4.7 Geology, Soils, Seismicity, and Mineral Resources

Introduction

To provide the context on which potential impacts of the proposed project can be assessed, this section presents information on the geologic, mineral, seismic, and soil setting of Plumas County. The environmental setting presents a description of local topography, geology, mineral resources, soil resources, and regional seismicity. The regulatory section includes a description of applicable State, local and regional plans and/or programs. A description of the potential impacts of the proposed project is also provided and includes the identification of feasible mitigation (general plan policies) to avoid or lessen the impacts. While background information regarding naturally occurring asbestos (ultramafic rock) conditions within Plumas County is described in this section, the air quality impacts associated with naturally occurring asbestos are addressed in Section 4.3 "Air Quality" and the public health impacts are addressed in Section 4.8 "Hazardous Materials and Public Safety" of this DEIR.

Summary of NOP Comments

Several public comments were received during the NOP scoping period suggesting that the DEIR address geologic hazard and mineral resource impacts.

Summary of Impact Conclusions

A summary of the soils and geologic-related impacts described in this section are provided below in **Table 4.7-1**.

TABLE 4.7-1
SUMMARY OF GEOLOGY, SOILS, SEISMICITY, AND MINERAL RESOURCES IMPACTS

Impact Number	Impact Topic	Impact Conclusion	Impact After Mitigation
Impact 4.7-1	Soil Erosion or Topsoil Loss	Less Than Significant	Less Than Significant
Impact 4.7-2	Exposure to Seismic-Related Hazards	Less Than Significant	Less Than Significant
Impact 4.7-3	Soil Stability	Less Than Significant	Less Than Significant
Impact 4.7-4	Expansive Soils	Less Than Significant	Less Than Significant
Impact 4.7-5	Loss of Mineral Resource	Less Than Significant	Less Than Significant
Impact 4.7-6	Mudflow or Seiche Hazard	Less Than Significant	Less Than Significant

Regulatory Setting

Federal and State Regulations

Executive Order 12699

If new construction of buildings owned, leased, constructed, assisted, or regulated by the federal government occurs in the County, Executive Order 12699, "Seismic Safety of Federal and Federally Assisted of Regulated New Building Construction," would apply to those structures. The Executive Order was signed by President George H. W. Bush on January 5, 1990 to further

the goals of Public Law 95-124, the "Earthquake Hazards Reduction Act of 1977," as amended. Guidelines and procedures for implementing the Executive Order were prepared in 1992 by the federal Interagency Committee on Seismic Safety in Construction. The guidelines establish minimum acceptable seismic safety standards, provide evaluation procedures for determining the adequacy of local building codes, and recommend implementation procedures. Each federal agency is independently responsible for ensuring appropriate seismic design and construction standards are applied to new construction under its jurisdiction.[1]

Under the original Executive Order 12699, the model code for the West Coast was the Uniform Building Code developed by the International Conference of Building Officials (ICBO). In 1994, the ICBO joined with other similar organizations in the Southeast and on the East Coast to form the International Code Council (ICC). In 2000, the ICC published the first International Building Code (IBC) based on the reassessment of earlier codes and the combined updated experience of ICC member organizations. The current 2006 IBC is the result of nearly 100 years of building code improvement and forms the basis of the California and County building codes, which are successively more stringent than the codes in force at the time of the implementation of the original federal guidelines.

Alquist-Priolo Earthquake Fault Zoning Act

The State legislation protecting the population of California from the effects of fault-line ground-surface rupture is the Alquist-Priolo Earthquake Fault Zoning Act (California Public Resources Code 1972, 1997). This Act was originally called the Special Studies Act, but was renamed in 1994. The Act was passed in response to the 1971 Sylmar Earthquake (also known as the San Fernando Earthquake), which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The primary purpose of the Act is to reduce the hazard of fault rupture by prohibiting the construction of buildings for human occupancy across the trace of an active fault.[2] The Act requires the State Geologist to delineate Earthquake Fault Zones along fault traces that are "sufficiently active" and "well defined." The zones extend 200 to 500 feet on either side of identified active fault traces and are revised periodically, as new information becomes available. The California Geologic Survey (CGS) has prepared nearly 600 maps delineating Earthquake Fault Zones.

No structures for human occupancy may be built across an identified active fault trace. An area of 50 feet on either side of an active fault trace is assumed to be underlain by the fault, unless proven otherwise. Proposed structures for human occupancy in an Alquist-Priolo Earthquake Fault Zone are permitted only following the completion of a fault location investigation report prepared by a California-registered Professional Geologist, usually in cooperation with a Geotechnical Engineer, and reviewed by a California-registered Professional Geologist. These reports conform to the guidelines set forth by CGS Note 49, Guidelines for Evaluating the Hazard of Surface Fault

[1] U.S. Department of Commerce, Technology Administration, National Institute of Standards and Technology, *Guidelines and Procedures for Implementation of the Executive Order on Seismic Safety of New Building Construction*, NISTIR 4852, 1992, pp. 1 through 7.

[2] Alquist-Priolo Earthquake Fault Zoning Act, California Public Resources Code, Division 2, "Geology, Mines, and Mining," Chapter 7.5 "Earthquake Fault Zones," Sections 2621 through 2630; signed into law December 22, 1972, most recently amended October 07, 1997.

Rupture, 1997a, and Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, 1997b. The investigations encompass the most recent information obtainable from the United States Geologic Survey (USGS), the CGS, and other published sources, as well as data recovered onsite from trenches, borings, test pits, and by geophysical methods. The location and structural design recommendations resulting from the investigation must be incorporated in the planning for, and structural design of, the proposed development (CGS, 2007).

The Act dictates that cities and counties withhold development permits for sites in an Earthquake Fault Zone until the fault location investigations demonstrate that the sites are not threatened by surface displacements from faulting. While several active faults traverse through the County, Plumas County is not located within a delineated Alquist-Priolo Earthquake Fault Zone.

Alfred E. Alquist Hospital Facilities Seismic Safety Act of 1983 (HFSSA) and Senate Bill 1953

If the construction of hospital buildings occurs in the County, the Hospital Facilities Seismic Safety Act of 1973, as amended by the Alfred E. Alquist Hospital Facilities Seismic Safety Act of 1983 (HFSSA), would apply to those structures. In response to the 1971 Sylmar earthquake, the California Legislature enacted laws which require that acute care hospitals be designed and constructed to withstand a major earthquake and ultimately to remain operational immediately after such an event. The HFSSA requires that construction and design plans for acute care hospitals in California be in full compliance with the regulations and standards developed by the Office of Statewide Health Planning and Development (OSHPD) pursuant to the HFSSA. The HFSSA preempts local regulatory authority over the design and construction of "health facilities," a category that includes hospital buildings and certain skilled nursing facilities. Under the HFSSA, OSHPD has the authority to review plans and specifications for such buildings, to conduct inspections, and to oversee the design and details of the architectural, structural, mechanical, plumbing, electrical, and fire and panic safety systems. Following the 1994 Northridge earthquake, Senate Bill 1953 (SB 1953) amended the HFSSA and reinforced the importance of retaining the structural integrity of medical facilities. By 2030, every "health facilities" building must be designed and constructed to remain standing and be operational following a major earthquake.[3]

California Building Code (CBC)

All development in the State of California must comply with the provisions of the California Building Code. The CBC provides minimum requirements for grading, building siting, development, and seismic design. Until January 1, 2008, the CBC was based on the then-current Uniform Building Code and contained Additions, Amendments and Repeals specific to building conditions and structural requirements in the state of California. The 2007 CBC, effective January 1, 2008, is based on the current (2006) International Building Code (IBC) and contains prominent enhancement of the sections dealing with fire safety, equal access for disabled persons,

[3] California Health and Safety Code, Sections 130000 – 1300025, 2005.

and environmentally friendly construction.[4] Each jurisdiction in the state may adopt its own building code based on the 2007 CBC. Local codes are permitted to be more stringent than Title 24, but, at a minimum, are required to meet all state standards and enforce the regulations of the 2007 CBC beginning January 1, 2008.

