was in some way adversely affected by this severe weather event.

Severe Windstorm

In any season, the mountainous landscape promotes the formation of wind, often winds at very high speed. Windstorms can affect all areas of the city during any month of the year. During the December, 2004 storm, wind speeds in excess of 80 miles per hour were recorded at Heavenly Ski Resort and over the western rim of the Tahoe basin.

Severe Rain or Thunderstorm

During the summer months, climatic factors combine to promote the development of thunderstorms. As heated air from lower elevations rises and rapidly cools, intense thunderstorm cells can develop in South Lake Tahoe's high elevation landscape. These thunderstorms often have hail as large as golf balls. Rainfall amounts may cause flooding or cause a dam breach. Section II Category 4 – Earthquake discusses dams within the District and dam failure in detail. Rainfall accumulations often exceed the areas design storm of .7 inches per hour. The design storm is a 20 year one hour storm. Local streets may experience flooding; however, no major flood damage has occurred in the District. Figure 4 below describes the 100 year flood zone for the LVFPD. No repetitive flood loss properties are located in the District. The National Flood Insurance Program (NFIP) as discussed below is not within the Districts authority or charter.

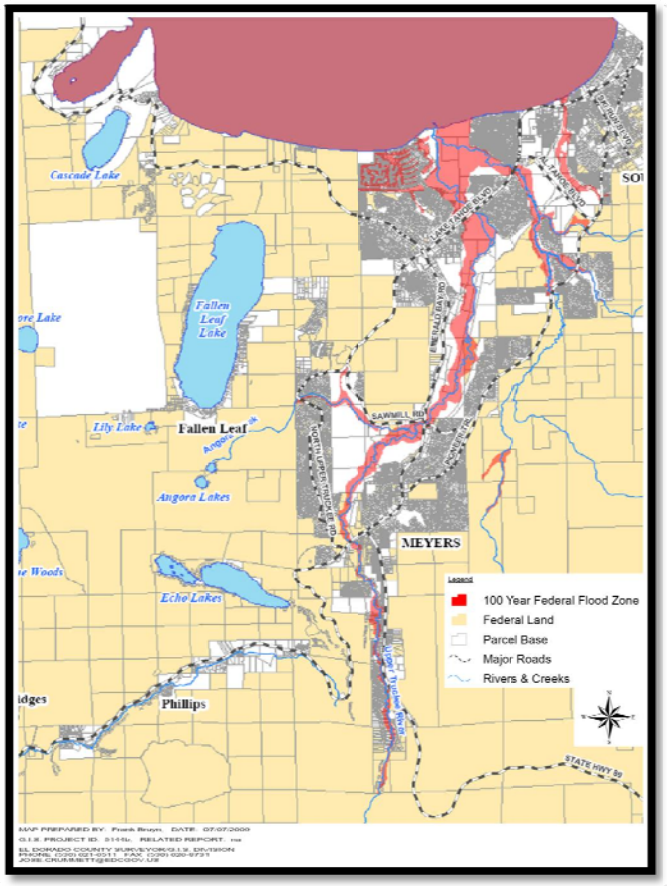

Figure 4. 100 year federal flood zone map for the Lake Valley Fire Protection District.

- Federal Regulations Regarding Flooding

    - National Flood Insurance Act (1968)

      The National Flood Insurance Act established the National Flood Insurance Program (NFIP), a federal program administered by FEMA. The NFIP enables property owners in participating communities to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the federal government.

El Dorado County is a participant in the NFIP, and, as required, the County has implemented an ordinance for 100-year flood protection. The U.S. Army Corps of Engineers (USACE), under contract to FEMA, prepared a flood insurance study report and a series of FIRMs that depict the location of the calculated 100-year flood, flood elevations, floodways, 500-year flood boundaries, and flood insurance rate zones. The most current land use information available at the time of the FIRM preparation, such as land use designation, are typically used to determine the maximum development density potential, which is used to estimate the peak flow and model the flood elevation. The latest FIRM for El Dorado County was completed in 1995. The County participates in the NFIP by reviewing specific development proposals to ensure that structures that may be in a 100-year floodplain are protected from flood damages and that any changes in the floodplain do not cause unacceptable increases in the elevation of the 100-year water surface.

Hazard Assessment

The effects of severe weather events such as snowstorms, thunderstorms, and windstorms are likely to exhibit certain similarities. Downed trees and fallen power lines might occur. Transportation around the city can be affected too, with road closures interrupting movement. Damages to homes, businesses, and government buildings are a possibility. Fatalities as a result of severe weather events are uncommon, but can occur on occasion. Localized flooding may occur, especially during rain on snow events. Dams may fail causing severe flooding. Electrical power outages happen with most extreme weather event. The interruption of power causes many problems. Loss of electricity affects heating of homes, heating of water, pumping of water, refrigeration, lighting, computing, and loss of communication systems like television and the internet. Additionally, businesses lose the use of cash registers, gasoline pumps, restaurant kitchen appliances, and the like.

Severe winter storms produce snow and ice. The majority of problems associated with severe winter storms are transportation related. Roads are closed or are open only to vehicles that are properly equipped. Productivity is lost due to the increased time it takes to go from one point in the county to another. When roads are closed for avalanche prevention or snow removal, drivers who must wait by the roadside are put at an increased risk because being stranded in route. Electrical power might be lost. Government offices may be closed or subject to reduced schedules. Public schools also may be closed or on a delayed start schedule. Structures are put at an increased risk due to increased snow loads on roofs, and the increased threat of falling trees or power lines.

Severe windstorms pose potential hazards. Power and phone lines may be knocked over and electrical power might be lost. Downed power lines pose a fire and/or electrocution threat. Uprooted trees and fallen limbs pose possible hazards to roadways, structures, vehicles, and people. Extremely violent windstorms might also damage large tracts of commercial forest causing economic losses to the forest products industry and to recreation.

Severe thunderstorms introduce natural hazards of lightning, hail stones, and flash flood. Electricity can be interrupted by lightning strikes, property damage can occur if hail stones reach a large diameter, and flooding can occur with particularly intense or prolonged rain events associated with the thunderhead. Recreational activities can also be interrupted. Playing field and pools and beaches may be temporarily evacuated, and hot springs facilities may close for safety reasons.

Probability and Risk

Severe storm events happen in all parts of Lake Tahoe at all times of the year. The degree of regularity is greater during various seasons for the different storm types, but the overall threat of a severe storm event is a relative constant over the calendar year. One of the largest storms on record according to NOAA Satellite and Information Service occurred on December 29, 1996. Heavy rains combined with melting snow caused widespread urban and small stream flooding in the greater Lake Tahoe area during the afternoon. In South Lake Tahoe, water was flooding streets, homes, and businesses. Minor flooding occurred in the District. A second large storm was recorded on December 31, 2005. Localized flooding was reported in areas south of Lake Tahoe. Sierra Pacific Power Company reported that at least eight power poles were knocked down, most likely due to the saturated ground. Power lines were also downed when trees fell on them. Around 4,000 people were left without power south of Lake Tahoe. This was the all-time record flood on Trout Creek in South Lake Tahoe and Tahoe Valley, flooding U.S. Highway 50.

Some storms are more severe than others. Hundreds of large storms have occurred within the last ten years. Few have set a record with regard to rain or snow. Therefore probability of occurrence is less than 2%. When the severe storms occur, assorted governmental services might be activated. These might include the public works department, fire agencies, emergency medical services, search and rescue units, and the county sheriff's department. The length of time electrical power is interrupted is often the leading indicator of a storm's severity, and also dictates the level of response from the indicated agencies. If a storm causes an extended period of power interruption, emergency shelter might be required, especially during the cold winter months. Do to the regularity of severe weather in the District, essential services and the community at large is well prepared.

Based on the history of severe storms in or near the District, there is a **moderate to high probability** of a severe storm event occurring in the District. There is a **low to moderate risk** to life and property within the District, due to the overall preparedness of this mountainous region in addressing, managing, and acclimating to severe weather events.

Conclusion

Of all natural hazards, the severe storm event has the greatest probability of occurrence in the District. Severe storms of any type can cause a great amount of damage and can affect the lives of District residents in a meaningful way. The entire District is subject to severe storm events, and these events can occur during any time of the year. Our community experiences all types of severe weather during all seasons of the year. Severe weather events can take the form of wind storms, rain storms, snow storms, hail and thunderstorms. When severe storm events do occur, they have the potential to significantly impact the community, presenting a genuine threat to the lives of our residents and the personal and real property of citizens, triggering the prospect for considerable economic loss. Due to the possible frequency of severe storm events, individual citizens, families, and businesses within the District need to be prepared to address severe storms when they occur. As in the case of earthquake, fire, and other natural disasters, citizens should prepare themselves before such events take place. To be able to effectively "weather the storm," citizens, families, and businesses should:

- Have a plan.
- Store extra supplies of food and water.
- Store other related supplies such as flashlights, batteries, firewood, etc.
- Have a battery-operated radio within their home or business.
- Trim all tree limbs away from buildings.
- Secure all potentially wind-blown possessions when not in use.

Category 3 Debris Slides

Avalanche

The LVFPD is located in a basin surrounded by the mountain peaks of the Sierra Nevada. The District's elevation ranges from a low of about 6200 feet to high elevations in excess of 7440 feet. With these elevation characteristics, all areas of the District are susceptible to snow storms, even the lowest lying areas around the lake.

Moreover, the District's topography is high-relief. The Sierra Nevada mountain range, a tilted fault block geologic formation, forms steep mountain slopes. The District's drainage patterns are typically fast-flowing streams and rivers which enunciate the high-relief terrain. The combination of snowfall potential and high relief creates a potential danger for snow avalanches throughout the winter months in the District. An avalanche shall refer to any fall, release, or slide of snow in an amount sufficient enough to cause damage to or threaten the safety of people.

