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SENT VIA EMAIL/FIRST-CLASS MAIL

February 22, 2011

Charlie Hoppin
Francis Spivy-Weber
Tam Doduc
Dwight Russell
State Water Resources Control Board
1001 I Street
PO Box 2815
Sacramento, CA 95812-2815

Re: *San Joaquin River Flow and Salinity Basin Plan Amendment Proceedings*

Dear Board Members:

This submittal is on behalf of the San Joaquin River Group Authority ("SJRGA") and its member entities. Enclosed is a preliminary analysis of impacts to hydro generation on the Stanislaus and Tuolumne Rivers. This is an initial draft of a cursory analysis that is intended to illustrate how additional downstream flow requirements may impact power generation. The analysis surrogates impacts upon the major foothill reservoir systems and does not include upstream hydro generation operations that may be affected by a SWRCB decision as well. The analysis makes a myriad of assumptions which may or may not be true because the SWRCB still has not defined "the project."

The analysis of Don Pedro and New Melones Reservoirs shows two similar and startling results. Not only is annual power production reduced, but generation is shifted from the summer to the spring, and the degree of the shift is extraordinary.

The reduction in annual generation would be 306 GWh. This is enough energy to light 32,000 residential customers for one year. Just as important, if not more, is the shift of power production from the summer to the spring, as shown in figure 4(c) of the analysis. Average annual, these entities would need to go into the market in the summer when prices are usually at their highest, and find alternative energy amounting to 45 gws.

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By virtue of being a generation owner/operators, transmission owner/operators, or a retail electric load serving entities, each of the SJRGA members' utilities is subject to federal law on electric reliability enforced by the Federal Energy Regulatory Commission under Section 215 of the Federal Power Act. Both the capacity and flexibility of the hydroelectric generation is critical to compliance with the reliability standards. We have not addressed how this will affect our reliability under NERC and WECC.

We have not yet analyzed the electrical demands and supplies in our electrical service areas or in the State to determine how these reductions in generation can be made up in the summer. Nor have we determined the transmission constraints of trying to bring power, if it was available, to California in the summer to make up for these severe shortfalls. Finally, we cannot begin to fathom the costs to our ratepayers of paying for alternate supplies in the summer.

It is clear that alternative power sources will need to be developed in California to make up for this lost generation. This will place additional burdens on our ratepayers. Alternative power is not without its impacts and these may be large in scale as the amount of land required for wind or solar power would be significant.

The alternative power may or may not lead to increased carbon emissions; this will need to be analyzed. This will also place additional burdens on our ratepayers to pay for these carbon emission credits.

It is clear that additional facilities and infrastructure to transmit the new in-State alternative power, or power from out of state, will be needed. This will place additional burdens on our ratepayers, many of whom are in disadvantaged communities in an already economically-depressed Central Valley economy. For example, Modesto Irrigation District ("MID") has what is referred to as a "CARES" program. "CARES" stands for "Community Alternate Rates for Electric Service." To be eligible for the program, individuals and families must meet certain low income guidelines. In MID's service area, approximately 19,850 customers/homes out of 89,000 residential customers qualified for the CARES program in 2005. In 2010, approximately 25,000 customers out of 103,000 residential customers were eligible for CARES. This is 24 percent of the total customer base. This baseline economic condition needs to be taken into account when performing your SED. (See *Citizens Assn. for Sensible Development of Bishop Area v. County of Inyo*, 172 Cal.App.3rd 151, 217.)

This analysis also does not include the increased electrical load that would be placed on the electrical distribution system due to groundwater pumping by landowners in the Districts to make up for lost surface water supplies during the summer months. This will result in an increased cost to our ratepayers and to the nation's food supply and further aggravate the shortfall of energy in the area and the State.

We also enclose the submittal by Merced Irrigation District dated January 31, 2011, to the FERC. While the SWRCB may have this in its 401 Water Quality Certification Section, we wanted to be sure it was in the record for the San Joaquin River Flow and Salinity Basin Plan Amendment proceedings as well. It tells a very similar story to the preliminary analysis of the Stanislaus and Tuolumne Rivers.

The SJRGA is working with other entities to develop a statewide model to look at loss of energy, transmission, carbon emissions, and costs of alternative power due to the proposed 20-40-60 percent bypass flows in your Draft Technical Report. We will be pleased to share our results with you once they are completed.

Very truly yours,

O'LAUGHLIN & PARIS LLP

TIM O'LAUGHLIN

TO/tb
Enclosures
cc (via email only): SJRGA
Tom Howard
Les Grober
Diane Riddle

February 15, 2011

Power Operation Impact Analysis Associated with SWRCB Staff Vernalis Flow Requirements[1]

SWRCB Staff have prepared a technical report "DRAFT TECHNICAL REPORT ON THE SCIENTIFIC BASIS FOR ALTERNATIVE SAN JOAQUIN RIVER FLOW AND SOUTHERN DELTA SALINITY OBJECTIVES", October 29, 2010, "to provide the Board with the scientific information and tools needed to establish SJR flow and southern Delta salinity objectives, and a program of implementation to achieve these objectives." As a means to demonstrate the applicability of the data, methods, and tools to analyze the effects of a range of SJR flow requirements, staff analyzed a sampling of requirements that included 20, 40, and 60 percent of unimpaired San Joaquin Valley inflows at Vernalis for the February through June time frame.

The purpose of the following is to describe the results of preliminary analyses that illustrate quantifiable potential power generation effects of alternative flow requirements applied to the major rim reservoir projects located on the Stanislaus, Tuolumne and Merced rivers. The analyses produce results that illustrate the magnitude of potential effects in terms of monthly and annual energy production and the seasonal shifts of generation that could occur. These results are derived from models that have been used by the San Joaquin River Group Authority (SJRGA) and its members throughout recent watershed and basin planning efforts.

Power generation is modeled as an incidental result of reservoir releases. Generation efficiency (kWh/AF) and capability (MW) curves, based on the reservoir elevation/storage parameter, applied to reservoir releases, provide month to month (or more frequent) generation values for each model's simulation period.

Two separate bodies of analysis have been used. The assumptions and results for a depiction of Merced River operations are described in a submittal of Merced Irrigation District to the Federal Energy Regulatory Commission (FERC) dated January 31, 2011 (Accompanying Document). The study was prepared within an investigation of instream flow requirements for the Merced River, and coincidentally explores the provision of "60 percent of unimpaired" inflow from the Merced River. For the Stanislaus River and Tuolumne River, an analysis was prepared that assumes proportional watershed compliance with an assumed flow requirement at Vernalis substantially equal to 60 percent of calculated unimpaired inflow to Vernalis. The compliance to the Vernalis requirement is provided through operations of the Stanislaus River, Tuolumne River and Merced River rim reservoir systems.[2]

The test studies for the Stanislaus and Tuolumne River operation are based on a flow compliance strategy that includes the following assumptions:

- The Stanislaus, Tuolumne and Merced Rivers will be the source of supplemental releases.
- The 60 percent Vernalis unimpaired flow requirement is translated into monthly-varying upstream flow requirements at rim reservoir minimum flow requirement control points which would provide the 60 percent Vernalis flow requirement. For the Stanislaus River the control point is Goodwin Dam, and for the Tuolumne River the control point is La Grange Dam.
- Each applicable watershed control point flow requirement (for Vernalis) will be based on a percentage of its own unimpaired flow (pseudo watershed proportion contribution).

[1] Prepared for the San Joaquin River Group Authority, by Daniel B. Steiner, Consulting Engineer
[2] Staff provided no guidance regarding potential implementation strategies for achieving Vernalis flow requirements. The assumptions used for the analyses are arbitrary.

- Monthly control point minimum requirements will be the greater of existing flow requirements or the surrogate Vernalis flow requirement.

Results

New Melones Project

Results of the power analysis for New Melones Reservoir operations are shown below. The baseline study of the New Melones Project includes a depiction of "existing" operations of the Stanislaus River. The existing operation of the system includes:

Stanislaus River

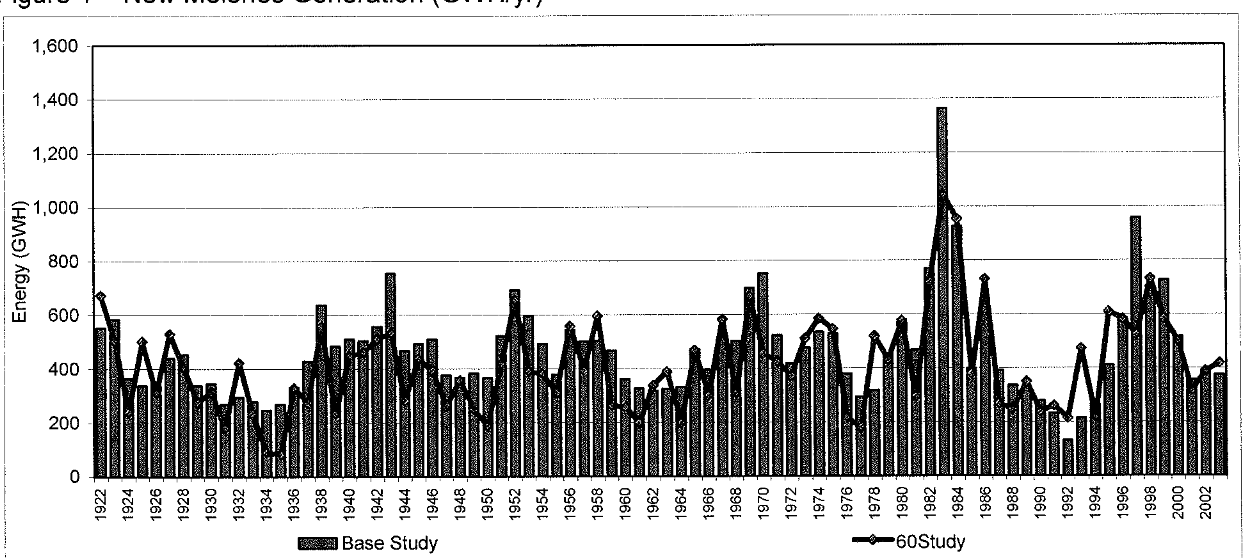
- 2009 Biological Opinion (Appendix 2E) Stanislaus River flows (as modeled in the June 2009 Biological Opinion)
- No Vernalis flow requirements
- Dissolved Oxygen requirements in the Stanislaus River, with relaxation in critical years
- D1641 Vernalis water quality objectives, with relaxation in critical years
- OID/SSJID demands based on land use requirements and contractual commitments
- CVP Contractor allocation/diversion: 0 TAF when NMI < 1,400; 49 TAF between a NMI of 1,400 and 2,178; and 135 TAF when NMI > 2,178

San Joaquin River

- No SJRRP releases
- No SJRA/VAMP

Figure 1 illustrates the annual energy production (at plant) for the New Melones generators for the modeled 1922-2003 hydrologic period. Shown are the results for both the baseline study (Base Study) and the test study (60Study). Each year average annual generation differs between the two operations, with the average annual energy decreasing by about 55 GWH/yr, about 12 percent, due to the increased flow requirements.

Figure 1 – New Melones Generation (GWH/yr)



Changes in annual generation by year type are shown in Table 1. The year types are based on rankings of the San Joaquin River index (60-20-20), along with an all-years average. Annual characteristics do not fully describe anticipated changes in generation. The seasonal shape of generation for each operation for each year type is shown in the Figure 2 series of graphs.