Chapter 16 of the CBC deals with Structural Design Requirements, including (but not limited to) regulations governing seismically resistant construction such as factors and coefficients used to establish seismic site class and seismic occupancy category for the soil/rock at a building location and the proposed building design. Chapter 18 deals with the requirements for foundation and soil investigations (Section 1802); excavation, grading, and fill (Section 1803); allowable load bearing values of soils (Section 1804); the design of footings, foundations, and slope clearances (Section 1805), retaining walls (Section 1806), pier, pile, driven, and cast in place foundation support systems (Section 1808, 1809 & 1810). Chapter 33 includes (but is not limited to) requirements for safeguards at work sites to ensure stable excavations and cut or fill slopes (Section 3304). Appendix J includes (but is not limited to) grading requirements for the design of excavations and fills (Sections J103 through J107) and for erosion control (Sections J109 & J110). Construction activities are subject to occupational safety standards for excavation, shoring, and trenching as specified in Cal-OSHA regulations (CCR, Title 8).

The County of Plumas uses the 2010 CBC as the basis for their building codes.

California Geological Survey Special Publications

The California Geological Survey produces a variety of on-line and hard-copy publications that provide guidance for individuals and municipalities addressing issues related to geology and geologic hazards including fault rupture, seismic groundshaking, liquefaction, landslides, settlement, etc. With the exception of Official Maps, such as Earthquake Fault Zones and Seismic Hazard Zones, these publications represent compendia of State legislation, professional judgment, and Best Management Practices recognized by the State of California as appropriate methods for investigating and mitigating geologic hazards. Although many of the guidelines have been adopted by the State for advisory purposes, none has the force of law in itself unless adopted specifically by a municipality as its "official" procedure. Most municipalities have not adopted any of these documents as official procedures, but expect their consultants to use them as intended – as the most practical and widely accepted guides for addressing issues arising from geologic conditions within the municipality's jurisdiction.

California Surface Mining and Reclamation Act of 1975

Enacted by the State Legislature in 1975, the Surface Mining and Reclamation Act (SMARA), Public Resources Code Section 2710 et seq., insures a continuing supply of mineral resources for the State. The act also creates surface mining and reclamation policy to assure that:

- Production and conservation of minerals is encouraged;

[4] California Building Standards Commission, *2007 California Building Code*, California Code of Regulations, Title 24, Part 2, Volumes 1 and 2, effective January 1, 2008.

- Environmental effects are prevented or minimized;
- Consideration is given to recreational activities, watersheds, wildlife, range and forage, and aesthetic enjoyment;
- Mined lands are reclaimed to a useable condition once mining is completed; and
- Hazards to public safety both now and in the future are eliminated.

Areas in the State (city or county) that do not have their own regulations for mining and reclamation activities rely on the Department of Conservation, Division of Mines and Geology, Office of Mine Reclamation to enforce this law. SMARA contains provisions for the inventory of mineral lands in the State of California. The State Geologist, in accordance with the State Board's Guidelines for Classification and Designation of Mineral Lands, must classify Mineral Resource Zones (MRZ) as designated below:

- **MRZ-1.** Areas where available geologic information indicates that there is minimal likelihood of significant resources.
- **MRZ-2.** Areas underlain by mineral deposits where geologic data indicate that significant mineral deposits are located or likely to be located.
- **MRZ-3.** Areas where mineral deposits are found but the significance of the deposits cannot be evaluated without further exploration.
- **MRZ-4.** Areas where there is not enough information to assess the zone. These are areas that have unknown mineral resource significance.

In addition to mineral resource conservation, the SMARA regulates surface mining operations within California. The California Mining and Geology Board has established reclamation regulations that fulfill the reclamation requirements of SMARA. SMARA requires that a mining report be submitted annually and include such information as the amount of land disturbed during the previous year, acreage reclaimed during the previous year, and amendments to local reclamation plans.

Mine Safety and Health Administration

The Mine Safety and Health Administration (MSHA), a division of the U.S. Department of Labor, administers the provisions of the Federal Mine Safety and Health Act of 1977. MSHA develops and enforces mandatory safety and health regulations pursuant to the Code of Federal Regulations that apply to all surface and underground mines located in the United States through inspections, rigorous training, and providing educational programs for employers and employees in the mining industry. The ultimate purpose is to eliminate fatal accidents, reduce the frequency and severity of nonfatal accidents, minimize health hazards, and promote improved safety and health conditions in mines throughout the nation. Project operations would be regulated by MSHA and periodic inspections would be performed under MSHA regulations to ensure maximum worker safety during project operation. The MSHA also conducts periodic safety inspections at specific project sites.

Seismic Hazards Map Act

The state regulations protecting the public from geologic and seismic hazards, other than surface faulting, are contained in California Public Resources Code, Division 2, Chapter 7.8 (the Seismic Hazards Mapping Act), described here, and 2007 California Code of Regulations (CCR), Title 24, Part 2 (the California Building Code), described above. Both of these regulations apply to public buildings, and a large percentage of private buildings, intended for human occupancy.

The Seismic Hazard Mapping Act was passed in 1990 following the Loma Prieta earthquake to identify and map seismic hazard zones for the purpose of assisting cities and counties in preparing the safety elements of their general plans, to encourage land use management policies and regulations that reduce seismic hazards, to reduce threats to public health and safety, and to minimize property damage caused by earthquakes. The act directs the CGS to identify and map areas prone to the earthquake hazards of liquefaction, earthquake induced landslides, and amplified groundshaking. The act requires site specific geotechnical investigations to identify potential seismic hazards and formulate corrective measures prior to permitting most developments designed for human occupancy within the Zones of Required Investigation.

As of August 2009, 117 official seismic hazard zone maps showing areas prone to liquefaction and landslides had been published in California. Most of the mapping is being performed in Southern California and the San Francisco Bay Area. CGS Special Publications 117, "Guidelines for Evaluating and Mitigating Seismic Hazards in California," provides guidance for the evaluation and mitigation of earthquake-related hazards for projects in designated zones of required investigations.

Environmental Setting

Regional Geology

Plumas County is located in the northern part of the Sierra Nevada geomorphic province. The Sierra Nevada province starts in the north at the Lassen Peak in the Cascade Range and continues southward to the Tehachapi Mountains. The Sierra Nevada range is primarily comprised of Cretaceous granitic features; remnants of Paleozoic and Mesozoic metavolcanic and metasedimentary rocks, and Cenozoic volcanic and sedimentary rocks. The Paleozoic and Mesozoic metavolcanic and metasedimentary rocks were intruded by the granitic features approximately 77 to 225 million years ago, resulting in local uplift and deformation of the overlying older rock. Regional uplift and rapid erosion of most of the overlying metamorphic rocks closely followed intrusion of the granitic features, exposing the underlying granitic rocks. Continued uplift and erosion, accompanied by volcanic activity and alpine glaciations resulted in the present pattern of deep-walled valleys that characterize the Sierra Nevada.

