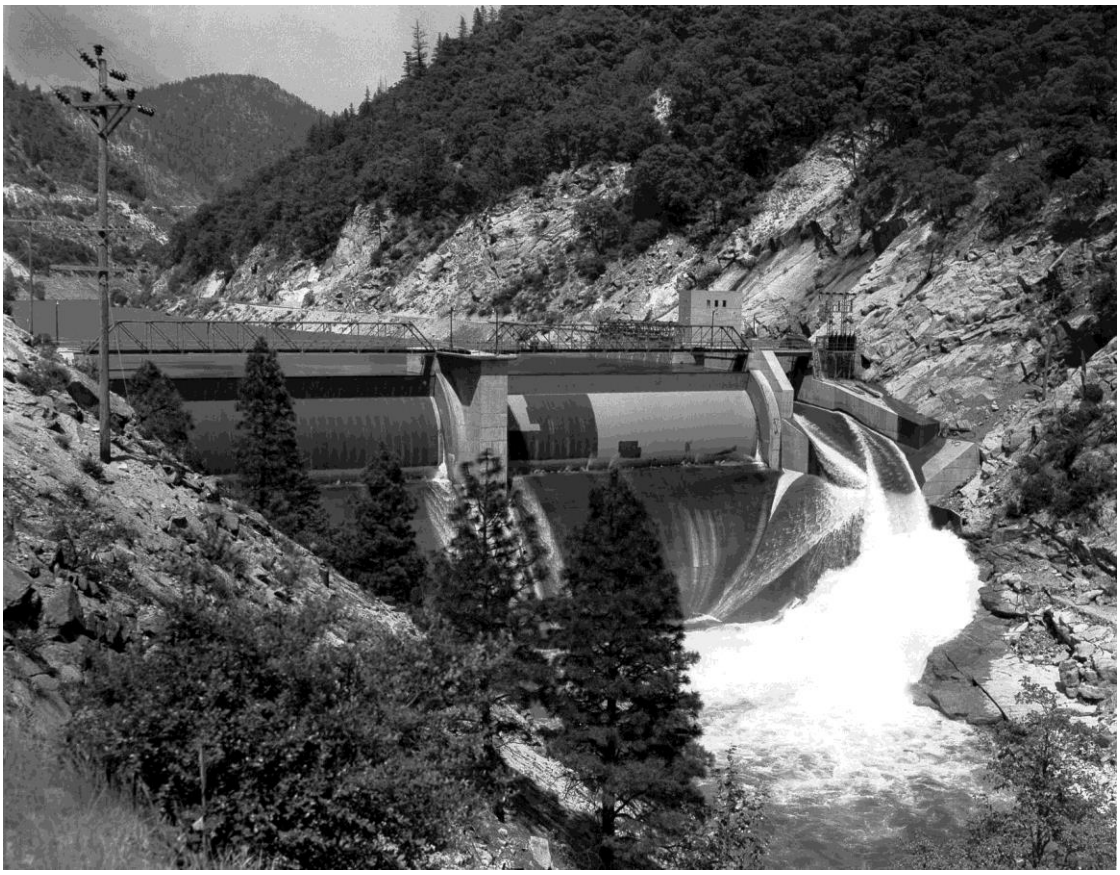
Additional Reasonable Water Temperature Control Measures Report

Rock Creek-Cresta Project, FERC No. 1962
License Condition No. 4.D



DRAFT

October 2022

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APPENDICES

ACRONYM LIST

Abbreviation	Definition
°C	degrees Celsius
2005 Informational Report	*North Fork Feather River Study Data and Informational Report on Water Temperature Monitoring and Additional Reasonable Water Temperature Control Measures* (PG&E 2005a)
4.D Report	*Additional Reasonable Control Measures Report*
Bucks Creek Project	Bucks Creek Hydroelectric Project, FERC No. 619
cfs	cubic feet per second
EIR	environmental impact report
EIS	environmental impact statement
ERC	Ecological Resources Committee
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Department of Agriculture, Forest Service
Fund	Coldwater Habitat and Fishery Mitigation and Enhancement Fund
IWTCM	interim water temperature control measures
Licensee	Pacific Gas and Electric Company
LLO	low-level outlet
MIFs	minimum instream flows
NFFR	North Fork Feather River
NGVD	National Geodetic Vertical Datum
PG&E	Pacific Gas and Electric Company
Poe Project	Poe Hydroelectric Project, FERC No. 2107
RCC Project	Rock Creek-Cresta Hydroelectric Project, FERC No. 1962
RCC Project License	License (issued October 24, 2001) for the Rock Creek-Cresta Hydroelectric Project, FERC No. 1962
SA	*Rock Creek-Cresta Relicensing Settlement Agreement*
SWRCB	State Water Resources Control Board
UNFFR	Upper North Fork Feather River
UNFFR Project	Upper North Fork Feather River Hydroelectric Project, FERC No. 2105
WYT	Water Year Type

1. EXECUTIVE SUMMARY

Pacific Gas and Electric Company's (PG&E) *Additional Reasonable Control Measures Report* (4.D Report) is prepared pursuant to Condition No. 4.D of the license for the Rock Creek-Cresta Hydroelectric Project, Federal Energy Regulatory Commission (FERC) No. 1962, which was issued on October 24, 2001. Condition No. 4.D requires PG&E to prepare a report that evaluates whether mean daily water temperatures of 20 degrees Celsius (°C) or less have been or will be achieved within the Rock Creek and Cresta reaches of the North Fork Feather River (NFFR), and if not, whether additional reasonable water temperature control measures are available to achieve this goal. The purpose of achieving a mean daily water temperature of 20°C or less is to enhance cold-water fish habitat, primarily for trout.

As described in the 4.D Report, PG&E collected data between 2002 and 2021 and verified that water temperature is not continuously contained at or below 20°C within the Rock Creek and Cresta reaches. Further, assessments completed by PG&E and the State Water Resources Control Board conclude that no reasonable water temperature control measures are available to achieve this goal. While several alternatives could reduce water temperature in the Rock Creek and Cresta reaches, the assessments show that they:

- Do not achieve year-round temperature below 20°C in the Rock Creek and Cresta reaches
- Require changes to infrastructure and operations associated with facilities that are not part of the Rock Creek-Cresta Project
- Could have a negative impact to fisheries in Lake Almanor
- Involve substantial costs that, if implemented, would be borne by PG&E's electric customers

The interim water temperature control measures employed since 2012 have not lowered water temperatures, and under certain conditions the measures could increase water temperatures.

Additionally, over 20 years of biological monitoring and observations in the Rock Creek and Cresta reaches has shown no evidence of physiological stress to the coldwater fishery. This suggests that the concerns about water temperature in these reaches is unfounded.

PG&E concludes that no reasonable control measures are available that can lower water temperatures to 20°C or below in the Rock Creek and Cresta reaches. PG&E recommends ceasing implementation of the interim water temperature control measures and investing no further effort or resources to address this objective.

2. INTRODUCTION

This report, the *Additional Reasonable Control Measures Report* (4.D Report), provides the results of Pacific Gas and Electric Company's (PG&E) evaluation of whether mean daily temperatures of 20 degrees Celsius (°C) or less, have been, or will be, achieved in the Rock Creek and Cresta reaches, and if not, whether additional reasonable control measures are available that would achieve this threshold. The Rock Creek and Cresta reaches are part of PG&E's Rock Creek-Cresta Hydroelectric Project, Federal Energy Regulatory Commission's (FERC) No. 1962 (RCC Project).

This 4.D Report is required by the following provisions:

- Ordering paragraph (D) from FERC's Order Modifying and Approving Water Temperature Monitoring Plan (issued February 28, 2003) under Article 401
- Article 401 and U.S. Department of Agriculture, Forest Service (Forest Service) 4(e), Condition No. 4.D (Additional Reasonable Control Measures) from the appendix of the Order Approving Settlement and Issuing New License (issued October 24, 2001) for the RCC Project (RCC Project License)
- Section I.4 from the *Rock Creek-Cresta Relicensing Settlement Agreement* (SA, PG&E 2000a)

The SA parties' agreement in Section I.4 of the SA to evaluate attainment of a temperature of 20°C in the Rock Creek and Cresta reaches was a negotiated temperature and is not based on any prior or existing approved water quality objective for the Feather River in the water quality control plan for the Sacramento and San Joaquin River Basins (SWRCB 2019).

FERC approved PG&E's plan and schedule for completing the 4.D Report in a letter to PG&E dated May 18, 2021 (provided in Appendix A).

Condition No. 4.D specifies that the 4.D Report shall include recommendations for implementing additional reasonable control measures to achieve mean daily temperatures of 20°C or less in the Rock Creek and Cresta reaches. The 4.D Report "shall also factor in economic considerations in evaluating whether additional measures are reasonable." Condition No. 4.D also states (FERC 2001):

> Subject to the provisions of Paragraph 5 below [referring to the Condition No. 4.E Coldwater Habitat and Fishery Mitigation and Enhancement Fund] which sets forth the licensee's total financial commitment for reasonable control measures as set forth in this condition, the ERC[1] and Forest Service shall make an affirmative determination whether additional temperature

[1] The Ecological Resources Committee (ERC) consists of PG&E, the California Department of Fish and Wildlife, the U.S. Fish and Wildlife Service, the State Water Resources Control Board, American Whitewater, the California Sportfishing Protection Alliance, and Plumas County. For the purposes of this document, the ERC refers to those entities except PG&E.

> control measures shall be implemented. This affirmative determination shall be based on the best scientific information available, the use of sound scientific methods, consideration of the relative cost of different control measures, and other relevant factors. As soon as practicable after such affirmative determination, the licensee shall implement any additional reasonable control measures for which no further regulatory approval is necessary. The licensee shall promptly apply for regulatory approval for any other additional reasonable control measures that the ERC and Forest Service affirmatively determine shall be implemented.

