

# Conceptual Design and Feasibility of a Natural Fishway at the Fremont BART Weir, Alameda Creek, California

Final Report September 2005

Prepared by

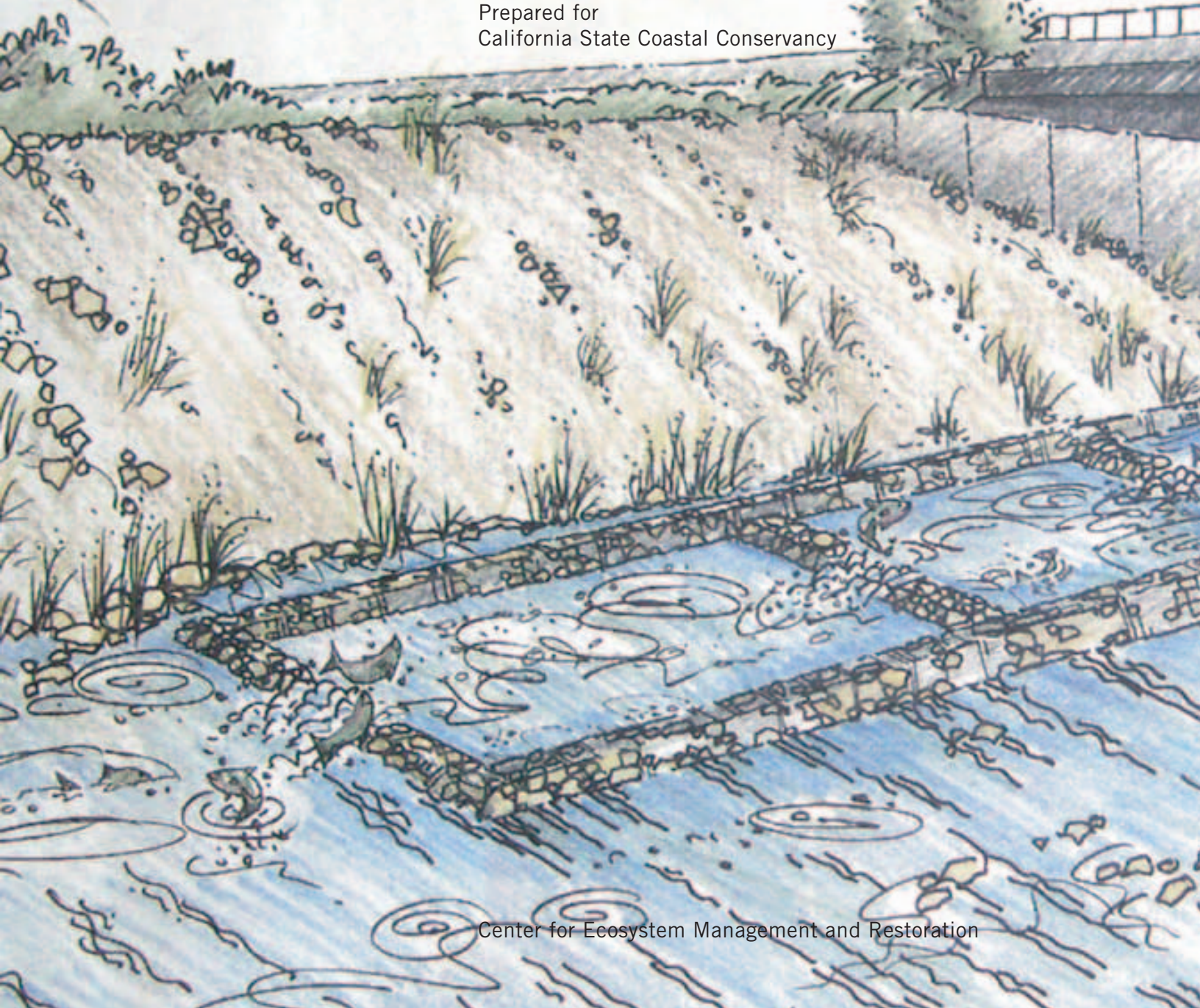
Center for Ecosystem Management and Restoration, Oakland, CA

