Jim Courtois
PO Box 10
Garberville, CA 95542-0010

Humboldt County Planning and Building Department
Humboldt County Planning Commission
3015 H Street
Eureka CA 95501

Comment on the Marshall Ranch Streamflow Enhancement Project

I and my family are longtime residents of Briceland, we bought our parcel in 1983, and love our small town. I am the operator of Briceland Community Service District's water plant. I am licensed by the state for water treatment and water distribution. I am writing this letter because this project represents an existential threat to our lives and our largest asset, our property. It is about 400 feet away and 100-150 feet looming over our House, the topography of the site is equivalent to a Shute or Shotgun aimed right at the house, with no obstacle's in between. I was told by Joel Monschke that they had alternate sites they could use for their project, but this site was "the most cost effective". Well the fact that it could cause loss of life and major property damage should be considered before coming to that conclusion! We have participated with the local non-profit Montessori School in raising over 2000 salmon fry and releasing them under our bridge with the Children in the school participating. We have also done stream rehab work with EARWIG in the past and we care for Redwood Creek and consider ourselves Stewards of it. We feel this project should be denied because of its obvious and serious problems.
I am asking that if you do not stop this project as submitted that you extend the public comment period for at least 60 days to allow the public more time to examine the relevant documents, which were only received by me in the last week.. I have personally met with the principals of SRF (Salmonid Restoration Foundation) on November 20th along with concerned neighbors and we reached an agreement with them to request an extension of the comment period. This is necessary, as people in Briceland, with only a few exceptions were even aware of this massive alteration of our town's character. There are serious issues with this project that in the event of the earth dam failure, which includes the loss of life, damage to property, and the devastating damage to Redwood Creek that would occur from debris and earth/mud /rock and woody debris washing into Redwood Creek and causing permanent damage. In the event of a dam failure this project is a threat to the very critical habitat that it is ostensibly designed to enhance. It is an ill conceived plan that threatens not only my family's lives but threatens the very resource it purports to help.
In the "National Engineering Manual – Title 210", section 520.26 section "D" it list "Determination for "External Review for Dam Safety" , in subsection (1) it indicates this project should require an external review. I would ask that this rule be followed as this is a "High hazard potential dam"

I have included a number of attachments that I would ask you to please look at and note the highlighted sections. Thank you.

Jim Courtois
11/25/19

USDA NRCS (National Resources Conservation Service)

Technical Release No. 60 Earth Dams and Reservoirs

Part 1 General

Dam classification

In determining dam classification, a number of factors must be considered. Consideration must be given to the damage that might occur to existing and future developments should the dam suddenly release large quantities of water downstream due to a breach, failure, or landslide into the reservoir. The effect of failure on public confidence is an important factor. State and local regulations and the responsibility of the involved public agencies must be recognized. The stability of the spillway materials; physical characteristics of the site and the valley downstream; and relationship of the site to industrial and residential areas, including controls of future development, all have a bearing on the amount of potential damage in the event of a failure.

Dam classification is determined by the above conditions. It is not determined by the criteria selected for design. The policy on classification is in the National Engineering Manual (NEM), Part 520, Subpart C, Dams.

Classes of dams

The following classes of dams have been established by policy and repeated here for convenience of the user.

- Low hazard class—dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.
- Significant hazard class—dams located in predominantly rural or agricultural areas where failure may damage isolated homes, main highways or minor railroads, or cause interruption of use or service of relatively important public utilities.
- High hazard class—dams located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads.

Peak breach discharge criteria

Breach routings are used to help delineate the area potentially impacted by inundation should a dam fail and can be used to aid dam classification.

Stream routings made of the breach hydrograph will be based upon topographic data and hydraulic methodologies mutually consistent in their accuracy and commensurate with the risk being evaluated.

