Bank Stabilization for Pastori Storm Drain Outfall
Fish Collection and Relocation Plan

Prepared for the:

Town of Fairfax
Department of Public Works
142 Bolinas Road
Fairfax, CA 94930

Prepared by:

Alice A. Rich, Ph.D.
A.A. Rich and Associates
Fisheries and Ecological Consultants
150 Woodside Drive
San Anselmo, CA 94960
www.aarichandassociates.com

January 26, 2011

TABLE OF CONTENTS

		PAGE NO.
LIST OF FIGURES		**ii**
I.	**INTRODUCTION**	**1**
	A. BACKGROUND	**1**
	B. DESCRIPTION OF CONSTRUCTION ACTIVITIES	**1**
II.	**FISH COLLECTION AND RELOCATION PLAN**	**1**
	A. INTRODUCTION	**1**
	B. FISH COLLECTION AND RELOCATION PLAN	**2**
	C. PROTECTING FISH BY MINIMIZING STRESS DURING HANDLING AND TRANSPORTATION	**4**
III.	**LITERATURE CITED**	**6**
APPENDIX :	**PHOTOS OF PROJECT AREA**	

LIST OF FIGURES

NO.		PAGE NO.
1	DIAGRAM OF FISH COLLECTION AND RELOCATION ACTIVITES …	3

I. INTRODUCTION

A. Background

The Town of Fairfax (Town), through the Governor's Office of California Emergency management Agency, has requested Federal Emergency management Agency's (FEMA) Public Assistance program funding for the a number of flood-related projects that were a result of the December 31, 2005 flood event. One of these projects is located on the right bank (as one faces upstream) of San Anselmo Creek just below the Pastori Avenue Bridge (see photos in Appendix). The flood caused the suspended terminal section of the 24-inch corregated metal pipe to fail and discharge stormwater onto the bank beneath the failed culvert. To protect the bridge and the adjacent residence from further bank erosion during the disaster event, the Town placed emergency rock rip rap on the eroded bank. However, as there is no vegetation on the eroded bank of the creek channel and the bank continues to erode, the culvert outlet needs to be replaced and the bank stabilized to prevent another bank failure immediately downstream this project (JARPA, 2011). Further details are provided in the JARPA (2011) for this project.

B. Description of Construction Activities

The existing 24-inch diameter storm drain outfall pipe will be replaced with a 48-inch diameter HDPE pipe. In 2008, the storm drain pipe within Pastori Avenue was replaced with a 48-inch diameter pipe. To replace the the 24-inch diameter piece of pipe, air-driven jack hammers will be used to break the wall for the storm drain pipe, and construction workers will stand on the rock rip-rap while doing the work. There will be no hydraulic equipment. Further details of the bank stabilization are provided in the JARPA (2011) for this project.

II. FISH COLLECTION AND RELOCATION PLAN

A. INTRODUCTION

Per the Endangered Species Act (ESA), any project that can potentially negatively affect threatened and/or endangered species must include measures to minimize those impacts. The South Central California Coast Steelhead (*Oncorhynchus mykiss*) is listed as threatened under the ESA and is known to inhabit San Anselmo Creek in Fairfax. During sampling in 2006 and 1999, juvenile rainbow/steelhead were collected in the large pool immediately below the fish ladder (Rich, 2006, 2000), an area that would be affected by the construction activities for this project. Therefore, because steelhead could be in this pool during the construction activities, all fish in

the pool below the fish ladder will have to be collected and relocated prior to any construction activities that could affect that area of San Anselmo Creek. The Town contracted with A. A. Rich and Associates (***AAR***) to prepare this *Fish Collection and Relocation Plan*.

B. FISH COLLECTION AND RELOCATION PLAN

Following are the steps in chronological order that ***AAR*** will follow to ensure that all fish, particularly any steelhead, have been moved out of the area that could be affected by construction activites. This protocol has been used successfully by ***AAR*** on a number of other projects in Marin and other areas in California (Rich, 2008, 2006a,b, 2005a,b, 2004).

Preparing Site and Initial Fish Collection and Relocation

1. Prior to the commencement of any construction activities (probably a day or two prior), ***AAR*** will prepare the area for the fish collection and relocation. A block net will be placed at the downstream end of the pool from which the fish are to be collected. To prevent small fish from passing through the net, the block net will be constructed of 1/8" mesh (Figure 1).

2. Fish will be collected using a Smith Root Type 12 Electrofisher. Extreme care will be taken not to disrupt the substrate, as this can result in clogging the gills of any fish present. Proceeding upstream, the "shocker" will be accompanied by two "netters", who will scoop up the fish and place them carefully in aerated buckets without physically touching the fish with. After each pass, the fish will be identified, and relocated upstream of the Pastori Avenue bridge to one or more suitable pools. Rainbow/ steelhead will be measured (fork length) before relocating them.

