United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825-1846

In reply refer to:

APR 17 2008

Ms. Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Subject: U.S. Fish and Wildlife Service Comments on the Final License Application Submitted by Pacific Gas and Electric Company for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project No. 803, in Butte County, California

Dear Ms. Bose:

The U.S. Fish and Wildlife Service (Service or USFWS) responds to the Final License Application (FLA) for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission (FERC or Commission) Project No. 803 (Project), which was filed by Pacific Gas and Electric Company (Applicant) with the Commission on October 2, 2007. Many technical studies providing critical information for relicensing the Project had not been completed by the Applicant and thus were not included in the FLA. Since then, the Applicant has been filing supplemental information with the Commission regarding the incomplete technical relicensing studies.

The Service has been in consultation with the U. S. Forest Service, National Marine Fisheries Service, Bureau of Land Management, National Park Service, California Department of Fish and Game, and the California State Water Quality Control Board (collectively, the Resource Agencies) regarding the review and comments on the FLA and its studies. The Service is aware of the concerns and comments of the Resource Agencies in regards to the FLA and its associated relicensing studies. The Service has had ongoing discussions regarding the continuous stream of new information supplementing and updating the FLA since the time of its filing with the Commission. The Service will continue to provide comments on post-FLA information or studies as it is filed with the Commission, to the extent time allows.

On February 22, 2008, the Commission amended by letter the Project's Process Plan and set a final due date for submitting all comments regarding the FLA and its associated studies to the Commission as April 21, 2008. As evidenced by the continued filing of studies and information by the Applicant, and supplements to the FLA, it is clear that the FLA is not a complete document and does not contain significant information to develop measures that would protect, mitigate, and enhance the fish and wildlife resources affected by the Project. Although the Applicant considers the FLA and its studies to be complete or substantially complete, the Service's review to date of the FLA and its studies indicates that some of these studies have significant portions that remain incomplete. For instance, some of the studies are missing critical field work and/or data analysis for participant's review and verification. The Service cannot review and provide substantive comments on the FLA until all of its studies have been completed and all information necessary to that review is submitted to the Commission. The process schedule, to date, of the Applicant's post-FLA filings and the Service/Resource Agencies' joint filing of comments is outlined below.

Resource Agencies

October 30, 2007.

"*Resource Agencies' Response to PG&E's September 6, 2007, Updated Study Report (USR) and Seventh Quarterly Progress Report, DeSabla-Centerville Hydroelectric Project, FERC No. 803-068.*" Resource Agencies, October 30, 2007, California. A joint comment letter which addressed the adequacy of 11 USR studies in the Draft License Application (RA 2007b).

December 26, 2007.

"*Resource Agencies' Comments on Pacific Gas and Electric Company's "Draft Study of Reduction of Heating in the DeSabla Forebay," DeSabla-Centerville Hydroelectric Project, FERC Project No. 803-068.*" Resource Agencies, December 26, 2007, California. A joint comment letter which responded to an Appendix No.611.2.2.3 of the FLA and provided comments on the DeSabla Forebay Study's objectives (RA 2007c).

Applicant

December 27, 2007.

"*Updated FLA Studies No. 6.3.2-5 (Water Quality) and 6.3.3-4 (Fish Population).*"

February 15, 2008.

"*Updated FLA Studies No. 6.3.2-4 (Water Temperature Monitoring and Temperature Model) and 6.3.8-2 (Traditional Cultural Properties).*"

March 14, 2008.

"*Updated FLA Study No. 6.3.2-4 (Water Temperature Model).*"

March 21, 2008.

"*Updated FLA Study No. 6.3.3-3 (Amphibian/Aquatic Reptile Study and Amphibian 2-D Habitat Model).*"

Comments on IFIM Studies

The Applicant performed four Instream Flow Incremental Methodology (IFIM) studies on the four reaches affected by the Project, which are located on Butte Creek and the West Branch Feather River. Results from these IFIM studies were presented in the FLA. The four Project-affected stream reaches are as follows: (1) Lower Butte Creek Reach, which includes the Middle and Lower Butte subreaches; (2) Upper Butte Creek Reach, which includes the subreaches that are upstream and downstream of the West Branch Butte Creek's confluence with Butte Creek; (3) Lower West Branch Feather River Reach, which includes the "Below Fall Creek," "Fall to Big Kimshew Creeks," and "Above Big Kimshew Creek" subreaches; and (4) Upper West Branch Feather River Reach, which includes the Upper, Round Valley, and Philbrook Creek subreaches. The Service and the other Resource Agencies have provided comments on the four IFIM studies in the past (USFWS 2005a, b; USFWS 2007a, b, c; RA 2007a, b, c). However, due to the large amount of post-FLA supplemental study information, the Service is now providing additional comments below on the four IFIM studies in the FLA. These IFIM studies are as follows: IFIM for Lower Butte Creek Reach (Study No. 6.3.3-2); IFIM for Upper Butte Creek Reach (Study No. 6.3.3-8); IFIM for Lower West Branch Feather River Reach (Study No. 6.3.3-9); and IFIM for Upper West Branch Feather River Reach (Study No. 6.3.3-10).

Lower Butte Creek Reach (Butte Creek)
From Lower Centerville Diversion Dam (RM 61.8) downstream to River-Mile 49.6 (RM 49.6 @ Honey Run Covered Bridge) (FLA Volume IIB, Section 6.3.2.6, Study 6.3.3-2)
***Subreaches*:**
Middle Butte Subreach: RM 61.8 downstream to Centerville Powerhouse (RM 55.2)
Lower Butte Subreach: RM 55.2 downstream to Honey Run Covered Bridge (RM 49.6)

Page E6.3-218: The Project Study Plan states:

> *"Pedestrian surveys to map habitat will be used for the two anadromous reaches below Centerville Diversion Dam and Centerville Powerhouse."*

In contradiction of the Study Plan, pedestrian surveys were not conducted in most of the upper portion of the Middle Butte subreach (between Lower Centerville Diversion Dam and Helltown Bridge). Instead, only four, one-mile sections used pedestrian surveys and only then to ground-truth low-altitude video mapping results. The Applicant stated in the FLA that the lack of pedestrian habitat mapping in these areas was due to safety concerns associated with hostile landowners and difficult terrain. However, the use of low-altitude video mapping, did not allow for the collection of substrate composition, estimated maximum pool depths, and unit length/width ratios that would have been available with the pedestrian surveys. As shown in Table 2 of the Study Plan, these attributes were to be assessed during habitat mapping. The lack of maximum pool depths is particularly problematic, since this is a required IFIM modeling input for assessing the effects of increasing summer flows in the Middle Butte subreach on the amount of adult spring-run Chinook salmon holding habitat in the Middle Butte subreach versus that within the Lower Butte subreach (between Centerville Powerhouse and Honey Run Covered Bridge). Without adequate data on pool depths in the Middle Butte subreach, the only alternative would be to assume that all of the pools in the Middle Butte subreach are adult spring-run Chinook salmon holding habitat, which may not be a valid assumption. Further, the lengths of the pools in the Middle Butte subreach are needed to determine the amount of adult spring-run Chinook salmon holding habitat as a function of distance downstream of the Lower Centerville Diversion Dam. The Service believes that the preliminary habitat mapping data, in which the lengths of each habitat unit were calculated from the low-altitude video mapping, will have to be used instead of the 3-second frequency analysis, which was also derived from the low-altitude video mapping, to determine pool lengths.

Tables E6.3.2.6-6 and E6.3.2.6-18 (pages E6.3-221 and 240): For the Lower Butte subreach, habitat should be simulated from 60 cubic-feet-per-second (cfs) (slightly more than 0.4 times the lowest measured flow of 105 cfs) to 450 cfs (2.5 times the highest measured flow of 180 cfs) to be more consistent with the range of flows simulated in USFWS (2003). Limiting the range of simulation flows to 130 to 200 cfs, as was done in PG&E's IFIM study, unnecessarily constrains the range of protection, mitigation and enhancement measures that can be evaluated. Considerations of controllable flows, water temperature, and salmon spawning habitat protection should be taken into account after flow-habitat relationships have been derived.

Page E6.3-223 to 224: The description of the use of the Middle Butte subreach velocity data sets is inconsistent with the calibration reports for these sites. Specifically, the text at this location states that the middle- and low-flow velocity data sets were used to calibrate the model, while the calibration reports state that the high-flow velocity data set was also used for calibration.

