Denniston Reservoir Restoration Project
Draft Initial Findings Report

December 2006

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Prepared for:
Coastside County Water District
766 Main Street
Half Moon Bay, CA 94019

Prepared by:
TRC Essex
637 Main Street
Half Moon Bay, California 94019

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1.0 INTRODUCTION

Denniston Reservoir is a primary local water source for the Coastside County Water District (CCWD) as it strives to meet its service obligation to the residents of coastal San Mateo County. In most years, approximately 25 percent of the water that CCWD distributes to its customers is provided by Denniston Reservoir. Siltation has marginalized the reservoir's ability to store and export quality water, and has reduced the efficiency of the water treatment and conveyance infrastructure. CCWD would like to restore the reservoir to its previous capacity to ensure its sustained production of quality water. CCWD has contracted TRC Essex to investigate the different parameters that would be involved in creating a regulatory strategy and restoration plan for the reservoir and its surrounding watershed.

In addition to providing a quality, local water supply for area residents, environmental factors must be considered. The Denniston Creek watershed is home to a variety of special-status fish and wildlife species. This unique coastal watershed connects adjacent wildlife corridors and eventually drains into Princeton Harbor and the Pacific Ocean. Potential restoration parameters for this project create opportunities to enhance habitat for these special-status species. Additional considerations for the restoration plan will be to continue to provide resources for the agricultural community that has been operating in the watershed for decades.

Early federal, state, and local agency consultation has been conducted to help guide and develop this restoration project. Developing a collaborative agency approach during the initial planning stage of this project has been critical and will help create an effective plan to overcome potential issues.

This report contains the results from TRC Essex's baseline watershed assessment and agency consultations and it identifies restoration goals and opportunities. It suggests additional research that needs to take place to better understand the physical parameters that are constantly affecting the watershed and reservoir. It outlines the studies, surveys, and documents that are needed to begin the regulatory permitting process. This report concludes with a discussion of the next steps that will need to be taken to begin implementing this important project.

2.0 SETTING

Denniston Reservoir is created by a dam on Denniston Creek in an unincorporated section of San Mateo County. Denniston Creek and its approximately 2,000-acre watershed are situated below Montara Mountain, which is in the northern section of the Santa Cruz Mountain Range. A watershed boundary map is provided in Attachment A. The reservoir is at an elevation of 115 feet. The mild climate in this area features temperatures ranging from 44 to 58 degrees Fahrenheit in the winter and 51 to 70 degrees Fahrenheit in the summer. Average annual precipitation for the area is about 28 inches. Dense coastal fog can occur year round and is considered a contributor to the water supply in the watershed.

Portions of the creek above and below the reservoir are bordered by agricultural fields. Dirt roads that are used for the farming operation and CCWD staff border large portions of the creek in the valley extending down to where the creek meets Highway 1. CCWD's pump station and

treatment plant are adjacent to the reservoir. The reservoir is approximately 1 mile east of Highway 1 between the communities of El Granada and Moss Beach. Denniston Creek is spring fed, and it originates in steep coastal hills and then flows through a lower-gradient rural valley and suburban area before it empties into Princeton Harbor. A vicinity map and an aerial photo are provided in Attachment A.

3.0 FINDINGS

3.1 RECONNAISSANCE-LEVEL FIELD REVIEW

Vegetation

A variety of vegetation communities exist in the Denniston Creek watershed. Native coastal scrub dominates the majority of the upland area that occurs on the steep slopes of the surrounding hills, extending to the ridgelines of the watershed (see Attachment B for photos). These areas have relatively low species diversity with a variable mixture of coyote brush (*Baccharis pilularis*), California sagebrush (*Artemisia californica*), golden yarrow (*Eriophylum staechadifolium*), and a grassy understory. Some pockets of northern maritime chapparal occur in the upper reaches of the watershed. Chaparral communities are typically established on well-drained, sandy substrates or shallow, stony, infertile soils. These chaparral communities could support Montara manzanita (*Arctostaphylos montaraensis*), a special-status plant species.

Denniston Creek's riparian corridor is densely vegetated along most reaches of the creek (see Attachment B). Willow-alder riparian forest is the main type of riparian plant community found throughout Denniston Creek. The tree overstory is dominated by arroyo willow (*Salix lasiolepis*) and red alder (*Alnus rubra*). There are also occasional stands of Monterey pine (*Pinus radiata*) and blue gum eucalyptus trees (*Eucalyptus globulus*). The shrub layer is dominated by California blackberry (*Rubus ursinus*) and nonnative German ivy (*Senecio mikanioides*). Additional riparian shrub species include creek-side dogwood (*Cornus californica*) and thimbleberry (*Rubus parviflorus*).