Table 1 – Comparison of New Melones Generation by Year Type
Energy (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Base and Comparison Study						
Base	603	508	429	400	305	467
60 Study	590	462	356	297	234	412
Change from Base						
Base	0	0	0	0	0	0
60 Study	-13	-47	-73	-103	-71	-55
% Change	-2%	-9%	-17%	-26%	-23%	-12%

Figure 2a – New Melones Generation (GWH) Wet and Above Normal Years

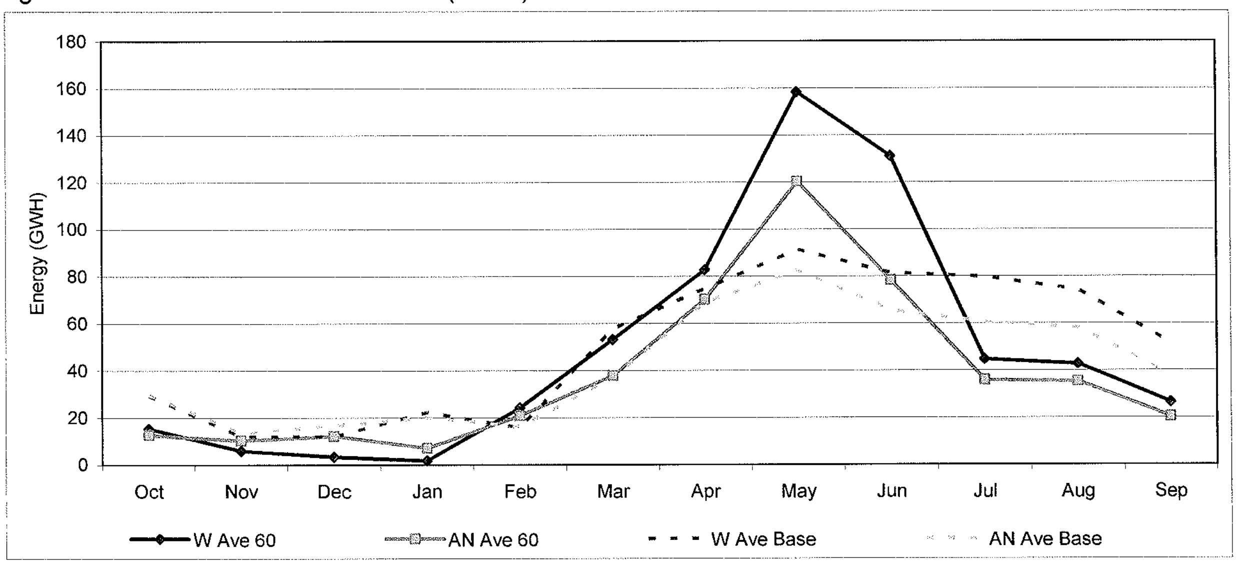


Figure 2b – New Melones Generation (GWH) Below Normal and Dry Years

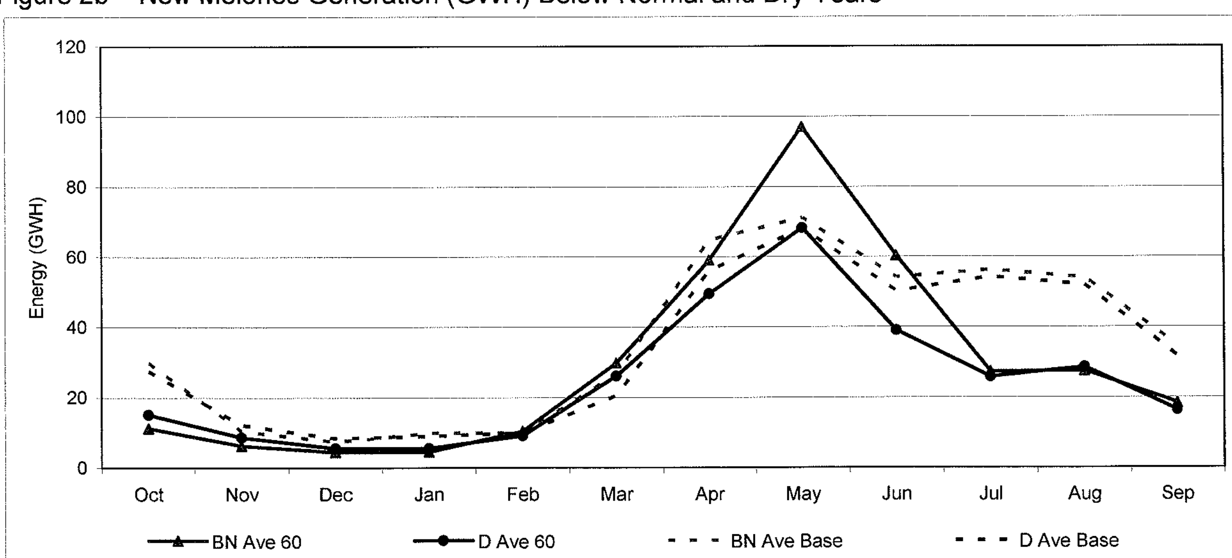
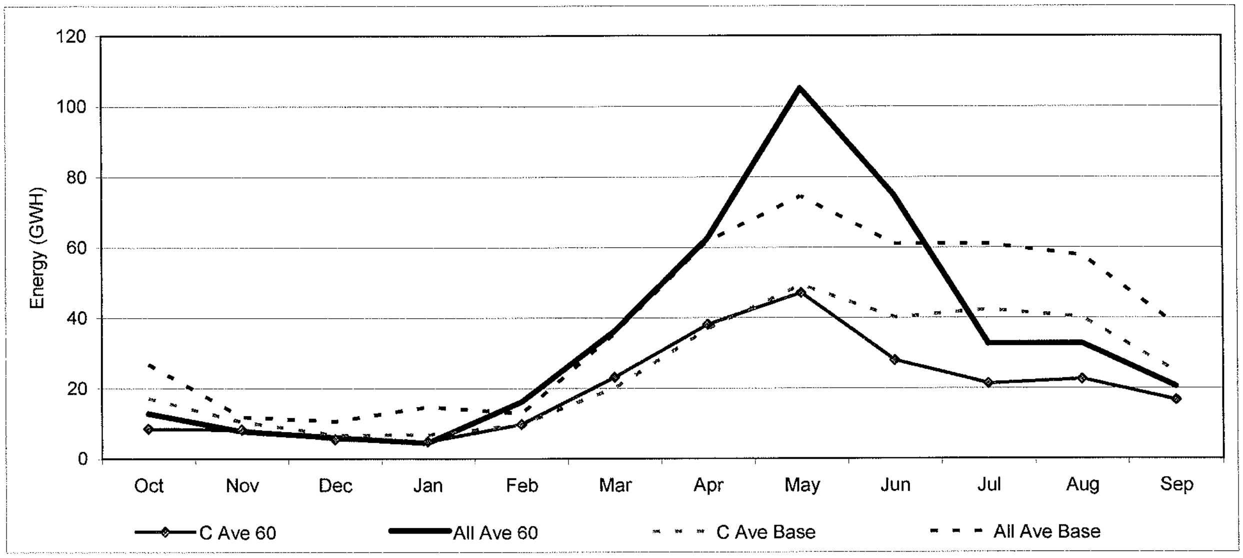


Figure 2C – New Melones Generation (GWH) Critical Years and All Years Average



The results show that average annual generation decreases with the increased flow requirements due to an overall reduction in head (lower reservoir stage) throughout the study period. There is also a shifting of generation from the summer into the May and June period (except in dry and critical years) which follows the increase of the flow which mimics the unimpaired runoff shape during that period. Generation is reduced during the summer due to the reduction in canal diversions which is associated with the loss in water supply which is now used for river releases earlier in the year. Results indicate there will be periods of no, or foregone generation (bypass of generators) under conditions when the reservoir is below minimum power pool or when releases exceed plant capability.

Don Pedro Project

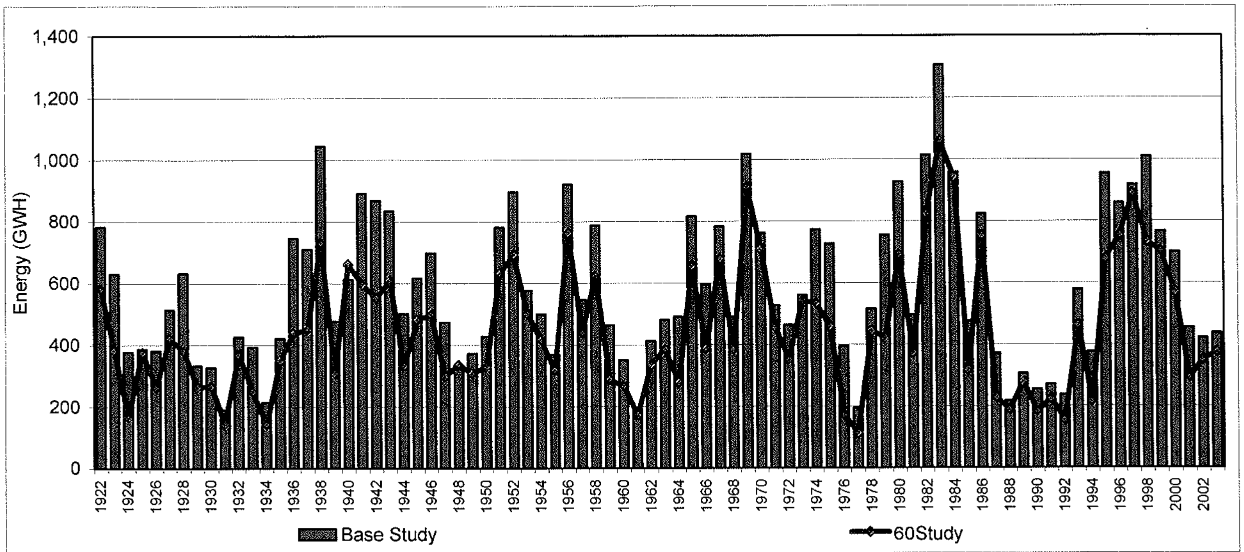
Results of the power analysis for Don Pedro Reservoir operations show a similar outcome. The baseline study of the Don Pedro Project includes a depiction of existing operations of the Tuolumne River which includes:

Tuolumne River
- 1995 FERC Settlement Agreement for minimum instream flows

San Joaquin River
- No SJRA/VAMP

Figure 3 illustrates the annual energy production (at plant) for the Don Pedro generators for the modeled 1922-2003 hydrologic period. Shown are the results for both the baseline study (Base Study) and the test study (60Study). Each year average annual generation differs between the two operations, with the average annual energy decreasing by about 135 GWH/yr, about 23 percent, due to the increased flow requirements.

Figure 3 – Don Pedro Generation (GWH/yr)



Changes in annual generation by year type are shown in Table 2. The seasonal shape of generation for each operation for each year type is shown in the Figure 4 series of graphs.

