A comparison of the preferred alternative (five dam removal) for the Battle Creek Salmon and Steelhead Restoration Project and alternative B (eight dam removal) with respect to sediment transport.

3/1/04

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Introduction

The Battle Creek Salmon and Steelhead Restoration Project (the Project) includes a number of restoration actions such as dam removal on the North and South Forks, and tributaries of these forks, of Battle Creek, CA. A full project description of the Project can be found in the Draft EIR/EIS (Jones and Stokes 2003). A number of alternatives are evaluated in the Draft EIR/EIS for the Project and the preferred alternative includes the removal of a total of five dams. An additional alternative, referred to as alternative B, calls for removal of three additional dams including the North Battle Creek Feeder, Eagle Canyon, and Inskip Dams. A review team was tasked with evaluating the difference between the preferred alternative (five dams) and alternative B (eight dams) with respect to three important aspects of the Project. These aspects are the availability of habitat, fish passage, and sediment transport.

This document outlines the comparison focusing on sediment transport differences between the alternatives. The availability of gravel for salmonid spawning, and the condition of that gravel as a function of fluvial process, is a key ecosystem attribute for salmon restoration projects and overall ecosystem function. The goal of this analysis is to determine if the addition of the diversion capacity at the three dam sites (resulting from dam removal) has bearing on sediment transport within Battle Creek. Time constraints of this comparison process precluded additional data collection and the analysis relies on previous reports and personal communication with specialists. A brief overview of pertinent, background information is included below.

Background

Alternative B includes removal of North Battle Creek Feeder Dam, Eagle Canyon Dam, and Inskip Dam, which are upstream of the dams in the preferred alternative (Figure 1).

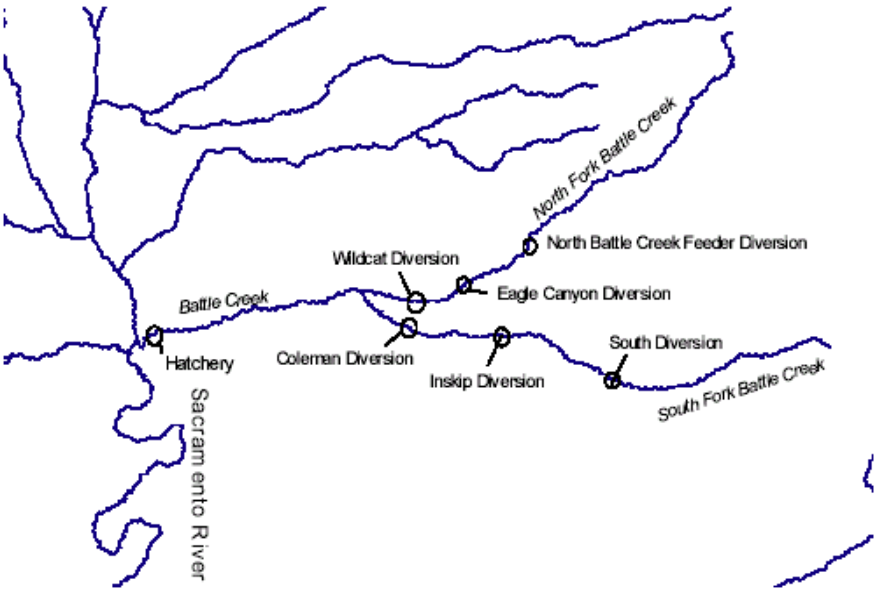


Figure 1. Map showing approximate location of diversion dams.

(From Greimann 2001b)

The following text is from the Draft EIR/EIS and includes descriptions of the three dams considered in alternative B.

North Battle Feeder Dam (no picture available)
North Battle Creek Feeder Diversion Dam and Canal were constructed around 1910 to divert 55 ft3/s of North Fork water into Cross Country Canal for generating power at South Powerhouse, located about 5 miles to the south. The dam is a rock-filled masonry type, 8 feet in height, with an overall length of approximately 93 feet at crest elevation 2082.4. A 5-foot-wide hydraulic sluice gate is set near the middle of the dam to allow sluicing of sediments that periodically accumulate behind the dam. This prevents sediments from blocking the canal headworks structure and fish ladder. Water is diverted through the concrete headworks structure located on the left side of the dam through a 36- inch-wide-by-48-inch-high electrically controlled slide gate that transitions into a metal flume. The left side of the dam is approximately 3 feet higher than the central overflow section to provide protection to the headworks area from flood flows.