The Diamond Mountains dominate the eastern portion of the County, while the Sierra Nevada Range dominates the southwestern portion of the County. Similar to the mountain ranges of the Great Basin area, the Diamond Mountains were formed by a series tilted fault blocks, which created a series of parallel-lying elongated valleys separated by low elevation ridges. Mesozoic

granitic rocks dominate these features. Many of the valleys once contained lakes that have become extinct only recently in geologic time. Today, these valleys comprise a vast alluvial meadow system that forms the headwaters of the Feather River.

The area between the Diamond Mountains and the Sierra Nevada Range is referred to as the Plumas Trench, a low strip of land extending from the Sierra Valley to the American Valley. In geologic terms the Plumas Trench is an elongated northwesterly trending graben, with strongly folded basement rocks underlying the area. West of the Plumas Trench is the northern Sierra Nevada Range and the western portion of the Feather River Watershed. East of the Plumas Trench is the Sierra Valley, an ancient lakebed dominated by quaternary lacustrine and alluvial deposits.

Geologic Hazards

Geologic hazards pose a substantial danger to property and human safety, and are present due to the risk of naturally occurring geologic events and processes affecting human development. Therefore, the hazard is influenced by the degree of human development as much as by the frequency and distribution of major geologic events. Through analysis of these factors, the risks can be assessed for specific planning areas and may be mitigated to an acceptable level. Common geologic hazards present in Plumas County include seismic shaking, liquefaction, and slope failure.

Faults

Faults form in rocks when ground movement or stresses overcome the internal strength of a particular rock, resulting in a fracture. Faults are mapped and studied to determine earthquake hazards since they are where earthquakes tend to reoccur. A historical plane of weakness is more likely to fail under stress and strain than a previously unbroken block of crust. Consequently, faults are considered a prime indicator of past seismic activity, and faults with recent activity are presumed to be the best candidates for future earthquakes. However, since slip is not always accommodated by faults that intersect the surface along traces, and since the orientation of stresses and strains in the crust can shift, predicting the location of future earthquakes is complicated. Earthquakes can occur in areas with previously undetected faults or along faults previously thought inactive.

Within California, the California Geological Survey and U.S. Geological Survey have developed a system to assess the activity of faults. Under this system, faults are classified active if they have ruptured in the last 11,000 years or within the Holocene period. Other faults are considered inactive.

Earthquakes and Seismicity

Earthquakes are caused by sudden slips of tectonic plates along fault planes. Seismic shaking typically is the greatest cause of damage to structures during earthquakes because, unlike fault-line rupture, it can affect areas that are distant from the causative fault. Earthquakes can cause structural damage, injury, and loss of life, as well as damage to infrastructure networks such as water, power, gas, communication, and transportation lines. Other damage-causing effects of

The risk of seismic hazards to residents of Plumas County is based on the approximate location of earthquake faults within and outside of the County. As shown in **Figure 4.7-1**, several potentially active faults pass through Plumas County and have been mapped by the California Geological Survey, including the Almanor Fault, Butt Creek Fault Zone, Indian Valley Fault, and the Mohawk Valley Fault. Additionally, the Honey Lake and Fort Sage Faults are two active faults located east of the County. While these faults are within and near the County and could result in several seismic-related effects (i.e., groundshaking, etc.) to County residents and property, seismic hazard mapping indicates that the County has low seismic hazard potential. Additionally, the County is not located within a delineated Alquist-Priolo Earthquake Fault Zone.

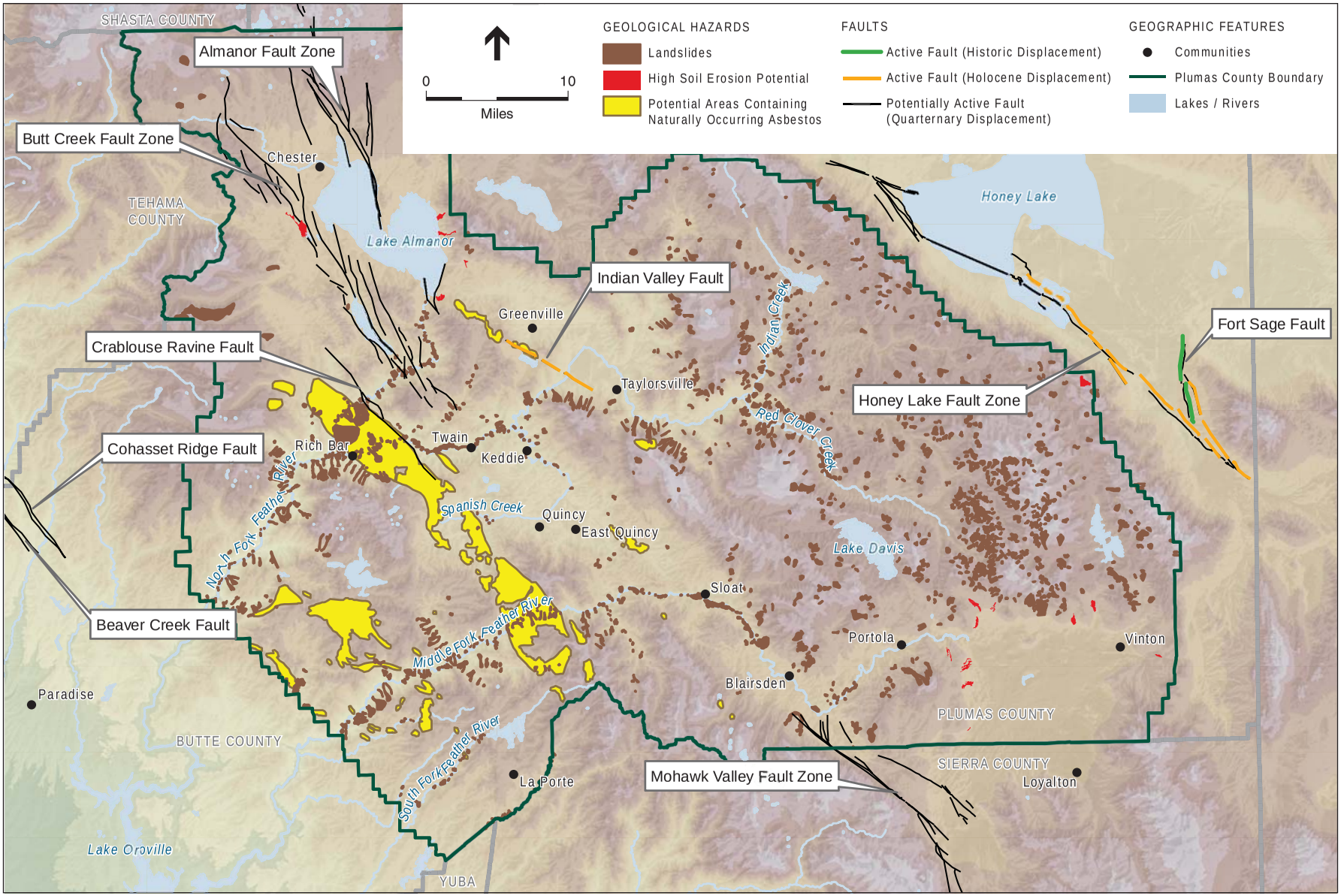
Table 4.7-2 provides the date, epicenter, and magnitude of major historical quakes that have affected Plumas County.