The minimum peak discharge of the breach hydrograph, regardless of the technique used to analyze the downstream inundation area, is:

- For depth of water at the dam at the time of failure where $H_w \geq 103$ ft

$$Q_{max} = (65) H_w^{1.85}$$

- For depth of water at the dam at the time of failure where $H_w \leq 103$ ft

$$Q_{max} = (1{,}100) B_r^{1.35} \qquad \text{where } B_r = \frac{(V_s)(H_w)}{A}$$

  but not less than $Q_{max} = (3.2)H_w^{2.5}$ nor more than $Q_{max} = (65)H_w^{1.85}$

- When the width of the valley, L, at the water surface elevation corresponding to the depth, H_w, is less than,

$$T = \frac{(65) H_w^{0.35}}{0.416}$$

  replace the equation, $Q_{max} = (65)H_w^{1.85}$, in 1 and 2 above with,

$$Q_{max} = (0.416)(L)H_w^{1.5}$$

where:

Q_{max} = peak breach discharge, ft³/s
B_r = breach factor, acre
V_s = reservoir storage at the time of failure, acre-ft
H_w = depth of water at the dam at the time of failure; however, if the dam is overtopped, depth is set equal to the height of dam, ft
A = cross-sectional area of embankment at the assumed location of breach, usually the template section (normal to the dam longitudinal axis) at the general floodplain location, ft²

USDA - NRCS Ponds - Planning, Design, Construction Handbook

Preliminary investigations

General considerations

Selecting a suitable site for your pond is important, and preliminary studies are needed before final design and construction. Analysis and selection of pond sites should be based on landscape structure and associated ecological functions and values. Relationship of the site to other ecological features within the landscape is critical to achieving planned objectives. If possible, consider more than one location and study each one to select the most ecologically appropriate, esthetic, and practical site. Weighing both onsite and offsite effects of constructing a pond is essential in site selection. Refer to figure 1 and the glossary to become familiar with the components of a pond and associated dam.

For economy, locate the pond where the largest storage volume can be obtained with the least amount of earthfill. A good site generally is one where a dam can be built across a narrow section of a valley, the side slopes are steep, and the slope of the valley floor permits a large area to be flooded. Such sites also minimize the area of shallow water. Avoid large areas of shallow water because of excessive evaporation and the growth of noxious aquatic plants.

If farm ponds are used for watering livestock, make a pond available in or near each pasture or grazing unit. Forcing livestock to travel long distances to water is detrimental to both the livestock and the grazing area. Space watering places so that livestock does not travel more than a quarter mile to reach a pond in rough, broken country or more than a mile in smooth, nearly level areas. Well-spaced watering places encourage uniform grazing and facilitate grassland management.

If pond water must be conveyed for use elsewhere, such as for irrigation or fire protection, locate the pond as close to the major water use as practicable. Conveying water is expensive and, if distance is excessive, the intended use of the water may not be practical.

Ponds for fishing, boating, swimming, or other forms of recreation must be reached easily by automobile, especially if the general public is charged a fee to use the pond. The success of an income-producing recreation enterprise often depends on accessibility.

Avoid pollution of pond water by selecting a location where drainage from farmsteads, feedlots, corrals, sewage lines, mine dumps, and similar areas does not reach the pond. Use permanent or temporary measures, such as diversions, to redirect runoff from these sources to an appropriate outlet until the areas can be treated.

Do not overlook the possibility of failure of the dam and the resulting damage from sudden release of water. Do not locate your pond where failure of the dam could cause loss of life; injury to persons or livestock; damage to homes, industrial buildings, railroads, or highways; or interrupted use of public utilities. If the only suitable pond site presents one or more of these hazards, hire a qualified person to investigate other potential sites to reduce the possibility of failure from improper design or construction.

Be sure that no buried pipelines or cables cross a proposed pond site. They could be broken or punctured by the excavating equipment, which can result not only in damage to the utility, but also in injury to the operator of the equipment. If a site crossed by pipelines or cable must be used, you must notify the utility company before starting construction and obtain permission to excavate.

Avoid sites under powerlines. The wires may be within reach of a fishing rod held by someone fishing from the top of the dam.

Area adequacy of the drainage

For ponds where surface runoff is the main source of water, the contributing drainage area must be large enough to maintain water in the pond during droughts. However, the drainage area should not be so large that expensive overflow structures are needed to bypass excess runoff during large storms.