Avalanches are possible when weak layers of snow within the cumulative seasonal snow pack fail to support the weight of the snow above and collapse. The result causes the overlying snow to break free and flow downhill. There are two destructive elements at work within an avalanche. Primarily, the actual impact from the displaced snow and ice is a concern. Embedded within the snow, debris such as broken-off trees and branches are just as dangerous as the snow itself. Secondly, the avalanche wind, caused by air pushed ahead of the moving mass of snow, can cause damage as well.

Areas most susceptible to snow avalanche are typically in sheltered regions of the mountain topography where snow is most prone to accumulate. In general, the most sheltered aspects in the Sierra Nevada, where snow can most greatly accumulate, are upon north and northeast facing slopes. These slope faces must also be situated above 7000 feet where snow is more likely to accumulate over the course of the winter snowfall season.

Hazard Assessment

The effects of an avalanche are for all intents and purposes confined to the areas within and around the avalanche path. Historically, areas of considerable avalanche danger were an unknown. Today, the areas of substantial avalanche danger are clearly known and usually avoided. Avalanche areas in the District's downhill ski resort and along the District's state highways are administered to drastically reduce the chance for avalanche causing conditions to develop. Thus, few unplanned or damage-causing avalanches occur in places where people or property might be threatened. Still, avalanches can and do happen in the District and although personal injury or property damage is unlikely, these misfortunes are a possibility. Avalanches occur every year regardless of snowfall amounts. There is a 100% probability of occurrence. The avalanche season extends from, the first major snowfalls of late fall, to whenever the last remnants of snow have melted away. In some of the highest elevation areas around the District, it may be possible during some years for snow to remain the entire year.

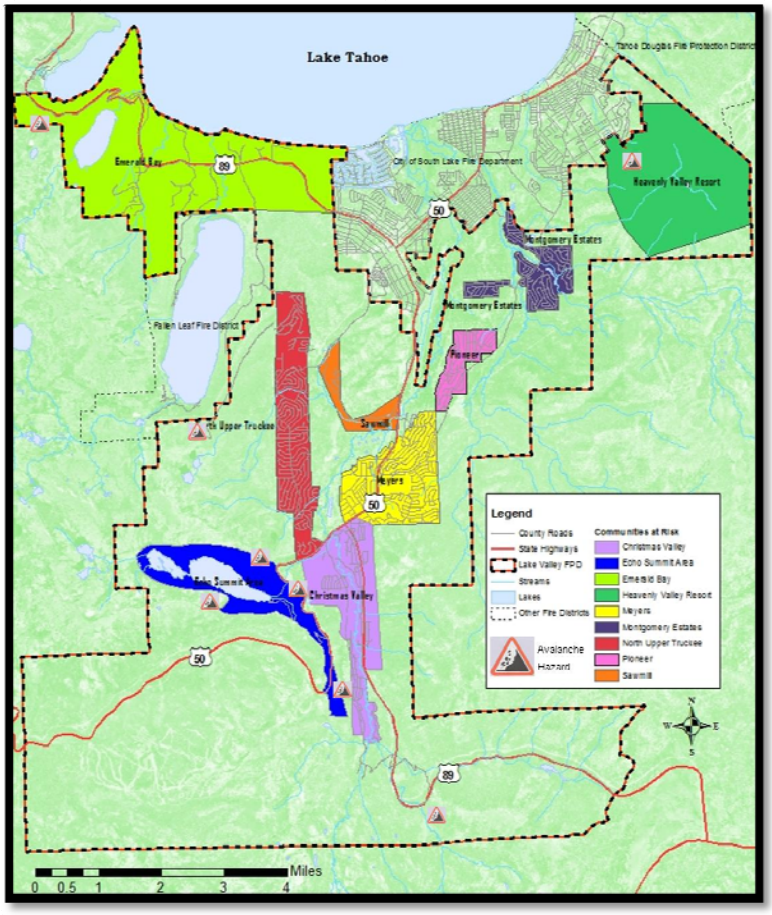

Figure 5 Known avalanche zones within the Lake Valley Fire Protection District

The greatest impact that avalanches have within the District are to transportation infrastructure. Two state highways pass through the District, Highway 50 over Echo Summit and Highway 89. Highway 50 over Echo Summit is closed intermittently during the winter months, in part because of avalanche danger. Figure 5 identifies the know avalanche zones within the District. Their closure limits the travel options of residents and places increased importance on Nevada State Route 207 and Highway 50 to Carson City, which is maintained as a year-round highway. Highway 50 thus is the city's only east to west travel corridor during the winter months and its

importance to transportation cannot be underestimated. Avalanches do impact this and other year-round thoroughfares.

During winter storms, periodic avalanche control must be performed on the highway in order to promote motorist safety over the pass. Without these avalanche control measures being performed by the California Department of Transportation, travel over the county's main highway corridors would be a very treacherous proposition during the winter season. With avalanche control, public safety is improved and avalanche danger is minimized.

The major ski resort in the District, Heavenly Lake Tahoe and Sierra-at-Tahoe employs avalanche control techniques to mitigate avalanche danger. Ski patrollers perform avalanche control every morning that it is required in order to promote safety throughout the mountain for all skiers and riders.

Much of the dangers associated with avalanches are known and efforts are made to lessen the potential for avalanche events in areas frequented by people. Problems can arise in backcountry areas where avalanche control measures are not in place. Here, out-of-bounds downhill skiers, cross country skiers, and snowmobile riders can trigger avalanches. Thus, avalanches are natural hazards that still pose a threat to life and property. Away from areas that have developed and maintain avalanche control methods, the people are still very vulnerable to avalanche danger. As long as individuals travel into backcountry regions during the winter, injuries will still be a possibility. Other problems associated with avalanches are loss of electricity due to power lines being disabled by avalanche and localized damage to the environment within the avalanche path.

Probability and Risk

Avalanches are isolated occurrence predominantly located in the backcountry areas of the District. Any avalanche would most likely affect individuals in the backcountry during the winter. There is also a lesser degree of avalanche danger within the established ski resorts of the District as well as on the highways that traverse the high-elevation passes in the county. Still, the greatest danger is to the very few who venture into winter backcountry settings. This considered, there is **low probability** and **low risk** associated with avalanche hazard in the District.

Conclusion

Avalanche hazards are most prevalent during the winter in the backcountry regions. Individuals who venture into the backcountry during the winter need to be aware of the dangers posed by avalanches and take the necessary precautions when the potential for an avalanche is present. Individuals who frequently snowmobile, ski, cross-country ski, or snowshoe in the backcountry in the winter should educate themselves in avalanche awareness and safety. Many certificate programs are available. The California Department of Transportation, the United States Forest Service, and the National Weather Service all have avalanche danger forecasting capabilities which they utilize to inform the public of any avalanche hazards. The Sierra Avalanche Center paired with the Tahoe National Forest to provide two full-time Forest Service Avalanche Forecasters through the winter. Information is available on the web at

www.sierraavalanchecenter.org. Regardless, no absolutely successful method has been found to keep individuals out of avalanche danger zones, even when it is extremely unwise to be present.

Landslide

The District's terrain and climate combine to create conditions conducive to landslides. Where avalanches are a threat isolated primarily to the winter months, the threat of landslides are generally distributed throughout the year. Most landslide events are associated with and resultant from other natural hazards such as seismic activity or floods.

Landslide is a generic term which is defined as the downward sliding of a relatively dry mass of earth and rock. An even more simplistic definition is "slope failure." The primary factor involved in landslides is gravity, but three other factors have varying degrees of influence. They are:

- slope angle
- slope material, and
- amount of water.

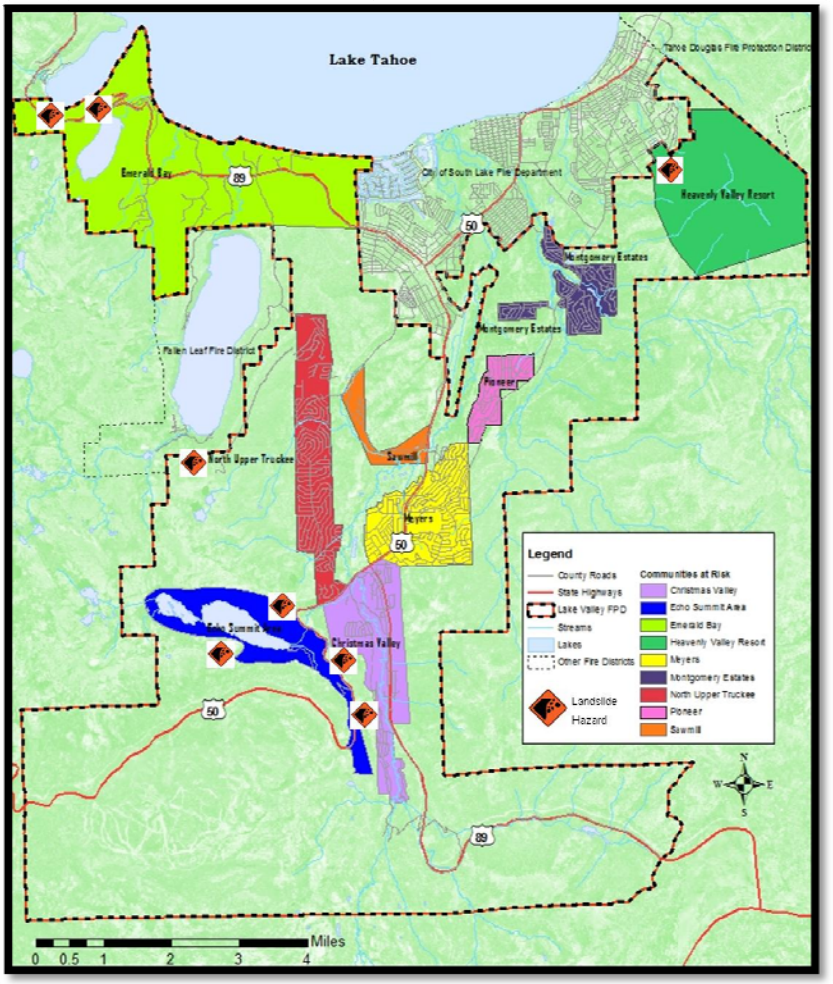

Figure 6 Potential landslide areas within the Lake Valley Fire Protection District.