TABLE 4.7-2
MAJOR HISTORIC EARTHQUAKES IN THE PLUMAS COUNTY AREA
GREATER THAN MAGNITUDE 5.0

Date	Epicenter	Richter Magnitude at Epicenter
January 24, 1875	Honey Lake	6.2
April 29, 1888	Mohawk Valley	6.2
June 23, 1909	Downieville	5.9

Source: California Geologic Survey, 2012

In addition to the Richter magnitude, the Moment magnitude provides a useful measure of comparison between earthquakes and is more widely used for scientific comparison since it accounts for the actual slip that generated the earthquake. Actual damage from an earthquake is due to the propagation of seismic or ground waves from initial failure, and the intensity of shaking is as much related to earthquake magnitude as the condition of the underlying materials of the affected area. Loose materials tend to amplify ground waves, while hard rock can quickly attenuate them, causing little damage to overlying structures. For this reason, the Modified Mercalli Intensity (MMI) Scale provides a useful qualitative assessment of earthquake intensity. The MMI Scale is provided in **Table 4.7-3**, below.



SOURCE: ESA, 2012

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Figure 4.7-1

Seismic and Geologic Hazards

TABLE 4.7-3
EARTHQUAKE MAGNITUDE SCALES

Magnitude	Modified Mercalli Intensity Scale	Effects
0.1 – 0.9	I	Not felt except by a very few under especially favorable conditions.
1.0 – 2.9	II	Felt only by a few persons at rest, especially on upper floors of buildings.
3.0 – 3.9	III	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
4.0 – 4.5	IV	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
4.6 – 4.9	V	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
5.0 – 5.5	VI	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
5.6 – 6.4	VII	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
6.5 – 6.9	VIII	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
7.0 – 7.4	IX	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
7.5 – 7.9	X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.
8.0 – 8.4	XI	Few, if any (masonry) structures remain standing. Bridges destroyed. Rails bent greatly.
8.5 +	XII	Damage total. Lines of sight and level are distorted. Objects thrown into the air.

SOURCE: http://earthquake.usgs.gov/learning/topics/mag_vs_int.php, accessed July 23, 2012.

Seiches

Seiches are standing waves set up on rivers, reservoirs, ponds, and lakes when seismic waves from an earthquake pass through the area. Effects of seiches are similar to those of a tsunami. Water bodies (including Lake Almanor) near populated areas could be affected by seiches and result in public safety issues for lakeside residents and visitors.

Liquefaction Potential

Liquefaction is the phenomenon in which uniformly sized, loosely deposited, saturated, granular soils with low clay content undergo rapid loss of shear strength through the development of excess pore pressure during strong earthquake induced groundshaking of sufficient duration to cause the soil to behave as a fluid for a short period of time. Liquefaction generally occurs in saturated or near-saturated cohesion less soils at depths shallower than 50 feet below the ground surface. If the liquefying layer is near the ground surface, the effect for any structure supported on it is much like that of quicksand, resulting in sinking or tilting. If the layer is deeper in the subsurface, it can provide a sliding surface for materials above it, resulting in lateral motion

(spreading or lurching) toward any nearby 'free face' (shore bluff, river embankment, excavation wall).

Liquefaction related phenomena include vertical settlement from densification, lateral spreading, ground oscillation, flow failures, loss of bearing strength, subsidence, and buoyancy effects.

Liquefaction potential within Plumas County predominately exists in the meadows and low-lying areas composed of loose-medium-dense sandy soils. As most of the County is comprised of denser granular soils and bedrock at shallow depths, liquefaction potential is considered minimal.

Landslides

Landslides are downward and outward movements of slope-forming materials which may be rock, soil, artificial fill, or combinations of these materials. The size of landslides varies from small slumps or soil flows (usually containing less than one cubic yard of material) to massive soil and rock movements containing hundreds to millions of cubic yards of material. Large landslides may move downslope for hundreds of yards or even several miles, moving rapidly or so slowly (creep) that a change of position can be noted only over a period of weeks or years.

The susceptibility of a given area to landslides depends on a many variables, such as:

- **Steepness of slope** – landslides usually occur on moderate to steep slopes.
- **Type of slope material** – loose, unconsolidated soils and soft, weak rocks are more hazardous than are firm, consolidated soils or hard bedrock.
- **Structure and physical properties of materials** – the orientation of layering and zones of weakness relative to slope direction strongly affect landslide potential.
- **Water content** – increasing water content increases landslide hazard because water decreases resistance to sliding and adds weight to the materials on a slope.
- **Amount of vegetation** – abundant vegetation with deep roots increases slope stability.
- **Proximity to areas undergoing rapid erosion or man-made cuts** – undercutting slopes may greatly increase landslide potential.
- **Earthquake ground motions** – strong ground motion may trigger landslides in marginally stable slopes or loosen slope materials and thus increase the risk of future landslides.

The County is located in an area with varying topography and slopes. Areas with steep slopes in the County could be prone to landslides, mud slides and avalanches. Landslides are dependent on slope, geology, rainfall, excavation or seismic activity. Mud slides are often caused by heavy rainfall. Areas that have recently been subject to wildfire are susceptible to mudslides. Avalanches consist of a rapid flow of snow down a slope. They often reoccur in the same areas and can be triggered by varying weather patterns and human activity.

As shown in Figure 4.7-1, the volcanic soils in the eastern portion of the Plumas National Forest are prone to landslides. The figure also shows that areas concentrated along the North and Middle Forks of the Feather River are also susceptible to landslides.

Soil Types

Due to the County's unique geologic and climatic setting, the County also exhibits diverse soil conditions. Generally, the west side of the Sierra Nevada Range is comprised of deeper more productive soils than the east side. This is largely the result of warmer temperatures and higher precipitation on the west side. Additionally, the northern facing slopes have deeper, more productive soils than south facing slopes due to increased evaporation from more direct sun exposure.

Soil types within the County include Alfisols, Andisols, Aridisols, Entisols, Inceptisols, Mollisols and Ultisols in combination with mesic, frigid, or cryic soil temperature regimes and xeric, udic, aridic, or aquic soil moisture regimes. Soils within the County are also considered more highly erosive (granitic soils – see geologic and soil hazards section, below). Soil types within specific areas of the County are more fully described below.

The soils adjacent to Lake Almanor, along the Plumas Trough to Mohawk Valley are mostly Ultic Haploxeralfs, Dystric Lithic Xerochrepts, Ultic Palexeralfs, and Typic Haploxerults. They are mostly Lithic Haploxerolls, Typic Xerochrepts, and Ultic Haploxeralfs on ultramafic rocks; and Cumulic Endoaquolls and Typic and Cumulic Haplaquolls on basin floors. The soils are mostly well drained, but on basin floors soils are poorly drained. Soil temperature regimes are mostly mesic. Soil moisture regimes are mostly xeric, but aquic on basin floors. (Ecosystem Science Foundation, 2005).

Along the North Fork of the Feather River and the upper portion of the County, the soils on granitic rocks are mostly Dystric, Lithic, and shallow Typic Xeropsamments and Typic and Dystric Xerochrepts. On other kinds of rocks they are mostly Dystric Xerochrepts, Andic Xerumbrepts, Lithic Ultic and Ultic Haploxerolls, and Ultic Haploxeralfs. Overall, the soils are well drained. (Ecosystem Science Foundation, 2005).

The Middle Fork and the South Fork of the Feather River have a slightly different distribution of soils. The soils are mostly Typic, Dystric, and shallow Dystric Xerochrepts, Mollic and Ultic Haploxeralfs, Lithic Xeropsamments, and shallow Entic Haploxerolls on granitic rocks; and Typic Haploxerults, Xeric Haplohumults, Lithic and Dystric Lithic Xerochrepts, and Ultic Palexeralfs on other kinds of rocks. These soils are also well drained. Soil temperature regimes are mostly mesic and soil moisture regimes are xeric. (Ecosystem Science Foundation, 2005).