Concerning the costs associated with water temperature control measures, Condition No. 4.E required the establishment of a Coldwater Habitat and Fishery Mitigation and Enhancement Fund (Fund), which limits the total financial commitment for reasonable control measures. The condition provides the following requirements for PG&E:

> [E]stablish the fund with $5,000,000 (current dollars) and an interest on the fund balance that accrues at the 90-day commercial paper rate as published by the Federal Reserve Bank of New York…add to the Fund an additional amount not to exceed $2,000,000 (January 2001 dollars, escalated based on the U.S. Gross Domestic Product - Implicit Price Deflator), provided that the Commission makes a determination, based on the water temperature monitoring report required by Condition 4.D, that further measures would be necessary for the licensee to maintain a mean daily water temperature of 20 degrees Celsius in the project reaches and that additional funding would be appropriate for this purpose…The Fund shall primarily be use for the water temperature control measures described in Condition 4.D…The Fund may be used to undertake other measures that directly enhance coldwater habitat and the fishery in the Rock Creek-Cresta bypassed reaches and/or in the North Fork Feather River Basin as may be required by the Commission during the license term.

To meet the objectives outlined in Condition No. 4.D, this report includes:

- An overview of the RCC Project and the North Fork Feather River (NFFR)
- Observations from the ongoing water temperature monitoring in the Rock Creek and Cresta reaches
- A review of the measures included in PG&E's initial report prepared to comply with Condition No. 4.D titled *North Fork Feather River Study Data and Informational Report on Water Temperature Monitoring and Additional Reasonable Water Temperature Control Measures* (PG&E 2005a) (2005 Informational Report), provided in Appendix B
- A summary and review of the outcome from multiple State Water Resources Control Board (SWRCB) studies associated with the relicensing the Upper North Fork Feather River (UNFFR) Hydroelectric Project, FERC No. 2105 (UNFFR Project) that investigated options for reducing water temperature in the NFFR
- Results from the implementation of interim water temperature control measures (IWTCM) in the Rock Creek and Cresta reaches
- A review of the conclusions of all evaluations (i.e., models, studies, and monitoring) related to water temperature control in the Rock Creek and Cresta reaches

3. 4.D REPORT PLAN AND SCHEDULE

On December 22, 2020, PG&E submitted an extension of time request to develop a plan and schedule by December 31, 2022, for preparing the 4.D Report (PG&E 2020). FERC informed PG&E that the deadline for the submission of the 4.D Report was December 31, 2022, and that a plan and schedule for completion of the 4.D Report was to be submitted by April 1, 2021 (FERC 2020).

After consultation with the ERC and Forest Service, PG&E submitted a final plan and schedule to FERC on April 1, 2021. FERC approved the plan and schedule on May 18, 2021 (FERC 2021).

Over the course of 2021, PG&E compiled all existing water temperature monitoring and modeling reports developed for the NFFR and provided them to the ERC and the Forest Service as part of the requirements of the plan and schedule. PG&E presented and discussed the outcome of these reports over a series of monthly meetings with the ERC and the Forest Service.

4. RCC PROJECT DESCRIPTION

The RCC Project is located on the NFFR, which is embedded in the greater Sacramento River Watershed. The NFFR originates at the southeastern slope of Mount Lassen and extends to Lake Oroville, traversing through Lassen, Plumas, and Butte Counties (Figure 1). The main stem of the Feather River is formed downstream of Lake Oroville. The North, Middle, and South forks of the Feather River are impounded behind Oroville Dam, which was completed in 1967.

The RCC Project is one of five PG&E hydroelectric projects within the NFFR watershed. The UNFFR Project is directly upstream of the RCC Project, and the Poe Hydroelectric Project, FERC No. 2107 (Poe Project) is directly downstream. The Bucks Creek Hydroelectric Project, FERC No. 619 (Bucks Creek Project) is located on a tributary above the RCC Project and drains into the Rock Creek Reach of the NFFR. The fifth project, Hamilton Branch, is located on a tributary upstream of Lake Almanor. Figure 2 provides a schematic of the overall hydrology within the NFFR Basin.

The RCC Project includes the Rock Creek Reservoir and its associated dam (crest elevation of 2,230.2 ft National Geodetic Vertical Datum [NGVD]), the Rock Creek Reach (an 8.4-mile-long bypass), Rock Creek Powerhouse, Cresta Reservoir and its associated dam (crest elevation of 1,690.2 ft NGVD), Cresta Powerhouse, and Cresta Reach (a 4.9-mile-long bypass). Upstream sources of water include the UNFFR and the East Branch of the Feather River. Cresta Powerhouse is located just upstream of the Poe Project. Tributaries draining into the Rock Creek Reach include Milk Ranch Creek, Chambers Creek, and Bucks Creek. Rock Creek Powerhouse discharges water into the Cresta Reservoir; other upstream sources of inflow into the Cresta Reservoir include:

- The NFFR downstream of Rock Creek Dam
- Tributary inflows to Cresta Reach from Chambers, Jackass, and other smaller tributaries
- Rock Creek

See Figure 3 for a map of the RCC Project and the surrounding features.