3. Letting the pool "settle" between electrofishing passes so that the turbidity decreases to the point where the water is clear, ***AAR*** will repeat the above procedure until as many fish as possible can be collected from the pool.

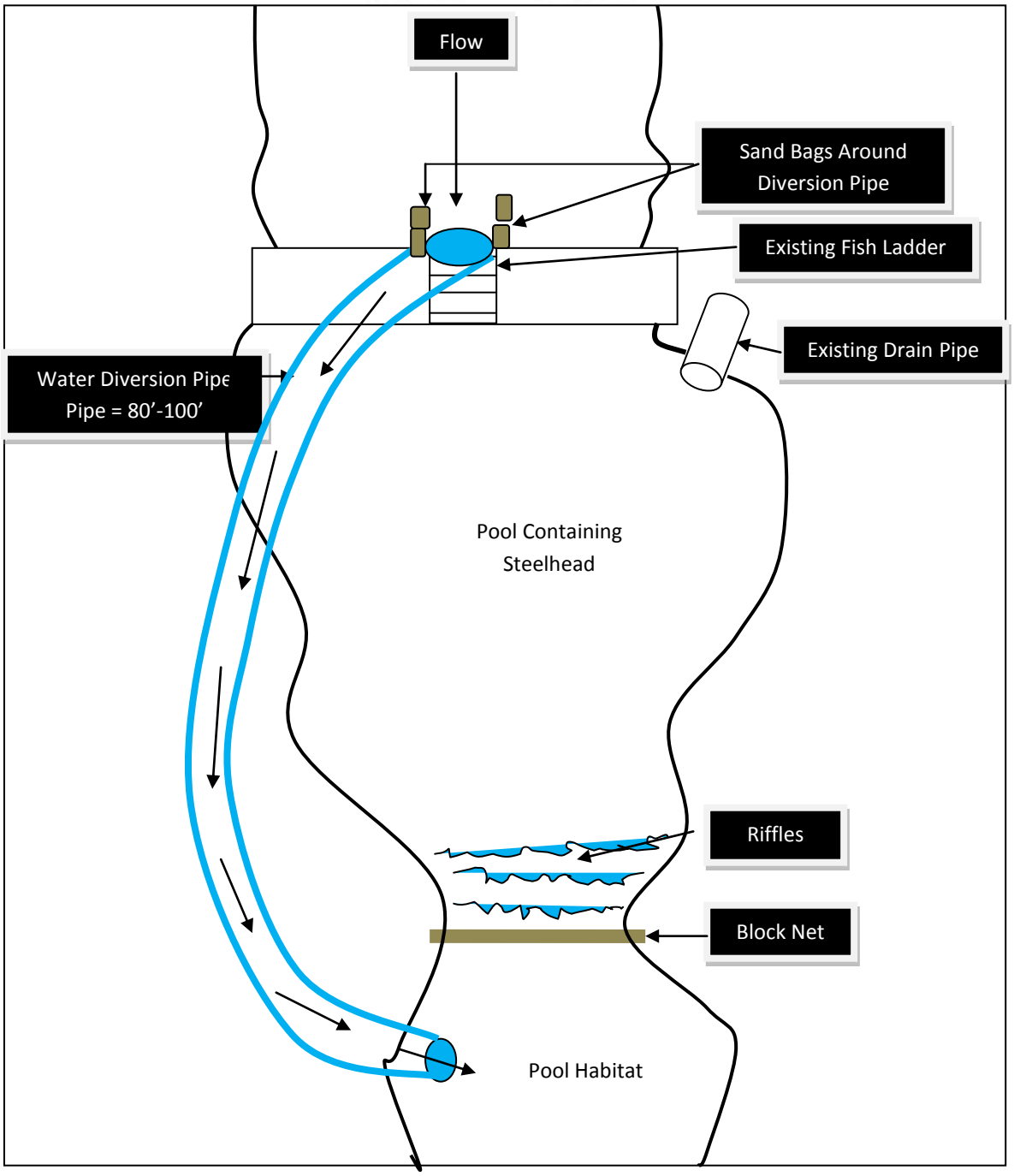

FIGURE 1. DIAGRAM DEPICTING FISH COLLECTION AND RELOCATION ACTIVITIES

Passively Divert Water and Resume Fish Collection and Relocation

1. Capturing fish using electrofishing is not very effectiving if the sampling area is too large (more than 2 feet deep and more than 3 feet wide). Due to the relatively large size of the pool (Rich, 2006a, 2000), it will probably be necessary to remove water from the pool before anymore fish can be collected. At the end of the first day of electrofishing, a water diversion pipe will be installed, beginning either at the upstream or downstream end of the fish ladder, so that water can be diverted around the pool area (Figure 1).