Table 2 – Comparison of Don Pedro Generation by Year Type
Energy (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Base and Comparison Study						
Base	865	652	481	450	288	584
60 Study	672	531	382	313	198	449
Change from Base						
Base	0	0	0	0	0	0
60 Study	-193	-120	-99	-137	-90	-135
% Change	-22%	-18%	-21%	-30%	-31%	-23%

Figure 4a – Don Pedro Generation (GWH) Wet and Above Normal Years

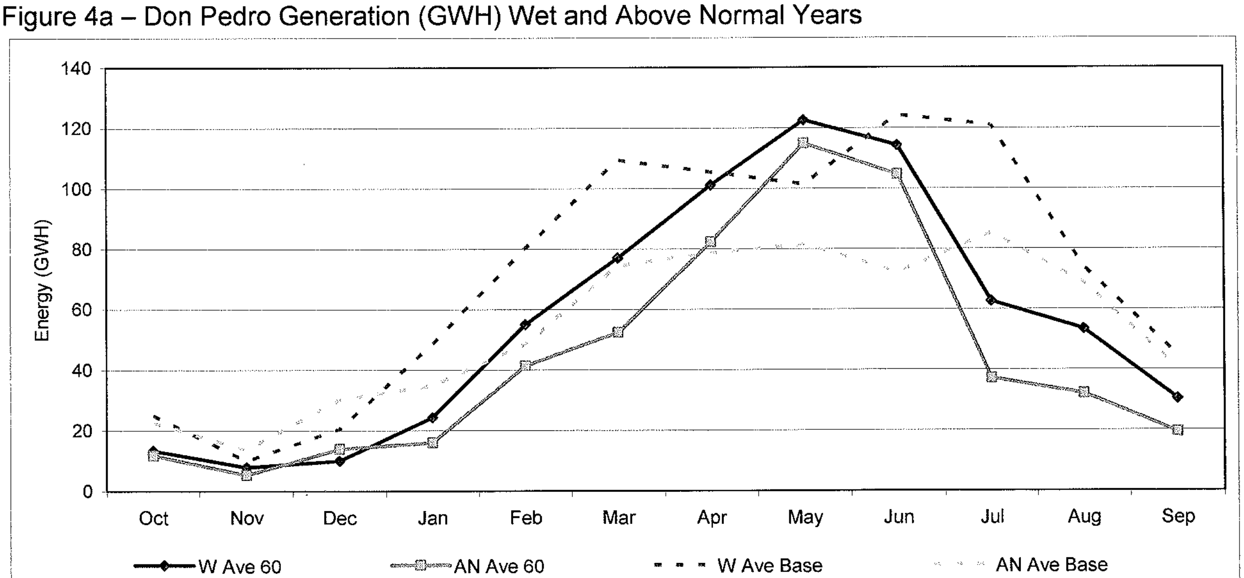


Figure 4b – Don Pedro Generation (GWH) Below Normal and Dry Years

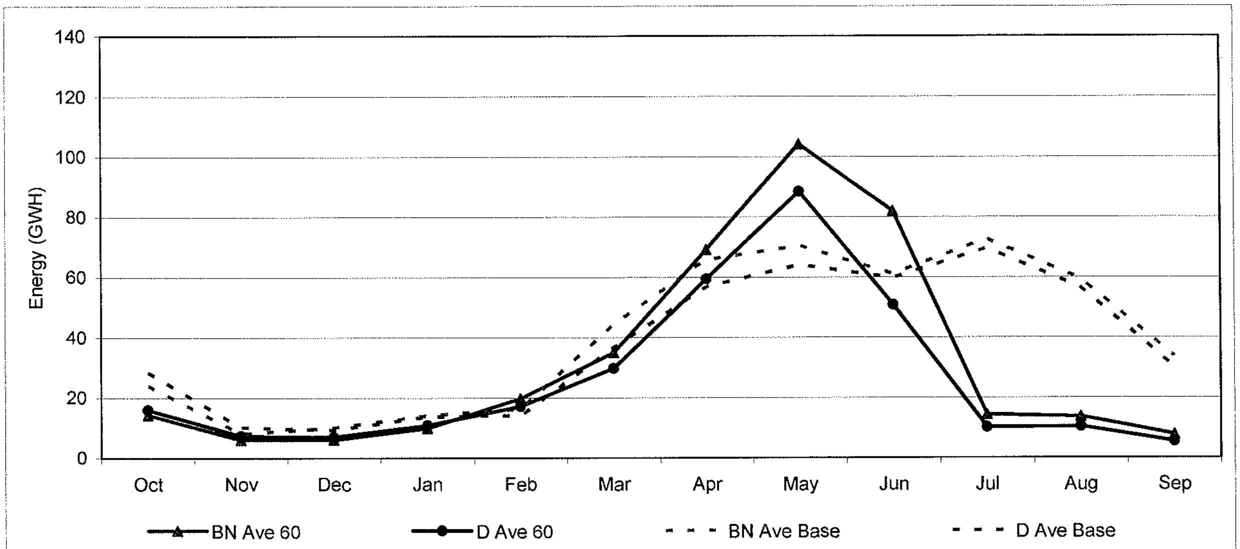
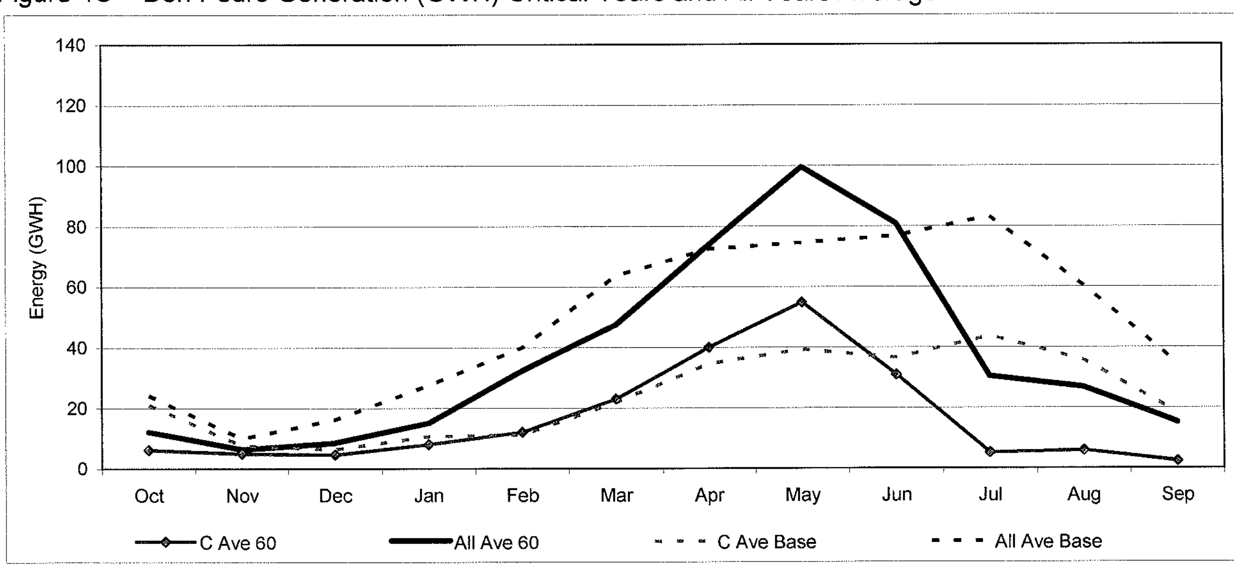


Figure 4C – Don Pedro Generation (GWH) Critical Years and All Years Average



Similar in results for the New Melones Project, the average annual generation of the Don Pedro Project decreases with the increased flow requirements due to an overall reduction in head (lower reservoir stage) throughout the study period. A shifting of generation from the summer into the May and June period (except in dry and critical years) occurs which follows the increase of the flow that mimics the unimpaired runoff shape during that period. Early winter generation may be reduced in wetter years due to fewer releases for flood control operations. Generation is reduced during the summer due to the reduction in canal diversions which are associated with the loss in water supply which is now used for river releases earlier in the year. Results indicate there could be periods of foregone generation (bypass of generators) under conditions when the releases exceed plant capability.

Merced River Project

As described in the Merced Irrigation District submittal to FERC, results of a power analysis for the Merced River Project show a significant reduction and shift in generation if minimum downstream releases were to increase to a level similar to the 60 percent unimpaired flow requirement. The baseline study of the Merced River Project includes a depiction of existing operations of the Merced River which includes:

Merced River

- Current FERC License and Davis-Grunsky Act flow requirements
- Fall fisheries releases
- 1926 Cowell Agreement flows

San Joaquin River

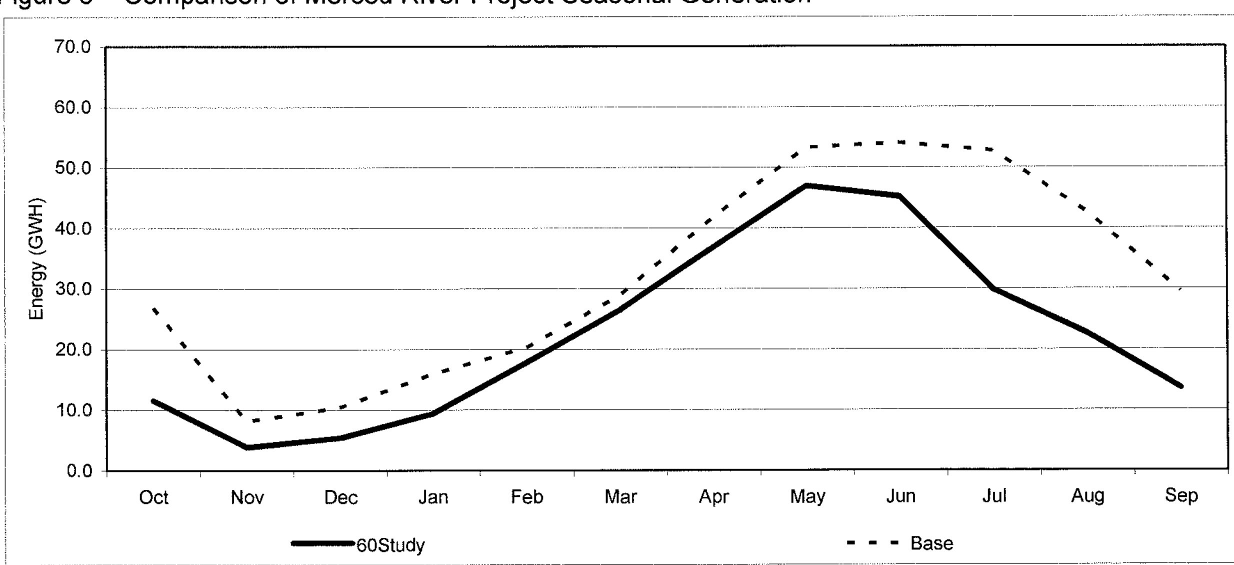
- SJRA/VAMP

Table 3 illustrates the energy production (at plant) for the Merced River Project under the baseline (Case 1 / Base) and test study (NMFS121710A / 60Study) condition. Annual generation by year type and changes from the baseline are shown. Figure 6 illustrates the seasonal shift of annual average generation.

Table 3 – Comparison of Merced River Project Generation by Year Type
Energy (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Base and Comparison Study						
Base	537	429	349	304	209	385
60 Study	439	420	277	140	30	269
Change from Base						
Base	0	0	0	0	0	0
60 Study	-98	-9	-72	-164	-179	-116
% Change	-18%	-2%	-21%	-54%	-86%	-30%

Figure 6 – Comparison of Merced River Project Seasonal Generation



Composite Summary

A consistent outcome throughout the three tributary projects is shown for the affect of additional release requirements upon power generation. When combining the results of the three project operation analyses it is anticipated that there will be an approximate 306 GWH, 21 percent reduction in average annual generation resulting from a Vernalis flow requirement that approximates a "60 percent of inflow" metric, if that metric is applied to the three projects. Table 4 illustrates the combined results of these analyses.