Page E.6.3-224: The description of minor velocity adjustments in the next to last paragraph is inconsistent with the calibration reports for these sites. Specifically, the text at this location states that replacing a measured 0.00 velocity with a velocity of 0.01 or 0.1 minimizes the need for manual adjustment of Manning's n values. In contrast, there are many cases in the calibration reports where velocities of 0.00 were addressed through manual adjustment of Manning's n values. The Service strongly recommends that the minor velocity adjustment method described in this paragraph be used extensively instead of manually adjusting Manning's n values. With regards to this method, we recommend that measured 0.00 velocity values be replaced with a velocity of 0.05 feet-per-second (ft/s). We believe that this method is a more accurate, and less arbitrary, method of simulating velocities for edge cells than the methods used by the Applicant. Our method more accurately simulates velocities for flows near the measured velocity data set's flow, but does not unduly limit the magnitude of velocities at simulation flows exceeding the measured velocity data set's flow.

Page E6.3-225: The range of acceptable Velocity Adjustment Factor (VAF) values of 0.1 to 5.0 given in the first paragraph should be changed to 0.2 to 5.0, which is the correct criteria for evaluating VAFs (USFWS 1994).

Habitat should also be modeled for fall-run Chinook salmon spawning, since fall-run Chinook salmon spawn throughout the same reaches as spring-run Chinook salmon. The following additional text should be added to the end of the second paragraph under *Habitat Suitability Criteria (HSC)*:

> "*The USFWS did not concur with the selection of the Battle Creek spring-run Chinook salmon fry and juvenile HSC for the following reasons: (1) the Battle Creek criteria are likely biased towards low depths and velocities due to effects of availability, because they are based entirely on habitat use data; (2) the Battle Creek*

criteria do not include cover criteria[1]*, which are an important attribute of Chinook salmon fry and juvenile habitat; and (3) the Battle Creek criteria do not include adjacent velocity criteria, which need to be included in Chinook salmon fry and juvenile HSC to capture the process of the delivery of drift to slow-water habitats from adjacent fast-water areas by turbulent eddies.*"

The last paragraph on page E6.3-225 is incorrect. The deepest steelhead/rainbow trout redd used to develop the Clear Creek HSC had a depth of 4.0 feet. In addition, the following should be added to the last paragraph on this page:

"*The USFWS recommends that the original steelhead depth curve be used exclusively for evaluation of spawning habitat suitability in Butte Creek based on the peer-reviewed method in Gard (1998) and because of the presence of steelhead/rainbow trout redds in depths as great as 19.9 feet in the Yuba River. The USFWS concludes that the modified steelhead depth curve is likely biased towards shallow depths due to limited availability of deeper conditions with suitable velocities and substrates.*"

Page E6.3-240: A table should be added that shows the range of simulation flows that were modeled using each of the velocity data sets for the Middle Butte subreach. The RJB-Data files for the two Middle Butte subreach sites indicate that the low-flow velocity data set (collected at 48 cfs) was used to simulate velocities for flows of 20 to 60 cfs, the middle-flow velocity data set (collected at 69 cfs) was used to simulate velocities for flows of 50 to 110 cfs, and the high-flow velocity data set (collected at 195 cfs) was used to simulate velocities for flows of 70 to 450 cfs. The Service recommends that the range of simulation flows that were modeled using each of the velocity data sets be modified as follows: Flows of 20 to 45 cfs should be simulated with the low-flow velocity data set, flows of 50 to 60 cfs should be simulated with the middle-flow velocity data set, and flows of 70 to 450 cfs should be simulated with the high-flow velocity data set. It is generally recommended to simulate down from a high-flow velocity data set than to simulate up from a low-flow velocity data set because it is more accurate to simulate down than to simulate up. We understand that the ranges of simulation flows used by the Applicant overlapped and it was the Applicant's intent that such an overlap would simulate a smoother transition of habitat from one velocity data set to another. However, the calibration modifications suggested below, particularly writing in Manning's n values calculated from velocities and depths measured for low-flow velocity data sets (for stations where velocities were not measured at high-flow velocity data sets), should result in a smoother transition from one velocity data set to another without having to average habitat calculated from multiple velocity data sets. Since the only purpose of specifying Manning's n values is to improve the simulation of velocities at flows higher than the velocity data set's flow, all Manning's n values should be deleted from the low-flow and middle-flow velocity data set calibration files, since these would only be used to simulate flows less than the velocity data set's flows. Similarly, two different calibration files should be created for the high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 70 to 190 cfs, with the only Manning's n values specified being those calculated from velocities and depths measured for low-flow velocity data sets (for stations

1 As noted on page E6.3-221, cover data was evaluated and recorded at each cell for the Middle and Lower Butte subreach transects, and thus could be used to simulate habitat in concert with appropriate cover criteria.

where velocities were not measured at the high-flow velocity data set); and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 210 to 450 cfs. Similarly, for the Lower Butte subreach, two different calibration files should be created for the high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 60 to 170 cfs, with no Manning's n values specified; and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 190 to 450 cfs.

Page E6.3-243: The evaluation of the range of depths with steelhead redds and at potential spawning locations is flawed in that it does not take into account whether or not the deeper areas of potential spawning locations had suitable substrates and velocities. In particular, the observation on page E6.3-241, that redds tended to be in areas with faster velocities than potential spawning areas, suggests that the deeper portions of the potential spawning locations had unsuitable (too low) velocities. As described in Gard (1998), we have found that the use of deeper areas by spawning anadromous salmonids is frequently limited by the availability of deeper conditions with suitable velocities and substrates. Without an evaluation of the effect of availability using the methods in Gard (1998), there is no basis for stating that the Butte Creek observations are not consistent with the Clear Creek depth HSC data from USFWS (2006).

Page E6.3-245 and 246: The last sentence on each page is incorrect. The habitat-discharge relationships in USFWS (2003) are a reach-wide assessment, calculated by extrapolating to the entire reach based on the percentage of redds that were in the study sites. This is a superior method of developing a reach-wide assessment for salmonid spawning habitat, versus a mesohabitat-based method for extrapolation, because it takes into account salmonids' preference for spawning in areas with high gravel permeability (Vyverberg et al 1996).

Figures E6.3.2.6-15a and E6.3.2.6-16a (pages E6.3-245 and 247): The Chinook spawning curves should be deleted from these figures. The curves shown in these figures overestimate the amount of spawning habitat in both the Lower and Middle Butte subreaches because they include data from more than just the high spawning use areas and they were calculated by extrapolating to the entire reach based on mesohabitat mapping data. Using a mesohabitat-based approach for modeling spawning habitat fails to take into account salmonids' preference for spawning in areas with high gravel permeability (Vyverberg et al 1996). In addition, having sites only in high-use spawning areas indirectly takes into account characteristics of spawning habitat, such as permeability and upwelling, which are key characteristics of spawning habitat and are not captured by depth, velocity, and substrate (Gallagher and Gard 1999). We recommend that Figures E6.3.2.6-15b and E6.3.2.6-16b be used to develop protection, mitigation and enhancement measures.

Page E6.3-248: The results of the habitat time series for the Lower Butte subreach should be presented as a habitat exceedance curve, using the full dataset of impaired and unimpaired hydrography, rather than just reporting the average values for each month. Results should also be reported for wet years, in addition to normal and dry years.

Tables E.6.3.2.6-19m and n, Figures E.6.3.2.6-17m and n (pages E6.3-261 to 262), Tables E.6.3.2.6-20m and n, and Figures E.6.3.2.6-18m and n (pages E6.3-282 to 283): These tables and figures should be deleted because the weighted-useable-area (WUA) data used overestimated the amount of spawning habitat in both the Lower and Middle Butte subreaches. Data was used from more than just the high spawning use areas and were calculated by extrapolating to the entire reach based on mesohabitat mapping data.

Page E6.3-288, second paragraph: The statement that "*...maximum WUA for all species/life-stage combinations is achieved with less than 150 cfs*" in the Middle Butte subreach is incorrect. Maximum WUA for spring-run Chinook salmon spawning is at 410 cfs in the Middle Butte subreach (USFWS 2003). Accordingly, the sentence in question should be modified to say: "*With the exception of spawning steelhead (using the Clear Creek depth criteria) and spawning spring-run Chinook salmon, maximum WUA for all species/life-stage combinations is achieved with less than 150 cfs.*"

<u>Upper Butte Creek Reach (Butte Creek)</u>
From Butte Creek Diversion Dam (RM 72.0) downstream to DeSabla Powerhouse (RM 61.9) (FLA Volume IIB, Section 6.3.2.7, Study 6.3.3-8)
Subreaches: Upstream of the West Branch Butte Creek's confluence
Downstream of the West Branch Butte Creek's confluence

Page E6.3-307: There is no description of the two "subreaches" within this reach until page 309. If all the resulting data was derived from two distinct subreaches, then data and information should have been collected, analyzed, and reported in that manner from the beginning of the study report.