Eagle Canyon Dam

Eagle Canyon Diversion Dam and Canal were constructed in 1910 to divert up to 70 ft3/s of North Fork water into Eagle Canyon Canal for generating power at Inskip Powerhouse, located about 3 miles to the southwest. The dam is of rock masonry construction, 15 feet in height, with an overall length of approximately 70 feet at crest elevation 1430.2. A 4-foot-wide, 10-foot high manually operated radial gate is set near the middle of the dam to allow sluicing of sediments that periodically accumulate behind the dam. A weir also stems off of the dam upstream of the fish ladder and canal entrance area on the left abutment. The radial sluice gate and weir help prevent sediments from blocking the fish ladder and canal entrance.

Inskip Dam

Inskip Diversion Dam diverts approximately 220 ft3/s of water from the South Fork Battle Creek (a mixture of North and South Fork water) to Inskip Canal, which conveys the water to the Inskip Powerhouse located approximately 5.4 miles downstream. Inskip Diversion Dam is a rock-filled masonry structure 28 feet in height with a steel-capped dam crest approximately 80 feet long at crest elevation 1,439. A 6-foot-wide, 17-foot-high radial sluice gate is set near the right abutment to allow the sluicing of sediments that periodically accumulate behind the dam. The radial sluice gate helps prevent sediments from blocking the adjacent canal entrance.

Existing Documents Informing This Analysis

There are a number of sediment and hydrology related documents that inform this analysis and pertinent findings are included here for background. The Draft EIR/EIS cites an analysis of sediment transport changes resulting from removal of the dams specified within the preferred alternative (Greimann 2001a). This report is titled "Sediment Impact Analysis of the Removal of Coleman, South, and Wildcat Diversion Dams on South and North Fork Battle Creeks: Battle Creek Salmon and Steelhead Restoration Project, California" and utilized field data collection and a numerical model for the analysis. Report findings are summarized below.

> "The impacts associated with the sediment release due to the removal of three diversion dams, Wildcat Diversion Dam, Coleman Diversion Dam and South Diversion Dams was analyzed. The estimated amount of sediment trapped behind each dam is found in Table 2. A simple analysis of Wildcat Diversion Dam proved that the impacts would be minimal and therefore, no numerical modeling was performed for Wildcat Diversion Dam. A numerical model was used to simulate the movement of sediment as the result of removing Coleman Diversion Dam and South Diversion Dam. The numerical model was used to analyze the rate at which material was removed from behind the dam and the downstream of effects. Based on the numerical modeling results, the return to near pre-dam conditions should occur within 1 or 2 normal water years. No sediment removal is

> necessary. However, if a low flow channel is not rapidly formed through the deposits behind the diversion dams, it is recommended that some minor reworking of the sediments be performed so that fish passage is ensured."

An independent technical review panel organized by CALFED recommended that further study be conducted to advance beyond this existing study and address remaining scientific uncertainty (Technical Review Panel Report 2003). In response, the adaptive management plan for the Project now includes a very robust sediment monitoring plan developed by Stillwater Sciences (Stillwater Sciences 2004).

Although not conveyed in the Draft EIR/EIS, the early technical team recognized the importance of gravel condition early in the planning process for the Project. As a result, sediment was one of first ecosystem attributes investigated in a study conducted in 1988 - 1989 by Kondolf and Katzel. This report titled "Spawning Gravel Resources of Battle Creek, Shasta and Tehama Counties" found the Battle Creek gravel resource to be in relatively good condition and sediment was no longer considered a limiting factor for project success (Harry Rectenwald and Mike Ward, personal communication 2003).

The Kondolf and Katzel (1989) study is of particular utility because it offers field data on sediment mobility directly applicable to this current analysis. The Kondolf and Katzel (1989) study used a number of methods to determine the affects of the hydro-power system on gravel mobility in Battle Creek. They evaluated movement of the streambed by placing individual tracer rocks and tracking for movement in high flows, by calculating the flows predicted by shear stress models to move gravels, and by utilizing repeat cross section surveys to evaluate changes in the streambed.

Findings of that study pertinent to this analysis are included below. These findings characterize the existing condition of the hydro-power project with all existing dams in place.

- Many but not all spawning gravels were mobilized by the high flow of March 1989 (7800 cfs at Coleman Fish Hatchery). This flow had a return period of about 2.4 years, suggesting that gravel deposits are mobilized every 2 to 3 years on average.
- The mobility studies imply that gravel in Battle Creek move frequently enough to remain clean and loose enough for spawning.
- The shear stress equations appear to be a useful model for predicting movement of spawning gravels at various sites and flow rates, as long as hydraulic conditions are relatively uniform and can be estimated.