Table 4 – Composite Results for Generation by Year Type

Energy (GWH)

	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
Base and Comparison Study						
Base	2,005	1,589	1,259	1,154	802	1,436
60 Study	1,701	1,413	1,015	750	462	1,130
Change from Base						
Base	0	0	0	0	0	0
60 Study	-304	-176	-244	-404	-340	-306
% Change	-15%	-11%	-19%	-35%	-42%	-21%

MERCED IRRIGATION DISTRICT

January 31, 2011

Filed via Electronic Submittal (E-File)

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

Subject: Merced River Hydroelectric Project, FERC Project 2179-042
Model Run Results

Dear Secretary Bose:

On December 3, 2010, the Merced Irrigation District (Merced ID or Licensee) filed a letter with the Federal Energy Regulatory Commission (Commission or FERC) requesting on behalf of Relicensing Participants that FERC grant a 2 week extension (from January 14 to January 29, 2011) to file comments on Merced ID's Initial Study Report and Initial Study Report meeting summary submitted by Merced ID in support of its relicensing of the Merced River Hydroelectric Project, FERC Project No. 2179 (Project).[1] The reason for the extension was to allow time for Relicensing Participants to consider model runs Merced ID would make, at the request of Relicensing Participants, of the relicensing Water Balance/Operation Model (Ops Model) and Water Temperature Model (Temperature Model).[2, 3]

The Commission granted Merced ID's request in a letter dated December 6, 2010, and required Relicensing Participants to file comments no later than January 29, 2011.

Subsequently, John Wooster of the United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), in an e-mail dated

[1] Merced ID filed its Initial Study Report on November 15, 2010, held its Initial Study Report meeting on November 30, 2010, and filed a meeting summary on December 15, 2010.

[2] In this letter, "Model" refers specifically to either Merced ID's Water Balance/Operation Model (Ops Model) or Water Temperature Model (Temperature Model), "model" refers to either Ops Model or Temperature Model, "Model Run" refers to a specific run of either model, and "model runs" refers to a group of Model Runs.

[3] To make a Water Temperature model run, Merced ID ran the relicensing Ops Model and then used the mean daily reservoir storage and release outputs from the Ops Model run as input into the Temperature Model to make the Temperature Model run.

Merced Irrigation District
744 West 20th Street
Merced, CA 95340

December 17, 2010, requested four model runs.[4] Merced ID completed the requested model runs and made the results available to Relicensing Participants on December 30, 2010.

The purpose of this letter is to provide FERC a summary of results of the model runs made by Merced ID during this period. Both the Ops Model and the Temperature Model, and all model results were provided on a DVD to FERC on January 12, 2011.

It is important to note that these model runs were performed by Merced ID at the request of the Relicensing Participants. The minimum flow requirements in the runs are for purposes of review by the Relicensing Participants and are not endorsed by Merced ID, nor does Merced ID make any representations as to the ability to meet the minimum flow requirements or water temperatures shown in these model runs.

DESCRIPTION OF REQUESTED MODEL RUNS

As described above, John Wooster of the NMFS requested four model runs on December 17, 2010. No other requests were received by Merced ID prior to the deadline for filing comments on Merced ID's Initial Study Report and meeting summary. Merced ID designated the runs as follows to indicate the requester and date the runs were requested.

- NMFS121710A
- NMFS121710B
- NMFS121710C
- NMFS121710D

The designation refers to both the Ops Model run and the Temperature Model run.

Each requested model run was generally similar to the other requested model runs, and all were modifications to Merced ID's Case 1. Under Case 1, the Project is operated to meet:

- flood control requirements described in the Water Control Manual
- minimum flow requirements, defined below in Table 1, that include:
  - current FERC license
  - Davis-Grunsky Act flows
  - April-May pulse flows as part of the Vernalis Adaptive Management Plan (VAMP)
  - fall fishery releases
- flows specified in the 1926 Cowell Agreement
- Merced National Wildlife Refuge requirements
- irrigation demands

[4] At the November 30, 2010 Initial Study Report meeting, Relicensing Participants stated they believed the relicensing Water Balance/Operations Model (Ver. 2) and relicensing Water Temperature Model (Ver. 1) as configured at that time were adequate for making model runs. Merced ID made minor modifications to both models in response to comments received at the November 30, 2010 meeting and based on Merced ID's review of certain model operations. The revised Water Balance/Operations Model (Ver. 3) and revised Water Temperature Model (Ver. 2) were provided to Relicensing Participants on December 30, 2010 and were used to make the model runs described in this letter.

Case 1 represents how the Project is currently operated, and has been operated for approximately the last 10 years.

Table 1. Summary of existing minimum flow requirements for Ops Model run Case 1.

Period	Current FERC License Articles 40 and 41 (cfs)		Davis-Grunsky Act (cfs)	Pulse Flows as Part of VAMP	Fall Fisheries Release
	Normal Year	Dry Year			
Oct 1 - 15	25	15	Not Applicable	Not Applicable	Pulse flow of 12,500 acre-feet total
Oct 16 - 31	75	60			
Nov	100	75	180 - 220		Not Applicable
Dec	100	75	180 - 220		
Jan	75	60	180 - 220		
Feb	75	60	180 - 220		
Mar	75	60	180 - 220		
Apr	75	60	Not Applicable	Up to 55,000 acre-feet based on flow of San Joaquin River at Vernalis	
May	75	60			
Jun	25	15		Not Applicable	
Jul	25	15			
Aug	25	15			
Sep	25	15			

Minimum flow requirements of each model run requested by Relicensing Participants are described in Table 2. The attachment to Mr. Wooster's December 17, 2010 e-mail, which further describes the requested runs, is attached to this letter.

Table 2. Summary of minimum flow requirements for requested Ops Model and Water Temperature Model runs.

Model Run Designation	Minimum Average Daily Flow Requirement at Shaffer Bridge		Comments
	February Through June	July Through January	
NMFS121710A	Maximum of: 1) 60% of unimpaired flow into Lake McClure on that day, or 2) existing minimum flow requirement	Existing minimum flow requirements	Merced ID imposed an additional maximum daily flow limitation on each of the four model runs. A maximum daily limit of 4,500 cfs was added to the model logic to prevent downstream flooding. Merced ID and the USACE attempt to keep flows below Crocker-Huffman Diversion Dam at or below 4,500 cfs, unless encroached into flood control space in Lake McClure. By comparison, 60% of unimpaired daily inflow to Lake McClure between February and June can be as high as 16,500 cfs. Merced ID's additional limitation affected 5% of all days (February to June) for the NMFS121710A run, 1% of February to June days for NMFS121710B run, and two days total for runs C and D.
NMFS121710B	Maximum of: 1) 40% of unimpaired flow into Lake McClure on that day, or 2) existing minimum flow requirement		
NMFS121710C	Maximum of: 1) 20% of unimpaired flow into Lake McClure on that day, or 2) existing minimum flow requirement		
NMFS121710D	Maximum of: 1) 20% of unimpaired flow into Lake McClure on that day, or 2) existing minimum flow requirement	275 cfs	

VAMP pulse flows were not included as part of the minimum flow requirement in the requested model runs. Fall fisheries releases were included in all requested model runs because these flows are a condition in Merced ID's water rights.

RESULTS OF REQUESTED OPS MODEL RUNS

The Ops Model is a tool for examining water quantity and reservoir operations under various scenarios. The Ops Model simulates reservoir storage, release, hydropower generation, canal diversions, and Merced River flows. The model covers the Project area from and including Lake McClure downstream approximately 23 river miles below the Project to the Merced River at Shaffer Bridge. A summary of Ops Model results for the requested model runs is presented below.

Merced River Hydroelectric Project Releases

All four of the requested Ops Model runs increased minimum flow requirements as compared to Case 1, thereby changing reservoir operations and Project releases. Project releases are summarized here as releases from McSwain Dam, the furthest downstream Project facility, and are the same as releases from New Exchequer Dam in the Ops Model. Table 3 presents average annual Project releases from McSwain Dam by Merced River Water Year Type (Water Year Type), and changes in average annual Project releases relative to Case 1.

Table 3. Comparison of average annual Project release in acre-feet (rounded to the nearest 1,000 acre-foot) from McSwain Dam for Ops Model run Case 1 and other requested model runs.

Run	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
CASE 1 AND REQUESTED MODEL RUNS						
Case 1	1,491,000	997,000	838,000	713,000	567,000	1,013,000
NMFS121710A	1,483,000	1,263,000	996,000	717,000	453,000	1,025,000
NMFS121710B	1,448,000	1,153,000	946,000	779,000	517,000	1,018,000
NMFS121710C	1,465,000	1,060,000	878,000	732,000	560,000	1,014,000
NMFS121710D	1,424,000	1,093,000	923,000	803,000	566,000	1,016,000
CHANGE FROM CASE 1						
Case 1	0	0	0	0	0	0
NMFS121710A	-9,000	266,000	158,000	4,000	-114,000	12,000
NMFS121710B	-43,000	156,000	107,000	66,000	-50,000	6,000
NMFS121710C	-26,000	63,000	39,000	19,000	-7,000	2,000
NMFS121710D	-67,000	96,000	85,000	89,000	-1,000	4,000

Results presented in Table 3 show how releases change on an annual basis under each of the requested runs. Average annual changes across all years are a small percentage of annual release, but changes in some Water Year Types are larger. In Wet Water Years, Project releases are reduced compared to Case 1. This occurs because storage in Project reservoirs is generally lower under all of the requested runs, as shown in subsequent figures. Lower storage conditions change reservoir flood control operations and releases, generally decreasing the volume of flood control releases, thereby decreasing average annual Wet Water Year releases because flood control releases typically occur in Wet Water Years. Project releases increase in Above Normal, Below Normal, and Dry Water Years to meet the increased minimum flow requirements under the requested model runs. Project releases decrease in Critical Water Years due to reductions in irrigation water supplies when storage in Lake McClure goes below minimum pool requirements in the existing FERC license.

Average annual releases provide information on the volume of water, but do not illustrate important changes in the timing of releases. Average monthly releases help illustrate general changes in the timing of Project releases. Figure 1 illustrates average monthly McSwain Dam release for all years for Case 1 and each requested run.