Page E6.3-308: The first sentence of the second paragraph under *Field Data Collection* should be modified as follows to be consistent with the range of simulation flows, as shown in Figure E6.3.2.7-4: "*Calibration flows were targeted to facilitate modeling from 16 to 250 cfs.*" Note that this modification is consistent with the next sentence, since the unimpaired summer flow downstream of Butte Creek Diversion Dam is 220 cfs, as shown in Table E6.3.2.7-4a.

Table E6.3.2.7-2 (page E6.3-311): Based on the number of transects selected for the Upper Butte Creek reach (25), we would anticipate that the 95% confidence interval would be plus or minus 35% of the flow for the highest juvenile trout WUA, based on the data from Gard (2005). The results of the juvenile trout habitat modeling should be interpreted by taking into account the resulting large uncertainty in the flow-habitat relationship for this life stage. Specifically, the flow with the maximum WUA for juvenile trout in the Upper Butte Creek reach could be as high as 108 cfs (80 x 135%).

Page E6.3-311: A table should be added that shows the range of simulation flows that were modeled using each of the velocity data sets for the Upper Butte Creek reach. The RJB-Data file for the Upper Butte Creek reach indicates that the low-flow velocity data set (collected at 30 cfs) was used to simulate velocities for flows of 15 to 60 cfs, and that the high-flow velocity data set (collected at 110 cfs) was used to simulate velocities for flows of 30 to 250 cfs. The Service recommends that the range of simulation flows that were modeled using each of the velocity data sets be modified as follows: Flows of 15 to 30 cfs should be simulated with the low-flow velocity data set and flows of 35 to 250 cfs should be simulated with the high-flow velocity data set. It is generally recommended to simulate down from a high-flow velocity data set than to simulate up from a low-flow velocity data set because it is more accurate to simulate down than to simulate up. We understand that the ranges of simulation flows used by the Applicant overlapped and it was the Applicant's intent that such an overlap would simulate a smoother transition of habitat from one velocity data set to another. However, the calibration modifications suggested below, particularly writing in Manning's n values calculated from velocities and depths measured for the low-flow velocity data set (for stations where velocities were not measured at the high-flow velocity data set), should result in a smoother transition from one velocity data set to another without having to average habitat calculated from multiple velocity data sets. Since the only purpose of specifying Manning's n values is to improve the simulation of velocities at flows higher than the velocity data set's flow, all Manning's n values should be deleted from the low-flow velocity data set calibration file, since this would only be used to simulate flows less than the velocity data set's flow. Similarly, two different calibration files should be created for the high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 35 to 110 cfs, with the only Manning's n values specified being those calculated from velocities and depths measured at the low-flow velocity data set (for stations where velocities were not measured at the high-flow velocity data set) and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 120 to 250 cfs.

Table E6.3.2.7-3 (page E6.3-311): The Study Plan states: "*The flow will then be dropped to the regulatory minimum, and re-measured (with a full stage and velocity data set) unless this data set has already been measured (e.g., in the fall of 2005).*" The Study Plan further states that the regulatory minimum is 16 cfs. Reliable stage-discharge relationships cannot be computed from the current data (at 30, 48 and 110 cfs) using the IFG4 Model (*IFG4*). Specifically, the narrow range between the low and middle flows (i.e. 30 to 48 cfs), versus the large range between the middle and high flows (48 to 110 cfs), result in the 110 cfs measurement having too large an effect on the stage-discharge relationship and the 30 and 48 cfs measurements having too little effect on the stage-discharge relationship. In addition, with no calibration flows between 48 and 110 cfs, there is no way to evaluate whether or not there is a log-log relationship between stage and discharge for this flow range; which is the major assumption of *IFG4*. We conclude, given the available data, that the stage-discharge relationships generated with *IFG4* for this site would not be adequate for purposes of making an effect assessment and developing protection, mitigation and enhancement measures. If an additional calibration water surface elevation cannot be collected at a flow of around 80 cfs (half way between 48 and 110 cfs), we recommend that all of the transects be calibrated with either the MANSQ Model (*MANSQ*) or the WSP Model (*WSP*), since neither of these models assume that there is a log-log relationship between stage and flow.

Page E6.3-312: The results of the habitat time series for the Upper Butte subreaches (upstream and downstream of West Branch Butte Creek) should be presented as a habitat exceedance curve, using the full dataset of impaired and unimpaired hydrography, rather than just reporting the average values for each month. Results should also be reported for wet years, in addition to normal and dry years.

<u>Lower West Branch Feather River Reach (West Branch Feather River)</u>
From Hendricks Diversion Dam (RM 29.2) downstream to the non-project Miocene Diversion (RM 15.0) (FLA Volume IIB, Section 6.3.2.8, Study 6.3.3-9)
***<u>Subreaches</u>*: Above Big Kimshew Creek (RM 29.2 - 23.2)**
Big Kimshew to Fall Creeks (RM 23.2 - 21.4)
Below Fall Creek (RM 21.4 - 15.0)

Page E6.3-337: The first sentence of the second paragraph under *Field Data Collection* should be modified as follows to be consistent with the range of simulation flows (as shown in Figure E6.3.2.8-6):

> "*Calibration flows were targeted to facilitate modeling from the current minimum instream flow of 15 cfs (as measured at Hendricks Dam) to unimpaired early summer flow downstream of Hendricks Dam of about 170 cfs.*"

Tables E6.3.2.8-2 and E6.3.2.8-7 (pages E6.3-336 and 342): These two tables are inconsistent. The first table identifies the uppermost study site as "Above Jordan Hill Bridge," while the second table identifies the uppermost study site as "Below Jordan Hill Bridge." Whichever table is incorrect should be corrected.

Page E6.3-340: A table should be added showing the habitat types and transect weighting for the Big Kimshew to Fall Creek subreach's transects. Based on the number of transects selected for the Big Kimshew to Fall Creek subreach (11), we would anticipate that the 95% confidence interval would be plus or minus 60% of the flow for the highest juvenile trout WUA, based on the data from Gard (2005). The results of the juvenile trout habitat modeling should be interpreted by taking into account the resulting large uncertainty in the flow-habitat relationship for this life stage. Specifically, the flow with the maximum WUA for juvenile trout in the Big Kimshew to Fall Creek subreach could be as high as 112 cfs (70 x 160%).

Table E6.3.2.8-5 (page E6.3-341): Based on the number of transects selected for the Below Fall Creek subreach (17), we would anticipate that the 95% confidence interval would be plus or minus 47% of the flow for the highest juvenile trout WUA, based on the data from Gard (2005). The results of the juvenile trout habitat modeling should be interpreted by taking into account the resulting large uncertainty in the flow-habitat relationship for this life stage. Specifically, the flow with the maximum WUA for juvenile trout in this subreach could be as high as 176 cfs (120 x 147%).

Table E6.3.2.8-6 (page E6.3-341): Based on the number of transects selected for the Above Big Kimshew Creek subreach (25), we would anticipate that the 95% confidence interval would be plus or minus 35% of the flow for the highest juvenile trout WUA, based on the data from Gard (2005). The results of the juvenile trout habitat modeling should be interpreted by taking into account the resulting large uncertainty in the flow-habitat relationship for this life stage.

Specifically, the flow with the maximum WUA for juvenile trout in this subreach could be as high as 94 cfs (70 x 135%).

Table E6.3.2.8-7 (page E6.3-342): The calibration flows for the site between Big Kimshew and Fall Creeks should be added to this table. The study plan stated for the Jordan Hill site:

> *"The flow will then be reduced to a mid-flow range (approximately 60 cfs) and study sites will be surveyed for changes in water surface elevation."*

In contrast, the actual middle-flow for the Below Jordan Hill Bridge site was 42 cfs. Reliable stage-discharge relationships cannot be computed from the current data (35, 42 and 101 cfs) using *IFG4*. Specifically, the narrow range between the low and middle flows (35 and 42 cfs), versus the large range between the middle and high flows (42 to 101 cfs), result in the 101 cfs measurement having too large an effect on the stage-discharge relationship and the 35 and 42 cfs measurements having too little effect on the stage-discharge relationship. In addition, with no calibration flows between 42 and 101 cfs, there is no way to evaluate whether there is a log-log relationship between stage and discharge for this flow range, which is the major assumption of *IFG4*. We conclude, given the available data, that stage-discharge relationships generated with *IFG4* for this site would not be adequate for purposes of making an effect assessment and developing protection, mitigation and enhancement measures. If an additional calibration water surface elevation cannot be collected at a flow of around 70 cfs (half way between 42 and 101 cfs), we recommend that all of the transects be calibrated with either *MANSQ* or *WSP*, since neither of these models assume that there is a log-log relationship between stage and flow.