Figure 1: Regional location of the Rock Creek-Cresta Project

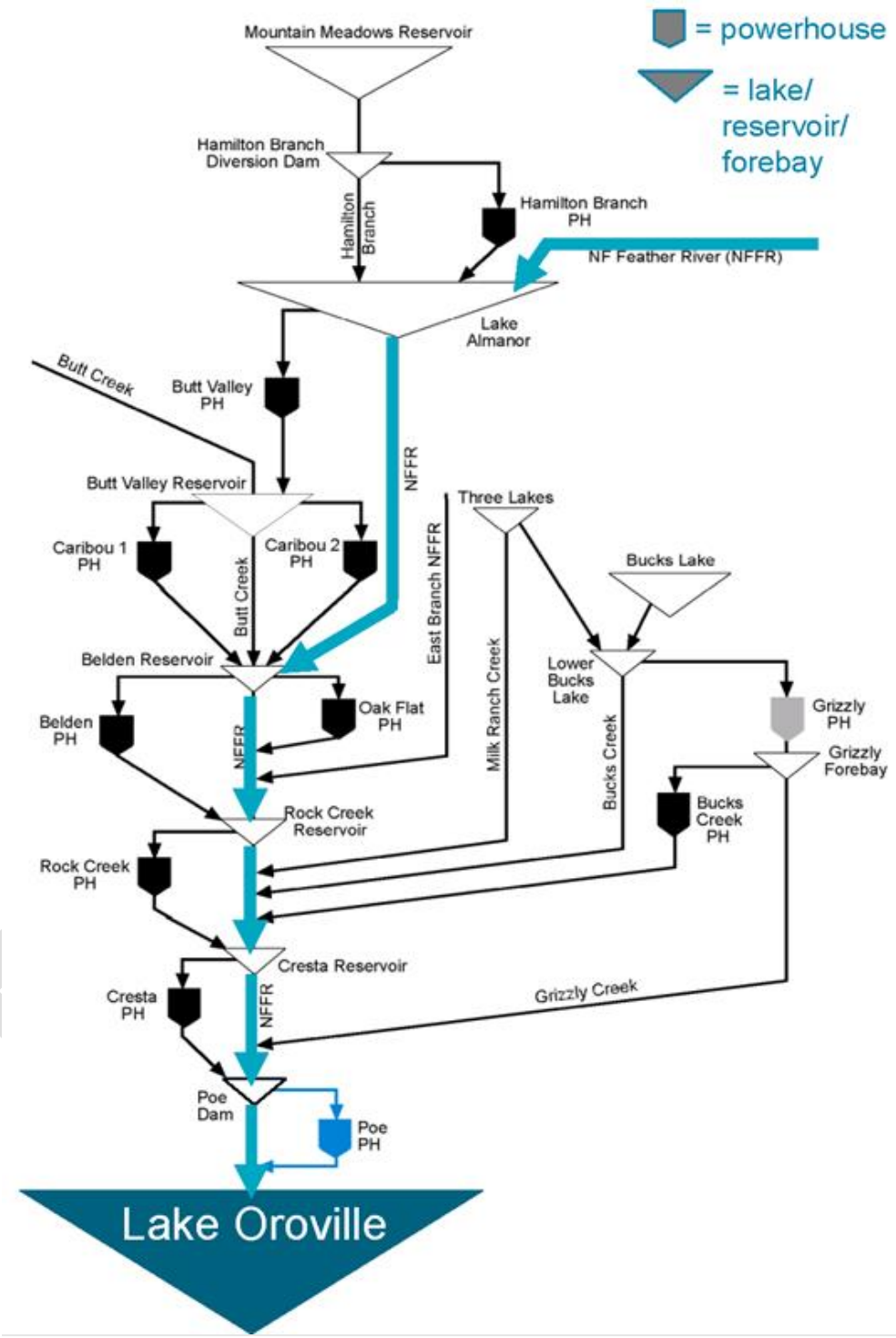


Figure 2: Schematic of the North Fork Feather River hydroelectric system

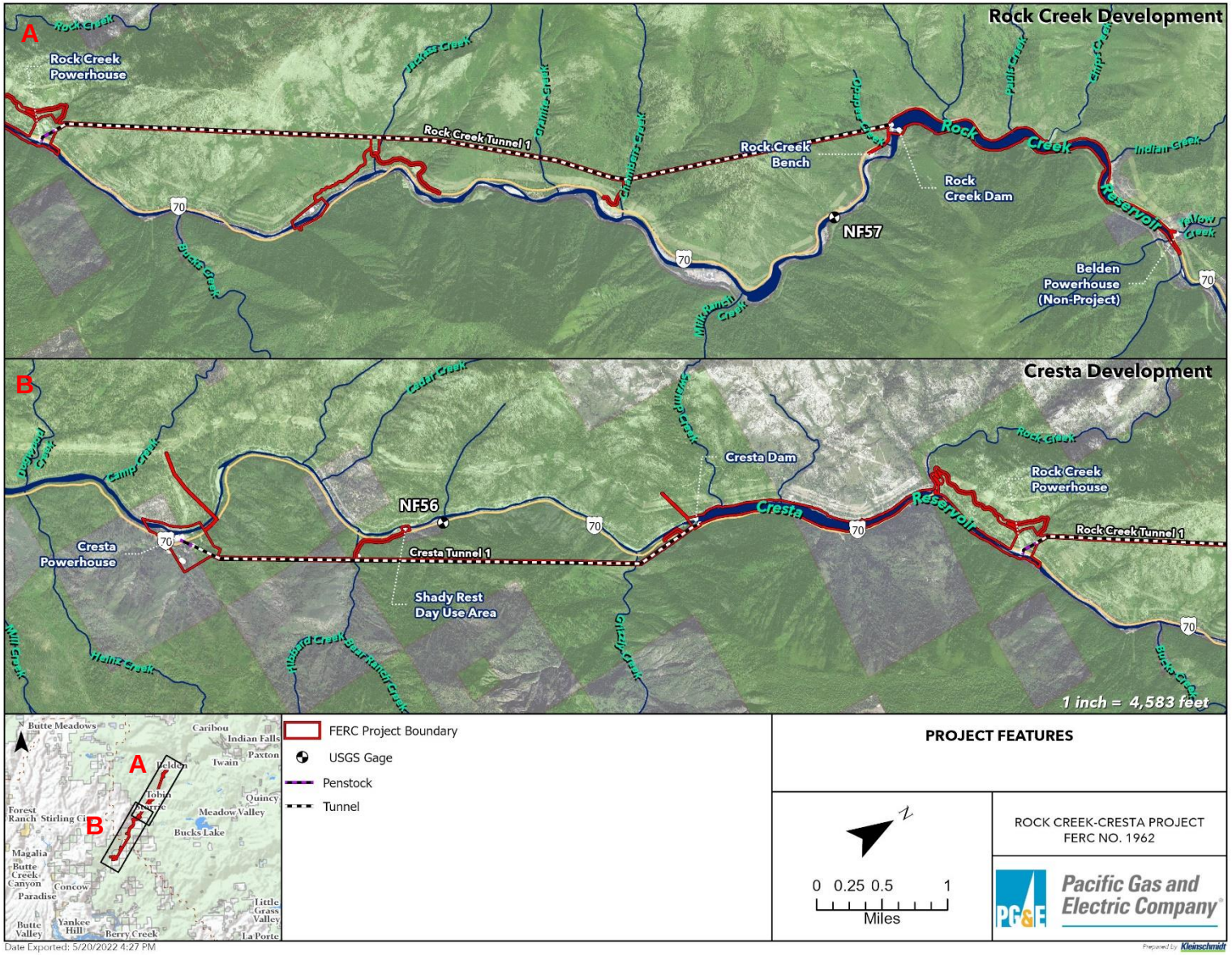


Figure 3: Overview map of the Rock Creek-Cresta Project

Under the current Rock Creek-Cresta license, PG&E (Licensee) is required to maintain minimum instream flows (MIFs) within the Rock Creek and Cresta reaches. MIF levels were implemented in a set of three test flow periods, each of which were designed to last 5 years, beginning in 2001, with MIFs increasing with each subsequent test flow period (FERC 2001, Table 1). MIFs for the three test flow periods were maintained via releases from the RCC Project dams based on the Water Year Type (WYT) and month. Four WYTs (i.e., Wet, Normal, Dry, and Critically Dry) are identified for the RCC Project waters based on California Department of Water Resources records of annual inflow to Lake Oroville (Table 2). All final WYT determinations are made in early May and are based on the Bulletin 120 report (Department of Water Resources). Dry and Critically Dry water years were assigned separate MIFs, while MIFs for both Normal and Wet years were the same. All three test flow periods varied in duration and were completed by 2019. PG&E finalized MIFs for the Rock Creek and Cresta reaches with the ERC and Forest Service in January 2022. PG&E has proposed to implement the final MIFs for the remainder of the RCC Project License term, including any annual license, after FERC has reviewed and approved a pending amendment to the RCC Project License.

Table 1: Minimum Instream Flows[1] for the Rock Creek and Cresta Reaches During Each of the Three Test Periods

Rock Creek Reach	Table A1			Table A2			Table A3		
Month	N&W	Dry	CD	N&W	Dry	CD	N&W	Dry	CD
Mar	250	200	110	350	280	110	525	420	150
Apr	250	200	110	350	280	110	525	420	150
May	250	200	150	350	280	150	525	420	150
Jun	220	175	150	260	210	150	390	310	150
Jul	180	150	150	260	210	150	390	310	150
Aug	180	150	150	260	210	150	390	310	150
Sep	180	150	150	260	210	150	390	310	150
Oct	180	150	150	260	210	150	390	310	150
Nov	180	150	110	260	210	110	390	310	110
Dec	200	160	110	350	280	110	525	420	110
Jan	225	180	110	350	280	110	525	420	110
Feb	225	180	110	350	280	110	525	420	110
Cresta Reach	Table A1			Table A2			Table A3		
Month	N&W	Dry	CD	N&W	Dry	CD	N&W	Dry	CD
Mar	250	200	100	250	200	100	400	350	100
Apr	250	200	100	250	200	100	525	420	100
May	250	200	140	600	500	140	490	420	140
Jun	240	190	140	500	400	140	460	385	140
Jul	220	175	140	325	260	140	440	350	140
Aug	220	175	140	325	260	140	351	300	140
Sep	220	175	140	325	260	140	300	250	140
Oct	220	175	140	325	260	140	200	200	140
Nov	220	175	100	325	260	100	150	150	100
Dec	240	190	100	240	190	100	400	300	100
Jan	240	190	100	240	190	100	400	300	100
Feb	240	190	100	240	190	100	400	300	100

Note: N&W = Normal and Wet; CD = Critical Dry
[1] Minimum instream flows are provided in cubic feet per second.

Table 2: Water Year Type Designation for the Rock Creek-Cresta Project

Water Year Type	Flow Threshold (Inflow to Lake Oroville)
Wet	> 5,679 thousand acre-feet
Normal	> 3,228 < 5,679 thousand acre-feet
Dry	> 2,505 < 3,228 thousand acre-feet
Critical Dry	< 2,505 thousand acre-feet

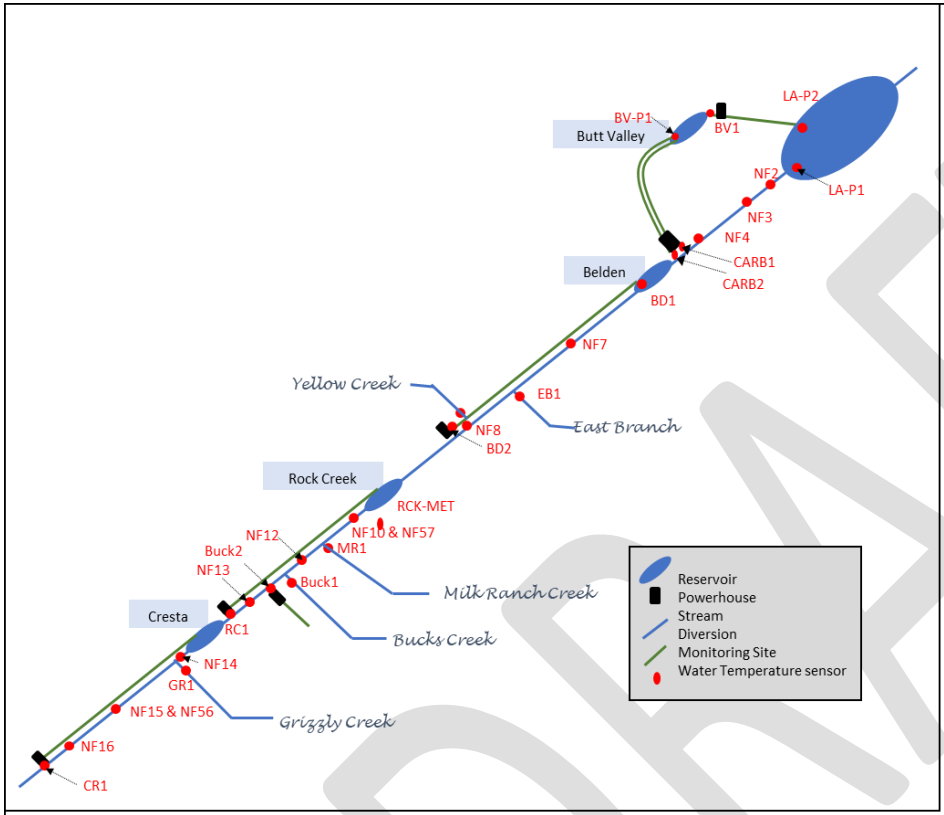
5. WATER TEMPERATURE IN THE ROCK CREEK AND CRESTA REACHES (2002–2020)

As required in Condition No. 4.D, PG&E assessed whether mean daily water temperatures of 20°C or less have been or will be achieved within the Rock Creek and Cresta reaches of the NFFR. Since issuance of the RCC Project License, PG&E has monitored water temperature annually (2002–2020) during the summer (June through September) in various locations along the NFFR, including both the Rock Creek and Cresta reaches (Figure 4). PG&E evaluated data from this effort and determined that mean daily water temperatures were not contained at or below 20°C within the Rock Creek and Cresta reaches.

During the monitoring period each of the four WYTs were applicable, which prompted a range of MIFs in the Rock Creek and Cresta reaches (Tables 3 and 4), as prescribed in the RCC Project License. Further, since 2012, four IWTCMs have been implemented. A description of these measures and their impacts to water temperature in the Rock Creek and Cresta reaches is included in Appendix E, "Evaluation of Interim Water Temperature Control Measures."

As shown in Figure 5, the daily average temperature in both reaches varied between 2002 and 2020 but followed a similar seasonal trend: gradually increasing until the end of July or early August before declining. The number of days in each year during which the average daily water temperature exceeded 20°C in the Rock Creek and Cresta reaches also varied significantly between years and at different locations along both reaches (Figure 6). For all years except 2011, temperatures exceeded 20°C along the entire length of the two reaches (Figure 6).

During the 2 years (i.e., 2006 and 2011) with the lowest number of days when temperatures exceeded 20°C, daily average air temperatures were cooler. In other words, for those 2 years air temperatures measured at Rock Creek Dam were at or below the average of daily average air temperatures measured between 2002 and 2019 (Figure 7). This suggests, at least in the Cresta Reach, that water temperature remaining below 20°C during the warm summer months is a rare occurrence and is a likely consequence of ambient air temperatures and not the result of a temperature control measure. Warming trends associated with ambient air temperatures are likely to further reduce the number of days when water temperatures remain below 20°C.



