Final Report

Preliminary geologic investigation of potential landslides in the vicinity of the southern Forest Service gate on the Ridge Route in northern Los Angeles County, California

by:

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Ridge Route Preservation Organization
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Ridge Route Landslide Report

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1.0 - Introduction

1.1 - Study Introduction and Purpose

Many locations along the Old Ridge Route Road (Forest Route 8N04) have been subject to landslides over the last 100 years. The purpose of this study is to identify potential landslide hazards near the southern Forest Service gate, approximately 1.4 miles north of Templin Highway in northern Los Angeles County. I have identified two locations that may be subject to future landslides. These locations, labeled Site 1 and Site 2, are near the southern Forest Service gate. The section of roadway under study is approximately 300 feet long and ascends approximately 15 feet heading northerly along the road. This study will assess if these two potential landslides are active and if they will cause damage to the historic roadway surfaces.

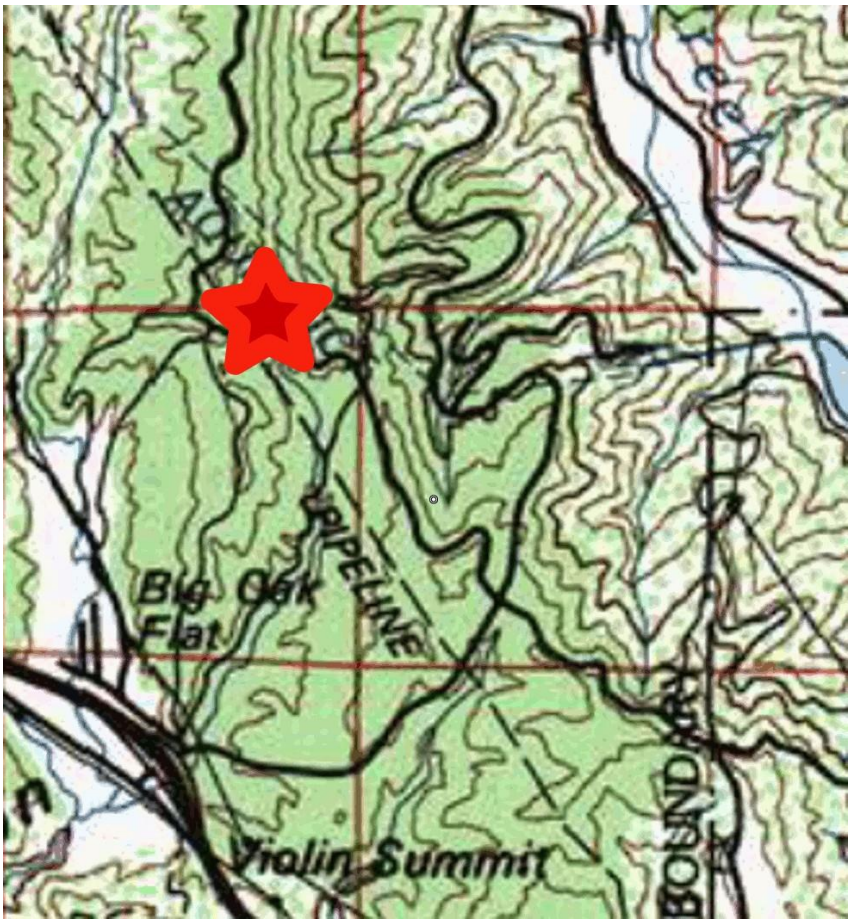

Figure 1 – Vicinity Map

Figure 2 – Specific Location Map
S1 – Site 1 and S2 – Site 2

1.2 - Site History

The original roadway was constructed between 1914 and 1915 as a graded dirt road. From 1918 to 1919, the road was paved with a 20’ wide concrete slab which was 4.5” thick and steel reinforced. During the mid-1920’s, the road was widened and realigned in places to reduce the curvature along the roadway. Maintenance has been minimal since October 1933 when the entire roadway was bypassed by a new alignment to the west. The section being studied, which is in a curve, was straightened and modified during this period. Any fill that was created during both the original construction and subsequent construction has not been engineered. The fill was originally left to settle on its own as the construction was under a tight budget and mostly predates modern geotechnical engineering techniques. In 2010, this section of roadway was overlain with an asphalt concrete mix to a width of about 18’ along the central portion of the road. This paving used a small aggregate, approximately 0.5” in size, and was poured to a average depth of about 3.5”.

