FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D. C. 20426
February 5, 2015

OFFICE OF ENERGY PROJECTS

Project No. 12496-002—California
Lassen Lodge Hydroelectric Project
Rugraw, LLC

Mr. Charlie Kuffner
Rugraw, LLC
70 Paseo Mirasol
Tiburon, CA 94920

Reference: Study Plan Approval and Additional Study Needs

Dear Mr. Kuffner:

On October 3, 2014, the Commission issued a letter requiring Rugraw, LLC (Rugraw) to develop study plans for the Lassen Lodge Hydroelectric Project (Lassen Lodge Project or project) to model water temperature in the project bypassed reach and sediment transport in South Fork Battle Creek.[1] Rugraw submitted the required study plans and documentation of consultation on December 3, 2014.

On January 8, 2015, Commission staff participated by teleconference[2] in a meeting with the Water Board, Cal Fish and Wildlife, the Service, Tehama County, NMFS, and Rugraw to discuss the Unit Characteristic and Hydraulic Geometry methods

[1] The letter specified that the study plans be developed in consultation with the National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (the Service), California State Water Resources Control Board (Water Board), California Department of Fish and Wildlife (Cal Fish and Wildlife).

[2] A Memo of Teleconference was filed on January 22, 2015.

that Rugraw used to quantify fish habitat in South Fork Battle Creek.[3] The status of Panther Grade Falls as a barrier to anadromous fish also was discussed at this meeting.[4]

Additional consultation between NMFS and Rugraw occurred on January 13 and 14, 2015, to discuss the modeling method to be used in the water temperature study. On January 21, 2015, NMFS filed comments on Rugraw's proposed study plans requesting that Rugraw use a different modeling method than what is proposed in the Water Temperature Modeling Study Plan. On January 27, 2015, Rugraw filed additional justification for the use of its proposed water temperature modeling method.

In the attached Schedule A, we request additional information regarding passage at Panther Grade Falls and the use of the Hydraulic Geometry Method, and approve the proposed study plans, as modified by Commission staff. Some comments were received that do not address the proposed study plans nor do they propose new studies. We do not address those comments, but rather address only comments that recommended changes in the proposed studies pursuant to section 4.32(b)(7) and 4.32(g) of the Commission's regulations.

If you have any questions, please contact Adam Beeco at (202) 502-8655, or via email at adam.beeco@ferc.gov.

Sincerely,

Timothy Konnert, Chief
West Branch
Division of Hydropower Licensing

Enclosure: Schedule A

cc: Mailing List
Public Files

[3] Appendix B: Salmonid Habitat Assessment for Upper South Fork Battle Creek was filed as part of the Lassen Lodge Final License Application on April 21, 2014.

[4] Rugraw provided the Panther Grade Falls Barrier Analysis in Supplemental Information for Final License Application Responses to Agency Comments filed on September 11, 2014.

Schedule A
Project No. 12496-002

Passage at Panther Grade Falls and Species of Concern

Panther Grade Falls is a potential barrier to upstream fish migration that is located at RM 18.9 on South Fork Battle Creek, approximately 1.7 miles downstream of the proposed powerhouse. Panther Grade Falls is the last potential barrier of fish migration into the proposed project area. Currently, anadromous salmonids cannot reach Panther Grade Falls because the Coleman (RM 2.5), Inskip (RM 8.0), and South (RM 14.3) Diversion Dams do not provide fish passage. The Battle Creek Salmon and Steelhead Restoration Project (BCSSRP)[5] includes plans to remove the Coleman and South Diversion dams and install a fish ladder at the Inskip Diversion Dam by 2019.[6]

Rugraw included a Panther Grade Falls Barrier Analysis in its Supplemental Information for Final License Application Responses to Agency Comments (supplemental information), filed on September 11, 2014. The analysis assessed whether adult steelhead could ascend Panther Grade Falls at a range of flows that could occur from October through March. The study concluded that adult salmon and steelhead cannot ascend Panther Grade Falls under any circumstances due to combined effects of turbulence, air entrainment, shallow jump pool depths, obstructions in jump pools, and high chute velocities. At the consultation meeting on January 8, 2015, staff from Cal Fish and Game and NMFS disagreed with this conclusion and stated that salmon and steelhead could feasibly ascend Panther Grade Falls.