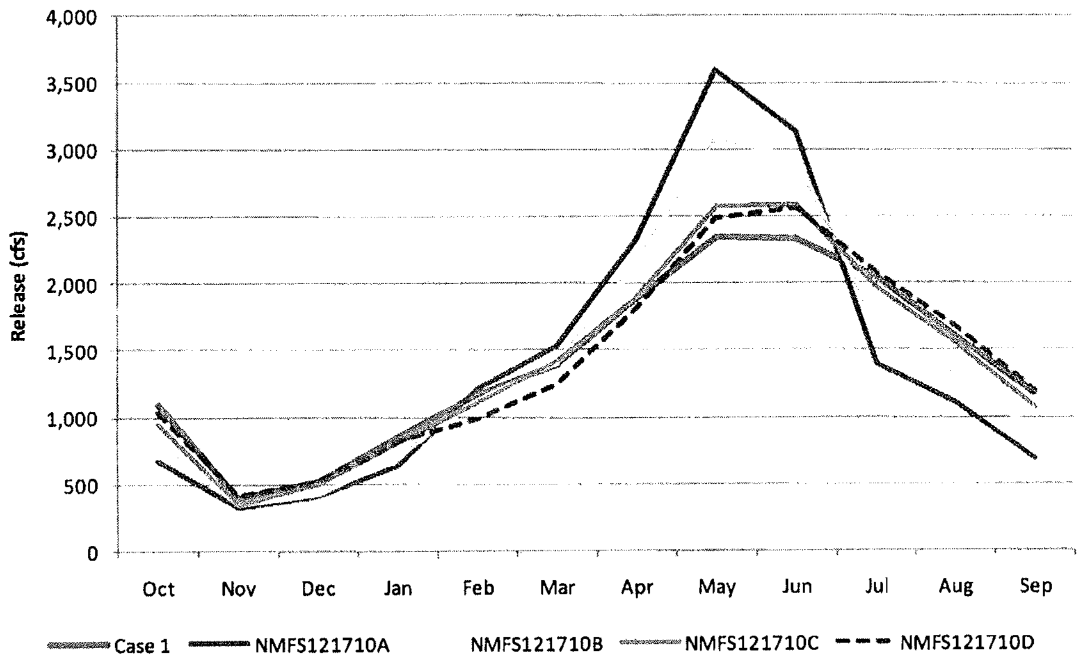


Figure 1. Comparison of average monthly release from McSwain Dam under Case 1 and each requested run.

Figure 1 illustrates the general monthly timing of Project releases. Changes in minimum flow requirements change releases in most months for all requested model runs compared to Case 1. The largest changes are increases in Project releases during the main runoff months of April, May, and June. Larger increases occur under NMFS121710A, with a minimum flow requirement of 60 percent of unimpaired inflow, than under NMFS121710C and D, with minimum flow requirements of 20 percent of unimpaired inflow. Decreases in Project releases occur in most months outside the February to June period under NMFS121710A, B, and C compared to Case 1. The largest decreases in Project releases occur July through October due to a combination of reductions in irrigation water supplies and changes in reservoir storage that change flood control releases, compared to Case 1.

Merced River Flow Immediately Downstream of Crocker-Huffman Diversion Dam

McSwain Dam releases water into PG&E's Merced Falls reservoir. Water is released from Merced Falls reservoir into the Merced River. The Merced River flows into the impoundment behind Crocker-Huffman Diversion Dam approximately 1.5 river miles downstream of Merced

Falls Dam. Water is diverted from Merced Falls reservoir into Merced ID's Northside Canal, and from the Crocker-Huffman Diversion Dam impoundment into Merced ID's Main Canal. The confounding effects of these two non-Project canals, and other smaller diversions, change Project releases and make necessary a summary of Merced River flow below Crocker-Huffman Diversion Dam to illustrate effects of the requested model runs on Merced River flows.

All four of the requested Ops Model runs increased the average annual flow in the Merced River immediately downstream of Crocker-Huffman Diversion Dam as compared to Case 1. Table 4 presents average annual flow at this location by Water Year Type and changes in average annual flow relative to Case 1.

Table 4. Comparison of average annual flow in acre-feet (rounded to the nearest 1,000 acre-foot) immediately downstream of Crocker-Huffman Diversion Dam for Ops Model run Case 1 and other requested model runs.

Run	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
CASE 1 AND REQUESTED MODEL RUNS						
Case 1	1,002,000	480,000	333,000	227,000	198,000	555,000
NMFS121710A	1,013,000	766,000	591,000	426,000	353,000	686,000
NMFS121710B	962,000	642,000	480,000	334,000	285,000	610,000
NMFS121710C	977,000	543,000	373,000	246,000	221,000	566,000
NMFS121710D	937,000	582,000	437,000	319,000	294,000	591,000
CHANGE FROM CASE 1						
Case 1	0	0	0	0	0	0
NMFS121710A	11,000	286,000	258,000	199,000	155,000	131,000
NMFS121710B	-40,000	162,000	147,000	106,000	87,000	56,000
NMFS121710C	-25,000	63,000	39,000	19,000	23,000	11,000
NMFS121710D	-65,000	102,000	104,000	92,000	96,000	36,000

Results presented in Table 4 show how flows change on an annual basis. Flows generally increase under all four requested runs; however, Wet Water Year flows decrease compared to Case 1. Flows decrease in Wet Water Years relative to Case 1 because of changes in reservoir storage that result in reduced flood control releases, as previously described. The exception to this general trend is requested model run NMFS121710A, in which release of 60 percent of unimpaired inflow from February through June exceeds the combination of existing requirements and flood control releases under Case 1.

Average annual flows provide information on volume of water, but do not illustrate changes in the timing of flows. Average monthly flows help illustrate general changes in timing. Figure 2 illustrates average monthly flow immediately downstream of Crocker-Huffman Diversion Dam for all years for Case 1 and each requested run.

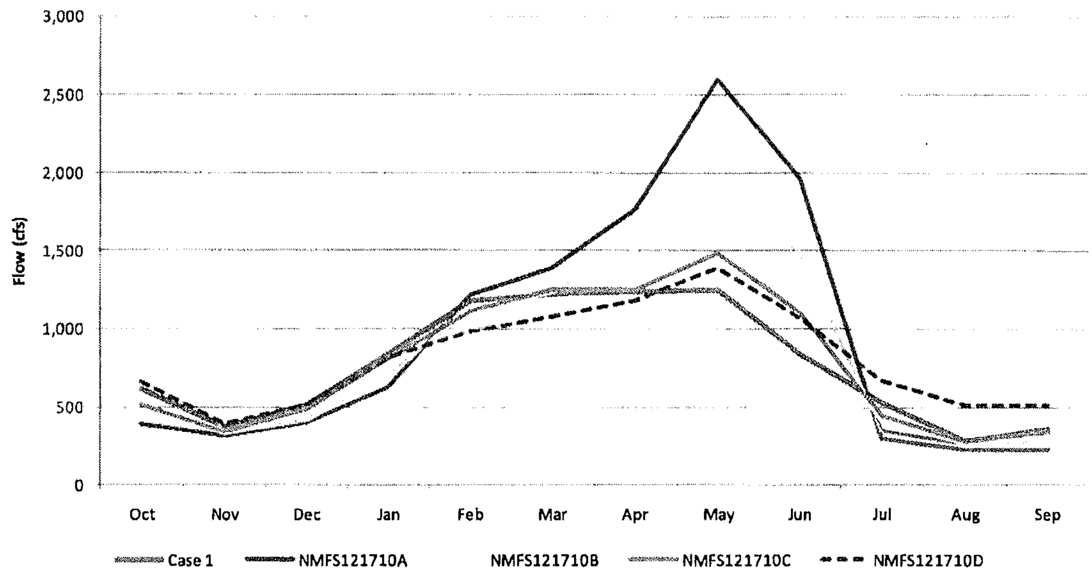


Figure 2. Comparison of average monthly flow immediately downstream of Crocker-Huffman Diversion Dam under Case 1 and each requested run.

Figure 2 illustrates general timing of flows below Crocker-Huffman Diversion Dam. Changes in minimum flow requirements change flows in most months for all requested model runs compared to Case 1. The largest change occurs during the main runoff months of April, May, and June. Flows from July through January are similar, but less than Case 1, for runs NMFS121710A through C. Differences in average monthly flows occur even in months when minimum flow requirements are the same due to changes in reservoir storage and operations that change the timing and magnitude of flood control releases. Average monthly flow from July through October under requested model run NMFS121710D is greater than Case 1 due to higher minimum flow requirements in those months.

Project Reservoir Storage

Flow is increased below Crocker-Huffman Diversion Dam by additional releases from Project reservoirs, and these additional releases reduce reservoir storage conditions in Lake McClure. Figure 3 is an example of reservoir storage differences between Case 1 and the requested Ops Model runs for a 7-year period from the Ops Model simulation. Figure 3 illustrates simulated storage in Lake McClure from October 1998 through September 2005. This period begins at the end of several Wet Water Years, covers several years of below average reservoir inflow, and ends with a Wet Water Year.

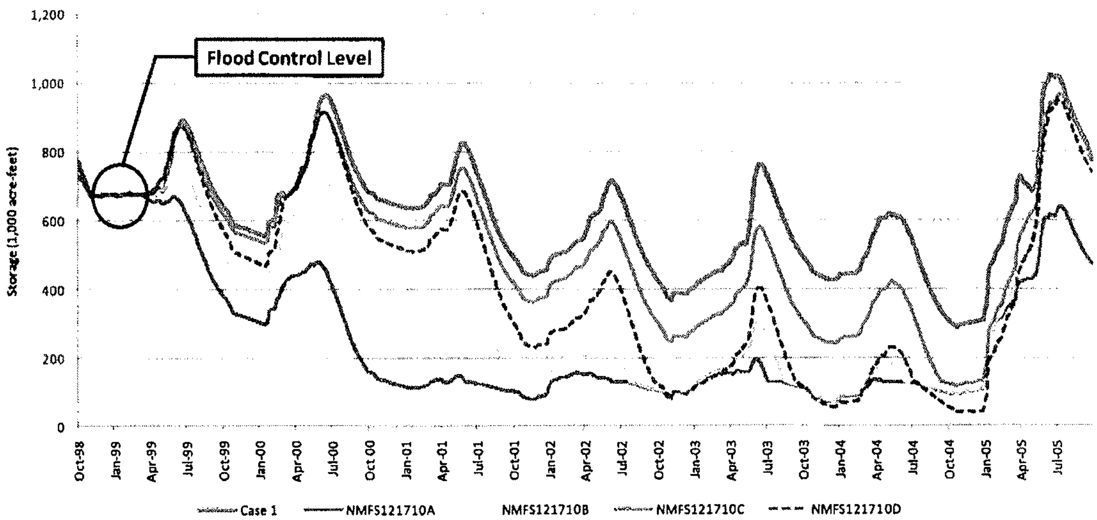


Figure 3. Example of simulated storage in Lake McClure under Case 1 and each requested run.

Figure 3 is an example of how storage in Lake McClure varies under the requested model runs. Storage under all runs is at flood control levels in January 1999 after several consecutive years of above average inflow. Requested model run NMFS121710A, with a minimum flow requirement of 60 percent of unimpaired inflow from February to June, decreases storage approximately 250,000 acre-feet by January 2000, compared to Case 1. Runs with releases of 20 or 40 percent of unimpaired inflow also decrease storage compared to Case 1. Runs that release a smaller percent of unimpaired inflow show greater increases in storage each spring, relative to each other; that is, storage under NMFS121710C, 20 percent minimum flow requirement, is greater than under NMFS121710A (60 percent) or B (40 percent).

Simulated storage under requested model runs NMFS121710A, B, and D is similar by January 2003 because storage goes below minimum pool levels and irrigation deliveries are interrupted. When irrigation deliveries are interrupted, Project releases are reduced until storage is above minimum pool. Therefore, storage conditions between runs are similar after periods of interrupted irrigation deliveries.

Figure 3 illustrates Lake McClure refills in 2005, a Wet Water Year, under Case 1. However, a single Wet Water Year does not refill Lake McClure under the requested model runs.

Water Supply Shortages

As described above, additional releases can reduce reservoir storage below required minimum pool and interrupt irrigation deliveries. The Ops Model tracks interrupted irrigation deliveries as water supply shortages ("shortages"). Shortages can interrupt water deliveries to Merced ID, other local water districts that receive water from the Merced River, and under some circumstances, deliveries to the United States Department of Interior's, Fish and Wildlife Service's Merced National Wildlife Refuge.