Page E6.3-343: A table should be added that shows the range of simulation flows that were modeled using each of the velocity data sets for the Above Big Kimshew and Below Fall Creek subreaches. The RJB-Data files for the Above Big Kimshew subreach sites indicate that the low-flow velocity data set (collected at 12 cfs) was used to simulate velocities for flows of 5 to 30 cfs and that the high-flow velocity data set (collected at 70 cfs) was used to simulate velocities for flows of 15 to 170 cfs. We recommend that the range of simulation flows that were modeled using each of the velocity data sets be modified as follows: Flows of 5 to 10 cfs should be simulated with the low-flow velocity data set and flows of 15 to 170 cfs should be simulated with the high-flow velocity data set. The RJB-Data files for the Below Fall Creek subreach site indicate that the low-flow velocity data set (collected at 35 cfs) was used to simulate velocities for flows of 15 to 65 cfs and that the high-flow velocity data set (collected at 101 cfs) was used to simulate velocities for flows of 35 to 250 cfs. We recommend for the Below Fall Creek subreach that the range of simulation flows that were modeled using each of the velocity data sets be modified as follows: Flows of 15 to 35 cfs should be simulated with the low-flow velocity data set and flows of 40 to 250 cfs should be simulated with the high-flow velocity data set. As we have stated previously, we understand the Applicant's intent. However, the calibration modifications suggested should result in a smoother transition from one velocity data set to another without having to average habitat calculated from multiple velocity data sets[2]. Since the only purpose of specifying Manning's n values is to improve the simulation of velocities at flows higher than the velocity data set's flow, all Manning's n values should be deleted from the low-flow velocity data set calibration files for both subreaches, since this would only be used to simulate flows less than the velocity data set's flow. Similarly, two different calibration files should be created for the Above Big Kimshew subreach high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 15 to 70 cfs, with the only Manning's n values specified being those calculated from velocities and depths measured at the low-flow velocity data set (for stations where velocities were not measured at the high-flow velocity data set) and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 75 to 170 cfs. Also, two different calibration files should be created for the Below Fall Creek subreach high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 40 to 100 cfs, with the only Manning's n values specified being those calculated from velocities and depths measured at the low-flow velocity data set (for stations where velocities were not measured at the high-flow velocity data set) and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 105 to 250 cfs. Finally, two different calibration files should be created for the Big Kimshew to Fall Creek subreach velocity data set: (1) a calibration file, to be used to simulate flows from 10 to 90 cfs, with no Manning's n values specified and (2) a calibration file with Manning's n values as appropriate, to be used to simulate flows from 100 to 300 cfs.

Page E6.3-345: The results of the habitat time series for the three Lower West Branch Feather River subreaches should be presented as a habitat exceedance curve, using the full dataset of impaired and unimpaired hydrography, rather than just reporting the average values for each month. Results should also be reported for wet years, in addition to normal and dry years.

Upper West Branch Feather River Reach (West Branch Feather River/Philbrook Creek)
Round Valley Reservoir (RM 43.8) downstream to Hendricks Diversion Dam (RM 29.2) and Philbrook Reservoir (RM 2.3) downstream to Philbrook Creek's Confluence with West Branch Feather River (FLA Volume IIB, Section 6.3.2.9, Study 6.3.3-10)
***Subreaches*: Philbrook Creek (RM 2.3 - 0.0, Confluence w/ West Branch Feather River)**
Round Valley (RM 43.8 - 42.5, West Branch Feather River)
Upper West Branch Feather River (RM 42.5 - 29.2)

Table 6.3.2.9-3 (page E6.3-381): The upper end of the target simulation flows for Philbrook Creek should be changed to 120 cfs to be consistent with the range of flows shown in Figure E6.3.2.9-9.

Table E6.3.2.9-7 (page E6.3-385): Based on the number of transects selected for the Upper West Branch Feather River subreach (16), we would anticipate that the 95% confidence interval

2 We note that the disjunct shown for the Jordan Hill WUA is a function of which flows were simulated with which velocity data sets. If the transition to the high-flow velocity data set to the low-flow velocity data set had been at 35 cfs, there would have been much less of a disjunct between the low-flow and high-flow WUA curves.

would be plus or minus 49% of the flow for the highest juvenile trout WUA, based on the data from Gard (2005). The results of the juvenile trout habitat modeling should be interpreted by taking into account the resulting large uncertainty in the flow-habitat relationship for this life stage. Specifically, the flow with the maximum WUA for juvenile trout in this subreach could be as high as 89 cfs (60 x 149%).

Table E6.3.2.9-9 (page E6.3-385): Based on the number of transects selected for the Philbrook Creek subreach (15), we would anticipate that the 95% confidence interval would be plus or minus 51% of the flow for the highest juvenile trout WUA, based on the data from Gard (2005). The results of the juvenile trout habitat modeling should be interpreted by taking into account the resulting large uncertainty in the flow-habitat relationship for this life stage. Specifically, the flow with the maximum WUA for juvenile trout in Philbrook Creek could be as high as 68 cfs (45 x 151%).

Page E6.3-386: A table should be added that shows the range of simulation flows that were modeled using each of the velocity data sets for the Inskip and Lower Philbrook Creek sites. The RJB-Data file for the Inskip site indicate that the low-flow velocity data set (collected at 41 cfs) was used to simulate velocities for flows of 5 to 100 cfs and that the high-flow velocity data set (collected at 80 cfs) was used to simulate velocities for flows of 30 to 200 cfs. We recommend that the range of simulation flows that were modeled using each of the velocity data sets be modified as follows: Flows of 5 to 40 cfs should be simulated with the low-flow velocity data set and flows of 45 to 200 cfs should be simulated with the high-flow velocity data set. The RJB-Data file for the Lower Philbrook Creek site indicate that the low-flow velocity data set (collected at 3 cfs) was used to simulate velocities for flows of 5 to 15 cfs and that the high-flow velocity data set (collected at 42 cfs) was used to simulate velocities for flows of 10 to 120 cfs. We recommend for the Lower Philbrook Creek site that the range of simulation flows that were modeled using each of the velocity data sets be modified as follows: No flows should be simulated with the low-flow velocity data set and flows of 5 to 120 cfs should be simulated with the high-flow velocity data set. As we have previously stated, we understand the Applicant's intent. However, the calibration modifications that we have previously stated should result in a smoother transition from one velocity data set to another without having to average habitat calculated from multiple velocity data sets.

As we have previously stated, all Manning's n values should be deleted from the low-flow velocity data set calibration files for the Inskip site, since this would only be used to simulate flows less than the velocity data set's flow. Similarly, two different calibration files should be created for the Inskip high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 5 to 80 cfs, with the only Manning's n values specified being those calculated from velocities and depths measured at the low-flow velocity data set (for stations where velocities were not measured at the high-flow velocity data set) and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 85 to 200 cfs. Also, two different calibration files should be created for the Lower Philbrook Creek high-flow velocity data set: (1) a calibration file, to be used to simulate flows from 5 to 40 cfs, with the only Manning's n values specified being those calculated from velocities and depths measured at the low-flow velocity data set (for stations where velocities were not measured at the high-flow velocity data set) and (2) a calibration file with Manning's n values as detailed in our comments on the calibration report, to be used to simulate flows from 45 to 120 cfs. Finally, two different calibration files should be created for the Upper Philbrook Creek velocity data set: (1) a calibration file, to be used to simulate flows from 5 to 45 cfs, with no Manning's n values specified and (2) a calibration file with Manning's n values as appropriate, to be used to simulate flows from 50 to 120 cfs.

Page E6.3-398: The results of the habitat time series for the Upper West Branch Feather River and Philbrook Creek subreaches should be presented as a habitat exceedance curve, using the full dataset of impaired and unimpaired hydrography, rather than just reporting the average values for each month. Results should also be reported for wet years, in addition to normal and dry years.

FLA Volume IID, Section 7.0 Environmental Analysis

Page E7-21: Given the Service's proposed instream flows for the Middle Butte subreach in September to mid-March, the following sentence should be modified:

> "*Existing habitat for spawning Chinook salmon is slightly decreased with unimpaired flow conditions, although the proposed minimum instream flows would increase this habitat to be more or less equal to unimpaired flow conditions.*"

The above sentence should be modified as follows:

> "*Existing habitat for spawning Chinook salmon is slightly decreased with unimpaired flow conditions, although the proposed minimum instream flows would increase this habitat to be substantially greater than unimpaired flow conditions.*"

Specifically, with regards to the above sentence, the amount of spring-run Chinook salmon spawning habitat in the Middle Butte subreach is 11.8 % greater at 120 cfs, versus the unimpaired flow of 74 cfs in normal years and 12.8 % `greater at 75 cfs, versus the unimpaired flow of 59 cfs in dry years.

FLA Volume IIB, Sections 6.3.2.6, 7, 8, and 9 (Instream Flow Studies Appendices)
Appendices for Instream Flow Studies are on CDs and noted as follows on FLA pages.