NMFS has asserted that Sacramento River Winter-run Chinook salmon, Central Valley spring-run Chinook salmon, Central Valley Fall-run Chinook salmon, California Central Valley steelhead, and resident *Oncorhynchus mykiss* could access the project

[5] The BCSSRP is a collaborative effort between Pacific Gas and Electric Company, the US Bureau of Reclamation, NMFS, the Service, the Water Board, Cal Fish and Wildlife, the Commission, and other agencies to restore approximately 48 miles of salmonid habitat in the Battle Creek drainage. Information on the project can be found at http://www.usbr.gov/mp/battlecreek/status.html.

[6] These plans and a schedule for implementation are documented in Pacific Gas and Electric's Draft Application for Amendment of License for the Battle Creek Hydroelectric Project (P-1121), filed with the Commission on September 3, 2014.

reach after downstream barriers are removed.[7] Data from redd surveys throughout the drainage, and rotary screw-trap and weir data on the mainstem of Battle Creek confirm that Chinook (fall-, late-fall-, winter-, and spring-run) and anadromous and non-anadromous *O. mykiss* occur in Battle Creek.[8] Critical habitat as defined by Section 7 of the Endangered Species Act has been designated within the project reach for spring-run Chinook and steelhead.[9] Furthermore, Essential Fish Habitat per the Magnuson Stevens Fishery Conservation and Management Act exists in South Fork Battle Creek up to Angel Falls (RM 22.3; inside the proposed project boundary), which is an undisputed barrier to upstream migration. Because of these habitat designations and because there is disagreement about whether Panther Grade Falls is passable, we are requesting that you consider the effects of proposed project operations on habitat requirements for all of the above-mentioned species when interpreting results of aquatic habitat, water temperature, and sediment transport studies.[10]

Hydraulic Geometry Method for Quantifying Aquatic Habitat

Water temperature and sediment transport models rely on data that relate wetted width, depth, and velocity to flow. On July 3 and 4, 2013, your contractor, Cramer Fish Sciences, measured length, width, depth, velocity, gradient, substrate composition, and wood complexity in every channel unit (n=51) from the proposed power house location (RM 20.6) upstream to Angel Falls (RM 22.3).[11] Stream discharge was 13 cfs and

[7] See Comments on Joint Scoping Document 1 for the Lassen Lodge Hydroelectric Project filed by NMFS on December 4, 2014.

[8] Appendix B: Salmonid Habitat Assessment for Upper South Fork Battle Creek was filed as part of the Lassen Lodge Final License Application on April 21, 2014.

[9] Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. 70 Federal Register 52488, September 2, 2005.

[10] The Recovery Plan for the Evolutionarily Significant Units of Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon and the distinct population segment of California Central Valley steelhead (July 2014), filed with the Commission by NMFS on October 6, 2014, is recognized as a Comprehensive Plan under Section 10(a)(2)(A) of the Federal Power Act.

[11] Fish habitat surveys are described in Appendix B: Salmonid Habitat Assessment for Upper South Fork Battle Creek, which was filed as part of the Final License Application on April 21, 2014.

surveyors used visual indicators of bankfull water level to estimate channel dimensions at bankfull flow. Cramer Fish Sciences then used width and depth data for 13 cfs and bankfull flow levels to estimate parameters for the Hydraulic Geometry Method, in order to estimate width, depth, and velocity at additional flows being considered for project operations. They also used the physical habitat data as input for the Unit Characteristic Method, which estimates carrying capacity for fish based on the availability of different channel unit types (e.g., pools, riffles, rapids, and cascades) and quantitative fish-habitat relationships for spawning and rearing life stages.[12]

In the consultation meeting and in their comments submitted to the Commission, NMFS staff raised concerns about the use of the Hydraulic Geometry Method for describing flow-habitat relationships.[13] NMFS staff disagreed with the use of only two data points for flow to derive flow-habitat relationships, especially when the bankfull flow data point was estimated. NMFS staff recommended that additional data be collected at additional flow levels within the range that is proposed for project operations.

