

## HUD Projects Summary Sheet

Project	Cost
#1: 3N01S Timber Retaining Wall and Ditch	\$150,000
#2: 1N96 Culvert Complex	\$80,000
#3: 1N10 Retaining Walls – Lumsden Road	\$230,000
#4: 1N10 Overside Drains with Intercepting Dips – Lumsden Road	\$70,000
#5: 1N10 Unmet, Anticipated Needs – Lumsden Road	\$600,000
<b>Total</b>	<b>\$1,130,000</b>

Estimates include engineering design, construction contract preparation, and construction contract administration.

## **Engineering Project #1: 3N01S Timber Retaining Wall and Ditch**

**Justification:** The burned up timber retaining wall is located at a critical road junction between 3N01S and 1N07. Both roads are major forest arterial roads, and are used by the local community to access recreation in the Forest. 1N07 provides primary access to Cherry Lake for the Hetch Hetchy Water and Power system. The destroyed retaining wall is no longer functional. The changed forest landscape has rendered the current situation unsafe.

**What:** A large soil retaining wall constructed of timber (about 100 feet by 5 feet high at the tallest point) was burned in the Rim Fire. Reduced structural integrity of the wall combined with the potential for enhanced sediment movement into the road and drainage system increases the risk of loss of function of the transportation system at this location. The retaining wall is no longer adequate to protect the road. Loss of function of the burned retaining wall has led to accumulation of material in the roadside ditch.

**Actions:** Engineering retaining wall and drainage design, Prepare construction contract, Administer construction contract, Remove burned timber wall, Installation of new retaining wall and ditch as needed

**Who:** Engineering by Forest Service and/or A&E Consultant Firm, Construction by Public Works Independent Road Contractor

**Time Frame:** 2 years

**Cost:** Approximately \$150,000

## **Engineering Project #2: 1N96 Culvert Complex**

**Justification:** The altered, post-fire landscape has changed the way that watersheds respond. The burnt soil may exhibit hydrophobic properties, limiting infiltration and enhancing runoff, both peak runoff and total volume. The absence of vegetation combined with accumulation of loose or disturbed soils intensifies debris movement potential in drainages. Capacities are permanently altered, and previous designs are no longer valid. Current drainage features do not function well enough to serve and protect permanent infrastructure. In this case, a paved, arterial access road, 1N07, needs to be protected to assure continued access.

**What:** A culvert under Road 1N07 is transporting a large sediment load into the outlet basin, which is shared as an inlet basin for a culvert running under road 1N96. On more than one occasion, the basin has filled with sediment, allowing sediment and water to flow over the road and cause erosion, loss of road structure, and a fill slope washout. The basin has been cleaned of sediment previously, only to be filled up again. The location requires a more permanent fix to accommodate post-burn runoff and these drainage features need to be resized and reconstructed.

**Actions:** Prepare construction contract, Administer construction contract, Excavate, remove and replace culverts under 1N07 and 1N96.

**Who:** Engineering by Forest Service and/or A&E Consultant Firm, Construction by Public Works Independent Road Contractor

**Time Frame:** 2 years

**Cost:** Approximately \$80,000

### **Engineering Project #3: 1N10 Retaining Walls – Lumsden Road**

**Justification:** Lumsden Road (NFSR 1N10) is the primary road access for the Tuolumne Wild and Scenic River Corridor. This canyon burned in the Rim Fire. The burn aggravated a situation of steep side slopes, little vegetation, and enhanced post-burn runoff. Road 1N10 is a critical piece of public infrastructure adjacent to the community of Groveland. Rafting businesses, a significant portion of Groveland's economy, depend on the road to access the Tuolumne River. This road receives substantial traffic in the summer. Much of the large material has washed down the drainages. However, a large storm still could move enough material to put temporarily installed rock buttresses at risk. This risk will exist until the canyon returns to a more stable, pre-fire condition, which will take several years. Fully engineered retaining walls need to be implemented in order to ensure the resiliency of the road after the fire, protect user safety, and assure the community's economy will be protected.