Gravity is the constant in any equation trying to quantify the stability or instability of a slope face. Slope angle, slope material, and the amount of water are the variable factors that, combined with gravity, determine slope stability. Other factors that help identify the stability of a slope to a lesser degree are vegetation and climate.

Landslides are categorized into groups using two variables; the type of movement and the type of material that is involved. Type of movement is categorized into three groups:

- falls
- slides, and
- flows

The amount of water usually is the defining ingredient when classifying the movement. In falls, very little water is present,

whereas in flows there is a substantial amount of water involved. The type of material involved is broken into three groups: soil (earth), rock, and debris. Thus, one can identify *rockfalls, earthflows*, or *debris* slides. Again, each of these events is determined by the composition of materials and the speed of movement. A *rockfall* is dry and fast while a debris flow is wet and fast. Regardless of the speed of the slide, the materials within the slide, or the amount of water present in the movement, landslides are a serious natural hazard.

Landslides and mudslides cause up to two billion dollars in damage annually in the United States. They are attributed to between 25 and 50 deaths annually. District's high-relief landscape, landslides are a natural hazard concern. Although no lives have been taken as a result of landslides, the threat to life and property is real. In recent history, landslides occurred as a result of the weather associated with the January 1997 storm.

Landslides are a natural process and are unavoidable in the long term, being due to the patient nature of gravity and the gradual weathering of the Earth's surface. Although natural disturbances like earthquakes and storms can trigger landslide events, humans can also have a direct effect on and even accelerate landslide occurrence. Any time a slope is graded or cut into, a formerly stable slope can become unstable, eventually seeking a new equilibrium in the form of a landslide.

Hazard Assessment

Landslides that may occur within the District would most likely be experienced as part of a larger, more widespread natural hazard event. Landslides could take place as a result of severe storms, floods, and earthquakes. They could also happen as an aftermath to wildland fires. The largest landslide to occur in the District occurred in 1955 in Emerald Bay as a result of widening the highway. No other landslides have occurred in the District. The probability of occurrence is less than 1%.

In that landslides are ancillary events within larger natural hazard events, the dangers resulting from these parent hazard events are concurrent to landslides. If electrical lines are compromised within the slide, electrical power can be lost. The length of time power is interrupted is a direct result of the size of the slide and its impact upon the power lines and electrical infrastructure. Water lines and other buried facilities can be put in danger or lost to a landslide as well. Roads and highways are often victimized by landslide events. Excavations into slopes to create roadbeds cause a disruption to the natural slope while simultaneously steepening the slope face. These two consequences together weaken slope structure and introduce the potential for landslides. This potential is often realized when severe storms produce increased moisture, the result being slope failure and landslides. When roads are compromised by landslides, motorist safety is threatened and travel time is lengthened. Emergency personnel response time is also affected.

Landslides can threaten the stability and safety of homes in two ways. If the slope fails above a home, the foundation and the structure itself can be threatened. The weight of the slide, the water, earth, and vegetation that has become mobile, can slam into a house, knock the structure from its foundation and perhaps even destroy the house. If the home sits on a bench cut into a hillside, the potential for a landslide is again introduced. Construction of a home on a graded or altered slope can have devastating effects. Changing of the slope face, the additional weight of the home and

associated materials, plus the added water of sprinkler systems and septic tanks, make a formerly stable slope unstable. Add a severe storm with substantial rainfall and the home and the artificial slope it sits upon can be victimized by landslides.

Since degree of slope directly affects the gravitational force exerted upon land and its potential to slide, much of the District is potentially impacted by landslides. This potential threat is increased when other natural hazards that trigger landslides occur. In this fact, city residents should be more alert to the potential for landslides whenever natural hazards that generate landslides, such as severe storms or floods, are happening.

Probability and Risk

Landslides are naturally occurring events that will inevitably happen as long as gravity itself is a controlling factor upon the landscape. Since the District mountainous terrain challenges gravity as it rises to over 7,400 feet, much of the high-relief topography in the county can be identified as land with the potential for landslides. Much of that land though is in remote and undeveloped locales, which reduces the risk of this natural hazard. Thus, there is a **very low probability** of landslide in the District, and a **very low risk** associated with this natural hazard.

Conclusion

Landslide hazard in the District can be considered a year-round phenomenon. The District's high-relief and high-altitude landscape promote the wearing away of the landscape via both physical and chemical weathering mechanisms. In the winter, added moisture in the soil strata can generate landslides, and the varying temperature ranges during the summer months can have a similar effect. In general, higher slopes equate to higher landslide potential. Therefore, individuals should be alert in high-relief areas to the threat to landslides at all times of the year. In flatter, level areas of the District, the threat from landslide is greatly diminished.

Landslides are more prevalent as a result of earthquakes, floods, and severe storms. They are also to be expected after wildland fires. This tendency can act as an early warning to the presence of landslide danger, allowing the public to be appropriately prepared for the possible occurrence of a landslide. With this said, damage to property and threat to the health of county residents is decreased with their ability to be prepared for landslide events during or as part of larger natural hazard events.

To be able to most effectively address the threat of landslides, citizens, families, and businesses should:

1. Have a plan, including alternative travel routes.
2. Store extra supplies of food and water.
3. Store other related supplies such as flashlights, batteries, and firewood.
4. Have a battery operated radio within their home or business.
5. Stay aware of soil conditions, especially during periods of considerable rainfall.

Category 4 Earthquake

Earthquake

Earthquakes can occur at any time in the District. There are no precursory events to signal an increased potential for an earthquake, no advanced alarm to warn of impended seismic activity, and no earthquake season per se. Earthquakes are simply a part of living in the District.

It should come as no surprise that such is the case. The District is located along the border of California and Nevada, two of the most geologically active, earthquake prone states in the United States. Here, two of the Earth's tectonic plates collide. The North American plate slowly moves westward, colliding with the Pacific plate. Simultaneously, the Pacific plate migrates north and westward. As it does so, the Pacific plate pulls at the North American plate to follow suit. This tensional force stretches the Earth's crust, causing a system of north-and south fault structural systems all along the boundary between the two tectonic plates. Also as a result of this tensional stress, ranges of tilted fault block mountain ranges are formed in response to this faulted crustal structure.

The District's earthquake prone geology is resultant from this tectonic stretching. The District's is considered to be part of the Basin and Range province of the western United States. Here the Earth's crust has been stretched up to 100% of its original width. The entire region has been subjected to extension that thinned and cracked the crust as it was pulled apart, creating large faults. Earthquakes occur as part of these huge faulted mountain ranges. Moreover, virtually the entirety of the District lies within the Sierra Nevada range of mountains. This mountain range formed less than five million years ago. Through a combination of uplift of the Sierran block and down dropping of the area to the east, the Sierra rose upward, rising far more steeply to the east than the west. The entire Sierra Nevada can be thought of as an enormous tilted fault block with a long, gentle slope westward to California's Central Valley and a steep eastern slope. The District sits atop the crest of this gigantic tilted block of granite.

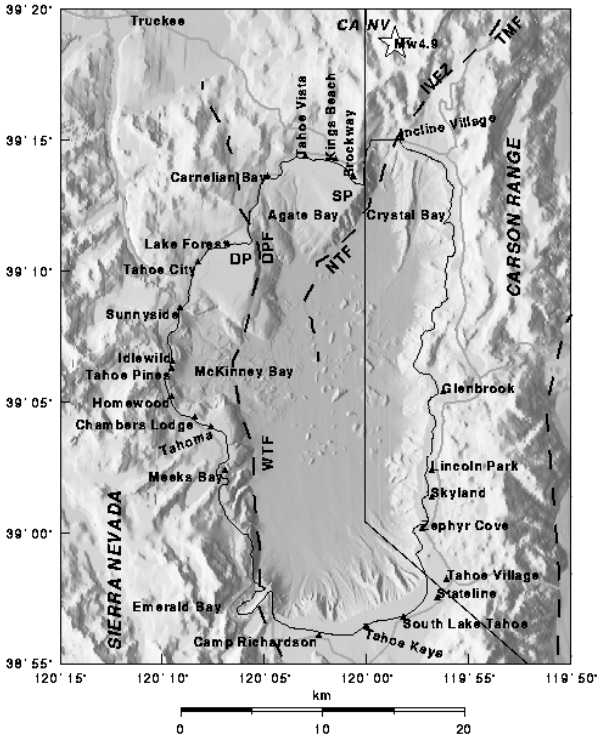

Figure 7 Map of two Lake Tahoe fault lines, WTF and NTF

With mountain ranges formed through the stretching and faulting of the earth's surface, earthquakes occur constantly within and around the county. Two fault lines run through the Lake Tahoe (see Figure 7). Thankfully, most are of a magnitude that causes no damage and may not even be felt by the population. Earthquake magnitude is commonly measured using the Richter scale. The Richter magnitude scale was developed in 1935 by Charles F. Richter of the

California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the amplitude of waves recorded by seismographs. Adjustments are included for the variation in the distance between the various seismographs and the epicenter of the earthquakes. On the Richter scale, magnitude is expressed in whole numbers and decimal fractions. For example, a magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. Because of the logarithmic basis of the scale, each whole number increase in magnitude represents a tenfold increase in measured amplitude; as an estimate of energy, each whole number step in the magnitude scale corresponds to the release of about 31 times more energy than the amount associated with the preceding whole number value. Thus, a 4.0 earthquake is roughly 31 times stronger than a 3.0 earthquake. Earthquakes with magnitude of about 2.0 or less are usually called micro earthquakes; they are not commonly felt by people and are generally recorded only on local seismographs. Events with magnitudes of around 4.5 or greater are strong enough to cause damage to property. As the magnitude increases beyond 5.0, the potential for damage to life and property increases dramatically.