ID	Location	Latitude	Longitude
LA – P1	Lake Almanor near Canyon Dam – near intake	40°10'34.00"N	121°05'19.30"W
LA – P2	Lake Almanor - Offshore of Prattville Intake (LA2)	40°12'59.80"N	121°09'36.80"W
NF2	NFFR below Canyon Dam (at NF-2)	40°10'09.09"N	121°05'33.94"W
NF3	NFFR at Seneca	40°07'02.45"N	121°05'03.87"W
NF4	NFFR above Caribou No.1 Powerhouse	40°05'08.08"N	121°08'48.04"W
BV1	Butt Valley Powerhouse Tailrace	40°10'32.21"N	121°11'25.82"W
BV-P1	BVR at Caribou No. 1 Intake	40°07'00.00"N	121°08'44.90"W
CARB1	Caribou No. 1 Powerhouse (internal)	40°05'07.84"N	121°08'53.98"W
CARB2	Caribou No. 2 Powerhouse tailrace (internal)	40°05'09.27"N	121°08'57.76"W
BD1	Belden Reservoir at powerhouse intake	40°04'32.68"N	121°09'34.68"W
NF7	NFFR near Gansner Bar	40°01'0.54"N	121°13'21.00"W
EB1	East Branch of NFFR above confluence	40°00'51.01"N	121°13'25.74"W
NF8	NFFR at Belden Town Bridge	40°00'23.97"N	121°14'49.56"W
BD2	Belden Powerhouse (internal)	40°00'26.85"N	121°14'58.45"W
YC1	Yellow Creek near mouth	40°00'36.90"N	121°14'55.70"W
RCK-MET	Meteorological Station on Rock Creek Dam	39°59'13.04"N	121°16'59.33"W
NF10	NFFR below Rock Creek Dam at NF-57	39°58'48.10"N	121°16'37.60"W
MR1	Milk Ranch Creek near mouth	39°57'39.72"N	121°16'26.02"W
NF12	NFFR above confluence with Bucks Creek	39°54'56.82"N	121°19'29.61"W
BUCK1	Bucks Creek near mouth	39°54'50.75"N	121°19'34.09"W
BUCK2	Bucks Creek Powerhouse tailrace	39°54'38.42"N	121°19'40.26"W
NF13	NFFR above Rock Creek Powerhouse	39°54'20.61"N	121°20'39.45"W
RC1	Rock Creek Powerhouse (internal)	39°54'17.64"N	121°20'42.87"W
NF14	NFFR below Cresta Dam	39°52'07.53"N	121°22'25.97"W
GR1	Grizzly Creek near mouth	39°52'04.49"N	121°22'22.25"W
NF15	NFFR downstream of Grizzly Creek at NF-56	39°51'08.00"N	121°23'32.84"W
NF16	NFFR upstream of Cresta Powerhouse	39°49'36.86"N	121°24'36.18"W
CR1	Cresta Powerhouse (tailrace)	39°49'33.29"N	121°24'36.05"W

Figure 4: Water temperature monitoring stations used in the assessment of interim water temperature control measures
The embedded table includes a brief description of the locations of the stations.

Table 3: Actual Minimum Instream Flow Schedules for the Rock Creek Reach during the Three Test-Flow Periods (2002–2019)

Test Period	Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Final Water Year Type
1	**2002**	150	110	110	110	110	250	250	250	220	180	180	180	Normal
	2003	180	180	200	225	225	250	250	250	220	180	180	180	Normal
	2004	180	180	200	225	225	250	250	250	220	180	180	180	Normal
	2005	180	180	200	225	225	200	250	250	220	180	180	180	Normal
	2006	180	180	200	225	225	250	250	250	220	180	180	180	Wet
2	**2007**	180	180	200	225	225	280	110	150	150	150	150	150	Critically Dry
	2008	150	110	110	110	110	280	280	150	150	150	150	150	Critically Dry
	2009	150	110	110	110	110	280	280	280	210	210	210	210	Dry
	2010	210	210	280	280	280	280	280	350	260	260	260	260	Normal
	2011	260	260	350	350	350	350	350	350	260	260	260	260	Wet
	2012	260	260	350	350	350	110	280	280	210	210	210	210	Dry
	2013	210	210	280	280	280	350	350	280	210	210	210	210	Dry
	2014	210	210	280	280	280	110	110	150	150	150	150	150	Critically Dry
3	**2015**	150	110	110	110	110	574	150	150	150	150	150	150	Critically Dry
	2016	150	110	110	110	110	676	600	525	390	390	390	390	Normal
	2017	390	390	525	525	525	676	600	525	390	390	390	390	Wet
	2018	390	390	525	525	525	150	500	525	390	390	390	390	Normal
	2019	390	390	525	525	525	676	600	525	390	390	390	390	Wet

Table 4: Actual Minimum Instream Flow Schedules for the Cresta Reach during the Three Test-Flow Periods (2002–2019)

Test Period	Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Final Water Year Type
1	**2002**	140	100	100	100	100	250	250	250	240	220	220	220	Normal
	2003	220	220	240	240	240	250	250	250	240	220	220	220	Normal
	2004	220	220	240	240	240	250	250	250	240	220	220	220	Normal
	2005	220	220	240	240	240	200	250	250	240	220	220	220	Normal
	2006	220	220	240	240	240	250	250	250	240	220	220	220	Wet
2	**2007**	220	220	240	240	240	200	100	140	140	140	140	140	Critically Dry
	2008	140	100	100	100	100	200	200	140	140	140	140	140	Critically Dry
	2009	140	100	100	100	100	200	200	500	400	260	260	260	Dry
	2010	260	260	190	190	190	200	200	600	500	325	325	325	Normal
	2011	325	325	240	240	240	250	250	600	500	325	325	325	Wet
	2012	325	325	240	240	240	100	200	500	400	260	260	260	Dry
	2013	260	260	190	190	190	250	250	500	400	260	260	260	Dry
	2014	260	260	190	190	190	100	100	140	140	140	140	140	Critically Dry
3	**2015**	140	100	100	100	100	350	100	140	140	140	140	140	Critically Dry
	2016	140	100	100	100	100	400	525	490	460	440	351	300	Normal
	2017	200	150	400	400	400	400	525	490	460	440	351	300	Wet
	2018	200	150	400	400	400	100	420	490	460	440	351	300	Normal
	2019	200	150	400	400	400	400	525	490	460	440	351	300	Wet

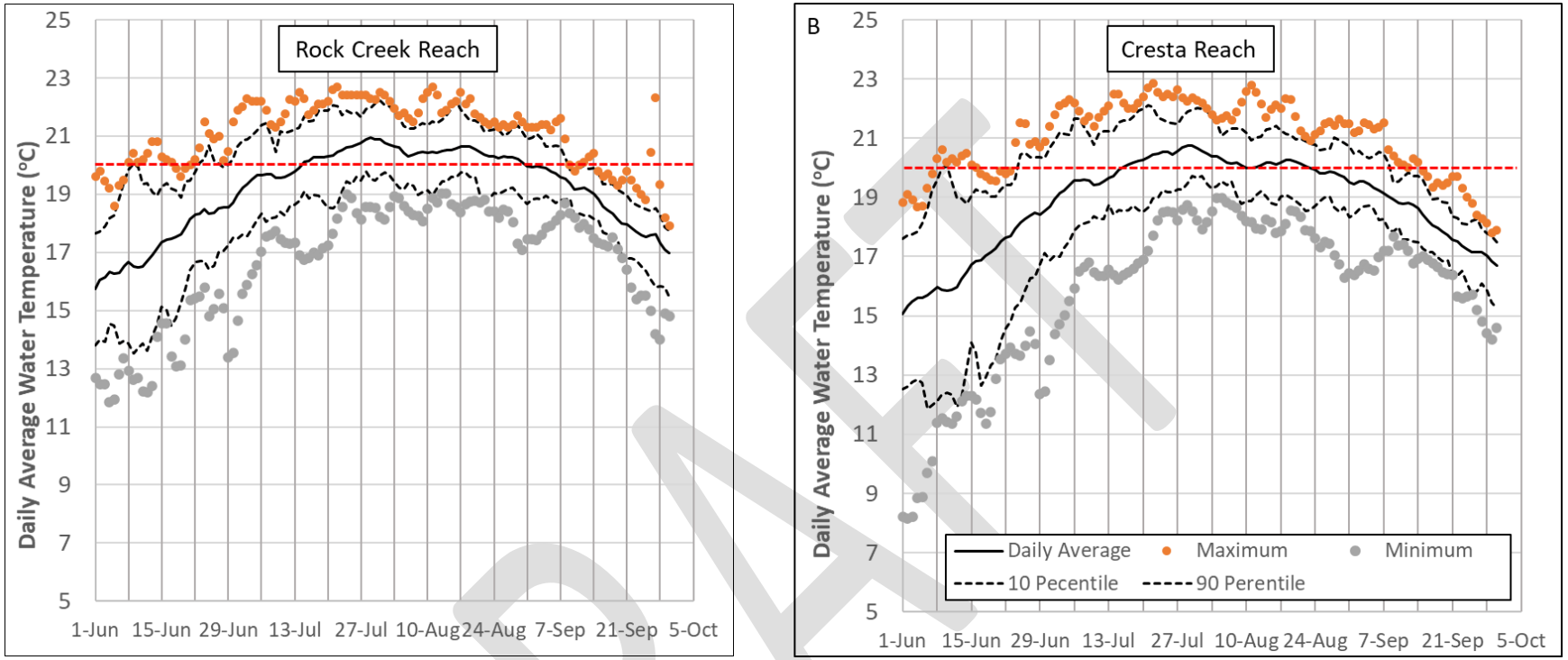


Figure 5: Daily average water temperature measured for 2002–2020 in the Rock Creek and Cresta reaches
Dashed redline indicates the 20ºC threshold identified in the RCC Project SA.