The amount of runoff that can be expected annually from a given watershed depends on so many interrelated factors that no set rule can be given for its determination. The physical characteristics that directly affect the yield of water are relief, soil infiltration, plant cover, and surface storage. Storm characteris-

- Safety factors for discharge gradient where seepage exits from sloping surfaces must be reduced by the tangent of the effective friction angle of the affected soils.
- A safety factor of at least 2.5 is considered acceptable when computed by the effective stress method for a blanket aquifer condition in soil. Safety factors must be computed using an assumed reservoir head set at the top of the embankment.
- Filters must be designed to have a coefficient of permeability of at least 10 times the permeability of the base soil for which they are intended to provide seepage relief.
- Drainage capacity must be increased by a factor of 30 for critical concrete and RCC structures such as chute spillways.

Design requirements

The need for cutoff and drainage measures to address potential seepage problems must be evaluated based on upon meeting minimum factors of safety, relative effectiveness, and impact on the functionality and purpose of the proposed structure. For some structures, the predicted performance of the structure is satisfactory with no drainage or filters, and those features may be eliminated from the design of structures with these highly favorable conditions.

Filter and drainage zones should be considered when backward erosion piping is predicted without them and where an effective cutoff of foundation seepage is [illegible] attainable or feasible.

Drainage measures or seepage berms must be included in designs where a blanket/aquifer condition exists and a minimum [illegible]

Filter and drainage zones must also be included in the design of all embankments where the following factors provide strong reasons for their inclusion:

- The hazard classification is significant or high.
- [illegible] permanent beneficial water storage (municipal, industrial, recreation-[illegible]
  [illegible] storage at crest of riser level and zoning [illegible] the [illegible]
- Embankment soils are dispersive clay, have a PI value less than [illegible]
- A positive control of seepage by appropriate cutoff measures is not practical or achievable or soils are susceptible to backward erosion piping.
- Foundation grouting cannot be considered a positive cutoff of seepage for purposes of eliminating drainage zones in a design.
- Differential settlement ratios exceed those values generally considered acceptable and hydraulic fracture of the embankment is predicted.
- Other embankment design constrictions (such as a need for increased shear strength) require soils to be compacted at water contents dry of optimum water content.
- Adjacent zones of the embankment or foundation strata in contact with the embankment are not filter compatible according to criteria presented in NEH 633.26.
- Seepage without drainage collection will damage infrastructure downstream of the impoundment.
- A high potential for desiccation cracking of the embankment exists because the embankment is constructed in climate or areas in the country conducive to the problem.

Designs may include but are not limited to the following:

- zoning of the embankment
- embankment chimney filters
- blanket filter zones
- foundation drainage zones of various types as shown in USACE EM 1110–2–1901, including relief wells.

Seepage collection systems must include access points (current Occupational Safety and Health Agency (OSHA) rules and regulations must be followed) that permit inspection and cleanout of drain pipes so far as practical. Where needed, collection systems must include measurement devices such as weirs or flumes.

Geosynthetics

The traditional functions of geosynthetics are filtration [illegible], planar drainage (transmission), rein-[illegible] materials, water barrier, and surface stabilization.

[illegible]

critical to the safety or satisfactory performance of

USDA / NRCS PUBLICATION

Subpart C – Dams

520.20 General

A. Dams are essential to soil and water resource development. To ensure safety, dams need controls to protect life and property.

B. NRCS requires uniform, high-quality standards in the planning, design, and construction of dams to ensure consistently safe and efficient performance.

520.21 Definition and Classes

A. As used in this manual, a dam is an artificial barrier, together with any associated spillways and appurtenant works, that impounds, may impound, or diverts water.

B. Storage is the capacity of the reservoir, in acre-feet, below the elevation of the crest of the lowest auxiliary spillway or below the elevation of the top of the dam if there is no open channel auxiliary spillway.

C. Overall height is the difference in elevation in feet between the top of the dam and the lowest elevation at the downstream toe.

D. Effective height is the difference in elevation, in feet, between the lowest open channel auxiliary spillway crest and the lowest point in the original cross section on the centerline of the dam. If there is no open channel auxiliary spillway, the top of the dam becomes the upper limit.