Lower Butte Creek Reach: Appendices E6.3.2.6-A to J2 (FLA pages E6.3-288-289).
Upper Butte Reach: Appendices E6.3.2.7-A to F2 (FLA page E6.3-329).
Lower West Branch Feather River Reach: Appendices E6.3.2.8-A to F3 (FLA page E6.3-370).
Upper West Branch Feather River Reach: Appendices E6.3.2.9-A to E2 (FLA page E6.3-415).

There is no calibration report for the study site, referred to as "OLD TRPA," on the West Branch Feather River between Big Kimshew and Fall Creeks. A calibration report should be added for this site so that the adequacy of the calibration file for this site can be assessed.

Appendices E6.3.2.6-H1-3, E6.3.2.7-D, E6.3.2.8-D1-2 and E6.3.2.9-C1-4: The VAF plots should show VAF values for all of the simulation flows. The following parameters are used for *WSP* and the values of these parameters should be given in the report for each transect calibrated with *WSP*: (1) the Manning's n value used for each transect and (2) the reach multiplier value used for each calibration flow. *WSP* is considered to have worked well if the following criteria are met: (1) the Manning's n value used falls within the range of 0.04 - 0.07; (2) there is a negative log-log relationship between the reach multiplier and flow; and (3) there is no more than a 0.1-foot difference between the measured and simulated Water Surface Elevations (WSELs). With the exception of Appendices E6.3.2.7-D and E6.3.2.8-D1 and 2, Table 2 in each Appendix does not give the predicted WSELs for the lowest and highest simulation flows. This information should be added and if this information shows water flowing uphill at the lowest or highest simulation flow, *WSP* should be used instead to calibrate the upstream transect of the transects with this phenomenon. The velocities in the RHABSIM Model files for stations with measured velocities of zero should be changed to 0.05 ft/s, instead of specifying Manning's n values for such stations or letting the Manning's n value be determined by the nearest station with a non-zero velocity. This method is a more accurate, and less arbitrary, method of simulating velocities for edge cells than the methods used by the Applicant, since it more accurately simulates velocities for flows near the measured velocity data set's flow, but does not unduly limit the magnitude of velocities at simulation flows exceeding the measured velocity data set's flow. Note that the above is the Service's standard procedure when it conducts instream flow studies.

Lower Butte Creek Reach: Appendices E6.3.2.6-A to J2 (FLA pages E6.3-288-289)
Appendix E6.3.2.6-H1: The general calibration criterion given on page 1, that Beta values should be kept within 2.0 and 5.0 for *IFG4* (log/log), is incorrect. The correct criterion is that Beta values should be kept within 2.0 and 4.5 for *IFG4* (USFWS 1994). The general calibration criterion given on page 1, that Manning's n values should be held within the range of 0.03 and 0.08 for *WSP*, is also incorrect. The correct criterion is that the Manning's n value used in *WSP* should fall within the range of 0.04 - 0.07 (USFWS 1994).

Appendix E.6.3.2.6-H1, Table 1: This table is inconsistent with the text on the previous page. The text on the previous page states that transect 1 was calibrated with *IFG4*. In Table 1, *WSP* should be deleted in the column for transect 1 and the mean error and stage-discharge relationship parameters for transect 1 should not be greyed-out. The text below this table is incorrect in stating that no statistics are available for *WSP*. The following parameters are used for *WSP* and should be given in the report for each transect calibrated with *WSP*: (1) the Manning's n value used for each transect and (2) the reach multiplier value used for each calibration flow. *WSP* is considered to have worked well if the following criteria are met: (1) the Manning's n value used falls within the range of 0.04 - 0.07; (2) there is a negative log-log relationship between the reach multiplier and flow; and (3) there is no more than a 0.1-foot difference between measured and simulated WSELs. There needs to be an explanation of why the stage of zero flow (SZF) values for transects 13-15 and 20 were increased from the values in the 1/16/07 calibration report. Specifically, the 1/16/07 calibration report had SZF values of 93.0 for transects 13-15 and 101.3 for transect 20, while the 8/20/07 calibration report has SZF values of 93.61 for transects 13-15 and 102.02 for transect 20. If additional fieldwork was done after January 2007 to survey in the new thalweg elevations at the hydraulic controls downstream of these transects to determine these new SZF values, this would be acceptable. However, if the SZF values were only arbitrarily increased without any field data to support this increase, this would not be acceptable. If that was the case, transects 13 to 15 and 20 should be calibrated with *MANSQ*. *MANSQ* should be used for calibration of transect 19 instead of *IFG4* since the Beta value for *IFG4* falls outside of the acceptable range of values and the mean error for *MANSQ* was less than the maximum acceptable value of 10 %. Further, it would be acceptable to use *MANSQ* for transect 19 since this transect is a low gradient riffle.

Appendix E.6.3.2.6-H1, Table 3: The Manning's n values (2.0) for stations 0.0 to 5.0 of transect T04 and values (1.0) for stations 0 to 5.9 and 57.0 to 63.0 of transect T12 are inconsistent with the criterion given on page 2 that Manning's n values for edge cells were reduced to 2.5. We recommend that the Manning's n values for these cells be reduced to 2.5 or not specified for stations 0 to 5.9 of transect T12, since the original Manning's n value for these cells was less than 2.5.

<u>*Lower Butte Creek Reach: Appendices E6.3.2.6-A to J2 (FLA pages E6.3-288-289).*</u>
<u>*Upper Butte Reach: Appendices E6.3.2.7-A to F2 (FLA page E6.3-329).*</u>
<u>*Lower West Branch Feather River Reach: Appendices E6.3.2.8-A to F3 (FLA page E6.3-370).*</u>
Appendices E.6.3.2.6-H2 and H3, E.6.3.2.7-D and E.6.3.2.8-D1: For the high-flow calibration files, Manning's n values, calculated on a cell-by-cell basis from the mid-flow velocity data set (for Appendices E.6.3.2.6-H2 and 3) or low-flow velocity data set (for Appendices E.6.3.2.7-D and E.6.3.2.8-D1), should be written in for cells where velocities were not measured at the high-flow. This would be a more accurate method of simulating velocities than using the depth-calibration modeling method, which only uses the depths present in each cell and a constant Manning's n value across the entire transect. The VAF plots should be combined together for the low-flow, middle-flow, and high-flow calibrations (for Appendices E.6.3.2.6-H2 and 3) or for the low-flow and high-flow calibrations (for Appendices E.6.3.2.7-D and E.6.3.2.8-D1). The resulting plots for Appendices E.6.3.2.6-H2 and 3 would have the following VAFs: VAFs from the low-flow calibration for the simulation flows that used the low-flow data set (presumably 40 to 48 cfs); VAFs from the middle-flow calibration for the simulation flows that used the middle-flow data set (presumably 50 to 69 cfs); and VAFs from the high-flow calibration for the simulation flows that used the high-flow data set (presumably 70 to 450 cfs).

<u>*Lower Butte Creek Reach: Appendices E6.3.2.6-A to J2 (FLA pages E6.3-288-289)*</u>
Appendix E.6.3.2.6-H2, Table 1: For transects 5, 6, 8, 9 and 15, the Beta value (second from bottom line) was greater than the maximum acceptable value of 4.5. Beta values greater than 4.5 generally indicate that a hydraulic control downstream of the transect was missed and that the SZF for the transect is too low. We suggest that the Applicant try recalibrating the run transects (transects 8 and 9) with *MANSQ* and try recalibrating transect 15 with *WSP*, using the stage-discharge relationship at transect 14 as the initial conditions. If this does not work, we would suggest additional fieldwork that would entail surveying in the new thalweg elevation of the hydraulic control below the transects (this value would be the true SZF for these transects). Note that there is no other option than doing the above fieldwork for pool transects 5 and 6. These two transects cannot be modeled with *MANSQ* because they do not have a nearby transect downstream of them (a nearby transect would have provided the initial conditions for using *WSP* to calibrate these transects).

Appendix E.6.3.2.6-H3, Table 1: The data given in the last two lines of this table should be given in the same format as for the Table 1 in the other Appendices, specifically:
Discharge = A * (Stage – SZF) ^ B. Note that the above formula should be substituted for the

current formula given on the third to last line of this table. Having the data in this format facilitates evaluating whether the *IFG4* Beta values fall within the acceptable range of 2.0 to 4.5. By examining the RHABSIM Model files for the Whiskeytown site, we determined that the Beta values for all 7 transects fell within the above range.