The report states that "There do not appear to be any serious sediment imbalances (areas of persistent aggradation or degradation) in the Battle Creek system that demand immediate management or remediation". The authors also evaluated a sediment management program at dam sites by estimating quantities of gravel in dredge piles and interviewing PG&E staff on management practices. The study found two large dredge piles at Coleman and Inskip Dams and other dam sites either had no evidence of dredging

or small piles. The authors estimated an average removal rate of 65 cubic yards per year for the two sites with large dredge piles. PG&E staff indicated that this does not represent total gravel removal as past aggregate has been utilized for road construction. PG&E staff also indicated that gravel is sluiced through gates generally during periods of high spill flows and closed as the high water recedes. For example, the Greimann report (2001a) states that "Sluicing is performed on a daily basis during the winter months at Coleman Diversion Dam. Based on visual observation, up to 10,000 yd3 of material is sluiced during the winter months." However, management of the gates and dredging activities are not well recorded.

The report states "In summary, the available evidence suggests that loss of spawning gravel due to permanent removal by PG&E is probably negligible, but definitive evidence is lacking." They also state that "Diversion dams interrupt the movement of gravel through the stream system." As a result, the authors recommended:

- Sluicing sediment through diversions at high flows to mimic natural gravel transport.
- Clear procedures be developed for this sluicing to prevent release of sediment downstream when flows are inadequate to transport it.
- Monitoring the effects of the sluicing so that the protocol can be revised as more is learned.
- If sediments must be removed from PG&E diversion facilities, we recommend that amounts be accurately documented and that the gravel fraction be returned to the stream below the dam for redistribution by subsequent high flows.

In response, sediment management at the dam sites is now more structured according to stream bed alterations permits issued by DF&G. Appendix A is an example streambed alteration permit and related communication. The permit precludes further excavation of aggregate from the streambed. A letter from DF&G to PG&E is also enclosed which characterizes how to conduct the sediment sluicing program. There is an apparent economic incentive to sluicing sediment instead of removal with machinery. The aggregate can no longer be used for local road material offering little justification for the expense of machinery to remove the aggregate instead of sluicing it through the radial gates.

Hydrology information for this analysis is provided by a report titled "Hydrology of North and South Fork Battle Creeks" (Greimann 2001b). Ideally, complete stage discharge relationships would be available at North Battle Feeder, Eagle Canyon, and Inskip Diversion Dams. However, existing relationships are incomplete and only lower flow quantities are gauged. More complete stage discharge relationships will be developed as part of the future adaptive management plan for the Project. Previous analyses, including the Greimann report (2001b), have utilized discharge per unit area relationships, which is a common practice to address these data gaps. The Greimann (2001b) report provides a log-Pierson type III flood frequency analysis based on flow records from 1940-1998 for the USGS gage (#11376550) near Coleman (Table 1). The table included here is adapted from Greimann (2001b). The original table did not include the 1.5 year return interval flood, which was taken from Figure 4 of the Greimann

(2001b) report. This frequency analysis is in close agreement with the Kondolf and Katzel (1989) analysis identifying 7800 cfs as the 2.4 year return interval flood.

Table 1. Return flows calculated from the measured yearly peak flows using a log-Pierson type III probability distribution.

Return Period (yr)	Flow (cfs)
1.5	5900
2	6700
2.33	7600
5	11600
10	15100
25	19700
50	23300
100	26900

The Greimann (2001b) report utilizes a discharge per unit area relationship (Table 2) to generate flood frequency curves for the dam locations (Table 3). The high flow fraction from Table 2 was utilized for generation of flood frequency curves.

Table 2. Calculated partitioning of flows in Battle Creek for long term averages and for peak flows. USGS gage is near Coleman National Fish Hatchery.

	USGS gage	**N Fork**	**S Fork**	**Wildcat Div.**	**Eagle Canyon Div.**	**N. Battle Feeder Div.**	**Coleman Div.**	**Inskip Div.**	**South Div.**
drainage area (Sq. mi)	357	212.8	123.6	189	186	133	102	88.3	66.7
approximate elevation (feet)	415	830	830	1070	1420	2060	1000	1410	2030
annual average flow fraction	1.0	0.53	0.47	0.53	0.53	0.44	0.47	0.44	0.38
high flow fraction	1.0	0.38	0.60	0.38	0.38	0.32	0.60	0.55	0.49

Table 3. Calculated flood flows using the partitioning in Table 2.