E. NRCS classifies dams according to the potential hazard to life and property if the dam should suddenly breach or fail. Dam classification requires consideration of existing and future downstream development, including controls for future development. The potential hazard from failure determines the classification of a dam as follows.

(1) Low Hazard Potential.—Dams in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.

(2) Significant Hazard Potential.—Dams in predominantly rural or agricultural areas where failure may damage isolated homes, main highways, or minor railroads, or interrupt service of relatively important public utilities.

(3) High Hazard Potential.—Dams where failure may cause loss of life or serious damage to homes, industrial or commercial buildings, important public utilities, main highways, or railroads.

F. Some dams have greater significance than others because of their potential to affect public safety. Although the public's concern for safety of dams often corresponds with the size of the dam and reservoir, small dams may also present a hazard. In addition, while some dams initially may present no hazard in terms of loss of human life, their degree of hazard can change because of downstream development. Because of this and the need to manage an overall NRCS program for dam safety, the Director, Conservation Engineering Division (CED), must maintain a national inventory of NRCS-assisted dams. Each State conservation engineer (SCE) must maintain the State inventory. NRCS considers dams meeting any of the following criteria as NRCS inventory dams:

(1) All significant and high hazard potential dams.

(2) Low hazard potential dams more than 6 feet in National Inventory of Dams (NID) height and with an NID storage of 50 acre-feet or more.

(3) Low hazard potential dams with an NID height of 25 feet or more and an NID storage of more than 15 acre-feet.

G. For the purposes of the NRCS inventory, U.S. Army Corps of Engineers (USACE) definitions apply as follows:

(1) Dam Height.—The vertical distance between the lowest point on the crest of the dam and the lowest point in the original streambed. Height of the dam is expressed in feet and rounded to the nearest foot.
(2) Structural Height.—The vertical distance from the lowest point of the excavated foundation to the top of the dam. Top of dam refers to the parapet wall and not the crest. Structural height is expressed in feet and rounded to the nearest foot.
(3) Hydraulic Height.—The vertical difference between the maximum design water level and the lowest point in the original streambed. Hydraulic height is expressed in feet and rounded to the nearest foot.
(4) NID Height.—Maximum value of dam height, structural height, and hydraulic height.
(5) Maximum Storage.—The total storage space in a reservoir below the maximum attainable water surface elevation, including any surcharge storage. Maximum storage is expressed in acre-feet.
(6) Normal Storage.—The total storage space in a reservoir below the normal retention level, including dead and inactive storage and excluding any flood control or surcharge storage. Normal storage is expressed in acre-feet.
(7) NID Storage.—Maximum value of normal storage and maximum storage.

H. NRCS must keep the NRCS inventory of dams current and accurate. SCEs are responsible for maintaining all inventory fields and updating the hazard classification of each project dam as required in Title 180, National Operations and Maintenance Manual (NOMM).

I. States must use the Web-based application GeoObserver for Dams to maintain the NRCS inventory of dams. User Guide 210-14-6, "GeoObserver for Dams," contains instructions for accessing GeoObserver for Dams.

J. The Director, CED, provides each SCE, and may provide other employees selected by the SCE, permission to access GeoObserver for Dams to edit the inventory in their State. The Director, CED may provide other NRCS employees the necessary permission to access GeoObserver for Dams to view all or portions of the NRCS inventory of dams.

K. Because the NRCS inventory of dams contains sensitive data, and data intended for agency use only, NRCS limits access. The Director, CED, submits portions of the data as required by law, to USACE for inclusion in the NID. USACE provides public access to portions of the NID. As needed, the Director, CED will provide USACE the names of NRCS employees requesting access to nonpublic portions of the NID.

520.22 Design Criteria

A. Low hazard potential earth dams with a product of storage times the effective height of the dam of less than 3,000 acre ft^2 and with an effective height of the dam of 35 feet or less must meet or exceed the requirements of Conservation Practice Standard (CPS) Pond (Code 378).