Appendix E.6.3.2.6-H3, Table 3: The Manning's n values used for edge cells should be consistent for all of the calibrations. The Service recommends that the criterion given on page 2 of Appendix E.6.3.2.6-H1, with Manning's n values for edge cells reduced to 2.5, be used for all of the calibrations. Accordingly, the Manning's n values for the following edge cells should be changed to 2.5: Station 47.5 of low-flow transect T03; stations 68 to 79 of middle-flow transect T03; stations 66.1 to 70.7 of middle-flow transect T04; stations 56 and 60.2 to 71.9 of middle-flow transect T05; stations 8, 9 and 36 of middle-flow transect T06; stations 0 to 5 and 23 of middle-flow transect T07; and stations 0 to 19.5 of high-flow transect T04. In addition, the Manning's n values for the following edge cells should be changed to -2.5: Stations 28 and 31 of low-flow transect T07 and stations 34.5 to 61 of middle-flow transect T07. The proposed revision of the Manning's n value for station 22 of low-flow transect T07 is not adequately justified. We would view the measured data as showing a non-smooth transition from positive to negative flow and we think that this pattern in the measured data should be maintained in the simulated velocities. Accordingly, we recommend that the Manning's n not be changed for this cell. The original simulated velocities for stations 22 and 61.3 of the high-flow transect T01 at the measured flow do not make any sense. At the measured flow, the simulated velocity should just be the original velocity times the VAF. In this case, 1.99*1.0568 = 2.10 ft/s for station 22 and 0.08*1.0568 = 0.084 ft/s for station 61.3. In contrast, Table 3 shows the original simulated velocities of 0.79 and 0.22 ft/s, respectively, for stations 22 and 61.3. We suspect that these discrepancies indicate that the original Manning's n values of 0.06 shown in Table 3 are different than the Manning's n values that would be computed from the measured depths and velocities (Manning's n values should only be computed from measured depths and velocities). These discrepancies put the adjustments of Manning's n for this transect in question. Similar problems exist for high-flow transects T02 and T03. Even more problematic are the original simulated velocities for station 39.7 of high-flow transect T06 and stations 4.5 and 5.1 of high-flow transect T07. At these three stations, the measured velocities were negative and the original simulated velocities at the measured flow were positive. In addition, the specified revised Manning's n for station 39.7 of high-flow transect T06 should have been negative to reflect the negative value of the measured velocity.

Upper Butte Reach: Appendices E6.3.2.7-A to F2 (FLA page E6.3-329)

Appendix E.6.3.2.7-D: How was the revision of the SZF values for transects T6, T7, T8 and T9 determined? If additional fieldwork was done to survey in the new thalweg elevations at the hydraulic controls downstream of these transects to determine these new SZF values, this would be acceptable. However, if the SZF values were only arbitrarily increased without any field data to support this increase, this would not be acceptable.

Appendix E.6.3.2.7-D, Table 1: The data given in the last two lines of this table should be given in the same format as for Table 1 in the other Appendices. Specifically:
Discharge = A * (Stage – SZF) ^ B. Note that the above formula should be substituted for the current formula given on the third to last line of this table. Having the data in this format

facilitates evaluating whether the *IFG4* Beta values fall within the acceptable range of 2.0 to 4.5. By examining the RHABSIM Model files for the Doe Mill site, we determined that the Beta values for all 25 transects fell within the above range, with the following exceptions: Beta values for transects 1, 2, 20, 21, 24 and 25 were greater than 4.5 and the Beta values for transects 6 to 9 were less than 2.0. Beta values greater than 4.5 generally indicate that a hydraulic control downstream of the transect was missed and that the SZF for the transect is too low. We suggest that the Applicant try recalibrating transects 1, 2, 20, 21, 24 and 25 with *MANSQ*. Note that it should be possible to calibrate all of these transects, located in runs and low gradient riffles, using *MANSQ*. If this does not work, we would suggest additional fieldwork which would entail surveying in the new thalweg elevation of the hydraulic control downstream of the transects (this value would be the true SZF for these transects). The low Beta values for transects 6 to 9 suggest that there might have been an error in the measurement of the SZF at the hydraulic control for these pool transects (the given SZF value of 96.6 is too high). We suggest that the Applicant recheck the differential leveling data for the measurements of the SZF to see if any mathematical errors were made in computing this value. Alternatively, we have found that there are situations with extremely strong downstream hydraulic controls, or where there are compound controls, where the *IFG4* Beta value can be as low as 1.37. If this was the case for these transects, the calibration report should document this. The data in this table should be checked with the data in the RHABSIM Model files to make sure that the two are consistent. For example, Table 1 shows a SZF of 105.60 for transect 20, while the RHABSIM Model file DMill_HO.RHB, dated July 16, 2007, has a SZF of 105.25 for this transect.

Appendix E.6.3.2.7-D, Table 2: The lower extrapolation of the stage-discharge relationships for transects 4 and 5 broke down, since water is flowing uphill at the lowest simulation flow (the WSEL for transect 5 is 0.04 feet lower than the WSEL for transect 4). As a result, transect 5 should be calibrated with *WSP*. Similarly, the upper extrapolation of the stage-discharge relationships for transects 2 and 3 broke down, since water is flowing uphill at the highest simulation flow (the WSEL for transect 3 is 0.07 feet lower than the WSEL for transect 2). As a result, transect 3 should also be calibrated with *WSP*. The same situation exists for transects 12 and 13, and thus transect 13 should also be calibrated with *WSP*.

Appendix E.6.3.2.7-D, Table 3: The revised Manning's n values for stations 22.6 to 28.6 of the high-flow transect T02 are not justified. We are assuming that the measured velocities for stations 22.6, 23.0 and 28.6 were zero. In such cases, the Service's standard practice is to set the velocity equal to 0.05 ft/s, rather than specifying a Manning's n value. The same comment applies for stations 52.0, 59.5 to 62.0, and 80.5 of high-flow transect T05; stations 9 to 22 of high-flow transect T07; station 4.5 of high-flow transect T11; station 1.5 of high-flow transect T14; station 43 of high-flow transect T16; stations 14 and 17 for high-flow transect T20; and station 15 of high-flow transect T24. The Manning's n values used for edge cells should be consistent for all of the calibrations. We recommend that the criterion given on page 2 of Appendix E.6.3.2.6-H1, with Manning's n values for edge cells reduced to 2.5, be used for all of the calibrations. Accordingly, the Manning's n values for the following edge cells should be changed to 2.5: Stations 42 to 54 (and no Manning's n specified for stations 56 to 87) of low-flow transect T01; stations 39 to 63 (and no Manning's n specified for stations 65 to 99) of low-flow transect T02; stations -8 to 9 and 67 to 74.5 (and no Manning's n specified for station 64.5) of low-flow transect T03; stations 0 to 14, 45, 49 and 51 for low-flow transect T08; stations 0 to 14.5 for low-flow transect T11; stations -5 to 5.5 and 41 to 77 for low-flow transect T12; stations 0 to 9 for low-flow transect T13; stations 36 to 92 for low-flow transect T14; stations 0 to 10 and 48 to 63 for low-flow transect T15; stations 21 to 21.5 for low-flow transect T17; station 27 for low-flow transect T19; stations 38.5 to 50 for low-flow transect T20; stations 0 to 20.8 and 47 to 49 for low-flow transect T21; and stations 0 to 21 for low-flow transect T22. In addition, the Manning's n values for the following edge cells should be changed to -2.5: Station 52 for high-flow transect T09; stations 0 to 6 for low-flow transect T01; stations 77 to 92 of low-flow transect T03; stations 59 to 68.4 for low-flow transect T08; stations 13, 15 to 18 and 39 for low-flow transect T13; station 37.5 for low-flow transect T20; and stations 41 to 43 and 46 for low-flow transect T21. The original simulated velocity for station 44 of the high-flow transect T10 at the measured flow does not make any sense. At the measured flow, the simulated velocity should just be the original velocity times the VAF (in this case 2.40*1.1158 = 2.68 ft/s). In contrast, Table 3 shows an original simulated velocity of 1.17 ft/s. If this problem is corrected, we suspect that it may not be necessary to specify a modified Manning's n value for this station. Manning's n values (neither the original 0.06 or the revised -1 or -2) should not be specified for stations 30.6 to 35 and 59.5 to 76 of high-flow transect T25. Not specifying Manning's n values for these stations would result in a more accurate simulation of velocities for these stations at the velocity data set's flow, specifically simulated velocities of -0.055 to -0.32 ft/s, versus measured velocities of -0.06 to -0.35 ft/s.

<u>*Lower WB Feather River Reach: Appendices E6.3.2.8-A to F3 (FLA page E6.3-370)*</u>
Appendix E.6.3.2.8-D1: The text needs to describe how it was determined that the low-flow calibration WSELs for transects T08-T10 were incorrect, versus the middle- and high-flow WSELs for these transects. For example, the differences in WSELs between transects 7 and 8 and between 10 and 11 were consistent between the middle- and high-flows, but were different for the low-flow versus the middle- and high-flows. Transects T08-10 should be calibrated with *MANSQ*. The *IFG4* should not be used with only two calibration flows, since there are no degrees of freedom left in the regression in that circumstance. With only two calibration flows, there is no way to determine if there is a log-log stage-discharge relationship over the range of calibration flows. With regards to *IFG4*, USFWS (1994), page 59, states:

> "*...it will develop a log-log relationship between water surface elevation and discharge. This requires at least three measured water surface elevations to be legitimate.*"

This is illustrated in Appendix E.6.3.2.8-D1, Table 1, where all of the ratios of measured versus predicted discharge are one and the mean errors are zero for transects 8-10. This is a direct result of having only two calibration flows.