2.0 - Geologic Description

The site is underlain by inter-bedded sandstone, siltstone, and pebble conglomerate of the Peace Valley (Tpv) and Ridge Route (Trr) members of the Miocene-Pliocene Ridge Basin Group. The sandstones exposed were found to be friable. Overall, the strata are heavily fractured. Many fractures viewed were found to have a reddish oxidation coating. Color of the sandstones and conglomerates range from tan to dark brown and are fine to medium-grained. The siltstones are generally light to medium gray. Some gypsum crystals can be found between layers, indicating possibly expansive soils. The formation within the study area generally dips to the west at 15 to 18 degrees. Dry ravel is common at cut slopes, creating large piles of debris along these slopes. Minor slope failures are also found along steeper cut slopes in the area.

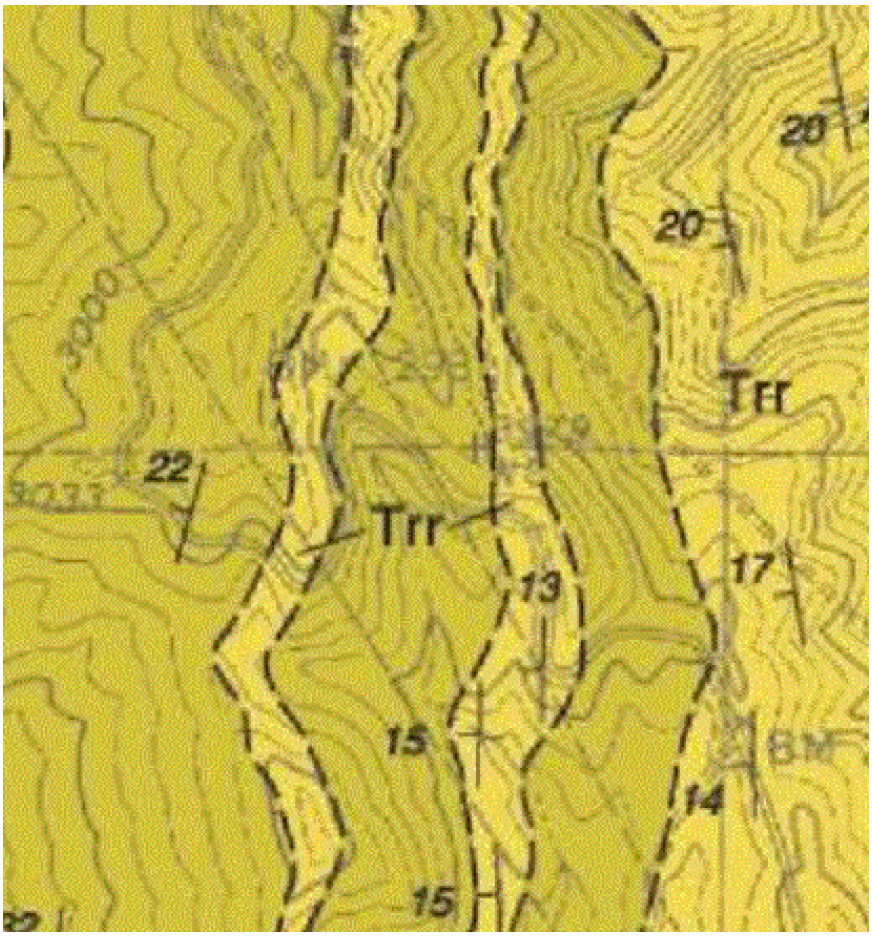

Figure 3 – Geologic Map – From Dibblee (1997)

3.0 - Landslide Assessment

3.1 - Site 1:

Cracking was found along the southbound, or down slope, side of the roadway. These cracks were approximately 58 feet long and averaged 2.9’ from the edge of the 2010 AC overlay. The cracks ranged from about 1.5’ to the edge at the south end to 3.9’ to the edge at the north end. The cracks exhibited approximately 0.5” of separation and less than 0.5” of subsidence on the east side. Some en-echelon fracturing was noted near the south end, which seemed to correlate with the separation that was found. This type of fracturing is generally related to spreading, which may mean that the edge of the slope is settling faster than the main roadway and may be due to fill settlement. An area of reeds was also found near the lower end of the fracture. These reeds, which are uncommon in this area, indicate an area of higher groundwater, perched groundwater, or a spring. Additional field work revealed the fracturing also correlated with the edge of the 1919 concrete, which explained the differential settlement of the asphalt overlay.

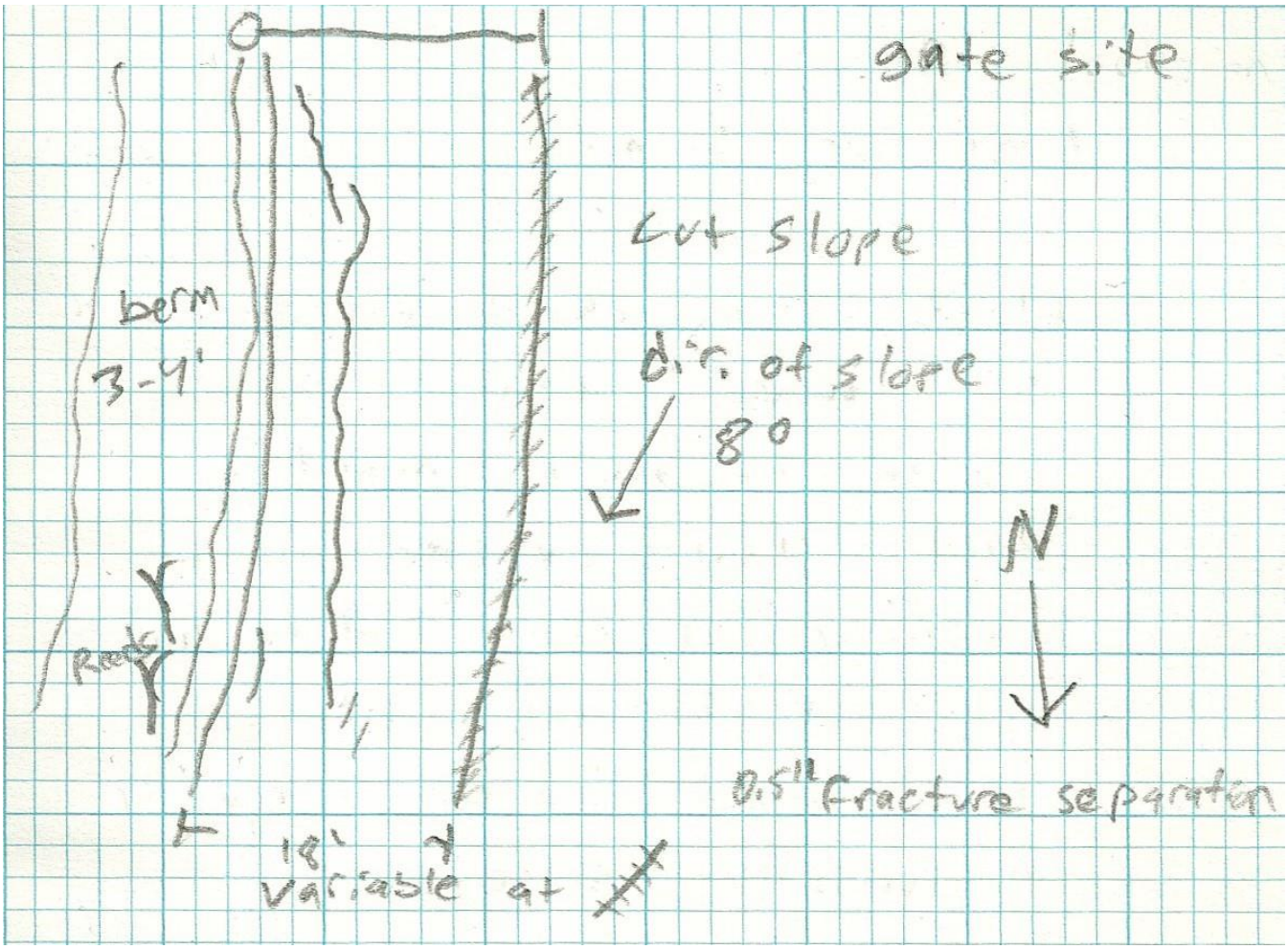

Figure 4 – Upper Site Diagram (S1). Not To Scale.

Photo 1 – Cracking at Site 1

Photo 2 – En-Echelon Fracturing at Site 1

*3.2 - **Site 2:***

Cracking at this site was approximately 17’ in length and averaged 6’ from the edge of the 2010 AC overlay on the southbound side of the roadway. Cracking was closer to the edge of the roadway at the west end at about 4’ and 7.5’ at the east end. Some uplift, approximately 1”-2” in height relative to the surrounding pavement was observed between the cracking and the edge of the roadway. Above this site, a medium sized slump-type landslide was found, with an approximate surface area of 450 ft^2. The headscarp of the slide was measured to be about 3 to 4’ high. The slide area has a hummocky surface but seemed to be well-drained toward its western side. The cut slope adjacent to Site 2, which exposed some slide material did not show any signs of additional movement. The slide plane may extend below the roadway at a shallow surface, as the uplift in the roadway seems to indicate.