Table 5 presents a summary for each requested model run of average annual shortages by Water Year Type and changes in shortages compared to Case 1. Note that reductions in irrigation deliveries are *increases* in water supply shortages. Results are presented by Water Year Type, with a water year defined as October 1 through September 30 of the following year. Therefore shortages in one April through October irrigation season cover two water years, from April through September of one water year and October of the following water year.

Table 5. Comparison of average annual water supply shortages in acre-feet (rounded to the nearest 1,000 acre-foot) for Ops Model run Case 1 and other requested model runs.

Run	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
CASE 1 AND REQUESTED MODEL RUNS						
Case 1	4,000	0	0	0	111,000	34,000
NMFS121710A	24,000	20,000	100,000	195,000	380,000	154,000
NMFS121710B	7,000	6,000	40,000	40,000	248,000	85,000
NMFS121710C	5,000	0	0	0	140,000	44,000
NMFS121710D	6,000	6,000	20,000	3,000	207,000	67,000
CHANGE FROM CASE 1						
Case 1	0	0	0	0	0	0
NMFS121710A	20,000	20,000	100,000	195,000	269,000	119,000
NMFS121710B	3,000	6,000	40,000	40,000	137,000	50,000
NMFS121710C	1,000	0	0	0	30,000	9,000
NMFS121710D	2,000	6,000	20,000	3,000	97,000	32,000

Table 5 shows that under Case 1, water supply shortages occur only in Critical Water Years. The 4,000 acre-feet of shortage shown in Wet Water Years under Case 1 occurs in October of Wet Water Years that follow Critical Water Years. Therefore, this shortage occurs during the irrigation season of Critical Water Years. Further review of results, as described below, shows water supply shortages occur after the first year of multi-year periods of below average water supply (drought periods).

Water supply shortages increase under each of the requested runs with the largest shortages under requested Model Run NMFS121710A, with a minimum flow requirement of 60 percent of unimpaired inflow from February through June. Additionally, three of the four requested runs create shortages in non-critical years.

Average annual water supply shortages by Water Year Type provide one metric for comparing water supply impacts. However, average annual values can mask large impacts in single years if impacts in other years are small. Large impacts in single years or several consecutive years during a drought period can be significant to Merced ID's irrigation operations. Table 6 presents shortages by water year for three drought periods simulated in the Ops Model. The ability to manage water supply during drought periods is a key metric for Merced ID. Years presented in Table 6 include the drought period and the year of above average water supply that has historically ended the drought period.

Table 6. Annual water supply shortages in acre-feet (rounded to the nearest 1,000 acre-foot) for three drought periods for Ops Model run Case 1 and other requested runs.

Water Year Type	Model Run				
	Case 1	NMFS121710A	NMFS121710B	NMFS121710C	NMFS121710D
1976 – 1977 DROUGHT PERIOD					
1976-Crit	0	450,000	164,000	0	0
1977-Crit	442,000	489,000	489,000	442,000	481,000
1978-Wet	31,000	33,000	33,000	31,000	33,000
Period Total	**472,000**	**973,000**	**687,000**	**472,000**	**514,000**
1987 – 1992 DROUGHT PERIOD					
1987-Crit	0	238,000	50,000	0	17,000
1988-Crit	154,000	414,000	330,000	195,000	315,000
1989-Crit	113,000	370,000	276,000	182,000	266,000
1990-Crit	253,000	416,000	356,000	301,000	377,000
1991-Crit	133,000	370,000	275,000	181,000	249,000
1992-Crit	121,000	375,000	301,000	222,000	295,000
1993-Wet	26,000	30,000	30,000	30,000	30,000
Period Total	**801,000**	**2,214,000**	**1,619,000**	**1,112,000**	**1,549,000**
2001 – 2004 DROUGHT PERIOD					
2001-Dry	0	317,000	0	0	0
2002-Dry	0	310,000	160,000	0	11,000
2003-BN	0	241,000	119,000	0	59,000
2004-Crit	0	375,000	277,000	19,000	212,000
2005-Wet	0	15,000	15,000	12,000	15,000
Period Total	**0**	**1,258,000**	**571,000**	**31,000**	**295,000**

Table 6 presents annual shortages for three drought periods: 1976 through 1977, 1987 through 1992, and 2001 through 2004. A Wet Water Year followed each of these periods and, under Case 1, Lake McClure refilled. Results presented for Case 1 show Merced ID avoids water supply shortages in the first year of each drought period, and has no shortages during the 2001 through 2004 period. However, Merced ID has annual water supply shortages that can exceed 100,000 acre-feet during multi-year drought periods under Case 1. Shortages in 1977, the driest year on record throughout most of California, are essentially all of Merced ID's Merced River water supply.

Project Hydropower Generation

Changes in minimum flow requirements, reservoir storage, and irrigation deliveries also affect Project hydropower generation. Table 7 presents a summary of average annual hydropower generation (generation) by Water Year Type, and changes in generation compared to Case 1.

Table 7. Comparison of average annual generation, in gigawatt hours, for Ops Model run Case 1 and other requested runs.

Run	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
CASE 1 AND REQUESTED MODEL RUNS						
Case 1	537	429	349	304	209	385
NMFS121710A	439	420	277	140	30	269
NMFS121710B	493	449	326	266	95	331
NMFS121710C	528	449	354	301	171	373
NMFS121710D	515	453	334	305	123	353

Table 8. (continued)

Run	Water Year Type					
	Wet	Above Normal	Below Normal	Dry	Critical	All Years
CHANGE FROM CASE 1						
Case 1	0	0	0	0	0	0
NMFS121710A	-99	-9	-73	-164	-179	-115
NMFS121710B	-45	20	-23	-38	-113	-54
NMFS121710C	-10	20	5	-3	-37	-12
NMFS121710D	-22	23	-15	1	-86	-32

Results presented in Table 7 show average annual generation is reduced relative to Case 1 under each of the four requested runs. Generation is reduced for several reasons related to changes in reservoir operations. The primary reason for changes in generation is an increase in releases that must bypass the powerhouse, either because releases exceed maximum powerhouse capacity (3,100 cfs at New Exchequer and 2,600 cfs at McSwain), fall below minimum powerhouse capacity (200 cfs at New Exchequer and 600 cfs at McSwain), or storage in Lake McClure does not provide adequate head for generation. The largest average annual reductions occur under requested model run NMFS121710A, in which generation is reduced by approximately 30 percent. Generation is reduced more in drier Water Year Types compared to wetter Water Year Types due to a combination of reduced reservoir storage and reduced Project releases.

Annual reductions alone do not illustrate all significant effects on generation. Changes in monthly generation are also important due to differences in monthly power demand. Reductions in generation during peak power demand months are more significant than those when demands are lower. Figure 4 illustrates average monthly Project generation for all years for Case 1 and each requested run.

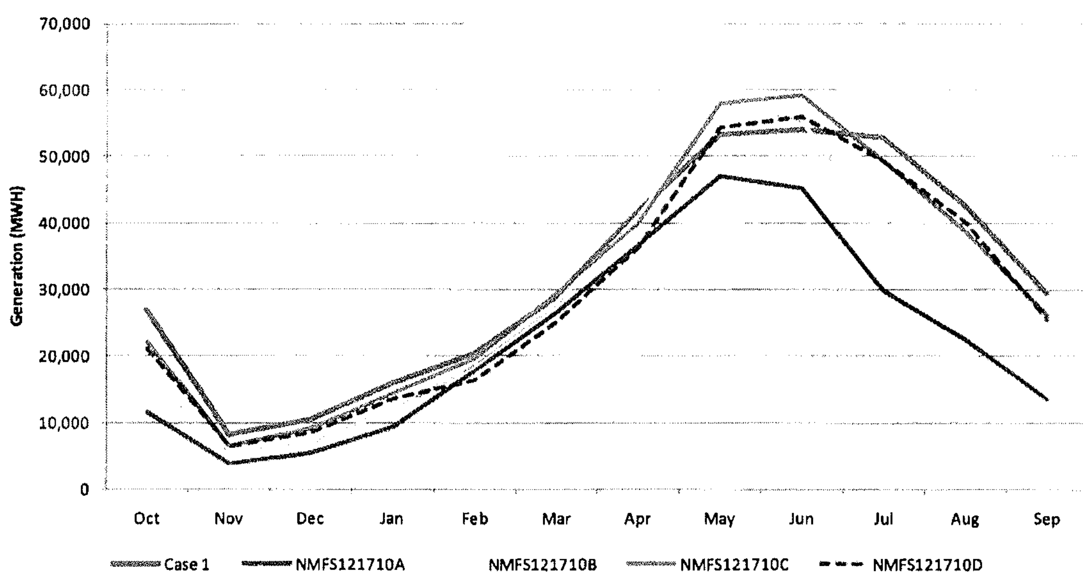


Figure 4. Comparison of average monthly generation under Case 1 and each requested model run.

Figure 4 illustrates that average monthly generation is less from October through February and July through September under all requested model runs as compared to Case 1. From March through June, average monthly generation can be more or less than Case 1, depending on the requested model run. The largest reductions in average monthly generation typically occur in the peak demand months of July through September.

RESULTS OF REQUESTED WATER TEMPERATURE MODEL RUNS

The Temperature Model simulates water temperatures that result from Project operations simulated in the Ops Model. The Temperature Model simulates water temperatures in Project and non-Project reservoirs and the Merced River, from and including, Lake McClure to Shaffer Bridge.

Reservoir operations and downstream flows simulated in the Ops Model were also simulated in the Temperature Model. The Temperature Model simulates water temperatures at a 6-hour time-step over a 27-year simulation period. Merced ID has developed and made available several tools to process and summarize the considerable quantity of model output for the purpose of comparing different Temperature Model runs. The following figures and discussion below are intended to summarize the general trends in how and why water temperatures change under each requested Temperature Model run.

One metric for assessing water temperature data or model results is the 7-day running average, maximum daily temperature. This metric was calculated from the maximum daily simulated water temperatures at three locations on the Merced River downstream of the Project. Seven-day running average, maximum daily temperatures were then averaged for each month of the simulation, and a single monthly average, 7-day average maximum daily temperature was calculated for each model run. This metric illustrates the general trends in how water temperatures change under each requested model run.

The following three figures illustrate average monthly, 7-day average maximum daily temperatures immediately downstream of Crocker-Huffman Diversion Dam, at the Highway 59 Bridge and at Shaffer Bridge. Crocker-Huffman Diversion Dam is located approximately 4 river miles downstream of McSwain Dam, the furthest downstream Project facility, and 3 river miles downstream of PG&E's Merced Falls Dam. Crocker-Huffman Diversion Dam is where water is diverted into Merced ID's Main Canal for irrigation. Highway 59 Bridge is located approximately 10 river miles below Crocker-Huffman Diversion Dam. Shaffer Bridge is located approximately 9 river miles below Highway 59 Bridge, 19 river miles below Crocker-Huffman Diversion Dam, and approximately 33 river miles upstream of the confluence of the Merced and San Joaquin Rivers.