**What:** In the first significant storm following the Rim Fire, sediment and large material was transported down the canyon drainage onto road 1N10. Boulders as large as 3 ft. diameter were deposited. In a few cases, the road was severely damaged and the surface was buried. In order to quickly reopen the road for temporary access, the road surface was cleared and re-compacted; and side slopes were armored with large rocks in three locations. The temporary fix works for now, but the repaired fill slope is reported to be "over steepened" in a report from a geotechnical engineer. A permanent, designed solution should be implemented guarantee the long term stability, resiliency, and safety of the road.

**Actions:** Geotechnical analysis, Engineering design, Prepare construction contract, Administer construction contract, Reinforce retaining walls

**Who:** Engineering by Forest Service and/or A&E Consultant Firm, Construction by Public Works Independent Road Contractor

**Time Frame:** 2 Years

**Cost:** Approximately \$230,000

#### **Engineering Project #4: 1N10 Overside Drains with Intercepting Dips – Lumsden Road**

**Justification:** Lumsden Road (NFSR 1N10) accesses the Tuolumne Wild and Scenic River corridor). This canyon burned in the Rim Fire. The burn aggravated a situation of steep side slopes, little vegetation, and enhanced post-burn runoff. Road 1N10 is a critical piece of public infrastructure to the local economy of the community of Groveland. This road receives substantial traffic in the summer, and would become a safety risk to users if not fixed. Because of the steep canyon hillsides, sediment will flow downhill easier and vegetation will take longer than average to regrow. The drainage needs to be engineered effectively to make the road more resilient to the fire affected landscape until the canyon can return to a more natural state.

**What:** Sediment transport down the drainages increased substantially following the burn. Debris, soil, and rocks moved onto and across the road. Emergency roadwork performed pushed extra material to the outside edge of the road. This material movement affected many of the overside drains. Some were dislodged, damaged, moved, or rendered ineffective. When the drains no longer function, all runoff contributes to the erosion of the road surface and edge.

**Actions:** Prepare construction contract, Administer construction contract, Fix or replace non-functioning overside drains, Add intercepting rolling dips to transport water across road into the overside drains

**Who:** Engineering by Forest Service and/or A&E Consultant Firm, Construction by Public Works Independent Road Contractor

**Time Frame:** 2 Years

**Cost:** Approximately \$70,000

## **Engineering Project #5: 1N10 Unmet, Anticipated Needs – Lumsden Road**

**Justification:** Lumsden Road (NFSR 1N10) is the principle road access to the Tuolumne Wild and Scenic River Corridor. Commercial and private rafters, fishermen, campers, Hetch Hetchy Water and Power, and recreating visitors use this road. It is considered an economic generator supporting the economy of the adjacent community of Groveland. This road is generally open year around and receives substantial traffic in the summer. Failure to address the long term stability of the road could present a safety risk to users. Because of the steep canyon, cut and fill slopes generated from the initial construction of the road are often nearly vertical. Many fill slope locations along the road are reinforced with old, dry stack rock walls. The Rim Fire burned the soil and vegetation that helped anchor the rock walls to the steep slopes. These changed conditions can affect slope stability and have likely reduced the factor of safety. The structural elements supporting the roadbed that were damaged in the fire need to be identified and mitigated to secure user access and safety.

**What:** Unidentified, underlying roadway structural and adjacent drainage elements that were damaged during or as a result of the fire.

**Actions:** Complete full survey and assessment of Lumsden road, Identify roadway structural elements compromised in fire, Prepare construction contracts, Administer construction contracts, Correct identified Issues

**Who:** Engineering by Forest Service and/or A&E Consultant Firm, Construction by Public Works Independent Road Contractor

**Time Frame:** 5 Years

**Cost:** Estimate \$100,000 to assess and identify needs and \$100,000 per site to mitigate based on previous site experience on Lumsden Road  
Estimated 5 sites to be discovered during assessment  
Estimated approximately \$600,000 total