Hazard Assessment

Earthquakes that occur within the District are unpredictable, and can occur at any time. Their anticipated magnitude is also an unknown, but an earthquake of high magnitude, 7.0 or greater, has occurred in the past and is a probability in the future. The Genoa Fault, which extends along the eastern front of the Carson Range south of Carson City, Nevada into the southern reaches of El Dorado, has been identified as responsible for two large earthquakes measuring in the magnitude seven (7) range during the past 1,000 years. An earthquake can trigger other natural hazard events including Seiche's. An earthquake can be the direct cause of landslides, avalanches, and dam failure due to seismic shaking of the ground and fracturing that might accompany any shaking. The damages wrought within an earthquake event can be the indirect cause of other natural hazard events too. Damages resulting from an earthquake might be responsible for igniting wildland fires if fallen power lines ignite or gas lines are ruptured.

The primary concern in assessing earthquake hazard is structural damage from the earthquake event. High magnitude earthquakes would most probably cause widespread structural damage within the District, especially near the epicenter of the seismic activity. It could be surmised that the closer a locale is to the origination of an earthquake the greater the extent of damage would be. Also, areas more susceptible to ground shaking are at a greater risk of damage from earthquakes. The District does include land with higher probabilities for amplified shaking during an earthquake. Thus, the distance from the epicenter and the potential for ground shaking are the two major indicators of potential damage from an earthquake. In that earthquakes cannot be predicted, all of the structures in the District are at risk of damage to one degree or another.

In conjunction with structural damage, earthquakes also can cause damage to utilities. Electrical lines can be compromised and power lost during an earthquake. Gas and propane lines can be ruptured. Loss of power can complicate recovery efforts. Loss of gas for heating and cooking can additionally exacerbate conditions and further discomfort citizens.

Transportation and communication infrastructure can be damaged in an earthquake. Roads can be closed by landslides or debris. Roads can suffer structural damage from fissuring, subsidence, or upheaval of the paved surface. Bridges can also be structurally compromised. When roads are compromised by earthquake events, safety is threatened, travel time is extended, and emergency personnel response times are lengthened. Telephone and internet communications can be interrupted in an earthquake as well. Telephone poles can be knocked over and telephone service lost. Likewise, internet and computer capabilities can be interrupted causing difficulties in exchange of information potentially critical in post-disaster response.

In an extreme earthquake, dam failure can become a concern. A small dam exists within the District controlling water flow from Echo Lake to Lake Tahoe. Some property damage could be anticipated in the event of any dam failure resulting from an earthquake. The Echo dam was created to regulate water from Echo Lake a naturally create lake not a reservoir. The dam is designed to maintain levels just above the natural rim of the lake. A breach of Echo dam would result in water rushing down naturally created rivers to Lake Tahoe. Figure 8 represents the area impacted by a flooding as a result of a dam failure. Few if any cabins located up the Truckee River in Christmas Valley would be affected. The result of a dam failure at Echo Lake would be insignificant.

Heavenly Lake Tahoe owns and maintains a small dam within the District. The dam was created to hold water for snowmaking. If the dam were to be compromised as a result of an earthquake, there would may ramifications to residents living in the City of South Lake Tahoe. No properties within the District would be impacted. The owner has it inspected yearly for safety compliance and earthquake preparedness. The small dam is not likely to fail.

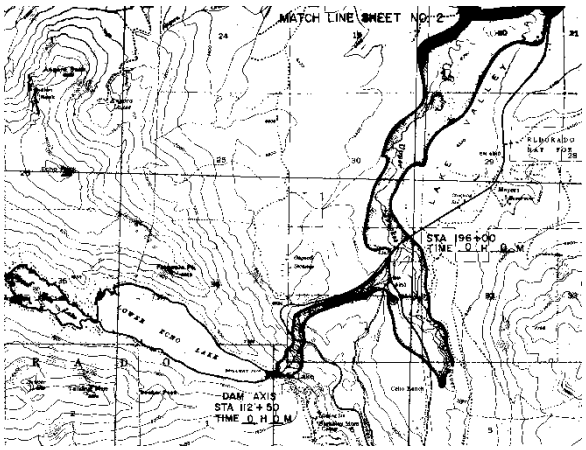

Figure 8 Inundation map for Echo Lake Dam failure in the Lake Valley Fire Protection District.

District residents cannot be expected to be ever vigilant in the anticipation of an earthquake. They can though, know that a future earthquake is a likely if not guaranteed event.

Probability and Risk

Earthquakes are naturally occurring events that will eventually and inevitably occur in this region of the world. Major quakes on seismic faults that run beneath Lake Tahoe have ruptured the earth's crust roughly every 3,000 years or so. Scientists are unsure when the last big one hit. Scientist do predict a major earthquake somewhere in California within the next 30 years. The combination of plate tectonics and associated mountain building geology, essentially guarantees an earthquake as a result of the periodic release of tectonic stresses. The District's mountainous terrain lies in the center of the North American and Pacific tectonic plate activity. There have been earthquakes as a result of this activity in the historic past, and there will continue to be earthquakes in the future.

Thus, there is a **moderate to high probability** of an earthquake in the District, but a **moderate to low risk** associated with this natural hazard.

Conclusion

The possibility of an earthquake is an ever-present phenomenon in the District. Although one cannot accurately predict the occurrence of seismic activity, they can be assured that the eventuality of an earthquake is a certainty. Therefore, individuals have an opportunity to plan for an earthquake in order to lessen the potential hazards that result either directly or indirectly from an earthquake event.

With this said damage to property and threat to the health of District residents is decreased with their ability to be prepared for earthquakes. To be able to most effectively address the threat of earthquakes, and the landslides, avalanches, and other dangers associated with them, citizens, families, and businesses should:

1. Have a plan, including alternative travel routes.
2. Store extra supplies of food and water.
3. Store other related supplies such as flashlights, batteries, and firewood.
4. Have a battery operated radio within their home or business.
5. Know the locations for turning off electrical and gas utilities.
6. Develop a home escape plan and practice implementing the plan.

<u>Seiches</u>

Seiches are oscillations in enclosed bodies of water caused by or causing seismic waves. They can occur very far from the source of an earthquake. A seiche occurred in Lake Union and Lake Washington in 1964 following the large Alaskan earthquake. The long, large waves beat boats against docks, damaging many of them. Long period movement of water can also be produced in lakes and reservoirs by large, usually distant, earthquakes, and sometimes by strong winds. In the late nineteenth century a Swiss professor, F.A. Forel made a systematic study of this type of a water wave, which he called a seiche. Seiches are described as "a standing wave in a closed body of water such as a lake or bay". A seiche can be characterized as the sloshing of water in the enclosing basin. The permanent tilting of lake basins caused by nearby fault motions has produced very energetic seiches. Seiches caused by earthquakes are termed as seismic seiches, a term coined by Anders Kvale in 1955 to describe oscillations of lake levels in Norway and England caused by the **M**8.6 1950 Chayu earthquake. More recently the **M**7.9 Denali earthquake in 2002, caused seiches as far as Louisiana and many other states in the continental United States.

Lakes in seismically active areas, such as Lake Tahoe in California/Nevada, are significantly at risk from seiches. Geological evidence indicates that the shores of Lake Tahoe may have been hit by seiches and tsunamis as much as 10 m (33 feet) high in prehistoric times, and local researchers have called for the risk to be factored into emergency plans for the region.

Hazard Assessment

Several factors could influence the size, shape, volume, and potential destructiveness of a seiche generated by local faults. First, since Lake Tahoe is deep, there are large volumes of water to displace. Therefore, a resulting seiche would be faster and have greater volume than those generated in the shallow water. Second, Lake Tahoe steeply, sloping bed tends to increase the chance that a seiche will break on the shore, thus potentially enhancing a seiche's destructiveness. All major roads that provide ingress and egress to the Tahoe Basin circumnavigate the lake and would be affected if not rendered impassable. Finally, the shape of Lake Tahoe could increase damage by funneling waves together, increasing wave height. The net result is unclear, as the depth versus shape relationship of Lake Tahoe is relatively unknown.

Estimated recurrence rate of an earthquake in the Lake Tahoe area faults of the size necessary to generate a seiche is estimated at once every 1,100 years. With regards to seiche threats, Lake Tahoe could experience a seiche as it did in prehistoric times. In those years, there was no development near the waterfront as there is now. As a result, since the seiche threat was not recognized until recently, most of the structures located near the water were probably not engineered to withstand them.

Additional impacts from a seiche include floating debris with the potential to batter and damage inland structures. The sheer impact of the waves could cause breakwaters and piers to collapse. Boats moored in harbors would also be at risk, as they could be swamped, sunk or left battered and stranded high on the shore.

A seiche's rapid onset could also hamper the ability of motorists to exit the District before it began. Additionally, the “sloshing” effect of a seiche could 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. Many landslide prone bluff areas are in residential settings, so risk could be quite high in the event of a secondary seiche threat.

Probability and Risk

Seiche’s are naturally occurring hazard events that have occurred in Lake Tahoe. The probability and risk of a seiche is directly related to land movement. That considered, there is a **moderate to high probability** of a land movement in this seismically active area, and, a **low risk** associated with this natural hazard because very little development within the District sits on or near the Lake.