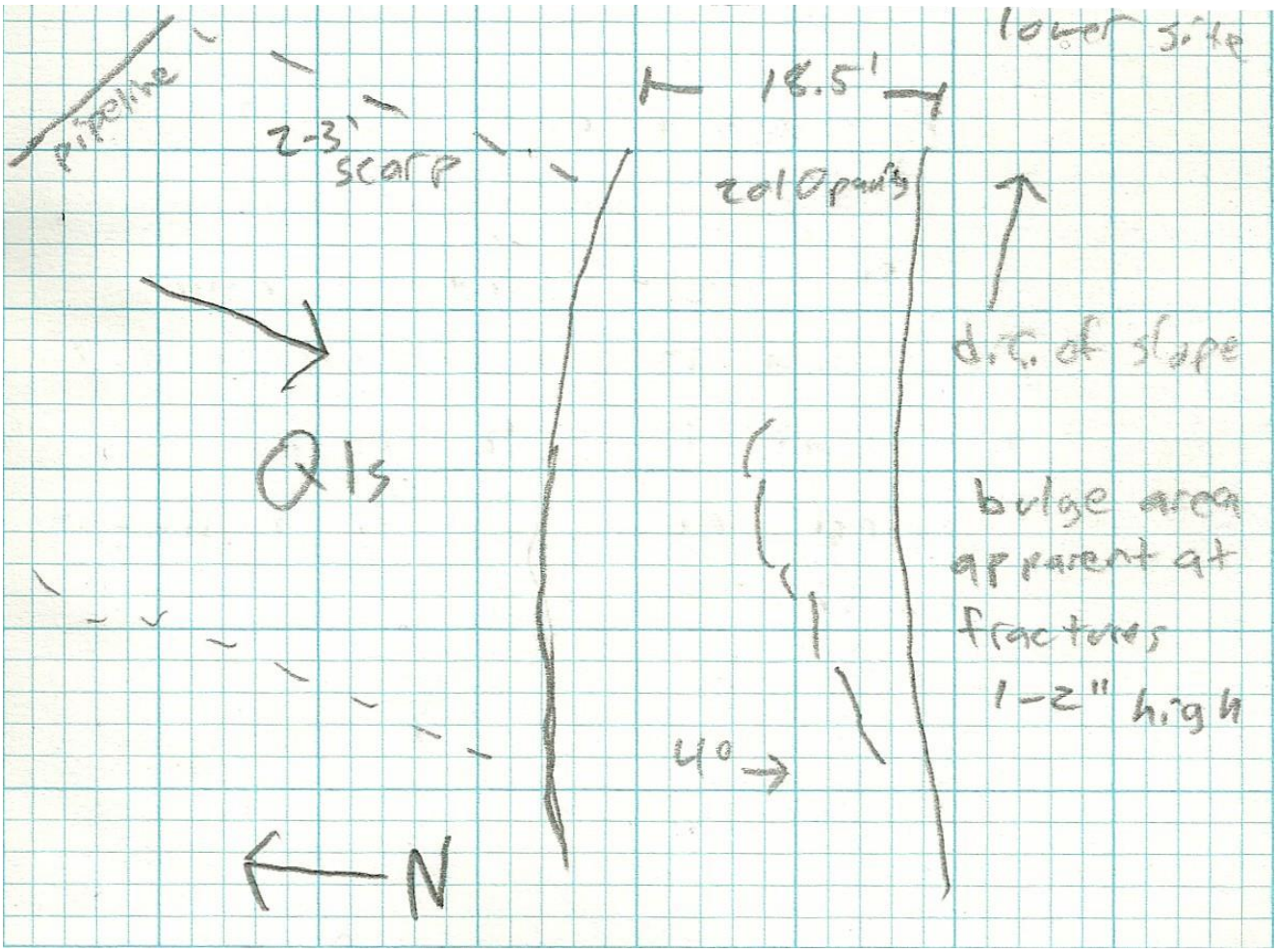

Figure 5 – Lower Site Diagram (S2). Not To Scale.

Photo 3 – Cracking at Lower Site (S2)

Photo 4 – Area of uplift and fracturing