	Flow (cfs)						
Return Period (yr)	**USGS gage**	**Wildcat Div.**	**Eagle Canyon Div.**	**North Battle Feeder Div.**	**Coleman Div.**	**Inskip Div.**	**South Div.**
2	6700	2500	2500	2100	4000	3700	3300
2.33	7600	2900	2900	2400	4600	4200	3700
5	11600	4400	4400	3700	7000	6400	5700
10	15100	5700	5700	4800	9100	8300	7400
25	19700	7500	7500	6300	11800	10800	9700
50	23300	8900	8900	7500	14000	12800	11400
100	26900	10200	10200	8600	16100	14800	13200

Hydrology information was also provided within data appendices from a Department of Water Resources report for fish ladder design at North Battle Feeder, Eagle Canyon, and Inskip Diversion Dams. These appendices provide the gauged PG&E diversion magnitudes at the three dam sites (Bill McLaughlin, DWR, personal communication 2004). Fortunately, these data include diversion magnitudes during the same March 1989 flood event evaluated for sediment transport within the Kondolf and Katzel (1989) report. During this flood event diversion magnitudes were 103 cfs, 45 cfs, and 65 cfs for the Inskip, North Battle Feeder, and Eagle Canyon respectively.

Technical Specialists

The following technical specialists were contacted for their professional opinion of potential affects of additional dam removal on sediment transport.

Ellen Wohl	Fluvial Geomorphologist, Colorado State University. Dr. Wohl is also a member of the CALFED independent review panel.
Charles Troendle	Hydrologist, SI International, Ft. Collins. CO. Contacted as per E. Wohl's suggestion.
Sandra Ryan	Research Hydrologist/Geomorphologist, USDA FS Forestry Sciences Lab, Laramie, WY. Contacted as per C. Troendle's recommendation.
Larry Schmidt	Hydrologist, Stream Research Center, Ft. Collins CO. Contacted as per S. Ryan's recommendation.
Scott McBain	Fluvial Geomorphologist, McBain and Trush, Inc. Arcata, CA. Contacted as per L. Schmidt's recommendation.

Analysis

Technical Specialist Recommendations

As a member of the CALFED independent review panel, Dr. Wohl was contacted first to discuss an evaluation approach. The discussion with Dr. Wohl lead to other specialists to contact regarding the approach and a number of common themes emerged from these discussions. The list below is not meant to indicate that every specialist commented on every theme. Instead, it is a compilation of important themes mentioned by at least one specialist. Individual comments will be attributed to specialists within the text.

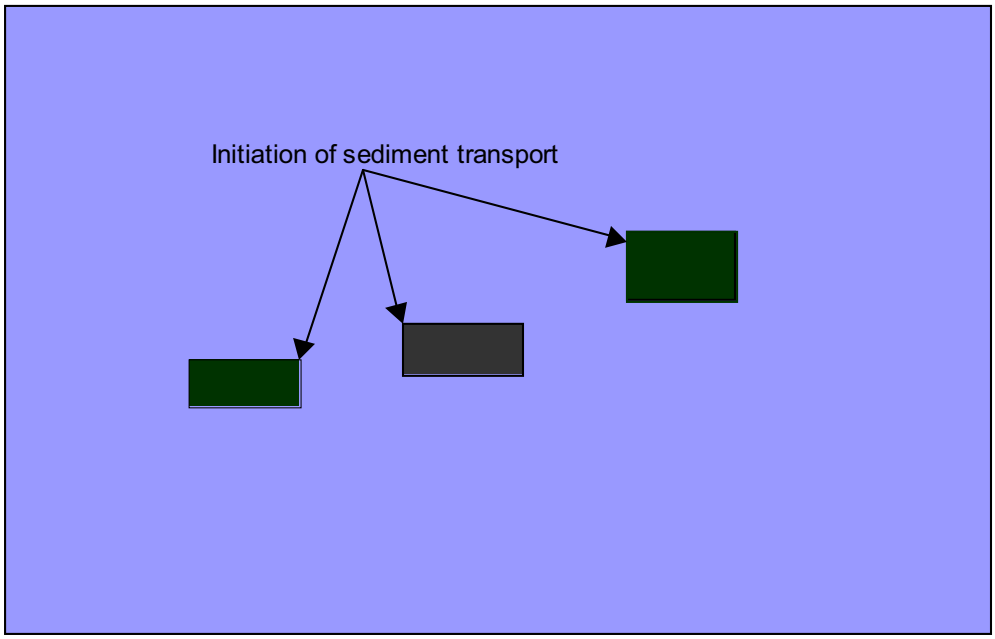
- The affect of diversion capacity on sediment transport should be evaluated with respect to its impact on the magnitude and duration of a threshold geomorphic event, one that overcomes resistant forces and affects geomorphic change.
- Recent work identified a range of flow magnitude between 0.6 – 0.8 of the 1.5 year return interval flow as responsible for initiating noticeable bedload sediment transport.

