

**FINAL REPORT  
FOR  
GRAHAM GULCH  
CULVERT REPLACEMENT  
FISH & GAME CONTRACT #P0310304**

**PROJECT LOCATION:**

This project was on Graham Gulch, a tributary to Freshwater Creek, at the confluence of the two water courses, approximately 4 miles southwest of Eureka (Figure 1), on Pacific Lumber Camp Road (County Road #41070). The project may be located on the USGS Arcata South Quadrangle Map, Section 3, Township 4N, Range 1E (Lat. 40°45'13.5"N, Long. 124°02'50"W). The contributing watershed may be seen in Figure 2.

**PROJECT PURPOSE:**

The purpose of this project was to replace the existing culvert under Pacific Lumber Camp Road at PM 0.1, with a new culvert that would not be a barrier to fish migration.

The removed culvert was identified as a fish migration barrier to species including salmonids listed under the Endangered Species Act. Adult passage through the old culvert was eased somewhat by the installation of Washington baffles, however the grade and outlet jump still presented a formidable barrier, completely excluding juveniles and all fish at lower flows. The Humboldt County Culvert Inventory and Fish Passage Evaluation (Ross Taylor, April 16, 2000) identified this culvert as a priority project for improvement of fish passage. The culvert was originally ranked at #13, but was dropped in priority to #29 due to the cost of repair. The 13.5-foot long corrugated metal pipe at the crossing was installed at a 2.7% grade with a 2-3 foot drop into the outlet pool.

Upstream of the project site there are approximately 2.48 square miles of drainage area and 13,400 feet of potential salmonid habitat. The watershed is moderately steep, dropping from 2,180 feet to 73 feet over a distance of 20,065 feet. The creek has fair base flow that continues through summer. In the vicinity of the project, the creek had aggraded a considerable amount bedload from upstream landslides. There is a good second-growth redwood/conifer and hardwood canopy shading the stream.

Graham Gulch flows into Freshwater Creek immediately below the proposed culvert installation with no further barriers.

The project removed the existing migration barrier, making the rest of the watershed habitat available to salmonids, and protected the downstream habitat by reducing the possibility of high flows washing out the old culvert and road fill.

**PROJECT DESCRIPTION:**

The project included the excavation and removal of the existing culvert and the installation of a 70' long x 18' wide x 9' high corrugated metal arch culvert with a natural creek bed flowline. The new culvert rests on two concrete footings measuring 70' long x 2' wide with rock slope protection (RSP) placed at the inlet and outlet to reduce erosion. Dimensions of the new arch were determined by using streambed simulation methodology and field observation of the creek channel. The span matches the top-width of the streambed during ordinary high water.

The bedrock outcroppings around the culvert narrow the channel and created some concern that the project would result in a high velocity chute without a gravel substrate above the new culvert. To retain some bedload and decrease the steep grade differential above the culvert a 1-ton boulder "vortex" weir was constructed. The weir structure creates an upstream pointing "V" with ~1-foot spacing between the boulders. The structure is retaining bedload while still providing an easy low-flow swim-through.

PURPOSE: REPLACEMENT OF EXISTING BARRIER CULVERT WITH AN ENHANCED PASSAGE STRUCTURE  
 LOCATION: PACIFIC LUMBER CAMP ROAD (County No. 43070)  
 FRESHWATER  
 TRIBUTARY BASIN: FRESHWATER CREEK  
 PROJECT VICINITY MAP