U.S. Army Corps of Engineers (ACOE) jurisdictional wetlands may occur around the fringe of Denniston Reservoir. This emergent wetland contains California bulrush (*Scirpus californicus*), rush (*Juncus* sp.), sedge (*Cyperus* sp.), and arroyo willow. This area appears to contain the three criteria needed to qualify as an ACOE jurisdictional wetland according to the ACOE 1987 Wetland Delineation Manual. Aquatic vegetation is present, sufficient hydrology exists, and indicators of wetland soils were observed. A protocol wetland delineation survey should be conducted to confirm or refute these initial observations and the wetland boundary should be defined.

Eucalyptus forests dominated by blue gum eucalyptus are found in the watershed. The spoils disposal area contains a large stand of these trees, which extends into the riparian corridor where they dominate and shade out many other species (see Attachment B). The spoils disposal site is an upland area approximately 0.5 mile east of the reservoir where CCWD has stored sediment from dredging activities in the past. Eucalyptus trees can be found sporadically along the riparian corridor, but the largest and most concentrated stand exists near the spoils disposal site. Just

beyond the spoils disposal site and below the easternmost agricultural field there is a small stand of Santa Cruz cypress (*Cupressus abramsiana*).

Special-status Species

A complete table of the special-status plant and animal species that are known to exist in the vicinity of the Denniston watershed can be found in Attachment C and a California Natural Diversity Database map is provided in Attachment A. To determine the presence or absence of a specific plant or animal species, protocol-level surveys may need to be conducted by a qualified biologist or botanist. The San Francisco garter snake (SFGS) (*Thamnophis sirtalis tetrataenia)* and the California red-legged frog (CRLF) (*Rana aurora draytonii)* are assumed to exist at the reservoir. The central California coast steelhead distinct population segment (*Oncorhynchus mykiss*) will likely return if fish passage barriers are removed. Barriers to fish passage exist where the creek crosses Prospect and Capistrano roads near Princeton Harbor, at Denniston Dam, and potentially at the water treatment plant access road. These three species life cycles and habitat needs will likely guide the design of the restoration plan.

San Francisco Garter Snake

The San Francisco garter snake (SFGS) (*Thamnophis sirtalis tetrataenia*) is a federally and state-listed endangered species. It is also considered a fully protected species by the California Department of Fish and Game (CDFG). It is found in San Mateo County and northern Santa Cruz County. Ideal habitat for this species includes freshwater marshes, ponds, slow-moving streams, and upland areas near water where they can sun themselves and retreat into existing rodent burrows. The SFGS prefers dense vegetative cover and water depths of at least 1 foot for escape routes. They will also use floating algal or rush mats, if available (USFWS, 2006). Emergent and bank-side vegetation, such as cattail (*Typha* spp.), bulrush (*Scirpus* spp.), spike rushes (*Juncus* spp. and *Eleocharis* spp.), coastal scrub, and grasslands, apparently are preferred and used for cover. The snake feeds exclusively on the Pacific tree frog (*Hyla regilla*) and CRLF.

Adult snakes sometimes aestivate in rodent burrows during summer months when ponds are dry. On the coast, snakes hibernate during the winter, but further inland, snakes may be active year round. Recent studies have documented SFGS movement over several hundred yards from wetlands to hibernate in upland small-mammal burrows (USFWS, 2006).

Urbanization destroyed the majority of prime habitat for the snake, and continues to fragment remaining habitat and eliminate habitat linkage corridors. Illegal collection of the SFGS, CRLF population decline, and the introduction of the bullfrog (*Rana catesbeiana*) have also led to its decline. Studies have been conducted on the distribution and ecology of the snake, and this information will be used to develop management plans for specific areas, such as Pescadero Marsh and Año Nuevo State Reserve. In 1985, the U.S. Fish and Wildlife Service (USFWS) published a final federal recovery plan for the snake.

California Red-legged Frog

The CRLF is federally listed as threatened by the USFWS and is considered a species of concern by the CDFG (CNDDB, 2006). Critical habitat was finalized for the species on April 13, 2006. The potential project site is not located in any of the designated areas.