- Although none of the specialists knew of data sets identifying a specific duration of flow event responsible for sediment transport, a “couple” or “few” days” was the informed professional opinion.
- The rising limb of the hydrograph is likely most responsible for sediment transport and a hysteresis affect is often seen with the receding limb of the hydrograph transporting less sediment.

Magnitude of a Threshold Event

The Kondolf and Katzel (1989) study is of particular utility because it offers field data on sediment mobility directly applicable to this analysis. Their study documented sediment transport during the March 1989 event of 7800 cfs, which they characterized as a 2.4 year return interval event. Although unknown, it is very likely that sediment transport initiated at a flow of less magnitude and frequency than 7800 cfs. The magnitude and frequency of a flood event responsible for bedload sediment transport is still an actively researched topic. However, a widely accepted concept in fluvial geomorphology is that it is a function of the “bankfull” or 1.5 year return interval flood (Wolman and Miller 1960). In addition, C. Troendle and S. Ryan indicated that although there is variability among systems, recent analyses indicate noticeable bedload sediment transport initiates within a range of 0.6 – 0.8 of the 1.5 year return interval flow. Utilizing this flow range for the current analysis is a very conservative approach because diversion quantities will represent a greater percentage of this lower range of flows instead of using the 2.4 year return interval flow.

Figure 2 integrates all of the above information with respect to the magnitude of flow for sediment transport at the three diversion locations. The analysis was conducted for flows during the March 1989 event because sediment transport was documented for that event. The 1.5 year return interval flow was calculated for each diversion locations using the discharge per unit area relationships in Table 2 applied to the 1.5 year return interval flow at Coleman from Table 1. The estimated 1.5 year return flows for North Battle Feeder, Eagle Canyon, and Inskip dams are 1900 cfs, 2250 cfs, and 3250 cfs respectively. The figure depicts the suggested range of sediment mobility at 0.6 to 0.8 of the respective 1.5 year flows.