B. Low hazard potential earth dams whose product of storage times the effective height of the dam is 3,000 acre ft^2 or more, those more than 35 feet in effective height, and all significant hazard potential and high hazard potential dams must meet or exceed the requirements of Technical Release (TR) 210-60, "Earth Dams and Reservoirs."

C. Dams of materials other than earth must comply with the applicable portions of CPS Pond (Code 378) and TR 60. Other features must meet or exceed the requirements as stated in other applicable NRCS standards.

520.23 Classification

A. Classification of dams is determined at the time of inventory and evaluation and verified immediately prior to construction. The person having the appropriate engineering job approval authority (section 501.4 of this manual) is responsible for the classification.

B. Documentation of the classification of dams is required. Documentation must include but is not limited to location and description of the dam, configuration of the valley, description of existing development (houses, utilities, highways, railroads, farm or commercial buildings, and other pertinent improvements), potential for future development, recommended classification, and signatures of those performing and concurring in the classification. When using breach routings as part of the classification process, documentation must also include results obtained from the breach routings.

C. If there are indications that any existing dam is misclassified, including changes resulting from downstream development, proposals for reclassification must be submitted to the SCE for action. If the SCE approves, NRCS officially reclassifies the dam. When this occurs, the SCE must document the case file, make proper notification, and update the inventory of NRCS assisted dams.

520.24 Special Considerations

A. Criteria in addition to the requirements in CPS Pond (Code 378) and TR 60 apply for some dams.

(1) Dams in series, dams with drainage areas of more than 10-square miles, and dams located in regions of high earthquake hazard require special considerations.

(2) Design low hazard potential dams for municipal or industrial water supplies with minimum criteria equivalent to criteria used for significant hazard potential dams.

(3) Do not construct high hazard potential dams and those with permanent storage over an active fault without the concurrence of the Director, CED.

B. Local experience, State laws and regulations, site conditions, or other special features may require the use of more stringent criteria to ensure a satisfactory dam.

520.25 Clearing Reservoirs

A. Clear reservoir areas to facilitate the movement of water, to provide for the proper functioning of outlets and spillways, to provide convenient access to dams and related structures for operation and maintenance, and to comply with State and local laws and regulations.

B. Use the following minimum standards to determine the clearing required for reservoir areas:

(1) Dry Dams.—Minimum requirements include—

(i) Clear reservoir areas for a distance of 200 feet upstream from the principal spillway inlet, except that no clearing is necessary above the elevation of the top of the inlet.

(ii) Clear areas immediately upstream from auxiliary spillways to the extent required to permit spillways to function properly.

(2) Dams That Retain Water in a Reservoir.—This includes dams with space allocated for sediment storage and dams that provide water storage for beneficial use. Minimum requirements include—

(i) Clear reservoir areas at least up to the elevation of the crest of the lowest ungated principal spillway inlet.

(ii) Consider allowing less clearing for a specific site if the structure incorporates fish and wildlife features and the sponsor or owner requests that the area not be cleared, or if the cost of clearing is disproportionate to the other costs of the structure and lack of clearing will not interfere with the functioning of the reservoir. The minimum area cleared must extend the full length of the dam for a distance of 400 feet upstream from the principal spillway and include the area upstream from the auxiliary spillway to the extent required for it to function properly. The operation and maintenance plan must include specific procedures addressing the potential for debris on the upstream slope of the dam and around the principal spillway.

520.26 External Reviews for Dam Safety

A. Definition of an External Review.—An external review is an examination and evaluation of procedures used and decisions made during the design and construction of a dam by peers from outside NRCS or from an organizational unit other than the one responsible for the design and construction. Section 511.2 of this manual provides the meaning of "design" used here.

B. Purpose of an External Review.—External reviews ensure that design and construction procedures and decisions reflect safety considerations and economy. The reviewer must determine whether the methods of analyses are appropriate and the assumptions are justified by the site conditions and whether the results are reasonable. An external review is not a substitute for expertise needed during design and construction.

C. Design Review.—Perform design reviews as established in section 511.5 of this manual. Perform independent reviews for quality assurance as established in section 501.5 of this manual. An independent review may only be considered an external review if the office performing the independent review had little or no role in the design.