2. The water diversion pipe will be installed to divert water around the pool from which the fish will be collected, and to keep water out of that pool area during construction activities (Figure 1). The downstream end of the pipe will flow into a pool that is located about 80 feet downstream of the Pastori bridge. To prevent fish from entering the fish ladder at the upstream end of the diversion pipe while water is being diverted around the pool, sand bags will be installed on either side of the diversion pipe. As the water recedes, collection and relocation of fish will commence once again. Details of this task will be "fine tuned" during the summer before the project begins, when the stream flows have receded and the size and location of the fish collection pool have been determined.

3. To prevent fish from flowing into the pool area, the upstream block net will remain in place during all construction activities.

C. PROTECTING FISH BY MINIMIZING STRESS DURING HANDLING AND TRANSPORTATION

1. To minimize stress on fish, particularly the sensitive salmonids, it is always critical that fish be "handled" with care and not touched, if at all possible. Thus, to minimize stress on the rainbow/steelhead when they are measured, the following protocol, designed by Dr. Rich, will be used. The trout will be placed in a bucket containing an anaesthetic (MS-222; 50 mg/l; buffered to pH 7.0 with baking soda) and then each trout will be gently scooped onto an underwater measuring board designed by Dr. Alice Rich. This procedure allows fish lengths to be measured without handling the fish. Handling fish removes their mucus, a substance that is critical to a fish's health. Mucus contains both antibodies and enzymes that can kill invading organisms and also acts as a physical barrier that inhibits the entry of disease organisms from the environment into the fish. Finally, mucus lubricates fish, thus assisting the fish's movement through water.

2. Care will be taken at all times to ensure that the fish are minimally stressed and that they are in good health. In addition, when the fish are being relocated, salt will be added to the bucket used to transport and relocate the fish. The salt reduces osmotic stress during transportation (Rich, 1983,1979).

3. A summary report will be prepared and submitted to the Town of Fairfax, U.S. Army Corps of Engineers, NOAA Fisheries, Department of Fish and Game, the Regional Water Quality Control Board, and CSW/Stuber-Stroeh. The report will provide a brief description of the methodology used to collect and relocate the fish, and the results, including photographs of the project area before, during, and after the construction activities.

III. LITERATURE CITED

JARPA, 2011. Prepared by CSW/Stuber-Stroeh. January 2011.

Rich, A. A. 2008. Codornices Creek Restoration Project at Albina Avenue, Berkeley, California-Pre-Construction Relocation of Fishes. Prepared for the U. S. Fish and Wildlife Service, Santa Rosa, California. February 5, 2008. 12 pages.

Rich, A. A. 2006a. Fishery Resources Assessment for the Town of Fairfax. Prepared for the Town of Fairfax, Department of Public Works. December 18, 2006. 77 pages plus Appendices.

Rich, A. A. 2006b. Biological Assessment for the Bank Failure Project at 323/325 Bolinas Road, Fairfax. Prepared for the Wassermans. September 19, 2006. 31 pages.

Rich, A. A. 2005a. Fish Relocation Summary of Results for Town of Ross (Marin County) Annual Dredging. Prepared for NOAA Fisheries, November 8, 2005. 10 pages

Rich, A. A. 2005b. Replacement of Deck at #14 and #16 Creek Lane, Mill Valley. Biological Assessment. Prepared for Cascade Properties, Boulder, Colorado. February 2005. 34 pp + Appendices.

Rich, A. A. 2004. Bank Stabilization at 1 Sylvan Lane, Marin County, Relocation of Fishes. Prepared for the U.S. Corps of Engineers, San Francisco, CA. March 29, 2004. 8 pp + Appendices.

Rich, A. A. 2000. Fishery Resources Conditions of the Corte Madera Creek Watershed, Marin County, California. Prepared for Friends of Corte Madera Creek Watershed, Larkspur, California. November 10, 2000. 120 pp. + Appendices.

Rich, A. A. 1983. Smolting: circulating catecholamine and thyroxine levels in coho salmon *(Oncorhynchus kisutch*). Ph.D. Dissertation, University of Washington, Seattle. 97 pp.

Rich, A. A. 1979. The use of stress to quantitate the survival potential of three strains of trout. M. S. Thesis, University of Washington, Seattle. 65 pp.

Smeltzer, M. and G. Orum. 2006. Geomorphic Assessment of Town of Fairfax Project Sites. Final Report. July 31, 2006. 37 pages + Appendices.

APPENDIX

PHOTOS OF THE PROJECT AREA

Facing upstream showing the fish ladder, pool to be surveyed, and the storm drain outfall pipe prior to December 31, 2005 flood. Photo taken in 2006

Facing storm drain outfall pipe area after emergency rip rap placement after the December 31, 2005 flood. Photo taken December 21, 2010

**Pool that water diversion pipe will flow into.
Approximately 80 feet downstream of
Pastori bridge.
Photo taken January 26, 2011**