Conclusion

The possibility of a seiche is an ever-present phenomenon in the District. Although one cannot accurately predict the occurrence of seismic activity, they can be assured that the eventuality of a seiche is a certainty. Therefore, individuals have an opportunity to plan for a seiche in order to lessen the potential hazards that result either directly or indirectly from a seiche event.

With this said, damage to property and threat to the health of District residents is decreased with their ability to be prepared for seiche. To be able to most effectively address the threat of seiche, and the landslides, floods, and other dangers associated with them, citizens, families, and businesses should:

1. Have a plan, including alternative travel routes.
2. Store extra supplies of food and water.
3. Store other related supplies such as flashlights, batteries, and firewood.
4. Have a battery operated radio within their home or business.
5. Know the locations for turning off electrical and gas utilities.
6. Develop a home escape plan and practice implementing the plan.

Category 5 Human Hazards

Human Hazards

Human hazards do exist in the LVFPD. Human hazards considered significant and necessitating discussion within the LHMP by the planning team are as follows:

1. contamination
2. chemical spill
3. wastewater spill
4. waterborne disease

Contamination or Chemical Spill

The District although small in size is at risk by contamination or a chemical spill. Highway 50 a major east and west route runs through the center of the LVFPD. Gasoline and other fuel derivatives are transported on Highway 50 everyday, even in the worst of winter conditions. Fuel also travels north and south on Highway 89 which runs through the District. Various other contaminates or chemicals travel along our highways in smaller vessels to industrial facilities nearby including the local hospital. Many of the hazards are carried by private carriers or FedEx and UPS.

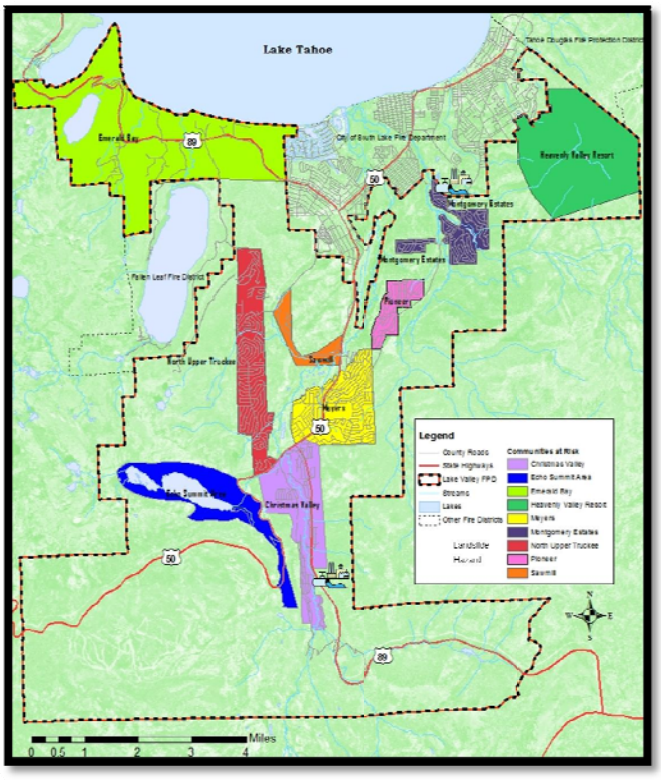

Figure 9 Potential areas for wastewater spill or contamination within the Lake Valley Fire Protection District.

Wastewater spill or Waterborne Disease

The District is at risk for wastewater spills and waterborne disease. On county land within the LVFPD is the South Tahoe Public Utility District (STPUD). STPUD, a public agency chartered in 1950, operates at the south shore of Lake Tahoe in El Dorado County. A wastewater spill could occur

adjacent to the STPUD facility or along their export line (see Figure 9). The STPUD supplies drinking water and provides wastewater collection and treatment. In addition, STPUD recycles 100 percent of its wastewater and sends it to Alpine County where its application benefits agricultural land. Lake Tahoe's seasonal tourism and the large number of part-time residents cause wide fluctuations in both daily water production and wastewater flows.

The STPUD serves water to more than 13,900 homes and businesses. Annual water production is nearly 2.6 billion gallons. Fourteen active wells, 22 water tanks, 15 booster stations, and 370 miles of water mainline make up the STPUD's water system.

The sewage collection system consists of more than 420 miles of collection lines and 42 lift stations, providing service to more than 17,800 homes and businesses. The wastewater treatment plant capacity is 7.7 million gallons per day. The design and operation of the wastewater treatment plant makes it possible to achieve water quality that allows water and biosolids recycling. Each year the plant treats and exports more than 1.6 billion gallons of recycled water that meets high reuse standards. Under provisions of the 1968 Porter-Cologne Water Quality Control Act, the STPUD transports the recycled water nearly 26 miles out of the Tahoe Basin to the STPUD-owned and operated Harvey Place Dam and Reservoir. The recycled water facilities, known as the Diamond Valley Ranch (DVR,) are near Woodfords, California in neighboring Alpine County.

STPUD's state-certified laboratory performs more than 30,000 tests annually to monitor a variety of chemicals and microorganisms in the drinking water, wastewater treatment, and recycled water export systems. These tests on groundwater, surface water, and soils safeguard District customers and the environment.

Any one of STPUD's water mainlines are at risk for contamination. Nearly eleven years ago, laboratory tests detected the presence of Methyl Tertiary Butyl Ether (MTBE) in the District's drinking water supply. MTBE is a fuel oxygenate designed to improve air quality by making gasoline combust more completely. It is a suspected carcinogen and imparts a turpentine-like taste and odor to drinking water at incredibly low levels, rendering the water undrinkable. In addition, it is extremely water-soluble and moves very quickly with groundwater. Due to MTBE contamination or threatened contamination, more than one-third of the District's drinking water wells were closed. This represented a 36% water production loss. Efforts to restore the lost production have been ongoing since that time.

Any one of STPUD's sewage collection lines or export lines can be broken. At anytime people, property or the environment can be contaminated. Continual monitoring, repair and/or replacement by the STPUD reduce the risk of contamination.

Hazard Assessment

The effects human hazard events such as; contamination, chemical spill, wastewater spill, and waterborne disease, are likely to exhibit certain similarities. The effect on life, property and the environment will most likely be temporary. People may be displaced and areas may be closed. Human health will be attended to first followed by property and the environment. Social and economic loss may occur among the residents. Recreational activities can also be interrupted. Playing field and pools and beaches may be temporarily evacuated, and hot springs facilities may close for safety reasons.

Probability and Risk

Few if any major contamination, chemical spill, wastewater spill, or waterborne disease events have occurred in the LVFPD. The chance of occurrence is greater during summer month when the population of South Lake Tahoe swells to over 100,000 people.

If a large event were to occur, assorted governmental services might be activated. These might include the public works department, fire agencies, emergency medical services, search and rescue units, and the county sheriff's department.

Based on the history of contamination, chemical spill, wastewater spill, or waterborne diseases occurrence in South Lake Tahoe, there is a **low probability** of a severe event occurring in the District. Although the probability of a severe storm is low, there is a **low to moderate risk** to life and property within the District, due to the difficulty in preparing for such events.

Conclusion

Of all human hazards, the contamination or chemical spill has the greatest probability of occurrence in the District. The entire District could be affected by contamination or chemical spill, and these events can occur during any time of the year. Due to the possibility an events, individual citizens, families, and businesses within the District need to be prepared. As in the case of earthquake, fire, and other natural disasters, citizens should prepare themselves before such events take place. To be able to effectively handle a major contamination or chemical spill citizens, families, and businesses should:

- Have a plan.
- Store extra supplies of food and water.
- Store other related supplies such as flashlights, batteries, firewood, etc.
- Have a battery-operated radio within their home or business.

The LVFPD should continue to train personnel in hazardous materials response and mitigation. The LVFPD should regularly train with regional hazmat teams in the area.

IDENTIFIED ASSETS AND POTENTIAL LOSSES

Assets Belonging to the District

The LVFPD's LHMP identifies critical facilities belonging to the District and the hazards to which these facilities are susceptible. A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life, or fulfills important public safety, emergency response, and/or disaster recovery functions.

Table 6 below identifies critical facilities in the District, specific natural hazards that might affect each individual facility, and the potential losses that might occur. Additionally, historical records were researched, citizens interviewed, and the District GIS was employed as an analysis tool to

define hazards and gauge levels of vulnerability. Insured replacement cost values for structures and contents (as of 2008) are as follows:

Table 6. Insured replacement cost for structures and contents of the Lake Valley Fire Protection District

	Appraised Value	Contents estimated replacement cost
Fire Station #7 (Headquarters)	Total for all Structures:	
Fire Station #6		
Fire Station #5	$1,782,299	
Land	$90,837	
Office Equipment		$59,966
Operating Equipment		$341,606
Vehicles		$1,648,307
Total Value		$3,923,015

Assets within the Community

The Lake Valley Fire Protection District is divided into nine communities (each with its own neighborhoods) to assess wildland fire impacts and other hazards within the district. The communities are:

- Christmas Valley
  - South Upper Truckee Neighborhood
  - Kekin/Henderson-Tahoe Paradise #60 Neighborhood
  - Hwy 89 South Neighborhood
  - Grass Lakes Road Neighborhood
- Meyers
  - Upper Apache/Mandan Neighborhood
  - Lower Apache Neighborhood
  - Elks Club/Skyline Neighborhood
- Pioneer
  - Gleneagles/Wintoon/Jicarilla Neighborhood
- Montgomery Estates
  - Golden Bear Neighborhood
  - Cattlemans Neighborhood
  - Black Bart Neighborhood
  - Marshall/Sierra House Neighborhood
  - Cold Creek Neighborhood
- Sawmill/Highway 50
  - Echo View Estates Neighborhood
  - Sawmill Road Neighborhood
- North Upper Truckee
  - Chiappa Neighborhood
  - North Upper Truckee/Lake Tahoe Blvd Neighborhood