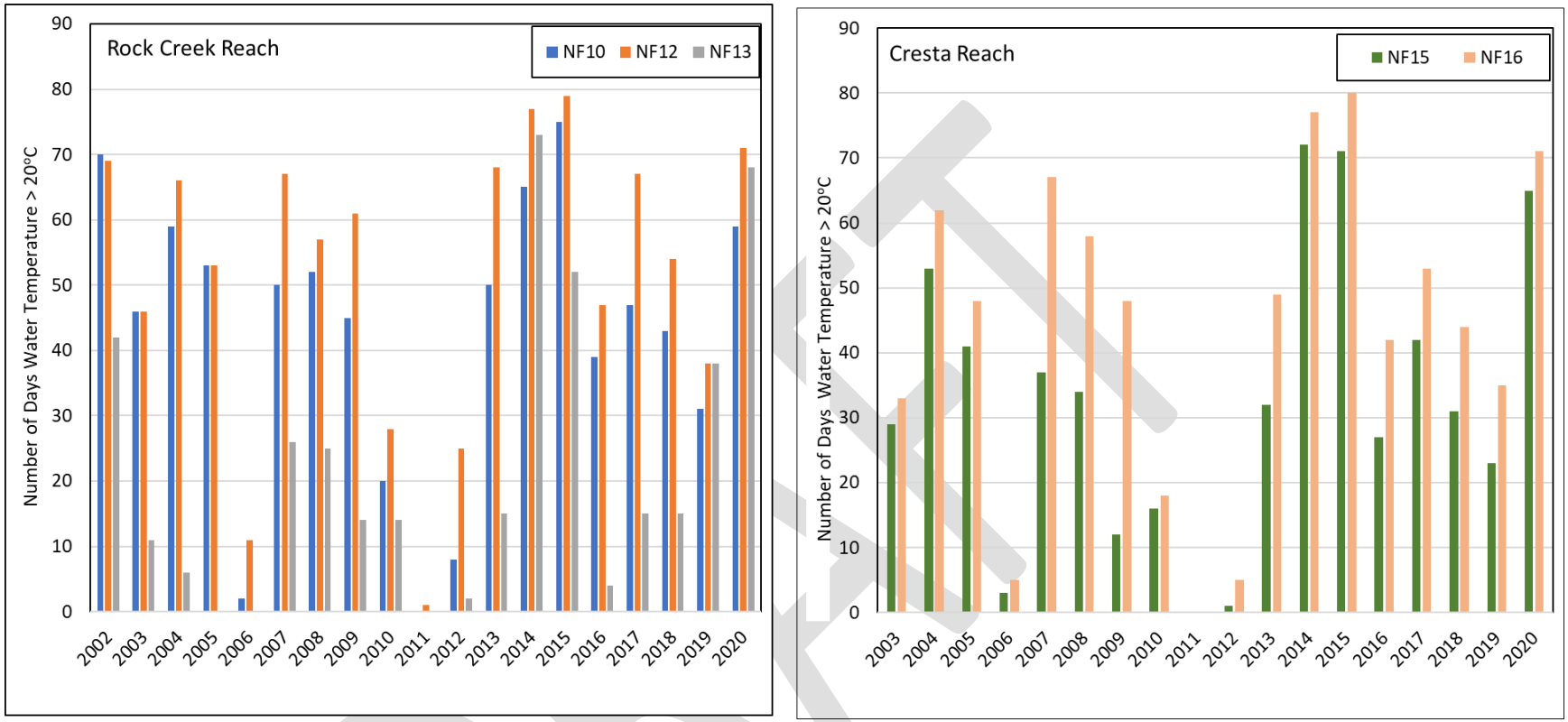


Figure 6: Number of days during each year that daily average water temperature exceeded 20ºC in the Rock Creek and Cresta reaches
The measurements are from multiple locations in both the reaches (as indicated in Figure 4).

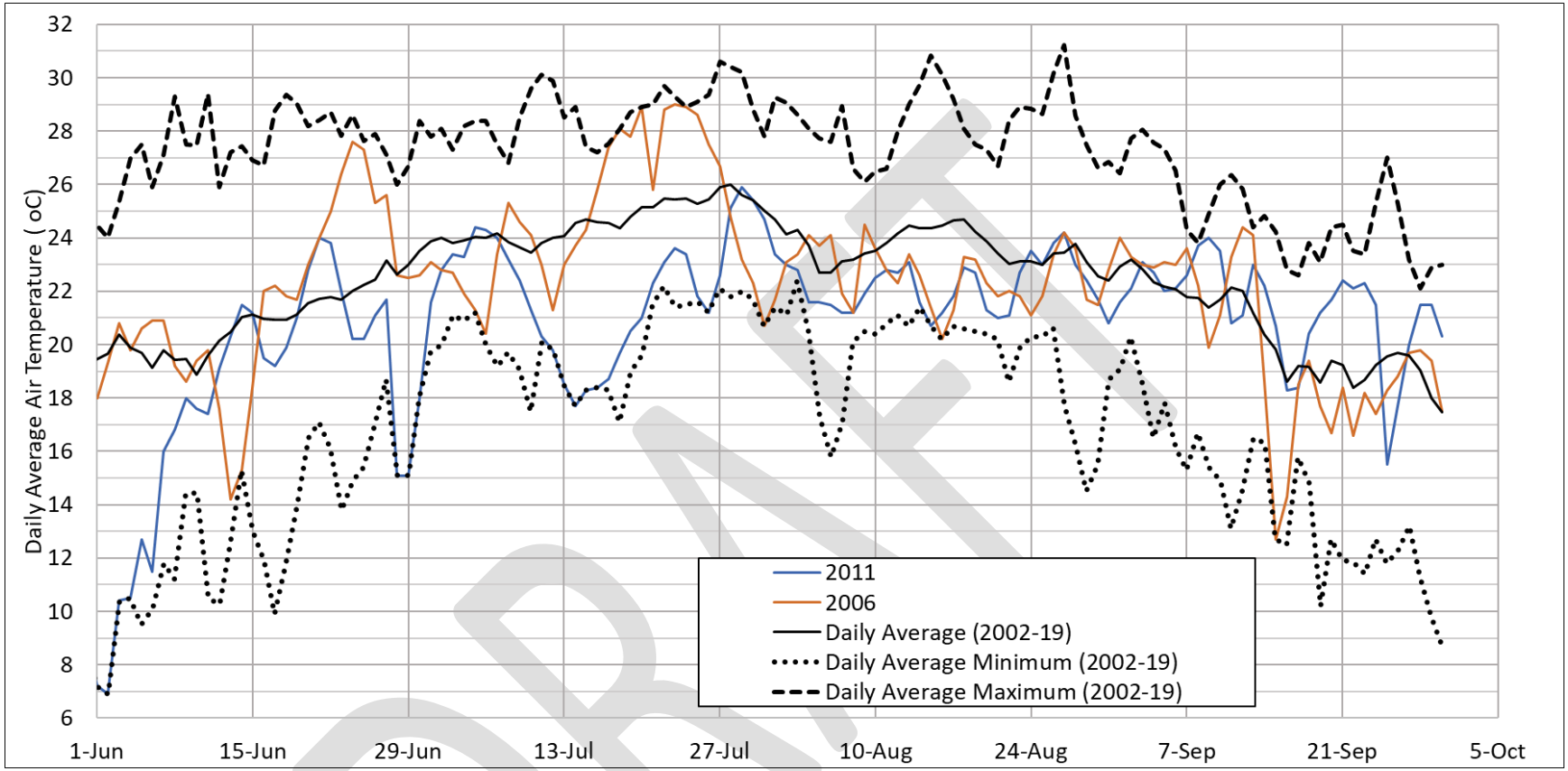


Figure 7: Daily average air temperature measured for 2002–2019 at Rock Creek Dam
Solid orange and blue lines indicate the daily average air temperature for 2006 and 2011, the years with the lowest number of days when water temperature in Rock Creek and Cresta reaches exceeded 20°C.

6. WATER TEMPERATURE CONTROL IN THE NFFR

Water temperature dynamics in the Rock Creek and Cresta reaches and along the NFFR in general have been studied for more than 30 years. PG&E or the SWRCB commissioned at least 14 studies to identify and evaluate water temperature reduction measures. Several of the technical reports produced from these studies provided details of model set-up, calibration, and validation, while others focused on the application of the models for determining the effectiveness of the water temperature reduction measures.

The studies can be broken into two distinct categories: (1) studies conducted from 1986 to 2004 for PG&E's initial report on water temperature and (2) the SWRCB studies conducted from 2004 to 2016 in support of the relicensing efforts for PG&E's UNFFR Project. Figure 8 provides a chronology of the various types of models and approaches, their connections, and the modeling reports involved in their development.

The following section provides an overview of events associated with identifying, evaluating, and implementing potential measures to control water temperature in the Rock Creek and Cresta reaches.