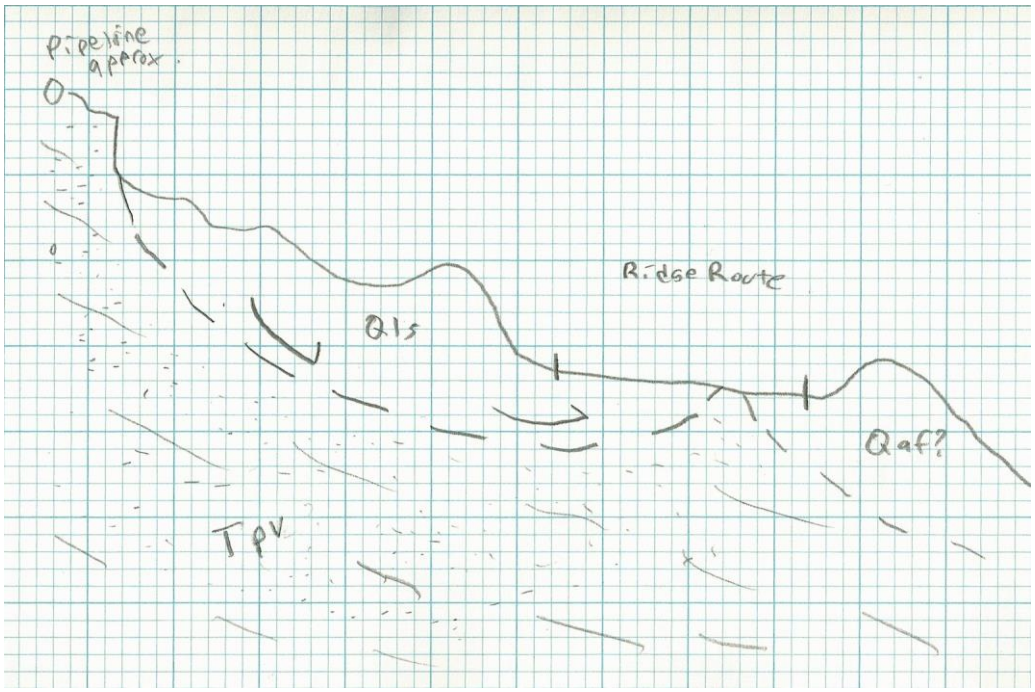

Figure 6 – Inferred Landslide Cross Section within the Peace Valley Fm (Tpv). Not To Scale.