Some human-induced factors have led to the local and regional decline of the species. These include alteration of watercourses and adjacent floodplain terraces, modification of upland habitat for development and flood control purposes, and alteration of natural seasonal stream-flow patterns due to dam construction. However, it is thought that manmade stock ponds associated with farming and ranching operations can provide excellent habitat for the CRLF. The CRLF also owes its decline to the widespread introduction of exotic aquatic predator fauna, such as the bullfrog, crayfish (*Procambarus clarkii*), and an array of other fishes, including sunfish (*Lepomis* spp.), mosquito fish (*Gambusia affinis*) and bass (*Micropterus* spp.) (Bury and Ludenbach, 1983).

The CRLF occurs in the Coast Ranges from Point Reyes National Seashore to Ventura County (Stebbins, 2003; Storer, 1925), with almost all of the Central Valley, Sierra Nevada foothill, and southern California populations now extirpated (Stebbins, 2003). The breeding season for CRLF in stream habitats extends from November to mid May (Jennings and Hayes, 1994). Adult CRLF utilize aquatic sites for reproduction and adjacent terrestrial habitat, such as riparian thickets on stream terraces, riparian scrub, riparian woodlands, and grasslands, for foraging and aestivation. Aquatic habitat is characterized by dense, shrubby, or emergent riparian vegetation, such as willow (*Salix* spp.), cattail, and bulrush, associated with deep (greater than 2 feet), still or slow-moving water. In addition, aquatic sites must contain adequate water depth for approximately four to five months for CRLF larvae to develop and survive (Jennings and Hayes, 1994).

Other important microhabitat features include overhanging vegetation, such as willow boughs that contact the water, overhanging banks formed by tree-root masses, and retreat sites at water levels that are close to relatively deep, still water. Adult CRLF are strongly associated with these microhabitats during surface activity (Hayes and Jennings, 1989; Jennings and Hayes, 1994). Juvenile and sub-adult frogs appear to favor more open, shallow aquatic habitats with dense emergent and submerged vegetation, as well as overhanging banks or stick masses (Hunt, 1998).

Central California Coast Steelhead Distinct Population Segment

The central California coast steelhead distinct population segment includes all naturally spawned steelhead occurring between the Russian River in Sonoma County and Aptos Creek in Santa Cruz County (DOC, 2005). The central California coast steelhead is a federally threatened species. The project does not fall within the designated critical habitat for steelhead. Critical habitat considers many requirements of the species, including (but not limited to) spawning sites, food resources, water quality and quantity, and riparian vegetation (DOC, 2005).

Factors causing the decline of steelhead populations include widespread degradation of freshwater and estuarine habitats, continuing habitat destruction, changes in ocean production, disease prevalence, predation, and changes in life history characteristics (NMFS, 1996). Urbanization, water impoundment, and water diversion have also created impacts (Watershed Protection and Restoration Council, 1997).

Steelhead spend much of their adult life in the ocean but return to natal streams to spawn from December through April. Females select a site with clean inter-gravel flow, then dig a redd (spawning site) and deposit eggs. A male then fertilizes the eggs. Eggs hatch, and the fry generally emerge from the gravel in approximately four to six weeks. Newly emerged fry move to shallow, protected areas along a stream margin and eventually move again to feeding locations, which they defend (Watershed Protection and Restoration Council, 1997). Juvenile steelhead inhabit riffles and some larger fish inhabit pools or deeper runs. Juveniles may remain in fresh water for one to several years before migrating downstream, undergoing physiological changes, and entering the ocean. Steelhead spend several months to three years in the Pacific Ocean before returning to freshwater to spawn (Watershed Protection and Restoration Council, 1997).

Geomorphology

The headwaters of this spring-fed creek system have a bedrock geology that consists of easily erodible granitic rocks. This weathered rock is the source of much of the sand in Denniston Creek. The five unnamed, spring-fed tributaries that feed Denniston Creek are surrounded by what the U.S. Department of Agriculture's Natural Resources Conservation Service classifies as Miramar coarse sandy loam (see Attachment A). This soil type is found in the upper portions of the tributaries on very steep slopes making them highly prone to erosion. Landslides are common occurrences under these conditions. Natural watershed erosion processes in the Denniston Creek watershed produce large amounts of sand and finer particles that are transported downstream. During large precipitation events, considerable amounts of sediment are transported downstream where they are eventually trapped behind the dam. It will be necessary to develop a sediment management plan to address this never-ending process.