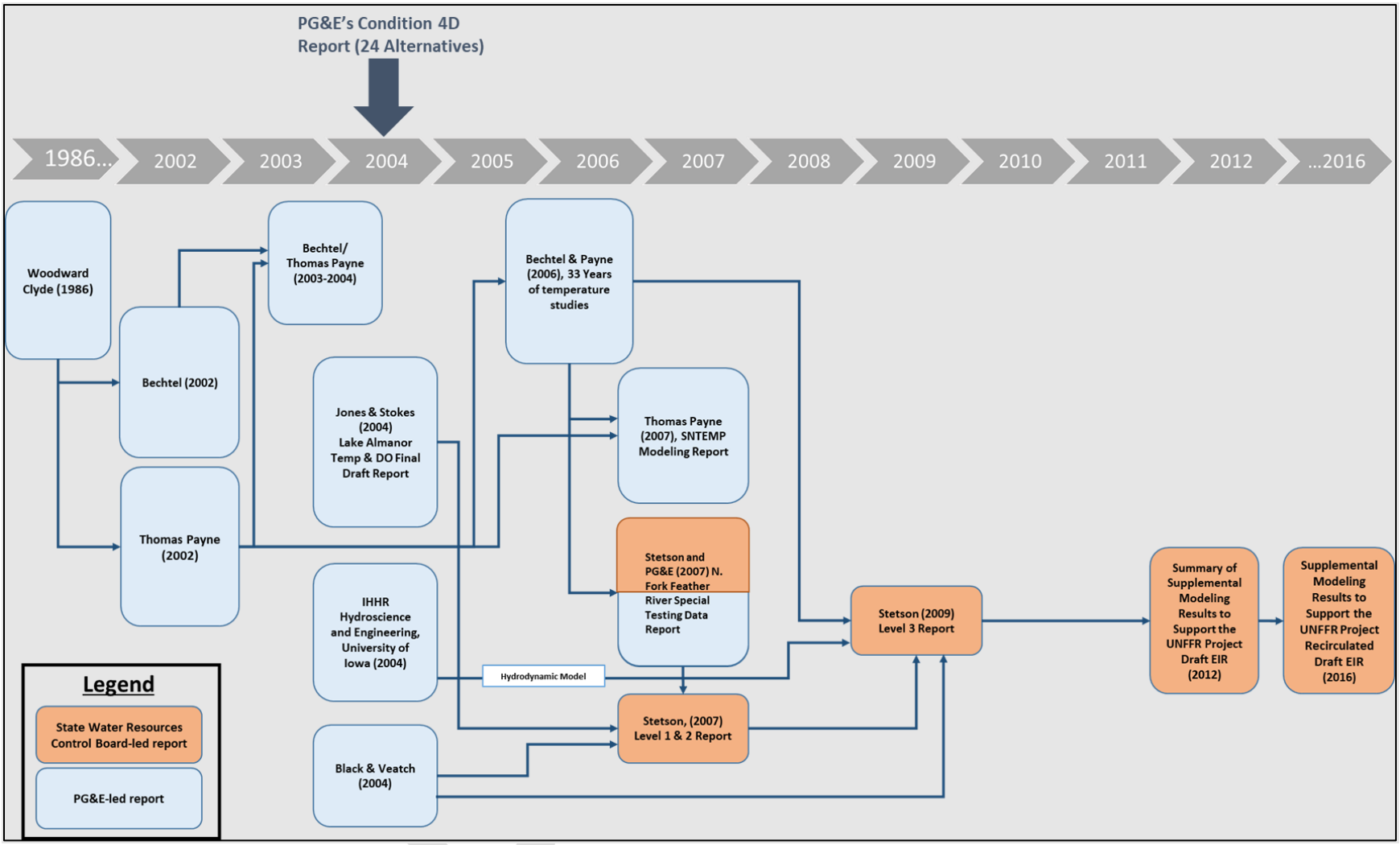


Figure 8: Chronology of water temperature modeling studies in the North Fork Feather River

6.1 THE 2005 INFORMATIONAL REPORT

6.1.1 Background

Formal discussions related to water temperature control measures were initiated during formulation of the RCC Project SA (PG&E et al. 2000a). These discussions precipitated the requirement for PG&E to identify potential measures to control water temperature and assess the measures' efficacy. The earliest study of water temperature related to the RCC Project was performed in 1986 (Woodward Clyde Consultants 1986a, 1986b) as part of the relicensing discussions for the RCC Project license.

Stipulations included in the SA and in the RCC Project License required a report on the assessment of water temperature control measures to be completed within 5 years of FERC approval of a water temperature monitoring plan. FERC approved the monitoring plan in 2003, which set the completion of the report to 2008 at the latest.

To develop the report (i.e., PG&E's 2005 Informational Report), PG&E conducted a series of studies from 2000 to 2004 that evaluated 24 water temperature control measures (alternatives). Bechtel and Payne (2004 and 2006) later collaborated on a study in support of the 2005 Informational Report that applied improved models to assess various water temperature control measures. PG&E conducted three more studies in 2004 for the 2005 Informational Report: (1) a physical model and hydrodynamic model of Lake Almanor (IIHR 2004), (2) a feasibility study based on the physical model and potential water temperature control measures (Black & Veatch 2004), and (3) a dissolved oxygen model of Lake Almanor (Jones & Stokes 2004). Using these studies and other available information (e.g., groundwater well driller logs), PG&E completed the assessment of water temperature control measures and submitted the study results to FERC on July 28, 2005 (PG&E 2005a). The report containing the study results is included in Appendix B.

After submission of the report, the ERC and Forest Service argued that it did not, but should, include the SWRCB's impending analysis in support of the UNFFR relicensing project. The SWRCB analysis was initiated in 2009 and continued through 2016, a timeframe that was outside of FERC's 2007 deadline to submit the report (as further described in Section 6.2).

On September 19, 2005, PG&E informed FERC that it was retracting the report as a formal response to the Condition No. 4.D requirement. While doing so, PG&E noted that the ERC and Forest Service (not PG&E) had characterized the report as premature and deemed that it did not fully satisfy the requirements for compliance with Condition No. 4.D. PG&E also requested that the title of the submitted report be changed to *North Fork Feather River Study Data and Informational Report on Water Temperature Monitoring and Additional Reasonable Water Temperature Control Measures, amended September 2005* (PG&E 2005b). Disagreements over the scope of potential water temperature control measures caused the ERC to decide not to submit recommendations for reasonable control measures at that time, opting instead to wait for

additional analysis of water temperatures in the NFFR that were being conducted for the relicensing efforts for the UNFFR Project and the associated SWRCB California Environmental Quality Act (CEQA) review as part of the water quality certification (PG&E 2006).

6.1.2 Alternatives Evaluated

To address the requisites in Condition No. 4.D, PG&E monitored water temperature along the NFFR, including the Rock Creek and Cresta reaches, and determined that water temperature in the Rock Creek and Cresta reaches routinely exceeded 20°C during the warm summer months (i.e., June–September). PG&E then identified 24 potential water temperature control measures (alternatives) for achieving colder water in the NFFR. PG&E assessed the efficacy of each measure by evaluating both the potential for water temperature reduction and the economic and ecological impacts of implementation.

Twenty of the 24 alternatives identified could be applied in the Rock Creek and Cresta reaches. Two others were targeted at the downstream Poe Reach, and two were targeted at the upstream Belden Reach. The 24 alternatives were grouped into the following three categories based on the source of cold water to be used for cooling:

Category 1: Alternatives with cold water sourced from Lake Almanor and accessed through the use of thermal curtains or other means at the existing Prattville intake structure located in the lake (Table 5).

Category 2: Alternatives with cold water sourced from Lake Almanor and obtained by increasing the magnitude of seasonal water releases using the low-level gates in the existing Canyon Dam outlet structure located in the lake, and/or by reoperating the Licensee's UNFFR, Rock Creek-Cresta, Poe, and Bucks Creek projects (Table 6).

Category 3: Alternatives with cold water from sources other than Lake Almanor (Table 7).

To evaluate the alternatives, PG&E developed and tested five instream water temperature models and two reservoir models using data from 1983 to 2003 from FERC-licensed projects (UNFFR, Rock Creek-Cresta, and Poe).

In addition to the water temperature response to each alternative, PG&E evaluated environmental and economic factors associated with the alternatives, including:

- Construction and implementation costs
- Potential impacts to water quality
- Potential impacts to fisheries

Table 5. Alternatives with Cold Water Sourced from Lake Almanor Accessed through the Use of Thermal Curtains or Other Means at the Existing Prattville Intake

Category	Alternative	Butt Valley Reservoir		Prattville (Lake Almanor)			Estimated Temperature Decrease		Negative Impacts	
		Thermal Curtain Upstream	*Thermal Curtain Downstream*	*Curtain*	*Hooded Pipeline*	*Dredge*	*Magnitude (ºC)*	*Location*	*Loss of Cold-Water Habitat (Lake Almanor)*	*Reduced Fish Population (Butt Valley Reservoir)*
1. Cold Water from Lake Almanor using thermal curtains or modifications to Prattville intake	1			x			~1	B, R, C, P	x	x
	2				x		<0.5	B, R, C, P		
	3			x	x	x	~0.5	B, R, C, P		
	4	x	x	x		x	~3	B, R, C, P	x	x
Notes: B = Belden Dam; C = Cresta Dam; NFFR = North Fork Feather River; P = Poe Dam; R = Rock Creek Dam.										

Table 6. Alternatives with Cold Water Sourced from Lake Almanor Obtained by Increasing the Magnitude of Seasonal Water Releases at the Low-Level Gates in Canyon Dam

Category	*Alternative*	Dam Releases (Increased Flows)					Butt Valley Reservoir		Lake Almanor		Temperature Change		Negative Impacts		Power Generation Decreases
		B	*R*	*C*	*P*	*BK*	*Butt Valley Powerhouse Release*	*Lake Almanor Release*	*Prattville*	*Canyon Dam*	*Magnitude (ºC)*	*Location*	*Reduced Fish Population*	*Reduced Flows to B, R, C, and P*	
2. Increased flows from Canyon Dam and/or reoperation of NFFR projects	5						Reduced flows	x			None	B, R, C, P	x	x	x
	6						Reduced flows	x		Increased flows	~1–2	B, R, C, P	x		x
	7										0.5–3 (few days)	C, B			
	8								Increased flows	Selective cold releases	None				x
	9	x									Temperature rise	B			x
	10		x								Temperature rise	R			x
	11			x							None				
	12				x						0.5–1.5	P			
	13					x					Minor				
Notes: B = Belden Dam; BK = Bucks System; C = Cresta Dam; NFFR = North Fork Feather River; P = Poe Dam; R = Rock Creek Dam.															

Table 7. Alternatives with Cold Water from Sources Other Than Lake Almanor

Category	Alternative	Activity	Location	Temperature Drop		Challenging Construction
				Magnitude (ºC)	*Location*	
3. Obtain Cold Water from Sources Other than Lake Almanor	14	Construct mechanical water-cooling towers.	B, R, C, P	~1	Immediately downstream of dam	
	15	Construct mechanical water chillers.	B, R, C, P	~1	Immediately downstream of dam	
	16	Construct water wells.	B, R, C, P			Not viable
	17	Construct a water pipeline and pumping stations to pump cool water from Lake Oroville.	B, R, C, P			
	18	Construct a new dam and water pipeline on Upper NFFR to cool the Belden Reach.	Above Caribou Powerhouse	~2.5	Below Belden Dam	
	19	Construct a new dam and water pipeline on Yellow Creek to cool the Rock Creek Reach.	Above Belden Powerhouse	~1.2	Below Rock Creek Dam	
	20	Construct a new diversion structure and water pipeline at Bucks Creek Powerhouse to cool the Cresta Reach.	Bucks Powerhouse tailrace	~1.2	Below Cresta Dam	
	21	Construct a new large dam and reservoir.	Yellow Creek and/or the East Branch Feather River			
	22	Enlarge an existing dam and reservoir.	East Branch Feather River			
	23	Plant and Manage Riparian Vegetation to Improve River Shading.	East Branch Feather River			
	24	Construct a Water Pipeline.	Existing Poe tunnel adit (#1) to portion of the Poe Reach			
Notes: B = Belden Dam; C = Cresta Dam; NFFR = North Fork Feather River; P = Poe Dam; R = Rock Creek Dam.						