D. Determination of Need for an External Review.—The SCE must evaluate all dams proposed for construction, modification, or repair to determine the need for an external review. The SCE must determine the need for an external review during preliminary design (see section 511.2C of this manual). For project structures, the SCE must determine the need for an external review during planning.

(1) For high hazard potential dams, factors to consider include the level of risk, size of the dam, reservoir volume, complexity of site geology, complexity and margin of safety reflected by the design layout and construction methods, and other unique condition or complexity noted during planning, design, or construction.

(2) To determine the need for an external review for all other dams, consider site complexity, unique design features, or other special conditions requiring special expertise.

E. Procedure for Establishing an External Review

(1) The SCE and the Director, CED, on class-VIII jobs will make a joint recommendation to the State Conservationist on the need for an external review. The recommendation must be supported by a justification statement and include a brief description of the site, the proposed structure layout, composition of technical specialists making up the review team, and other essential data. This becomes part of the design folder. The initiation of an external review may occur at any stage of the design or construction process.

(2) The State Conservationist is responsible for implementing the external review and advising the Director, CED, of the plan to conduct the external review.

(3) When recommending an external review, the State Conservationist must request a list of employees and others qualified to make the review from the Director, CED.

development to the owner or sponsor. It is the responsibility of the owner or sponsor to transmit the description of the potential impact area and precautions on development to—

(i) The local land-use control agency or county.

(ii) The State agency responsible for dam safety.

(iii) The conservation districts and others, as appropriate.

(2) If requested by the owner or sponsor, or if the owner or sponsor fails to act, the State Conservationist must make the specified notification.

4 GEOLOGY AND TECTONICS

The Redwood Creek watershed is in a tectonically active plate-boundary deformation zone, defined by right-lateral movement along the San Andreas Fault Zone that separates the Pacific plate to the west from the North American plate to the east (Kelsey and Carver 1988). Northward progression of the San Andreas Fault Zone is characterized by lateral shearing and vertical compression due to the major westward turn in the fault zone upon reaching the Mendocino Triple Junction near Cape Mendocino. These primary deformation styles are what create the dominant NNW-SSE trending topographic and structural grain in the region (Kelsey and Carver 1988). The evolution of this regional topographic and structural grain has developed pervasive shearing, fracturing, and faulting throughout the north coast of California.

The Garberville-Briceland fault zone trends NNW-SSE across the watershed (Figure 2) (McLaughlin et al. 2000). The fault zone consists of multiple named and unnamed fault traces with varying orientations of displacement. Although recent displacement along the fault zone is undifferentiated, it is considered Quaternary in age (i.e., active within the last 1.6 million years). The Briceland Fault trace is approximately 4,300 feet northeast of the project site and the Garberville Fault trace is approximately 2.75 miles to the northeast (Figure 2).

The Redwood Creek watershed is primarily underlain by the diverse Coastal and Central belts of the Franciscan Complex, the younger marine and non-marine Wildcat Group, and minor amounts of serpentinized peridotite of the Coast Range Ophiolite (Figure 2). The project site is located along mainstem Redwood Creek between the Miller Creek and Somerville Creek confluences. The site is partially underlain by an isolated exposure of Pliocene-aged moderately consolidated sandstone, argillite, and conglomerate, included by some with the Wildcat Group (McLaughlin et al. 2000). The area surrounding the project site, and most of the Redwood Creek watershed, is underlain by various subunits of the Eocene to Paleocene Yager terrane (Franciscan Complex Coastal Belt), which primarily consists of sheared and highly folded mudstone (McLaughlin et al. 2000). The mudstone includes minor rhythmically interbedded arkosic sandstone and local lenses of conglomerate. This lithology produces terrain with relatively irregular topography lacking a well-incised system of sidehill drainages when compared to other subunits of the Franciscan Complex Coast Belt.

