

4.2 GEOLOGY, SOILS AND SEISMICITY

A Geotechnical Review of the project area was prepared by Taber Consultants (September 7, 1999) and is part of the Project Study Report for this project, which is available for review at the locations listed in Section 2.7 of this EIR.

4.2.1 ENVIRONMENTAL SETTING

GEOLOGY

The proposed project area is located within the southern portion of the Klamath Mountains Geologic Province. Within Trinity County, the Province is generally mountainous with peaks ranging between 5,000 and 9,000 feet in elevation. The upper elevations show signs of glaciation although glaciers have retreated in this area. The mountains are generally northwesterly trending.

The terrain is steep within the project area, and the existing and proposed road alignment parallels the course of Hayfork Creek, approximately 5 to 20 meters (15 to 65 feet) above the creek bed. The existing road is two lanes in the project area, with high, steep cutbanks on the upslope side and steep slopes below the road to Hayfork Creek. A number of small, shallow slope failures have been observed along Hyampom Road. However, no evidence of deep-seated failures was observed along the segment of Hyampom Road that lies within the project area (Taber Consultants, 1999; FHWA, 2001). The geotechnical review that was completed for the project in addition to the FHWA Reconnaissance and Scoping Report noted rock failures at existing cut slope locations, localized embankment slope failures, and areas of water erosion of the road and slope (Taber Consultants, 1999; FHWA, 2001).

SOILS

The southern portion of the Klamath Mountains Geologic Province contains soils that are generally stable (FHWA, 2001). The area is underlain by granitic rocks of Jurassic and Cretaceous origin, chiefly hornblende diorite, quartz diorite, and granodiorite, including minor gabbro and granite. The general soil type in the area is Class VII, i.e., fairly well suited for grazing or forestry, very steep slopes, very shallow soils which are subject to with a tendency toward erosion (Hahn, Wise and Associates, 1973). A Natural Resource Conservation Service Soil Survey report has not been prepared for the project area. Along the roadway, the thickness of loose native soil exposed at the top of cuts is variable, but generally less than 1 meter (3 feet) (Taber Consultants 1999). Soils in the project area could be subject to erosion and potential landslides, however lateral spreading, subsidence, liquefaction, or collapse are not expected to occur (McMillan, 1974b). Project construction and design will be completed so as to lessen the potential for erosion and slope instability. Based on the nature of the parent material, expansive soils are not expected to be encountered.

SEISMIC HAZARDS

Active faults are not known to be present within the project area. The nearest active fault is the Yager fault located 45 km to the west. Pre-Quaternary thrust faults are located four km to the southwest and six km to the northwest (Taber, 1999). Seismic shaking can occur in the area, however, the seismic risk is relatively small, with peak ground accelerations estimated at 20-30% g (i.e., percent of gravity; CDCDMG, 1998). The project elevation, topography and terrain, and the underlying materials indicate that the area is not susceptible to liquefaction, therefore it is not expected that lateral spreading, subsidence, liquefaction, or collapse would pose a threat to the proposed project.

4.2.2 PLANNING DOCUMENT GOALS, OBJECTIVES, AND POLICIES

TRINITY COUNTY GENERAL PLAN SAFETY ELEMENT

The Trinity County General Plan Safety Element contains the following applicable goals, objectives, and policies related to geology, soils, and seismicity:

- S.4 Seismic Safety Goal: Reduce the threat to life and property from seismic and geologic hazards.
- S.4.1 Objective: Promote safety from seismic and geologic hazards.
 - Policy B. Geologic hazards and seismic safety shall be considered in the preparation of environmental documents as required by the California Environmental Quality Act.
 - Policy C. Building design and construction shall promote seismic safety and structural integrity.
 - Policy E. The County shall confirm that all construction and grading activities done will not adversely affect the stability of any slope.
 - Policy F. Building design and construction shall consider soil conditions prior to development.

