

SLIDE RIDGE

A public safety project
APWA 2022 Project of the Year Submission

Photo by Miles Bergsma



Chelan County Flood Control Zone District
Division: <\$5 million
Category: Disaster or Emergency Construction/Repair





Project Overview

Located on the east facing slope on the Chelan Mountain terrain, Slide Ridge, also known as Granite Ridge, produces violent discharges of soil and rock material that have become more frequent over recent years.

The elevation change in the area is from 1,100 feet at the edge of Lake Chelan to 1,800 feet at the apex of the alluvial fans and over 5,000 feet at the uppermost relief. It's a sparsely vegetated slope characterized by unstable rock formations and coupled with overly steep slopes. Geological indicators show rockslides and debris flows have been occurring at Slide Ridge for hundreds of years.

One of the largest tourist destinations in the state, Lake Chelan is frequently hit by intense rain and thunderstorms that can deliver more than an inch of rainfall in an hour's time. Rainfall on Slide Ridge results in water flowing down its steep slopes, dislodging rock down the slope to the lake. Neighbors living near Slide Ridge have described the events as sounding like a train hurdling down the steep slope. The storms have left a mix of woody, rocky and muddy debris as high as 12 feet on South Lakeshore Road, the only north-south corridor for people living or vacationing along the west side of Lake Chelan.

Chelan County has been recording these violent events at Slide Ridge for decades. From 2003 to 2019, 11 events

have occurred that resulted in the hauling away of more than 50,000 total cubic yards of material. Cleanup costs of removing the material, hauling it offsite and re-establishing the existing engineered channel have cost Chelan County taxpayers more than \$1 million from 2003 to 2019.

In addition, the destructive events typically closed South Lakeshore Road for one to two days and left it impassable for weeks. People became stranded when debris covered the road, and emergency services did not have access into the area via South Lakeshore Road. Existing utilities are overhead and utility poles, which are within the debris zone, were typically struck when a slide occurred.

Slide Ridge was always one thunderstorm away from a catastrophic disaster – until now.

In 2022, the Chelan County Flood Control Zone District (FCZD) completed its first major mitigation project, spending more than \$3.8 million to remove the roadway at Slide Ridge and replace the 27-year-old stilling basin and its 72-inch culvert that were routinely overwhelmed by the barrage of mud, rocks and other debris.

In their place is a 108-foot long, single-span bridge that has been built over the earthen channel, allowing mud



and debris flows to freely pass under – not over – the roadway. The channel from the bridge to Lake Chelan also has been re-engineered and rebuilt. Construction started in June 2021 and was completed in July 2022. The project was paid for in part with a \$1.3 million grant from FEMA. Remaining costs were paid for by the newly formed FCZD.

In 2022, as the new bridge was opened to traffic and the construction project was wrapping up, two more mudslide events occurred within weeks of one another following brief rainstorms. Neighbors captured on video the debris and mud coming down Slide Ridge and flowing under the new bridge and down the earthen channel to the alluvial fan on Lake Chelan. Today, the new bridge ensures a year-round, continuous corridor for the community that surrounds Lake Chelan. It is a proactive solution to a problem that Chelan County has dealt with for decades. And it eases concerns that one day someone may have become harmed by or even trapped in the mud and debris flows.

Construction Management

Construction management was handled in house with Chelan County Public Works staff. The team had the forethought during the design phase to investigate the time it would take to construct the precast concrete girders. Between COVID-19 impacts and mega projects in Western Washington, the only two concrete companies that could manage such a large order were a minimum of three months out to complete. As a result, the county made the determination to procure the girders ahead of the construction contract, under a separate contract for fabrication and storage of the girders. The precast concrete girders were put out to bid in February 2021, three months prior to the call for bids on the project. The

PROJECT TIMELINE

- **November 2017:** Contract signed with project design team KPFF of Seattle
- **August 2017:** \$1.3 million FEMA Post-Disaster Mitigation (PDM) grant awarded for construction
- **February 2021:** Girder fabrication goes out to bid
- **May 2021:** Project awarded to contractor KRCI of Wenatchee
- **June 2021:** Construction begins
- **August 2021:** Fire shutdown (2 weeks)
- **November 2021:** Superstructure completed (abutments, girders, and deck)
- **January 2021:** Winter shutdown (3 months)
- **April 2022:** Work below the ordinary high water mark of Lake Chelan completed
- **July 2022:** Project considered substantially complete



— Before Photos —

In 1995, an earthen engineered drainage channel was constructed in the slide area of Slide Ridge. The drainage channel conveyed material to a stilling basin on the west side of South Lakeshore Road (top photo), where a 72-inch corrugate metal culvert was intended to convey material under the roadway to the east (right photo) and down the lower portion of the channel (left photo). During large storm events, the volume of material frequently overwhelmed the culvert and caused it to fail. This caused material to backup, fill the stilling basin and flow on top of South Lakeshore Road, thereby stranding people north of the culvert and emergency access into the area.

