



Five Counties Salmonid Conservation Program (5C)

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January 1, 2012

Summary Report Usal Road LITH Design/Build Project

Purpose and Need: There is a need to design additional Best Management Practices and low impact to hydrology (LITH) road treatment techniques to reduce rutting and erosion from “through cut” road segments which cannot be economically upgraded using existing LITH techniques. Mendocino and Humboldt Counties have historic road segments that due to their original design, placement, and maintenance practices that over the past 100 years have left them with deep through cut segments that cannot be effectively drained.

Within these through cut areas seeps, hillslope drainage, and rainfall are concentrated onto the road surface which then acts like a stream channel and bog. Saturated road surfaces deform and rut quickly and grading to remove the ruts requires deepening of the cuts even further. Many of these through cut have been exacerbated by the lack of local, affordable, permitted rock sources to surface roads to reduce rutting (in these areas rock often sinks, becoming ineffective in a few years). On several road segments the road cuts have become so deep that the roads have narrowed to the width of a bulldozer blade and are 6’-10’ below natural slope grade. In these instances the long term solution is to abandon and relocate road segments, but short term de-watering techniques can be tested to see if the need to blade the roads deeper can be eliminated or minimized.

The design/build project will prevent sedimentation from Usal Road reaching Waterfall Gulch, a tributary to Usal Creek, which has habitat for listed Coho Salmon and Steelhead Trout. Road related sediment is identified as a significant contributor to degraded fish habitat in the Usal Creek watershed.

Project Location: Usal Road, CR 431 Milepost 10 to 12, Sections 5& 8, T23N, R16W, HB&M



Figure 1. the lower “Quagmire” site ~400’ south of Waterfall Gulch before (left) and after (right). The treatment included outslope with berm breaks, non-woven geo-textile fabric, 8” of roller compacted rock surfacing, and upgraded stream crossings (Photos by Richard Gienger).

Proposed Design/Build: This project used design/build process to test and implement several techniques within a two mile stretch of Usal Road, Mendocino County Road #431. The design/build treatments will

be monitored this winter and spring to test their effectiveness for possible application on up to 50 miles of County roads with large segments with through cuts.

Below Left: Usal Road at the “Quagmire” Site. The road is impassable in winter and following rainstorms. The banks are 3’-6’ high and the road narrowed down to a single lane. Cars drive around the site when the road is wet. Below Right the top of the “Quagmire” site which show the detour route (straw area) that was created by trespass.



Below Left: Looking south from Waterfall Gulch at the road through cut. Below Right: Usal Road south of Waterfall Gulch Creek, where deep ditches on either side of the road can run for hundreds of feet and can only discharge into the stream.



Design Considerations:

- Conduct pre, during and post project photo point monitoring
- Modify existing LITH standards for roads that cannot be drained with outslope and rolling dip techniques
- Conduct effectiveness monitoring
- Retain water in the drainage of origin whenever possible

Design/Build Sites:

Rolling Dip Design/Build Treatments and Effectiveness:

1. Construct variations of rolling dips to assess effectiveness and cost for each treatment as follows:

- Dip #1- Install rolling dip in native surface with a berm knockout at ~450 north of Waterfall Gulch culvert - *This structure was constructed as designed.*
- Dip #2- Install a rolling dip, with 50' woven geo-textile fabric and 6" of local rock for 50' through the dip located ~300' north of Waterfall Gulch culvert. At this site install a ~250 ft² sediment retention basin, lined with geo-textile fabric to trap and measure sediment yield from the road¹. *This site was constructed with 8" of rock and no geo-textile fabric. The sediment basin was designed as a 70' "V" notch rather than square basin.*
- Dip #3- Install a rolling dip with 6" of local rock for 50' through the dip located ~125' north of the Waterfall Gulch culvert. *This structure was constructed with woven geo-fabric and 8" of rock.*
- Dip #4- Install a rolling dip with 50' non-woven geo-textile fabric and 6" of local rock for 50' through the dip within native surface area, with a berm knockout at ~400' south of the Waterfall Gulch culvert (at an existing DRC location). *This structure was constructed as designed*
- Dip #5- Install a rolling dip, rocked with 12" of local rock for 50', no geo-textile, with a berm knockout downslope of the "quagmire" site. Remove existing plugged 12" culvert. *This structure was constructed as designed*

All dips- Install a fiber roll sediment trap at the outlet of each dip (see Appendix "B") except Dip #2

Objective: To assess differences in rolling dip treatments and determine the treatment with the best cost to benefit.

Evaluation: Evaluate the extent of rutting length and depth within the dip and down road rutting rill and gully at each dip. Method: 1) Measure 3 cross sections within dip at time of construction as well as pre-existing ruts, rills or gullies below dip to point of termination off road; 2) Post winter re-measure cross sections; 3) Post winter measure rut area within dip (length x width) as well as any ruts, rills or gullies below dip to point of termination; 5) Measure sediment within sediment basin at dip #2; 5) Photo document before and after treatments.