6.1.3 Evaluation Results

PG&E's analysis of the 24 potential water temperature control alternatives indicated that a few of the first and second category alternatives had the potential to reduce water temperatures in the Rock Creek and Cresta reaches. However, none of the alternatives could contain water temperature at or below 20ºC for the duration of the summer. Further, reductions in water temperature would increase the cold-water trout habitat in the Rock Creek Reach by about 3 to 8 percent and in the Cresta Reach by about 0.5 to 2 percent in July and August of normal water years. The overall benefits of such modest gains in cold water trout habitat were found to be limited and likely not measurable given natural fish population variability. Also, these alternatives were found to likely reduce cold-water fish habitat in Lake Almanor and fish production in Butt Valley Reservoir, resulting in a decrease of the aquatic resources and recreational value at each of these reservoirs.

All potential water temperature control alternatives were found to have substantial costs (i.e., in the range of tens of millions of dollars), which, if implemented, would be borne by PG&E's customers. As a result of the analysis, PG&E concluded that no additional reasonable water temperature control measures were available for achieving a year-round water temperature of 20°C or less in the Rock Creek and Cresta reaches.

6.2 STATE WATER RESOURCES CONTROL BOARD STUDIES (2009–2016)

6.2.1 Background

In April 2004, the UNFFR Project reached a final relicensing settlement agreement (PG&E et al. 2004a). This settlement agreement set out new flow requirements for the UNFFR Project and was agreed upon and supported by all signatory parties. FERC subsequently completed an environmental impact statement (EIS) as part of the National Environmental Policy Act process, and the SWRCB completed a draft environmental impact report (EIR) through the CEQA process as part of the water quality certification process.

For the draft EIR, the SWRCB analyzed various water temperature control measures between 2007 and 2016 for the UNFFR, Rock Creek-Cresta, and Poe projects and provided the results in a series of reports. The SWRCB drew on PG&E's modeling studies and the 2005 Informational Report to identify and assess temperature control measures. The SWRCB also contracted with Stetson Engineers, Inc., to complete a series of modeling and technical studies, including a collaborative operational testing study with PG&E (Stetson Engineers Inc. and PG&E 2007). The SWRCB investigations resulted in the Level 1, Level 2, and Level 3 reports (Stetson Engineers, Inc. 2007, 2009), followed by two supplemental reports (Stetson Engineers, Inc., 2012, 2016). The alternatives evaluated are summarized in Section 7 of this report, and the entire reports are included in Appendix C, with additional details included in Appendix D.

On July 16, 2020, FERC determined that the SWRCB had waived its water quality certification authority under Section 401 of the Clean Water Act for the UNFFR Project relicensing (FERC 2020).

Consistent with *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region, Fifth Edition* (Basin Plan) (SWRCB 2019), the UNFFR settlement agreement contains no requirements for the UNFFR Project to maintain water temperature at or below 20°C in the Rock Creek and Cresta reaches. The only commitment to evaluate the goal to maintain water temperatures at or below 20°C in the Rock Creek and Cresta reaches is found in the RCC Project SA.

The following section summarizes the water temperature studies the SWRCB completed.

6.2.2 Alternatives Evaluated

The SWRCB's analysis built on PG&Es 2005 Informational Report. In addition to the 24 alternatives assessed by PG&E in the 2005 Informational Report, the SWRCB's assessments included some additions and modifications. During the initial stages of developing the draft EIR for the UNFFR Project, the SWRCB identified 17 additional alternatives, resulting in a total of 41 potential water temperature control measures. These measures were evaluated through a "Preliminary Formulation" (Stetson Engineers, Inc., 2007). This was followed by the Level 1, 2, 3, and two additional supplemental modeling studies completed in 2016. These studies involved the elimination, addition, and modification of various alternatives that resulted in nine water temperature control measures the SWRCB identified as potentially viable. For the Level 3 evaluations, the SWRCB assessed alternatives that were not eliminated during the Level 2 process. Specifically, additional modeling was used to determine the effectiveness, feasibility, sustainability, and reliability of the water temperature reduction alternatives. The 2012 and 2016 supplemental studies further investigated a select number of alternatives.

The 41 alternatives considered in the preliminary formulation are summarized in Appendix D, Table 1 and the 14 alternatives considered in Level 1 and 2 are summarized in Appendix D, Table 2. The alternatives added for Level 3 and the 2012 and 2016 supplemental modeling are summarized in Appendix D, Tables 3 through 5.

6.2.3 Evaluation Results

The SWRCB's preliminary assessment of PG&E's 24 alternatives and an additional 17 measures resulted in the elimination of 27 measures (Appendix D, Table 1). The remaining 14 alternatives became part of the Level 1 evaluation (in Appendix D, Table 2) during which three alternatives were eliminated. Five other alternatives were eliminated through the Level 2 assessment. Subsequently, Level 3 focused on alternatives remaining after Level 1 and 2 studies, in addition to three new alternatives.

During the Level 3 assessment, three alternatives were eliminated. A later supplemental modeling study in 2012 added two new alternatives derived from the existing alternatives. Another supplemental modeling study was performed in 2016 that included three additional alternatives.

Figure 9 outlines the evolution of the temperature control measures the SWRCB evaluated.

The SWRCB's assessments (as detailed in the Levels 1–3 and Supplement 1 and 2 reports) found that none of 63 alternatives considered could achieve the Condition No. 4.D objectives by containing water temperatures at or below 20°C year-round in the Rock Creek and Cresta reaches. The SWRCB's modeling results also showed potential for certain measures to significantly diminish cold-water habitat in Lake Almanor, negatively affecting ecological life supported in the lake.

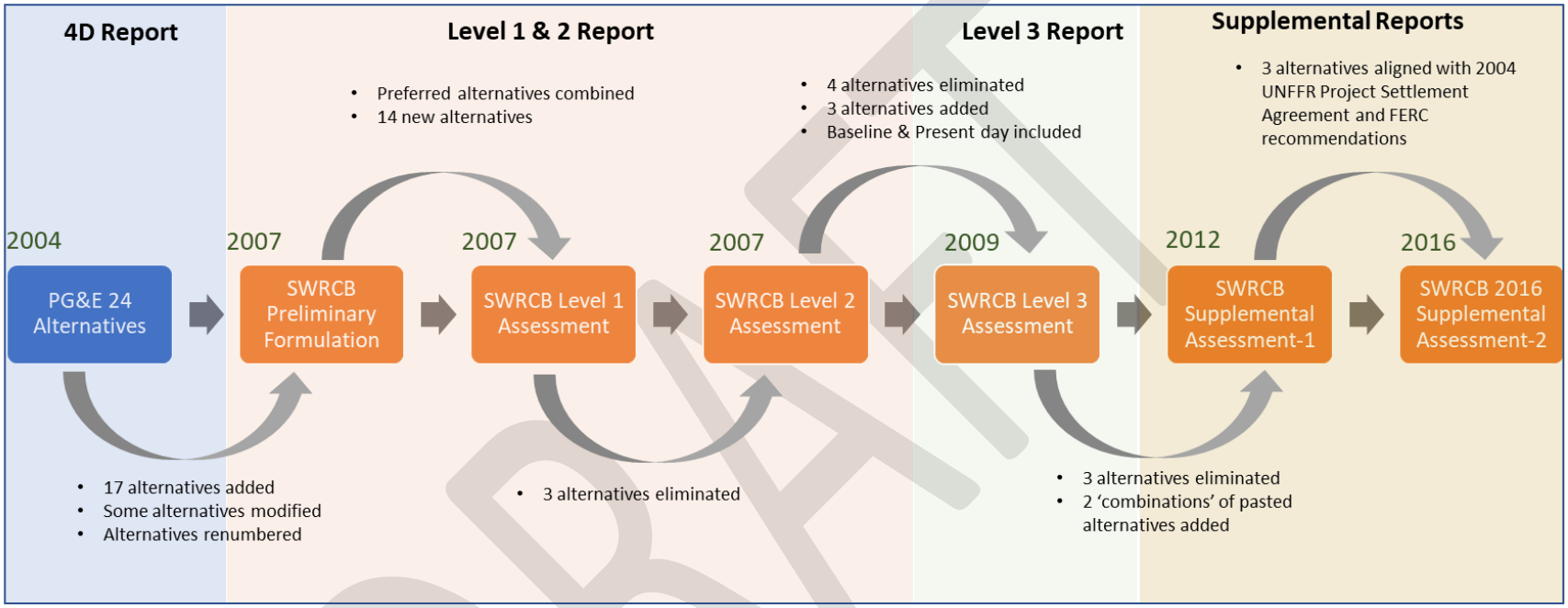


Figure 9: Progression of the State Water Resources Control Board's evaluation of water temperature control measures (alternatives) for the NFFR

6.3 INTERIM WATER TEMPERATURE CONTROL MEASURES

6.3.1 Background

In a letter to FERC dated April 30, 2012 (PG&E 2012), PG&E requested an extension of time to file an updated 4.D Report, as in previous years since 2009. As part of this request, PG&E submitted a proposal, developed with the ERC and Forest Service, to implement five IWTCMs, four of which were directly related to water temperature control. FERC approved this proposal on July 18, 2012 (FERC 2012). PG&E implemented the IWTCMs in part to determine their effectiveness in reducing water temperature in the Rock Creek and Cresta reaches and to inform the ERC and Forest Service of their potential as permanent control measures. PG&E has implemented the IWTCMs since 2012 and annually reported the results to the ERC, the Forest Service, and FERC. PG&E is required to continue to implement the IWTCMs until FERC makes a final determination after reviewing this 4.D Report.