    - Angora Highlands Neighborhood
- Heavenly Valley
- Echo Summit
- Highway 89N/Emerald Bay
    - Camp Richardson Area Neighborhood
    - Spring Creek Neighborhood
    - Cascade Lake Neighborhood
    - Cascade Properties Neighborhood

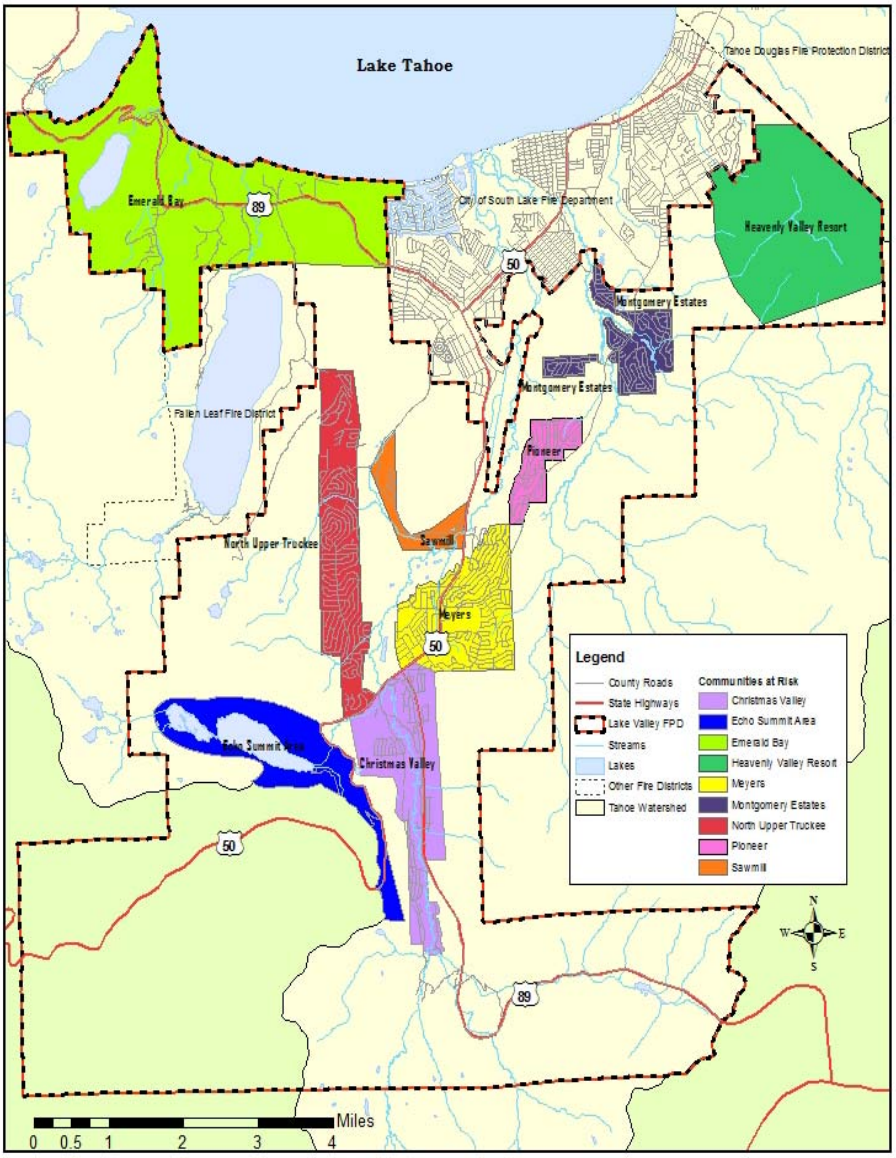

Figure 10 Lake Valley Fire Protection District Communities.

Figure 10 below represents the communities of the Lake Valley Fire Protection District along with the surrounding local, state and federal land. Table 7 on page 41 represents the present value of structures by community. Less than 1% of the District is commercial or industrial zoned. The largest commercial or industrial zoning is located in the Meyers community. Present value of structures in the majority of the communities is between $200,000 and $350,000. A loss 254 structures in North Upper Truckee as witnessed by the Angora Fire in 2007 would have a financial impact on the community of approximately $72,390,000. Another way to consider financial impact would be to consider an average 2000 square foot home and reconstruction costs of $241.80 per square foot in the Tahoe Basin, the property damage would be over $123 million without considering home contents or the miles of infrastructure for power lines that would need to be replaced by Sierra Pacific Power.

Table 7. Present value of structures by community in the Lake Valley Fire Protection District

	Average Structure Value	Approximate # of Residential Lots	Total Dollar
Christmas Valley	$350,000.00	510	$178,500,000.00
Meyers	$280,000.00	500	$140,000,000.00
Pioneer	$275,000.00	90	$24,750,000.00
Montgomery	$205,000.00	755	$154,775,000.00
Sawmill	$230,000.00	95	$21,850,000.00
North Upper Truckee	$285,000.00	890	$253,650,000.00
Heavenly	$2,000,000.00	1	$2,000,000.00
Echo Summit	$200,000.00	190	$38,000,000.00
Hwy 89/Emerald Bay	$1,000,000.00	180	$180,000,000.00
Total	$4,825,000.00	3211	$993,525,000.00

Finally, there is damage to the local tourist-dependent economy. The Angora Fire caused a 25% decrease in hotel occupancies that lasted through the busy tourist season according to a news article in the LA Times. This impact was communicated directly by John Koster, Regional President for Harrah's Resorts and a member of the Tahoe Basin Fire Commission appointed by Nevada Governor Jim Gibbons.

SECTION III – LAKE VALLEY FIRE PROTECTION DISTRICT HAZARDS MITIGATION STRATEGY

MITIGATION GOALS

The LVFPD's LHMP has identified the hazards that could impact the residents and their property and assessed the risks inherent to each hazard.

Mitigating the effects of these natural hazards has been a goal of our residents. Residents have looked for and implemented measures designed to lessen the effects of natural hazards. As an example, the Montgomery Estates Fire Safe Chapter recently facilitated a hazardous fuels reduction program in Cold Creek. Here, a grant was utilized to facilitate community-based wildland fire prevention activities, including a fuel break along the neighborhood and fuel reduction treatments on individual lots.

The goals identified in the District's LHMP are multi-jurisdictional in their scope and intent. As indicated in the introduction of this document, the goals of creating and implementing the Local Hazard Mitigation Plan are to:

- Save lives and protect property.
- Reduce impact of future disaster events.
- Enable post-disaster funding.
- Hasten recovery from disasters.
- Demonstrate a dedication to improving the community's safety and well-being.

These goals are applicable to all natural hazards identified in this plan. Although the plan goals might appear overly broad in scope, their intent, namely to reduce the threat of a hazard through mitigation approaches, is still quite clear in definition and vision. From these goals come the objectives of the District's LHMP. The objectives are arranged in a manner that addresses each hazard individually. From the goals, objectives are derived, and from the objectives, actions are formulated.

A final set of objectives addresses mitigation measures that are applicable to all natural hazards identified within the plan.

PRIORITIZING MITIGATION MEASURES

In order to identify which natural hazards pose the greatest threat to the District, a multi-faceted and multi-tiered approach was utilized. First, the probability and risk assessments from Section II of this plan were scaled and quantified in order to provide an overall District-wide assessment of where the greatest threat from a hazard lies. From this probability and risk matrix, an initial measure of the identified natural hazards was calculated. Although basic in nature, the Hazard Probability/Risk Assessment Scoring Matrix below provides a fundamentally sound, broad-based foundation from which to build more refined comprehension of natural hazard threats in the District.

Table 4 Hazard Probability/Risk Assessment Scoring Matrix

SCALING	NATURAL HAZARD	PROB.	RISK	TOTAL	
1 Very Low	Landslide	1	1	2	**Low Threat**
2 Low	Avalanche	2	2	4	
3 Moderate/Low	Contamination or chemical spill	2	3	5	
4 Moderate	Wastewater spill or waterborne disease	2	3	5	**Medium**
5 Moderate/High	Other fires	5	3	8	
6 High	Earthquake	6	3	9	
7 Very High	Severe storms	5	3	9	**High**
	Wildfire	6	6	12	**Threat**

Second, the District and plan development participants completed an area specific risk assessment below which allowed the District to rate hazards as they expressly related to a location. A number

score of one was given to specific communities where the hazard exists and a number score of zero was given to specific communities where the hazard does not exist. For example, an avalanche score of one was placed in the Christmas Valley community because of avalanche potential. This allowed for a more refined rating of hazards in relation to the various communities represented in the plan. The following hazard rating table is the assemblage of planning meeting participation and planning team hazard assessment research, providing a much clearer perspective of the variability of hazard threats experienced within District.

Table 5 Lake Valley Fire Protection District Hazard Rating by Community

Communities	Avalanche	Landslide	Contamination or chemical spill	Wastewater spill or waterborne disease	Other fires	Earthquake	Severe Storm	Wildland Fire	**TOTAL**
Christmas Valley	1	1	0	1	1	1	1	1	**7**
Meyers	0	0	0	0	1	1	1	1	**4**
Pioneer	0	0	0	0	1	1	1	1	**4**
Montgomery Estates	0	0	1	1	1	1	1	1	**6**
Sawmill/Highway 50	1	1	1	0	1	1	1	1	**7**
North Upper Truckee	0	0	0	0	1	1	1	1	**4**
Heavenly	1	1	0	0	0	0	0	1	**3**
Echo Summit	1	1	1	0	1	1	1	1	**7**
Highway 89N/Emerald Bay	1	1	0	0	0	0	0	1	**3**
Total	5	5	3	2	7	7	7	9	

- Score (1) means hazard exist.
- Score (0) means hazard does not exist.