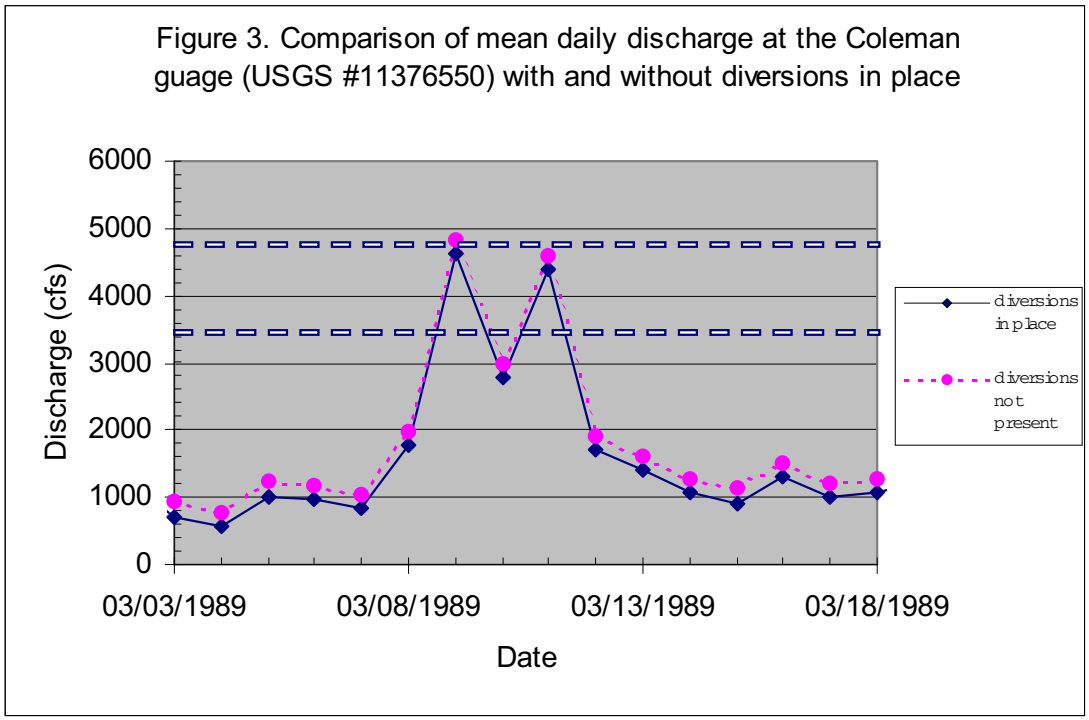


It is unlikely that addition of the diversion quantities to the March 1989 event would have offered significant benefit to sediment transport processes at the dam sites. All of the specialists contacted suggested that the diversion magnitudes appeared minor compared to the magnitude of the event resulting in sediment transport in the Kondolf and Katzel (1989) report. S. Ryan suggested that diversion magnitudes could almost be considered within the margin of error in stream discharge measurement for this event. A point of context for this analysis is that both the Kondolf and Katzel (1989) and Greimann (2001a) reports found little impact to sediment transport processes within the Battle Creek system when all eight dams in question were in place. That finding that all eight dams have little affect on sediment transport, suggested that little benefit could be derived from removal of the additional three dams with respect to the magnitude of flood event responsible for sediment transport within the Battle Creek system.

Duration of a Threshold Event

E. Wohl suggested that diversion magnitudes be evaluated for their affects on the duration of flood events responsible for sediment transport. In additional to flood magnitude, flood duration is also an important factor in determining the geomorphic effectiveness of a flood event (Costa and O'Connor 1995). An exact duration of event responsible for sediment transport on Battle Creek is unknown. However, C. Troendle, S. Ryan, L. Schmidt, and S. McBain all indicated that a "couple" or a "few" days was probably an appropriate time scale to evaluate for duration changes on Battle Creek. S. McBain offered the insight that a high flow release of 1.5 to 2 days would ensure that steady-state hydraulic conditions would occur (fill floodplain water storage) and initiate desired intended bed mobility and scour objectives at study sites on the Trinity River and upper San Joaquin River. The duration of release needed to eliminate flood peak attenuation would depend on the flow magnitude, length of the reach, and the amount of floodplain storage over that reach.

The impact of diversions on the duration of flood events cannot be directly evaluated at dam sites because complete stage discharge curves, and consequently hydrographs, are unavailable. The March 1989 event at the Coleman gauge is used here as a surrogate. Figure 3 compares the mean daily discharge at the Coleman gauge with and without the total diversion capacities added.



The total diversion capacity added in Figure 3 is 213 cfs (103 cfs, 45 cfs, and 65 cfs for the Inskip, North Battle Feeder, and Eagle Canyon respectively). The dashed lines represent the 0.6 (3500cfs) to 0.8 (4700cfs) range of the 1.5 year return interval flood for the Coleman gauge. The duration of streamflow occurring within this suggested range is approximately 3 days. Although not specifically defined as a threshold that induces geomorphic change, this duration is in agreement with the professional opinion of days as the appropriate time scale of evaluation. Addition of a total of 213 cfs during the March 1989 flood does not significantly alter this timescale. Therefore, it is not likely that addition of the total diversion quantity would have had a significant affect on sediment transport.

Summary

Based on the findings of existing reports and further evaluation, removal of North Battle Feeder, Eagle Canyon, and Inskip Dams probably offers little benefit to the Battle Creek system's sediment transport characteristics.

The removal of North Battle Feeder, Eagle Canyon, and Inskip Dams should first be viewed in the context of the existing conditions of the hydro-power project. Both the Kondolf and Katzel (1989) and Greimann (2001a) reports indicate that there is little

impact to sediment transport processes due to the existing hydro-power project when all eight dams in question are present. The Kondolf and Katzel (1989) report referred to the diversion dams as "too small to serve as sediment sinks" and that a well-documented sediment sluicing program was the appropriate management practice.

Addition of a total diversion quantity of 213 cfs (103 cfs, 45 cfs, and 65 cfs for the Inskip, North Battle Feeder, and Eagle Canyon, respectively) does not appreciably alter either the magnitude or duration of a flow event known to affect geomorphic change. With respect to sediment transport, diversion quantities are relatively small compared to the magnitude of geomorphically effective events. Although it is not currently possible to generate accurate flood frequency curves at dam sites, it is unlikely that addition of the diversion capacities would significantly alter the frequency of geomorphically effective events.