The bed, banks, and floodplain of Denniston Creek where it travels through the valley are classified as Farallone coarse sandy loam. This soil type is described as seeped, coarse sandy loam on top of coarse sands that are found on gentle slopes. The U.S. Geological Survey (USGS) classifies this areas liquefaction susceptibility as very high (see Attachment A). Thus, during earthquakes and large storm events these soils can liquefy, which would cause damage to manmade structures and create dangerous situations for people such as CCWD staff and the farmers. Special building permits and surveys may be required to build in this area.

Bank erosion is another natural process that occurs in the watershed. As a creek evolves it meanders and naturally erodes its banks. Reaches of the creek that have been channelized between roads, agricultural fields, and steep mountainsides have accelerated rates of bank erosion. Channelization increases the creek's velocity and concentrates its energy rather than dissipating it over a flood plane. Therefore, incisions and undercut banks are more severe and frequent in these confined areas. In addition, areas that lack riparian vegetation have eroded even faster under these conditions. It will be impossible to stop this process altogether, but sedimentation can be decreased by revegetating and stabilizing highly eroded banks. If a sediment basin is constructed, the reach between it and the existing reservoir should be a top priority for bank stabilization.

Land use and management in the watershed are also affecting stream morphology and water quality. Unpaved roads parallel large sections of the creek along the valley floor. These unpaved roads and road cuts can be a source of fine sediment in the watershed. There are some large agricultural fields adjacent to the creek in the upper portion of the valley. Topsoil loss resulting from sheet flow from the fields, especially when they are fallow, is likely a large source of sedimentation (see Attachment B).

Hydrology

The main sources of water in the Denniston Creek watershed are rainfall, fog, and accumulated groundwater that reaches the surface as natural springs. The USGS does not have a gauging station set up on Denniston Creek. CCWD has installed a staff gauge and a Parshall flume; however, the data associated with these devices is not accurate. The staff gauge is located just upstream of the water treatment plant road and it is in a section of the creek that is braided. In this section of the creek, the channel splits and ultimately flows into two culverts that are located under the water treatment plant road. Therefore, not all of the flow is being measured. The partial flume is approximately 20 yards upstream from the staff gauge. This flume was installed many years ago and it has not been maintained. As a result, it does not capture all of the water that is flowing through the channel.

The farmer and CCWD are pumping water out of Denniston Reservoir. As a result, stream flows are considerably lower below the dam. CCWD has accurate records of the amount of water that they are pumping out of Denniston Reservoir. The farmer takes out different amounts of water from year to year depending on the weather. An estimated range of typical water used by the farmer could most likely be determined. CCWD is currently appropriated 2 cubic feet per second; however, they lack the necessary infrastructure to realize this entire amount. Water that is pumped out of the reservoir can be highly turbid, especially during storm events. CCWD also has some wells adjacent to the creek downstream of the dam. These wells have not been very productive and are currently in need of maintenance; however, if they are put back into use they would affect flow rates.

Historic Reservoir Boundaries

In the past, the reservoir has had more storage capacity and a larger area of open water. Ongoing sedimentation and the lack of an adequate maintenance plan have greatly reduced the reservoir's storage capacity and open water surface area. CCWD would like to see the reservoir look like it did in 1982 just after they completed an approximate 20,000-cubic yard dredging and vegetation removal project (see Attachment A). A more recent aerial view shows how the conditions have drastically changed compared to what it looked like in 1982 (see Attachment A). Decades of sedimentation and subsequent vegetation establishment has reclaimed approximately 1,100 linear feet of what used to be open water. Undertaking a project that would produce the same results as the 1982 project would impact approximately 2.5 acres of riparian and wetland vegetation. The historic reservoir boundary as seen under current conditions can be seen on the historic reservoir boundary map in Attachment A. A comprehensive vegetation management and removal plan will be an important part of the project design.

3.2 AGENCY CONSULTATION AND PERMITTING

The information below assumes that CCWD is proposing the project and that it is their goal to remove approximately 20,000 cubic yards of sediment from the reservoir. It also assumes CCWD will take a typical project permitting approach. See Attachment D for a detailed permitting schedule. This report also describes how this permitting scenario would be altered if the project were initiated by the USFWS as a federal recovery action.