Soils in the eastern part of the County are mostly shallow Typic and Dystric Xeropsamments, Typic and Entic Xerumbrepts, and at lower elevations Ultic Haploxeralfs. Soils on volcanic rocks are mostly Lithic and Andic Xerumbrepts, Typic Argixerolls, and Andic Haploxeralfs. These soils are mostly well drained. Soil temperature regimes are mostly frigid, with some mesic, while soil moisture regimes are xeric. (Ecosystem Science Foundation, 2005).

The Frenchman area of the County is composed of Tertiary volcanic terrain north of Sierra Valley. These soils are mostly Ultic Argixerolls, Ultic Haploxeralfs, Andic Xerumbrepts, and a diverse group of shallow soils. Dystric Xeropsamments, Entic Haploxerolls, and Entic and Dystric Xerochrepts are common on granitic rocks. There are Cumulic Endoaquolls, Aridic Haploxerolls, and Aridic and Pachic Argixerolls on alluvial and lacustrine deposits. The soils are mostly well drained. Soil temperature regimes are mostly frigid, with some mesic in the valleys. Soil moisture regimes are mostly xeric, but some are aridic and some in the valleys are aquic. (Ecosystem Science Foundation, 2005).

Sierra Valley, which is in the block-faulted part of the Sierra Nevada at the head of the Middle Fork of the Feather River, lies just south of the Frenchman area. Soils are mostly Pachic and Aquic Argixerolls, Aridic Haploxerolls, Typic Haplaquolls, and Aquic Natrargids, plus Abruptic Xerollic Durargids on alluvial fans on the east side of the valley. These soil types are well to poorly drained. Soil temperature regimes are mesic. Soil moisture regimes are xeric on the west side, commonly aquic on the basin floor, and aridic on the east side of the valley. (Ecosystem Science Foundation, 2005).

Soil Hazards and Erosion

Soils are directly affected by individual land use changes and climate patterns since they lie at the surface, where development impacts are concentrated. Consequently, soil conditions are a primary consideration of most project-specific geotechnical investigation or soils reports. Soil types ideal for wildlife habitat or agriculture activities may not be suitable for building foundations or roadways. Once site-specific soil properties are identified, potential impacts on particular land use projects should be evaluated and necessary mitigations implemented. Improper design for specific soil conditions can cause public safety concerns and property loss resulting in significant financial losses. Common soil hazards present in Plumas County include erosion and expansive soils.

Erosion

Erosion is a natural and inevitable geologic process whereby earth materials are loosened, worn away, decomposed or dissolved, and are removed from one place and transported to another location. Precipitation, running water, and wind are all factors that contribute to erosion. Ordinarily, erosion proceeds very slowly as to be imperceptible, but when the natural equilibrium of the environment is changed, the rate of erosion can be greatly accelerated. Accelerated erosion within an urban area can cause damage by undermining structures, blocking storm sewers and depositing silt, sand, or mud in roads and tunnels. Consequently, these erosion effects can result in a variety of aesthetic, maintenance and engineering problems. Eroded materials are also eventually deposited into local waterways where the carried silt remains suspended for some time, constituting a pollutant and altering the normal balance of a waterway ecosystem. In Plumas County, erosion is a significant force that affects two distinct types of land use: agricultural/timber land and residential development.

Overall, the County is primarily characterized as having a moderate potential for soil erosion (see **Table 4.7-4**) based on available mapped data. Areas classified as having a low and high potential

for erosion are also found in the County, with a fairly significant portion of the County unclassified or not mapped. Areas with a high potential for erosion are identified on Figure 4.7-1 and coincide with locations located at higher elevations in the County.

TABLE 4.7-4
SOIL EROSION POTENTIAL IN PLUMAS COUNTY

Soil Erosion Potential	Acres in the County
High	2,040
Moderate	1,178,600
Low	31,590
Not Mapped	460,240

Notes: Erosion potential is based on "k" factor, which is an indication of a soil's inherent susceptibility to erosion, absent of slope and groundcover factors.

Expansive Soils

Expansive soils shrink and swell depending on moisture level as the clay minerals in these soils expand and contract. Soils with moderate or high expansion potential are susceptible to shrinking and swelling due to fluctuations in moisture content and are a common cause of foundation deterioration, pavement damage, cracking of concrete slabs, and shifting of underground utilities. According to the California Building Code, soils with an expansion index exceeding 91 are considered highly expansive; such soils would typically have a liquid limit of 40 or more and plasticity index exceeding 15. These soils are undesirable for use as engineered fill or subgrade directly underneath foundations or pavement, and must be replaced with non-expansive engineered fill or require treatment to mitigate their expansion potential.

Naturally Occurring Asbestos

Asbestos is a naturally occurring fibrous material found throughout California. Disturbance of rocks and soil (ultramafic rock) containing asbestos could lead to several public health issues. Exposure to asbestos fibers may result in health issues such as lung cancer, mesothelioma (a rare cancer of the thin membranes lining the lungs, chest and abdominal cavity), and asbestosis (a non-cancerous lung disease which causes scarring of the lungs). Figure 4.7-1 identifies areas with the potential to contain naturally occurring asbestos. The highest concentration of these mapped areas is found in the western portion of the County.

Impacts and Mitigation Measures

Methodology

The assessment of impacts to geologic and soil resources as well as analysis of seismic hazards is a qualitative review of the existing geologic, soil, and seismic conditions within the County and a determination of whether the proposed project includes adequate provisions to ensure safety for County residents, visitors and businesses as well as continued protection of these resources.

To reduce or mitigate potential hazards from earthquakes or other local geologic hazards, the County ensures that development proposals comply with local and State regulations. These

regulations include the California Building Code (with the Uniform Building Code incorporated by reference), the Alquist-Priolo Earthquake Fault Zoning Act, and the Seismic Hazard Mapping Act. Policies and implementation programs developed for the proposed project include continued conformance with these applicable local and State building regulations.

Significance Criteria

The significance criteria for this analysis were developed from criteria presented in Appendix G, Environmental Checklist Form", of the CEQA Guidelines and based on the professional judgment of the County of Plumas and its consultants. The proposed project would result in a significant impact if it would:

- Result in substantial soil erosion or the loss of topsoil;
- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    - Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
    - Strong seismic ground shaking.
    - Seismic-related ground failure, including liquefaction.
    - Landslides;
- Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse;
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code, creating substantial risks to life or property;
- Result in the loss or availability of a known mineral resource that would be of value to the region and the residents of the State;
- Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan;
- Result in the loss of availability of a known oil and/or gas resource that would be of value to the region and the residents of the State; or
- Result in inundation by seiche, tsunami, or mudflow.

Impact 4.7-1: Soil Erosion or Topsoil Loss

LTS	**The proposed project could result in substantial soil erosion or the loss of topsoil.**
	Level of Significance Before Mitigation: *Less than Significant*
	Required Additional Mitigating Policies and Implementation Programs*: None*
	Resultant Level of Significance: *Less than Significant*

Development activities resulting from implementation of the proposed project would accelerate the erosion rate through both an increase in short-term construction-related activities and an overall increase in the amount of impervious surfaces within all of the County's individual Planning Areas. Development in the County would be subject to local and State codes and requirements for erosion control and grading. In addition, project sites encompassing an area of one or more acres would require compliance with best management practices included as part of a National Pollutant Discharge Elimination System (NPDES) permit and consequently the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). This state requirement is restated in General Plan Policy W-9.2.5.