Appendix E.6.3.2.8-D1, Table 1: There should be an explanation of why the given stages for transect 11 were different in the 1/16/07 calibration report (90.87, 91.22 and 91.40) versus in the 2/22/07 calibration report (90.82, 91.32 and 91.38). Similarly, there should be an explanation of why the given stage at the mid flow for transects 8, 9 and 12 were different in the 1/16/07 calibration report (88.44, 88.46, and 91.36) versus in the 2/22/07 calibration report (88.43, 88.44 and 91.69). Finally, there should be an explanation of why the given stages at the low- and high-flows for transect 4 were different in the 1/16/07 calibration report (85.63 and 85.99) versus in the 2/22/07 calibration report (85.62 and 86.03). There needs to be an explanation of why the SZF values for transects 1 to 3 were increased from the values in the 1/16/07 calibration report. Specifically, the 1/16/07 calibration report had a SZF value of 80.21 for transects 1 to 3, while the 2/22/07 calibration report had a SZF value of 81.30 for transects 1 to 3. If additional fieldwork was done after January 2007 to survey in the new thalweg elevations at the hydraulic controls downstream of these transects to determine these new SZF values, this would be acceptable. However, if the SZF values were only arbitrarily increased without any field data to support this increase, this would not be acceptable. If that was the case, transects 1 to 3 should be calibrated with *MANSQ* instead. *MANSQ* should be used for the calibration of transect 4 instead of *IFG4* since the Beta value for *IFG4* falls outside of the acceptable range of values. Further, it would be acceptable to use *MANSQ* for transect 4 since this transect was located in a low gradient riffle.

Appendix E.6.3.2.8-D1, Table 2: The lower extrapolation of the stage-discharge relationships for transects 13 and 14 and for transects 15 and 16 broke down, since water is flowing uphill at the lowest simulation flow (for example, the WSEL for transect 14 is 0.059 feet lower than the WSEL for transect 13). Similarly, the upper extrapolation of the stage-discharge relationships for transects 1 and 2 and for transects 15 and 16 broke down, since water is flowing uphill at the highest simulation flow (for example, the WSEL for transect 2 is 0.007 feet lower than the WSEL for transect 1). As a result, transects 2 and 14 to 16 should be calibrated with *WSP*.

Appendix E.6.3.2.8-D1, Table 3: The modified Manning's n values for stations 0 to 27.2 for high-flow transect T07 are not justified. We are assuming that the measured velocities for stations 22.6 and 25.3 were zero. We recommend changing these values to 0.05 ft/s and not specifying Manning's n values for stations 0 to 27.2. We believe that this would produce a more accurate simulation of velocities at flows exceeding the calibration flow by establishing positive velocities for stations 0 to 25.3 and maintaining the measured negative velocity for station 27.0. We believe that this method is a more accurate and less arbitrary method of simulating velocities for edge cells than the methods used by the Applicant, since it more accurately simulates velocities for flows near the measured velocity data set's flow but does not unduly limit the magnitude of velocities at simulation flows exceeding the measured velocity data set's flow. The Manning's n values used for edge cells should be consistent for all of the calibrations. We recommend that the criterion given on page 2 of Appendix E.6.3.2.6-H1, that Manning's n values for edge cells were reduced to 2.5, be used for all of the calibrations. Accordingly, the Manning's n values should not be revised for stations 0 to 28.5 of high-flow transect T17 and should be changed to 2.5 for the following edge cells: Stations 91.9 to 96 of high-flow transect T13; stations 70.7 to 100 of high-flow transect T14; and stations 0 to 50 of low-flow transect T13.

Appendix E.6.3.2.8-D2, Table 1: The given stages should be reported to the nearest 0.01-foot, rather than to the nearest 0.1-foot, as is currently in this table. There needs to be an explanation of why the SZF values for transects 6 to 10 were increased from the values in the 1/12/07 calibration report. Specifically, the 1/12/07 calibration report had SZF values of 91.80 for transects 6 to 8 and 99.65 for transects 9 and 10, while the 2/20/07 calibration report has SZF values of 92.60 for transects 6 to 8 and 100.15 for transects 9 and 10. It should be noted that the increase of the SZF for transects 6 to 8 reduced the Beta values below the minimum acceptable value of 2.0, while the SZF values in the later 1/16/07 calibration report resulted in Beta values within the acceptable range of 2.0 to 4.5.

Appendix E.6.3.2.8-D2, Table 3: The Manning's n values used for edge cells should be consistent for all of the calibrations. We recommend that the criterion given on page 2 of Appendix E.6.3.2.6-H1, that Manning's n values for edge cells were reduced to 2.5, be used for all of the calibrations. Accordingly, the Manning's n values for the following edge cells should be changed to 2.5: Stations 29 to 31 of low-flow transect T07; stations 32, 42.5, 46, 48 and 53 to 63 of low-flow transect T08; station 43.5 of low-flow transect T09; and stations 63 and 66 to 100.3 of low-flow transect T10. In addition, the Manning's n values for the following edge cells should be changed to -2.5: Station 38 of low-flow transect T06 and station 63.5 of low-flow transect T10.

Appendix E.6.3.2.8-D3, Table 1: There needs to be an explanation of why the SZF values for transects 1 to 5 and 10 to 12 were increased from the values in the 1/16/07 calibration report. If additional fieldwork was done after January 2007 to survey in the new thalweg elevations at the hydraulic controls downstream of these transects to determine these new SZF values, this would be acceptable. However, if the SZF values were only arbitrarily increased without any field data to support this increase, this would not be acceptable. If that was the case, transects 1 to 5 and 10 to 12 should be calibrated with *MANSQ* instead. It should be noted that the *IFG4* Beta values for transects 3 to 5, 10 and 11 still exceed the maximum acceptable value of 4.5. Beta values greater than 4.5 generally indicate that a hydraulic control downstream of the transect was missed and that the SZF for the transect is too low. We suggest that the Applicant use *MANSQ* to calibrate transects 1 to 5 and 10 to 12. It should be possible to calibrate all of these transects with *MANSQ*, since they are all located in runs or low gradient riffles. The SZF values in the 1/16/07 and the 2/20/07 calibration reports are shown in Table 1 below (FLA, PG&E 2007).

Table 1. The Stage Zero Flow (SZF) Values from the 1/16/07 and the 2/20/07 Instream Flow Modeling Calibration Reports for the Project (FLA, PG&E 2007).

Transect	1/16/07 SZF values	2/20/07 SZF values
1	74.01	74.50
2	74.01	74.50
3	81.92	83.50
4	82.13	83.50
5	82.84	83.50
10	89.95	89.85
11	89.95	90.00
12	95.92	96.50