TRINITY COUNTY GENERAL PLAN OPEN SPACE AND CONSERVATION ELEMENT

The Trinity County General Plan Open Space and Conservation Element contains the following applicable objective and recommendation related to geologic resources:

- Objective: The objective is to protect the natural resources that are important to Trinity County and preserve areas which are important as commercial natural resources for future generations.
 - Recommendation: Conserve lands which provide valuable natural mineral deposits for potential future use.

TRINITY COUNTY REGIONAL TRANSPORTATION PLAN

The Trinity County Regional Transportation Plan contains the following goals, objectives, and policies related to geology, soils and seismicity impacts of the proposed project:

- Goal 7.1: To coordinate this plan with adopted environmental goals and policies addressed in the Trinity County General Plan and other documents. These goals and policies include, but are not limited to air, water, timber, and land management plans.
- Objective 7.1.1: Support those social, economic, recreational, safety, and service needs of the people in Trinity County which will preserve the quality of life outlined in the County General Plan.
 - Policy 7.1.1C: Assign funding priority to projects which would reduce or eliminate existing environmental impacts.
 - Policy 7.1.1G: The appropriate state and county agencies shall revegetate highly eroded areas, to the extent feasible, along highways and roads.
 - Policy 7.1.1H: The appropriate state and county agencies shall take active measures to stabilize unstable areas to the extent feasible along highways and roads.

SHASTA-TRINITY NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN

The proposed action area is included in Management Area 17, Hayfork Creek, and Management Area 19, Indian Valley/Rattlesnake of the Shasta-Trinity National Forests Land and Management Plan (LMP; USDA, 1995). The *Shasta-Trinity National Forest Land and Resource Management Plan (LMP)* policies regarding geologic resources that relate to the proposed project are as follows (USDI, 1995):

Applicable Forest Goals related to geologic resources include the following:

- Provide for the orderly development of mineral resources.
- Maintain or improve soil productivity and prevent excessive surface erosion, mass wasting, and cumulative watershed impacts.

Applicable Forest Standards and Guidelines include the following:

- Analyze each land disturbing project for its effect on the appropriate 2nd or 3rd order watershed to prevent excessive cumulative impacts on stream channel condition and water quality.
- Management activities within 5th order watersheds, which are in condition class 3, will emphasize watershed improvement and overall reduction in ERA levels.
- Implement BMPs for protection or improvement of water quality, as described in “Water Quality Management for National Forest System Lands in California,” for applicable management activities. Determine specific practices or techniques during project level planning using information obtained from on-site soil, water, and geology investigations.

- Implement Forest Soil Quality Standards and the Forest supplement of the Regional BMPs for areas identified as having highly erodible soil. Specifically, apply the special practices dealing with timber harvest, site preparation, and road construction in highly erodible soils.
- Forest Soil Quality Standards, in relation to ground cover, soil organic matter, and soil porosity will be used to protect soil productivity.
- Identify and treat areas with a degraded watershed condition in a cost-effective manner and according to beneficial use priorities. High priority items include domestic use, anadromous fish habitat, and sensitive species habitat. Improvement activities will be designed to meet Management Area objectives.
- Give full recognition to the tendency for erosion, mass land movement, and severe watershed damage potential when implementing vegetation management and related land management activities.
- Assess the potential impacts of vegetation management, road construction, and related activities on slope stability and watershed condition for areas identified as moderately or highly unstable.

Supplemental LMP management direction for geologic resources within Management Area 17 includes the following:

- When implementing projects, recognize the potential for cumulative watershed effects, especially within the Gulch watershed.

Supplemental LMP management direction for geologic resources within Management Area 19 includes the following:

- When implementing projects, recognize the potential for mass wasting and severe watershed damage. This is particularly true in the inner gorges along the South Fork Trinity River
- When implementing projects, recognize the potential for cumulative watershed effects, especially within the Rattlesnake Creek and Butter Creek watersheds.