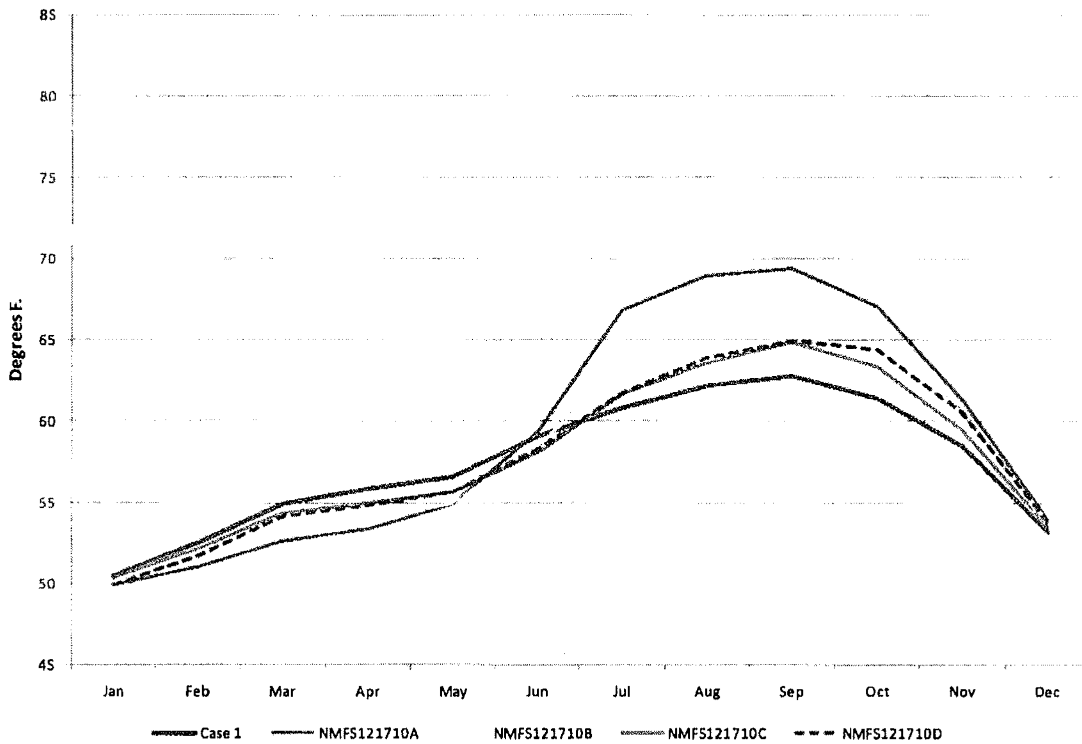


Figure 5. Comparison of average monthly, 7-day average maximum daily water temperature in the Merced River immediately downstream of Crocker-Huffman Diversion Dam under Case 1 and each requested run.

Figure 5 shows that water temperatures below Crocker-Huffman Diversion Dam are generally cooler under all requested model runs from January through June, and warmer from July through December, as compared to Case 1. The largest absolute differences from Case 1, either warmer or cooler, are temperature increases from August through November.

Interaction between reservoir storage and releases under each Ops Model run result in changes in water temperatures. In general, higher releases create higher flows downstream that are slower to change temperature, either warm or cool, in response to differences between water and ambient air temperatures. That is, release temperature is maintained farther downstream of the reservoir. However, higher releases result in lower reservoir storage conditions, and smaller reservoir pools are quicker to change temperature in response to differences between warmer or cooler ambient air temperatures; that is, temperature of the water held in the reservoir changes quicker when there is less water in the reservoir. In general, cooler temperatures of the Merced River immediately below Crocker-Huffman Diversion Dam from January to June under the requested model runs are the result of increased reservoir releases and flows in those same months. Warmer temperatures from July through December are the result of the water in Project reservoirs warming due to lower storage conditions as illustrated in Figure 3. These same principles apply to downstream locations with some differences in the magnitude of change in different months.

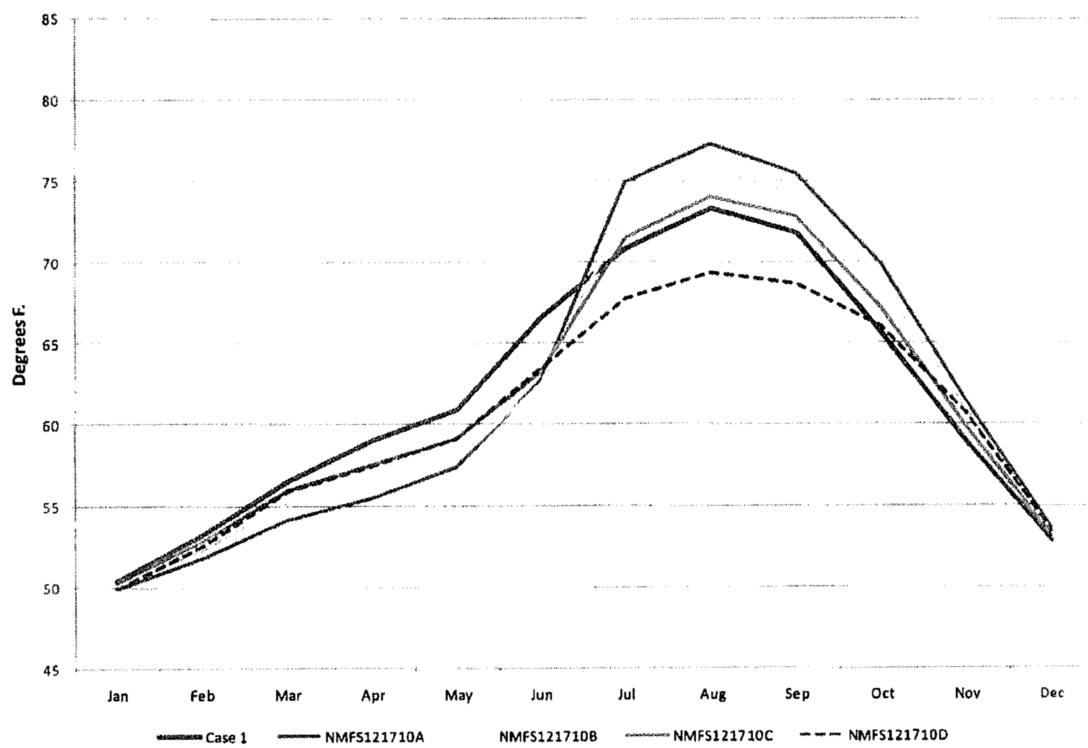


Figure 6. Comparison of average monthly, 7-day average maximum daily water temperature in the Merced River at the Highway 59 Bridge under Case 1 and each requested run.

Figure 6 illustrates that the same general changes in water temperatures simulated to occur at Crocker-Huffman Diversion Dam occur downstream at Highway 59. At this location, differences in flow between the requested model runs and Case 1 create larger temperature differences from March to June than seen below Crocker-Huffman Diversion Dam. Temperature differences from July through December are smaller at this location because water temperature approaches an equilibrium condition as it moves downstream. At this location, higher flows under requested model run NMFS121710D from July through January result in lower water temperatures from July to September relative to Case 1.

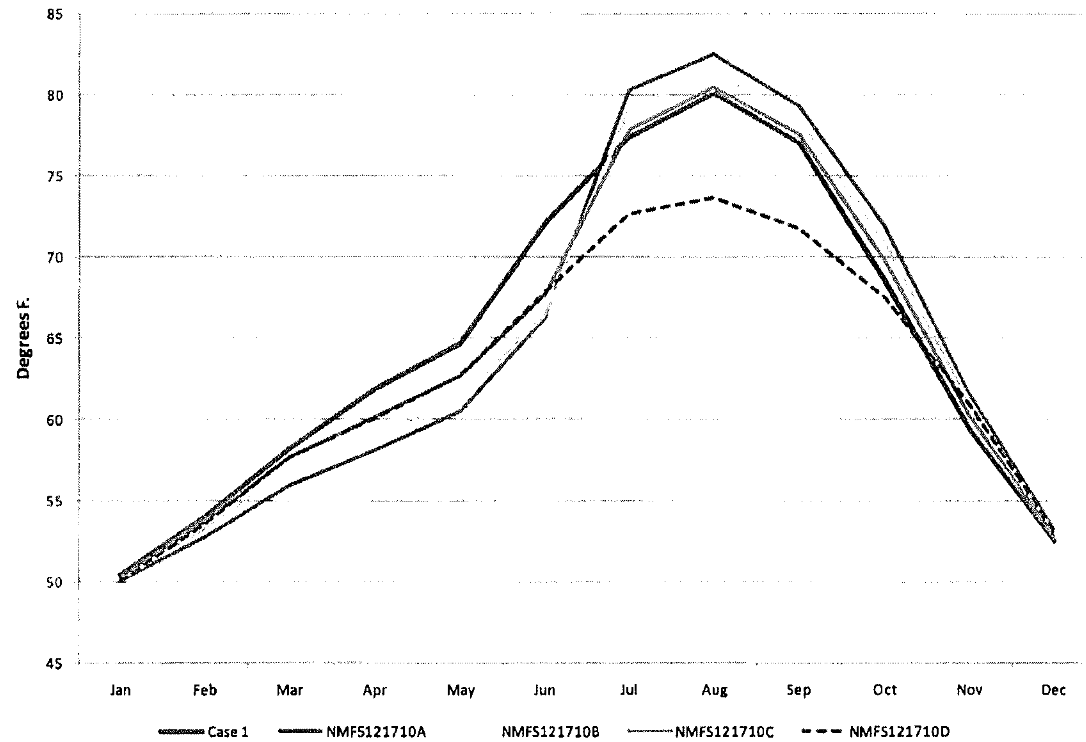


Figure 7. Comparison of average monthly, 7-day average maximum daily water temperature in the Merced River at Shaffer Bridge under Case 1 and each requested run.

Figure 7 shows the same general changes in water temperatures seen at upstream locations occur downstream at Shaffer Bridge. Differences in flow between the requested model runs and Case 1 create similar magnitude temperature differences from March to June as seen upstream at Highway 59. Temperature differences from July through December are smaller still at this location because water temperature continues to approach an equilibrium condition as it moves downstream. At this location, higher flows under requested model run NMFS121710D from July through January result in lower water temperatures from July to October relative to Case 1.

Additional understanding of the Project's effects on water temperature, how temperatures change downstream, and the effects of the requested runs on water temperature are illustrated in the following three figures. These figures present average monthly, 7-day average maximum daily water temperatures at locations upstream, within, and downstream of the Project for Case 1 and requested model runs NMFS121710A and NMFS121710D. These two requested runs were selected for comparison because these runs create the largest changes in reservoir operations, Project releases, downstream flows, and water temperature. Figures are presented for three different months: April representing spring conditions; July representing summer conditions; and October representing fall conditions.