Ditch relief culvert

1. Install two ditch relief culverts to assess effectiveness and cost for each treatment as follows:

DRC #1- Install an 18" HDPE culvert ~200' north of the Waterfall Gulch Culvert, with woven geo-textile fabric and rock 6" deep for 100'. *An 18" HDPE culvert was installed with hand set rocked inlet control and the road was surfaced with 8" of rock. No geo-fabric was applied at this crossing.(refer to Stream Crossing #4 below).* Design and installation a culvert "cap" consisting of geo-textile materials with a structural base to facilitate removal of the cap after the first winter following installation. *The culvert "cap" will be installed in mid-October.*

DRC#2- Install an 18" HDPE culvert ~200' south of the Waterfall Gulch Culvert, with woven geo-textile fabric and rock 6" deep for 100'. Design and install a downspout with a "T" energy dissipater. *A 24" HDPE culvert was installed with rocked inlet and outlet. The road was outsloped and surfaced with 8" of rock with non-woven geo-textile underneath.*

¹ This basin is located within a spur road owned by Redwood Forest Foundation (Campbell Timber Group). If the road needs to be opened the basin would need to be clean out and the surface returned to the current configuration.

Two additional 18" HDPE ditch relief culverts and 5 24" HDPE culverts were installed in Class II or III ephemeral streams/springs.

Objective: To assess two new approaches to DRC installation. These two sites are not comparable to each other but each is anticipated to be useful in future applications. There has been a long standing need for a slip on cover, or cap, over culverts that can trap short term increases in sediment following construction, or to measure current yield at a site. At DRC #1 test a cover that is intended to be low cost and that can be readily managed once it is full.

Ditch relief culvert site #2 represents a very steep inner gorge situation where energy dissipation for a DRC is problematic. At this site the use of a downspout, "T" dissipater and fiber roll sediment traps will be installed and assessed.

Evaluation: DRC #1- Evaluate the effectiveness of sediment trapping slip cover to trap short term sediment yield following construction, ditch cleaning, and other practices that result in short-term sediment pulses from a road ditch. DRC #2- Assess the structural integrity of a steep downspout and "T" energy dissipater within an inner gorge road segment. Method: DRC #1 Measure the performance of the structure to trap and store sediment and the integrity to lift and remove cover filled with sediment using photo documentation; DRC #2- check structural stability following winter flows and identify failure points or additional structural needs to maintain stability. Photo document site

Outslope Road and Fabric Tests

1. Construct outslope road segments to assess the benefits of using geo-textiles with rock versus rocking alone and to assess track and roller compactor compaction of road surfaces.

Outslope Segment #1- Modify road surface for ~75' by outsloping, placing woven geo-textile and 6" road base, roller compacted. *This segment was expanded to 300' and crossed Waterfall Gulch, extending ~75' south of the Gulch crossing. The north side of the crossing was outsloped and the reach underlain with woven geo-textile and surfaced with 8" of rock.*

Outslope Segment #2- Modify road surface for ~75' by outsloping, placing non-woven geo-textile and 6" road base, roller compacted. The "lower quagmire site" was treated with 300' of non-woven geo-textile fabric, outsloped, and surfaced with 6" of roller compacted rock.

Outslope Segment #3- Modify road surface for ~75' by outsloping and placing geo-grid textile and 6" road base, roller compacted. *Geo-grid was not utilized in the project, this reach was outsloped and 6" road base was roller compacted.*

Outslope Segment #4- Modify road surface for ~75' by outsloping and placing 12" road base, wheel/track compacted

All excess loose soil and spoils were end hauled to the extent practical and feasible and appropriate native grass seed and weed-free straw mulch was applied.

Numerous additional treatments were undertaken as summarized below. Each will be incorporated into a post project monitoring report.

In all the following areas were treated:

1,100' of outsloped road as follows:

- 350' outsloped with woven geo-fabric placed under 8" of rock baseⁱ.
- 350' outsloped with non-woven geo-fabric placed under 8" of base rockⁱⁱ.
- 400' outsloped, no geo-fabric, rockedⁱⁱⁱ

13 rolling dips were installed as follows:

- 5 dips were installed with 8" of base rock and no geo-fabric^{iv}
- 2 dips were installed with 8" of base rock and woven geo-fabric^v
- 1 dip was installed with 8" of base rock and non-woven geo-fabric^{vi}
- 5 rolling dips installed, no rock, no geo-fabric^{vii}

8 culverts were installed as follows:

- Class III stream crossing, 18" HDPE culvert, no geo-fabric, no rock, and a drop inlet is to be installed^{viii}
- Class III stream crossing, 24" HDPE culvert, no geo-fabric, no rock road surface, and hand set rock armored inlet to be installed^{ix}
- Class II spring crossings, 24" HDPE culvert, and rocked w/8" of rock^x
- 18" DRC (HDPE) with hand set rock inlet, rocked, no geo-fabric, hand set rock inlet^{xi}
- Class II stream crossings, 24" HDPE culvert, non woven geo-fabric, and rocked w/8" of rock^{xii}
- Class III stream crossing, 24" HDPE culvert, no geo-fabric, no rock^{xiii}
- 18" DRC (HDPE) culvert, no geo-fabric, no rock
- 18" DRC (HDPE) culvert, no geo-fabric, no rock^{xiv}

In all approximately one mile of road was treated with culverts, rolling dips and/or outsloping. Not all of it was completed, but the road will drain substantially different than before. Like all projects there were setbacks and adaptations to setbacks.

The first setback was the delay by Campbell in giving permission to move Shuster's road crew in to develop the rock pit, which was planned for Saturday and Monday. The road was opened for hauling late Tuesday. Once Campbell approved the use of the road and pit, things were set in motion for Shuster's crew to move in Monday. Opening the road took more time than Tom at PWA had anticipated and the County had to devote 2-3 people and a grader to get the rock pit road in shape to haul to the Usal Road by late Tuesday afternoon.

The inability to move in the Shuster equipment on Saturday delayed rock delivery until Wednesday, effectively. That in turn resulted in less rock being available overall, but the county adjusted as best as possible by working Friday to take advantage of the rock source. We were not be able to rock all areas where drainage was modified, but the dips and culvert are all rocked. It is hoped that the dewatering of much of the road will allow the unrocked segments to hold up better than in the past.

Another delay that changed our plans was the 36 hour delay in the arrival of our rented excavator, setting back our timeline for installation of culverts. But again, the road crew pressed ahead and got all of the pipes in by staying until Friday. Because of the equipment delays the plans changed and work was extended north of Waterfall Gulch by more than a 1000' feet beyond what was planned. As a result, we had to focus on rocking those disturbed areas first and the truck traffic from the rock pit road to north of Waterfall Gulch slowed operations north of the pit road as equipment and trucks had to be constantly moving out of each other's way. Beginning late Wednesday and at the suggestion of Danny and Tom of PWA, we moved Shuster's D-7 from opening the rock pit road to shaping dips and spreading road rock

on Usal Road. That move greatly improved our ability to catch up on the north side and by Thursday morning we were able to begin work on the south side. The time delays and loss of the Trinity crew on Thursday stretched the Mendocino crew far and wide, but with less traffic overall and the dozer working behind them they got the rough shaping on the south side up to and above the upper quagmire. The biggest issues remaining are insufficient rock to cover all disturbed areas, the need to rock inlets/outlets and final touch up grading.

After a week I noted several opportunities for more efficient hauling by County(ies) crews and I expect we could have squeezed out ~10 additional loads of rock over the three days of hauling, but that number might be a bit optimistic given the limited turnarounds, constant internal traffic "congestion" and delays in getting culverts in Tuesday. Considering all of that, we learned a lot about logistics for hauling and equipment movement for the future larger effort on this extremely narrow road. Rock will remain a significant problem for any future project. The only mechanical issue was a broken air brake line on a dump truck, not bad considering the overhanging limbs and chance to catch a hose on one.

Richard Gienger set to work building hand stacked rock culvert inlet just north of Waterfall Gulch. These represent excellent craftsmanship and make a nice statement about the work that people will notice long after we are out of there. Also I used native mulch on two dips on the Tribal side of the road instead of the rice straw.

I want to call out the efforts of our partners, Richard, PWA and Shuster's for their tremendous help. I also want to recognize the work of the road crews; they worked 10 hours+ per day, never complained and had good attitudes working with each other.

ⁱ (250' north of Waterfall Gulch to 75' south of Waterfall Gulch)

ⁱⁱ (Lower Quagmire site)

ⁱⁱⁱ South of Waterfall Gulch and south of Lower Quagmire

^{iv} 8 north of Waterfall Gulch, 4 south of Waterfall Gulch

^v First crossing north of Waterfall Gulch and 2nd dip south of Waterfall Gulch

^{vi}

^{vii} 4 south of Waterfall Gulch

^{viii} Last crossing at the north end of the project area South of Lower Quagmire, channel with upstream piping

^{ix} South of Lower Quagmire, channel with upstream piping

^x Spring site just south of shallow debris slide north of Waterfall Gulch

^{xi} First new culvert north of Waterfall Gulch

^{xii} At Lower Quagmire Site

^{xiii} South of Lower Quagmire, channel with upstream piping

^{xiv} Furthest south installation, below original Quagmire