5 GEOMORPHIC ASSESSMENT

A geomorphic assessment was conducted to characterize the existing geomorphology of the project area, assess risks associated with potential hazards, support the opportunities and constraints assessment, and inform project designs. Specifically, the geomorphic assessment included a topographic survey that was integrated with 2007 LiDAR data, review of existing data, and a field assessment. Existing data that were reviewed included geologic mapping (McLaughlin et al. 2000), geomorphic and landslide mapping (Spittler 1984), and historical aerial photographs from 1942, 1947, 1954, 1963, 1965, 1984, 1988, 1996, 2000, 2005, 2009, 2010, 2012, and 2014. A geotechnical investigation was also conducted by SHN Engineers & Geologists and is described below in Section 6.

Hillslope and stream channel morphologies in the Redwood Creek watershed are similar to those found throughout the western side of the South Fork Eel River basin, due to the prevalence of the underlying Franciscan Coastal Belt terranes. Although there is variability among the terranes, the rock strength in Coastal Belt rocks typically leads to steeper, ridge-and-valley topography with organized drainage networks. Small to large-scale landslides are still common in the basins that drain the Coastal Belt terranes, particularly where sedimentary rocks are less competent and in mélange units.

Upper elevations in the Redwood Creek basin are characterized by narrow, steep-walled canyon slopes that are covered by relatively thin soils and dense conifer and hardwood stands and drained by perennial and intermittent streams. At mid-elevations, the steep canyons transition into gently rounded upland ridges supporting grass meadows and shrub and oak woodland vegetation. The valley width greatly expands near Briceland, where Redwood Creek meanders between large elevated terraces (Figure 3). Channel incision in the Redwood Creek basin is likely due to ongoing tectonic uplift related to the nearby Mendocino Triple Junction, extensive anthropogenic land-use practices, and climate change altering hydrologic patterns. The flight of terrace and floodplain surfaces in the project vicinity record over 120 feet of vertical incision of Redwood Creek.

The project site consists of uplifted fluvial terraces and lower floodplain surfaces adjacent to Redwood Creek, which flows from the southwest to the northeast across the project area (Figure 3). Upland hillslopes border the site to the south and east. The project site is bound by small intermittent streams to the east and west that are tributary to Redwood Creek. These streams are hereinafter referred to as the east-side and west-side tributaries. The northern central edge of the upper terrace has been eroded by a third smaller drainage. Multiple landslide features are located around the project area and are further described in the following sections.

IX. Hydrology and Water Quality. Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements?		X		
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	X			X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, which would result in substantial erosion or siltation on- or off-site?	X	X		
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?		X		
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?		X		
f) Otherwise substantially degrade water quality?		X		
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary of Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk or loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	X			X
j) Result in inundation by seiche, tsunami, or mudflow?	X			X

Discussion:

(a) Less Than Significant with Mitigation Incorporated: The project will not violate any water quality standards or waste discharge requirements. There is the potential for minor short-term increase in turbidity during installation of instream structures and/or pond construction, however the mitigation measures described in Appendix B Mitigation, Monitoring and Reporting will assure that the project actions are in compliance with water quality standards. As a result, mitigation measures will ensure that any potentially significant short-term impacts are avoided or mitigated to below a level of significance.

(b) No Impact: The project will not substantially deplete groundwater supplies or interfere substantially with groundwater recharge. The project site is underlain by nearly impervious shale bedrock, with minimal groundwater recharge potential. Construction of grade control structures in the two drainages adjacent to the project site will reduce incision and drainage of shallow groundwater. THIS IS FALSE

THE EMERGENCY SPILLWAY DUMPS DIRECTLY INTO AN ACTIVE LAND SLIDE AREA.

(c) Less Than Significant with Mitigation Incorporated: The project will ~~not~~ substantially alter the existing drainage pattern of the work sites in a manner that would result in substantial erosion or siltation on- or off-site. Such an impact will not occur because several of the project actions are designed to result in decreased overall erosion. The instream boulder and large wood placement and rock armor grade control structures in the smaller drainages as well as the pond will alter drainage patterns by slowing the transport of sediment and water. These projects are expected to reduce channel entrenchment, restore alluvial streambeds, and increase water storage capacity. Instream structures will produce a local redistribution of bed load, facilitating the deposition of spawning gravel in riffles and improving scour to maintain pools for juvenile fish habitat. This local redistribution of bed load will not produce a net increase of erosion. Mitigation measures described in Appendix B will assure that all project actions, including construction activities, are in compliance with water quality standards.