PROJECT BENEFITS

1. **REDUCES** risks to life & property, including public utilities
2. **ENSURES** unobstructed emergency response for medical, fire and law enforcement personnel
3. **ALLOWS** for a continuous, year-round, corridor for residents, visitors, local service providers and school buses
4. **MAINTAINS** access to state and federal lands
5. **MANAGES** conveyance of mud and debris flows from Slide Ridge
6. **SAVES** road maintenance costs, for a savings to taxpayers

superstructure was completed in November 2021.

If not for this forethought, the contractor would have had a substantial delay in completing the project, which could have easily added months and costs onto the already extended project timeline. Instead, the project was constructed under budget and within the contractual working days allowed.

Safety Performance

Working in the area of Slide Ridge, particularly in a flood channel, comes with looming safety concerns. A flood response plan was established and weekly safety meetings were held on site. Weather conditions and forecasts were monitored daily by the Chelan County inspector. The contractor was briefed on all safety concerns regarding a potential event and, out of concerns of flash flooding and debris flows, the crew was kept out of the channel unless work was directly related to the channel. After each working day and on weekends, all equipment and construction materials were removed from the potential flood zone to upland staging areas.

In addition, the project was shut down during the highest level of concern for the 25-Mile Fire (see Unusual Accomplishments). No injuries occurred during the construction of the project.

On the public side, automated signals were utilized throughout the construction of the project, reducing the need for flaggers during and after work hours. The automated, lighted signals provided the added safety benefit of providing better visibility and warnings of traveling in a construction zone along a winding, wooded roadway that attracts thousands of tourists and visitors throughout the year. The signals were placed on either end of a short one-lane detour road that ran parallel to South Lakeshore Road. The detour road was utilized to keep the roadway open to the public and emergency vehicles.

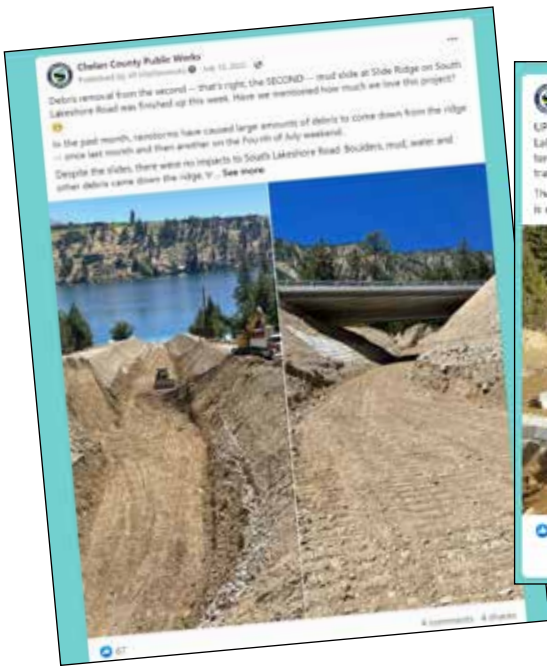


LOCATION MAP



VICINITY MAP

SITE MAP



Community Relations

When informing the public of the Slide Ridge project and its impacts, Chelan County had to work around statewide COVID restrictions on community gatherings, relying more on video, photos and its website and social media. The following public outreach methods were used:

- A project website was established: www.co.chelan.wa.us/flood-control-zone-district/pages/slide-ridge. The website gave detailed information about the project, its impacts to the public and frequently asked questions. It also included links to reports and designs. The website was updated nearly weekly during construction.
- Letters to all property owners in the project area and beyond were sent out, informing them of the website and asking them to sign up for construction updates that would be emailed directly to them. The county was able to use the email list to reach out to impacted property owners directly and quickly.
- The Chelan County Public Works team met onsite with individual property owners in the immediate project area to discuss the project and how it would impact their access to South Lakeshore Road.
- A listserv was created with not only property owners but also people interested in the project. Updates were sent on it at least twice a month from start of construction to completion of the project.
- County commissioners and/or the County Engineer gave regular updates on the project on the local Lake Chelan radio station. The county public information officer gave regular updates on the project to other local media sources.
- The county public information officer created an email list of service providers, emergency responders, state and federal partners, the local school district, the Lake Chelan Chamber and other need-to-know partners. They were regularly updated on construction progress and impacts to travel on South Lakeshore Road.
- Information about the project and its impacts to the public were published regularly on the Chelan County Public Works, Chelan County Emergency Management and Chelan County government Facebook pages.