Additionally, the Goals and Policies Report addresses erosion-related impacts from a variety of perspectives including open space preservation, improved soil conservation practices, and by minimizing future develop within hazardous geologic areas. For example, W-9.2.3, W-9.2.4, W-9.2.5, W-9.2.6, COS-7.2.4, COS-7.3.2 and COS-7.3.4 relate specifically to monitoring design and construction activities through NPDES enforcement, requiring the use of Best Management Practices (BMPs), and other mitigation measures designed to control erosion and protect surface water and groundwater from the adverse effects of construction activities. Other policies from the Public Health and Safety Element (see Policies PHS 6.2.4 and PHS 6.2.5) limit construction-related activities and development in areas with slopes in excess of 30 percent or prone to avalanche, landslide or mudflow hazards, which could result in several public safety issues and increased hillside erosion. Additionally, Policies PHS 6.1.1 and PHS 6.1.3 limit development densities to reduce public safety issues and promote awareness and education among residents regarding possible natural hazards, including soil conditions, landslides, earthquakes, flooding, wildfire hazards and emergency procedures. Policies within the Conservation and Open Space and Agriculture and Forestry elements (COS-7.3.5 and AG/FOR-8.6.4) encourage agricultural property owners to use practices and participate in programs that reduce soil erosion and increase soil productivity.

TABLE 4.7-5
MITIGATING POLICIES AND IMPLEMENTATION MEASURES

Water Resources (W), Public Health and Safety (PHS), Conservation and Open Space (COS), and Agriculture and Forestry (AG/FOR) Elements			
Policies and measures designed to improve soil conservation practices and address soil erosion impacts include the following:			
W-9.2.3	County Facilities	AG/FOR-8.6.4	Soil Conservation
W-9.2.4	Wildfire and Water Quality Controls	COS-7.3.2	Soil Erosion and Vegetation Protection
W-9.2.5	Wastewater Standards and National Pollutant Discharge Elimination System (NPDES)	COS-7.3.4	Erosion Control Plan
W-9.2.6	Erosion and Sediment Control Measures	COS-7.3.5	Soil Improvement Practices
Policies designed to preserve open space areas and limit development within hazardous geologic areas include the following:			
PHS-6.1.1	Development Constraints	COS-7.2.4	Stream Corridor Development
PHS-6.1.3	Hazard Awareness and Public Education	COS-7.4.7	Location and Maintenance of Resource Transportation Routes
PHS-6.2.4	Development on Slopes		
PHS-6.2.5	Avalanche, Landslide and Mudflow Hazards		

Significance Determination

Adoption and implementation of the proposed policies and implementation programs (including the incorporation of modern erosion control practices) under the proposed project (in addition to current local, state, and federal stormwater, grading, and erosion control regulations described above) would ensure that soil erosion impacts would be reduced to a less-than-significant level.

This impact is considered ***less than significant***. No additional mitigation measures are required.

Significance Conclusion

Implementation of the proposed project would not result in significant erosion and water quality impacts and therefore associated impacts would be ***less than significant***.

Impact 4.7-2: Exposure to Seismic-Related Hazards

LTS	**The proposed project could expose people to injury or structures to damage from potential rupture of a known earthquake fault, strong groundshaking, seismic-related ground failure, or landslide.**
	Level of Significance Before Mitigation: *Less than Significant*
	Required Additional Mitigating Policies and Implementation Programs*: None*
	Resultant Level of Significance: *Less than Significant*

While Plumas County is not located within an Alquist-Priolo Earthquake Fault Zone, several potentially active faults pass through the County, including the Almanor Fault, Butt Creek Fault Zone, Indian Valley Fault, and the Mohawk Valley Fault. Additionally, the Honey Lake and Fort Sage Faults are two active faults located east of the County. While these faults are within and near the County and could result in several seismic-related effects (i.e., groundshaking, etc.) to County residents and property, seismic hazard mapping indicates that the County has low seismic hazard potential.

The proposed project includes several policies designed to address a variety of public health and safety issues resulting from seismic hazards. For example, the Public Health and Safety and Conservation and Open Space elements provides a number of policies that have been developed to ensure a safe environment for the County's residents, visitors, and businesses. These policies include continued compliance with all applicable development requirements (i.e., California Building Code, etc.), seismic retrofitting of structures (see policy PHS-6.2.2, PHS-6.2.3 and PHS-6.2.7), and the restriction of development in hazardous areas (see policies PHS-6.2.4, PHS-6.2.5 and COS-7.4.7). Additionally, Policies PHS 6.1.1 and PHS 6.1.3 limit development densities to reduce public safety issues and promote awareness and education among residents regarding possible natural hazards, including soil conditions (i.e., liquefaction), landslides, earthquakes, flooding, wildfire hazards and emergency procedures. The Public Health and Safety Element also includes a number of policies (PHS-6.7.1 through PHS-6.7.6) that require updating emergency response plans and facilities and providing training to ensure the County's ability to effectively respond to natural disasters, such as seismic events, and keep residents and visitors safe. With adherence to these codes and regulations and implementation of the policies contained in the Public Health and Safety and Conservation and Open Space elements, geologic hazard impacts associated with potential rupture of known earthquake fault, strong seismic groundshaking, liquefaction, and seismic-related ground failure would be minimized.

TABLE 4.7-6
MITIGATING POLICIES AND IMPLEMENTATION PROGRAMS

Conservation and Open Space (COS), Public Health and Safety (PHS), and Agriculture and Forestry (AG/FOR) Elements	
Policies designed to promote soil conservation and prevent future development in steep slope areas.	
COS-7.3.2 Soil Erosion and Vegetation Protection COS-7.3.4 Erosion Control Plan COS-7.3.5 Soil Improvement Practices	PHS-6.2.4 Development on Slopes PHS-6.2.5 Avalanche, Landslide and Mudflow Hazards AG/FOR- 8.6.4 Soil Conservation
Policies designed to minimize geologic hazard impacts to people and structures in the County include the following:	
PHS-6.1.3 Hazard Awareness and Public Education PHS-6.2.2 Design Measures PHS-6.2.3 Seismic Retrofitting PHS-6.2.7 Development Requirements PHS-6.7.1 Emergency Response Services Coordination with Government Agencies PHS-6.7.2 Mutual Aid Agreement	PHS-6.7.3 Maintenance of Emergency Evacuation Plans PHS-6.7.4 Streets and Highways Upgrades PHS-6.7.5 Search and Rescue PHS-6.7.6 Joint Exercises COS-7.4.7 Location and Maintenance of Resource Transportation Routes

Significance Determination

Implementation of the proposed project could potentially result in adverse impacts related to ground shaking and exposure to other seismic-related hazards. The majority of new development proposed under the proposed project would not occur in areas of high probability for strong seismic ground shaking. Additionally, primary mitigation for reducing risk would require new construction in Plumas County to comply with CBC seismic building criteria standards. These are designed to reduce ground shaking risks to acceptable levels by making new structures more resistant to seismic shaking damage, and they contain construction requirements that minimize the potential loss of life from an earthquake. Development in accordance with the proposed

project and enforcement of the CBC would ensure that impacts related to potential ground shaking, liquefaction, and other seismic-related hazards would be less than significant.

This impact is considered ***less than significant***. No additional mitigation measures are required.

Significance Conclusion

Implementation of the proposed project would not result in significant seismic hazard-related impacts and therefore associated impacts would be ***less than significant***.