There is remaining scientific uncertainty in sediment transport relationships and the affects of dam removal within the Battle Creek system. This uncertainty will be more fully addressed with robust studies called for in the Project adaptive management plan.

Appendix A

Streambed alteration permit and associated communication.

95-0106

STATE OF CALIFORNIA--THE RESOURCES AGENCY
PETE WILSON, Governor

DEPARTMENT OF FISH AND GAME
601 LOCUST STREET
REDDING, CA 96001
(916) 225-2300

February 21, 1995

Mr. Gene Terry
Pacific Gas & Electric Company
Post Office Box 409
Manton, California 96059

Dear Mr. Terry:

Your 1994 Agreement No. 94-0147 to alter a streambed has been renewed for the calendar year 1995. The same conditions and recommendations shall apply.

The new number assigned to the project for 1995 is No. 95-0106.

Sincerely,

Richard L. Elliott

Richard L. Elliott
Regional Manager

RLE/js

cc: Captain Akin
Warden Matirko
CVRWQCB
Rec Board

ORIGINAL
To Payer

STATE OF CALIFORNIA—RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

No. 14162

COPY—NOT A VALID RECEIPT

Feb 21 19 95

Received of PG & E $ 505.00

Five hundred five and no/100 Dollars

For Streambed Agreements

CASH

Jon Smith
Signature of Employee
1603 Clerk
Title

F & G 139 85 93274

The department has 30 days from date of receipt of a completed application in which to make its recommendations. This time period does not begin until the department receives the appropriate fee (see attached fee schedule).

T.H.P. No. _____

Notification No. 95-0107 Received 2-21-95

CA>H #132.00

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

NOTIFICATION OF REMOVAL OF MATERIALS AND/OR ALTERATION OF LAKE, RIVER, OR STREAMBED BOTTOM, OR MARGIN

A. APPLICANT Pursuant to Sections 1601–1607 of the California Fish and Game Code

I, Gene Terry (Name of Applicant) of Manton Vista Rd Manton Ca. P.O. Box 409 (Mailing Address) Ca 96059.

Representing Pacific Gas & Electric (Name and address of Individual, Agency, Company, etc. owning property or doing work.)

Hereby notify the California Department of Fish and Game of operations to be carried out by or for me

from March 1 1995 (Starting Date) to Feb 28 1996 (Finding Date) on or affecting

S. Battle Cok (Name of Stream, River, or Lake) of Tehama County, tributary to Sacramento River (Major Water Body)

Located Coleman Diversion Dam 1 mile upstream of County Rd A-6 (Distance and Direction to Landmarks)

Section _____ Township _____ Range _____

USGS Map _____ Co. Assessor's Parcel No. _____

Property owners name and address (if different from applicant) _____

Larry Coghuen (Name of Person to Be Contacted at Site During Operations) is responsible for operations at the site.

He/she can be reached at P.O. Box 409 Manton Ca 96059 (Mailing Address) 474-3333 (Telephone)

B. Description of operation 1. The nature of said operations will be as follows:
Check all squares which apply.

- ☒ Soil, sand, gravel, and/or boulder removal or displacement
- ☐ Water diversion or impoundment
- ☐ Mining—other than aggregate removal
- ☐ Road or bridge construction
- ☐ Levee or channel construction
- ☐ Timber harvesting or any related activity required for harvesting timber
- ☐ Temporary, recreational or irrigation dam
- ☐ Fill or spoil in bed, bank, or channel
- ☐ Other—Describe below

2. Type of material removed, displaced or added ☐ Soil ☒ Sand ☒ Gravel ☒ Boulders
Volume 100 cu yards
3. Equipment to be used in the described site Crawler D-5 or D-7 & large backhoe
4. Use of water (i.e., domestic, irrigation, gravel, washing, etc.) Hydro generation Quantity _____
5. Describe type and density of vegetation to be affected, and estimate area involved.
None
6. What actions are proposed to protect fish and wildlife resources and/or mitigate for project impacts? Care in excavation to minimize turbidity in stream flow

7a. Does project have a local or state lead agency or require other permits? ☐ Yes ☒ No

7b. If 7a answer is yes, please attach or identify any available environmental document.

7c. For state-designated wild and scenic rivers, a determination of the project's consistency with the California Wild and Scenic Rivers Act must be made by the Secretary for Resources. Until the Secretary determines the project is consistent with the Act, the Department cannot issue a valid agreement. A tentative agreement will be issued, conditioned upon a finding of consistency by the Resources Secretary.