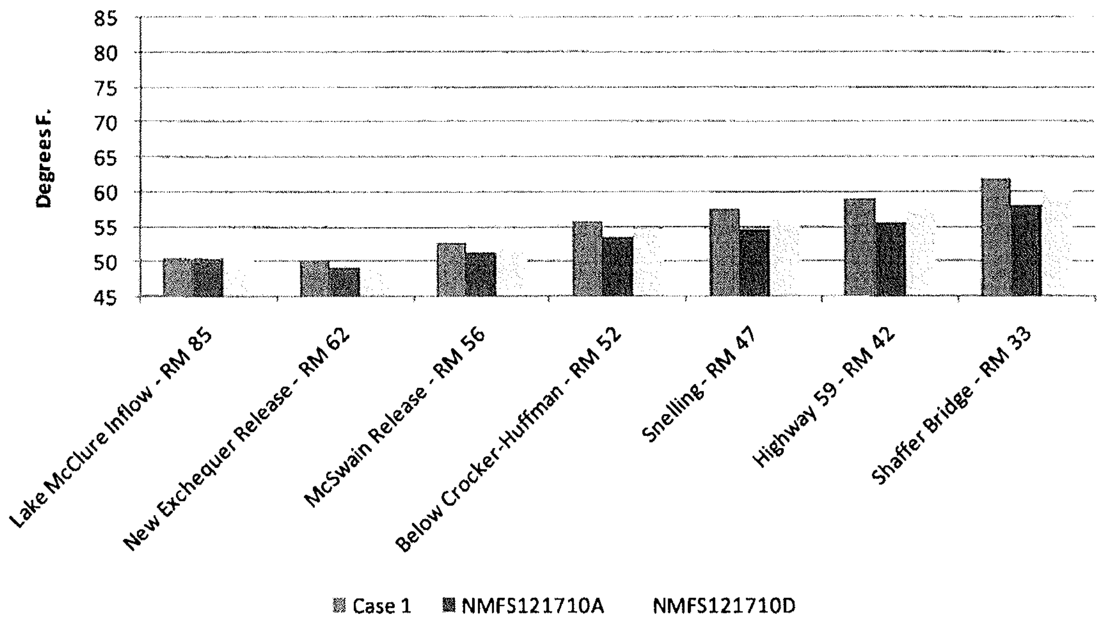


Figure 8. Comparison of average April, 7-day average maximum daily water temperature at several locations under Case 1, NMFS121710A, and D.

Figure 8 illustrates that average April maximum New Exchequer release temperatures are approximately the same as inflow water temperatures under Case 1, and 1 °F to 2 °F cooler than inflow under requested model runs NMFS121710A and D. Water temperatures begin warming in McSwain Reservoir under all runs and continue warming as water moves downstream. Under model run NMFS12170A, higher average April Project releases and flows downstream of Crocker-Huffman Diversion Dam warm less than lower flows under Case 1 and model run NMFS121710D.

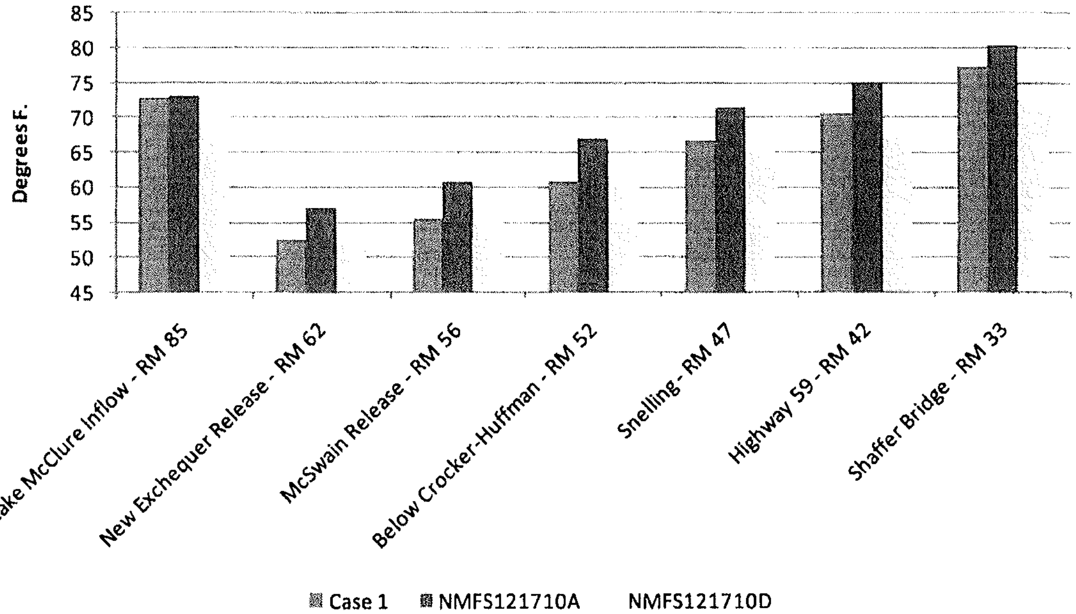


Figure 9. Comparison of average July, 7-day average maximum daily water temperature at several locations under Case 1, NMFS121710A, and D.

Figure 9 illustrates that average July maximum New Exchequer release temperatures are approximately 20 °F cooler than inflow temperatures under Case 1, and 15°F less than inflow under requested model run NMFS121710A. Under requested model runs NMFS121710A and D, 3 °F to 5 °F increases in average maximum July New Exchequer Powerhouse release temperatures, compared to Case 1, are the result of lower storage conditions in Lake McClure. Under requested model run NMFS121710A, higher release temperatures, combined with reduced Project releases and flow below Crocker-Huffman Diversion Dam result in water temperatures remaining approximately 5 °F warmer than Case 1 downstream of Crocker-Huffman to Highway 59 and remaining several degrees warmer at Shaffer Bridge. Temperatures under requested model run NMFS121710D are warmer than Case 1 above Crocker-Huffman Diversion Dam due to higher Project release temperatures, but lower than Case 1 below Crocker-Huffman Diversion Dam due to higher Project releases and flows. Stated another way, under model run NMFS121710D, lower storage conditions create warmer July release temperatures; however, higher flows do not warm as quickly as they move downstream.

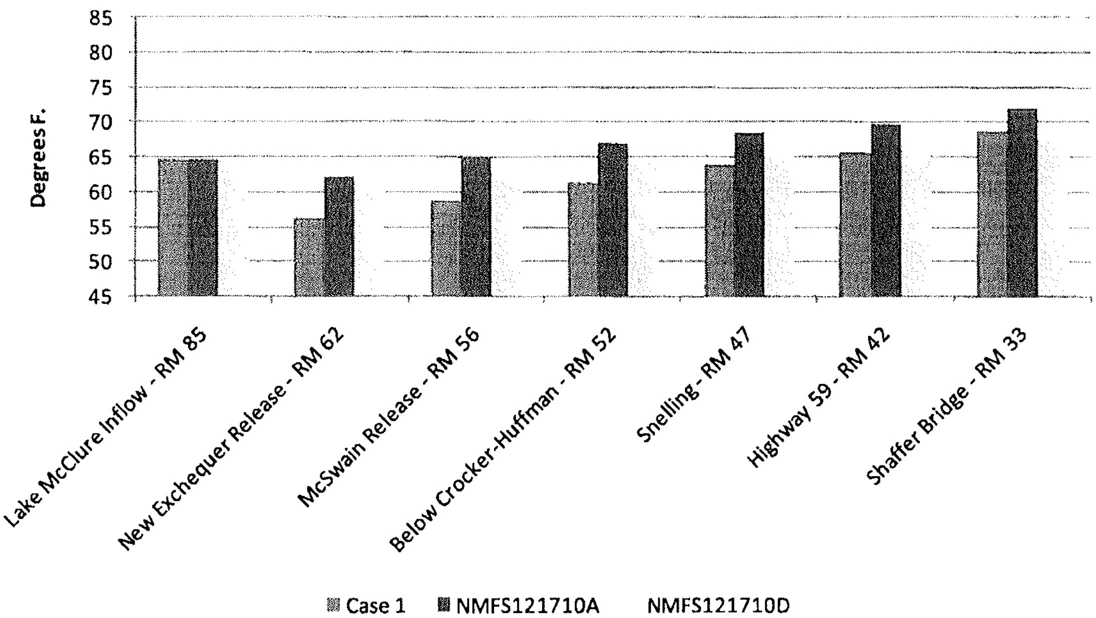


Figure 10. Comparison of average October, 7-day average maximum daily water temperature at several locations under Case 1, NMFS121710A, and D.

Figure 10 illustrates that average October maximum New Exchequer release temperatures are approximately 8°F cooler than inflow temperatures under Case 1, and 3°F cooler than inflow under model run NMFS121710A. Increases in average maximum October New Exchequer release temperatures compared to Case 1 result from lower storage conditions in Lake McClure under model runs NMFS121710A and D. Under model run NMFS121710A, higher release temperatures, combined with reduced Project releases and flow below Crocker-Huffman Diversion Dam result in water temperatures remaining approximately 3°F to 6°F warmer than in Case 1 downstream to Shaffer Bridge. Temperatures under requested model run NMFS121710D are warmer than Case 1 above Highway 59 due to higher release temperatures, but lower than Case 1 below Highway 59 due to higher Project releases and flows.

SUMMARY

The model runs span a potential range of future conditions from the continuation of existing minimum flow requirements to increasing the requirements to as high as 60 percent of the unimpaired flow into the Project or the existing requirement, whichever is greater.

With regards to water temperature, changes in minimum flow requirements create changes in reservoir operations and Project releases that result in differences in the water temperature of Project releases and water downstream of the Project. Comparisons of requested model runs NMFS121710A, B, and C with Case 1 show that increased Project releases in April, May, and June cool water temperatures in these months (see Figure 5 through Figure 8). However, from

July through November, lower reservoir storage conditions as a result of increased Project releases in the spring, combined with decreased Project releases warm water temperatures (see Figure 5 through Figure 7, Figure 9, and Figure 10). Under requested model run NMFS121710D that includes increased minimum flow requirements year-round, water temperatures are cooled in April, May, and June with additional reservoir releases. This run partially compensates for the resulting warmer summer and fall water temperatures being released from the Project through additional releases in these months, but at a cost in terms of increased water supply shortages and lost power generation. Under requested model run NMFS121710D, Project release temperatures in the summer and fall are warmer and remain warm downstream, but become similar to and eventually cooler than water temperatures under Case 1 due to the insulating effect of higher flows (see Figure 9 and Figure 10).

With regards to water quantity, comparisons of average monthly Project releases and Merced River flow presented in Figure 1 and Figure 2 illustrate the confounding effects of Crocker-Huffman Diversion Dam. Project releases do not translate one-for-one into flow in the Merced River below Crocker-Huffman Diversion Dam. Average monthly Project releases display a defined peak in the months of April, May, and June while average monthly flows immediately below Crocker-Huffman Diversion Dam are relatively stable from February through June. Diversions and return flows in the Merced River downstream of Crocker-Huffman Diversion Dam, outside the control of Merced ID, further complicate the issue.

Additionally, water supply impacts associated with even the smallest change in minimum flow requirements evaluated here (i.e., requested model run NMFS121710C had the smallest increase in minimum flow requirements compared to Case 1) can still be significant. Under requested model run NMFS121710C, average annual flow immediately downstream of Crocker-Huffman Diversion Dam increased 11,000 acre-feet compared to Case 1 (see Table 4). The 11,000 acre-foot increase was provided through reduction of irrigation water supply by 9,000 acre-feet (see Table 5) and 2,000 acre-feet of additional Project release (see Table 3). Average annual water supply shortages mask more significant impacts that occur during drought periods such as water year 1987 through 1992 (see Table 6). The fact that significant water supply impacts occur with the smallest change in minimum flow requirements evaluated here demonstrates that there is very limited water available to increase Merced River flow that does not come at the expense of irrigation water supplies.

Please contact me if you have any questions.

Sincerely,

MERCED IRRIGATION DISTRICT

Bryan Kelly

Bryan Kelly, P.E.
Director of Regulatory Compliance
and Government Affairs, Water

Attachments:	Attachment to John Wooster's (NMFS) December 17, 2010 E-Mail to Merced ID DVD with all model results for requested runs and latest versions of Ops and Temperature Models
cc:	Matt Buyhoff, FERC DC Relicensing Participants Contact List (via e-mail)