4.2.3 SIGNIFICANCE CRITERIA

Appendix G of the CEQA *Guidelines*, the CEQA Environmental Checklist, poses the following questions to be considered in determining whether the project would cause significant floodplain impacts:

Would the project:

- Result in the loss of 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?

- 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? Refer to Division of Mines and Geology Special Publication 42.
 - Strong seismic ground shaking?
 - Seismic-related ground failure, including liquefaction?
 - Landslides?
- Result in substantial soil erosion or the loss of topsoil?
- 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 (1997), creating substantial risks to life or property?
- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

4.2.4 IMPACTS AND MITIGATION MEASURES

PERMANANT IMPACTS AND MITIGATION MEASURES

Development of the proposed project would result in no change in underlying geologic materials or structure. There are no known unique geologic resources located within the project area. Rock material within the project area is considered suitable for construction of the proposed project. Although placer deposits of gold are known to occur in Hayfork Creek, the project would not result in the loss of availability of those mineral resources. Although realignment and minor widening of the roadway will require grading and ground preparation, it will not result in significant topographic change.

Septic tanks and leach systems are not proposed as part of the project. Temporary portable toilets will be used during construction of the project.

Geology Impact – 1: The proposed project may result in soil erosion and slope instability.

The project will disturb earth by grading, cutting and filling, and therefore would increase erosion potential during and shortly after construction, until revegetation is established. Short-term, construction-related, erosion control would include sediment barriers, synthetic slope covers, hydroseeding, etc. Long-term erosion control, particularly for embankment slopes, would include establishing vegetation and controlling surface water flow and subsurface drainage. Rock slope protection and retaining wall systems will be constructed to address the high potential for slope instability and erosion within the project area. The replacement of the culvert at James Creek will eliminate the potential for culvert plugging and resulting overtopping of the road or erosion of road base and fill material. The installation of more frequent ditch relief culverts, underdrains, inlet and outlet protection and other proposed improvements to the surface and subsurface drainage systems will also reduce the existing erosion of road fill and native materials adjacent to the road.

The roadway will be designed with the use of all-weather (i.e., paved) surfaces and sufficient drainages, which will minimize long-term sediment yield into Hayfork Creek.

Specific erosion control measures will be developed in the project design phase and specific locations of erosion control devices will be detailed in the project plans and specifications.

Significance: Potentially Significant, but mitigated.

Geology Mitigation –1 Areas disturbed during construction will be stabilized and revegetated in accordance with a revegetation plan prepared by TCDOT in consultation with the Forest Service as part of the design phase of the project and incorporated into the project plans and specifications. The following seed mix is proposed for use during revegetation, pending approval by the Forest Service: California brome (*Bromus carinatus*), Blue wildrye (*Elymus glaucus*), Idaho fescue (*Festuca idahoensis*), Lotus (*Lotus crassifolius/L. purshianus*), and Arroyo lupine (*Lupinus succulentus*). The seed will be obtained from a supplier that has certified weed-free stock genetically related to natives found in Trinity County. Seed, fiber, commercial fertilizer and water will be applied by hydroseeding, in accordance with methods identified as Type D erosion control measures in Section 20-2 through 20-3 of the Caltrans Standard Specifications. Seed will be applied in the fall or spring, when soils are moist or expected to be moist soon after distribution. Certified weed-free straw or rice straw will be used for mulching the reseeded areas. The straw will be applied with the hydroseed mix, or spread at least two inches thick and in a way to insure good contact with the soil. No herbicides or pesticides shall be applied.

Significance After Mitigation: Less than Significant

Geology Impact – 2: The proposed project could expose people or structures to seismic hazards.