7d. THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

8. Briefly describe proposed construction methods. Attach diagram or sketch of the location of your operation to clearly indicate the stream or other water and access and distance from named public road. Indicate locked gates with an "X". Show existing features with a solid line (————) and proposed features with a broken line (– – – – – –). Show compass direction. Attach larger scale map if necessary.

Eugene F. Terry
Signature of Applicant

Date 67 03409

NO CARBON NEEDED
FG2023 (REV. 11/87)

Region 1
601 Locust Street
Redding, CA 96001
(916) 225-2300

Notification Number 95-0106

CALIFORNIA DEPARTMENT OF FISH & GAME
Proposed Amendment To
Streambed Alteration Agreement

TO: Mr. Gene Terry
Pacific Gas & Electric
P.O. Box 409
Manton, CA 96059

Enclosed you will find two copies of the proposed amendment to your streambed alteration agreement in response to your notification dated February 14, 1995.

If the provisions and recommendations of this amendment are acceptable to you, please sign and return one copy to the above address.

Please retain one copy for your records. If you have any questions, please call Warden Scott Willems (916) 527-2604.

The amendment becomes effective upon signature, payment of all appropriate Department fees, and receipt of the original signature copy at our office. Should you anticipate your project extending beyond the termination date, you can obtain an extension in writing from the Redding Regional office.

Thank you

Scott F. Willems, Warden
Department Representative

Date March 23, 1995

Notification No. 95-0106

AMENDMENT TO
AGREEMENT REGARDING PROPOSED STREAM OR LAKE ALTERATION
FISH AND GAME CODE SEC. 1600 ET SEQ.

THIS AMENDMENT to agreement No. 95-0106, entered into between the State of California, Department of Fish and Game, hereinafter called the Department, represented by Scott F. Willems, and Gene Terry, representing Pacific Gas & Electric of Manton, State of California, hereinafter called the Operator, is as follows:

WHEREAS, pursuant to the terms and conditions stated in the original agreement, the Operator, on the 14th day of February 1995, notified the Department that he intends expand, change or modify the project as originally described.

THEREFORE, IT IS AGREED THAT:

1. This amendment allows for the expansion of the project to include: Placement of accumulated gravels downstream of the Inskip diversion dam. If this amendment is found to be in conflict with any other provision of law or general conditions of public safety, it is void.

2. All terms, conditions, and provisions of the original agreement remain in force, and apply to any changes, expansions or modifications of the original project addressed herein.

3. All provisions of this amendment remain in force throughout the term of the original agreement.

PROVISIONS:

Includes all provisions and recommendations in the original agreement.

1. This amendment provides for the removal of accumulated sand and gravel from behind the Inskip diversion dam by pushing the material through the dam's gates within the original project site as specified in the Operator's notification and attached project description.

2. One vehicle may be driven in wet portions of the stream/lake to accomplish the work authorized by this Agreement. This work is only authorized when the vehicle is completely clean of petroleum residue and water levels are below the gear boxes of the equipment in use or lubricants and fuels are sealed such that inundation by water shall not result in leaks.

3. Excavated sand and gravel may be flushed through the dam's gates or placed down stream where high flows will carry it away to provide fish spawning habitat.

4. When equipment is operating in the flowing stream, precautions shall be taken to avoid increasing the turbidity of the water. After each individual pass of equipment that causes a plume of turbidity above background levels, the work area shall be allowed to "rest" for a minimum of 30 minutes to allow the water to clear. Work shall resume only after the stream has reached the original background turbidity levels, and those levels are maintained for a minimum of 15 minutes.

5. A copy of this amendment shall be attached to all copies of the original agreement, retained at the work site, and provided to all contractors and subcontractors.

If the Operator's work changes from that stated in the notification specified above, this amendment is no longer valid and a new notification shall be submitted to the Department. Failure to comply with the provisions and requirements of this agreement and with other pertinent Code Sections, including but not limited to Fish and Game Code Sections 5650, 5652, and 5948, may result in prosecution.

Nothing in this amendment authorizes the Operator to trespass on any land or property, nor does it relieve the Operator of responsibility for compliance with applicable federal, state, or local laws or ordinances. A consummated amendment does not necessarily constitute Department endorsement of the proposed operation, or assure the Department's concurrence with permits required from other agencies.

This agreement becomes effective upon receipt of signed agreement by all parties.

Operator Eugene S. Serry

Title Generation Supervisor

Organization P.G.&E. Manton

Date 3-28-95

Department Representative
Title: Game Warden

Department of Fish & Game
State of California
Date 3-23-95

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