Based on Table 5 results, most hazards exist in the communities of Christmas Valley, Sawmill/Highway 50, and Echo Summit. The least hazards exist within the communities of Heavenly and Highway 89N/Emerald Bay. Page 92 of the CWPP (Attachment B) identified the communities of Meyers, Sawmill/Highway 50, and Highway 89N/Emerald Bay as having the highest structural ignitability and there for the highest priority for structural improvements for wildfire protection. Several factors will be considered in choosing a community as priority for hazard reduction. Other factors such as land ownership and permitting can delay some projects and force other projects to move forward.

Benefit-Cost Review and Action Prioritization

The LVFPD LHMP committee utilized Benefit-Cost Review in Mitigation Planning (FEMA 386-5), which provided methods and examples to review benefits and costs, prioritize actions and document the entire process. All actions were identified through the planning process as described in Section I of this plan. LVFPD's planning committee conducted a broad review of actions. The

review covered monetary as well as non-monetary costs and benefits associated with each action. LVFPD's planning committee thought through the following questions:

- How many people are affected by the hazard?
- What is the area affected by the hazard?
- How many properties are affected by the hazard?
- What is the potential dollar amount in property damage?
- What is the potential loss in use (number of properties/physical assets [e.g., bridges] in number of days)?
- What is the potential loss of life (number of people)?
- What is the potential injury (number of people)?
- Is the risk reduction short- or long-term?
- Are other community goals achieved?
- Is the action easy to implement?
- Is funding available?
- Is the action politically or socially acceptable?
- Is there a construction cost (amount in $)?
- Is there a programming cost (amount in $, # of people needed to administer)?
- How long will the action take to implement?
- Is the action unfair to a certain social group?
- Is there a public or political opposition?
- Are there any adverse effects on the environment?

After reviewing the actions for benefits and cost, the LVFPD LHMP committee prioritized the actions. The committee placed an emphasis on Benefit-Cost Review as part of the prioritization process. By directly linking the prioritization process to the Benefit-Cost Review, LVFPD's process meets DMA 2000 requirements. The qualitative method (How-to Guide FEMA 386-5) described below helped the LVFPD accomplish the task of prioritizing actions:

Step 1: List identified actions

For each hazard, list the actions identified earlier in the plan.

Step 2: Identify benefits and costs

Identify all expected benefits (i.e., positive effects) and costs (i.e., perceived obstacles) of the actions and write these down in the benefits and costs columns, respectively.

Step 3: Assign priority

As a result of the Benefit-Cost Review, the Planning Team assigns a priority to each action. Priority can be expressed in many ways, such as:

- High, medium, low, accompanied by an explanation of what each term means.

- Priority 1, Priority 2, etc.
- Immediate, short-term, and long-term, accompanied by an explanation of what each category means (e.g., immediate = within a month, short-term = within 6 months, long-term = within 2 years).

The LVFPD completed all three steps as described above. The LHMP committee identified benefits and costs (see Attachment P). All actions were assigned a priority along with a time frame for completion based on the cost benefit review. The mitigation objectives section below describes the process in more detail.

Mitigation Objectives

The following is a list of objectives developed in conjunction with the overall goals of this plan. Within each objective, one or more actions designed to facilitate the realization of the objective are identified. The objectives are sorted by specific natural hazards and are arranged in the order of priority identified in the hazard rating table above. The highest priority actions are listed first, with the lowest priority actions listed last. Actions were prioritized as high, moderate or low through in the Benefit-Cost Review (see Attachment P). In general, high priority was given to actions requiring little if any funding or actions were there is already funding available. For-example, highest priority is given to fuel reduction projects because funding is available.

WILDLAND FIRE

Objective #1: Minimize the threat to lives, property and the environment posed by the possibility of wildland fire within the District.

Responsibility: LVFPD maintains responsibility for the protection of life, property and the environment from fire within its District. LVFPD provides this protection through our fire prevention program and by enforcing state and local fire ordinances designed to safeguard our community.

Objective 1.0: Removing sufficient dead, dying or suppressed trees and surface material from a forest stand can alter fire behavior. The removal process is referred to as fuel reduction. Larger, fire tolerant trees are less susceptible to fire. Reducing surface material in treatment areas minimizes fire flame heights. The LVFPD's CWPP recommends reducing hazardous fuels near structures and identifies several fuel reduction projects.

Action 1.0: Complete fuel reduction on lands identified in the Community Wildfire Protection Plan.
Timeframe: 10 years
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, volunteer labor, state and federal landowners, correctional crews

Administrators: LVFPD along with individual property owners, the California Tahoe Conservancy, El Dorado County Transportation, and the U.S. Forest Service Lake Tahoe Management Unit.
Responsible agency: LVFPD along with individual property owners, the California Tahoe Conservancy, El Dorado County Transportation, and the U.S. Forest Service Lake Tahoe Management Unit.

Objective 1.1: Removing sufficient dead, dying or suppressed trees and surface material near a structure along with the use of flame resistant building materials can reduce the ignitability of a structure. The LVFPD's CWPP and Tahoe Fire Commission Report recommend enforcement of the laws.

Action 1.1: Inspect for compliance with defensible space laws and enforce.
Timeframe: More than 30 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, Title III, SNPLMA
Administrators: LVFPD along with individual property owners and CALFIRE.
Responsible agency: LVFPD along with individual property owners, CALFIRE and Nevada Fire Safe Council

Objective 1.2**:** According to the Tahoe Fire Commission Report (Attachment Q), there are many homes in the basin which have wood shake shingle roofs that pose a risk to the dwelling and surrounding homes as well. Furthermore, the report recognizes that replacing wood shake shingle roofs is one of the most effective retrofits a homeowner can do. Finding 17A specifically states that "the use of appropriate building materials helps prevent homes from ignition in a fire." Finding 17B also states that "there is a need to require the retrofitting of such structures to make them safer from the hazards of catastrophic fire within the basin." Additionally, pages 91-93 of the CWPP recommend improving structure ignitability within the District as a priority.

Action 1.2: Replace roofs within Fire Safe Chapters to reduce structure ignitability.
Timeframe: 10 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, Title III
Administrators: LVFPD along with individual property owners and Nevada Fire Safe Council.
Responsible agency: LVFPD along with individual property owners and CALFIRE.

Action 1.3: Improve suppression capabilities and infrastructure or equipment where needed.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding
Administrators: LVFPD
Responsible agency: LVFPD

Action 1.4: Evaluate the use of increased patrol in remote areas of the community during fire season
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, Title III
Administrators: LVFPD along with individual property owners and Nevada Fire Safe Council, USFS or CALFIRE.

Responsible agency: LTBMU, CALFIRE, LVFPD

Action 1.5: Evaluate the use of cameras and remote sensing devices for early detection of fire.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, Title III
Administrators: LVFPD along with individual property owners and Nevada Fire Safe Council, USFS or CALFIRE.
Responsible agency: LTBMU, CALFIRE, LVFPD

Action 1.6: Implement ordinance requiring 100 feet of defensible space regardless of ownership.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, Title III
Administrators: LVFPD along with individual property owners and Nevada Fire Safe Council, USFS or CALFIRE.
Responsible agency: LTBMU, CALFIRE, LVFPD

Action 1.7: Develop evacuation centers with other responsible agencies.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding
Administrator: District's Fire and Fuels Division, TRPA, California Tahoe Conservancy and United States Forest Service Basin Management unit, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District
Responsible agency: LTBMU, CALFIRE, LVFPD

Action 1.8: Promote community green waste program for removal of vegetative material from private parcels.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding
Administrator: LVFPD, TRPA, South Tahoe Refuse
Responsible agency: LVFPD

Action 1.9: Develop partnerships with concerned citizen groups to identify and implement neighborhood-specific fire safety programs.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazard mitigation plan funding, Nevada Fire Safe Council, and residents of LVFPD
Administrator: LVFPD and Nevada Fire Safe Council
Responsible agency: LVFPD

SEVERE STORM

Objective #2: Lessen storm related damages for all types of severe storms that impact the District.

Responsibility: El Dorado County and the Departments contained therein. Although not directly responsible for, the LVFPD does render aid to victims of manmade and natural hazards. LVFPD

is also committed to the multi-agency coordination and preplanning exercises provided through the Emergency Management Community Council (EMCC).

Action 2.0: Provide public education on severe storm events via pamphlets, public service messages, and at public events.
Timeframe: 5 years.
Funding sources: LVFPD and El Dorado County
Administrator: LVFPD, local radio and newspaper
Responsible agency: LVFPD and El Dorado County

Action 2.1: Develop agency coordination for use of heavy equipment during major storm event
Timeframe: 5 years.
Funding sources: No funding required
Administrator: LVFPD, TRPA, California Department of Transportation, El Dorado County Public Works, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District.
Responsible agency: LVFPD and El Dorado County

Action 2.2: Develop evacuation centers with other responsible agencies.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: LVFPD and El Dorado County

Action 2.3: Survey district facilities to determine structural vulnerabilities to severe storms, including snow loads
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD
Responsible agency: LVFPD

Action 2.4: Develop flood maps for District and match to exposures of personnel, facilities and equipment.
Timeframe: 5 years.
Funding sources: No funding required
Administrator: LVFPD
Responsible agency: LVFPD

EARTHQUAKE

Objective #3: Minimize the threat to lives and property as a result of an earthquake within the Tahoe Basin.

Responsibility: El Dorado County and the Departments contained therein. Although not directly responsible for, the LVFPD does render aid to victims of manmade and natural hazards.