Federal

National Environmental Policy Act

To satisfy the National Environmental Policy Act (NEPA) the ACOE, acting as the lead federal agency, would conduct an Environmental Assessment (EA) as a part of the individual permit determination process. The findings of their assessment will determine if a Finding of No Significant Impact or an Environmental Impact Statement (EIS) will be prepared. If an EIS is required, it is likely that an Environmental Impact Report (EIR) will be required through the California Environmental Quality Act (CEQA) process. If that is the case, a memorandum of understanding may be reached between the lead state and federal agencies to authorize the production of a joint EIR/EIS.

ACOE Individual Permit

It has been determined by an ACOE staff member that this project will most likely require an Individual Permit to comply with section 404 of the Clean Water Act. A Nationwide or General Permit was not an option because a potentially large amount of wetland and riparian vegetation will need to be removed. The individual permit process will require a wetland delineation, development of the 404 (b) (1) alternatives analysis, NEPA-compliant EA, and a public review and comment period. Compliance with Section 7 of the Coastal Zone Management Act, Endangered Species Act, Section 106 of the National Historic Preservation Act, and all state laws will be required.

USFWS/National Oceanic & Atmospheric Administration Fisheries Section 7 Formal Consultation

Formal consultation with the USFWS and National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) will be required to comply with Section 7 of the Endangered Species Act. This will require preparing a Biological Assessment that will include surveys for special-status plant and animal habitat, recommended conservation measures, and impact determinations. Species-specific requirements will be determined once a project description is created; however, it is assumed that the CRLF and SFGS exist at Denniston Reservoir. It will be necessary for the USFWS to issue a draft Biological Opinion. It is likely that securing compensatory mitigation for temporary and permanent impacts will be required.

State

California Environmental Quality Act

TRC Essex is assuming CCWD will be the lead CEQA agency. To comply with the CEQA guidelines, CCWD will need to file an application, complete the CEQA checklist, and perform an Initial Study. Depending on the outcome of the Initial Study, the project will require a

Negative Declaration, Mitigated Negative Declaration, or an EIR. If an EIR is required, a memorandum of understanding may be reached between the lead state and federal agencies to authorize the production of a joint EIR/EIS.

CDFG 1602 Streambed Alteration Agreement and a Memorandum of Agreement
Conversations with CDFG staff revealed that a Memorandum of Agreement (MOA) for the SFGS, a state fully protected species, will most likely not be issued. In addition, the conditions that will be included in the 1602 agreement for the SFGS will make the project very difficult and costly to implement. CCWD will want to closely evaluate the costs associated with implementing these conservation measures. It is important to keep in mind that if the project proceeds without an MOA and take of the SFGS occurs the fines and penalties will be substantial.

Regional Water Quality Control Board 401 Water Quality Certification, National Pollution Discharge Elimination System, Notice of Intent Under General Stormwater Permit, and Dewatering and Low-threat Discharge Permit
To comply with section 401 of the Clean Water Act, water quality certification will need to be obtained. To comply with the National Pollution Discharge Elimination System requirements an application and appropriate descriptions will need to be submitted to the Regional Water Quality Control Board (RWQCB) for the discharge and disposal of dredged materials. A Notice of Intent to comply with the General Construction Storm Water Permit for the RWQCB and preparation of a Storm Water Pollution Prevention Plan will be required. In addition, it is anticipated that a dewatering plan will need to be included for the Dewatering and Low-threat Discharge Permit.

California Division of Safety of Dams
A permit may be required from the California Division of Safety of Dams (DSOD) if it is determined that the height of Denniston Dam is greater than 25 feet, or if the reservoir will store more than 50 acre feet of water after the project is complete. The height of the dam is calculated by measuring the stream bottom below the dam where it is adjacent to the toe of the dam to the top of the spillway. Conversations with CCWD's engineer indicated that the height of the dam is unknown. It is recommended that the height of the dam or the final capacity of the reservoir be determined to see if a permit from the DSOD will be required.

Local

San Mateo County Coastal Development Permit and Grading Permit
To comply with the California Coastal Act and San Mateo County's Local Coastal Plan (LCP), a coastal development permit will be required. The County's LCP is consistent with the regulations put in place by the California Coastal Commission (CCC). Any decisions that are made by the County can be appealed by the CCC. In addition, it is likely that a Grading Permit will be required.