Based on our assessment of the final license application, supplemental information, study plans, and comments received during the consultation process, we conclude that additional data collection is needed to inform the Hydraulic Geometry Method in order to accurately quantify how fish habitat changes with flow. As part of this additional data collection, you should:

1. Within 45 days from the date of this letter, provide the Commission and consulting agencies with a schedule for collecting the data and filing an interim and final report.
2. Collect additional data to inform the Hydraulic Geometry Method.
    a. At a subset of channel units, obtain field data for physical habitat at one flow level in addition to the existing data for 13 cfs. The second flow level should be between approximately 30 to 95 cfs.
    b. At a subset of channel units, obtain field data for physical habitat at a total of three to six flow levels (i.e., 13 cfs and two to five additional flow levels). The subsample should include all channel unit types that were identified in the full sample.

[12] Rugraw provided documentation for the Unit Characteristic and Hydraulic Geometry Methods in Supplemental Information for Final License Application Responses to Agency Comments, filed on September 11, 2014.

[13] NMFS noted this disagreement in comment letters filed in response to: (1) the Final License Application (June 12, 2014); (2) Joint Scoping Document 1 (December 3, 2014); and (3) the proposed Sediment Transport and Water Temperature Modeling study plans (January 21, 2015).

3. File an interim report on the results from (1)(a), and consult with interested agencies and the Commission to assess the appropriate number of channel units and flow levels for (1)(b).
4. File a final report that presents the results of all data collection and related analysis and provides documentation of your consultation with interested agencies.

South Fork Battle Creek Sediment Transport Modeling

In your Sediment Transport Modeling Study Plan, you propose to use the Hydrologic Engineering Center's River Analysis System (HEC-RAS) to model one-dimensional flow and sediment transport for two reaches located near the proposed diversion structure and power house on Upper Battle Creek. The proposed methods include:

- Establish cross-sections upstream of (3 transects), downstream of (3 transects), and at (2 transects) the proposed diversion structure and power house sites (8 transects per study reach).
- Measure channel geometry data in the field including depth, bankfull depth, and sediment grain size distribution within cross-sectional transects and thalweg elevation profile between transects.
- Estimate reach-average Manning's n using grain size measurements and estimate channel hydraulics including depth, velocity, and shear stress for specified flows.
- Run the HEC-RAS model for flow regimes to be determined in consultation with interested agencies. You stated that flow levels for simulations will include proposed minimum instream flow(s), 2-year flow, 5-year flow, and a range of potential project flows.
- Describe sediment mobilization thresholds, sediment transport capacity, and sediment load estimates for all flow levels under conditions with ("with-project") and without ("baseline") the proposed project.
- Use standard model sensitivity assessments to describe model reliability.
- Distribute a draft report of results to consulting agencies and the Commission.

In comments filed on January 21, 2015, NMFS suggested that the modelers calibrate the Manning's-n parameter using observed stage and discharge data rather than grain size distributions from pebble counts. NMFS stated that you agreed to do so and that you are modifying the study plan to incorporate this suggestion.

We have concerns about the spatial extent of the study area. The intention when requiring this sediment transport study was to evaluate effects on: (1) sediment accumulation behind the dam; (2) loss of sediment downstream of the dam; (3) changes

in sediment grain size distribution in the project reach; and (4) changes in channel geomorphology that could affect habitat for fish and invertebrates. If a large part of the project area is not modeled, you must be able to demonstrate that reaches being modeled are representative of the project area as well. You also should ensure that the modeled reaches include the types of habitat that are expected to be most sensitive to changes in erosion and deposition regime, such as areas with spawning gravels or pools.

You did not specify transect locations, modeling scenarios (i.e., flow regimes), all sources of input data, or temporal extent and resolution in your study plan. In addition, you did not include a schedule for conducting the study and filing a study report. Based on our assessment of your study plan, supporting documentation that you have filed, and agency comments, we are approving your Sediment Transport Modeling Study Plan with the following modifications:

1. Complete the following tasks as part of your study planning and implementation.
    a. Within 45 days from the date of this letter, provide the Commission and consulting agencies with a schedule for implementation of the sediment transport model and filing an interim and final report.
    b. Determine operational scenarios and time steps for the model in consultation with the Commission and other agencies.
    c. Provide a map of proposed locations for HEC-RAS cross sections.
    d. In map or tabular form, quantify the habitat unit types within the project area and the habitat unit types that would be included within the modeled reaches to verify that the modeled reaches are representative of the entire project area.
    e. Distribute tables that describe model input parameters to the Commission and interested agencies and allow 30 days for comment before finalizing model results.
2. File an interim report on the results of 1(a) through (e) and consult with interested agencies and the Commission to assess the need for further changes to your study plan.
3. File a final report with the Commission that presents final results of the sediment transport model and documents your consultation with interested agencies.