FIGURE 1

DATED: 4/11/05



**Instream Barrier Modification Projects: Culvert Replacement**

**Graham Gulch, Pacific Lumber Camp Road**  
Humboldt County Public Works

T4N, R1E

SECTION 3

40 45'13.5"N

124 02'50"W

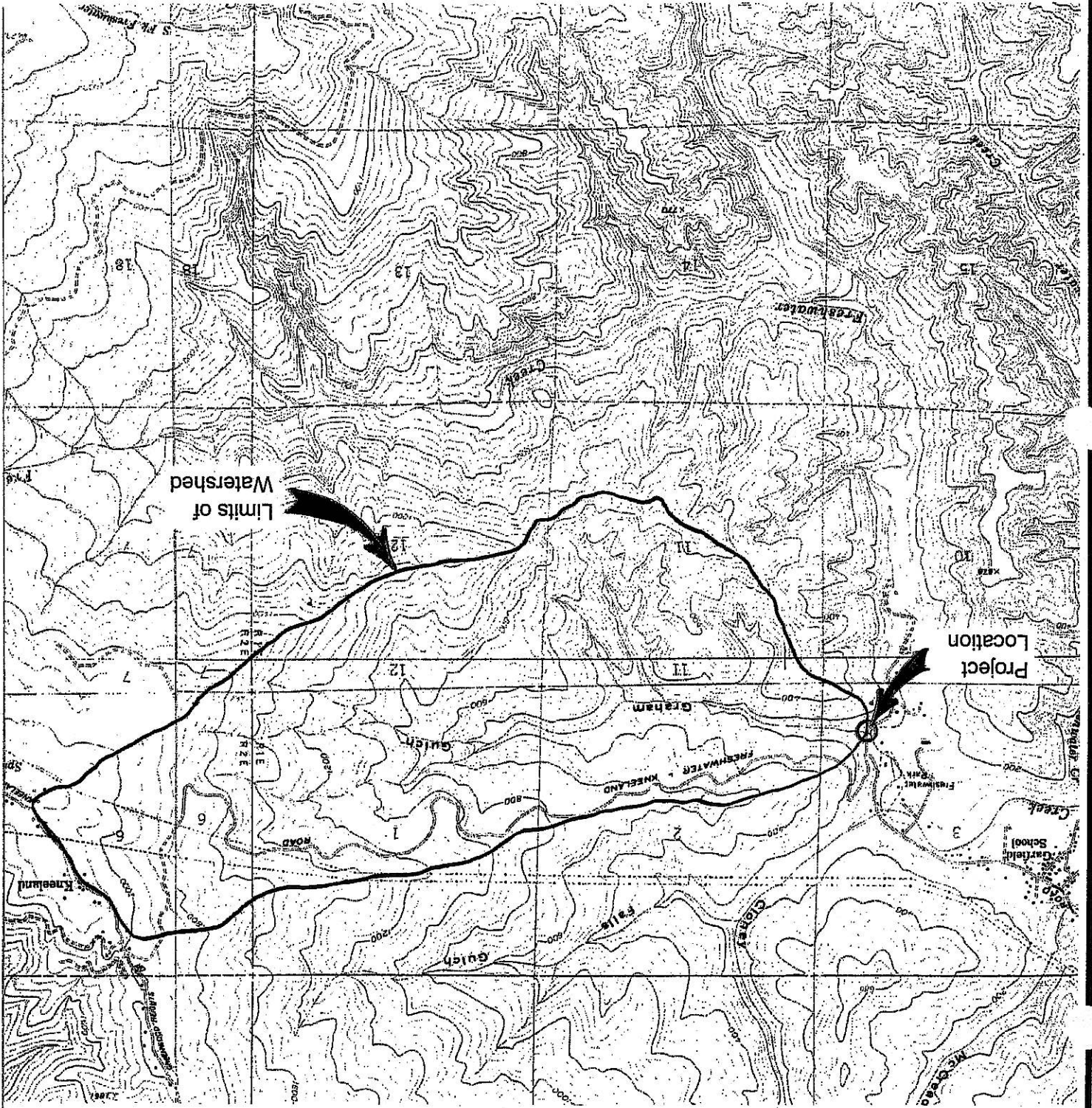
DATED: 4/11/05

California-Humboldt Co.

7.5 Minute Series (Topographic)

Arcata South 7.5' Quadrangle

**FIGURE 2**





The new culvert foundations are embedded into the underlying bedrock at a slope of 2%. This naturalized slope was based on approximately 500' of thalweg survey. 197 tons of RSP was placed around the culvert inlet and outlet to prevent the erosion of loose soils on the embankment fills.

A flat car was placed over the culvert excavation to keep the road open during construction.

1,770 cubic yards of material was excavated for the culvert installation. 1,370 cubic yards of material were used to backfill the structure resulting in a net removal from the site of 400 cubic yards. The excess material was removed from the site and disposed of at an existing County stockpile site.

#### **FISH PASSAGE ANALYSIS:**

Graham Gulch contains habitat for Chinook and coho salmon, steelhead, and cutthroat trout. The existing culvert was perched with a 2-3 foot jump required to access the outlet. This presented some difficulty to adult migrating salmonids and was a complete barrier to juveniles. The grade of the old culvert was fairly steep, but was ameliorated through the installation of steel Washington baffles.

The new culvert provides a natural bottom of sufficient width to eliminate the grade and velocity barriers to juvenile and adult salmonid upstream migration. In addition, the new culvert is designed to pass a 100-year flood. This will ensure the passage of high flows and debris and will reduce the potential for sediment inputs resulting from culvert failure.

The monitoring and maintenance program to evaluate fish passage will consist of semi-annual site visits with visual observation to establish the presence of live fish or redds. Young of the year salmonids were observed immediately upstream of the new culvert during a site visit this winter.

#### **EROSION CONTROL PLAN:**

The erosion control plan had four components: silt fences, sediment dams, rocked fill slopes and the limited excavation of upstream silt deposits.

Some minor problems occurred due to early rains and the need to winterize the site before completion, but these issues were resolved quickly and the project was completed the following spring without further complication.

#### **TIMING OF EQUIPMENT OPERATIONS:**

Construction started on August 16, 2005 and was completed on August 3, 2006. The project was put into winter suspension in November 20, 2005. On July 24, 2006 work was restarted and pursued until completion of the contract.

The following is a brief chronological description of project activities performed:

| <u>DATES, 2005</u> | <u>DESCRIPTION OF WORK PERFORMED</u>                       |
|--------------------|------------------------------------------------------------|
| 06/22              | Completed design and permitting                            |
| 08/16              | Installed upstream fish exclusion screens and water bypass |
| 08/18              | Completed construction of rock vortex weir                 |
| 09/15              | Installed downstream fish exclusion screens                |
| 09/21              | Began excavation of existing 13' diameter culvert          |
| 09/23              | Placed flatcar                                             |
| 09/30              | Began forming footings and placing rebar                   |
| 10/19              | Poured concrete for footings                               |
| 10/23              | New multi-plate culvert assembled                          |
| 10/24              | Began backfilling culvert                                  |

|             |                                                          |
|-------------|----------------------------------------------------------|
| 11/1        | Remove water diversion & exclusion fencing               |
| 11/11       | Removed flatcar                                          |
| 11/20       | Winter suspension                                        |
| <u>7/24</u> |                                                          |
| 7/24        | Re-stack RSP and install cross-culvert on adjoining road |
| 8/2         | Prepare roadway and pave                                 |
| 8/3         | Straw and seed. Project completed                        |

# **COSTS:**

The project costs have been broken out into four main categories as follow:

|                      |                     |
|----------------------|---------------------|
| Engineering          | \$ 51,976.18        |
| Materials            | \$ 17,327.37        |
| Equipment            | \$ 4,142.50         |
| Construction         | \$190,222.46        |
| <b>Project Total</b> | <b>\$263,668.51</b> |
| Five County Funding  | \$ 5,447.30         |
| F&G Grant Funding    | \$245,775.00        |
| County Cost          | \$ 12,446.21        |