Preliminary geotechnical review indicates no active or potentially active faults or deep-seated slope failures on or adjacent to the project site. The proposed project is therefore not expected to expose people to loss, injury or death involving seismic hazards. The project would be exposed to seismic shaking at levels commonly experienced in Trinity County. The roadway improvements will be designed by a California-Registered Civil Engineer in accordance with the Caltrans Design Manual, AASHTO Design Guide, and California Standard Plans and Specifications. The proposed structures will be designed by a California-Registered Civil or Structural Engineer to withstand anticipated seismic hazards. The project is a roadway, not a habitable structure. By improving the road and stabilizing cut slopes, the project would actually reduce the exposure of people to risk from seismic hazards.

Significance: Less Than Significant Impact

Mitigation Measure: None Required

Geology Impact – 3: The proposed project could impact the potential for minerals recovery.

Mines, claims, and mineral deposits are present within the project vicinity, but no locally important mineral resource recovery sites are delineated on local plans (Hahn, Wise and Associates, 1973; TCPD, 1990). Existing mining claims and mineral resources in the project vicinity will continue to be available once the project is constructed.

Significance: Less Than Significant Impact

Mitigation Measure: None Required

TEMPORARY IMPACTS AND MITIGATION MEASURES

Geology Impact-4: Construction activities associated with the project would temporarily expose soils to wind and water erosion within the proposed project area.

The project will involve new cuts and fills, excavation, grading, and construction zone soil disturbance on steep slopes. Excavations into inboard slopes and/or fill onto outboard slopes will be required to achieve the desired width. Fills up to 9 meters (30 feet) high at slopes of 1 vertical to 1.5 horizontal, and cuts up to 18 meters (60 feet) high at slopes of 1 to 1 are anticipated. Disturbed soils may be subject to erosion. As discussed above, permanent erosion control measures shall be incorporated into the project plans and specifications. The project Plans and Specifications will include specific methods and locations of both temporary and permanent erosion control structures, materials and Best Management Practices. Further

details for temporary erosion controls during construction will be included in the Stormwater Pollution Prevention Plan prepared by the contractor and approved by the TCDOT engineer. In addition, the contractor would be required to implement water pollution control measures that are included in Section 7-1.01G of the Caltrans Standard Specifications. The Project Description (see Section 3.6.17, 3.6.18 and 3.6.19) contains excerpts from the Caltrans Standard Specifications and other measures to prevent erosion. In addition, the following mitigation is proposed.

Significance: Potentially Significant, but mitigated.

Geology Mitigation-2 The following measures will be implemented:

- **Soil exposure will be minimized during construction through the use of standard Best Management Practices, including but not limited to geofabrics, silt fences, straw bales and wattles, and temporary sediment basins. Exposed dust-producing surfaces will be sprinkled daily until wet while avoiding producing runoff.**
- **The TCDOT contractor will conduct daily inspections and maintenance of erosion and sediment control measures. Failures will be repaired each workday if they occur.**
- **All temporary erosion and sediment control measures will be removed after the working area is stabilized or as directed by the project engineer.**

Significance After Mitigation: Less than significant

CUMULATIVE IMPACTS AND MITIGATION MEASURES

Geology Impact –5: The proposed project could add to cumulative increases in soil erosion due to development within the project vicinity.

The construction of the proposed project and other projects proposed for the vicinity will result in some increased exposure of soils to wind or water erosion. As discussed above, standard measures and Best Management Practices will be implemented to lessen the potential for soil erosion during construction. Rock slope protection and retaining wall systems will be constructed to address the high potential for slope instability and erosion within the project area, resulting in a long-term reduction of erosion. Following construction of the proposed project, the road prism will be stabilized and revegetated in accordance with the County and Caltrans guidelines and specifications with USFS concurrence in order to reduce the potential for erosion of disturbed earth. Because the geology, seismicity and erosion impacts of this project would be mitigated to less than significant, and because similar standard measures would be implemented for the other public projects proposed for the vicinity, including other projects to improve Hyampom Road, significant cumulative geology, seismicity and erosion impacts are not expected to occur.

Significance: Less Than Significant

Mitigation Measure: None Required