Impact 4.7-3: Soil Stability

LTS	**The proposed project could result in potential structural damage from development on a potentially unstable geologic unit or soil.**
	Level of Significance Before Mitigation: *Less than Significant*
	Required Additional Mitigating Policies and Implementation Programs*: None*
	Resultant Level of Significance: *Less than Significant*

Implementation of the proposed project would result in new develop within previous undeveloped areas with the County's Planning Areas. As a result, more persons and structures could be exposed to geological hazards such as the effects from unstable geologic units or soils (including liquefaction, subsidence, or collapse). Newly constructed buildings, pavements, and utilities could be damaged by differential settlement due to soil expansion and contraction. Variations in ground settlement may ultimately lead to structural failure and damage to infrastructure. Impacts related to these types of geological hazards are site specific and would need to be evaluated on a site by site basis as development moves forward under the proposed project. Only geotechnical tests can determine the existence of unstable geologic units or soils(including liquefaction, subsidence, or collapse) at a particular site and, thus, the probability for structural damage.

Similar to the impact discussion provided above under Impact 4.7-2, the proposed project includes several policies designed to address a variety of public health and safety issues resulting from geologic and soil hazards. These policies include continued compliance with all applicable development requirements (i.e., California Building Code, etc.), seismic retrofitting of structures (see policy PHS-6.2.2, PHS-6.2.3 and PHS-6.2.7), and the restriction of development in hazardous areas (see policies PHS-6.2.4, PHS-6.2.5 and COS-7.4.7). Additionally, Policies PHS-6.1.1 and PHS 6.1.3 limit development densities to reduce public safety issues and promote awareness and education among residents regarding possible natural hazards, including soil conditions, landslides, earthquakes, flooding, wildfire hazards and emergency procedures. The Public Health and Safety Element also includes a number of policies (PHS-6.7.1 through PHS-6.7.6) that require updating emergency response plans and facilities and providing training to ensure the County's ability to effectively respond to natural disasters, such as seismic events, and keep residents and visitors safe. With adherence to these codes and regulations and

implementation of the policies contained in the Public Health and Safety and Conservation and Open Space elements, geologic hazard impacts would be minimized.

TABLE 4.7-7
MITIGATING POLICIES AND IMPLEMENTATION PROGRAMS

Conservation and Open Space (COS), Public Health and Safety (PHS), and Agriculture and Forestry (AG/FOR) Elements			
Policies designed to promote soil conservation and prevent future development in steep slope areas.			
COS-7.3.2	Soil Erosion and Vegetation Protection	PHS-6.2.4	Development on Slopes
COS-7.3.4	Erosion Control Plan	PHS-6.2.5	Avalanche, Landslide and Mudflow Hazards
COS-7.3.5	Soil Improvement Practices	AG/FOR- 8.6.4	Soil Conservation
Policies designed to minimize geologic hazard impacts to people and structures in the County include the following:			
PHS-6.1.3	Hazard Awareness and Public Education	PHS-6.7.3	Maintenance of Emergency Evacuation Plans
PHS-6.2.2	Design Measures	PHS-6.7.4	Streets and Highways Upgrades
PHS-6.2.3	Seismic Retrofitting	PHS-6.7.5	Search and Rescue
PHS-6.2.7	Development Requirements	PHS-6.7.6	Joint Exercises
PHS-6.7.1	Emergency Response Services Coordination with Government Agencies	COS-7.4.7	Location and Maintenance of Resource Transportation Routes
PHS-6.7.2	Mutual Aid Agreement		

Significance Determination

New development in accordance with the proposed project could result in construction activities overlying unstable soils (including those associated with liquefaction, subsidence, or collapse). However, no new structures would be permitted without development of a site-specific soil sampling and laboratory soils testing report and adherence to the recommendations outlined therein, such as the proper subsoil preparation, drainage, and foundation design for constructing on more unstable soils. These requirements (including those contained in policies under the proposed project) limit the potential for development to occur without design features to mitigate the risks associated with unstable geologic conditions and soils (including those associated with liquefaction, subsidence, or collapse).

This impact is considered ***less than significant***. No additional mitigation measures are required.

Significance Conclusion

Implementation of the proposed project would not result in significant geologic and soil hazard impacts and therefore associated impacts would be ***less than significant***.

Impact 4.7-4: Expansive Soils

LTS	**The proposed project could increase the potential for structural damage from development on expansive soil.**
	Level of Significance Before Mitigation: *Less than Significant*
	Required Additional Mitigating Policies and Implementation Programs*: None*
	Resultant Level of Significance: *Less than Significant*

Implementation of the proposed project would result in new develop within previous undeveloped areas with the County's Planning Areas. As a result, more persons and structures could be exposed to geological hazards such as the effects from expansive soils. Newly constructed buildings, pavements, and utilities could be damaged by differential settlement due to soil expansion and contraction. Variations in ground settlement may ultimately lead to structural failure and damage to infrastructure. Impacts related to these types of geological hazards are site specific and would need to be evaluated on a site by site basis as development moves forward under the proposed project. Only geotechnical tests can determine the existence of expansive soils at a particular site and, thus, the probability for structural damage.

Similar to the impact discussion provided above under Impact 4.7-2, the proposed project includes several policies designed to address a variety of public health and safety issues resulting from geologic and soil hazards. These policies include continued compliance with all applicable development requirements (i.e., California Building Code, etc.), seismic retrofitting of structures (see policy PHS-6.2.2, PHS-6.2.3 and PHS-6.2.7), and the restriction of development in hazardous areas (see policies PHS-6.2.4, PHS-6.2.5 and COS-7.4.7). Additionally, Policies PHS-6.1.1 and PHS 6.1.3 limit development densities to reduce public safety issues and promote awareness and education among residents regarding possible natural hazards, including soil conditions, landslides, earthquakes, flooding, wildfire hazards and emergency procedures. The Public Health and Safety Element also includes a number of policies (PHS-6.7.1 through PHS-6.7.6) that require updating emergency response plans and facilities and providing training to ensure the County's ability to effectively respond to natural disasters, such as seismic events, and keep residents and visitors safe. With adherence to these codes and regulations and implementation of the policies contained in the Public Health and Safety and Conservation and Open Space elements, geologic hazard impacts (including those associated with expansive soils) would be minimized.

TABLE 4.7-8
MITIGATING POLICIES AND IMPLEMENTATION PROGRAMS

Conservation and Open Space (COS), Public Health and Safety (PHS), and Agriculture and Forestry (AG/FOR) Elements			
Policies designed to promote soil conservation and prevent future development in steep slope areas.			
COS-7.3.2	Soil Erosion and Vegetation Protection	PHS-6.2.4	Development on Slopes
COS-7.3.4	Erosion Control Plan	PHS-6.2.5	Avalanche, Landslide and Mudflow Hazards
COS-7.3.5	Soil Improvement Practices	AG/FOR- 8.6.4	Soil Conservation
Policies designed to minimize geologic hazard impacts to people and structures in the County include the following:			
PHS-6.1.3	Hazard Awareness and Public Education	PHS-6.7.3	Maintenance of Emergency Evacuation Plans
PHS-6.2.2	Design Measures	PHS-6.7.4	Streets and Highways Upgrades
PHS-6.2.3	Seismic Retrofitting	PHS-6.7.5	Search and Rescue
PHS-6.2.7	Development Requirements	PHS-6.7.6	Joint Exercises
PHS-6.7.1	Emergency Response Services Coordination with Government Agencies	COS-7.4.7	Location and Maintenance of Resource Transportation Routes
PHS-6.7.2	Mutual Aid Agreement		

Significance Determination

New development in accordance with the proposed project could result in construction activities overlying expansive or unstable soils. However, no new structures would be permitted without development of a site-specific soil sampling and laboratory soils testing report and adherence to the recommendations outlined therein, such as the proper subsoil preparation, drainage, and foundation design for constructing on more unstable soils. These requirements (including those contained in policies under the proposed project) limit the potential for development to occur without design features to mitigate the risks associated with unstable geologic conditions and soils.