Bypassed Reach Water Temperature Modeling

In your Water Temperature Monitoring Study Plan, you propose to use the one-dimensional Water Temperature Transaction Tool (W3T) model to evaluate effects of proposed project operations on water temperatures in the bypassed reach and downstream

of the project.[14] W3T computations are done in Visual Basic and input and output data are contained in Microsoft Excel spreadsheets. W3T requires data on physical channel characteristics (cross-sectional form, channel slope, tributaries, and diversions), shading features, meteorological conditions, and flow. In the study plan you list data sources for modeling water temperature of South Fork Battle Creek. The proposed methods include:

- Model sites from RM 23.0 located upstream of the proposed intake, within the bypassed reach, and downstream of the powerhouse to RM 18.5, which is located approximately two miles downstream of the return of project flows to South Fork Battle Creek.
- Assess temperature changes in the penstock using a separate conduction model.
- Use South Fork Battle Creek water temperature data measured in 2004 to 2006 and 2013 to present to calibrate the model.
- Include model scenarios for critical, dry, below normal, above normal, and wet water years, which are based on historical data from 2014, 2007, 2002, 2004 or 2005, and 2006, respectively.
- Include scenarios that represent with-project and without-project conditions.
- Run the temperature model from April through October and report results on an hourly time step.
- Provide summary tables of input parameters and report standard outputs (e.g., daily maximum, minimum, and mean temperature) for all scenarios that are evaluated.
- Distribute a report that documents input data, model implementation and calibration, assumptions and parameters, and model performance metrics.

In comments filed on January 21, 2015, NMFS staff recommended the use of HEC-RAS to model water temperature because: (1) it is a proven, industry-standard platform; (2) it can show changes in water temperature that result from small changes in discharge, which is relevant to the Lassen Lodge Project; and (3) it is already being proposed to be used in the sediment transport modeling, and using it in the water temperature modeling would allow the further leveraging of that effort.

If HEC-RAS is used for water temperature modeling, a spatially-continuous model would need to be developed for the entire project reach, which would substantially increase cost and effort. While we agree that HEC-RAS provides a modeling tool that is well suited for both temperature and sediment modeling, we conclude from the provided

[14] The W3T model was developed by the National Fish and Wildlife Foundation. Rugraw provides model details and documentation in the Water Temperature Modeling Study Plan filed on December 3, 2014.

description and documentation of the W3T model that it would also sufficiently meet information needs for the project, at less of a cost and effort. Therefore, we are not requiring the use of HEC-RAS to model temperature in South Fork Battle Creek.

Unresolved issues for temperature modeling include specification of the calibration parameters, the temporal scope, and agreement on additional modeling scenarios. You did not specify the operational scenarios to be modeled and instead you stated that "operational scenarios will be developed concurrent with the implementation and calibration for the temperature model." Initial estimates of hydropower operations are based on design powerhouse capacities with minimum and maximum flows of 5 and 95 cfs. In your study plan you stated that "selected periods within the April to October window will be assessed," which implies that you may not run the model for a continuous period between April and October. Because hydrologic year type can influence both magnitude and timing of effects of project operations, we caution against limiting the time periods for model runs before evaluating continuous output data for the entire April to October period. The temporal scope should be justified scientifically, for example it might exclude periods when low flows would not support project operations or periods when water temperatures meet water quality standards at all potential flow levels.

Based on our assessment of your study plan, supporting documentation that you have filed, and agency comments, we are approving your Water Temperature Modeling Study Plan with the following modifications:

1. Complete the following tasks as part of your study planning and implementation.
    a. Within 45 days from the date of this letter, provide the Commission and consulting agencies with a schedule for implementation of the water temperature model and filing an interim and final report.
    b. Determine operational scenarios to be modeled in consultation with the Commission and other agencies.
    c. Distribute tables that describe model input parameters to the Commission and interested agencies and allow 30 days for comment before finalizing model results.
    d. Present results for the entire April to October time to allow for examination of temporal variability in operational effects.
2. File an interim report on the results of 1(a) through (d) and consult with interested agencies and the Commission to assess the need for further changes to your study plan.
3. File a final report with the Commission that presents the results of temperature modeling and documents your consultation with interested agencies.