Appendix E.6.3.2.8-D3, Table 3: The table for the low-flow transect T06 is missing. The revised Manning's n values for stations 26 to 29 of the high-flow transect T03 are not justified. The revised Manning's n values do not maintain the negative values of the measured velocities, and the reason given makes no sense. It would be expected that simulated velocities at higher flows would have larger magnitude negative values than the measured velocities. The original simulated velocities for station 54 of high-flow transect T08 at the measured flow do not make any sense. At the measured flow, the simulated velocity should be just the original velocity times the VAF (in this case, -0.28*1.0084 = -0.28 ft/s). In contrast, Table 3 shows an original simulated velocity of -2.83 ft/s. The Manning's n values used for edge cells should be consistent for all of the calibrations. The Service recommends that the criterion given on page 2 of Appendix E.6.3.2.6-H1, with Manning's n values for edge cells reduced to 2.5, be used for all of the calibrations. Accordingly, the Manning's n values for the following edge cells should be changed to 2.5: Stations 47 and 51.5 to 59 of low-flow transect T01; stations 0 to 24.5 and 39.5 to 42.5 of low-flow transect T02; stations 10, 11, 26 to 30.5, 46.5 and 47.5 of low-flow transect T03; stations 0 to 14, 36 and 37.5 of low-flow transect T04; stations 8 and 9 (and do not specify Manning's n values for stations 0 to 7 and 31 to 100) of low-flow transect T05; stations 0 to 47 and 49 (and do not specify Manning's n values for stations 48 and 50) of low-flow transect T07; station 30 of low-flow transect T09; stations 0 to 10, 18.5, 20 and 45.5 to 66 (and do not specify Manning's n values for station 17.5) of low-flow transect T10; stations 27 and 41 to 62 of low-flow transect T11; stations 0 to 28.5 of low-flow transect T13; stations 0 to 32, 62 and 66 to 90 of low-flow transect T14; stations 0 to 9.5 and 72 to 74 (and do not specify Manning's n values for stations 12 and 14.5) of low-flow transect T15; stations 0 to 16 (and do not specify Manning's n values for station 48) of high-flow transect T01; stations 0 to 10.1 and 14.9 to 24.5 (and do not specify Manning's n values for stations 11 and 26) of high-flow transect T02; stations 0 to 8 and 37.5 to 40.1 (and do not specify Manning's n values for stations 36 and 42 to 95) of high-flow transect T04; stations 0 to 4 (and do not specify Manning's n values for stations 10.5, 15, 33, 34, 36 and 37) of high-flow transect T05; stations 0 to 21.5 and 57 to 92.5 of high-flow transect T06; stations 61, 63 and 78.3 to 80 of high-flow transect T07; station 34 of high-flow transect T08; stations 79 to 88.3 (and do not specify Manning's n values for stations 0 to 20.1) of high-flow transect T13; stations 72 to 90 (and do not specify Manning's n values for stations 20, 68 and 70) of high-flow transect T14; and stations 0 to 7 and 72.8 to 74 (and do not specify Manning's n values for stations 12, 14.5 and 72.7) of high-flow transect T15. Similarly, Manning's n values should not be specified for stations 41 and 48 to 62 of high-flow transect T11 since the original Manning's n values were less than 2.5. In addition, the Manning's n values for the following edge cells should be changed to -2.5: Stations 53 to 55 of low-flow transect T08 and station 18.5 of high-flow transect T10.

<u>Upper WB Feather River Reach: Appendices E6.3.2.9-A to E2 (FLA page E6.3-415)</u>

Appendix E.6.3.2.9-C1, Table 1: There should be an explanation of why the given stages for transect 7 were different in the 1/12/07 calibration report (94.73, 94.87 and 95.06) versus in the 2/19/07 calibration report (94.69, 94.83 and 95.07). There needs to be an explanation of why the SZF value for transect 7 was increased from the value in the 1/12/07 calibration report. Specifically, the 1/12/07 calibration report had a SZF value of 92.23 for transect 7, while the 2/19/07 calibration report had a SZF value of 92.91 for transect 7. If additional fieldwork was done after January 2007 to survey in the new thalweg elevations at the hydraulic controls downstream of this transect to determine the new SZF value, this would be acceptable. However, if the SZF value was only arbitrarily increased without any field data to support this increase, this would not be acceptable. If that was the case, transect 7 should be calibrated with *MANSQ*.

Appendix E.6.3.2.9-C1, Table 3: The Manning's n values used for edge cells should be consistent for all of the calibrations. We recommend that the criterion given on page 2 of Appendix E.6.3.2.6-H1, with Manning's n values for edge cells reduced to 2.5, be used for all of the calibrations. Accordingly, the Manning's n values for the following edge cells should be changed to 2.5: Stations 0 to 12.4 of high-flow transect T02; stations 43 to 71.5 of high-flow transect T08; stations 64.2 to 74.3 of high-flow transect T09; stations 0 to 35.1 of high-flow transect T11; station 47.7 of high-flow transect T14; stations -10 to 4.5 of low-flow transect T06; and station 18 (and do not specify Manning's n values for stations 0 to 13.9 and 33) of low-flow transect T14. Similarly, Manning's n values should not be specified for station 13 of high-flow transect T04, since the original Manning's n value was than 2.5.

Appendix E.6.3.2.9-C2: VAF plots are missing for this Appendix.

Appendix E.6.3.2.9-C3: This Appendix should be deleted because it appears to be an earlier version of Appendix E.6.3.2.9-C4.

The Service appreciates the opportunity to comment during this stage of the Project. If you have any questions regarding this response, please contact Mr. William Foster of my staff at (916) 414-6600.

Sincerely,

Michael B. Hoover

Michael B. Hoover
Acting Field Supervisor

cc:
Original and eight hardcopies filed FERC
FERC #803 Service list, DeSabla-Centerville Project

REFERENCES

California Department of Fish and Game (CDFG). 2008. Tracy McReynolds, CDFG, Personal Communication, "*Depending on water temperature, the last emergence of spring-run Chinook salmon fry can be as late as March 8 in a given year.*"

Gallagher, S. P. and M. F. Gard. 1999. *Relationship Between Chinook Salmon (Oncorhynchus tshawtscha) Redd Densities and PHABSIM Predicted Habitat in the Merced and Lower American Rivers, California*. Canadian Journal of Fisheries and Aquatic Sciences 56: 570-577.

Gard, M. 1998. *Technique for Adjusting Spawning Depth Habitat Utilization Curves for Availability*. Rivers: 6: 94-102.

Gard, M.F. 2005. *Variability in Flow-Habitat Relationships as a Function of Transect Number for PHABSIM Modeling*. River Research and Applications 21: 1013-1019.

Pacific Gas and Electric Company (PG&E). 2007. Final License Application: Volumes I and IIA-IID, October 1, 2007 (Noticed as Tendered by FERC on 10/09/07). PG&E, San Francisco, California.

Resource Agencies' (RA). 2007a. RA Letter to FERC: "*Resource Agencies' Response to PG&E's May 14, 2007 Draft License Application DeSabla-Centerville Hydroelectric Project, FERC No. 803-068.*" RA, August 31, 2007, California.

RA. 2007b. RA Letter to FERC: "*Resource Agencies' Response to PG&E's September 6, 2007, Updated Study Report (USR) and Seventh Quarterly Progress Report, DeSabla-Centerville Hydroelectric Project, FERC No. 803-068.*" RA, October 30, 2007, California.

RA. 2007c. RA Letter to FERC: "*Resource Agencies' Comments on Pacific Gas and Electric Company's "Draft Study of Reduction of Heating in the DeSabla Forebay", DeSabla-Centerville Hydroelectric Project, FERC Project No. 803-068.*" RA, December 26, 2007, California.

U.S. Fish and Wildlife Service (USFWS). 1994. *Using the Computer Based Physical Habitat Simulation System (PHABSIM)*. Fort Collins, Colorado: U.S. Fish and Wildlife Service.

USFWS. 2003. *Flow-Habitat Relationships for Spring-Run Chinook Salmon Spawning in Butte Creek*. U.S. Fish and Wildlife Service, Sacramento, California.

USFWS. 2005a. Service Letter to FERC: "*U.S. Fish and Wildlife Service Comments on the March 18, 2005, Pre-Application Document (PAD) and Proposed Study Plans for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project #803-068.*" USFWS, May 31, 2005, Sacramento, California.

USFWS. 2005b. Service Letter to FERC: "*U.S. Fish and Wildlife Service Comments on the March 18, 2005, Proposed Study Plan and Pre-Application Document (PAD) Document (and the June 2, 2005, Revised Proposed Study Plans) for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project #803-068.*" USFWS, June 15, 2005, Sacramento, California.

USFWS. 2006. *Flow-Habitat Relationships for Spring-Run Chinook Salmon and Steelhead/Rainbow Trout Spawning in Clear Creek Between Whiskeytown Dam and Clear Creek Road.* U.S. Fish and Wildlife Service, Sacramento, California.

USFWS. 2007a. Service Letter to FERC: "*U.S. Fish and Wildlife Service Comments on the Supplemental Initial Study Report and the Supplemental Initial Study Report Meeting Summary for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project No. 803-068.*" USFWS, March 16, 2007, Sacramento, California.

USFWS. 2007b. Service Letter to FERC: "*U.S. Fish and Wildlife Service Comments on the Supplemental Initial Study Report (SISR) for Study 6.3.3-6, Assessment of Fish Entrainment and Upstream Fish Passage Issues at DeSabla-Centerville Project Facilities, the SISR Meeting Summary for Study 6.3.3-6, and Additional Supplemental Fish Population and Entrainment Information for the DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project No. 803-068.*" USFWS, May 4, 2007, Sacramento, California.

USFWS. 2007c. Service Letter to FERC: "*Fish and Wildlife Service Comments on Selected Studies in the Draft License Application Submitted by Pacific Gas and Electric Company for its DeSabla-Centerville Hydroelectric Project, Federal Energy Regulatory Commission Project No. 803-068, in Butte County, California.*" USFWS, July 3, 2007, Sacramento, California.

Vyverberg, K., B. Snider and R.G. Titus. 1996. *Lower American River Chinook Salmon Spawning Habitat Evaluation October 1994.* California Department of Fish and Game, Environmental Services Division, Stream Flow and Habitat Evaluation Program, Sacramento, California. 120 pp.