This impact is considered ***less than significant***. No additional mitigation measures are required.

Significance Conclusion

Implementation of the proposed project would not result in significant geologic and soil hazard impacts and therefore associated impacts would be ***less than significant***.

Impact 4.7-5: Loss of Mineral Resource

LTS	**The proposed project could result in the loss of availability of a known mineral resource, or a locally important mineral resource recovery site that would be of value to the region and residents of the State.**
	Level of Significance Before Mitigation: *Less than Significant*
	Required Additional Mitigating Policies and Implementation Programs*: None*
	Resultant Level of Significance: *Less than Significant*

Plumas County has a long history of mining and mineral production activities (i.e., copper, gold, etc.). While mining activity and employment has been declining in recent years, some mining and

mining reclamation activities still occur within the County. Implementation of the proposed project would result in new urban development within undeveloped areas of the County. However, the proposed project includes various policies that require the conservation of areas with significant mineral resources, as well as an emphasis of focused new development within designated Planning Areas. This land use approach is designed to preserve significant undeveloped areas and minimize encroachment and potential land use conflicts into mineral resource extraction areas.

The proposed project includes a number of policies in the Conservation and Open Space Element designed to conserve this important County resource. For example, Policies COS-7.4.1, COS-7.4.2 and COS-7.4.4 recognize the important contribution of mineral resources to both the local and regional economy and provide for the future conservation of identified and/or potential mineral deposits within the County.

Policies LU-1.2.1and COS-7.1.1 provide for an appropriate range of land use types and densities within the County and limit the development of incompatible land uses adjacent or near identified or potential mineral deposits. Policy COS-7.4.2 identifies "mining resource production areas" whose location have accessibility, surrounding land uses, and environmental setting that will permit extraction of materials without major adverse environmental impacts. Policy COS-7.4.7 requires that new mineral resource transportation routes avoid incompatible areas, including residential, recreational, and school areas. Additionally, other policies (see COS-7.4.3, COS-7.4.5 and COS-7.4.6) ensure that mineral extraction operations are performed in a manner compatible with land uses on the site and surrounding area and do not adversely affect the surrounding environment.

TABLE 4.7-9
MITIGATING POLICIES AND IMPLEMENTATION PROGRAMS

Conservation and Open Space (COS) Elements			
Policies designed to promote environmental practices and the efficient use of mineral extraction resources include the following:			
COS-7.4.1	Mineral Resource Area Identification	COS-7.4.4	Mineral Resource Preservation
COS-7.4.2	Mining Resource Production Areas	COS-7.4.5	Mineral Resource Operations
COS-7.4.3	Resource Permitting	COS-7.4.6	Mining Site Reclamation
Policies designed to minimize future land use conflicts associated with mineral extraction activities include the following:			
LU-1.2.1	Land Use Designations	COS-7.4.5	Mineral Resource Operations
COS-7.4.1	Mineral Resource Area Identification	COS-7.4.7	Location and Maintenance of Resource Transportation Routes
COS-7.4.2	Mining Resource Production Areas		

Significance Determination

Implementation of the proposed project would not result in the loss of availability of a known mineral resource of value to the region or the residents of the state. In addition, the policies contained in the proposed project address the need to protect access to mineral resources in the County and have been designed to address both environmental and land use conflicts with surrounding development. This would be achieved through compliance with applicable laws that govern surface mining and reclamation and by implementing policies to assist in the proper

placement or expansion of mining activities. This impact is considered ***less than significant***. No additional mitigation measures are required.

Significance Conclusion

Implementation of the proposed project would not result in significant mineral extraction or land use conflict impacts and therefore associated impacts would be ***less than significant***.

Impact 4.7-6: Mudflow or Seiche Hazard

LTS	**The proposed project could expose persons and property to seiche or mudflow hazards.**
	Level of Significance Before Mitigation: *Less than Significant*
	Required Additional Mitigating Policies and Implementation Programs*: None*
	Resultant Level of Significance: *Less than Significant*

Implementation of the proposed project could result in new urban and agricultural development in undeveloped areas. As a result, more persons and structures would be exposed to hazards related to seiches and mudflows (see Figure 4.7-1). However, the proposed project includes various policies that require the avoidance of areas with naturally occurring hazards (i.e., liquefaction, steep slopes, mud flows, etc.), as well as an emphasis of focused new development within designated Planning Areas.

Similar to the impact discussion provided above under Impact 4.7-2, the proposed project includes several policies designed to address a variety of public health and safety issues resulting from geologic and soil hazards. These policies include continued compliance with all applicable development requirements (i.e., California Building Code, etc.) and the restriction of development in hazardous areas (see policies PHS-6.2.4, PHS-6.2.5 and COS-7.4.7). Additionally, Policies PHS 6.1.1 and PHS 6.1.3 limit development densities to reduce public safety issues and promote awareness and education among residents regarding possible natural hazards, including hazardous soil conditions, landslides, and mud flow areas. The Public Health and Safety Element also includes a number of policies (PHS-6.7.1 through PHS-6.7.6) that require updating emergency response plans and facilities and providing training to ensure the County's ability to effectively respond to natural disasters, such as seismic events, and keep residents and visitors safe. With adherence to these codes and regulations and implementation of the policies contained in the Public Health and Safety and Conservation and Open Space elements, seiche and mudflow impacts would be minimized.

TABLE 4.7-10
MITIGATING POLICIES AND IMPLEMENTATION PROGRAMS

Conservation and Open Space (COS), Public Health and Safety (PHS), and Agriculture and Forestry (AG/FOR) Elements			
Policies designed to promote soil conservation and prevent future development in steep slope areas.			
COS-7.3.2	Soil Erosion and Vegetation Protection	PHS-6.2.4	Development on Slopes
COS-7.3.4	Erosion Control Plan	PHS-6.2.5	Avalanche, Landslide and Mudflow Hazards
COS-7.3.5	Soil Improvement Practices	AG/FOR- 8.6.4	Soil Conservation
Policies designed to minimize geologic hazard impacts to people and structures in the County include the following:			
PHS-6.1.3	Hazard Awareness and Public Education	PHS-6.7.3	Maintenance of Emergency Evacuation Plans
PHS-6.2.2	Design Measures	PHS-6.7.4	Streets and Highways Upgrades
PHS-6.2.3	Seismic Retrofitting	PHS-6.7.5	Search and Rescue
PHS-6.2.7	Development Requirements	PHS-6.7.6	Joint Exercises
PHS-6.7.1	Emergency Response Services Coordination with Government Agencies	COS-7.4.7	Location and Maintenance of Resource Transportation Routes
PHS-6.7.2	Mutual Aid Agreement		

Significance Determination

Within Plumas County, the areas with the greatest possibility of seiche or mudflow impacts are generally not populated. No anticipated increase in exposure to these hazards is expected over existing levels. However, there is a remote possibility that mudflows could inundate some areas where significant slopes are located. However, in terms of mudflow, no development would be permitted on slopes greater than 30% without mitigated exception. In addition, new development would be required to meet all applicable standards of the CBC, which includes standards related to slope stability. Therefore, adherence to policies under the proposed project would ensure that no additional exposure to these hazards would be created.

This impact is considered ***less than significant***. No additional mitigation measures are required.

Significance Conclusion

Implementation of the proposed project would not result in significant seiche or mudflow impacts and therefore associated impacts would be ***less than significant***.