FarWest Restoration Engineering, Alameda, California

WRECO, Walnut Creek, California

Prepared for

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## TABLE OF CONTENTS

1.0	<b>Summary</b>	p. 5
2.0	<b>Introduction</b>	p. 7
2.1	Overview	
2.2	Re-graded channel alternative study	
2.3	Contents of the report	
2.4	Disclaimer	
3.0	<b>Setting and design parameters</b>	p. 11
3.1	Physical setting	
3.2	Fisheries resources and steelhead passage requirements	
3.3	Hydrology	
3.4	Flood protection and stability	
3.5	Water supply	
3.6	Natural fishways	
4.0	<b>Pool-weir natural fishway conceptual design and passage evaluation</b>	p. 19
4.1	Design features	
4.2	Fish passage evaluation	
4.2.1	<i>HEC-RAS analysis</i>	
4.2.2	<i>Evaluation of steps</i>	
4.2.3	<i>Evaluation of pool turbulence</i>	
5.0	<b>Roughened channel natural fishway conceptual design and passage evaluation</b>	p. 29
5.1	Design features	
5.2	Fish passage evaluation	
5.2.1	<i>HEC-RAS analysis</i>	
5.2.2	<i>Evaluation of turbulence</i>	
6.0	<b>Effects on flood protection, stability, and water supply</b>	p. 35
6.1	Flood protection	
6.1.1	<i>Model design</i>	
6.1.2	<i>Water surface elevation</i>	
6.2	Stability analysis	
6.2.1	<i>Fishway stability</i>	
6.2.2	<i>Stability of other facilities</i>	
6.3	Water supply impacts	

7.0	<b>Cost estimates</b>	p. 43
8.0	<b>Conclusions and recommended next steps</b>	p. 45
9.0	<b>References and personal communications</b>	p. 47
10.0	<b>RCA study team</b>	p. 49
	<b>Acknowledgements</b>	p. 51
	<b>Figures</b>	p. 53
	<b>Appendicies</b>	p. 81

The Alameda Creek watershed historically supported a steelhead run that no longer exists due to a combination of factors. Most importantly, structures were constructed in the creek channel that acted as barriers to migration, water management facilities were developed that diverted substantial creek flows, and habitat degradation occurred from various land use activities in the creek basin. A stakeholder organization, the Workgroup, has been working for a number of years to address these issues and restore a viable steelhead population to the creek.

The most downstream total migration barrier in Alameda Creek is the so-called “BART weir,” which is a bank-to-bank sloping concrete apron constructed by the U.S. Army Corps of Engineers to prevent channel erosion. This drop structure allows flows to pass through a high gradient reach of the flood control channel without producing instability to the channel walls or the piers supporting the adjacent railroad and BART tracks.

A 2001 investigation produced conceptual designs for facilities to provide fish passage at the BART weir and the Alameda County Water District’s inflatable dam immediately upstream, and to add fish screens at the district’s water diversion facilities associated with the dam. In this design, the fish ladder passes a relatively small amount of creek flow (~35 to 50 cubic feet per second), and the associated conceptual design report does not address the efficiency of the ladder at passing fish when creek flows substantially exceed the capacity of the ladder.

Due in part to concerns about attracting steelhead into the fish ladder at higher flows, the Workgroup decided to evaluate alternatives to the 2001 conceptual design and to select an alternative for further study. This process led to creation of an approach referred to as the Re-graded Channel Alternative wherein a longer, moderately sloped ramp would replace the short, steep BART weir. By re-grading the channel in the vicinity of the BART weir, members of the Workgroup hoped to address the fish passage problem while maintaining water supply and flood protection functions in the creek.

The present study was conducted to provide conceptual design of fish passage and water supply facilities and to examine their feasibility, effectiveness, and cost. An expert advisory group consisting of staff at the Alameda County Public Works Agency and the Alameda County Water District, representatives from various public agencies, and a consulting engineer was assembled to advise the project team on constraints, and on design and analysis approaches.

The team selected natural fishway designs as most appropriate for the site. (Natural fishways mimic conditions found in medium gradient portions of streams, and are sometimes referred to as “engineered riffles.”) Standard engineering techniques were used to evaluate the fishways in terms of their passage, flooding, and water supply impacts. Modeling results indicated the range of flows under which fish passage criteria (*i.e.*, depth, velocity, and turbulence) were met. Our hydraulic model showed whether the project would reduce flood carrying capacity in the channel, and whether the flow conditions would produce adverse scour conditions. Modeling performed by the water district determined the effects of the proposed facilities on water supply. Finally, the project team and water district staff made cost estimates of the proposed facilities in order to compare the natural fishway approach to the 2001 approach using a fish ladder and screens at the BART weir complex.

The feasibility analysis indicates that a natural fishway and a set of new water diversion facilities may be used to accommodate the various goals for the flood control channel in the vicinity of the BART weir. The study concludes that the proposed design will

provide fish passage at an extremely wide range of flows and therefore offers the best available approach. The study results indicate that the project would not have substantial flood protection or water supply impacts. The natural fishway and the water supply facilities described in this report would cost substantially more than the traditional fish ladder and fish screens contained in the 2001 design report. Additional cost should be weighed against the value of implementing a project with the highest potential for providing successful fish passage at the BART weir.

This study was conducted prior to developing a protocol for releasing water from various Alameda Creek watershed diversion facilities for the purposes of providing fish habitat (*i.e.*, “fish flows”). Also, to guide sizing the natural fishway (*i.e.*, design capacity) we relied on a limited amount of data regarding creek discharge occurring when spawning steelhead arrive at the BART weir. Both of these issues are being addressed by on-going Workgroup efforts intended to produce consensus opinions. We expect that information developed in these processes will highlight the advantages of the natural fishway design and allow final design to be undertaken.