Federal Recovery Action Scenario

CCWD would have difficulty complying with CDFG regulations for a project they initiate due to the issues surrounding the fully protected SFGS and the amount of material they would like to

remove. The conservation measures that would be imposed by the CDFG would likely make the project very challenging and complying with these measures would be difficult. However, if the project were initiated by the USFWS as a federal recovery action, these issues could be avoided. The purpose of a recovery action is to recover or create habitat for endangered species. The project's main purpose would be to create habitat for the SFGS and CRLF, and an incidental benefit of that project would be that CCWD could regain capacity in the reservoir. The reservoir design would serve both the purposes of creating habitat and maintaining capacity so CCWD could continue to use it as a source of municipal water.

Initial conversations with the USFWS, CDFG, and NOAA Fisheries have indicated that they are very interested in working collaboratively on a project like this. They realize the potential to serve the interests of both the species and CCWD. There is also the possibility of utilizing federal and state funds for the project. Additional research needs to be done and certain conditions need to be met before it can be determined if this scenario is viable. There is no model or template to work from so it is going to take some further investigating to determine if it is feasible or not. Staff members from the USFWS and CDFG are currently investigating ways to make the project work. One of the conditions that will need to be met to move forward is for CCWD and the landowner, Peninsula Open Space Trust (POST) to come to some agreements surrounding the project. Section 5.0 of this report discusses this in detail.

The main permitting benefit that could be realized from the USFWS initiating this project as a federal recovery action would be that the CDFG could potentially issue a special Memorandum of Agreement (MOA) for the SFGS. CDFG would be able to do this for a fully protected species because the intent of the project would be to create and maintain habitat for that species. In addition, if the project qualifies as a federal project a 1602 Streambed Alteration Agreement may not be necessary. USFWS would have to comply with the Fish and Wildlife Coordination Act to make sure that all state laws are followed.

Other permitting benefits may be realized as well, for example, some federal recovery action projects qualify for Categorical Exclusions from NEPA. USFWS will need to comply with the Federal Coastal Zone Management Act and a Coastal Development Permit (CDP) will likely be necessary, however, the process for obtaining the CDP would be much easier if the USFWS was initiating the project for the purpose of special status species habitat creation.

Key factors that will affect the permitting strategy for a federal recovery action project include design parameters in the project description and the level of federal involvement in the project. It is possible that the project will be set up as a joint venture between CCWD and the USFWS. It will be necessary to determine the level of federal involvement and funding that will be required for the project to qualify as a federal project. Additional research and consultation is required to fully understand how a federal recovery action project will be permitted. Staff members from the resource agencies are currently researching permitting requirements.

4.0 RECOMMENDATIONS

4.1 ADDITIONAL STUDIES

The following recommendations for additional studies should be considered to help determine restoration plan design and satisfy permitting requirements. Requirements for various permits are largely dependent upon activities outlined in a project description. Some of the following recommended studies may or may not be required.

Biological Resources

Protocol-level surveys to determine the presence or absence of special-status species may be required. Presence is assumed for the CRLF and the SFGS. A focused survey may be required to determine the type of trout that are living in the reservoir, but it is not likely. Preconstruction surveys will likely be required for the SFGS, CRLF, San Francisco dusky-footed wood rat (*Neotoma fuscipes annectens)*, black rail (*Laterallus jamaicensis)*, clapper rail (*Rallus longirostris*), and western pond turtle (*Actinemys marmorata*). It is not anticipated that any entomological surveys will be required. A Biological Assessment will be required to comply with Section 7 of the Endangered Species Act.

Botanical Resources

Rare plant surveys may be required to comply with CEQA.

Archaeology

A records search and archaeological surveys will be required to comply with Section 106 of the National Historic Preservation Act.

Geomorphology

To aide with restoration and reservoir design bathymetric surveys of the reservoir should be conducted. Once the bathymetry of the reservoir is determined, that data can be used to help guide the design of the restored reservoir. In addition, an engineering and survey crew will need to produce construction-level drawings for the reservoir. It is also recommended that a sediment transport budget be determined for the watershed. This information will be helpful in determining the size of an additional sediment basin and subsequent maintenance schedules for that basin and the existing reservoir. Plans could also be suggested to make improvements to unpaved roadways and agricultural fields.