A detailed assessment of the four measures' temperature impacts is included in Appendix E.

6.3.2 Alternatives Implemented

The four measures that have been implemented by PG&E since 2012 are summarized below:

Measure 1

When the daily average water temperature in the Rock Creek or Cresta reach exceeds the 20ºC criterion for 2 consecutive days, PG&E maximizes the release of the minimum instream flow requirement at each reservoir through the low-level outlet (LLO) located approximately 30-feet below the invert of the radial gates.

Measure 2

PG&E preferentially operates the Caribou 1 Powerhouse over the more efficient Caribou 2 Powerhouse once the temperature criterion is exceeded. To preserve the finite amount of colder water in Butt Valley Reservoir, PG&E attempts to maintain Butt Valley Reservoir at maximum pool and minimizes the operation of Caribou 1 until July 15 or until the first occurrence of average daily temperatures exceeding 20ºC for 2 days in either the Rock Creek Reach (NF-57) or Cresta Reach (NF-56), whichever occurs sooner. During this special operation of Caribou 1, Caribou 2 operation is reduced as much as reasonably possible to minimize mixing the colder water with surface water. This operation lasts 5 days because effective cold-water withdrawal from Caribou 1 diminishes after this period.

Measure 3

PG&E operates the Bucks Creek Powerhouse in a manner that helps reduce daily average water temperatures both in the lower Rock Creek Reach (between Bucks Creek and Rock Creek powerhouses) and the Cresta Reach. Bucks Creek Powerhouse discharges to the NFFR approximately 1 mile upstream of Rock Creek Powerhouse.

Measure 4

During critically dry years, after implementing Measures 1 through 3 and when daily average temperatures at NF-57 or NF-56 are above 20ºC, PG&E increases the minimum instream flow from the Rock Creek (150 cubic feet per second [cfs]) and Cresta (140 cfs) dams to 200 cfs.

6.3.3 Evaluation Results

Measure 1, which calls for flows from the LLO outlets in Rock Creek and Cresta dams is ineffective, because no cooler pool of water exists in either reservoir because of the small size of each reservoir and the mixing that occurs in them.

Measure 2, which involves using the cold-water pool in Butt Valley Reservoir, has the potential to temporarily reduce the water temperature in the Rock Creek and Cresta reaches early in the summer (i.e., before mid-July). However, the cold-water pool is relatively small and temperature reductions occur for a short period (i.e., 1–4 days). Further, this is not a guaranteed source of cooling later in the summer because the cold-water pool in Butt Valley Reservoir becomes increasingly susceptible to warming.

Measure 3, using the Bucks Creek Project to provide cooler water, is effective in significantly reducing the water temperature in approximately 0.8 miles of Rock Creek Reach and to a lesser extent in the Cresta Reach. This measure relies on the operation of Bucks Creek Powerhouse, which is likely to run during the warm periods when water temperatures in the NFFR are high.

Measure 4, increasing flows from 150 cfs to 200 cfs during Critically Dry years, resulted in no clear indication that this measure could reduce water temperatures in the Rock Creek and Cresta reaches. Some potential exists for the intended results to occur in June, but the data also show the opposite effect during the latter part of summer, with higher flows sometimes aligning with larger increases in water temperature downstream. This phenomenon suggests that PG&E's operation (diverting water through granitic tunnels and penstocks) maintains cooler water downstream than releasing more water at the dam through MIFs.

None of the 4 IWTCMs can maintain water temperatures of 20ºC in the Rock Creek and Cresta reaches. Measures 1 and 4 are completely ineffective at reducing water temperatures in the Rock Creek and Cresta reaches. Measure 2 may provide a very short-term (approximately 3 days) reduction in temperature in the Rock Creek and Cresta reaches, but at the cost of reducing the limited coldwater pool of Butt Valley Reservoir. Measure 3 provides a relatively clear but very localized benefit to approximately 0.8 miles of the Rock Creek Reach but is contingent on the operation of the Buck Hydroelectric Project, which is not part of the RCC Project License. PG&E's ability to maintain this measure is limited as maintenance and repairs typically occur during the summer months due to the elevation of the Bucks Hydroelectric Project.

7. DISCUSSION

PG&E's monitoring of water temperature in the Rock Creek and Cresta reaches from 2002 to present confirms that this section of the NFFR consistently exceeds 20°C during the summer months. This is true even with implementation of the IWTCMs since 2012. Results from PG&E's and then the SWRCB's exhaustive studies completed over the last 40 years indicate that, even with significant manipulations to flows in the NFFR, no feasible option is available for attaining water temperatures below 20°C.

As agreed to in the SA and stated in the RCC Project License, Condition No. 4.D tasks PG&E to identify "reasonable" control measures that can be implemented as part of the RCC Project to prevent water temperature in the RCC Project reaches from exceeding 20°C. PG&E and the SWRCB have investigated dozens of measures, some of which are not reasonable because involve they facilities or operations that are outside the scope of the RCC Project license and SA or they far exceed the cap for costs associated with these measures set forth in the SA and license Condition No. 4.E or they provide harm and/or no benefit to resources in the NFFR and affected reservoirs. Based on these analyses, no options are available that rely solely on RCC Project operations to cool water temperatures in the Rock Creek and Cresta reaches to the negotiated temperature of 20°C. The RCC Project has no operational control of cold water that can be used to reduce the temperature of water flowing through the RCC Project.

Even if the operation of adjacent upstream hydroelectric projects (i.e., Bucks and UNFFR) are considered, the PG&E and SWRCB studies show that no alterations to those projects would result in sustained containment of water temperature at or below 20°C in the Rock Creek and Cresta reaches. These studies also show that measures that briefly reduce water temperature in the Rock Creek and Cresta reaches rely on consuming the finite cold-water pools in Butt Valley Reservoir and Lake Almanor Reservoir. The impacts of pulling cold water from Butt Valley Reservoir have not been evaluated; however, the water temperature studies suggest that using cold water from Lake Almanor to cool the Rock Creek and Cresta reaches could degrade the cold-water fishery in Lake Almanor.

Further, certain measures identified to have potential to reduce temperatures in the Rock Creek and Cresta reaches involve capital projects (e.g., thermal curtains and modifications to the Lake Almanor Dam intake tower) and changes to project operations on the UNFFR Project. These modifications would involve costs that far exceed the total financial commitments required under Condition No. 4.E. See Appendix B and C-2 for details on cost analyses of selected water temperature control measures.

The IWTCMs PG&E has implemented since 2012 have not been found to contain water temperature at or below 20°C in the Rock Creek and Cresta reaches. PG&E's evaluation of the IWTCMs shows that two of the four measures (Measures 1 and 4) result in no reduction of water

temperature, while the other two (Measures 2 and 3) have limited spatial and temporal benefits, with no tangible benefits to the trout habitat; thus, implementing them provides no value.

Measures 1 and 4 are based on the incorrect assumption that the LLOs at Rock Creek and Cresta dams release cooler water. The LLOs do not access a cooler pool of water because the reservoirs above these dams are not thermally stratified. Additionally, the LLOS have a limited capacity (< 150 cfs) and any additional flow requirements above that are met via the radial gates on each dam, which can only access the uppermost (and warmest) portions of the reservoir. Therefore, introducing higher MIFs does not lower water temperatures. At most, higher flows could result in less thermal loading, which was not observed to be the case in the Rock Creek and Cresta reaches.

The preferential release of flows from the Caribou 1 Powerhouse (IWTM 2) can sometimes provide 2–4 days of suppressed water temperature early in the summer, before high water temperatures dominate for a period of 6–8 weeks. However, this temperature suppression is not guaranteed because high air temperatures during this period of Caribou releases can overwhelm any cooling. Therefore, no obvious biological benefit to trout population in the Rock Creek and Cresta reaches occurs as a result of implementing Measures 1 and 4.

The implementation of IWTCM 3 has shown that the potential exists for the approximately 0.8-mile-long lower section of the Rock Creek Reach to remain below 20ºC, but that depends on the continuous operation of Bucks Creek Powerhouse during the summer months, which is not always feasible because of geographic and operational constraints that limit access and maintenance to the summer months.

All additional information corroborates the conclusions presented in the 2005 Informational Report that no reasonable measures exist to maintain water temperatures at or below 20°C in the Rock Creek and Cresta reaches.

The goal in the RCC SA to maintain temperatures below 20°C is an arbitrary, negotiated metric. There is no scientific consensus on the optimum temperature for trout populations. Further, there is no water quality objective in the Basin Plan that supports or requires attainment of water temperature in the Rock Creek and Cresta reaches below 20°C. The Rationale Report for the Rock Creek-Cresta Relicensing Settlement Agreement (Rationale Document) is inconclusive on preferred temperatures for trout. Some appendices in the Rationale Document suggest that trout are cable of acclimating to temperatures as high as 24°C (PG&E et al. 2000b). The trout population in the East Branch of the NFFR, which is much warmer than the RCC Project reaches during the summer, corroborates these studies. Over the last 20 years biological monitoring and anecdotal observations indicate that there is no physiological stress to fish populations in the Rock Creek and Cresta reaches, suggesting that the current temperature regime is not impacting the cold-water fishery (PG&E 2021). The current stable populations of cold-water and warmwater fish in the reaches suggests that this section of the NFFR may not be classified

accurately to reflect existing conditions and should be reclassified as a transitional zone that supports both a warm and cold-water fishery.

8. RECOMMENDATIONS

Given the exhaustive list of potential water temperature reduction measures that the ERC, the SWRCB, and PG&E have identified, vetted, and found to be ineffective, and given the conclusion from multiple evaluations that most measures are often associated with potential negative ecological impacts to Lake Almanor and Butt Valley Reservoir, PG&E strongly recommends investing no additional efforts or customer resources to contain water temperatures at or below 20°C in the Rock Creek and Cresta reaches.

The past four decades has demonstrated the futility of efforts to control water temperature in the RCC Project reaches, at considerable expense to PG&E's customers. The failure of all the measures analyzed and the ineffectiveness of the IWTCMs strongly suggests that natural environment factors prevalent in the system (e.g., ambient air temperatures and seasonal sun exposure) are responsible for the observed water temperatures in the Rock Creek and Cresta reaches.

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