Action 3.0: Inspect all District buildings and, where applicable, upgrade structures to withstand earthquake events.
Timeframe: 5 years.
Funding sources: No funding required unless upgrade are required
Administrator: LVFPD and El Dorado County Building Dept
Responsible agency: LVFPD

Action 3.1: Educate homeowners on earthquake preparedness.
Timeframe: 5 years.
Funding sources: No funding required unless upgrade are required
Administrator: LVFPD and El Dorado County
Responsible agency: El Dorado County

Action 3.2: Develop agency coordination for evacuation centers
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County

Other Fires

Objective #4: Minimize the threat to lives and property posed by the possibility of other types of fires.

Responsibility: LVFPD maintains responsibility for the protection of life, property and the environment from fire within its District. LVFPD provides this protection by enforcing state and local fire ordinances designed to safeguard our community. LVFPD also maintains an active and extensive fire prevention program.

Action 4.0: With new building permit applications, ensure compliance with current fire and building codes.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazardous mitigation funds
Administrator: LVFPD
Responsible agency: LVFPD, California State Fire Marshal

Action 4.1: Promote fire safety in schools; ensure every grade level receives age appropriate material.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazardous mitigation funds
Administrator: LVFPD
Responsible agency: LVFPD, California State Fire Marshal, and the Lake Tahoe Unified School District

Action 4.2: Conduct business and commercial building inspections.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazardous mitigation funds
Administrator: LVFPD
Responsible agency: LVFPD, California State Fire Marshal

Action 4.3: Provide public education on fire prevention via pamphlets, public service messages, and at public events.
Timeframe: 5 years.
Funding sources: LVFPD, benefit assessment, hazardous mitigation funds
Administrator: LVFPD and El Dorado County
Responsible agency: LVFPD, El Dorado County

Wastewater spill or waterborne disease

Objective #5: Minimize the threat to life, property and the environment posed by the possibility of wastewater spill or waterborne disease within the District.

Responsibility: South Tahoe Public Utility District (STPUD) and El Dorado County and the Departments contained therein. Although not directly responsible for, the LVFPD does render aid to victims of manmade and natural hazards.

Action 5.0: Coordinate with South Tahoe Public Utility District on their response procedures and develop District response plan for unified command.
Timeframe: 5 years.
Funding sources: STPUD and hazardous mitigation funds
Administrator: STPUD
Responsible agency: STPUD

Action 5.1: Develop agency coordination for evacuation centers
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: STPUD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: STPUD

Action 5.2: Secure equipment, staffing and training for wastewater spill.
Timeframe: 5 years.
Funding sources: STPUD and hazardous mitigation funds
Administrator: STPUD
Responsible agency: STPUD

Contamination or chemical spill

Objective #6: Minimize the threat to life, property and the environment posed by the possibility of contamination or chemical spill within the District.

Responsibility: El Dorado County and the Departments contained therein. LVFPD maintains responsibility for the protection of life, property and the environment from hazardous material spills within its District.

Action 6.0: Coordinate with El Dorado County Environmental Health, and mutual aid departments on their response procedures.
Timeframe: 5 years.
Funding sources: El Dorado County hazardous mitigation funds
Administrator: El Dorado County
Responsible agency: LVFPD, El Dorado County Environmental Health, Regional Hazardous Materials Team

Action 6.1: Develop agency coordination for evacuation centers
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County

Action 6.2: Secure equipment, staffing and training for contamination or chemical spill.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County Environmental Health, Regional Hazardous Materials Team

LANDSLIDE
Objective #7: Minimize the threat to life, property and the environment posed by the possibility of a landslide within the District.

Responsibility: El Dorado County and the Departments contained therein. Although not directly responsible for, the LVFPD does render aid to victims of manmade and natural hazards.

Action 7.0: Coordinate with El Dorado County Public Works and Engineering, and California Department of Transportation and United States Geologic Survey on potential.
Timeframe: 5 years.
Funding sources: No funding required.
Administrator: LVFPD, El Dorado County Public Works and Engineering, and California Department of Transportation and United States Geologic Survey
Responsible agency: El Dorado County

Action 7.1: Develop agency coordination for evacuation centers, especially in the event roads in and out of the Basin are closed.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed

Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County

Action 7.2: Secure equipment, staffing and training for response to a landslide.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County

AVALANCHE

Objective #7: Minimize the threat to life, property and the environment posed by the possibility of an avalanche within the District.

Responsibility: El Dorado County and the Departments contained therein. Although not directly responsible for, the LVFPD does render aid to victims of manmade and natural hazards.

Action 7.0: Coordinate with Sierra Avalanche Center, California Department of Transportation, and local ski resorts on evaluating the threat.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort
Responsible agency: Sierra Avalanche Center, California Department of Transportation, and local ski resorts and El Dorado County

Action 7.1: Develop agency coordination for evacuation centers, especially in the event roads in and out of the Basin are closed.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County

Action 7.2: Secure equipment, staffing and training for response to an avalanche.
Timeframe: 5 years.
Funding sources: No funding required unless work is needed
Administrator: LVFPD, TRPA, Heavenly Lake Tahoe, Sierra at Tahoe Ski Resort, Lake Tahoe Unified School District, Emergency Management Community Council (EMCC).
Responsible agency: El Dorado County

IMPLEMENTING MITIGATION STRATEGIES

Many mitigation measures are pre-existing functional strategies. These actions are included as a means of reinforcing those current hazard mitigation efforts. Many are linked to District and jurisdictionally specific codes and ordinances or to existing plans such the District's Community Wildfire Protection Plan. In all cases, the District's Local Hazard Mitigation Plan seeks to function in harmony with, and as an enhancement to pre-existing plans, ordinances, rules and regulations.

Other mitigation actions are new and not a part of any preexisting District or organizational decree. In this case, the implementation of these action strategies will be contingent upon the necessary approvals from the appropriate governmental bodies and the securing of necessary funding from yet to be determined sources. Generally speaking, the District has little or no funding earmarked for natural hazard mitigation. Thus, the District and plan participants will look to secure federal and state natural hazard mitigation grant funding in an effort toward implementing mitigation strategies. A comprehensive list of federal mitigation programs, activities, and initiatives is available online through the Federal Emergency Management Agency's website. This information can be accessed at http://www.fema.gov/doc/fima/fmpai.

A primary emphasis will be placed upon implementing actions that provide the highest cost-to-benefit ratio. Knowing that funding is an ever-present issue, all effort will be given to identify actions most beneficial to the citizens and property within the District. The greatest natural hazard threat to lives and property is wildland fire. Wildland fire is the highest-scoring natural hazard threat in the Natural Hazard Probability / Risk Assessment Scoring Matrix and also is identified as the greatest natural hazard threat in the Natural Hazard Rating Table. Therefore, it is clearly indicated that mitigation actions focused toward reducing the threat of wildland fire in the District have the greatest cost-to-benefit ratios and will provide the greatest mitigative relief for the residents of the District.

PLAN MAINTENANCE

When the plan is updated, the LVFPD will assess how the LHMP maintenance process worked and identify whether changes to the process are needed. Taking into consideration future updates, adjustments to the method and schedule for maintaining the plan may be necessary to ensure its value for comprehensive risk reduction.

As the mitigation plan evolves through updates, the plan maintenance process serves as the basis for the next update, and the process of updating the plan shall provide the LVFPD with an opportunity to document progress in achieving mitigation goals. When the LVFPD prepares a plan update, the mitigation planning regulation at 44 CFR Part 201 requires that the plan discuss how the community was kept involved during the plan maintenance process over the previous five years.

This section includes the following three subsections:

- Monitoring, Evaluating, and Updating the Plan
- Incorporation into Existing Planning Mechanisms
- Continued Public Involvement

Monitoring, Evaluating, and Updating the Plan

The LVFPD shall be responsible for carrying out all monitoring of the plan on an annual basis and every five years as part of the EDC MHMP update. Monitoring may include periodic reports by those involved in implementing projects or activities, site visits, phone calls, and meetings conducted by the person responsible for overseeing the plan, or the preparation of annual reports that capture the highlights of the previously mentioned activities.

The LVFPD shall be responsible for evaluating the plan on an annual basis and every five years as part of the EDC MHMP update. The evaluation *should* assess, among other things, whether:

- The goals and objectives address current and expected conditions.
- The nature, magnitude, and/or type of risks have changed.
- The current resources are appropriate for implementing the plan.
- There are implementation problems, such as technical, political, legal, or coordination issues with other agencies.
- The outcomes have occurred as expected (a demonstration of progress).
- The agencies and other partners participated as originally proposed.

The LVFPD shall be responsible for updating the plan on an annual basis and every five years as part of the EDC MHMP update. The plan be will be updated within five years from the date of FEMA approval. As recommended the plan will be reviewed and updated on an annual basis or after a hazard occurrence to determine the effectiveness of programs, and to reflect changes in land development or programs that may affect mitigation priorities. Monitoring, evaluation, and updating activities should take place continuously within the five-year timeframe.

Incorporation into Existing Planning Mechanisms

The LVFPD will incorporate mitigation strategies, including the goals and objectives, and mitigation actions *into* other planning mechanisms. Information contained in this plan, including hazard identification and the risk assessment, will be integrated into other planning mechanisms. Although the LVFPD does not have a comprehensive plan, capital improvement plans or other long-range plan, the District does plan to develop a strategic plan. Where appropriate, mitigation actions will be incorporate into the strategic plan.

Continued Public Involvement

The District is committed to public involvement within this hazard mitigation plan. For both the plan evaluation and update, a public hearing will be held at a regularly scheduled Board meeting. The hearing will be publicized and the public will be asked for comment concerning the plan. With constant and concerned review, the Lake Valley Fire Protection District Local Hazard Mitigation Plan will continue to develop as an outstanding planning tool, helping the citizens create a safer place to live, work, and play.