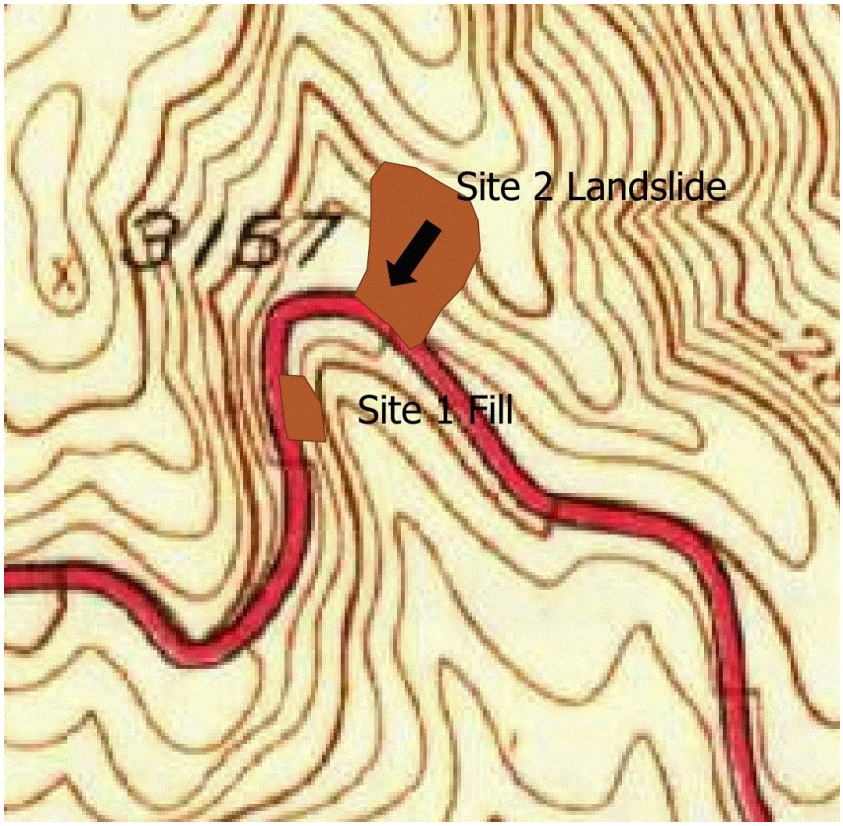

Figure 7 – Map of Study and Landslides

4.0 - Conclusions

The movement at Site 1 correlated more closely with fill settlement at the edge of the 1919 concrete, which may have been reactivated by the 2010 resurfacing and the subsequent heavy winters of 2015 and 2017. I recommend that further monitoring of the fractures is necessary and will present a better indication of possible future movement. At Site 2, the older landslide found above the roadway, which appears to have a shallow slide plane in the tens of feet, is affecting the roadway surface and has moved at least a few inches since 2010. If this slide becomes reactivated due to increased moisture, it could damage the roadway severely. I propose that preventative measures be taken at this site to stabilize the slide mass, including dewatering of the slide mass through the use of horizontal piping draining the slide mass and buttressing the up-slope side of the roadway. If this slide increases in length headward, it may also affect the oil and gas pipelines which run above its current headscarp. Drilling to determine the actual depth of the slide plane may be necessary and can be done without damaging the integrity of the 1918-1926 roadway surfaces. Sites for drilling, if determined to be necessary, will be surveyed and assessed by a licensed geotechnical engineer. Additional soil testing will also be required to determine if any additional geotechnical work or remediation will be necessary.

5.0 - References

Dibblee, Thomas Jr., *Geologic map of the Whitaker Peak quadrangle*, Los Angeles and Ventura Counties, California, 1997

Scott, Harrison, *Ridge Route: The Road that United California*, 2015

United States Geological Survey, *Whitaker Peak*, 6’ Quadrangle, 1935, 1935 Edition

United States Geological Survey, *Whitaker Peak*, 7.5’ Quadrangle, 1995, 1999 Edition