Overall, community outreach efforts resulted in a minimal number of public complaints. The community was highly supportive of this project because of its direct impacts to better public safety and emergency response.

— Slide Photos —



PROJECT PARTNERS

Managing Agency

Chelan County
Flood Control
Zone District

Chelan County
Public Works

Primary Consultant

KPFF Inc. of Seattle

Primary Contractor

KRCI, LLC
of East Wenatchee

Subconsultants

RH2 Engineering
of East Wenatchee

Indicator Engineering,
PLLC of Seattle

PanGeo Inc. of Seattle

Environmental Considerations

Within 200 feet of the ordinary high-water mark of Lake Chelan, the project called for about 1,000 cubic yards of channel excavation and 4,100 cubic yards of fill for the extension of the berms and side slopes. Extensive debris modeling also determined that extending the conveyance berms/side slope would need to occur below the ordinary high-water line down to the low water line of Lake Chelan in order to protect adjacent private property from impacts during higher debris flow events. This resulted in another estimated 80 cubic yards of channel excavation and 5,500 cubic yards of fill.

To avoid in-water work and having the greatest impact on the environment, this work had to occur in the dry between November and May, when Lake Chelan is lowered annually. The work occurred in the dry and was completed in April 2022.

In addition, the contractor utilized material found onsite from past debris flow events to raise the berm/side slope height. This limited the number of potential heavy truck trips that would otherwise have been needed to import the material, thus lowering potential greenhouse gas emissions.

Unusual Accomplishments

Because of its location along the rocky, remote slopes of Lake Chelan, the Slide Ridge project and its construction schedule were under nearly a constant threat.

Construction on the project started in June 2021 and had to be stopped two months later because of emergency wildfire evacuation orders in the area. The 25-Mile Fire was burning on the slopes above 25-Mile Creek State Park, which is near the end of South Lakeshore Road and only less than 5 miles from the project site. Construction was shut down for two weeks out of safety concerns for the contractor's crew as well as the urgent need to maintain an unobstructed emergency route in and out of the area via South Lakeshore Road for the community and emergency responders and vehicles.

A winter shutdown then was required because of the wet conditions in the project area. And, lastly, a debris flow in early summer 2022, just as the project was wrapping up, required that the contractor re-establish the channel to its final grade before receiving a substantial completion.

Despite these unplanned pauses in construction, the project was completed under budget and within the contractual working days allowed.

Additional Considerations

No construction project will never be able to stop the rock and mud flows on Slide Ridge. However, by putting aside its reactionary response and embracing

—Construction Photos—





a proactive approach, Chelan County and its partners have created a solution that should stand the test of time at Slide Ridge.

This project has a sound design that eliminates impacts to the South Lakeshore Road. It improves drainage patterns in the vicinity of the site by routing all water off of Slide Ridge toward the lake, minimizing the potential of this runoff going over the roadway and into adjacent residential areas.

The design also decreases future maintenance costs for Chelan County by attempting to keep the debris confined to one area of the more than 2,500-foot debris channel. By changing the slope of the lower channel (from the new bridge down to the lake), debris will no longer spread over the entire channel length but, instead, be confined to the lower 800 feet. Access points were designed to allow construction equipment to maintain the channel or remove material following debris flows.

The overall design of this project showed great creativity in finding a way to keep South Lakeshore Road open at all times, especially during emergencies, and to mitigate a serious hazard to the traveling public.

Use of Alternative Practices

A large portion of this project was paid for with a nearly \$1.3 million grant from FEMA. Without the alternative funding source, the project would have taken more time to complete. However, Slide Ridge appears to be having more frequent events, with two most recently in 2022. In this case, Chelan County did not have time to spare.

To help the Washington State Emergency Management Division understand the magnitude of Slide Ridge and its potential for loss of life and damage to property, Chelan County in 2018 invited the State Hazard Mitigation program manager and his team to join county staff on site, where the scale of Slide Ridge is very hard to ignore.

Standing on South Lakeshore Road, below Slide Ridge, gave the program manager a realistic picture of what hazards the community is dealing with in Chelan County, and its commitment to sustainability and climate change resiliency. In looking back, holding an informal tour of Slide Ridge was one of the most important steps in bringing this project to completion.

Final Photos