Hydrology

For this project to move forward, it will be essential to determine annual flow rates for Denniston Creek. In addition, an ongoing stream-monitoring program that collects flow data on a weekly or biweekly basis should be implemented and maintained. The existing staff gauge and the flume will both need to be recalibrated or replaced to gather accurate data. A qualified hydrological firm will be able to use a combination of the district's existing data, data from the farmer, new

data that they collect, and watershed modeling methods to determine a water budget for the Denniston watershed. It may also be helpful to hire a hydrology firm that specializes in fish passage to help with bypass flow negotiations.

Bioengineering

Stream reaches upstream of the reservoir should be evaluated for bank stabilization and revegetation opportunities to decrease sedimentation. The reach of stream between the proposed sediment basin and the existing reservoir will be critical to stabilize in an effort to keep water traveling from the sediment basin to the intake valves as low in turbidity as possible. Design parameters for the sediment basin could also benefit from a bioengineered design to help reduce impacts to special-status species and their habitat.

Wetland Delineation

A qualified wetland delineator should conduct field delineations and prepare a formal wetland delineation report per the ACOE's 1987 Wetland Delineation Manual for the area around the reservoir. All wetland resources should be mapped according to ACOE minimum mapping standards.

4.2 RESTORATION DESIGN GOALS AND PARAMETERS

The key question to ask at the start of any restoration effort is to determine what it is one is trying to restore and to what condition will it be restored to. One of the main goals of this project is to restore Denniston Reservoir to the condition it was in during the early 1980s when it was operating as a viable municipal water source. Another goal of this project is to restore habitat for native species that exist in the watershed. The goal for habitat restoration is to create and maintain habitat that accommodates the SFGS, CRLF, and steelhead life cycles. The design parameters for this project are intended to satisfy both of these goals simultaneously.
The suggested restoration design goals and parameters that are listed in this section apply to Denniston Reservoir and the watershed as a whole. Taking a watershed-level approach to restoration allows one to address the many problems that are occurring in different locations throughout the watershed. Many of the listed measures are intended to reduce sedimentation and improve water quality. Others are intended to aide in restoration design and help with the future management of the watershed. Most of the following criteria are to be implemented upstream of or at the existing reservoir.

- Create a bathymetric design for the reservoir that accommodates CCWD's need to maintain the reservoir as a viable source for municipal water and creates special-status species habitat. The amount of sediment to be removed could be in the range of 20,000 cubic yards. This design will include measures on how existing riparian and wetland vegetation will be manipulated and created. Some of the factors that should be considered when manipulating vegetation include habitat design, erosion control and flood control. This design will be created collaboratively between the USFWS, CDFG, NOAA Fisheries, CCWD, POST, and the appropriate personnel from professional engineering firms.

- Determine a location to build a sediment basin upstream of the existing reservoir. The size of this basin should be determined by evaluating the sediment budget in the watershed. This basin will be regularly maintained with heavy equipment and the appropriate resource agencies should be consulted to determine if the basin could act as an attractive nuisance for special-status species. Maintenance dredging of this basin will need to include measures to avoid impacts to sensitive species. The location of the basin should be chosen based on its accessibility for regular maintenance activities. In addition, the location should not be too far upstream from the reservoir in an effort to decrease the amount of sedimentation that occurs between the sediment basin and the reservoir.

- Permits will need to be set up so that regular maintenance can occur on the sediment basin. Weather patterns and the size of the basin will affect how often sediment will need to be removed. It will also be important to allow some flexibility in the maintenance schedule because large storm events can transport huge amounts of sediment in a very short amount of time. Sediment management should be monitored closely and an adaptive approach should be used to account for variable weather conditions. Sediment disposal locations will need to be identified because the current disposal site in the watershed will not be large enough to accommodate ongoing maintenance.

- If the reservoir is dewatered, CCWD engineers should investigate the possibility of replacing the large release valve that exists between the intake valves and the spillway on the dam. It has not been used for many years and is considered non-operational. If replaced, this valve could be opened periodically to flush sediment away from the intake valves.

- Bank stabilization and revegetation locations should be identified and prioritized in stream reaches above the reservoir to decrease sedimentation. Bioengineered bank stabilization methods and native plants should be used. Unstable banks between the proposed sediment basin and the reservoir should be fixed first to maintain water quality.

- Landslides in the lower portion of the watershed should be evaluated to see if there are any opportunities for stabilization. Controlling this natural process will likely be very difficult. However, if a site is directly affecting the creek and it is accessible, a stabilization and revegetation plan should be considered.