(d) Less Than Significant with Mitigation Incorporated: The project will ~~not~~ substantially alter the existing drainage pattern of the work sites, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. The project will decrease the risk of flooding by capturing runoff in the pond and reducing gully incision that if left unchecked could eventually lead to mass wasting.

(e) Less Than Significant with Mitigation Incorporated: The project will not create or contribute runoff water that would exceed the capacity of existing or planned storm-water drainage systems, or provide substantial additional sources of polluted runoff. Overall, the project aims to reduce storm water runoff through capture of wet-season runoff.

(f) Less Than Significant with Mitigation Incorporated: The project will not substantially degrade water quality. During placement of instream structures and/or pond construction, some minor turbidity may be generated. The potential for degradation of water quality will be reduced to a less than significant level through implementation of the mitigation measures presented in Appendix B. Some short-term and minor increases in turbidity may also occur as the streambed around instream structures adjusts during the first high streamflow event following activity completion. However, this is not expected to produce a significant increase over background turbidity. Mitigation measures will ensure that any potentially significant short-term impacts to water quality are avoided or mitigated to below a level of significance. The goal of the project is to improve water quality in the dry season by adding cool water to Redwood Creek. The project design includes features designed specifically for this objective including a cooling gallery and circulation system in the pond.

(g) No Impact: The project will not place housing within a 100-year flood hazard area as mapped on any flood hazard delineation map. No housing will be created as part of this project.

(h) No Impact: The project will not place within a 100-year flood hazard area structures which would significantly impede or redirect flood flows. Instream structures are built to change the direction and velocity of stream flow. However, these structures are small (sized to affect conditions in the low flow channel) and will not impede flood flows.

(i) Less than Significant Impact: The placement of instream structures will not impede flood flows and will therefore not increase flooding risk to people or structures. The construction of the pond poses a less than significant risk of flooding as geotechnical investigation and engineering design and construction oversight will ensure long-term stability of the pond and dam.

DIRECT THREAT ACKNOWLEDGED @ 11-20-19 MEETING BY JOEL MONSCHKE OF STILLWATER SCIENCES.

OBVIOSLY UNTRUE IN EVENT OF DAM FAILING.

(j) No Impact: The project will not expose people or structures to a significant risk of inundation by seiche, tsunami, or mudflow. Such an impact will not occur because project actions are designed to improve or stabilize conditions at the work sites. Restoration actions will reduce the chance of mudflow by stabilizing disturbed areas and restoring natural drainage patterns. Project work sites are not located in areas at risk to inundation by seiche or tsunami.

Mitigation Measures:

Specific Mitigation Measures can be found in Appendix B, Section 2, IX. Hydrology and Water Quality (1-9).

XIV. Mandatory Findings of Significance.	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	X	X		
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects).	X			X
c) Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	X			X

Discussion:

(a) Less Than Significant with Mitigation Incorporated: The project does have the potential to degrade the quality of the environment. However, the potential is reduced to less than significant by implementing the mitigation measures in Appendix B. The project shall be implemented in a manner that will avoid short-term adverse impacts to rare plants and animals, and cultural resources during construction. The project activities are designed to improve and restore stream habitat, thereby providing long-term benefits to both anadromous salmonids and other fish and wildlife.

(b) No Impact: The project does not have adverse impacts that are individually limited, but cumulatively considerable. Cumulative adverse impacts will not occur because potential adverse impacts of the project are only minor and temporary in nature and will be mitigated to the fullest extent possible. It is the goal of the project that the beneficial effects of habitat enhancement actions will be cumulative over time and contribute to the recovery of listed anadromous salmonids.

(c) No Impact: The project does not have environmental effects that will cause substantial adverse effects on humans. Measures implemented as part of this project will contribute to improved water quantity and quality, increased soil stability, and the recovery of listed salmonids, all of which will be beneficial to human beings.

THIS PROJECT DOES THREATEN SUBSTANTIAL ADVERSE EFFECTS ON HUMANS (MY FAMILY)