- Unpaved roads that run parallel to the creek increase erosion potential during storm events due to improper road drainage. Sections of road that have been washed out should be repaired and drainage control measures should be implemented. No additional roads should be built in the watershed. Unused roads that exist above the easternmost agricultural field should be decommissioned and revegetated (see attachment B).

- Drainage improvements for agricultural fields should be assessed to decrease sedimentation from overland flow. Additional measures should be evaluated for fields that lay fallow.

- Efficiencies in irrigation practices should be evaluated. Research should be conducted on potential funding sources for irrigation improvements. Federal, state, and private grants are

available for watershed improvement and water conservation projects for farmers. In some cases more efficient irrigation systems can improve efficiency by 30 to 50 percent.

- Existing wells on the property should be maintained for water storage and production.

- Invasive species management plans should be established for the newly created habitat around the reservoir.

- The possibility of using a floating intake valve to divert water from the reservoir should be investigated. Existing or new intake valves should be designed so that they cannot cause harm to frogs, fish, snakes, or other aquatic species.

- If it is determined that enough water is available, fish passage barriers should be repaired and a fish ladder should be designed for the spillway on Denniston Dam. Initial summer and fall bypass flow requirements suggested by the CDFG are 2.5 cubic feet per second. Initial conversations with NOAA Fisheries suggest that a fish ladder for the Denniston Dam would require 1 cubic foot per second of bypass to maintain it in the summer.

- A conservation easement should be drafted to limit additional development in the watershed (see Attachment A), protect water resources, and manage special-status species habitat.

- Any restoration efforts that are implemented should have a corresponding monitoring plan to evaluate their effectiveness. It will be important to use an adaptive management approach in the watershed that allows for flexibility and changes in management practices as new information and methodologies are discovered.

4.3 PUBLIC INVOLVEMENT

CCWD is a public agency and the intent of this project is to create benefits for the public, and specifically, the members of the communities that CCWD serves. CCWD has already made it clear to the public that restoring Denniston Reservoir is a priority. They have outlined the benefits that could be realized from the project in a flyer that was sent to their ratepayers. Furthermore, there has been much discussion of this proposed project during monthly, televised board meetings. Gaining public support and inviting public comment will be an important part of this process.

This project is still in the initial research phase. There are many unanswered questions at this time. It has not yet been determined how the project might be initiated or if it will even be possible at all. At this point, it is important that the public understands this. Critical issues concerning the water budget, the landowner, and the role that federal and state agencies will play are still unanswered. The research phase is gaining a lot of momentum and much progress has been made; however, the many unknown factors that exist make it impractical to begin to entertain public comments on the project at this time. Once a more clear direction has been established and all the stakeholders agree on how to proceed it will be appropriate to entertain public comment on the project.

5.0 NEXT STEPS

The top priority that must be addressed to enable this project to move forward is to determine a water budget for the Denniston watershed. A firm that specializes in hydrology and engineering should be hired to determine a water budget and implement a long-term stream flow-monitoring program. By evaluating newly collected data, CCWD's existing data, the farmer's data, and watershed modeling methods, a water budget for the watershed can be determined. This information will guide future negotiations and restoration design.

To be able to continue to evaluate the possibility of setting this project up as a federal recovery action, CCWD and POST need to come to some agreements regarding the project. Both parties will need to agree on initial project parameters, stream flow allocation, conservation easement strategy, titleholder designation, and future management of the watershed. Once these two parties come to some agreements they will need to draft a letter that discusses these agreements and endorses the project. The letter will be sent to senior management staff at the USFWS, CDFG, and NOAA Fisheries. Once the resource agencies realize that the two primary stakeholders agree on how to move forward they will be in a better position to authorize the project as a federal recovery action.

Once the water budget has been determined, a strategy on how to negotiate CDFG-mandated bypass flow requirements will need to be created and eventually negotiations will need to start. Parties that will likely be involved include experts from the CDFG and NOAA Fisheries, CCWD, POST, the farmer, hydrology consultants, and fisheries consultants.

Specific project design criteria can start to be developed and the permitting process can begin once a water budget has been determined, agreements have been made between CCWD and POST, a bypass flow has been established, and the USFWS authorizes the project as a recovery action.

6.0 REFERENCES

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Attachment A: Map Book

Attachment B: Photo Documentation

Attachment C: Special-status Species List

Attachment D: Permit Schedule